OPERATIONS, MAINTENANCE, AND MONITORING MANUAL

Former Carborundum Facility
2040 Cory Drive
Village of Sanborn, Town of Wheatfield, Niagara County, New York

Submitted to:

New York State Department of Environmental Conservation
Division of Hazardous Waste Remediation
270 Michigan Avenue
Buffalo, New York 14203

Submitted by:

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A BP affiliated company

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August 2013

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TABLE 1
UPDATES TO FORMER CARBORUNDUM FACILITY, SANBORN, NY
OPERATIONS, MAINTENANCE, AND MONITORING MANUAL FOR GROUNDWATER REMEDIATION SYSTEM

Date	Affected Sections	Reason For Change
August 2013	All	OM&M Manual Update

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Operations, Maintenance, and Monitoring Manual For:

GROUNDWATER REMEDIATION PROGRAM AT THE FORMER CARBORUNDUM FACILITY

Village of Sanborn, Town of Wheatfield, Niagara County, New York

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May 2013

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SECTION 1

INTRODUCTION

1.1 PROJECT BACKGROUND

The Atlantic Richfield Company, on behalf of BP manages an environmental remediation system at the former Carborundum Facility at 2040 Cory Drive in Sanborn, NY (see Figures 1 and 2, Site Plan). The system was designed, built, and commenced operation in mid-1993. The system incorporated a soil vapor extraction system (SVES), as well as treatment of groundwater extracted by the groundwater remediation system (GRS) for discharge to the SPDES outfall (see Appendix A for the original record drawings). The systems were installed in order to address chlorinated solvents identified in the soil and groundwater. The SVES operated until September 2001. All SVES operations were discontinued in 2002 with approval of the New York State Department of Environmental Conservation (NYSDEC). The SVES was completely decommissioned by the end of 2006. The GRS continued operation after the SVES operations were discontinued. In 2012, the Vault Water Collection and Conveyance (VWCC) system was added to collect the groundwater from the Metaullics furnace vaults for processing through the treatment system along with the recovery well groundwater. The GRS operates with goals to provide onsite migration control, and to prevent offsite migration of groundwater containing volatile organic compounds (VOCs).

1.2 PURPOSE OF OM&M MANUAL

This document presents an operations, maintenance, and monitoring (OM&M) manual for post-remedial construction activities at the site, which complies with the requirements set forth under 6 NYCRR Part 360-2.1 5(i)(7). This manual was prepared in accordance with guidance from NYSDEC Draft DER-10 (NYSDEC, 2002) and BP REMED-GP 35-0001 Inspection and Maintenance Requirements for Remediation Systems Manual Section 5.5. In addition to GRS operation and maintenance, this manual describes the groundwater monitoring, reporting requirements, emergency response procedures, and community involvement.

1.3 SPECIAL SITE-SPECIFIC SAFETY WARNINGS (DO'S AND DON'TS)

A Health, Safety, Security, and Environment (HSSE) Plan is included in Appendix B, detailing the site safety requirements. A hard hat, high visibility vest, long sleeve shirt, protective glasses with side shield, gloves as needed, and steel-toed boots are required at the site, both inside the treatment plant and outside. Elevated levels of volatile organics (mainly chlorinated ethenes) have been identified in the groundwater at the site. Mechanical and electrical hazards exist within the treatment plant, and therefore, any repairs or operation of the system should be done by someone with appropriate knowledge and training following Parsons Defined Practices. Any work at the site requires that a Work Risk Assessment be developed in advance of the work. Once the Work Risk Assessment is completed, TSEAs, Tool-box meetings, and any required work permits (ie. working at heights, hot work, etc.) will be completed daily prior to the start of work.

1.4 RECORDS MANAGEMENT

SPDES

In accordance with the current State Pollutant Discharge Elimination System (SPDES) permit, a copy of the permit, along with a minimum of the three most recent years of all documentation related to the SPDES discharge, are maintained at the site. These documents will include the monthly discharge monitoring reports (DMRs) that are provided to NYSDEC, and letters, memoranda, and facsimiles related to excursions of the SPDES permit. Inspection of the system and documentation are completed by NYSDEC approximately annually.

Monitoring Reports

Monitoring reports are completed quarterly, based on a calendar year. The first report covers the months of January, February, and March; the second covers April, May, and June; the third includes July, August, and September; and an annual report (Periodic Review Report or PRR) is completed covering the entire year. Reports document the day-to-day operation of the system and results of the quarterly groundwater monitoring. Reports are maintained at the site and in the Parsons office file.

Site Activities

A Daily Toolbox Meeting Record (DTMR) form is completed on a daily basis and covers the activities planned for that specific day. For each activity to be completed at the site, a Task Safety Environmental Analysis (TSEA) is completed and reviewed each time that the activity is planned. Certain jobs require the completion and authorization of work permits including working at heights, confined space entry, and hot work. Appendix B of the HSSE plan includes copies of blank DTMR's, TSEA's, and work permits. The HSSE plan should be referenced to determine what activities require completion and authorization of a work permit. DTMR's, TSEA's, and work permits are available at the work site during the time that the documents are active, and are later maintained in a project file.

Incident Reporting

All incidents must be reported, whether or not they result in lost work time or injury. Reporting is required to both Parsons and Atlantic Richfield Company. The HSSE plan in Appendix B provides information on reporting requirements.

SECTION 2

SITE DESCRIPTION AND BACKGROUND

2.1 HISTORY OF SITE OPERATIONS

Industrial operations at the site began in 1963. In 1983, trichloroethene (TCE) was first identified in the facility's SPDES outfall from samples collected during a NYSDEC inspection and in groundwater samples from production well P-2. The Remedial Investigation (RI) report indicates that TCE was used at the site from 1963 through 1983. Other chlorinated organics used during this time period included 1,1,1-trichloroethane (TCA) and carbon tetrachloride. TCA was still in use at the site in 1990, but carbon tetrachloride was not. Methylene chloride was used beginning in June 1988 (E&E, 1990).

The first field investigation was conducted in August 1984 and included soil borings, well installations, and groundwater sampling. Six groundwater monitoring wells (B-3M through B-8M) were installed in the top of rock during the first investigation. The second investigation was completed in 1986 and 1987. Tasks during the second investigation included the installation of six additional groundwater monitoring wells (B-9M through B-14M), a soil gas survey, a 24-hour pumping test at well P-2, private well and sump sampling, and seismic refraction and resistivity surveys. A third phase of work, designed to further define the extent of chlorinated organic impacts in the groundwater and fill in data gaps for the remedial design, was completed in 1988 and 1989. Tasks included the installation of 10 additional groundwater monitoring wells in the top of rock, three wells in deep bedrock, residential well and sump sampling within a 0.75-mile radius of the site, installation of a groundwater recovery well, sediment and surface water sampling, sampling for dense non-aqueous phase liquid (DNAPL), investigation of the sewer trench on Cory Road, and conceptual development of an Interim Remedial Measure (IRM) for septic tank closure on the plant site (ROD, 1991).

In February 1989, an Order on Consent was implemented to combine all of the studies and conduct further work under the New York State Superfund program. A Phase II RI was completed in 1989 and 1990, and included the installation of four additional top-of-rock wells, a soil gas survey at the DOD housing facility, soil sampling at the SPDES outfall, completion of an IRM for septic tank closure, and preparation of a vacuum extraction treatability study in a source area. Ecology and Environment, Inc. (E&E) completed a Feasibility Study (FS) report in October 1990. The FS determined that the preferred alternatives for impacts at the site were: extract the groundwater both on and off site, treat onsite soils to 3 parts per million (PPM) or less, and monitor groundwater and soil gas.

A Soil Remediation/Groundwater Treatment System was designed, built, and commenced operation in mid-1993. The system incorporated a soil vapor extraction system (SVES), as well as treatment of groundwater extracted by the groundwater remediation system (GRS) for discharge to the SPDES outfall. The SVES operated until September 2001. All SVES operations were discontinued in 2002 with approval of NYSDEC. The GRS continued operation after the SVES operations were discontinued.

In 2012, the Vault Water Collection and Conveyance (VWCC) system was added to collect the groundwater from the manufacturing facility furnace vaults for processing through the treatment system along with the recovery well groundwater. The GRS operates with goals to provide onsite migration control, and to prevent offsite migration of groundwater containing VOCs.

2.2 SITE GEOLOGY AND HYDROGEOLOGY

Overburden deposits encountered during the RI consisted of approximately 8 to 25 feet of unconsolidated material underlain by dolomitic bedrock (E&E, 1990). Most of the borings at the site encountered silty-clay lacustrine deposits, with irregular zones of sand and gravel at the bottom of the overburden in some locations (E&E, 1990).

The RI identified the underlying bedrock as the Lockport Dolomite. It was investigated in the RI to a maximum depth of 70 feet from ground surface. Regional studies of the Lockport Dolomite show the upper 10 to 20 feet to be more highly fractured and transmissive than the lower bedrock zones (Zenger, 1965; Johnston 1964). The majority (85%) of the wells installed for the RI were installed into the upper 5 to 15 feet of bedrock. The degree of fracturing in the upper bedrock was found to be inconsistent across the site (E&E, 1990).

Groundwater was encountered during the RI in the unconsolidated deposits as well as the bedrock beneath the site. Groundwater elevations were reported to drop significantly in the summer and early fall, and rise in the late winter and spring (E&E, 1990).

The RI report identified the following prominent hydrogeologic features:

- The direction of groundwater flow in the bedrock is to the southwest, south, southeast, and east. The predominant flow is to the south and southwest;
- The overburden is 8 to 25 feet thick and partially saturated;
- The overburden is comprised mostly of silt and clay and is a saturated aquitard rather than an aquifer;
- Groundwater flow through the overburden is slow;
- The upper 10 to 20 feet of the bedrock is more highly fractured than the deeper bedrock;
- Groundwater flow through the upper bedrock is primarily controlled by the bedding plane fractures;
- A vertical fracture system may also exist in the area, providing conduits for flow between bedding plane fractures and for limited deeper migration. Vertical fractures are secondary to the bedding plane fractures;
- The vertical gradient within the bedrock aquifer varies laterally and seasonally across the area;
- The vertical gradient from overburden to the bedrock appears to be upward in the late winter and spring and downward in the fall;
- The interconnectedness of the bedrock fracture system beneath the site controls the rate and, to some extent, the direction of groundwater flow.

The Evaluation Report (H&A, 1998) identified that the site hydrogeology was more complex than previously identified in the RI (H&A, 2000). Review of local and regional geologic references, aquifer response to GRS operations, down-hole observations, vertical and

horizontal permeability test results, rebound test results, packer withdrawal sampling results, and vertical gradients, indicated that the bedrock beneath the site was comprised of distinct hydrogeologic zones. These were denoted as Top of Rock, and Zones 1 through 4. The Evaluation Report indicated that the distinct bedrock hydrogeologic zones beneath the site have independent piezometric heads and water-bearing and contaminant characteristics. The report further identified that vertical fractures are likely present and possibly allow contaminant/DNAPL migration. However, it appears that the horizontal zones dominate groundwater flow. Based on this information, pumping wells were re-constructed to collect groundwater from shallower zones (Top of Rock and Zone 1) in 2001 and 2002.

2.3 DESCRIPTION OF REMEDIAL ACTION

The system is a groundwater extraction and treatment system with treatment accomplished by air stripping with carbon polish. Water from the GRS and VWCC system is discharged to the SPDES outfall.

2.4 GOALS OF REMEDIAL ACTION

With the discontinuation of the SVE system and re-evaluation of the remedial goals (H&A, 1998 and July 2001 meetings), the primary goal of the system was refocused on providing on-site groundwater migration control to prevent off-site migration of dissolved solvents.

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SECTION 3

MONITORING AND TESTING

Monitoring of the treatment system is conducted to verify proper system operation and remediation status. Specific data collection activities and schedules discussed in this section are pertinent for normal operations and regularly scheduled inspection and monitoring activities.

3.1 GROUNDWATER MONITORING PLAN

Changes to the previous groundwater sampling plan were proposed to NYSDEC in a letter dated September 22, 2005. NYSDEC was agreeable to the changes, as stated in an October 14, 2005 approval letter from NYSDEC. In 2009, PW-4 was added to the list of wells to be sampled quarterly with approval from NYSDEC.

During each quarter, groundwater samples are collected and submitted to a New York State certified analytical laboratory (Lancaster Laboratories, Inc. (LLI)) for volatile organic compound (VOC) analysis by USEPA Method 8260B. The quarterly sampling event in April also includes sampling for natural attenuation parameters. These analyses are also completed by LLI. Table 1 provides a summary of the current groundwater monitoring program sampling schedule. Figures 2 and 2A provide the well locations on the Site Plan. Limited data validation is performed on the analytical results. Data reports from the laboratory are reviewed for compliance with holding times and calibration parameters.

LLI became the selected analytical laboratory for groundwater samples beginning in 2010. LLI is a New York State certified laboratory, and NYSDEC was notified of the change.

3.1.1 Water Level Monitoring

Water levels are measured in all of the monitoring and pumping wells (see Figures 2 and 2A, Site Plan) quarterly, on the same day, prior to the collection of groundwater samples. Water levels are measured (to the nearest 0.01 feet) from the top of the well casing using an electronic water level meter. The water level meter is decontaminated between measurements at each well. Water level elevations are calculated using the surveyed elevations of the top of well casings and the measured depth to groundwater. The groundwater elevation data is then contoured for presentation in the quarterly monitoring reports.

3.1.2 Groundwater Sample Collection

VOC Samples Only

For VOC samples, each well is first purged by removing three to five well volumes of water with a decontaminated purge pump, dedicated high-density polyethylene (HDPE) bailer, or the sampling port on the pumping well until parameters are stabilized. Purge water is contained, transported to the treatment building, and placed into the treatment system. During purging, the number of gallons purged, temperature, specific conductivity, turbidity, and any comments are recorded on a field form several times during purging and at sample collection.

Groundwater samples are divided into three different groups based on historical analytical results from individual wells. The sampling groups are identified as least impacted (low), medium impacted (medium), and most impacted (high). To the extent practicable, the wells in the low group are sampled first, followed by wells in the medium group, and lastly wells in the high group. Each sample submission group is marked on the chain-of-custody (COC) prior to delivery to the analytical laboratory.

Groundwater samples are collected using dedicated HDPE bailers. Immediately after sample collection, pH, conductance, temperature, and turbidity are measured and recorded. Groundwater sample collection data and field records are presented in the quarterly data summary reports. The samples are placed in pre-cleaned, labeled 40-ml glass vials provided by LLI. The sample vials do not contain preservative, in accordance with NYSDEC protocols. Three sample vials are collected from each well. Containers are visually inspected to confirm that they do not contain air bubbles.

Quality assurance/quality control (QA/QC) samples include field duplicates, matrix spike/matrix spike duplicates (MS/MSD), and equipment blanks. To the extent practical, QA/QC sample sets are collected at a rate of one per sample designation group. Equipment blanks are collected using laboratory supplied deionized water run through decontaminated sampling equipment.

Natural Attenuation and VOC Samples

Low-flow sampling methods are employed in April of each year for collection of groundwater samples from specified wells (see Table 1). A pneumatically operated bladder pump is placed approximately 1 to 2 feet above the well bottom. Groundwater is pumped through an in-line flow cell until groundwater quality readings for the indicator parameters (pH, temperature, conductivity, redox, and dissolved oxygen) stabilize. Once the parameters stabilize, the groundwater sample is collected. Flow rates during purging and sampling are kept at or below 1,000 milliliters per minute (ml/m). Purge water is contained, transported to the treatment building, and placed into the treatment system. Groundwater quality readings are documented on the field sampling form.

Groundwater samples are submitted to LLI and are analyzed for select halogenated VOCs and natural attenuation parameters (biological oxygen demand, chemical oxygen demand, chloride, nitrate, nitrite, sulfate, iron, manganese, methane, ethane, and ethene). Field tests are immediately completed by the sampler for alkalinity and ferrous iron, while still at the sampling location. The results of the field tests are documented on the field sampling form. The analytical reports, analytical summaries, COCs, and a water quality database historic summary are presented in the quarterly reports for the site.

3.2 SPDES COMPLIANCE SAMPLING

3.2.1 General

Weekly samples are collected at Outfall 01A in order to comply with the State Pollution Discharge Elimination System (SPDES) discharge permit for the site. A copy of the permit is kept at the site for reference. Outfall 01A is at the discharge from the treatment system

immediately prior to leaving the treatment building. Its location is after the water has passed through the particulate filters, air strippers, and carbon units.

3.2.2 Sampling Program

Discharge volume is measured continuously. VOC and pH samples are collected weekly. Twice monthly, samples are collected for biological oxygen demand (5-day), total suspended solids, oil and grease, and total phenolics. Monthly samples are collected for temperature, total residual chlorine, total metals (iron, cadmium, chromium, copper, lead, arsenic, and zinc) and dissolved metals (copper and zinc). Total nickel and silver are analyzed and reported quarterly. All analytical work is completed by LLI, except for temperature, pH and residual chlorine which are measured immediately after sample collection in the field.

3.2.3 Sampling Procedures

A totalizer at 01A monitors discharge volume continuously. SPDES effluent samples are collected at the 01A sample point inside the treatment building. Samples are collected and held within a refrigerator until they are transported to the analytical laboratory (LLI). Metals, phenols, total suspended solids (TSS) and BOD5 samples are collected as a 24-hour composite using a programmed ISCO brand sampler. VOC's are sampled using grab samples taken every two hours over an 8-hour period to allow for individual sample analysis as well as an 8-hour composite sample which is completed by the laboratory. pH, oil and grease, temperature, and total residual chlorine are collected via grab sampling. Total residual chlorine, pH, and temperature grab samples are measured in the field.

3.2.4 SPDES Reporting

A Discharge Monitoring Report (DMR) covering each month, is required to be submitted to NYSDEC by the 28th of each month, for the period covering the prior month. In the event of an exceedence of one or more permit levels, the analytical laboratory (LLI) immediately contacts the permit holder. The permit holder completes a Notice of Non-Compliance for submittal to NYSDEC if needed. NYSDEC is required to be notified by phone within 24 hours of identifying the exceedence, and informed that an exceedence has occurred. The written noncompliance report must be submitted within five days if directed to do so by NYSDEC.

In accordance with the SPDES permit, any information pertaining to the permit must be kept in a file at the site for a minimum of three years. Information to be maintained at the site includes all calibration and maintenance records, copies of all reports required by the SPDES permit, and records of all data used to complete the application for this permit. A copy of the SPDES permit is included in Appendix D, Permits and Registrations.

3.3 ANALYTICAL METHODS

Analytical work related to samples for SPDES compliance will comply with 40 CFR Part 136, unless otherwise stated in the SPDES permit. Table 2 provides the sample analytical methods used for both the groundwater and SPDES compliance samples.

3.4 TREATMENT SYSTEM MONITORING

The groundwater treatment system will be monitored for proper system operations and individual equipment status and performance. Monitoring requirements will be discussed

individually. The Programmable Logic Controller (PLC) via the Human Machine Interface (HMI) shall be used when possible to check system performance and system operating conditions. The system can also be monitored remotely using a VNC system on a PC. In addition to utilizing the PLC, operator inspections will be performed to ensure proper system operation. The process system monitoring goals include determining the influent flow rates to the treatment building, accurately measuring the mass of VOCs extracted from the subsurface, and determining equipment inspection and maintenance schedules.

3.4.1 Monitoring Frequency

The recovery and treatment system is monitored 24 hours per day, seven days per week by the PLC. Inspection of the treatment and recovery system is performed by the operator on each site visit to ensure that the system operates as designed. Inspections include a site walk-through to monitor flow meter readings, freeze protection, piping integrity, pump and blower operation, and system pressures. Specific monitoring/inspection log sheets, such as daily monitoring logs, are located in Appendix C, Records and Forms.

3.4.2 Groundwater Treatment System Monitoring

To ensure proper operation of the groundwater treatment system, routine inspections will be conducted to verify optimum performance of all system components. The PLC via the HMI will be used to monitor the performance of the system components.

Performance monitoring includes the following:

- Recovery Well (P-2, P-3, P-4, PW-1, PW-3, PW-4) level and pump status
- Containment area drain sump/building drain sump status
- Influent/Equalization (T-801) and effluent (T-802) tank levels
- Treatment system filter feed pump (P-803B, P-803C) status
- VWCC vault (1, 2, 3) levels and pump (P-001, P-002, P-003) status
- VWCC tank levels (T-001[a.k.a. consolidation sump], T-002)
- VWCC consolidation sump (T-001) pump (P-004, P-005) status
- VWCC system filter feed pump (P-006, P-007) status
- VWCC pre-filter motor control valve status
- VWCC filter differential pressure status
- Air stripper (S-801A) sump level
- Air stripper transfer pump (P-805A, P-805C) status
- Air stripping blower (B-801) status
- Effluent pump (P-810A, P-810B) status
- Effluent flow rate

Abnormal operating conditions are monitored by the PLC using the alarms listed below:

- Groundwater extraction well high and low level alarms
- Loss of radio telemetry for groundwater extraction wells
- Influent/Equalization tank (T-801) water level, high and low level alarms
- Filter feed pumps (P-803B, P-803C) failure to start alarms
- Air stripper reservoir high and low water level alarms
- VWCC Vaults (1,2,3) and tanks (T-001, T-002) high level alarms

- VWCC pre-filter differential pressure and alarm
- Air stripper blower air low flow rate alarm
- Air stripper transfer pump (P-805A, P-805C) failure to start alarms
- Effluent tank high and low level alarms
- Effluent pump (P-810A, P-810B) failure to start alarm
- Containment area drain sump/building drain sump high level alarms

Facility inspections are conducted on a periodic basis to record additional operating pressures, differential pressures, temperatures, and flow rates. Refer to the IM Program Inspection and Maintenance Plan located in Attachment III, Appendix E.

3.5 SYSTEM EVALUATION AND CONTINGENT/CORRECTIVE ACTIONS

Data collected during routine operator inspections is reviewed by the operator and/or Project Engineer weekly. If data collected reveals non-optimum performance, the operator and/or Project Engineer shall review potential contingent corrective actions to remedy the problems. Remedies shall then be implemented until the problem is solved. Prior to adjusting the treatment system components based on an evaluation of the monitoring data, it is necessary that the remedial systems be in full working order with no obvious mechanical or electrical problems. The operator must be knowledgeable of the general start-up procedures presented in SOP-1 (Volume II of this manual). Many of these procedures will apply to the assessment of possible contingent/corrective actions identified through analysis of monitoring data. The operator must be thoroughly familiar with the maintenance schedules provided in Section 8.0.

The general maintenance program is important to prevent deterioration or malfunction of the individual components. Many of the inspections that may arise out of an analysis of monitoring data will be identical to these procedures. Potential conditions that may arise and require changes in the system or indicate maintenance is required are summarized below.

- If the water pressure drop across the air stripper has significantly increased, this may indicate that fouling has occurred, creating insufficient surface area for air/water contact or channeling of flow within the unit. The fouling may be due to either biological growth, mineral scaling (calcium/magnesium/iron), and/or high levels of suspended solids. It may be recommended that samples be collected from the discharge of the air stripper in order to assess the degree of fouling. In the event of scaling, the stripper must be shut down and visual observation made of the tray tops and bottoms via inspection ports. If a fouling problem is verified, then corrective procedures will be implemented. These may include adding a biocide feed system, cleaning of the air stripper trays, or complete replacement of the trays, if conditions warrant.
- If the pressure drop across the pre-filters has significantly increased, this may indicate that the filter element needs cleaning or replacing. The pre-filters contain disposable bag filters that may be changed as required following manufacturer's recommendations.
- Flooding or leak conditions are usually related to breaks in system piping, or leaks from system fittings. Other causes may be attributable to: malfunctioning transfer pumps, faulty high level sensors in either the influent tank or air stripper reservoir, improperly aligned ball valves, stress cracks in the treatment equipment or piping, or

loose seals or couplings. Each of these should be assessed for applicability, and the appropriate corrective actions taken. In the event of a leak in the treatment system, a containment sump will collect the water and pump back to the influent/equalization tank (T-801).

- If the pressure drop across the lead liquid phase carbon unit has significantly increased, this may indicate that the unit needs to be backflushed, backwashed, or replaced. If it is determined that the carbon needs to be replaced, complete the change following manufacturer's recommendations.
- Low pumping rate from VWCC vault pumps (P-001, P-002, P-003) and/or lack of control of water level in the vaults is usually caused by debris (sand in vaults 1&2) building up around pump inlet or partial blockage of the pipe from the vault pump to the consolidation sump (T-001). Pumps in the sumps must be cleaned out and if necessary, the pipe flushed out using potable water. Failure of vault pumps to start or stop can be caused by the pump-mounted float becoming obstructed by debris impeding float travel and must be cleared.

3.6 DATA PRESENTATION

Data collected during treatment system monitoring will be made available in the form of periodic reports. Also, data collected during monitoring will be included in the quarterly monitoring reports. Data included in these reports will include, but not be limited to the following:

- VOC removal rate versus cumulative time
- TCE removed versus time
- Groundwater pump information (on/off times)
- Discharge flow rates and concentrations
- Data listed above shall be provided in graphical format when applicable.

SECTION 4

GROUNDWATER RECOVERY SYSTEM

This section describes the procedures for operating and maintaining extraction wells P-2, P-3, P-4, PW-1, PW-3, and PW-4. This section also provides instructions to acquaint personnel with the capabilities, purpose, and intended operation of the wells.

The following are a description of the system, an outline of operating procedures, maintenance, monitoring, record keeping, personnel, and health and safety requirements. Manufacturer's data for the system is contained in Volume III of this manual.

4.1 DESCRIPTION

The purpose of the system is to satisfy groundwater remediation goals, which are to provide groundwater migration control and limit off-site migration of groundwater containing VOCs.

The PLC, HMI PC computer, pump motor starters, power panels, and telephone auto-dialer unit, are in the on-site treatment building. Well-heads for each of the six groundwater extraction wells are enclosed in sheds. The shed at each well contains flow and level sensors and transmitters, manual valves, pressure indicators, and power disconnects.

Power to the pump motors is controlled by a "hand-off-automatic" (HOA) switch on the respective pump motor control panel. Green "run" lights and red "stop" lights for each pump are also provided on the main control panel. When the switch is in the "automatic" position, the corresponding motor will operate under PLC control unless interlocks are activated. Further discussion of alarms and interlocks is presented in Section 4.3.5. When the switch is in the "hand" position, the pump will operate manually.

Flowrates, pump runtime, and quantity of water pumped is regulated by the water level elevation in the groundwater extraction well. Transducers are set at high and low set points. Once the water level in the groundwater extraction well reaches the high set point, the pump is automatically turned on. Once the water level is lowered to the low set point due to pumping, the pump is automatically shut off. A mechanical flow meter at the well-head monitors discharge volume from each well. Set points are discussed in Section 4.3.4.

4.2 MAINTENANCE

The system was designed to:

- Remove groundwater from pumping wells.
- Carry groundwater from the pumping wells to the Treatment Building.

A process flow diagram is provided in Figure 3, P & ID Recovery Wells.

4.2.1 Wells

The system consists of six pumping wells, P-2, P-3, P-4, PW-1, PW-3, and PW-4. The pumping well specifications are presented below:

P-2 Casing: 10-inch inside diameter (I.D.) carbon steel

Well depth: 26.4 feet
Pump intake depth: 24.4 feet
Groundwater pumping rates: 5 gpm (average)
8 gpm (maximum)

P-3 Casing: 8-inch I.D. 304 stainless steel

Borehole: 7 1/2-inch diameter
Well depth: 33.7 feet
Pump intake depth: 31.7 feet
Groundwater pumping rates: 5 gpm (average)
8 gpm (maximum)

P-4 Casing: 10-inch I.D. carbon steel

Borehole: 7 1/2-inch diameter
Well depth: 34.2 feet
Pump intake depth: 32.2 feet
Groundwater pumping rates: 5 gpm (average)
8 gpm (maximum)

PW-1 Casing: 12-inch I.D. carbon steel

Well depth: 29.8 feet
Pump intake depth: 27.8 feet
Groundwater pumping rates: 25 gpm (average)
30 gpm (maximum)

PW-3 Casing: 6-inch I.D. stainless steel

Well depth: 18.2 feet
Pump intake depth: 16.7 feet
Groundwater pumping rates: 5 gpm (average)
8 gpm (maximum)

PW-4 Casing: 6-inch I.D. stainless steel

Well depth: 30.8 feet
Pump depth: 26.0 feet
Groundwater pumping rates: 60 gpm (average)
120 gpm (maximum)

4.2.2 Pumps

The pumps are located approximately one foot off the bottom of the wells. Pumps are to remain at this location unless hydrogeological conditions at the site require modification. A change of this type must be approved by Atlantic Richfield and NYSDEC.

All well pumps with the exception of PW-4 are Grundfos submersible pumps designed for continuous operation. PW-4 has a Gould brand pump. The electric motors for each pump utilize 480-volt, three-phase, 60-hertz power. The pumps have horsepower ratings of ½ hp for all but PW-1 (2 hp) and PW-4 (5 hp).

Each pumping well is covered by a building that houses the process equipment. Entry to the building is through a 3-foot by 7-foot standard door. PW-1 has a 6-foot wide double door. The buildings are heated seasonally using portable 120V heaters. Each well has a continuous level sensor (pressure transducer) that feeds signal back to the treatment building PLC via radio telemetry to control the well pump based on high and low setpoints.

The groundwater is piped to the Treatment Plant Equalization Tank (T-801). Each well has a pressure gauge to help monitor pump output. Sampling ports are provided in the piping within the equipment enclosures above each pumping well to facilitate the collection of groundwater samples.

4.2.3 Instrumentation and Control

The system contains instruments, automatic controls, and manually operated equipment for operation and monitoring the groundwater recovery system. The instrumentation included in the system consists of flow indicators/meters, well level sensors, telemetry, various indicators, PLC control and alarms. A description of the major features of the instrumentation and control system follows and is presented to familiarize the reader with the system's basic operational controls. Refer to the Process Flow Diagram (Figure 3) and Record Drawings (Appendix A) for additional clarity.

4.2.4 Set Points

System control and alarm/interlock set points are outlined below. Adjustments or modifications to these set points should not be made unless directed by the project manager and approved by Atlantic Richfield and NYSDEC.

The set point for the well levels (depth in feet from ground surface) is

- Pumping well P-2: 18.9 to 21.9
- Pumping well P-3: 26.2 to 30.0
- Pumping well P-4: 26.7 to 30.2
- Pumping well PW-1: 21.8 to 24.8
- Pumping well PW-3: 10.2 to 14.2
- Pumping well PW-4: 20.8 to 23.3

4.2.5 Alarms and Interlocks

Alarms and interlocks have been designed into the system to protect the equipment, personnel, and the environment. The interlocks perform automatic corrective actions; therefore, immediate operator attention is not necessary. Under normal system operation, without alarm conditions present, no messages should be seen on the PLC HMI. Once an alarm condition is detected by the system, an alarm message will be displayed on the HMI screen. To clear the alarm status, the operator must log in to the HMI system and click on the "Acknowledge" button on the screen. If the alarm condition (for example, low level) is still present, the alarm will remain active on the screen. When the conditions have cleared, the PLC will display an "Out Alarm" message on the HMI screen and will automatically reset to normal status. There are many alarms. Most are informational for the operators attention. Alarms that are system critical are listed in Section 3.4.2. These alarms will call out using the Automatic Telephone Dialer System for immediate attention from the Operator.

The automatic telephone dialer alarm calls a set of programmed telephone numbers and plays back appropriate "system failure" message when the telephone receiver is picked up. Once the receiver is picked up and the message is played, the alarm call must be acknowledged by pressing the "*" button on the phone. If this is not done, the auto-dialer will continue to call the programmed numbers until the alarm is acknowledged. The process alarm condition must then be corrected within a period of two hours, or the auto-dialer will initiate the calling process again. The automatic dialer may also be called to determine system status. To call the dialer for status, dial (716) 731-5424.

Upon receiving an alarm call, the Operator must log in to the VNC system to remotely view the PLC HMI screen to determine the source of the alarm. In some cases, the Operator may be able to correct a problem remotely. Otherwise the Operator must respond to the site to address the problem. Note: if an alarm stays in active status, it will keep calling out on the dialer every two hours regardless of being acknowledged.

4.2.6 Troubleshooting

This section describes troubleshooting techniques to be used for locating causes of equipment failure in the system. Corrective actions for each alarm condition are described in Volume II: Site Specific Operating Procedures (SOPs), SOP-10.

4.2.7 Preventative Maintenance Program

The component selection for the system was conducted to use equipment with minimal maintenance requirements. After system start-up, maintenance is required only when alarm conditions are present. Flow meters, level sensors, control valves, submersible pumps, and control panels require no preventative maintenance.

In 2011, BP Remediation Management started the Integrity Management (IM) Program. At the start of 2012, an Inspection and Maintenance Plan was implemented for Protective System Devices (PSD). The Plan was updated at the end of 2012 to include the VWCC system. See SOP 7 and Appendix E, the IM Program Inspection & Maintenance Plan.

Weekly or more frequent inspection of the system operation is to be conducted after the initial setup to verify proper system operation. The timing of these inspections may be adjusted based on operating experience. Refer to the IM Program Inspection and Maintenance Plan located in Attachment III, Appendix E. Where repairs need to be conducted, it is important that the manufacturer's installation and operating manual be reviewed.

4.3 RECORD KEEPING

Records of inspections, service, repairs, and maintenance are to be kept for the duration of the GRS operation. An inspection report form has been developed for the system and is provided in the daily log. The inspection report is to be completed for each scheduled or unscheduled visit to the GRS by operations personnel. A bound logbook (Operator's Notebook) is also kept where daily activities, observations, maintenance etc. are recorded.

4.4 PERSONNEL

Note that O&M personnel will be assigned by Parsons and include Project Supervisor, Operator, and other staff as identified in Section 10.3.

4.5 HEALTH AND SAFETY REQUIREMENTS

The safety of the public and of personnel operating and maintaining the system is of highest importance. A detailed HSSE plan is provided in Appendix B and is required to be reviewed by all personnel prior to beginning any work at the site. Any work at the site requires that a Work Risk Assessment be developed in advance of the work. Once the Work Risk Assessment is completed, TSEAs, Tool-box meetings, and any required work permits (ie. working at heights, hot work, etc.) will be completed daily prior to the start of work.

Four key health and safety concerns associated with the operation and maintenance of the system are:

- Physical hazards typically present at manufacturing facilities;
- Mechanical/electrical equipment maintenance and repair hazards;
- Safe operation of the system; and
- Exposure to contaminated groundwater, soil, and vapors.

All personnel and contractors must meet the requirements in the HSSE Plan.

4.5.1 Physical Hazards

Personnel at manufacturing facilities typically must maintain a higher degree of safety awareness due to the increased presence of physical hazards. Personnel must exercise caution in all activities around the facility and the system. Typical physical hazards include trips or falls, punctures, cuts, and electrical shock.

4.5.2 Equipment Maintenance and Repairs

Maintenance and repairs to mechanical and electrical equipment associated with the system may pose additional potential health and safety hazards. Personnel untrained in the operation and maintenance of the system should not handle, adjust, or tamper with any electrical equipment, machinery, or piping. Machinery should not be repaired or adjusted while electrically energized or in operation. Automatically operated mechanical equipment may start and/or stop without warning. No repairs should be made on this equipment until it is locked out and tagged as described in the HSSE plan (see Appendix B). Using your own lock, always open and lock the main circuit breaker in Power Panel MCC 1 (where applicable) and the mechanical disconnect associated with the equipment to be worked on. Check components for power with a volt-ohm-amp meter. After repairs are completed, clear personnel from the area before closing the main breaker. Equipment repair safety practices are discussed in the HSSE Plan (see Appendix B) and in the installation, operation, and maintenance literature presented in Volume III of this OM&M Manual.

4.5.3 Safe GRS Operation

System start-up, shutdown, and standard operation pose health and safety concerns due to automatic equipment operation, pressurized piping, and high water-flow rates. Ensuring that personnel are thoroughly trained in the operation of the system and knowledgeable of its capabilities will reduce the potential for accidents. The HSSE Plan (see Appendix B) and equipment manufacturers' information should be reviewed for specific safety requirements.

4.5.4 Contaminant Exposure

Exposure to contaminated groundwater, soil, or vapor is a health and safety concern primarily when conducting repairs on equipment that is in contact with the groundwater and/or soil during environmental sampling activities. The potential for exposure to contaminated groundwater, soil, or vapor is minimal during other activities associated with the system; however, personnel should continually be aware of the contaminant hazards at the site. The HSSE Plan (see Appendix B), is a site specific plan developed for situations in which potential exposure to hazardous contaminants is possible. The plan outlines potential physical and chemical hazards, personnel protection methods, monitoring techniques, and provides information on emergency resources and contacts.

All activities conducted within the well enclosures require Level D protection at a minimum. Protective equipment shall be worn according to the requirements of the HSSE Plan (see Appendix B). In the event of an emergency, a contingency plan for the site has been completed (Appendix B).

SECTION 5

VAULT WATER COLLECTION & CONVEYANCE (VWCC) SYSTEM

This section describes the procedures for operating and maintaining the VWCC system. This section also provides instructions to acquaint personnel with the capabilities, purpose, and intended operation of the VWCC system. Manufacturer's data for the system is contained in Volume IV of this manual. An Operations Functional Description is contained in Appendix F.

5.1 PROJECT BACKGROUND

Metaullics operates a graphite rod and tube manufacturing facility in Sanborn, New York. The facility operates furnaces for the annealing and cooling of the graphite rods and tubes in its main manufacturing building. The furnaces are installed in vaults which are positioned belowgrade. During a period of higher groundwater elevations, three of these furnace vaults (i.e., Vault 1, 2, and 3) may accumulate groundwater, which historically was dewatered to the site sewer. NYSDEC requested that the vault water be managed separately instead of being discharged to the sewer. Initially, to address NYSDEC request, well PW-4 was installed with the intent to indirectly control groundwater levels in the vicinity of the three vaults and eliminate groundwater from collecting in the vaults. Well PW-4 has been in operation since January of 2008 with insufficient control on groundwater levels in the vicinity of the vaults. In 2012, the VWCC system was added to collect the groundwater from the manufacturing facility furnace vaults for processing through the treatment system along with the recovery well groundwater. With the VWCC system in operation recovery well PW-4 was turned off.

This section describes the system designed to collect and convey the water collected directly from the sumps to the on-site Groundwater Treatment Plant (GWTP) for treatment.

5.2 INFLUENT DEFINITION AND TREATMENT REQUIREMENTS

5.2.1 Flow Basis

The design is based on a maximum 5-gallon per minute (gpm) production rate from each of the three furnace vaults in the Metaullics facility. The combined flowrate of three vaults is assumed to be 15-gpm.

5.2.2 Treatment Requirements

The design assumes that the vault water contains up to 100 mg/L of total suspended solids (TSS) and that TSS should be reduced to approximately 5 mg/L prior to introduction to the existing treatment system. The further assumption is that the TSS particles are filterable at 50 micron nominal pore size. The design incorporates flexibility to filter at pore size up to two orders of magnitude smaller. Dissolved constituents in the vault water are treated in the GWTP and discharged through the SPDES Outfall 01A.

5.3 PROCESS MECHANICAL

5.3.1 General

Water from each of the existing furnace vaults in the Metaullics facility is pumped to a common consolidation sump (T-001) located to the south of the Metaullics facility. The contents of T-001 are pumped through below grade piping to the existing Treatment Building and to a horizontal equalization tank (T-002). Water from T-002 is pumped through parallel bag filters and discharge to the existing equalization tank (T-801) for commingling with the other site streams and treatment in the remainder of the existing treatment facility.

Major equipment, valve, and line lists associated with the Vault Water Collection and Conveyance System are provided in Volume IV for reference.

5.3.2 List of Drawings

The following drawings support the process mechanical design description and are included in Appendix C, Records and Forms, for reference while reviewing this section.

446476-C-001	Site Plan
446476-D-001	Process Flow Diagram and Mass Balance
446476-D-100	P&ID Legend
446476-D-101	Vault Water Conveyance P&ID
446476-D-102	Filtration P&ID
446476-M-001	Partial Pipe Trench & Vault Plan, Elevation, and Details
446476-M-002	Partial Pipe Trench & Consolidation Sump Plan & Elevation and Details
446476-M-003	Treatment Building Modification Plan

5.3.3 General Piping Criteria

The following general design considerations apply to the process mechanical design for this project:

1. All piping proposed in this design is single-walled piping.
2. A spare pipeline has been installed adjacent to all runs of belowgrade or sub-slab piping. This was done to provide protection against a clogged pipeline. Each spare pipeline was terminated in a capped-end shortly after it daylights abovegrade or above-slab.
3. Bypass tees with isolation valves were provided on each vault water line within the Metaullics building to allow operators to temporarily discharge vault water elsewhere, including to the existing sanitary sewer or temporary storage tanks in the event of a shutdown condition of the GWTP. The bypass tees also allow for connection to flushing water in the event lines require flushing. It should be noted that the existing hard-pipe connection to the sewer were eliminated as part of this design.

5.3.4 Metaullics Vaults

The Metaullics vaults hold furnaces for the manufacture of graphite rods and tubes. The vaults experience elevated temperatures during furnace operation. It is assumed that temperatures in the vaults in the vicinity of the equipment will not exceed 90ºC (194ºF).

The vaults have the following approximate depths from the local point of access to the vault bottom:

- Vault 1 – 12.5-ft
- Vault 2 – 11.5-ft
- Vault 3 – 16.0-ft

Each vault has a sump with the following characteristics:

- Vault 1 – 1-ft square sump, approximately 1-ft deep located at northeast of vault
- Vault 2 – 1-ft diameter sump, approximately 1-ft deep located at southwest of vault
- Vault 3 – 1-ft square sump, approximately 1-ft deep located in central access area

A small, ½-hp sump pump was installed in each vault sump (P-001, P-002, P-003). The discharge from each vault is run independently to the Consolidation Sump (T-001) in ¾-in lines consisting of a mix of carbon steel (above-slab) and high-density polyethylene (below-slab). The pumps have tether chains and the in-vault piping is provided with sufficient unions to allow operators to remove the pump assemblies for maintenance without entering the vaults.

Discharge flowrate is throttled and set by adjusted manual valves on each discharge line. The actuators on the manual valves are positioned to allow operator access without entering the vaults. Each vault discharge line is provided with check valves to prevent back-draining to the vaults and unnecessary cycling of the pumps.

Automatic control of the pumps is by an integral float switch on the pump – the float switch provides the pumps with On-Off controls. A high-high level alarm in the downstream Consolidation Sump (T-001) stops the three vault pumps (P-001, P-002, and P-003) to prevent an overtopping condition.

Piping from Vault 1 exits the vault below the facility floor slab and runs south to near Vault 2 where it daylights above the facility floor slab. Vault 1 and Vault 2 piping then runs in parallel in an easterly direction along the southern facility wall towards Vault 3. Along the southern wall double-doors, the piping is placed in an existing steel-plate covered floor trench. The piping in and around the double-door area is insulated and heat-traced for freeze protection.

Vault 3 piping meets with the Vault 1 and 2 piping and exits the building's southern wall at a position opposing the Consolidation Sump (T-001). The three lines turn belowgrade and enter the Consolidation Sump at approximately 4-ft below ground surface. The exposed portion of piping that exits the building is insulated, heat-traced, and protected by a small wooden structure for freeze protection.

5.3.5 Consolidation Sump (T-001)

The Consolidation Sump (T-001) is installed outdoors, adjacent to the Metaullics facility. It is comprised of a cast-in-place concrete structure with interior dimensions of 4-ft x 4-ft x 8.5-ft deep with 12-in thick walls. The floor and walls of the structure are HDPE-lined using a concrete protective liner (e.g., by Agru-America) that is incorporated during casting. An aluminum hatch provides access to the sump interior. Pipes enter and exit T-001 below the frost line at 4-ft. As such, approximately the bottom 3.5-ft of the sump is working volume, the rest is free headspace. The top deck of the sump is positioned approximately 8-inches abovegrade to prevent the admission of surface stormwater flow.

T-001 has duty-standby submersible pumps (P-004 and P-005) that discharge sump contents to a new Equalization Tank (T-002) in the Treatment Building. The pumps are mounted on guiderails and provided with a chain for removal by operators from the ground surface when necessary for maintenance.

Automatic control of the pumps is by level in the sump – the pumps start at a high level setpoint and stop at a low level setpoint. Manual start-stop control is also provided. The pumps periodically alternate duty to provide even wear. A high-high level alarm and interlock with the downstream Equalization Tank (T-002) is provided and will stop the sump pumps (P-004 and P-005) to prevent an overtopping condition. As discussed above, a high-high alarm and interlock in T-001 is provided to shutdown the three upstream vault pumps (P-001, P-002, and P-003).

Piping from T-001 to T-002 is single-wall HDPE and runs in a belowgrade trench. A short section of pipe daylights aboveground prior to entering the Treatment Building. This section is insulated, heat-traced, and protected by a small wooden structure.

5.3.6 Equalization Tank (T-002)

The equalization tank (T-002) is located within the treatment building and is comprised of a vertical, 500-gallon HDPE tank. The tank has duty-standby centrifugal pumps (P-006 and P-007) that provide the pressure necessary for filtration and conveyance to the existing equalization tank (T-801).

The pumps are mounted on housekeeping pads. In addition to manual start-stop control, the pump has T-002 level-based automatic control. The duty pump will start at a high level setpoint and stop at a low level setpoint. The pumps are programmed to periodically alternate duty to provide even wear. As discussed above, a high-high alarm and interlock is provided to shutdown the Consolidation Sump pumps (P-004 and P-005).

5.3.7 Bag Filters (U-001, U-002, U-003, U-004)

There are four bag filter canisters between pumps P-004 and P-005 and T-801. Each canister has a clean water throughput of 125-gpm, which allows a greater time between bag changeouts. The filters are arranged in two parallel trains of two units in series (see 446476-D-102 in Appendix E). A differential pressure system is used to automatically detect differential pressure. At an adjustable high setpoint, the system will automatically switch between the duty and standby train by opening and closing XV-1001 and XV-1002 as needed. The system will

also alarm to alert operators to change the filter bags on the train that was placed in standby mode. A high-high differential pressure alarm is also provided.

5.3.8 List of Protective Devices

The protective system devices (PSD's) indicated in the narrative above as well as those shown on the P&IDs are listed in Section 5.7 for reference. This control strategy is further detailed in the VWCC System Functional Description provided in Appendix F.

5.4 CIVIL, STRUCTURAL, AND ARCHITECTURAL (CSA) DESIGN CRITERIA

5.4.1 List of Drawings

The following drawings support the CSA design description and are included in Appendix A for reference while reviewing this section.

446476-C-001 Site Plan

446476-S-100 Structural Sump Plan, Elevation, and Details

Details for the above items are shown with the process mechanical design as on the M drawings (446476-M-001 through 446476-M-003).

5.5 ELECTRICAL DESIGN CRITERIA

5.5.1 General

The GWTP constructed in 1994 is served by a 4.8kV distribution feeder from outdoor switchgear #2. A 750 kVA pad mounted transformer is located behind the GWTP building and supplies 480 volt, 3-phase, 3-wire power to Motor Control Center MCC 1. MCC 1 has a 1200A main breaker and bus system. Due to elimination of a number of process equipment, MCC 1 has adequate spare capacity and space to accommodate the VWCC system. A one-line diagram of the power feeders from MCC 1 is included as drawing 446476-E-201 in Appendix A.

No standby generator power is being planned for this system. If the mainline power to the GWTP MCC fails, the vault water collection and conveyance system will also fail until power is restored. This may lead to elevated groundwater levels in the Metaullics vaults during power outages.

5.5.2 Electrical Rating Considerations

There are two classes to consider with respect to electrical hazardous classification for this project: Class I (flammable liquids and vapors) and Class II (combustible or conductive dusts). Each is discussed below.

Class I – Flammable Liquids or Vapors

The vault water contains VOC contaminants that, in a concentrated form, are classified as flammable liquids (e.g., trichloroethene). However, an analysis of the historical vault water data shows that the concentrations of groundwater VOCs are well below levels that would raise concerns regarding headspace vapors approaching 25% of the respective lower-explosivity-limit (LEL) values. As such, the equipment installed for the VWCC system is non-classified (i.e., non-hazardous) from an electrical perspective with respect to the Class I category.

Class II – Combustible or Conductive Dusts

The manufacturing processes in the Metaullics facility produces graphite dust that settles in the plant area. Although graphite has an NFPA flammability classification of 1, there is no listing for graphite (e.g., natural graphite, mineral carbon, or black lead) in the 2008 Edition of NFPA 499 – Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations and Chemical Process. The facility is currently not electrical classified for Class II dusts. Based on a review of NFPA 499 and based on site conditions and applicable code equipment installed for the VWCC system is non-classified (i.e., non-hazardous) with respect to Class II dusts.

5.5.3 List of Drawings

The following drawings support the electrical design and are included in Appendix A for reference while reviewing this section.

446476-E-100	Electrical General Notes and Legends
446476-E-201	One-Line Diagram, Motor Control Center MCC-1
446476-E-401	Overall Site Plan
446476-E-411	Power and Instrumentation Ground Water Treatment Building Part Plan
446476-E-412	Power and Instrumentation Metaullics Manufacturing

5.5.4 Metaullics Vaults

There are three small, single-phase, submersible pumps (P-001, P-002, and P-003) located in furnace vault sumps within the Metaullics manufacturing facility. These pumps convey water from the sumps to the new consolidation sump (T-001) located outside the building. T-001 has two larger, 3-phase, one-half horsepower submersible pumps (P-004 and P-005) that pump to the GWTP. The motor controls for all five pumps is assembled in a 24-in x 60-in x 72-in high free standing NEMA 4X stainless steel enclosure near the sump.

The Sump Control Panel (SCP) is fed 480 volts from an existing 100-amp spare breaker in Motor Control Center (MCC) 1 at the GWTP. Included in the SCP is a 10-kVA, 120/240-V transformer to provide power for the single-phase pumps, electrical heat trace and instrumentation. Pumps P-004 and P-005 have a Hand-Off-Auto selector switch (HOA) for manual and automatic operation under the level controls. Level control for the sump is analog pressure transducers with local indicating controllers as described under Section 6.0 - Instrumentation and Controls Design Criteria. Controls for the three vaults are integral floats mounted on the pump.

5.5.5 Groundwater Treatment Plant

In the GWTP, the new electrical equipment consists of two, ½-hp transfer pumps (P-006 and P-007). MCC 1 has one spare size 1 starter, and a second new size 1 starter has been added. Each MCC combination starter also includes a HOA selector switch, run indicating light and motor overload reset button. Auto control is controlled by the PLC related to tank levels and process interlocks.

5.5.6 Conduit and Wiring

All circuits have been run in conduit. Interior conduits are rigid galvanized steel size per the National electrical code. Exterior conduits and conduits buried a minimum 24" below grade have schedule 40 PVC encased in concrete. All wiring has been sized in accordance with the National Electrical Code and is stranded copper, THHN/THWN 90°C.

5.6 INSTRUMENTATION AND CONTROLS DESIGN CRITERIA

5.6.1 General

The major control elements of the VWCC system are the three sump pumps for individual furnace vaults inside the Metaullics Facility, the consolidation sump (T-001) outside, the new equalization tank at the GWTP (T-002), and new bag filters (U-001 through U-004). The attached P&ID drawings, 446476-D-101 and 446476-D-102, indicate the instrument location in the process stream.

The GWTP is mainly an unmanned facility controlled by an Allen-Bradley CompactLogix PLC, and the operator interface is through a computer terminal using Rockwell Automation Factory Talk Studio software. The PLC has adequate spaces for all the described inputs and outputs (I/O). A Functional Description Specification has been prepared, and I/O wiring connection drawings have been prepared for procurement of I/O terminations as well as PLC and OIT programming.

The project Instrument List is provided in Volume IV, and the VWCC System Functional Description Specification is provided in Appendix F. The Functional Description Specification, coupled with the following P&ID drawings, define the intended operation of the system.

446476-D-100 P&ID Legend

446476-D-101 Vault Water Conveyance P&ID

446476-D-102 Filtration P&ID

5.6.2 Metaullics Vaults

A local pressure transducer in each vault feeds an analog signal to a level indicator located in SCP-1. This device is cable-supported, which allows access from the floor level removal and maintenance without entering the vault. Each SCP-1 level indicator has a high level setpoint for alarm. The high level alarm is hardwired to the GWTP PLC and is combined with an alarm output on the autodialer and will appear on the computer terminal.

The submersible sump pumps are controlled by integral float switches. An Off-Auto switch is located in SCP-1 to turn the pumps off, but all "on" operation will be controlled by the integral float switch. Vault level readings are local at the SCP-1 and on the PLC HMI.

5.6.3 Consolidation Sump

The Consolidation Sump has two submersible pumps operating in duty-standby mode. A submersible pressure transducer, similar to that used in the vaults, has been installed in a pipe stilling well and is used for level measurement and pump control. A local indicating controller in the SCP-1 cycles and operates the pumps. The controller and a redundant high-level float switch signals a high level alarm condition which is hard wired to the GWTP PLC.

5.6.4 Equalization Tank T-002 and Transfer Pumps P-006 & P-007

The Equalization Tank T-002 is a 500-gallon HDPE tank in the GWTP. Two centrifugal pumps, P-006 and P-007, operating in duty-standby mode, pump from the equalization tank and feed through two sets of duplex bag filters (U-001 through U-004) on to the existing GWTP equalization tank T-801 at the head of the treatment process. The pump control of T-002 is On-Off while maintaining a minimum level in the tank for flow dilution. Level is measured by an external pressure transmitter located on a low tank nozzle and transmits an analog signal to the GWTP PLC. The PLC uses the same pump logic for cycling as the existing pumps and can also initiate a high level alarm.

5.6.5 Bag Filters (U-001 Through U-004)

Pressure transmitters are located at a common point in the input pipe lines and output pipe lines that send an analog signal to the PLC. Programming in the PLC compares the inlet to the outlet pressure establishing a differential pressure where setpoints for warning and then alarm pressures are initiated. The warning and alarm pressure conditions are displayed on the operator. The PLC will automatically alternate the position of XV valves to provide automatic switching between duty and standby bag filters.

5.7 VAULT WATER COLLECTION AND CONVEYANCE DESIGN

Summary of VWCC Protective Safety Devices

Item	Tag Number	Protective and Safety Function
1	LAHH-200	Provides a high-high level alarm signal at the GWTP PLC for Vault 1 conditions.
2	LAHH-201	Provides a high-high level alarm signal at the GWTP PLC for Vault 2 conditions.
3	LAHH-202	Provides a high-high level alarm signal at the GWTP PLC for Vault 3 conditions.
4	LSHH-203	Interlocks (stops) the vault pumps (P-001, P-002, and P-003) under a high-high level condition in the Consolidation Sump (TK-001).
5	LAHH-203	Provides a high-high level alarm signal at the GWTP PLC for the Consolidation.
6	LSHH-222	Interlocks (stops) the sump pumps (P-004, P-005) under a high-high level condition in the Equalization Tank (TK-002).
7	LIC-207	Provides a high-high level alarm signal at the GWTP PLC for the Equalization Tank (TK-002).
8	PSE-228	Rupture disc provides over- and under –pressurization protection for the Equalization Tank (TK-22) if the normal vent line becomes constricted.
9	FIQ-200. FIQ-201,	Tracking the difference in the sum of FIQ-200, 201, 202 versus

	FIQ-202. FIQ-206	FIQ-206 will provide indication of significant leaks in the belowgrade structures.
10	DPI-212	Provides high differential pressure alarm to indicate operators of a bag changeout and a high-high alarm to indicate a closed filter.
11	LSHH-219	Interlocks (stops) the Equalization Tank pumps (P-006 and P-007) under a high-high level condition in the existing tank T-801.

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SECTION 6

TREATMENT SYSTEM

6.1 GENERAL DESCRIPTION

The Groundwater Treatment System consists of the following process equipment:

1. Equalization Tank (T-801)
2. Tray Stripper Feed Pumps (P-803B & P-803C)
3. Water Filters (F-801B & F-802B)
4. Low Profile Tray Type Air Stripper (S-801A)
5. Tray Stripper Blower (B-801)
6. Carbon Feed Pumps (P-805A & P-805C)
7. Liquid Phase Carbon Filters (LC-801A & LC-801B)
8. Effluent Tank (T-802)
9. Effluent Pumps (P-810A & P-810B)
10. Effluent Monitoring System
    a. Samplers
    b. Flow Meter

A description of each of the treatment system components follows.

6.1.1 Equalization Tank (T-801)

The Equalization Tank is a 7.5 ft diameter by 9 ft high vertical, polyethylene tank with a capacity of 3,000 gallons. It provides both flow equalization and concentration equalization for all of the groundwater, VWCC system water, and miscellaneous waters that may be generated at the site.

Equalization is a critical component of treatment systems because it smoothes out peaks and dips of water flow and allows the treatment system to operate at nearly a constant flow rate. Water from the recovery wells enters through the side of building and discharges into the side of the tank near its roof. The VWCC system tank T-002 discharges through 50 *u*m filters to another side connection at the same elevation as the groundwater well water inlet.

Groundwater from six recovery wells (P-2, P-3, P-4, PW-1, PW-3 and PW-4) is pumped via five individual underground conveyance pipes. Pump PW-4 shares the same line as P-2. The five underground conveyance pipes join to a single conveyance pipe outside the treatment building (PW-3 connects inside before the influent meter), then enters the treatment building and empties into the Equalization Tank (T-801). Water also enters periodically from the VWCC system via discharge from Tank 002. Other infrequent sources of water entering the EQ Tank include water from the two floor sumps and backwash water from the liquid phase carbon filters. All incoming flow enters through the roof or side of the tank.

T-801 tank is equipped with a 2-inch PVC vent. To prevent the escape of any volatile organics and odors into the building, the vent is routed to a Calgon Ventsorb Carbon Canister (VC-801). Any organic vapors and odors emanating from the EQ tank are adsorbed by the

carbon. The outlet from the Ventsorb Canister is vented outside to the roof of the treatment building.

From T-801, the contents are pumped to the water filters and tray stripper by means of the Tray Stripper Feed Pumps (P-803A & P-803B). A level element and transmitter (LE-201 & LT-201, respectively) in T-801 control the level in the tank and the operation of the pumps as well as high and low level alarms. Additionally, a float switch provides redundant high level alarm back up. A local level indicator located at the bottom of the tank allows the operator to observe the water level in the tank. Because T-801 is oversized for the current groundwater flow, the operating levels (high & low) within the tank are limited in order to prevent the onset of septic conditions.

In the event of a system failure, the equalization tank is equipped with high and low level alarms which alerts the operator of an abnormal condition, when the water level reaches eight feet. and one foot, respectively. In the event of exceeding the high level alarm, a float switch will provide a redundant back-up high level alarm.

For maintenance purposes, T-801 is fitted with a top manway and bottom drain and potable water connection (normally isolated and locked out).

6.1.2 Low Profile Air Stripper Feed Pumps (P-803A & P-803B)

The existing Stripper Feed Pumps are 3 HP, centrifugal pumps, Series 320, Model 3X4X9A manufactured by Aurora. The pumps are rated at 20 gpm at 10 feet TDH. The pumps feed the groundwater to the Tray Stripper at a constant flow rate of 20 gpm.

The pumps are controlled by the level element and level transmitter in the Equalization tank (T-801), and are operated on an alternating “lead-lag” basis. The lead pump is started when the liquid level in the tank reaches the high set-point and turned off when the liquid level reaches the low-set-point. With the lead pump in operation, if the water level in the Equalization tank reaches the High-High level, the “lag” pump will turn “ON” to assist the “lead” pump in reducing the liquid level in the tank. As the water level drops, the lag pump will turn “OFF” when the liquid level reaches the low set-point.

6.1.3 Water Particulate Filters

Since a build up of particulates within the Tray Stripper could adversely affect its operation, the groundwater is filtered prior to air stripping. The water filters are four Bag Filters, Model BFA-5-150-6-CS, manufactured by Plenty Co. The four filters are configured in parallel pairs to allow for isolation of one pair at a time for filter bag changes without shutting down the system. Normal operation utilizes all four filters at the same time. Filters should be changed at 75% of the discharge pressure of the 803 pump feeding at the time (Example: if pump P-803C is operating at 28 psi, the filter should be changed when the pressure gauge on top of the filter (filter inlet) read approximately 21 psi).

6.1.4 Low Profile Air Stripper (S-801A)

The Tray Stripper is a Stat Series Low Profile Tray Stripper, Model Stat 180, manufactured by Carbonair. The unit is equipped with 6 trays, each tray being 72 inches by 36 inches by 12 inches, and can operate at liquid flow rates from 10-200 gpm. All parts of the stripper are

constructed of stainless steel. Minimum and maximum design air flow to the unit is 650 cfm and 900 cfm, respectively.

Equalized and filtered groundwater is introduced into the top of the unit while air is introduced into the bottom of the Tray Stripper through an 8-inch air inlet pipe just below the bottom tray. As the water cascades down through the trays, it is contacted with a mass of air moving upward through the trays. This intimate contact of air and water results in the transfer of volatile and semi-volatile organics from the water phase to the air (vapor) phase. Water, stripped of the volatile and semi-volatile organic compounds, accumulates in the bottom sump of the Tray Stripper, while the organic-laden air exits the top of the Tray Stripper through a 12-inch air outlet duct. Treated water accumulates in the sump and is eventually pumped to the Liquid Phase Carbon filters for polishing.

The stripper sump is equipped with level sensors which control the pumps that evacuate the treated groundwater from the sump, and pump it to the Liquid Phase Carbon Filters. When the water level in the sump reaches the High Level Switch (LSH-302), the lead pump is activated and pumps the water from the sump to the carbon filters. If the water level continues to rise and reaches the High-High Level Switch (LSHH-301), the lag pump is activated and an alarm is sounded. With two pumps operating, when the water level drops to the High Level Switch, the lag pump shuts down. When the water level reaches the Low Level Switch (LSL-301), the lead pump is turned "OFF." A high alarm at the Tray Stripper sump will shut down the transfer pumps into the Tray Stripper (P-803B and P-803C).

A pressure gauge is mounted on the air inlet of the Tray Stripper. An increase in the inlet pressure over a period of time indicates that the trays are experiencing plugging or fouling and will at some time require operator attention.

6.1.5 Low Profile Air Stripper Blower (B-801A)

Air to the Stripper is supplied by a 10 HP, 230v, 3-phase TEFC blower rated at a maximum of 900 cfm at 43 inches water column (WC). A Low Pressure Switch (PSL-301) is mounted on the discharge duct of the blower and will alarm in the event of a low pressure in the duct work leading to the inlet of the Tray Stripper.

6.1.6 Carbon Feed Pumps (P-805A & P-805C)

The existing Carbon Feed Pumps are 5 HP, centrifugal pumps, Model 3 x 2 x 11A with a 9-inch impeller, manufactured by Aurora. The pumps are rated at 200 gpm at 35.1 TDH. The pumps feed the groundwater to the carbon vessels at a constant rate.

6.1.7 Liquid Phase Carbon Filters (LC-805A & 805C)

Following air stripping, the groundwater is pumped from the sump of the Tray Stripper to the Liquid Phase Carbon Filters for final treatment. Carbon treatment is provided by a Calgon Model 7.5 Granular Carbon Adsorption System consisting of two carbon filters operating in series. Each carbon filter is 7.5 ft in diameter with a straight side height of 7.67 feet, and contains up to 10,000 pounds of activated carbon. The carbon filters are rated for operation at 75 psig at 150 deg F. Each filter can accommodate flow rates up to 350 gpm, resulting in an Empty Bed Residence Time (EBRT) of 6 minutes per contactor. At the maximum flow rate of 350 gpm, the pressure drop across the carbon bed is 23 psi. It is expected that the Liquid Phase Carbon filters will be operated at a flow rate of approximately 100 gpm, resulting in an EBRT of

21 minutes per contactor. The corresponding pressure drop through the carbon bed is expected to be less than 15 psi.

In the event a carbon bed is fouled, either by particulates, biological growth, or a combination of both, it will be necessary to backwash it to restore its hydraulic characteristics. Backwashing is accomplished by introducing potable water at a high flow rate in the opposite direction of normal flow. This causes the carbon bed to expand allowing the particulates to be washed out of the carbon bed. It should be noted that some carbon fines, due to attrition of the granular carbon particles, will be evident in the backwash water. This is a normal consequence of backwashing. The recommended flow rate for backwashing the Model 7.5 carbon contactors is 400 gpm, resulting in an EBRT of 4.3 minutes/filter. Because all backwash water is captured in T-801, it is recommended that T-801 be drained to its minimum level, and the Recovery Wells be shut down prior to commencing backwashing.

Water pre-treated by air stripping enters the lead carbon contactor and flows downward through the carbon bed, where the organics are adsorbed into the micro-pores of the activated carbon. Water exits the bottom of the first contactor and enters the top of the second contactor. Having two contactors on-line ensures a sufficient contact time for the adsorption of organics to take place. Having two contactors operating in series allows for monitoring the lead contactor for "breakthrough" of organics, without the risk of exceeding the discharge limitations.

Each Carbon filter is equipped with piping to remove spent carbon and install fresh carbon. In the event the carbon in the "lead" filter has been exhausted, new carbon will be ordered immediately and change-out scheduled as soon as possible. Once the spent carbon is removed and new carbon has been installed, the piping and valve arrangement of the system allow the "lead" and "lag" carbon filters to switch positions. The previous lag vessel becomes the lead vessel with the vessel with new carbon become the lag vessel. Monitoring continues between lead and lag vessel for breakthrough once again. A carbon maintenance SOP for the liquid phase carbon units is included in Volume II of this Manual.

6.1.8 Effluent Tank (T-802)

Treated ground water is collected, stored and sampled in the Effluent Tank prior to being discharged to a permitted discharge point. The existing Effluent Tank is a 7.5-ft diameter by 14.8-ft high vertical, polyethylene tank with a capacity of 4,400 gallons. A Level Element and Transmitter (LE-401 and LT-401, respectively) control the water level in the tank by controlling the operation of the Effluent Pumps (P-810A, P-810B), which empty the tank. A local level indicator located at the bottom of the tank allows the operator to ascertain the water level in the tank. A Level Switch (LS-402) will alarm if the water level in the tank reaches 8 ft. A high alarm will shut off pumps P-805A and P-805C.

A sampling port located at the bottom of the tank allows the treated ground water to be sampled prior to discharge. Sampling is conducted automatically by means of an ISCO sampler that is programmed to take samples in accordance with the SPDES discharge permit along with grab samples taken by the Operator as required (Appendix D, Permits and Registrations).

A vent located on the roof of the tank allows the tank to "breathe" during filling and draining cycles. The tank is also equipped with a bottom drain.

6.1.9 Effluent Pumps (P-810A & P-810B)

The treated ground water is pumped from the Effluent Tank (T-802) to the SPDES discharge location by one of two Effluent Pumps operating on a lead-lag basis. The Effluent Pumps are 5 HP, centrifugal pumps Model 3 x 4 x 9A with an 8-inch impeller manufactured by Aurora, and have a pumping capacity of 300 gpm at 43.4 ft total dynamic head (TDH).

The pumps are controlled by the Level Element and Level Transmitter (LE-401 & LT-401, respectively) in the Effluent Tank (T-802). The lead pump is started when the liquid level in the tank reaches the high set-point of 5 ft, and turned off when the liquid level reaches the low-set-point of 2 ft. In the event the lead pump is operating and the water level continues to rise and reaches the High-High level of 7.5 ft, the "lag" pump will turn "ON" to assist the "lead" pump in reducing the liquid level in the tank. As the water level drops, the lag pump will turn "OFF" when the liquid level reaches the "High" set-point. The "lead" pump will turn "OFF" when the Low Level set point (2 ft) is reached.

6.1.10 Sampling and Monitoring Equipment

The sampling and monitoring equipment are installed in accordance with the requirements presented in the SPDES permit. Treated groundwater is sampled from the Effluent Tank (T-802) on a routine basis dictated by the terms of the SPDES Permit. The samples are automatically collected using an ISCO Sampler, Model 3710 for all non-volatile samples, and grab samples for volatiles and HEM (Oil and Grease). Samples are refrigerated until they are packed on ice in insulator cooler(s) and sent to the laboratory for chemical analyses.

As the treated groundwater is pumped from the Effluent Tank to the SPDES permitted discharge location, the flow rate is monitored and recorded. The Flow Element (FE-403), Transmitter (FT-403) and Totalizer (FIQ-403 are located downstream of the pump outlet before the pipe exits the building. The flow meter is a gear driven meter with dial manual totalizer and remote signal to the PLC for instantaneous flow rate readout, 24-hour running flow totalization and resettable continuous totalizer all shown on the HMI screen.

6.1.11 Sump Pumps (P-804A & 804B)

Two sumps are located within the treatment building, one in the main aisle of the treatment building adjacent to the carbon contactors, known as the building sump which does not receive water from the treatment process area. The second sump is adjacent to the Effluent Tank and is known as the Containment Sump since it is located inside the treatment system containment area. The sumps are designed to collect any liquids that may get on the floor within the confines of the treatment building. Water collected in the sumps is pumped to the Equalization Tank and subsequently treated by the GWTS.

The sump pumps are ½ HP, centrifugal pumps, Model 457-2 manufactured by Liberty.

6.2 STANDARD OPERATING PROCEDURES

Volume II of this manual contains the following SOPs and additional SOPS may be added if the need arises:

1. SOP-1 SYSTEM START-UP
2. SOP-2 FLOW METER OPERATION, FLOW BALANCING, AND FLOW ADJUSTMENT

3. SOP-3 GRANULAR ACTIVATED CARBON SYSTEM OPERATION
4. SOP-4 COMPLIANCE SAMPLING FROM EFFLUENT OUTFALL 01A
5. SOP-5 SYSTEM SHUT-DOWN
6. SOP-6 ACCIDENTAL SPILL PREVENTION PLAN
7. SOP-7 ROUTINE OPERATION, MAINTENANCE, AND RECORDKEEPING
8. SOP-8 LOCKOUT / TAGOUT PROCEDURE
9. SOP-9 PUMPING WELL PUMP REPAIRS
10. SOP-10 ALARMS AND CORRECTIVE ACTIONS
11. SOP-11 FLOW MEASUREMENT

6.3 MAINTENANCE

In 2011, an Integrity Management Program was put in place focused initially on Protective System Devices. See the IM Program Inspection and Maintenance Plan in Appendix E. The program will expand stepwise to critical equipment and eventually all equipment in future years. The program provides an intensive inspection and maintenance plan to provide maximized uptime and a focus on zero incidents, while allowing the system to function as designed.

The system was designed to:

- Remove organic solvent contaminants from the groundwater.
- Discharge treated groundwater to a SPDES permitted discharge location.
- Maintain continuous compliance with the SPDES permit.

An updated process flow diagram is provided in Figure 3, P & ID Recovery Wells.

6.3.1 Waste Handling

The only waste generated from the day-to-day operation of the treatment system are water filter bags. Used filter bags are placed in a labeled 55-gallon drum that is staged within the containment area of the treatment system. Drums are disposed as hazardous waste within 90 days after they are full. Less than one drum is generated annually.

6.3.2 Low Profile Air Stripper (S-801A)

The Low Profile Air Stripper will require periodic cleaning of the trays due to fouling or scaling. Fouling of the trays will be manifested by an increase in the air inlet pressure to the air stripper. Another manifestation of tray fouling is flooding of the trays, which will necessitate a reduction in the groundwater flow rate to the stripper. Immediate corrective action must be taken to prevent further build-up or fouling. The trays should be cleaned pursuant to the manufacturer's recommendations, as presented in Volume III of this manual with site and system-specific details discussed in SOP-11. Piping, stripper tray gasket seams, and the tray access handhole cover should be inspected every time on site for leaks.

6.3.3 Pumps

The pumps referred to herein include:

1. Stripper Feed Pumps (P-803B and P-803C)
2. Carbon Feed pumps (P-805A and P-805C)
3. Effluent Feed Pumps (P-810A and P-810B)

4. Sump Pumps (P-804A and P-804B)

All of the above referenced pumps are Aurora centrifugal pumps, with the exception of the building sump which has a Liberty Pump, all designed for continuous operation. The electric motors for each pump utilize 440-volt, three-phase, and 60-Hertz power. The pumps have the following horsepower ratings and pumping capacity:

1. Stripper Feed Pumps — 10 HP and 200 gpm at 65 ft TDH
2. Carbon Feed Pumps — 10 HP and 200 gpm at 35.1 ft TDH
3. Effluent Feed Pumps — 5 HP and 300 gpm at 43.4 ft TDH
4. Sump Pumps — 1/2 HP and 15 gpm at 25 ft TDH

Due to their relative inactivity, sump pumps should be tested every 30 days and cleaned at least every 90 days by flushing with potable water. Test the pump by manually activating the float switch. Upon switching off the pump, listen for flow past the pump outlet check valve. Grit and dirt collected at the pump inlet shall be removed. Note any unusual noise produced by the pump.

Routine maintenance and preventative maintenance (PM) activities are to be conducted in accordance with the manufacturer's specification as presented in Volume III of this manual.

6.3.4 Instrumentation and Control

The system contains instruments, automatic controls, and manual control equipment for controlling and monitoring the system. The instrumentation included in the system consists of flow sensors/indicators/totalizers/level sensors/indicators/controllers and alarms. A description of the major features of the instrumentation and control system follows and is presented to familiarize the reader with the system's basic operational controls. Refer to the Process Flow Diagram (Figure 3) and record drawings (Appendix A) for additional clarity.

6.3.5 Set Points

System control and alarm/interlock set points are outlined below. Adjustments or modifications to these set points should not be made unless directed by the project manager and approved by BP. The set points for controlling pumps within the treatment system are presented below.

- Equalization Tank — 3.2 ft. pump ON, 2.0 ft. pump OFF, 4 ft "lag" pump ON
- Effluent Tank — 5.0 ft. pump ON, 2.0 ft. pump OFF, 7.5 ft "lag" pump ON
- VWCC Tank 002 — 5.0 ft. pump ON, 1.0 ft. pump OFF, 6.0 ft "lag" pump ON
- Stripper Sump — 14 in. pump ON, 4 in. pump OFF, 18 in "lag" pump ON

6.3.6 Alarms and Interlocks

Alarms and interlocks have been designed into the system to protect the equipment, personnel, and the environment. While interlocks perform automatic corrective actions, making immediate operator attention unnecessary, it is important to acknowledge a dialer alarm and then log in to the HMI using the VNC (remote access) system. See Section 4.2.5. Each alarm condition and interlock is discussed below.

Alarm Conditions

Abnormal operating conditions are monitored by the PLC using the alarms listed below:

- Groundwater extraction well high and low level alarms
- Loss of radio telemetry for groundwater extraction wells
- Influent/Equalization tank (T-801) water level, high and low level alarms
- Filter feed pumps (P-803B, P-803C) failure to start alarms
- Air stripper reservoir high and low water level alarms
- VWCC Vaults (1,2,3) and tanks (T-001, T-002) high level alarms
- VWCC pre-filter differential pressure and alarm
- Air stripper blower air low flow rate alarm
- Air stripper transfer pump (P-805A, P-805C) failure to start alarms
- Effluent tank high and low level alarms
- Effluent pump (P-810A, P-810B) failure to start alarm
- Containment area drain sump/building drain sump high level alarms

Interlocks

An interlock exists between the Air Stripper Low Pressure Switch (PSL-301) and the GWTS PLC. In the event low pressure is detected in the air inlet to the stripper, the PLC will automatically begin an automatic shut-down of the GWTS, VWCC System and recovery wells. Interlocks in the GWTS and VWCC System are typically associated between the process pumps and water levels in the three tanks and the Stripper sump. The set points for controlling the operation of the pumps are provided in Section 5.3.5 above.

6.3.7 Preventive Maintenance Program

The component selection for the system was conducted to use equipment with minimal maintenance requirements. After system start-up, maintenance is required only when performance decreases and/or alarm conditions are present. Flow meters, level sensors, control valves, submersible pumps, and PLC's generally require no preventative maintenance. Rotating equipment in the GWTS requires periodic lubrication as specified in the manufacturer's specification as presented in Volume III of this manual.

Weekly or more frequent inspection of the system operation is to be conducted after the initial setup to verify proper system operation. The timing of these inspections may be adjusted based on operating experience. The inspection report forms are to be completed each time operations personnel are present at the site. Refer to the IM Program Inspection and Maintenance Plan located in Attachment III, Appendix E. Where repairs need to be conducted, it is important that the manufacturer's installation and operating manual be reviewed.

6.4 SAMPLING AND MONITORING PROGRAM

Sampling is conducted in accordance with the Groundwater Sampling and Monitoring Program for the site. See Section 3 for detailed SPDES sampling and analytical procedures.

6.5 RECORD KEEPING

Records of inspections, service, repairs, and maintenance are to be kept for the duration of the GWTS operation. An inspection report form has been developed for the system and is

provided in the daily log. The inspection report is to be completed for each visit to the GWTS by operations personnel.

One copy of the inspection and maintenance/repair reports, and the inspection/maintenance/repair log, is to remain at the treatment plant in and copies of the reports are to be distributed to the project manager for review and upload to ENFOS. Complete, accurate, and timely completion of the inspection reports is important to ensure optimal system operation.

6.6 PERSONNEL

Note that O&M personnel will be assigned by Parsons and include Project Supervisor, Operator, and other staff as identified in Section 10.2.

6.7 HEALTH AND SAFETY REQUIREMENTS

The safety of the public and of personnel operating and maintaining the system is of highest importance.

Four key health and safety concerns associated with the operation and maintenance of the system are:

- Physical hazards typically present at manufacturing facilities;
- Mechanical/electrical equipment maintenance and repair hazards;
- Safe operation of the system; and
- Exposure to contaminated groundwater, soil, and vapors.

All personnel and contractors must meet the requirements in the Health, Safety, Security, and Environment (HSSE) Plan. The HSSE plan is provided in Appendix B.

6.7.1 Physical Hazards

Personnel at the GWTS must maintain a high degree of safety awareness due to the presence of physical hazards. Personnel must exercise caution in all activities around the facility and the system. Typical physical hazards include trips or falls, punctures, cuts, and electrical shock. In response to these hazards, safety practices and procedures for the facility are contained in the HSSE plan. All personnel should be well acquainted with these documents prior to conducting work on or around the GRS.

6.7.2 Equipment Maintenance and Repairs

Maintenance and repairs to mechanical and electrical equipment associated with the system pose additional potential health and safety hazards. Personnel untrained in the operation and maintenance of the system should not handle, adjust, or tamper with any electrical equipment, machinery, or piping. Machinery should not be repaired or adjusted while electrically energized or in operation. Automatically operated mechanical equipment may start and/or stop without warning. No repairs should be made on this equipment until it is locked out and tagged as described in the HSSE plan (Appendix B). Using your own lock, always open and lock the main circuit breaker in Power Panel MCC 1 and the mechanical disconnect associated with the equipment to be worked on. Check components for power with a volt-ohm-amp meter. After repairs are completed, clear personnel from the area before closing the main breaker. Equipment

repair safety practices are discussed in the HSSE Plan (Appendix B) and in the installation, operation, and maintenance literature presented in the OM&M Manual.

6.7.3 Safe GWTS Operation

System start-up, shutdown, and standard operation pose health and safety concerns due to automatic equipment operation, pressurized piping, and high water-flow rates. Ensuring that personnel are thoroughly trained in the operation of the system and knowledgeable of its capabilities will reduce the potential for accidents. The HSSE Plan (Appendix B) equipment manufacturers' information should be reviewed for specific safety requirements.

6.7.4 Contaminant Exposure

Exposure to contaminated groundwater or vapor is a health and safety concern primarily when conducting repairs on equipment that is in contact with the groundwater. The potential for exposure to contaminated groundwater or vapor is minimal during other activities associated with the system; however, personnel should continually be aware of the contaminant hazards at the site. The site specific HSSE Plan (Appendix B) has been developed for situations in which potential exposure to hazardous contaminants is possible. The plan outlines potential physical and chemical hazards, personnel protection methods, monitoring techniques, and provides information on emergency resources and contacts.

All activities conducted within the treatment building require Level D protection, at a minimum. Protective equipment shall be worn according to the requirements of the HSSE Plan (Appendix B). In the event of a spill of contaminated groundwater outside the confines of the treatment building, the operator shall follow the spill prevention, control, and countermeasures (SPCC) procedures (Appendix B, HSSE Plan).

SECTION 7

SYSTEM OPERATION

Proper operation of the groundwater extraction wells and the treatment system will ensure successful treatment of the extracted groundwater and prolong equipment life. A thorough understanding of normal operation and control, start-up procedures, sampling and monitoring, and shut-down procedures are necessary to prevent discharge of untreated or partially treated air and water.

Several control panels are provided for operation of the treatment systems: the motor control center (MCC); the main control panel (MCP), which houses the PLC; the PLC; and the local control panel at each groundwater well; and HMI interface (PC). The MCC controls the main power sources for the treatment systems. The MCP contains the interconnection point for flow, temperature, and fluid level switches and the alarm annunciator, and PLC system. The well local control panels provide local hand-off-automatic (HOA) control, remote input and output controls for the PLC, and automatic well level controls.

The groundwater air stripping system is designed to run in an automatic, unattended mode. Protective sensors which monitor air flow, water level, etc., will shut the system down if critical equipment stops or fails. Well pumps will cycle according to their water level. The air stripper automatically regulates sump levels through level controls in the PLC. Blower air flow rate may be manually adjusted over time for average total influent flow rate. The system may be run in Hand mode, but protective functions "interlocks" that typically result in system shut-down while operating in Auto mode will be bypassed. All protective functions that disallow operation of the system, such as high pressure differential switches or tank level indicators and setpoints are not functional while operating in the Hand mode.

7.1 NORMAL OPERATION

Normal operating procedures are described in this section. These procedures have been prepared assuming the System Start-Up procedures as described in SOP-1 (Volume II of this manual) will be implemented. SOP-7 in Volume II of this manual describes the routine tasks and documentation to be completed by the system operator during normal operation. The groundwater treatment system is designed to operate under a wide range of hydraulic flows. The groundwater treatment system can operate with any number of the available extraction wells operating. The groundwater system is capable of treating flow rates from 10 to 100 gpm. The Equalization Tank (T-801) allows the system to treat groundwater pumped from various extraction wells at varying flow rates. The GWTS tank and stripper sump level sensors allow for the variations in flow rate due to well cycling, to turn on/turn off lead/lag pump combinations allowing water levels in tanks/sumps to be maintained within prescribed operating levels. SOP-5 of Volume II provides detailed instructions for system shut-down.

7.1.1 Groundwater Extraction Wells

Normally, the extraction well pumps will be pumping water on a cyclic basis, shutting off when the low water level setpoint is reached and turning on when the high water level setpoint is

reached. The pump installed in each well was selected based on the flow rate required to most efficiently cycle the pump operation.

The well's water level is maintained by the PLC utilizing a continuous level signal form a downwell pressure sensor. The PLC compares the well level with the control level setpoints, which are the desired high and low water levels. The PLC sends an output signal to the starter that turns the pump on or off.

Each pump has a Hand-Off-Auto mode of control switch. Figure 4 shows the current well construction details. Note the placement of the level probes, the pump intake elevations, and level transmitter.

Revised flow rates for each of the operational pumping wells are listed in Table 3, Recovery Well Specifications. These values should be considered target values for the system after the focus of remediation was revised to Top of Rock and Zone 1. The target values may change over the life of the project and must be reassessed periodically to determine whether the system is maintaining the optimal drawdown. The level set point is changed by logging in to the PLC HMI with your ID and password, then press the "PLC Setup" radio button, and once that opens, then press the "Alarm Setup 1" radio button, then make changes to setpoints as required. If a level is adjusted, the flow rate and operation should be checked frequently to ensure that the proper control and pump cycling has been attained. Flow rates are checked using the flow rate/totalizer meter installed at the well head.

7.1.2 Treatment Plant

The groundwater treatment system is intended to be operated and controlled from the PLC HMI PC, using the PLC as the central monitoring and control point for all system functions. Process status and control functions are displayed on the HMI graphic control displays to allow the operator to access all process data, control and alarm functions. Control/graphic screens have been developed to show increasing detail when a process element (tank, pump, etc.) is clicked on until all input parameters have been displayed.

All motor start/stop control is directed with graphic controls on the HMI, including mode selection between Manual and Automatic. In manual mode, radio buttons for START and STOP are used for pump control. In automatic mode, with parallel paired pumps, lag and lead selection can be made. All motors supplied from the MCC at 480V have HOA switches on the MCC starter panel as the backup mode, with the MCC switch in Auto for the PLC controls to function. The graphic displays show motor symbols (icons), colored Red for running status, power on, and Green for not running status, safe condition.

Real-time process values are also displayed with graphical representation of the unit process (tank, pump, etc.)the unit-specific parameters (level, flow, etc.). Alarms are displayed by red flashing of a displayed value on the HMI and are summarized in alarm graphic displays. Alarms can be acknowledged from the HMI, but cannot be reset until alarms has cleared (Out Alarm message on HMI screen).

Normal operation of the treatment systems includes control, monitoring and adjustment, if required, of the following equipment:

- the equalization tank (T-801) transfer pump system (P-803B, P-803C);

- the air stripper blower (B-801A);
- the air stripper sump pump system (P-805A and P-805C); and
- the final effluent tank (T-802) transfer pump system (P-810A, P-801B).

7.1.2.1 Groundwater Treatment System Operation

Upon start-up of the groundwater treatment system, the first equipment to run must be the air stripper blower, B-801A. An alarm and manually-reset interlock for "Air Stripping System Failure" includes detection of the following: low air pressure (PSL-301) with blower running; analog value check on T-801, S-801A; and T-802 level values (LSL and LSH alarms). After blower start, air flow should be detected within 20 seconds.

With blower running, the T-801 pumps (P-803B, P-803C) are enabled. The groundwater wells will function in auto until the equalization tank T-801 reaches high level alarm condition. In Auto mode, the wells are sequentially started, with 30-second delays between each well start. The VWCC Tank 002 pumps (P-006, P-007) will transfer to tank T-801 until the high level float switch is activated.

The control system uses a cascade approach. If a bottleneck develops and a tank or stripper sump hits the high alarm level, the pumps just prior to that unit are locked-out by the PLC until the level alarm condition is cleared. The following is a list of these interlocks in the control system:

- Final Effluent Tank (T-802) high level alarm locks out stripper sump pumps (P-805A, P-805C)
- Stripper Sump (S-801A) high level alarm locks out filter feed pumps (P-803B, P-803C)
- Equalization Tank (T-801) high level alarm locks out recovery well pumps (P-2, P-3, P-4, PW-1, PW-3 and PW-4)
- Equalization Tank (T-801) high-high level float switch alarm locks out VWCC Tano T-002 pumps (P-006, P-007)
- VWCC Tank T-002 high level alarm locks out the VWCC Consolidation Sump (T-001) pumps (P-004,P-005)
- VWCC Consolidation Tank (T-001) locks out vault sump pumps (P-001, P-002, P-003)

The groundwater treatment process transfer pumps are all controlled from PLC set points for the tanks (T-801 and T-802) and air stripper sump (S-801A). The PLC logic uses set points to start and stop each transfer pump based on water level increasing or decreasing, with a small level and time delay (deadband) between each pump operation to prevent short cycling. The graphic displays allow selection of the pump starting order (two pumps, as lead-lag) to allow matching of pump capacity to system influent flow rates. Time delays and level set points are adjustable from the tank/pump level setpoint graphic control screen.

7.1.2.2 PLC Human Machine Interface (HMI)

An IBM compatible personal computer provides the Human Machine Interface (HMI). The operator control screens provide a graphical representation of the process and its major unit operations (tanks, pumps, etc.). The main screen of the HMI is a simplified representation of the

process flow diagram with real-time process data displayed. By clicking on a treatment system element, a graphical representation of that specific unit is displayed with greater levels of data detail. Control of system setpoints, lag/lead pump selection, and manual operation of pumps is done via the HMI. Alarms are visually displayed graphically in some cases and in text in all cases on the bottom of the main HMI screen. Pumps can be put in manual mode and operated via the HMI, but continuous operator attention is required as interlocks like tank high or low level will not shut the pump down. Putting a pump in manual mode in the STOP condition is also a method to shut down and make it unavailable for PLC control. For conducting maintenance on or long term isolation of a pump, the defined practice of energy isolation must be employed.

The complete process control scheme is shown on the process and instrumentation diagram (P&ID) presented in Appendix A. The operators will need to become familiar with these drawings and the mechanical/electrical drawings to properly perform system operations.

7.2 TROUBLESHOOTING

The groundwater treatment system is designed for hands-free operation during normal operating conditions. Normal operating conditions include full operation of all installed equipment. However, any equipment may malfunction at some time in the operation of the system; therefore, this section on troubleshooting has been prepared to provide information on the most likely causes and solutions for system malfunctions. Additional information may also be found in the Equipment Manufacturer's Information provided in Volume III of this Manual.

7.2.1 Safety Procedures

The HSSE plan provided in Appendix B of this manual must be reviewed prior to any work at the site. Maintenance and Troubleshooting procedures occasionally require the operator to work on the equipment with the system operational. Therefore, the operator must exercise extreme caution. Automatic or manual activation of a device, or devices, could result in serious injury to personnel. There is also the possibility of being exposed to water containing elevated levels of TCE. Personnel must have appropriate training as specified in the HSSE Plan and a thorough understanding of the procedures outlined in this OM&M Manual prior to working on the system. Personal protective equipment must be worn as needed or as required by the HSSE Plan (Appendix B).

7.2.2 Equipment

The following equipment is recommended to work on the system:

- A good quality 3-1/2 Digit digital Volt Meter (DVM) capable of reading at least 1,000 Volts AC and DC and Resistance values of at least 10 MegOhms;
- An AC current clamp or ammeter capable of reading up to 200 Amps (AC);
- A screwdriver set (both blade and Phillips type);
- Open or Closed-end wrench set (up to 1-inch);
- Pipe wrench capable of handing 3-inch pipe;
- Hammer;
- Socket Set (up to 1-inch);

- Appropriate Safety Equipment; and
- Flashlight.

7.2.3 Troubleshooting Procedures

Troubleshooting information is available in the equipment manufacturer's operation and maintenance literature provided in Volume II and Volume III of this manual. Information on the following equipment is provided along with other associated supporting equipment:

Groundwater Collection and Treatment System Equipment

- Air Stripper Blower (B-801);
- Air Stripper (S-801A);
- Liquid Phase Carbon Units (LC-801A, LC-801B);
- Equalization/Effluent Tanks (T-801, T-802);
- Groundwater Recovery Wells (P-1, P-2, P-3, PW-1, PW-3, and PW-4);
- Pre Filters (F-101B, F-102B);
- Building and Containment Sump Pumps (P-804A, P-804B);
- Transfer Pumps (P-803B, P-803C, P-805A, P-805C, P-810A, P-810B);
- VWCC System Pumps (P-001, P-002, P-003, P-004, P-005, P-006, P-007)
- VWCC System Tanks (T-001, T-002)
- VWCC System Particulate Filters (BF-001, BF-002, BF-003, BF-004)

Although some preliminary troubleshooting is possible by the operator, a trained instrument technician and/or electrician may be required for problems with the electrical power, control, or instrumentation systems. References should be made to the as-built panel drawings presented in Appendix A as needed.

7.3 CONTINGENCY PLANS

During system operations, the operator must be prepared to rectify any problem that may occur. The operator should be very familiar with the HSSE plan in Appendix B. In the front of the HSSE plan, before the table of contents, is a Site Emergency Response Plan. This plan includes emergency contacts including phone numbers, emergency route, the route to the nearest hospital in map and text form, and a site specific Evacuation and Contingency Plan. This information is also posted on the control room safety bulletin board.

7.3.1 System Failure

In the event that a system failure occurs, the system will shut itself down. Because the system will operate hands-free, if a major fluid release, elevated pressures, or other system upset occurs, the system pumps will stop. Control logic in the PLC includes backup shutdown controls for the processes.

The control system is equipped with an auto dialer which will notify, via telephone, the operator and other persons in the event that a system failure or upset has occurred. The auto dialer is programmed to contact the Operator and appropriate back-up personnel.

The auto dialer will initiate calling and continue down the list until acknowledgment of the autodialer occurs by responding by pressing * when receiving the call. Immediately upon acknowledging the dialer, the VNC system must be used to check the PLC HMI for detail on alarm condition. Until an alarm condition is cleared, the auto dialer will continue to call out every two hours.

SECTION 8

SITE MAINTENANCE

Any work at the site requires that a Work Risk Assessment be developed in advance of the work. Once the Work Risk Assessment is finalized and before beginning any work, an Authorization to Work (Daily Toolbox) is required to be completed, reviewed by anyone working on the task, and signed by each team member working on the task. If a Task Safety Environmental Analysis (TSEA) does not already exist for the tasks, a new TSEA should be completed. Any applicable permits should be prepared prior to beginning the task (confined space entry, working at heights, hot work, etc.).

The groundwater treatment system maintenance requirements for each major component is described in this section. Maintenance requirements are included for the following:

- Building and grounds maintenance
- Power supply, instrumentation, and controls
- Piping and appurtenances
- Valves
- Flow meters
- Annual maintenance checklist
- Pumping wells, pumps and controls
- Transfer and sump pumps
- Tanks
- Filters
- Air stripper system
- Liquid Phase Carbon Units

Information in this section is based on a review of the equipment manufacturer's literature and on previous experience with equipment similar to that installed at the site. In Volume III and IV of this manual, a listing is provided of the brand and model number of the equipment used for components of the remedial systems. They also contain manufacturer's information for equipment used in the remedial systems. The manufacturer's information includes equipment descriptions, performance specifications, and operating and maintenance procedures.

WARNING: Before Performing Any Maintenance Procedures, Personnel Should Be Thoroughly Familiar With The Safety Procedures Outlined In Appendix B Of This Manual. Equipment Utilized In This Section Poses A Potential Shock Or Injury Hazard To Personnel. Do Not Attempt To Work On This System Unless You Are A Qualified Technician, Have Thoroughly Reviewed This Manual, And Have Received The Appropriate Training.

The elements of a good maintenance program include but are not limited to:

- Records of operating parameters;
- Planning and appropriate scheduling of maintenance activities;
- Maintenance records; and
- Adequate spare parts list availability.

Maintenance can be divided into three categories:

1. Routine maintenance;
2. Preventive maintenance; and
3. Corrective maintenance.

Routine maintenance shall be performed as needed by authorized personnel. It requires daily attention to numerous small items which might otherwise be overlooked such as changes in motor sound, vibrations, or odors in the air.

Preventive maintenance shall be conducted routinely on a scheduled basis throughout the life of the system to ensure that the system operates as designed. Preventive maintenance enhances the life and performance of equipment, and helps to minimize system shut-down conditions due to equipment failure.

Corrective maintenance is required when equipment break-down occurs. This condition usually requires more extensive work than preventive maintenance. Corrective maintenance may be required at odd hours and may involve a critical piece of equipment. Emphasis should be placed on preventive maintenance to avoid corrective maintenance.

In 2011, an Integrity Management Program was put in place focused initially on Protective System Devices. See the Inspection and Maintenance Plan in Appendix E. The program will expand stepwise to critical equipment and eventually all equipment in future years. The program provides an intensive inspection and maintenance plan to provide maximized uptime and a focus on zero incidents, while allowing the system to function as designed. The IM plan requires specified inspections and tracking of maintenance activities with a Corrective Action Log.

Following is a list of maintenance procedures which are to be performed at the specified intervals. These procedures and intervals should be reviewed periodically and expanded as needed to ensure proper, reliable operation is achieved. For more information regarding equipment maintenance, refer to Section 6.5 – Troubleshooting, and Volume III & IV– Equipment Manufacturer's Literature and Equipment Spare Parts List.

8.1 MAINTENANCE ACTIVITIES

A general inspection of the treatment building, well houses and grounds should occur on a frequent basis at least weekly. Specific information is provided in the following sections.

8.1.1 Site Fence

Much of the site, although not all, is contained within a chain-link fence. The fence should be visually inspected quarterly to confirm the integrity of the fence. Any required repairs should be made promptly.

8.1.2 Signs

Emergency numbers are posted on the front of the treatment plant in the event of an emergency at the site during business hours or outside of normal business hours. This sign should be updated or replaced as required. There is also NYSDEC required signage at the SPDES outfall that must be maintained and kept up to date with contact information.

8.1.3 Cover

The site is covered by a mix of open vegetated areas, pavement, a stone drive and parking area, and buildings. Routine mowing is conducted during the growing season approximately once per month. The parking and driveway areas are maintained as required.

8.1.4 Groundwater Conveyance System

Piping and Appurtenances

All exposed pipes and fittings should be visually inspected for leaks, loosening, and general condition. To check for leaks, the associated pump must be running. If it is not running, put the pump HOA switch in Hand. Before leaving the extraction well, make sure the pump HOA switch is returned to the Auto position. Visually inspect all piping and fittings located in the well sheds and treatment building as described above. Monitor pressure gauges for pressure drop indicating leak in the system.

Valves

Periodic inspection of valve fittings is necessary to ensure system integrity. Failure can be detected by examining the valve for leakage while under pressure (pump running). If leakage is found, the line must be shut down for repair. Leakage is usually caused by a loose coupling or packing nut or a seal failure.

Ball, Butterfly, and Gate Valves

Ball, butterfly, and gate valves are utilized primarily to isolate equipment or re-direct process flow.

WARNING: Valve Settings Should Only Be Changed By Persons Knowledgeable With The Site and Process Operation.

Valves generally should be exercised every 180 days. Exercise the valves at appropriate times so as not to interfere with system operation. In some cases it may be necessary to shut down a pump to exercise a valve. Open and close the valve at least two times. Note whether an excessive amount of force is required to change the valve position. Be sure to restore the valve to its normal operational position and all equipment restored to running condition.

Check Valves

Check valves are used to control flow direction, particularly to prevent the reversal or backflow of fluids in piping systems. Typically, there are no operator adjustments to be made to a check valve. However, the operator should note whether the check valve is re-seating correctly when pumping is stopped. If water is heard flowing through the valve after pumping has stopped, the valve may not be re-seating. Also, if the driving pump begins rotating in the opposite direction when the motor is shut off, a problem may exist with the check valve.

Back-Flow Preventer

A back-flow preventer was installed on the incoming potable water line and is located in the treatment building to prevent introduction of fluids into the Municipal water supply. The installed back flow preventer is a Watts 909 series, three inch cast iron body with stainless steel internal parts. The back flow preventer was installed following all State, County and Town plumbing codes, and should be inspected annually by a certified plumber registered in the County of Niagara, Town of Wheatfield. This certificate can be found in Appendix C, Records and Forms.

8.1.5 Groundwater Monitoring Wells

Groundwater monitoring wells should require little maintenance under normal conditions. Locked padlocks should be maintained on each protective casing or well cap. Wells should be painted a bright color and labeled with the ID number and should be maintained as needed. Any damage should be reported and addressed in a timely fashion.

8.1.6 Settlement & Subsidence Control

During inspections of the site, any settlement or subsidence should be noted. Repairs should be completed as required.

8.1.7 Vehicle Access Road

A gravel access road and parking area at the site is maintained by Atlantic Richfield. Any tire ruts or unevenness of the access road or parking area should be addressed by the plant operator.

8.1.8 Bentomat Cover

A portion of the site was covered with Bentomat to enhance the soil vapor extraction and air injection system. With the soil vapor extraction and air injection system removed, repairs to the Bentomat are no longer required.

8.2 GROUNDWATER EXTRACTION SYSTEM

Well Pumps

Well pumps should be checked annually for the items listed below. Operation and performance values should be recorded for future reference (see Volume III – Equipment Manufacturer's literature for specific procedures and typical values):

1. Current draw and phase-to-phase current balance (it should be noted that the pump current will change with pumping rate and/or head pressure changes);
2. Insulation resistance of motor leads from phase-to-phase and ground;
3. Motor winding resistance; and
4. Discharge rate.

Well Sheds

Well sheds should likewise require little maintenance under normal conditions. Padlocks should be maintained on each well shed to prevent unauthorized entry. Door hardware must be maintained to provide secure closure and good weather seal for winter heating. During cold

weather months, portable heaters must be maintained to prevent freezing of well head piping. Heater operation will be verified at least weekly when in service. Wooden well sheds should be inspected for peeling paint or rotting wood. Plastic sheds should be inspected for cracking and holes. Weed control should be practiced around the well shed locations as needed for a good appearance.

8.3 DESCRIPTION OF MAINTENANCE REQUIREMENTS FOR EACH COMPONENT OF THE TREATMENT FACILITY

Lighting

Lighting fixtures and light bulbs shall be replaced during routine maintenance when required. For replacement of lighting fixtures and lamps, refer to the manufacturer's literature, located in Volume III, for exact size and model numbers. Be sure to practice energy isolation prior to servicing any electrical equipment.

Heating

Check operation of heaters weekly during winter months and every 180 days the remainder of the year by manually turning on heater with thermostat. If heater does not respond to thermostat controller, check circuit breaker and thermostat settings. Refer to manufacturer's literature in Volume III for replacement of parts and maintenance procedure.

Treatment System Control Equipment

Performance of the control system should be observed in light of the description provided in Section 6. Refer to Section 6.5.3 for troubleshooting procedures if abnormal or erratic system response is observed.

Every six months, the following items should be inspected and tested:

- Inspect for loose or corroded electrical connections at all terminal blocks.
- Measure the control power voltage provided by the 120 VAC control power transformer for the well shed control panels that powers the level sensor, radio telemetry, heater, lighting (PW-1 and PW-3 only), and power receptacle. The nominal voltage is 120 VAC. The minimum voltage is 105 VAC.
- Visually inspect all fuses.
- Visually inspect all control wiring for indications of damage or wear.
- Visually inspect all panels for moisture and corrosion.

Observe all equipment manufacturer's procedures and safety precautions prior to commencing any of the above equipment checks.

Programmable Logic Controller

The PLC is used to operate the groundwater recovery and treatment system. Refer to manufacturer's literature (Volume III) for detailed programming instructions, operational instructions and troubleshooting procedures operations.

Transfer and Sump Pumps

See Section 5.3.2 for a detailed description of pump maintenance.

Tanks

Maintenance activities for the equalization and effluent tanks primarily include periodic cleaning and inspection. Detailed maintenance activities are summarized below.

General

The tanks are inspected for damage and scale build-up during daily inspections. Tank cleaning was not required during the first 19 years of operation but in the event that tank cleaning is required, it will be completed following manufacturer's recommendations. The fluid level transmitters are checked daily by comparing water levels in the tank to the PLC reading. If the fluid level transmitters are not accurately reading, they will be cleaned. If the fluid level transmitters are still not accurate, the fluid level transmitters will be recalibrated.

Solid Removal

The solids build-up in the bottom of the tanks should be minimal, but solids may have to be periodically removed. The depth of solids should be checked once a month. Solids depth should be checked when the liquid in the tank is in a quiescent state. Care should be taken when lifting the equalization tank manhole to avoid potential exposure to volatile organic vapors that may be present. A photoionization detector should be used to monitor volatile organic vapors prior to this maintenance activity. When cleaning tanks, the operator shall follow procedures for confined space entry discussed in the HSSE Plan (Appendix B). The solids should be removed from the tanks once a year or more frequently if the level of solids in the tank rises above the effluent discharge pipe.

To remove solids, the tanks must first be drained. The tanks can be drained by shutting off influent flow pumps and pipeline valves and operating the discharge pumps in manual mode. Monitor the fluid level in the equalization tank closely until it approaches the solid interface. Care should be exercised to prevent solids from being pumped to avoid overloading downstream systems with solids.

WARNING: Do Not Let The Filter Feed Pumps, Air Stripper Transfer Pumps or the GAC Feed Pumps Run Dry. It will destroy the seal and cause fluid leakage.

The tank should be cleaned without entry utilizing vacuum truck service. Removal of solids should be able to be accomplished by hosing from the top hatch while pulling from a bottom tank connection with the vacuum truck. The solids should be placed on a 6-mil poly-lined drying bed appropriate in size for the amount of solids removed from the tanks. Solids should be screened with a photoionization detector, and then stored in 55 gallon drums for off-site disposal.

Sensors and Measurement Devices

Under normal operating conditions, sensors and measurement devices, including water level probes, water level indicators, and pressure indicators should require little maintenance. If the sensor or measurement device is providing anomalous or faulty data, the input voltage, current, and probe connections to the PLC, should be checked first before pulling the cable/probe. After making sure all aforementioned items are correct, remove the cable/sensor and inspect for corrosion. In the case of the groundwater wells, the connecting cable at ground surface also should be inspected for damage when the sensing element is removed and inspected.

Maintenance for level sensors and measurement devices should be compared monthly against manual measurements to check for proper operation. Removal and cleaning should only be necessary if the probe is determined to be malfunctioning. The condition of the wires leading to the control box should be checked when doing weekly pump house inspections and flow meter reads. In some cases, the level probe is inserted in a small pipe to act as a stilling well, and the tube should be checked to assure that no blockage is present that would prevent water from freely entering.

Tank level transmitters should be checked for accuracy when conducting plant inspections and recalibrated as necessary.

Gauges

Pressure gauges and all other gauges for the remedial system should be checked monthly for proper operation. Malfunctioning gauges should be replaced immediately.

Filters

The treatment system utilizes four bag filters simultaneously. The four bag filters are configured as two sets operated in parallel. Valves exist at the inlet and outlet from each filter pair that allow isolation for filter bag change while the other pair of filters stay in service to prevent system shutdown. The bags should be changed when the inlet pressure to the filters (gauge on top of each filter) is about 65-70% of the filter feed pump (P-803B, P-803C) outlet pressure (with only one pump running at a time). An example – if the filter feed pump has a discharge pressure of 30 psi, the filters should be changed at about 65-70% of that pressure, or about 20 psi. All four filter bags are changed at the same time using 50 *u*m bags.

To change the filters, first isolate a pair of filters by closing the inlet and outlet valves. Then open the bottom drain valves then open the top air vent valves. The top cover is then opened for filter replacement. Allow the filters to drain until they can be easily lifted out. Place the removed filter on the containment sump grating and allow them to completely drain. Allow filters to dry out completely before placing them in the waste drum which is located in the containment area. When full, the drum is sent for off-site disposal. Inspect the strainer basket in the filter and remove and clean if biofouling is noted. Be sure to pull all filter bag cloth into the filter housing so the metal ring in the top of the filter opening seats firmly on top of the filter strainer basket. During change out, "O" rings seated in the edge of the filter housing should be inspected and replaced if worn or damaged. Upon completion, close cover assembly, being careful not to disturb "O" ring, and tighten cover lugs evenly so filter lid seats completely. Close filter drain valves and top vent valves on both filter, then open the inlet valve to the filter pair, then open the outlet valve on that order so the filters bags are initially seated correctly.

Air Stripper System

Air Blower

Adequate air flow to the air stripper is critical to achieving acceptable effluent quality. Operators should pay close attention to blower operation and take corrective action if a problem is suspected.

The blower is a direct coupled unit which eliminates power transmission issues that come with gears or belts. Fan (impellor) balance and lubrication is all that is required for reliable continuous operation. Maintenance instructions can be found in Volume III of this manual.

Stripper

Maintenance procedures for the air stripper are provided in Section 6.3.1.

Liquid Phase Carbon Units

During carbon transfer operations, inspection of the vessel internal parts should be made to ensure the underdrain, vessel lining, and nozzles are in good condition. Any nozzles showing signs of wear or damage should be replaced. Pressure gauges used to monitor the pressure drop across each carbon bed should be read weekly. If above average pressures are observed, then corrective action (backwashing) should be taken before the pressure becomes a problem with reduced flow rates potentially creating a bottleneck in the treatment process. If an underdrain nozzle fails or if pressure increases, the system should be shut down until the system is repaired.

WARNING: Activated carbon readily scavages oxygen, any inspection of the vessel must be done with care while following energy isolation and confined space entry defined practices.

If a major leak or similar problem develops, flow to the adsorber should be stopped immediately and steps taken to correct the problem. Proper safety procedures should be observed at all times to prevent damage to the equipment or injury of personnel.

8.4 MAINTENANCE SCHEDULE

Table 4 lists the plant inspection that should be done at least weekly. Discrepancies in data trends should be investigated and corrected as necessary. A chronological maintenance checklist for the remediation system for each month of the year is included in the IM Program Inspection and Maintenance Plan located in Attachment III, Appendix E. Detailed inspection/maintenance log sheets are provided in Appendix C, Records and Forms. For each major equipment system, the checklist shows the suggested timing of the maintenance activity to be performed. The frequency of the maintenance activity is indicated by the location of each “check-off” box. For detailed explanations of the required maintenance, refer to the text in this section.

In 2011, an Integrity Management Program was put in place focused initially on Protective System Devices. See the IM Program Inspection and Maintenance Plan in Appendix E. The program will expand stepwise to critical equipment and eventually all equipment in future years. The program provides an intensive inspection and maintenance plan to provide maximized uptime and a focus on zero incidents, while allowing the system to function as designed.

SECTION 9

REPORTS

9.1 QUARTERLY REPORTS

Quarterly monitoring reports are completed and provided to NYSDEC. The first report of the year covers all activities at the site between January 1 and March 31. The second report covers April 1 through June 30, and the third covers July 1 through September 31. The entire calendar year is summarized in an Annual Report (see next section). Quarterly reports are submitted on approximately May 15, August 15, and November 15 each year.

Quarterly monitoring reports present the results of groundwater samples collected and analyzed during the period, water level data and interpretation, and a summary of operations and maintenance activities during the period. Well sampling field forms, laboratory data reports, and the water quality database are presented in the report appendices.

9.2 ANNUAL REPORTS

Annual Reports covering the calendar year are completed each year and submitted to NYSDEC. Since 2010, the Annual Reports have been referred to as Periodic Review Reports, with added engineering certifications to comply with NYSDEC requirements. Annual Reports are submitted on approximately February 15 each year. The Annual Reports include the same information as the quarterly reports, as well as data concerning health and safety performance, details of the annual performance of the treatment system, waste disposal, plots of concentration over time for each well sampled, and any changes that have been approved to the OM&M program during the year.

9.3 MONTHLY REPORTS

A monthly discharge monitoring report (DMR) is completed summarizing the analytical results of the SPDES outfall sampling for each month. DMRs are due to NYSDEC on the 28th of each month covering the previous month. The DMRs are completed by the treatment plant operator, reviewed by Parsons, and provided to Atlantic Richfield Company for review, signature, and submittal to NYSDEC. Submittal of the DMRs to NYSDEC is a requirement of the SPDES permit for the site.

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SECTION 10

CITIZEN PARTICIPATION

10.1 OM&M CITIZEN PARTICIPATION PLAN

The goal of the citizen participation program is to increase public understanding of the remediation process at the site.

The site repository may be found at the following address:

Niagara County Community College
Library Learning Center
3111 Saunders Settlement Road
Sanborn, NY 14132

10.2 CONTACT LIST

The Atlantic Richfield project manager is:

William B. Barber
Atlantic Richfield Company
4850 East 49th Street
MBC3-147
Cuyahoga Heights, OH 44125

The New York State Department of Environmental Conservation contact is:

Brian Sadowski
New York State Department of Environmental Conservation
Division of Environmental Remediation
270 Michigan Avenue
Buffalo, NY 14203-2999

The Parsons team includes:

George W. Hermance, Eric A. Felter, Dan Chamberland and Doug Taylor
Parsons
40 La Riviere Dr., Suite 350
Buffalo, NY 14202
(716) 541-0730

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SECTION 11

PERSONNEL

11.1 ORGANIZATION

The principal parties involved in implementation of the OM&M program at the Former Carborundum Site, Sanborn, New York are: NYSDEC, Atlantic Richfield Company, the OM&M Project Manager, OM&M field personnel, and a subcontracted analytical laboratory. Responsibilities, qualification, and training requirements for the OM&M personnel are described in the following paragraphs.

11.2 MANPOWER REQUIREMENTS

Typical day-to-day operations, maintenance and inspections will be completed by the plant operator. In the event that work that requires breaching the treatment system (for example, cutting a pipe or fixing a leak), working at heights, or other work requiring a work permit (any ground penetrating work or confined space entry), a minimum of two persons will be on site. The changing of the water filters may be completed by the operator alone. The groundwater monitoring will be completed with a minimum of two persons on the site.

11.3 RESPONSIBILITIES AND DUTIES

Implementation of the OM&M Plan will require onsite personnel. Personnel will conduct routine inspections, sampling, and maintenance, of the groundwater extraction, VWCC and treatment system. Additionally, the OM&M Project Manager will organize and oversee all field activities on behalf of Atlantic Richfield Company.

The OM&M Project Manager will have the following responsibilities:

- Schedule and coordinate all monitoring activities;
- Evaluate all environmental monitoring data to determine if reportable exceedances occur, and to determine if any health or environmental hazards are present;
- Inspect the site to ensure adequate maintenance is being conducted;
- Maintain and submit all required documentation and records of OM&M activities;
- Oversee all activities conducted by the OM&M field personnel;
- Be available to respond in an emergency situation in accordance with the Contingency Plan; and
- Maintain records of all OM&M costs for the site.

The OM&M field personnel will have the following responsibilities:

- Obtain environmental samples as described in this manual, and complete chain-of-custody forms and field notes;
- Conduct all inspection and maintenance activities;

- Conduct regular calibration of site sampling and monitoring equipment and maintain calibration records;
- Adhere to the requirements of the site HSSE Plan (Appendix B); and
- Promptly inform the project manager of any problems associated with the groundwater monitoring system, groundwater treatment system, or site security.

The subcontracted analytical laboratory will have the following responsibilities:

- Coordinate all analytical testing with the project manager;
- Schedule, analyze, and maintain quality assurance of all analytical work;
- Notify the project manager immediately in the event of an analytical result that is an excursion of the SPDES permit; and
- Provide timely reports to the OM&M project manager, summarizing analytical results.

11.4 TRAINING (INCLUDING HEALTH AND SAFETY)

All persons completing work at the site must be 40-hour OSHA (HAZWOPER) trained and Confined Space trained for entry of non-permit required confined spaces.

11.5 MATERIAL SAFETY DATA SHEETS

A Material Safety Data Sheet (MSDS) will be on file at the site for all chemicals used or stored at the site. MSDSs kept at the site may include, but are not limited to, the following:

- Hydrochloric Acid (sample preservative, removing scale and mineral build up)
- Sulfuric Acid (sample preservative)Nitric Acid (sample preservative)
- Testing Reagents for Total Residual Chlorine and pH

FIGURES

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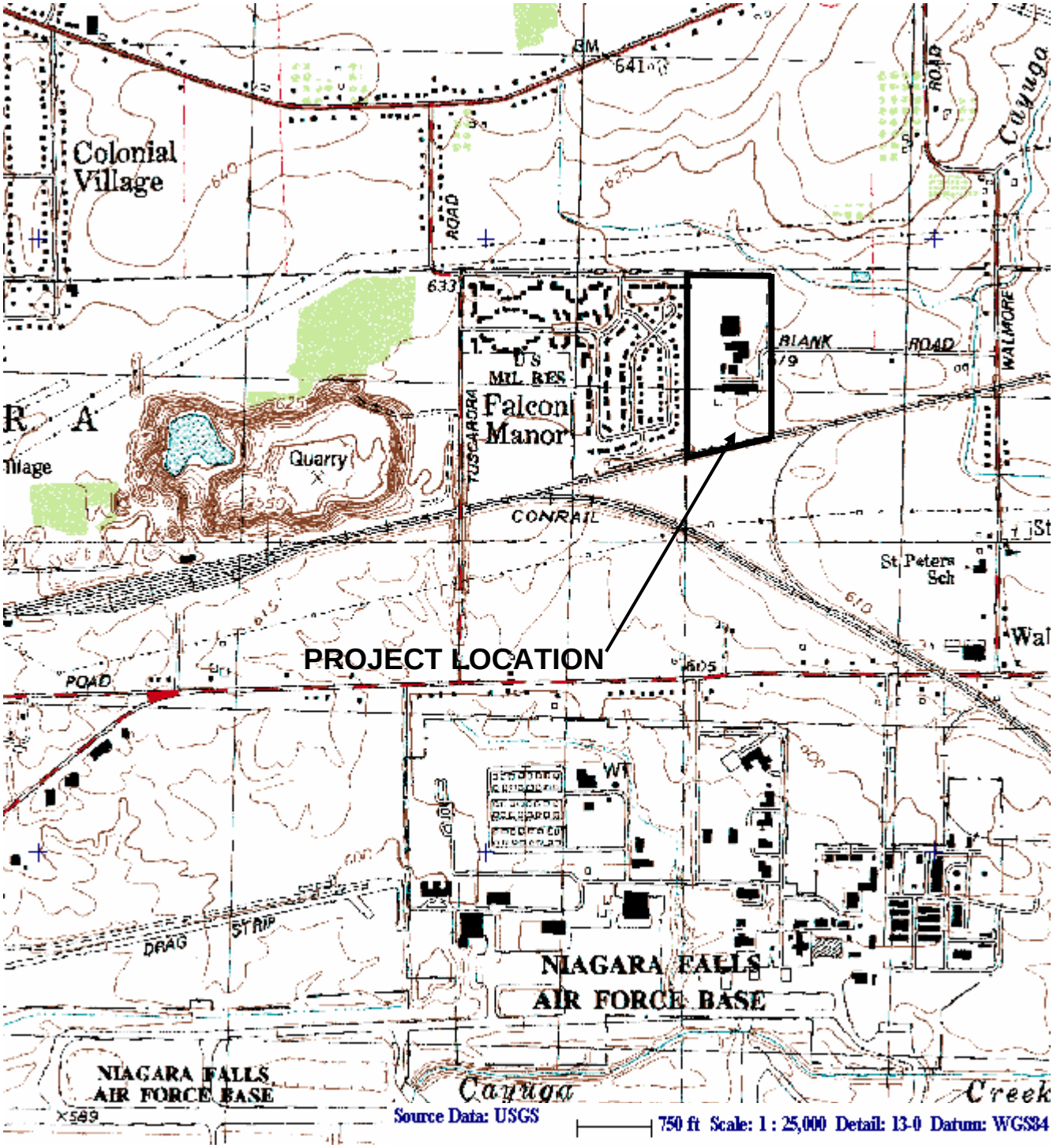

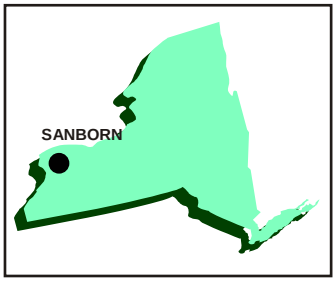

New York
Quadrangle

LATITUDE: N43° 07' 43"
LONGITUDE: W78° 56' 18"

N

SOURCE: DeLORME 3-D
TOPOQUAD PROGRAM

FIGURE 1

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY
SANBORN, NEW YORK

PROJECT LOCATION PLAN

PARSONS
180 LAWRENCE BELL DRIVE*WILLIAMSVILLE, NEW YORK, 14221 * (716) 633-7074

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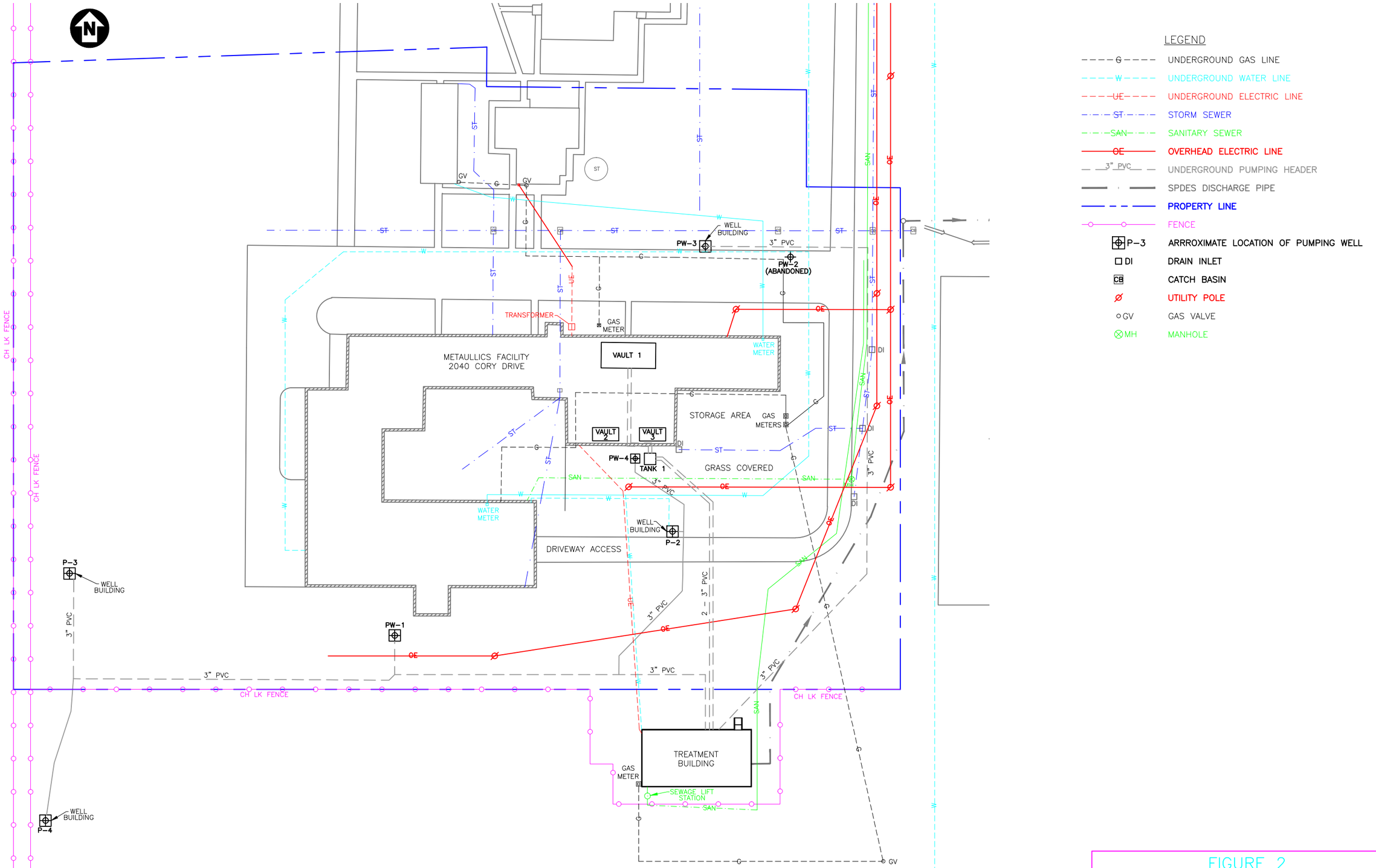

NOTE: PIPING LOCATIONS ARE APPROXIMATE.

80 40 0 80 160

SCALE: 1"=80'

PARSONS
40 LA RIVIERE DRIVE, SUITE 350
BUFFALO, NEW YORK 14202
716-541-0730

FIGURE 2

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY

SITE PLAN - UTILITIES

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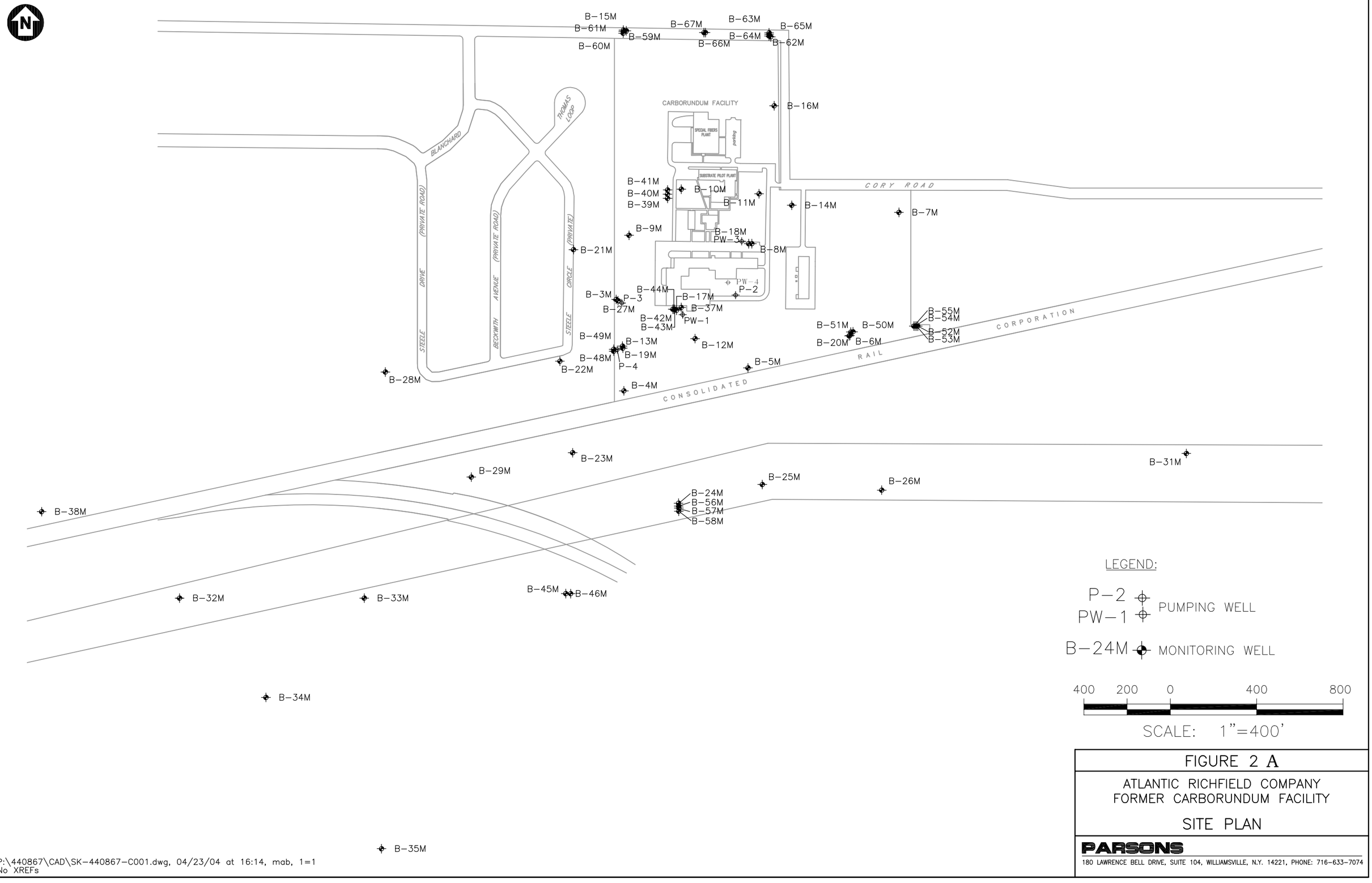

LEGEND:

P-2 PUMPING WELL

PW-1 PUMPING WELL

B-24M MONITORING WELL

400 200 0 400 800

SCALE: 1"=400'

FIGURE 2 A

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY

SITE PLAN

PARSONS
180 LAWRENCE BELL DRIVE, SUITE 104, WILLIAMSVILLE, N.Y. 14221, PHONE: 716-633-7074

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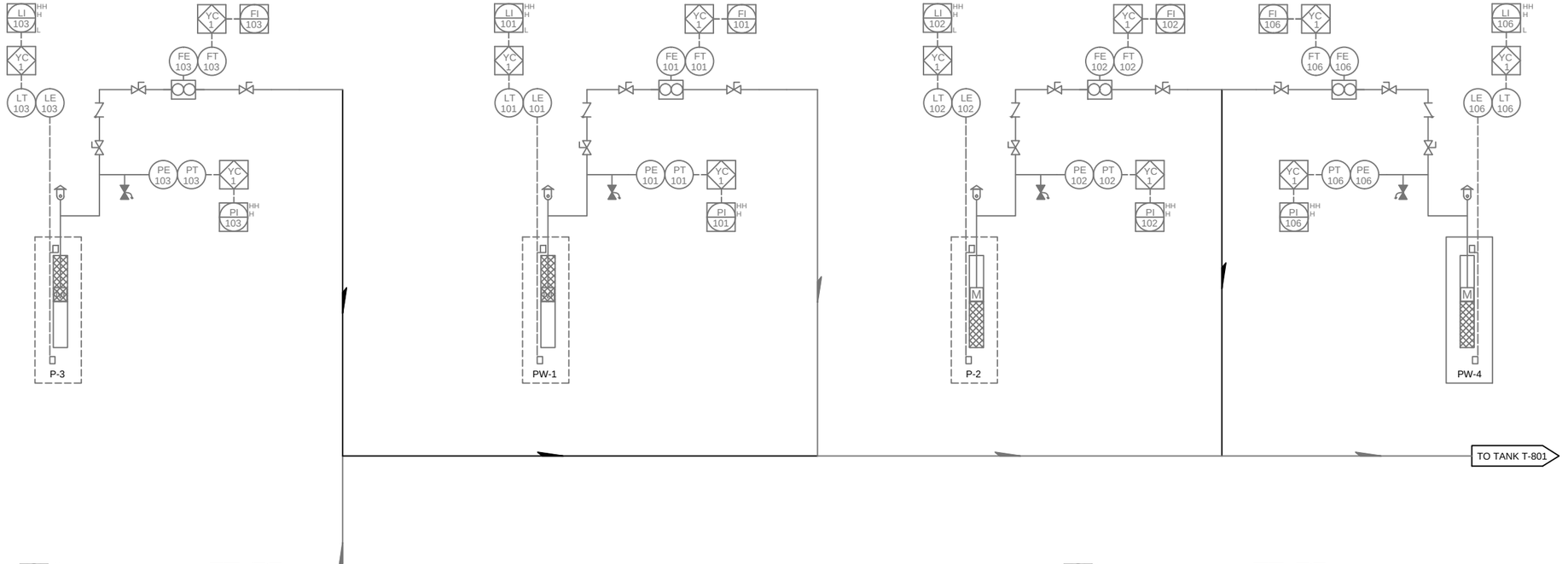

LEGEND

NEW FEATURE

EXISTING FEATURE

NOTE: DRAWING BASED ON HALEY & ALDRICH PROCESS AND INSTRUMENTATION DIAGRAM, DATED SEPTEMBER 2004.

PARSONS
40 LA RIVIERE DRIVE, SUITE 350
BUFFALO, NEW YORK 14202
716-541-0730

FIGURE 3

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY
P & ID
RECOVERY WELLS

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LSL 803 HH — HUMAN USER INTERFACE (HUI) INCLUDES DISPLAY, STATUS, ALARM, AND/OR SETPOINTS

LSL 803 — REMOTE READ INSTRUMENT (E.G., SENSOR OR TRANSMITTER)

LSL 803 — LOCAL READ INSTRUMENT (E.G., GAUGE)

LSL 803 — LOCAL PANEL MOUNTED--EQUIPMENT (E.G., HAND--OFF--AUTO SWITCH, LIGHT)

YC 1 — PROGRAMMABLE LOGIC CONTROLLER INPUT/OUTPUT

B-3"-SW-HDPE-303

INSULATION TYPE
B=BARE
J=INSULATED JACKETED & HEAT TRACED

NOMINAL PIPE SIZE

STREAM DESCRIPTION
AA=ATMOSPHERIC AIR
CW=COLLECTED WATER
SW=STRIPPED WATER
TW=TREATED WATER

MATERIAL TYPE
CPVC80=CHLORINATED POLYVINYL CHLORIDE SCHEDULE 80
HDPE=HIGH DENSITY POLYETHYLENE
SS=STAINLESS STEEL

LINE NUMBER

TO PERMITTED AIR DISCHARGE

VAPOR PHASE CARBON FILTER

FLEX CONNECTION

LOW PROFILE AIR STRIPPER

FROM CARBON FILTER LC-801, SEE DETAIL

FROM SUMP PUMPS, SEE DETAIL

FROM PW-3

FROM P-2

FROM P-3, P-4

FROM PW-1

T-801 EQUALIZATION TANK

B-3"-CW-CPVC8-201

B-3"-CW-CPVC8-202

P-803A

P-803B

F-801A

F-802A

F-801B

F-802B

B-3"-SW-CPVC8-303

B-16"-AA-SS-302

B-10"-AA-SS-301

FROM PLANT ATMOSPHERE

BLOWER B-801A

T-802 EFFLUENT TANK

B-3"-SW-CPVC8-305

B-3"-SW-CPVC8-304

LC-801A & LC-801B LIQUID PHASE CARBON FILTER

SEE LC-801 DETAIL BELOW

P-807A

P-807B

B-6"-TW-CPVC8-402

B-4"-TW-CPVC8-403

B-4"-TW-CPVC8-404

P-810A

P-810B

B-4"-TW-CPVC8-407

B-6"-TW-CPVC8-408

B-6"-TW-CPVC8-409

SYPHON BREAKER

INSIDE BURIED

PERMITTED SPDES DISCHARGE OF TREATED WATER 50-150 GPM

TO OUTSIDE AIR VENT

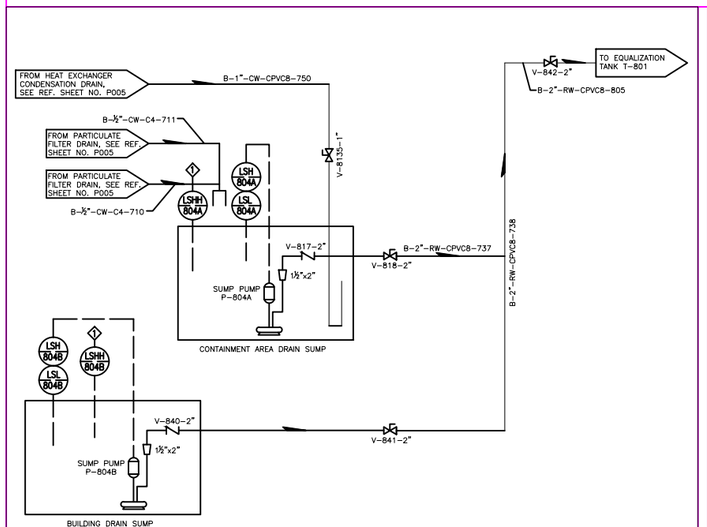
VENTSORB CARBON CANISTER VC-801

EQUALIZATION TANK T-801

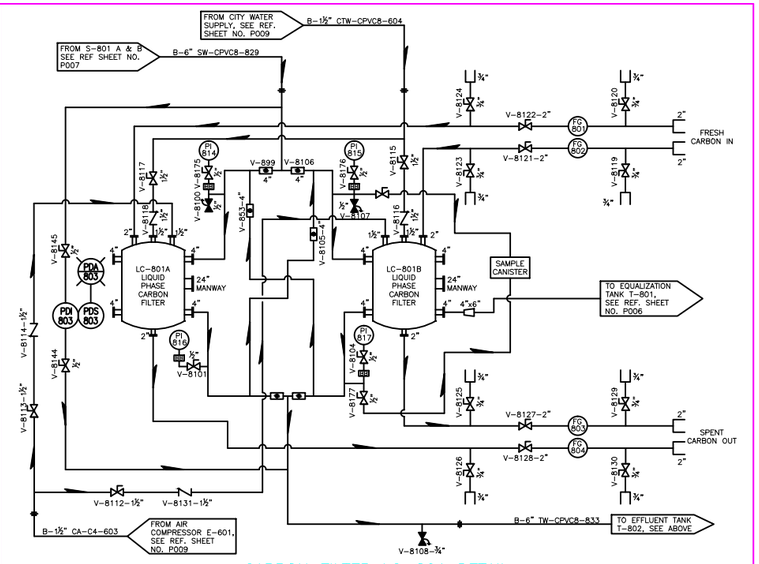
MAKE UP WATER FROM CITY WATER SUPPLY

VENTSORB CARBON CANISTER VC-801 DETAIL

NOTE: DRAWING BASED ON HALEY & ALDRICH PROCESS AND INSTRUMENTATION DIAGRAM, DATED SEPTEMBER 2004.



SUMP PUMP DETAIL



CARBON FILTER LC-801 DETAIL

LETTER [ALL POSITIONS]	FIRST POSITION [MEASURED VARIABLE]	SUCCEEDING LETTERS [MODIFIERS]
A	ANALYSIS	ALARM OR ACTIVATE
C	CONDUCTIVITY	CONTROL OR CLOSE
D	DIFFERENTIAL	DRIVE
E	VOLTAGE	ELEMENT
F	FLOW	FRACTION
H	HAND	HIGH
I	CURRENT	INDICATOR
L	LEVEL	LOW OR LIGHT
O	ORIFICE	OPEN
P	PRESSURE OR VACUUM	POINT
Q	QUANTITY	TOTALIZER
S	STRAIN OR LIMIT	SWITCH OR STATUS
T	TEMPERATURE	TRANSMITTER
V	VARIABLE	VALVE
W	WATER	WELL
X	ELECTRICAL SWITCH	RELAY
Y	EVENT OR PROCESS	COMPUTE
Z	POSITION	FINAL CONTROL

PIPING SYMBOLS:
- CONCENTRIC REDUCER
- FLEXIBLE HOSE COUPLING
- STRAINER
- ATMOSPHERIC VENT
- DIRECTION OF FLOW

MISC. SYMBOLS:
- INSTRUMENT INTERLOCK
- M MOTOR

VALVE SYMBOLS:
- GATE VALVE
- BALL VALVE (NORMALLY OPEN)
- BALL VALVE (NORMALLY CLOSED)
- BUTTERFLY VALVE
- MOTOR OPERATED VALVE
- CHECK VALVE
- WAFER CHECK VALVE
- SAMPLE VALVE (NORMALLY CLOSED)
- BB BLOCK AND BLEED VALVE

NOT TO SCALE

PARSONS
40 LA RIVIERE DRIVE, SUITE 350
BUFFALO, NEW YORK 14202
716-541-0730

FIGURE 4

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY

GROUNDWATER TREATMENT SYSTEM

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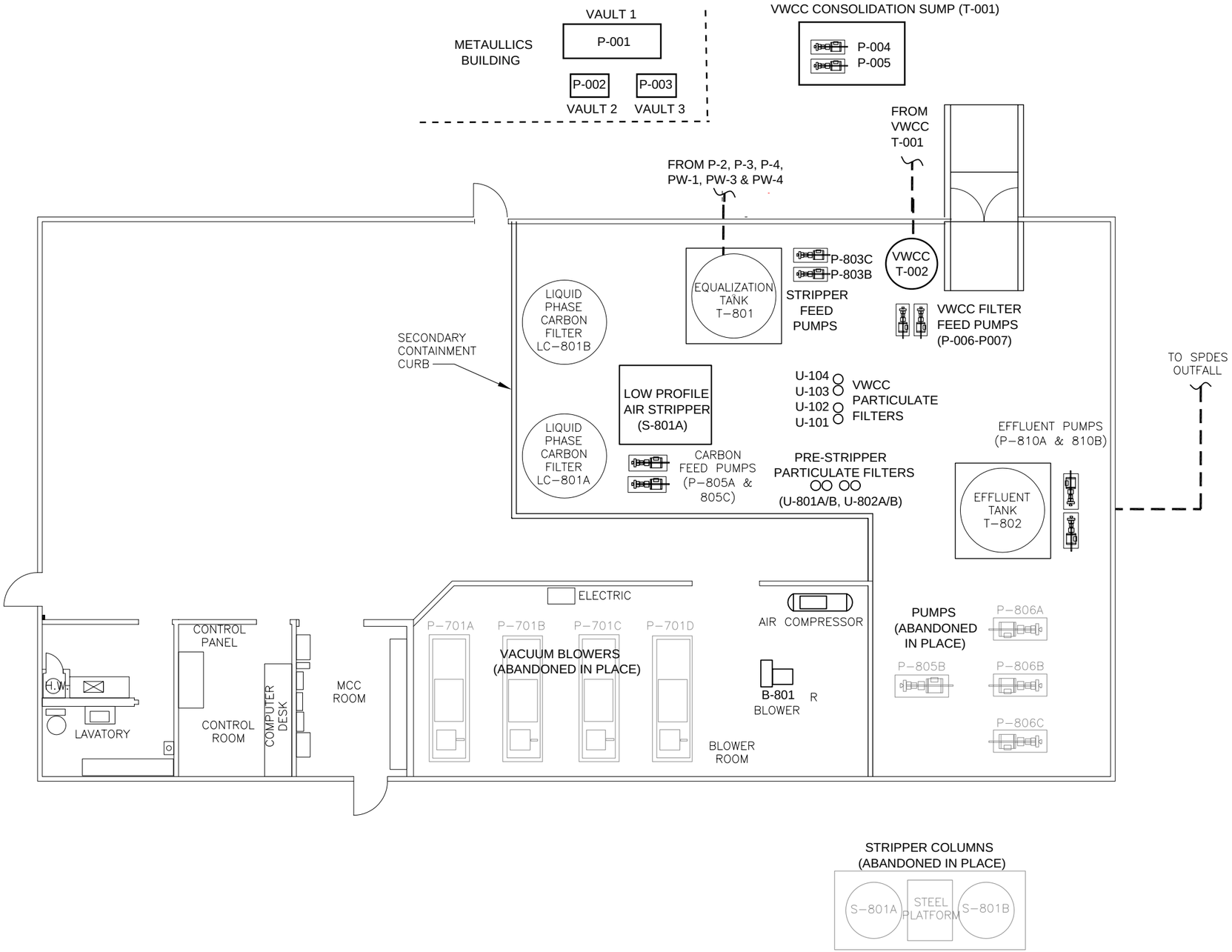

STRIPPER COLUMNS
(ABANDONED IN PLACE)

PARSONS
40 La Riviere Dr., Suite 350
Buffalo, NY 14202
(716) 541-0730

FIGURE 5

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY

EQUIPMENT LAYOUT

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TABLES

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TABLE 1
SANBORN GROUNDWATER MONITORING PROGRAM
Former Carborundum Facility
Wheatfield, New York

WELL No.	GROUNDWATER SAMPLING			
	JAN	APR	JUL	OCT
B-3M			S	
B-4M			S	
B-5M			S	
B-6M	S	S	S	S
B-7M			S	
B-8M	S	S/LF/NA	S	S
B-9M	S	S	S	S
B-10M		S/LF/NA	S	S
B-11M			S	
B-12M			S	
B-13M	S	S/LF/NA	S	S
B-14M			S	
B-15M			S	
B-16M			S	
B-17M	S	S/LF/NA	S	S
B-18M			S	
B-19M	S	S/LF/NA	S	S
B-20M			S	
B-21M	S	S	S	S
B-22M	S	S/LF/NA	S	S
B-23M	S	S/LF/NA	S	S
B-24M	S	S	S	S
B-25M				
B-26M			S	
B-27M				
B-28M	S	S	S	S
B-29M			S	
B-30M			S	
B-31M			S	
B-32M			S	
B-33M			S	
B-34M				
B-35M				
B-37M				
B-38M	S	S	S	S
B-39M	S	S/LF/NA	S	S
B-40M	S	S/LF/NA	S	S
B-41M	S	S/LF/NA	S	S
B-42M	S	S/LF/NA	S	S
B-43M	S	S/LF/NA	S	S
B-44M	S	S/LF/NA	S	S
B-45M			S	
B-46M			S	
B-48M	S	S/LF/NA	S	S
B-49M	S	S/LF/NA	S	S
B-50M			S	
B-51M			S	
B-52M			S	
B-53M			S	
B-54M			S	
B-55M			S	
B-56M	S	S	S	S
B-57M	S	S	S	S
B-58M			S	
B-59M			S	
B-60M			S	
B-61M			S	
B-62M			S	
B-63M			S	
B-64M			S	
B-65M			S	
B-66M			S	
B-67M			S	
P-2	S	S	S	S
P-3	S	S	S	S
P-4	S	S	S	S
PW-1	S	S	S	S
PW-3	S	S	S	S
PW-4	S	S	S	S
Quarry		S		S

Notes:
1. S indicates that groundwater sampling and analysis will be performed. LF indicates low flow sampling.
NA Indicates that natural attenuation sampling and analysis will be performed.
2. July was selected for the yearly sampling event, since it typically has had the highest TCE concentrations.
3. The well sampling may change as the groundwater remediation program alters the plume configuration.
4. Water Levels are to be collected from every well, on a quarterly basis.

TABLE 2
SAMPLE ANALYTICAL METHODS

Groundwater Samples

Parameter	Method
VOCs	8260
Iron	6010 B
Manganese	6010 B
BOD	405.1
COD	ASTM D1252-88B
Chloride	300.1
Nitrate	300.1
Nitrite	300.1
Sulfate	300.1
Methane	RSK 174
Ethane	RSK 174
Ethene	RSK 174

SPDES Permit Compliance Samples

Parameter	Method
Chloroform	8260
1,1-Dichloroethane (1,1-DCA);	8260
1,2-Dichloroethane (1,2-DCA);	8260
1,1-Dichloroethene (1,1-DCE);	8260
cis-1,2-Dichloroethene (cis-1,2-DCE);	8260
trans-1,2-Dichloroethene (trans-1,2-DCE)	8260
Methylene chloride;	8260
1,1,1-Trichloroethane (1,1,1- TCA);	8260
Trichloroethene (TCE);	8260
Vinyl chloride (VC)	8260
pH	150.1
Oil & Grease	1664
BOD, 5-day	405.1
Solids, Total Suspended	160.2
Chlorine, Total Residual	HACH
Phenols, Total	420.1
Cadmium, Total	200.7
Chromium, Total	200.7
Copper, Total	200.7
Copper, Dissolved	200.7
Iron, Total	200.7
Lead, Total	200.7
Mercury, Total	245.1
Arsenic, Total	200.7
Cyanide, Total	335.2
Zinc, Total	200.7
Zinc, Dissolved	200.7
Nickel, Total	200.7
Silver, Total	200.7

TABLE 3
RECOVERY WELL SPECIFICATIONS
Former Carborundum Facility
Sanborn, New York

Well	Revision Date	Grundfos Pump Model Number	Revised Well Bottom Depth (ft)	Approximate Intake Depth (ft)	Target Water Level Depth (ft)	Revised Set Points		
							Depth	Range
P-2	9/13/2010	5S03-9 0.5 hp - 5gpm	26.4	24.4	21.9	On Off	18.9 21.9	 3.0
P-3	9/13/2010	5S03-9 0.5 hp - 5gpm	33.7	31.7	30.0	On Off	26.2 30.0	 3.8
P-4	9/13/2010	5S03-9 0.5 hp - 5gpm	34.2	32.2	30.2	On Off	26.7 30.2	 3.5
PW-1	9/13/2010	25S15-20 1.5 hp - 25 gpm	29.8	27.8	24.8	On Off	21.8 24.8	 3.0
PW-3	9/13/2010	5S03-9 0.5 hp - 5gpm	18.2	16.7	14.2	On Off	10.2 14.2	 4.0
PW-4	9/13/2010	75S75-12 5 hp - 120 gpm	30.8	26.0	23.3	On Off	20.8 23.3	 2.5

Revised 1/27/2011

TABLE 4

Routine Inspection Log And Record Of Operating Conditions — Operator:
Groundwater Treatment Project — DateTime
Carborundum Facility, Sanborn, NY

.

Equip./Instrument No.	Equipment		Status*	Normal Op. Range	Design	Operating Condition
T-801 / LIT-803	Tank 801			3'-8'		
P-803B / PI-805	Filter Feed Pump	A	Lag	27.3 - 31.6 psi	30.3 psi	
P-803C / PI-806	Filter Feed Pump	A	Lead	36.8 - 38.6 psi	38. 1 psi	
U-801A&802A	Prefilters- 50 micron	# of P-803 ON 0		0-10 psi diff	5 psi	
U-801B&802B	Prefilters- 50 micron	# of P-803 ON 0		0-10 psi diff	5 psi	
B-801A	Air Stripping Blower	A	Run	650-900 cfm	850 cfm	
Stripper Tray Sump	Back Pressure			25 - 35 " water	30" water	
Stripper Tray Sump	Water Level			4" - 20"	4"-24"	
P-805A / PI-809	Stripper Tray Transfer Pump	A	Lead	25- 40 psi	16 psi	
	805 A					
P-805C/ PI-811	Stripper TrayTransfer Pump	A	Lag	25 - 40 psi	35 psi	
	805 C					
LC-801A&B/PI1403	Liquid Phase Carbon Vessel	# of P805 ON 0		4.8 - 23.0 psig		
LC-801A / PI-814	Vessel Inlet Pressure	# of P805 ON 0		10.4-32.5 psig		
LC-801A / PI-816	Vessel Discharge Pressure	# of P805 ON 0		5.6-21.6 psig		
LC-801B / PI-815	Vessel Inlet Pressure	# of P-805 ON 0		10.4-32.5 psig		
LC-801B / PI-817	Vessel Discharge Pressure	# of P805 ON 0		5.6-21.6 psig		
T-802 1 LIT-805	Tank 802			2'-10'		
T-001 / LT-207	Tank 001			1'-5'		
P-810A	Effluent Pump	A	Lag	0-200 gpm	160 gpm	
P-810B	Effluent Pump	A	Lead	0-200 gpm	160 gpm	
P-804A	Containment Area Sump	A			Water Level <2'	
P-804B	Building Sump	A			Water Level <2'	
Waste Drums,NO Leaks, Proper Labeling, Within 90 Day Limit						OK
Alarms Functioning Properly						OK

APPENDIX A

RECORD DRAWINGS AND AS-BUILT DRAWINGS

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GROUNDWATER TREATMENT
COMPILED RECORD DRAWINGS
FORMER CARBORUNDUM FACILITY
SANBORN, NEW YORK

ORIGINAL McLAREN HART BP CONTRACT REFERENCE DRAWINGS

CS001	COVER SHEET	M001	TREATMENT PLANT LAYOUT	E001	SINGLE LINE DIAGRAM
G001	STANDARD ABBREVIATIONS & SYMBOLS	M003	SITE PLAN WELLS AND PIPING LOCATION	E002	ELECTRICAL SITE PLAN
G002	PROCESS FLOW DIAGARAM SOIL REMEDIATION/GROUNDWATER TREATMENT	M004	PIPING PLAN	E003	ELECTRICAL DETAILS
C001	SITE PLAN – UTILITIES	M005	VESSEL SCHEDULE	E004	TREATMENT PLANT LIGHTING PLAN
C002	SOIL PROFILE LOCATION PLAN	M006	SITE DETAILS II	E005	TREATMENT PLANT CONDUIT PLAN
C003	SOIL PROFILES	M007	TREATMENT BUILDING UTILITY PLAN	E006	5KV POWER DISTRIBUTION DETAILS
C004	SOIL COVER SYSTEM DETAILS	S001	TREATMENT PLANT FOUNDATION PLAN		
P005	PROCESS AND INSTRUMENTATION DIAGRAM VII GROUNDWATER TREATMENT SYSTEM	S002	FOUNDATION DETAILS I		
P006	PIPING AND INSTRUMENTATION DIAGRAM UTILITY STATIONS	S003	FOUNDATION DETAILS II		
		S004	TREATMENT BUILDING ELEVATIONS		

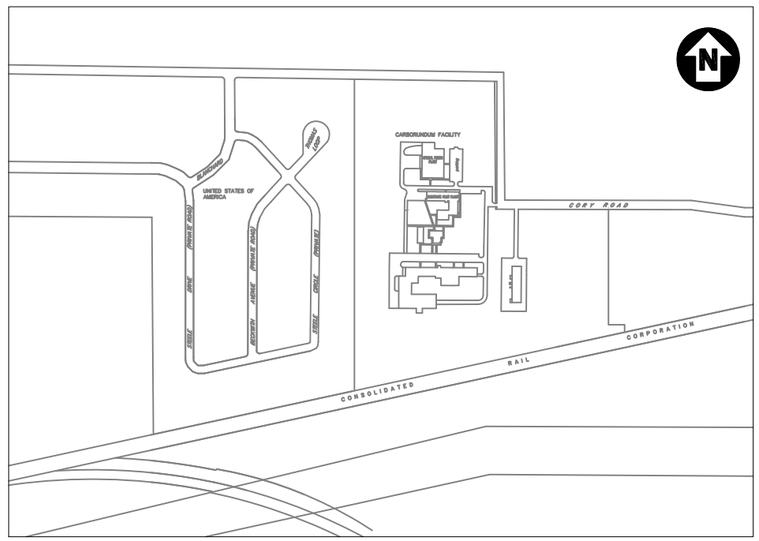
SITE LOCATION MAP

1 Mi 0.5 Mi 0 1 Mi 2 Mi

SCALE: 1"=1 Mile

SHEET INDEX

FIGURE NO.	DESCRIPTION
1	SITE MAP
2	SITE PLAN – UTILITIES
2A	SITE PLAN – WELLS
3	P&ID RECOVERY WELLS
4	P&ID TREATMENT SYSTEM
5	EQUIPMENT LAYOUT



VICINITY MAP

800 400 0 800 1600

SCALE: 1"=800'

PARSONS
40 LA RIVIERE DRIVE, SUITE 350
BUFFALO, NEW YORK 14202
716-541-0730

CS001

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY

COVER

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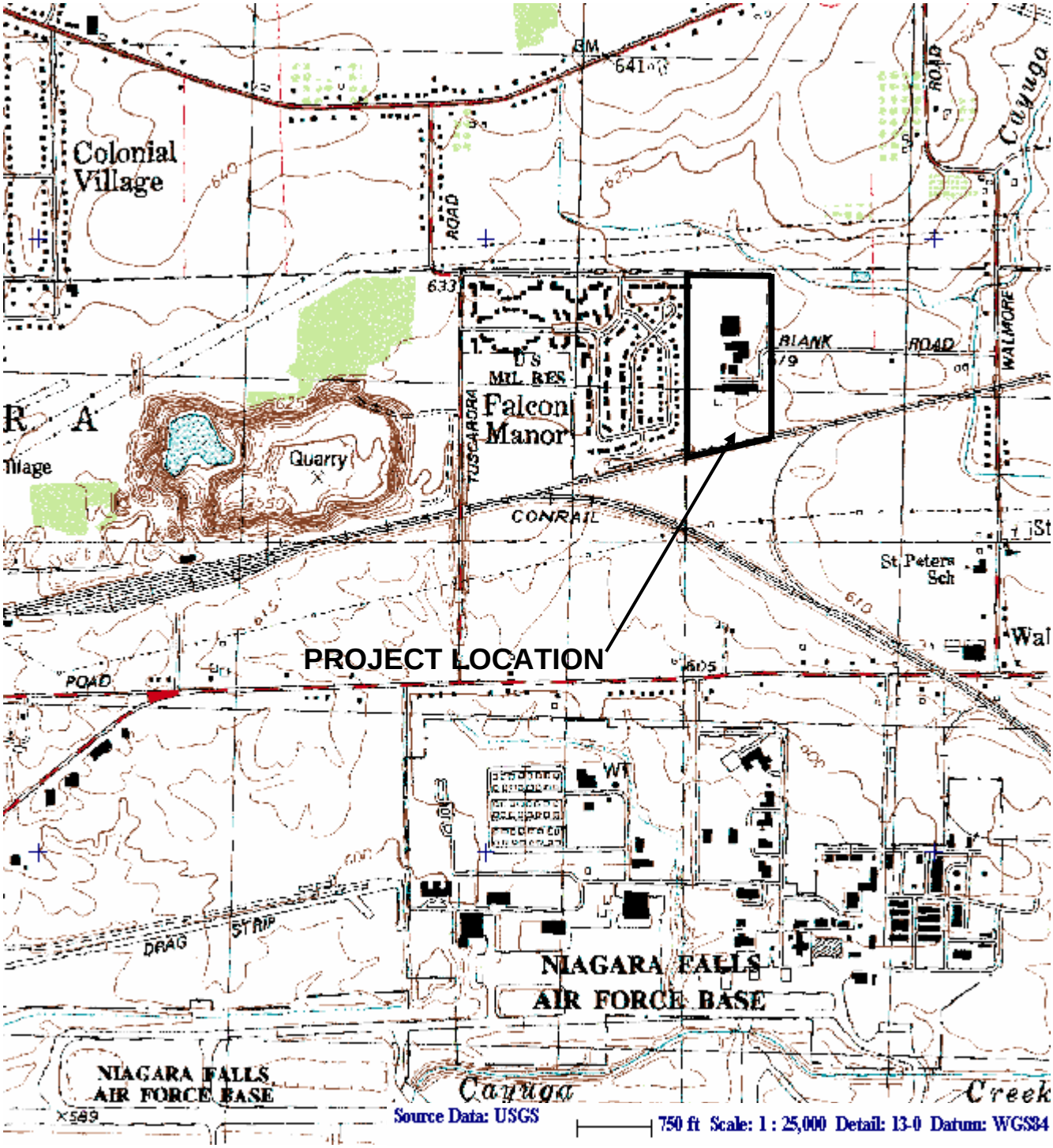

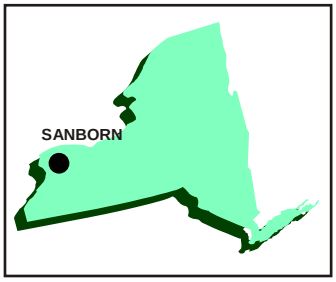

New York
Quadrangle

LATITUDE: N43° 07' 43"
LONGITUDE: W78° 56' 18"

N

SOURCE: DeLORME 3-D
TOPOQUAD PROGRAM

FIGURE 1

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY
SANBORN, NEW YORK

PROJECT LOCATION PLAN

PARSONS
180 LAWRENCE BELL DRIVE*WILLIAMSVILLE, NEW YORK, 14221 * (716) 633-7074

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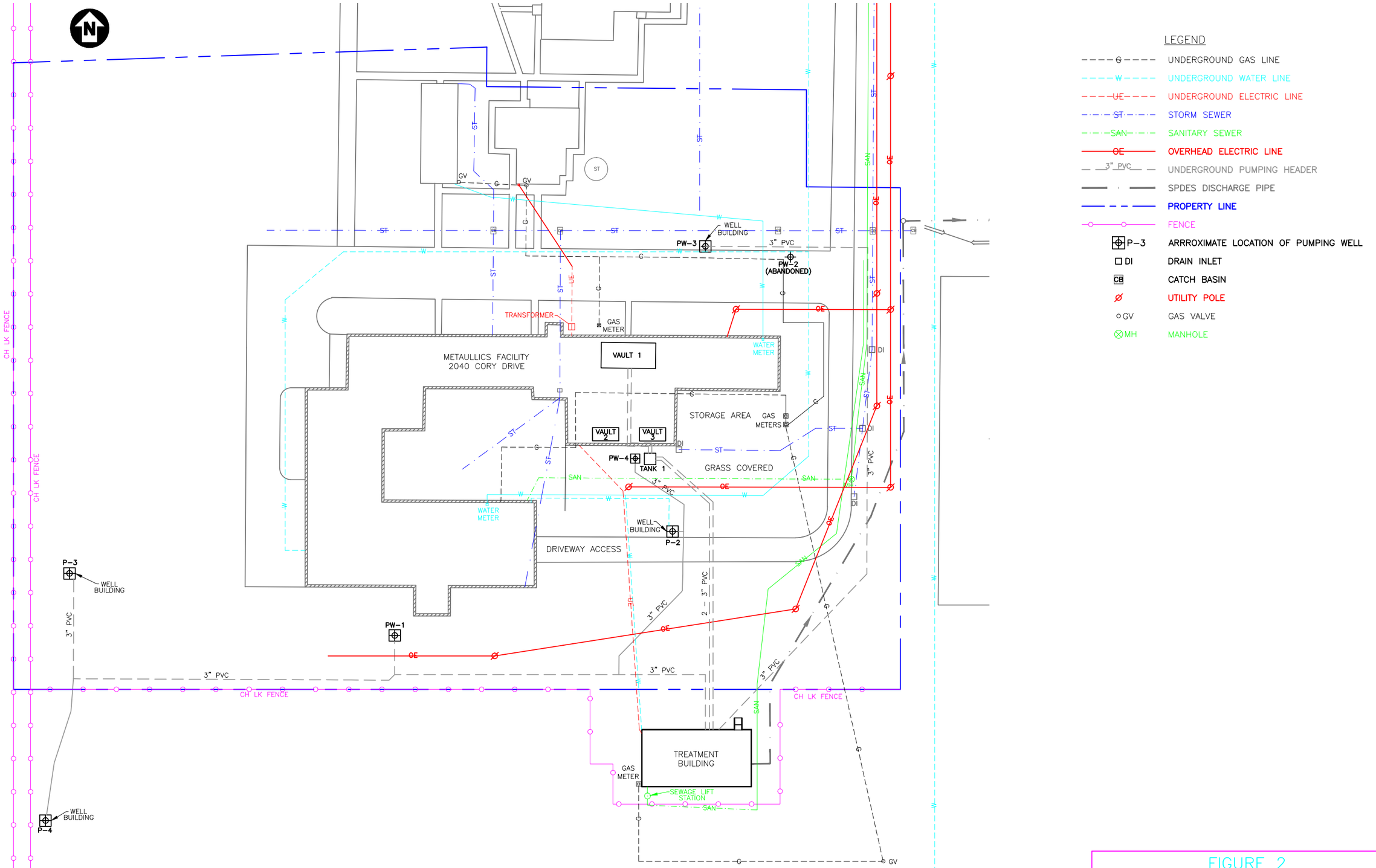

NOTE: PIPING LOCATIONS ARE APPROXIMATE.

80 40 0 80 160

SCALE: 1"=80'

PARSONS
40 LA RIVIERE DRIVE, SUITE 350
BUFFALO, NEW YORK 14202
716-541-0730

FIGURE 2

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY

SITE PLAN - UTILITIES

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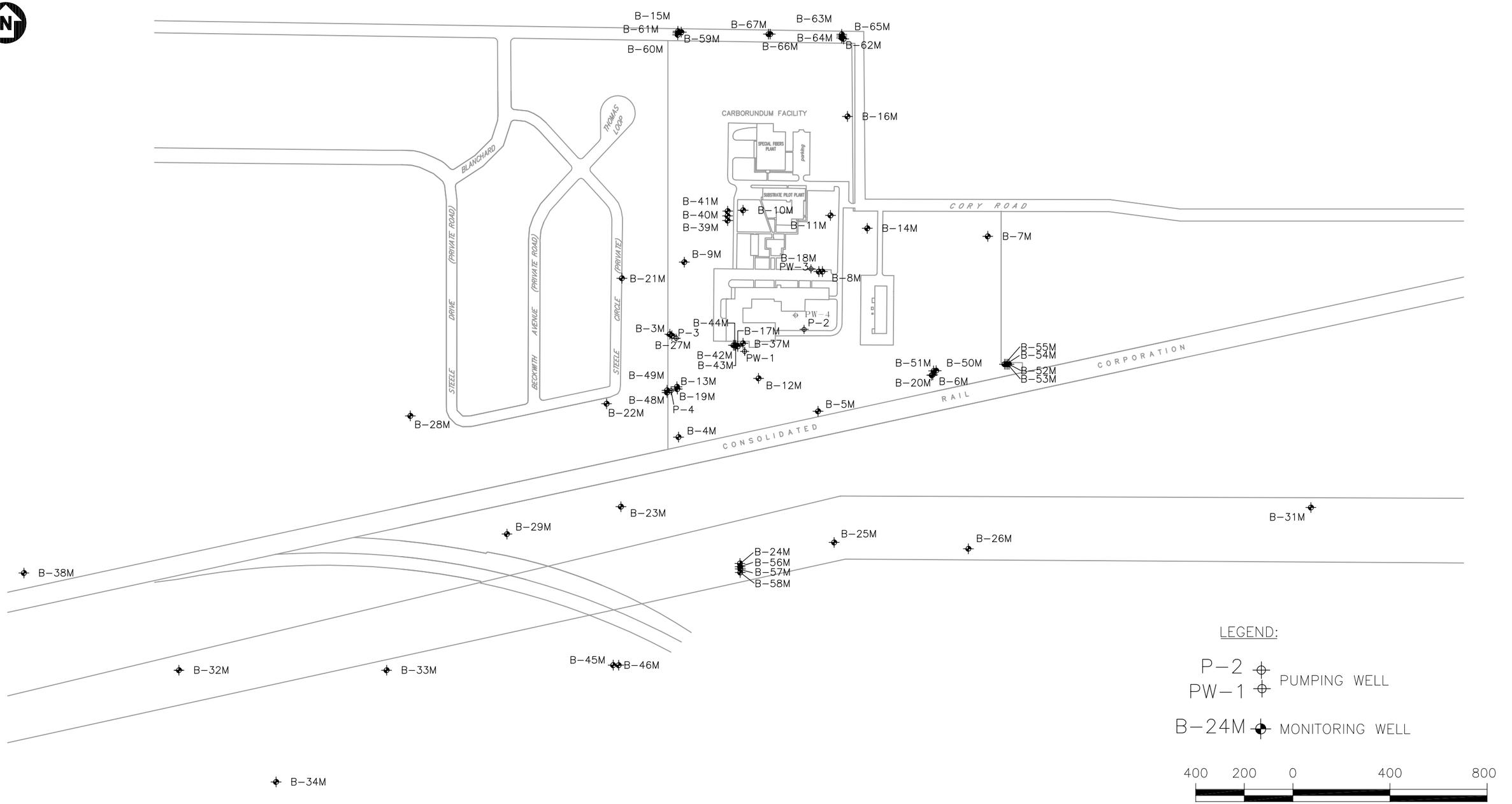

LEGEND:

P-2 PUMPING WELL

PW-1 PUMPING WELL

B-24M MONITORING WELL

400 200 0 400 800

SCALE: 1"=400'

FIGURE 2A

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY

SITE PLAN

PARSONS
180 LAWRENCE BELL DRIVE, SUITE 104, WILLIAMSVILLE, N.Y. 14221, PHONE: 716-633-7074

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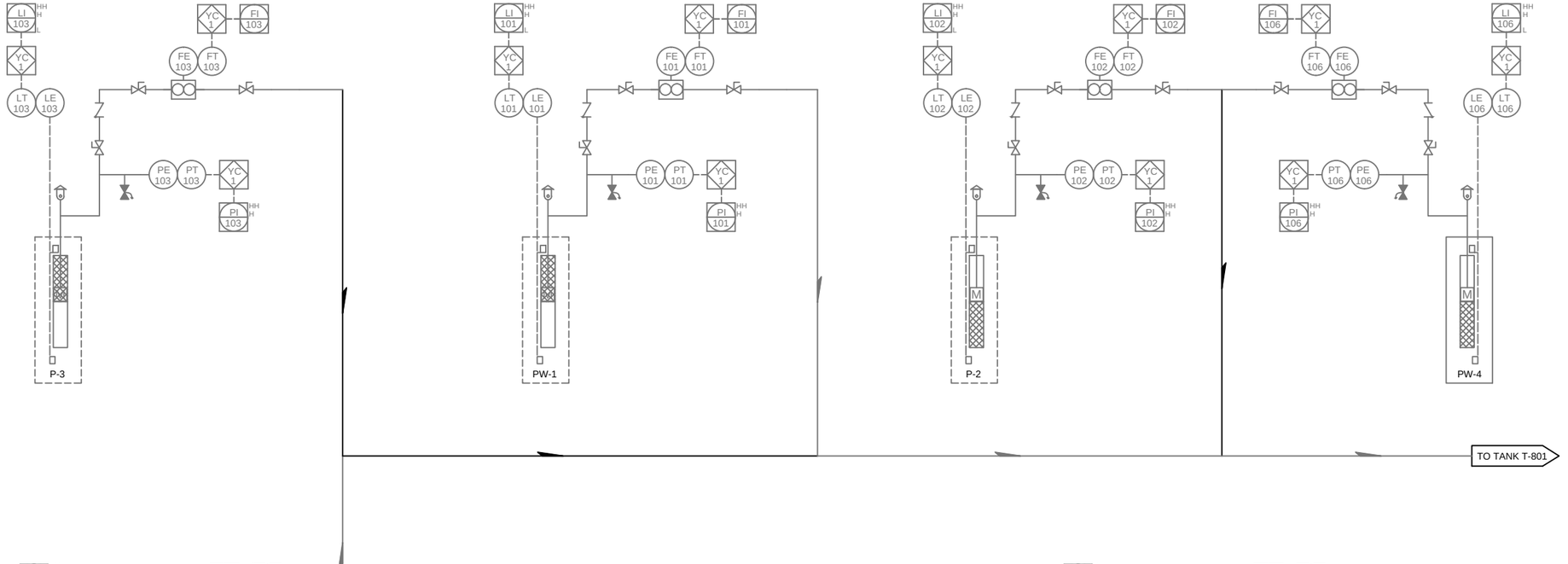

LEGEND

NEW FEATURE

EXISTING FEATURE

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PARSONS
40 LA RIVIERE DRIVE, SUITE 350
BUFFALO, NEW YORK 14202
716-541-0730

FIGURE 3

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY
P & ID
RECOVERY WELLS

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No XREFs

LSL 803 HH — HUMAN USER INTERFACE (HUI) INCLUDES DISPLAY, STATUS, ALARM, AND/OR SETPOINTS

LSL 803 — REMOTE READ INSTRUMENT (E.G., SENSOR OR TRANSMITTER)

LSL 803 — LOCAL READ INSTRUMENT (E.G., GAUGE)

LSL 803 — LOCAL PANEL MOUNTED--EQUIPMENT (E.G., HAND--OFF--AUTO SWITCH, LIGHT)

YC 1 — PROGRAMMABLE LOGIC CONTROLLER INPUT/OUTPUT

B-3"-SW-HDPE-303

INSULATION TYPE
B=BARE
J=INSULATED JACKETED & HEAT TRACED

NOMINAL PIPE SIZE

STREAM DESCRIPTION
AA=ATMOSPHERIC AIR
CW=COLLECTED WATER
SW=STRIPPED WATER
TW=TREATED WATER

MATERIAL TYPE
CPVC80=CHLORINATED POLYVINYL CHLORIDE SCHEDULE 80
HDPE=HIGH DENSITY POLYETHYLENE
SS=STAINLESS STEEL

LINE NUMBER

TO PERMITTED AIR DISCHARGE

VAPOR PHASE CARBON FILTER

FLEX CONNECTION

LOW PROFILE AIR STRIPPER

FROM CARBON FILTER LC-801, SEE DETAIL

FROM SUMP PUMPS, SEE DETAIL

FROM PW-3

FROM P-2

FROM P-3, P-4

FROM PW-1

T-801 EQUALIZATION TANK

B-3"-CW-CPVC8-201

B-3"-CW-CPVC8-202

P-803A

P-803B

F-801A

F-802A

F-801B

F-802B

B-3"-SW-CPVC8-303

B-16"-AA-SS-302

B-10"-AA-SS-301

FROM PLANT ATMOSPHERE

BLOWER B-801A

T-802 EFFLUENT TANK

B-3"-SW-CPVC8-305

B-3"-SW-CPVC8-304

LC-801A & LC-801B LIQUID PHASE CARBON FILTER

SEE LC-801 DETAIL BELOW

P-807A

P-807B

B-6"-TW-CPVC8-402

B-4"-TW-CPVC8-403

B-4"-TW-CPVC8-404

P-810A

P-810B

B-4"-TW-CPVC8-407

B-6"-TW-CPVC8-408

B-6"-TW-CPVC8-409

SYPHON BREAKER

INSIDE BURIED

PERMITTED SPDES DISCHARGE OF TREATED WATER 50-150 GPM

TO OUTSIDE AIR VENT

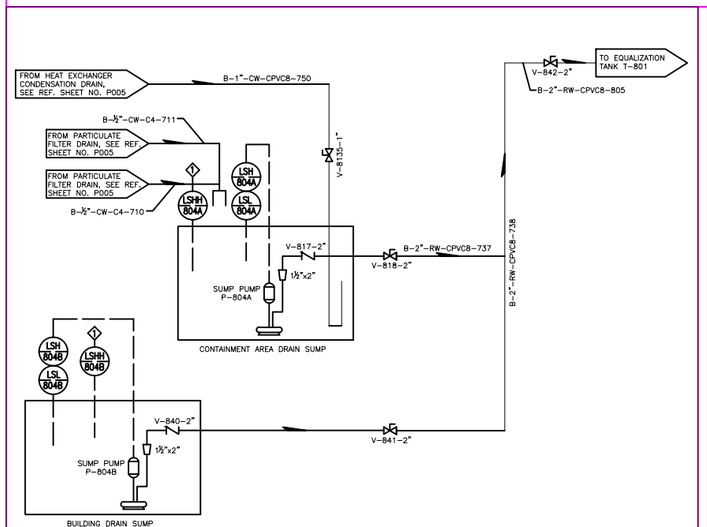
VENTSORB CARBON CANISTER VC-801

EQUALIZATION TANK T-801

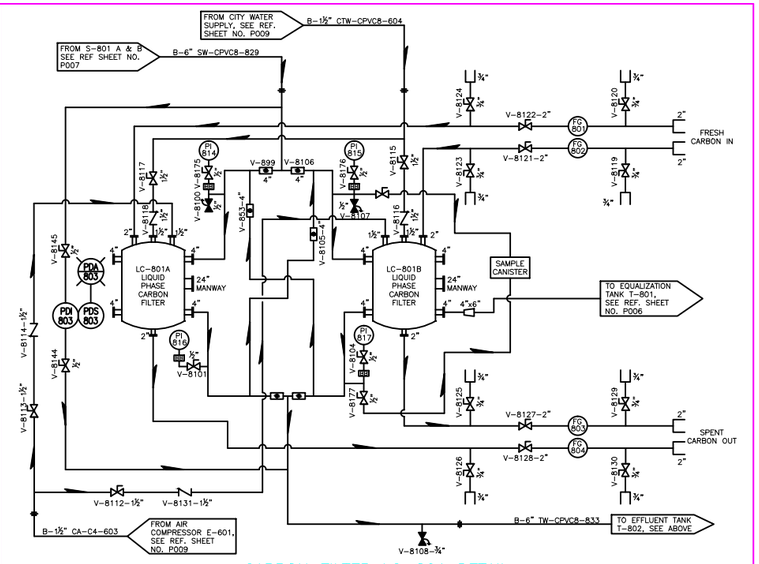
MAKE UP WATER FROM CITY WATER SUPPLY

VENTSORB CARBON CANISTER VC-801 DETAIL

NOTE: DRAWING BASED ON HALEY & ALDRICH PROCESS AND INSTRUMENTATION DIAGRAM, DATED SEPTEMBER 2004.



SUMP PUMP DETAIL



CARBON FILTER LC-801 DETAIL

LETTER [ALL POSITIONS]	FIRST POSITION [MEASURED VARIABLE]	SUCCEEDING LETTERS [MODIFIERS]
A	ANALYSIS	ALARM OR ACTIVATE
C	CONDUCTIVITY	CONTROL OR CLOSE
D	DIFFERENTIAL	DRIVE
E	VOLTAGE	ELEMENT
F	FLOW	FRACTION
H	HAND	HIGH
I	CURRENT	INDICATOR
L	LEVEL	LOW OR LIGHT
O	ORIFICE	OPEN
P	PRESSURE OR VACUUM	POINT
Q	QUANTITY	TOTALIZER
S	STRAIN OR LIMIT	SWITCH OR STATUS
T	TEMPERATURE	TRANSMITTER
V	VARIABLE	VALVE
W	WATER	WELL
X	ELECTRICAL SWITCH	RELAY
Y	EVENT OR PROCESS	COMPUTE
Z	POSITION	FINAL CONTROL

PIPING SYMBOLS:
- CONCENTRIC REDUCER
- FLEXIBLE HOSE COUPLING
- STRAINER
- ATMOSPHERIC VENT
- DIRECTION OF FLOW

MISC. SYMBOLS:
- INSTRUMENT INTERLOCK
- M MOTOR

VALVE SYMBOLS:
- GATE VALVE
- BALL VALVE (NORMALLY OPEN)
- BALL VALVE (NORMALLY CLOSED)
- BUTTERFLY VALVE
- MOTOR OPERATED VALVE
- CHECK VALVE
- WAFER CHECK VALVE
- SAMPLE VALVE (NORMALLY CLOSED)
- BB BLOCK AND BLEED VALVE

NOT TO SCALE

PARSONS
40 LA RIVIERE DRIVE, SUITE 350
BUFFALO, NEW YORK 14202
716-541-0730

FIGURE 4

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY

GROUNDWATER TREATMENT SYSTEM

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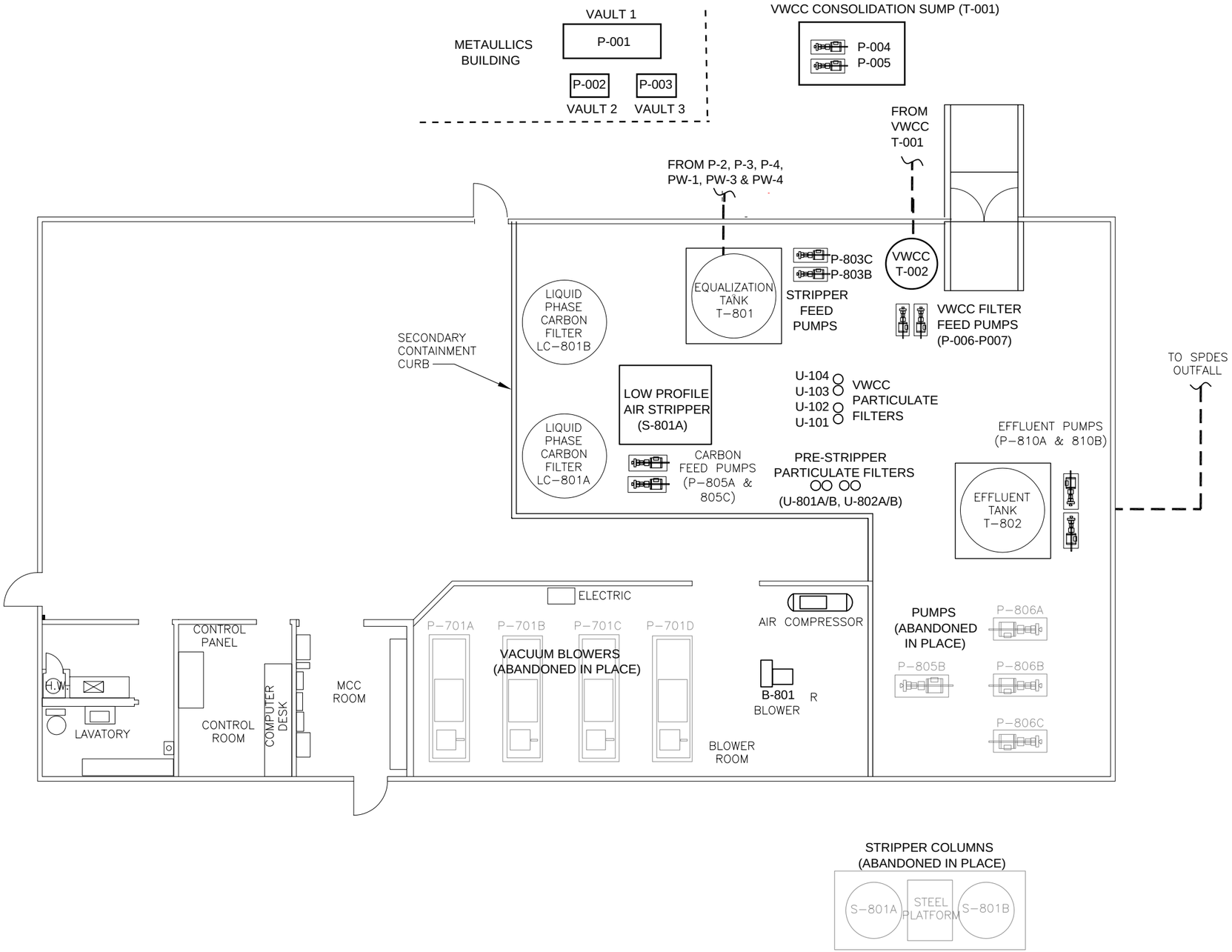

STRIPPER COLUMNS
(ABANDONED IN PLACE)

PARSONS
40 La Riviere Dr., Suite 350
Buffalo, NY 14202
(716) 541-0730

FIGURE 5

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY

EQUIPMENT LAYOUT

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STANDARD ABBREVIATIONS

A	AIR
A.A.	AMBIENT AIR INLET
A.B.	AGGREGATE BASE
A.C.	ASPHALTIC CONCRETE
APPROX.	APPROXIMATE
A.S.	AIR SUPPLY
B.C.	BEGINNING OF CURVE
B.F.	BLIND FLANGE
BKH.	BACKWASH
B.V.	BUTTERFLY VALVE
BLV	BALL VALVE
C	CONDENSATE
CAP	CAPACITY
C.E.	CLARIFIER EFFLUENT
CHF.	CHEMICAL FEED
CL	CENTERLINE
CONC.	CONCRETE
CPLG.	COUPLING
C.S.	CARBON SLURRY
CV	CONTROL VALVE
D	DRAIN
DI	DUCTILE IRON
DIA	DIAMETER
DWG.	DRAWING
EA.	EACH
E.C.	END CURVE
EFF.	EFFLUENT
EFW.	EFFLUENT WATER
EL.	ELEVATION
ELEC.	ELECTRICAL
ELB.	ELBOW
E.S.	EACH SIDE
E.W.	EACH WAY
EXIST. (E)	EXISTING
EXP.	EXPANSION
F	FILTRATE
F.A.	FLUIDIZING AIR
F.C.	FAIL CLOSE
F.O.	FAIL OPEN
FLEX. CONN	FLEX CONNECTION
F.M.	FLOW METER
F.L.	FLOW LINE
FT.	FOOT
FUT.	FUTURE
FIN. FLR.	FINISH FLOOR
FIN. GR.	FINISH GRADE
F.E.	FLANGED END
FLW.	FLUSHING WATER
FNPT	FEMALE NATIONAL PIPE THREAD
FRP	FIBERGLASS REINFORCED PLASTIC
FW.	FEED WATER
GA.	GAUGE
GALV.	GALVANIZED
G.I.	GALVANIZED IRON
G.P.M.	GALLONS PER MINUTE
GR.	GRADE
GND	GROUND
GSKT.	GASKET
HORIZ.	HORIZONTAL
HP	HORSEPOWER, HIGH POWER
HR.	HOUR
HYD.	HYDRANT
IA.	INSTRUMENT AIR
ID	INSIDE DIAMETER
IN.	INCHES
INV. EL	INVERT ELEVATION
I.P.S.	IRON PIPE SIZE
JT.	JOINT
JB.	JUNCTION BOX
L	LIME
LG	LONG
LS.	LIME SLUDGE
M.G.D.	MILLION GALLONS PER DAY
M.J.	MECHANICAL JOINT
MIN.	MINUTE, MINIMUM
MISC.	MISCELLANEOUS
M	MOTOR
MTD	MOUNTED
NA	NITRIC ACID
N.C.	NORMALLY CLOSED
N.I.C.	NOT IN CONTRACT
N.O.	NORMALLY OPEN
NO.	NUMBER
N	NORTH
N.T.S.	NOT TO SCALE
OD	OUTSIDE DIAMETER
O.L.	OXIDIZED LIQUOR
O.S.	OXIDIZED SLUDGE
OVHD.	OVERHEAD
O.W.	OXIDIZED WASTE
PA	PHOSPHORIC ACID
P.G.	PRESSURE GAUGE
P.L.	PROPERTY LINE, PIPELINE
PL	PLATE
POL.	POLYMER
P.R.V.	PRESSURE REGULATING (REDUCING) VALVE
P.S.I.A.	POUNDS PER SQUARE INCH, ABSOLUTE
PVC	POLYVINYL CHLORIDE
P.V.	PROCESS VARIABLE
PR.	PAIR
PRW.	PROCESS WATER
PW.	POTABLE WATER
R	RADIUS, RISER
R.C.	REINFORCED CONCRETE
RC.	REGENERATED CARBON
RCL.	RECOVERED LIQUOP
REQ'D.	REQUIRED
REF.	REFERENCE
RS.	RECYCLE SLUDGE
RV.	RELIEF VENT
RW.	RAW WASTE
S	SLUDGE
SA.	SODA ASH
SC.	SPENT CARBON
SCH.	SCHEDULE
SECT.	SECTION
SHT.	SHEET
SPEC.	SPECIFICATION
SQ.	SQUARE
STA.	STATION
STD.	STANDARD
S.D.	STORM DRAIN
S.B.O.	SUPPLIED BY OWNER
SOL.	SOLVENT
S.T.	SAMPLE TAP
S.S.P.	SUPERVISORY SET POINT
S.P.	SET POINT
SST	STAINLESS STEEL
TYP.	TYPICAL
T.O.	TOP OF
T.O.C.	TOP OF CASING
UTIL.	UTILITY
U.N.O.	UNLESS NOTED OTHERWISE
V	VALVE, VAPORS
VAC.	VACUUM
V.C.	VIRGIN CARBON
VAR.	VARIES, VARIABLE
VT.	VENT
VERT.	VERTICAL
W/	WITH
W/O	WITH OUT
W.S.	WATER SURFACE, WASTE SLUDGE
WWF	WELDED WIRE FABRIC
WWTP	WASTE WATER TREATMENT PLANT

PROCESS LINE DESCRIPTION

- FITTINGS, GENERAL PURPOSE
- MAIN PROCESS LINE
- SECONDARY PROCESS LINES
- ELECTRIC SIGNAL PROCESS LINE
- PNEUMATIC SIGNAL
- CAPILLARY TUBE
- HYDRAULIC SIGNAL
- CHEMICAL FEED LINE
- PROCESS AIR
- BUILDING PERIMETER
- EXISTING PIPE OR EQUIPMENT

B-2"TW-PVC8-101

INSULATION TYPE
B=BARE
D=DOUBLE WALL
I=INSULATED
J=INSULATED JACKETED & HEAT TRACED
T=STEAM TRACED AND INSULATED

NOMINAL PIPE SIZE

STREAM DESCRIPTION
AA=ATMOSPHERIC AIR
A=LOW PRESSURE AIR
BW=BACKFLUSH WATER
CA=COMPRESSED AIR
CDA=CLEAN DISCHARGE AIR
CTW=CITY WATER
CW=COLLECTED WATER
DR=DRAIN LINE
HG=HOT GAS
IA=INSTRUMENT AIR
NAPL=NON-AQUEOUS PHASE LIQUID
NG=NATURAL GAS
NU=NUTRIENT
OP=ORGANIC PHASE
PW=PROCESS WATER
R=REAGENT
RB=REGENERATED BYPASS
RC=REACT CARBON
RG=REGENERATED GAS
RR=REGENERATED RETURN AIR
RW=RAW WATER
SC=SPENT CARBON
SL=SLUDGE
SLA=SOLVENT LADEN AIR
ST=STEAM
SW=STRIPPED WATER
TV=TREATED VAPOR
TW=TREATED WATER
V=VENT

LINE NUMBER

MATERIAL TYPE
AT=ARMCO TRUSS
C4=CARBON STEEL SCHEDULE 40
C8=CARBON STEEL SCHEDULE 80
CD=CARBON STEEL DUCT 18 GAUGE
CU=COPPER
C900=POLYVINYL CHLORIDE AWWA C-900
DI=DUCTILE IRON
FH=FLEXIBLE HOSE
FRP=FIBER REINFORCED PLASTIC
GD=GALVANIZED STEEL DUCT 18 GAUGE
GAL4=GALVANIZED STEEL SCHEDULE 40
GAL8=GALVANIZED STEEL SCHEDULE 80
LI=POLYPROPYLENE LINED STEEL
PPL=POLYPROPYLENE
PVC4=POLYVINYL CHLORIDE SCHEDULE 40
PVC8=POLYVINYL CHLORIDE SCHEDULE 80
SS4=STAINLESS STEEL A304 SCHEDULE 40
SSD=STAINLESS STEEL DUCT 10 GAUGE
VIT=VITON

PIPING SYMBOLS

- DOUBLE WALL PIPE
- ELECTRICALLY TRACED PIPE WITH INSULATION
- HOSE CONNECTION
- BLIND FLANGE
- FLANGE
- UNION
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- REDUCING FLANGE
- FLEXIBLE HOSE COUPLING
- STRAINER
- THREADED CONNECTIONS
- FLANGED CONNECTIONS
- BUTT WELD CONNECTIONS
- SOCKET WELD CONNECTIONS
- AIR INTAKE FILTER
- QUICK DISCONNECT
- SIGHT FLOW INDICATOR
- SIGHT GLASS
- DRAIN (ID)
- ATMOSPHERIC VENT
- EYE WASH AND DELUGE SAFETY SHOWER
- VICTAULIC COUPLING
- VENT WITH WEATHER HOOD
- DIRECTION OF FLOW
- PITOT TUBE
- BLOCK & BLEED (BB)
- ORIFICE PLATE
- TRAP/W AUTOMATIC DRAIN
- DAMPER

EQUIPMENT SYMBOLS

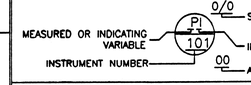
- CENTRIFUGAL BLOWER
- CENTRIFUGAL PUMP
- BAG FILTER
- PROGRESSIVE CAVITY PUMP
- SUBMERSIBLE PUMP
- SUBMERSIBLE WELL PUMP
- PNEUMATIC WELL PUMP
- METERING PUMP
- DOUBLE DIAPHRAGM PUMP
- UNIT HEATER (UH)
- HEAT EXCHANGER
- CONE ROOF TANK
- PRESSURE VESSEL
- TANK HEATER
- AIR COMPRESSOR
- ROTARY FEEDER
- PUG MILL
- IN LINE PUMP
- HORIZONTAL TANK WITH SADDLES
- POSITIVE DISPLACEMENT BLOWER
- OVERFLOW CONTAINMENT SUMP
- INLINE FILTER
- FLOW ELEMENT
- SILENCER
- VENTURI

INSTRUMENTATION SYMBOLS & ABBREVIATIONS

INSTRUMENT LEGEND

	FIRST LETTER INITIATING VARIABLE	SUCCEEDING LETTERS OUTPUT FUNCTIONS
A	ANALYSIS	ALARM
B	BURNER	
C	CONDUCTIVITY	CONTROL
D	DENSITY	DIFFERENTIAL
E	POTENTIAL (VOLTS)	PRIMARY ELEMENT
F	FLOW RATE	RATIO (FRACTION)
G	FIRE ALARM	GLASS (SIGHT GAUGE)
H	HAND (MANUALLY)	HIGH
I	CURRENT (AMPERES)	INDICATE
J	POWER	
K	TIME	
L	LEVEL	LOW
M	MOISTURE/HUMIDITY	LIGHT (PILOT)
N	EQUIPMENT STATUS	
O	OPERATION	OPERATION
P	PRESSURE	POINT (TEST CONNECTION)
Q	QUANTITY	INTEGRATE (TOTALIZE)
R	TURBIDITY	RECORD/PRINT
S	SPEED	SWITCH
T	TEMPERATURE	TRANSMIT
U	MULTIVARIABLE	MULTIFUNCTION
V	VIBRATION/VOLUME/VISCOSITY	VALVE / DAMPER
W	WEIGHT/FORCE/TORQUE	WELL
X	UNCLASSIFIED	UNCLASSIFIED
Y	STATUS	RELAY/COMPUTE
Z	POSITION	DRIVE / ACTUATE

SYMBOLS FOR INSTRUMENTS



- LOCAL OR FIELD INSTRUMENT
- PANEL MOUNTED INSTRUMENT
- BEHIND PANEL MOUNTED INSTRUMENT
- STATUS LIGHT
- I/P CURRENT TO PNEUMATIC
- INTERLOCK

SIGNAL CONDITIONING

INPUT / OUTPUT CONVERTERS E/P, I/P (TYP.)

SYMBOL	FUNCTION	SYMBOL	FUNCTION
E	VOLTAGE	P	PRESSURE (PNEUMATIC)
H	HYDRAULIC	1-0	ON-OFF
I	CURRENT	Σ	SUMMATOR
R	RESISTANCE	⊠	HIGH SELECTOR
A	ANALOG	⊠	LOW SELECTOR
D	DIGITAL		
O	ELECTROMAGNETIC OR SONIC		

ANALYSIS FUNCTIONS

CO	COMBUSTIBLES	pH	ACID ALKALINE SCALE LOG
CI	CHLORINE	TC	TOTAL CARBON
COND	CONDUCTIVITY	TOC	TOTAL ORGANIC CARBON
DO	DISSOLVED OXYGEN	Th	TURBIDITY
ORP	OXIDATION REDUCTION POTENTIAL	O	OXYGEN

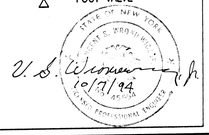
ELECTRICAL SYMBOLS

- CONDUIT RUN EXPOSED
- CONDUIT RUN UNDERGROUND
- EXISTING CONDUIT RUN
- COMBINATION MAGNETIC STARTER, FVNR
- SINGLE RECEPTICAL, 120 V
- DUPLEX RECEPTACLE, 120 V; SINGLE PHASE WP-WEATHERPROOF
- ETM ELAPSED TIME METER
- FUSE
- GROUND
- GROUND ROD (3/4" COPPER WELD)
- LIGHTNING ARRESTER
- HEATER STRIP
- (J) JUNCTION BOX, PB-PULLBOX
- (T) THERMOSTAT
- NON-FUSIBLE DISCONNECT SWITCH
- O.L. OVERLOAD PROTECTION DEVICE
- PILOT LIGHT R=RED, W=WHITE, G=GREEN A=AMBER, B=BLUE, C=CLEAR
- SELECTOR SWITCH AO="AUTO"-"OFF" & HOA="HAND"-"OFF""AUTO"
- S_2 SWITCH, 120-277V; 2-2 POLE; 20A
- (R) TIME DELAY RELAY, CR-CONTROL RELAY
- TRANSFORMER
- UNDERGROUND PULLBOX
- 10' HIGH LIGHT STANDARD
- (M) MOTOR
- SOLENOID VALVE
- SWITCH N.O.
- SWITCH N.C.
- TIME DELAY N.O.
- INSTANTANEOUS N.O.
- LIMIT SWITCH N.O.
- LIQUID LEVEL SWITCH N.O.
- PRESSURE SWITCH N.O.
- TEMPERATURE SWITCH N.O.
- FLOW SWITCH N.O.

VALVE SYMBOLS

NORMALLY OPEN	NORMALLY CLOSED		NORMALLY OPEN	NORMALLY CLOSED	
		GATE VALVE (DARK-NC)			AIR ACTUATED VALVE
		NEEDLE GATE VALVE			BACK PRESSURE VALVE
		GLOBE VALVE			PRESSURE REDUCER VALVE
		BALL VALVE			ANGLE VALVE
		BUTTERFLY VALVE			THREE WAY VALVE
		DIAPHRAGM OPERATED VALVE			
		SOLENOID VALVE			FOUR WAY VALVE
		MOTOR OPERATED VALVE			

- CHECK VALVE
- WAFER CHECK VALVE
- TECHNO-CHECK VALVE
- BACKFLOW PREVENTOR
- SAMPLE VALVE
- PRESSURE RELIEF VALVE
- AIR RELIEF VALVE
- FOOT VALVE



ELECTRICAL ABBREVIATIONS

A	AMPERES
AC	ALTERNATING CURRENT
ALM	ALARM
ANN	ANNUCIATOR
AUTO	AUTOMATIC
BAT	BATTERY
BD	BUS DUCT
BKR	BREAKER
C	CONDUIT
CB	CIRCUIT BREAKER
CLG	CEILING
CP	CONTROL PANEL
CTRL	CONTROL
DC	DIRECT CURRENT
DIS	DISCONNECT
DP	DOUBLE POLE
DT	DOUBLE THROW
EG	ENCLOSED AND GASKETED
E (OH)	ELECTRICAL (OVERHEAD)
E (UG)	ELECTRICAL (UNDERGROUND)
EMER	EMERGENCY
EPO	EMERGENCY POWER OFF
EMT	ELECTRICAL METALLIC CONDUIT
EXP	EXPOSED
FBO	FURNISHED BY OTHERS
FLEX	FLEXIBLE METAL CONDUIT
FRN	DUAL ELEMENT FUSE "FUSETRON"
FS	FLOW SWITCH
GEN	GENERATOR
GFI	GROUND-FAULT CIRCUIT-INTERRUPTER
GND	GROUND
GRC	GALVANIZED RIGID STEEL CONDUIT
HP	HORSEPOWER
HPS	HIGH PRESSURE SODIUM
HZ	CYCLE PER SECOND
IRD	INFARED DETECTOR
JB	JUNCTION BOX
LB	LINE BOX
LS	LEVEL SWITCH
LMS	LIMIT SWITCH
LTG	LIGHTNING
MCC	MOTOR CONTROL CENTER
M	MOTOR STARTER COIL, MOTOR SIZE FOR MOTOR
MAN	MANUAL
MCP	MOTOR CIRCUIT PROTECTOR
NF	NON-FUSED
OL	THERMAL OVERLOAD
PBS	PUSHBUTTON STATION
PF	POWER FACTOR
ø	PHASE
PTT	PUSH TO TEST
PL	PILOT LIGHT
PS	PRESSURE SWITCH
PWR	POWER
RCPT	RECEPTACLE
RECVR	RECIEVER
SP	SINGLE POLE
ST	SINGLE THROW
SPKR	SPEAKER
SN	SOLID NEUTRAL
SW	SWITCH
TC	TIME DELAY CLOSING
TO	TIME DELAY OPENING
TF	TRANSFORMER
TPCP	TREATMENT PLANT CONTROL PANEL
TSP	TWISTED SHIELDED PAIR
UF	UNDER FLOOR
UG	UNDERGROUND
V	VOLTS
VP	VAPOR PROOF
W	WATTS
WP	WEATHERPROOF
XFMR	TRANSFORMER
XMTR	TRANSMITTER
XP	EXPLOSION PROOF

ISSUE	DATE	DESCRIPTION	APPROVED
6	10/05/94	AS-BUILTS	MCP
5	01/20/94	CONSTRUCTION REVISIONS	M.C.P.
4	08/27/93	AGENCY REVIEW	J.P.
3	07/30/93	CLIENT REVIEW	J.P.

BP OIL COMPANY
CARBORUNDUM FACILITY
WHEATFIELD, NEW YORK

STANDARD ABBREVIATIONS AND SYMBOLS

CHECKED BY / DATE:	S.F. 7/29/93	SCALE: AS SHOWN	DRAWN BY: B.J.F.
APPROVED BY / DATE:	J.P. 7/30/93	DESIGNED BY: J.P.	DATE: 06/14/93

McLaren Hart sm
M/H ENGINEERS EAST, P.C.

DRAWING NUMBER: 1056D002
SHEET NUMBER: G001

HUMAN USER INTERFACE (HUI) INCLUDES DISPLAY, STATUS, ALARM, AND/OR SETPOINTS

REMOTE READ INSTRUMENT (E.G., SENSOR OR TRANSMITTER)

LOCAL READ INSTRUMENT (E.G., GAUGE)

LOCAL PANEL MOUNTED--EQUIPMENT (E.G., HAND--OFF--AUTO SWITCH, LIGHT)

PROGRAMMABLE LOGIC CONTROLLER INPUT/OUTPUT

B-3"-SW-HDPE-303

INSULATION TYPE
B=BARE
J=INSULATED JACKETED & HEAT TRACED

NOMINAL PIPE SIZE

STREAM DESCRIPTION
AA=ATMOSPHERIC AIR
CW=COLLECTED WATER
SW=STRIPPED WATER
TW=TREATED WATER

MATERIAL TYPE
CPVC8=CHLORINATED POLYVINYL CHLORIDE SCHEDULE 80
HDPE=HIGH DENSITY POLYETHYLENE
SS=STAINLESS STEEL

LINE NUMBER

TO PERMITTED AIR DISCHARGE

VAPOR PHASE CARBON FILTER

FLEX CONNECTION

LOW PROFILE AIR STRIPPER

FROM CARBON FILTER LC-801, SEE DETAIL

FROM SUMP PUMPS, SEE DETAIL

FROM PW-3

FROM P-2

FROM P-3, P-4

FROM PW-1

T-801 EQUALIZATION TANK

B-3"-CW-CPVC8-201

B-3"-CW-CPVC8-202

P-803A

P-803B

F-801A

F-802A

F-801B

F-802B

B-3"-SW-CPVC8-303

B-16"-AA-SS-302

B-10"-AA-SS-301

FROM PLANT ATMOSPHERE

BLOWER B-801A

T-802 EFFLUENT TANK

B-3"-SW-CPVC8-305

B-3"-SW-CPVC8-304

LC-801A & LC-801B LIQUID PHASE CARBON FILTER

SEE LC-801 DETAIL BELOW

P-807A

P-807B

B-6"-TW-CPVC8-402

B-4"-TW-CPVC8-403

B-4"-TW-CPVC8-404

P-810A

P-810B

B-4"-TW-CPVC8-407

B-6"-TW-CPVC8-408

B-6"-TW-CPVC8-409

SYPHON BREAKER

INSIDE BURIED

PERMITTED SPDES DISCHARGE OF TREATED WATER 50-150 GPM

TO OUTSIDE AIR VENT

VENTSORB CARBON CANISTER VC-801

EQUALIZATION TANK T-801

MAKE UP WATER FROM CITY WATER SUPPLY

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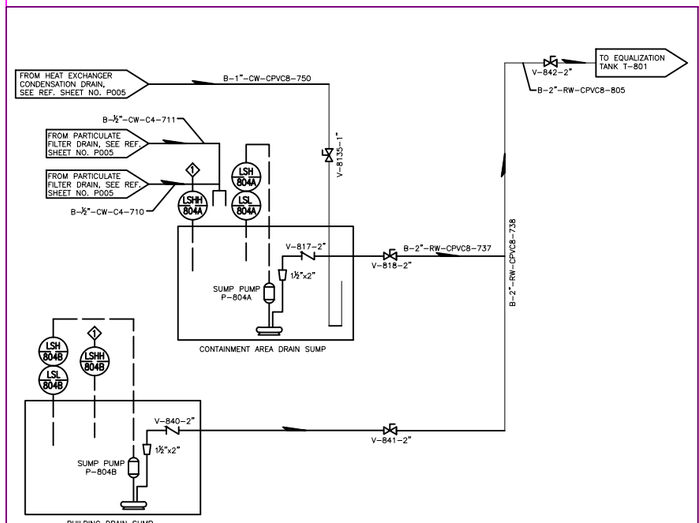

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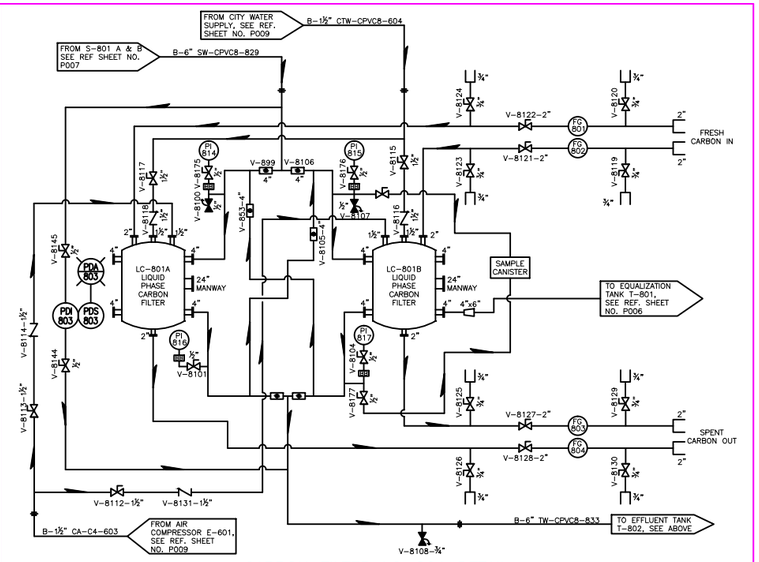

CARBON FILTER LC-801 DETAIL

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Y	EVENT OR PROCESS	COMPUTE
Z	POSITION	FINAL CONTROL

PIPING SYMBOLS:
- CONCENTRIC REDUCER
- FLEXIBLE HOSE COUPLING
- STRAINER
- ATMOSPHERIC VENT
- DIRECTION OF FLOW

MISC. SYMBOLS:
- INSTRUMENT INTERLOCK
- MOTOR

VALVE SYMBOLS:
- GATE VALVE
- BALL VALVE (NORMALLY OPEN)
- BALL VALVE (NORMALLY CLOSED)
- BUTTERFLY VALVE
- MOTOR OPERATED VALVE
- CHECK VALVE
- WAFER CHECK VALVE
- SAMPLE VALVE (NORMALLY CLOSED)
- BLOCK AND BLEED VALVE

NOT TO SCALE

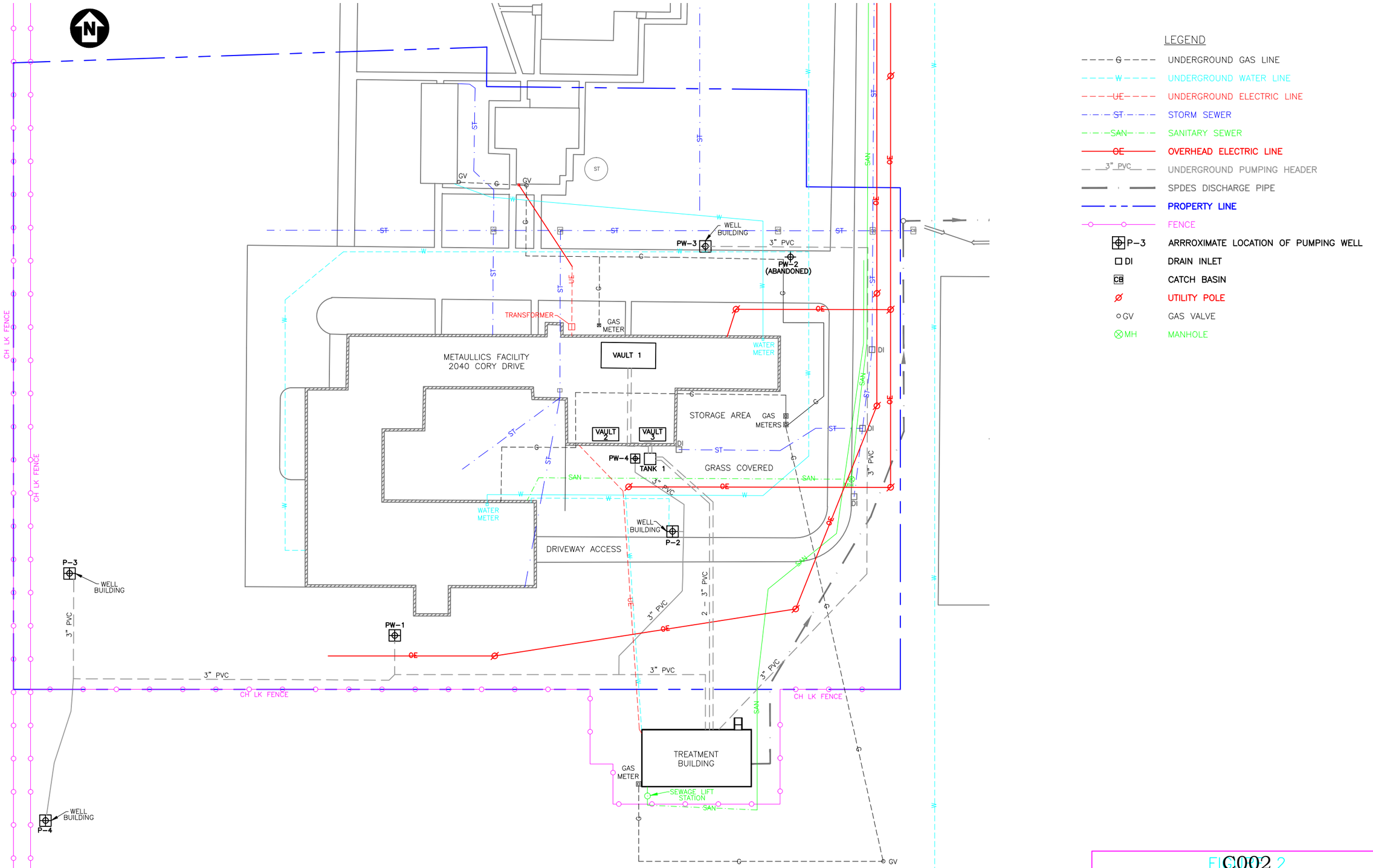
PARSONS
40 LA RIVIERE DRIVE, SUITE 350
BUFFALO, NEW YORK 14202
716-541-0730

FIGURE 4

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY

GROUNDWATER TREATMENT SYSTEM

P:\Sanborn\\447601\Record Drawings\SK-442156-c19_Fig4.dwg
No XREFs



LEGEND

- G — UNDERGROUND GAS LINE
- W — UNDERGROUND WATER LINE
- UE — UNDERGROUND ELECTRIC LINE
- ST — STORM SEWER
- SAN — SANITARY SEWER
- OE — OVERHEAD ELECTRIC LINE
- 3" PVC — UNDERGROUND PUMPING HEADER
- SPDES DISCHARGE PIPE
- PROPERTY LINE
- FENCE
- P-3 — ARRROXIMATE LOCATION OF PUMPING WELL
- DI — DRAIN INLET
- CB — CATCH BASIN
- UTILITY POLE
- GV — GAS VALVE
- MH — MANHOLE

PARSONS
40 LA RIVIERE DRIVE, SUITE 350
BUFFALO, NEW YORK 14202
716-541-0730

FIGURE 2

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY

SITE PLAN – UTILITIES

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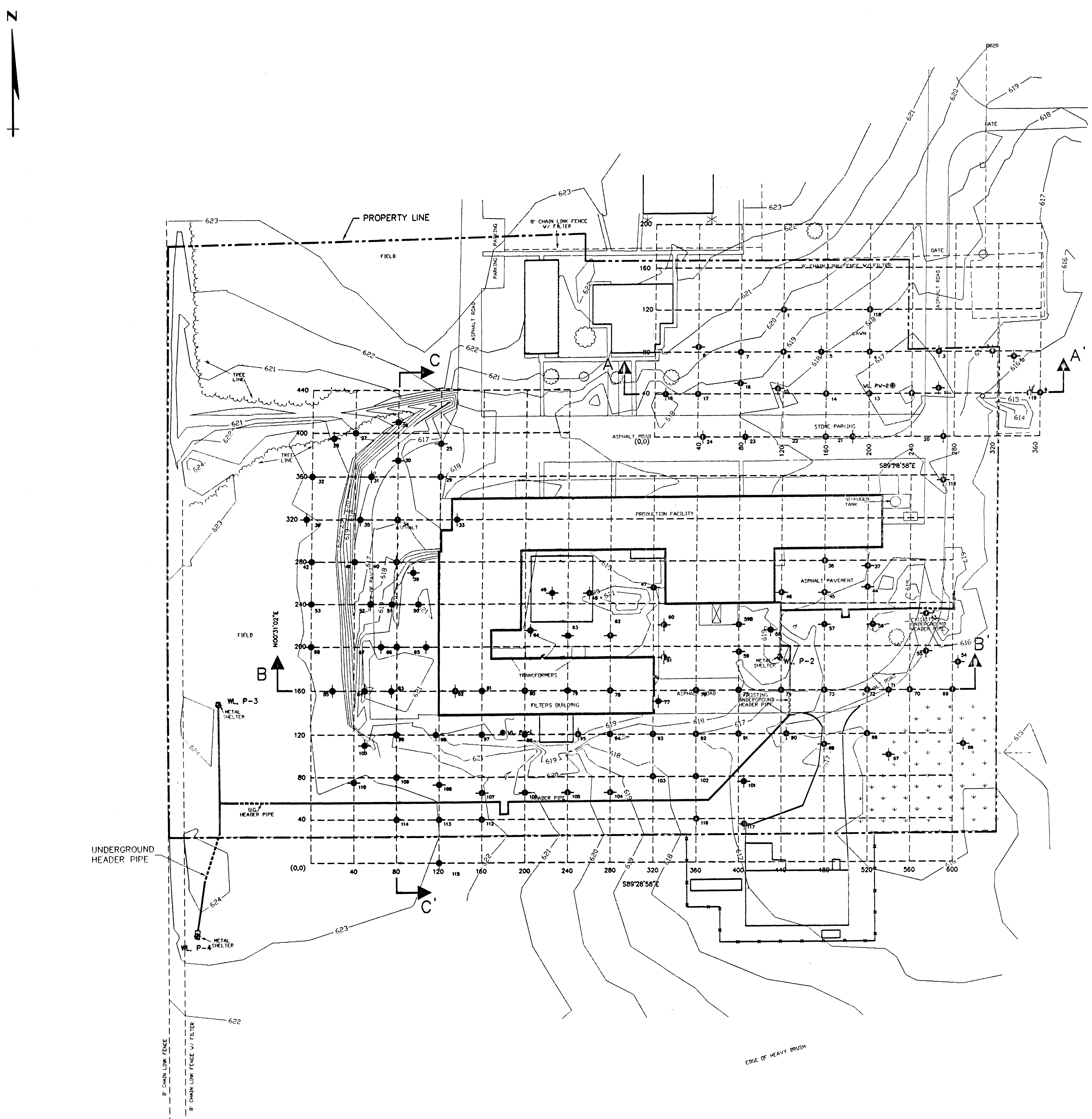
DRAWING NUMBER: 1056D043 | SHEET NUMBER: C003 | ISSUE #: 5



LEGEND:

- ⌖10 SOIL BORING LOCATION
- —·—·— PROPERTY LINE
- - - - - GEOLOGIC SITE GRID

SCALE

0 50 100 150 FEET

MAP REFERENCES:

1. SOIL BORING GRID AND SAMPLING DATA WERE PREPARED FROM SOIL SAMPLING PROGRAM PERFORMED BY ECOLOGY AND ENVIRONMENT ENGINEERS, DATED DECEMBER 1992.
2. EXISTING TOPOGRAPHY AND SITE PLAN PREPARED FROM GROUND SURVEY PERFORMED BY NIAGARA BOUNDARY, NIAGARA FALLS, NEW YORK, DATED 5/25/93.

V.S. Winnewez 10/7/94

ISSUE	DATE	DESCRIPTION	APPROVED
5	10/05/94	AS-BUILTS	MP
4	08/27/93	AGENCY REVIEW	J.P.
3	07/29/93	CLIENT REVIEW	J.P.
1	06/15/93	PRELIMINARY CLIENT REVIEW	J.P.

BP OIL COMPANY

CARBORUNDUM COMPANY FACILITY

WHEATFIELD, NEW YORK

SOIL PROFILE LOCATION PLAN

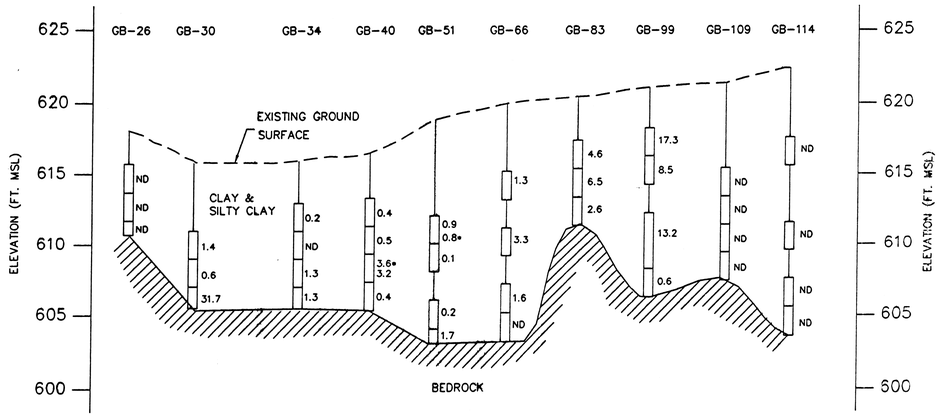
CHECKED BY / DATE: L.N. 07/29/93	SCALE: AS SHOWN	DRAWN BY: M.J.H.	
APPROVED BY / DATE: M.C.P. 07/30/93	DESIGNED BY: J.Z.	DATE: 07/26/93	

McLaren Hart
M/H ENGINEERS EAST, P.C.

DRAWING NUMBER: 1056D043

SHEET NUMBER: C003

C



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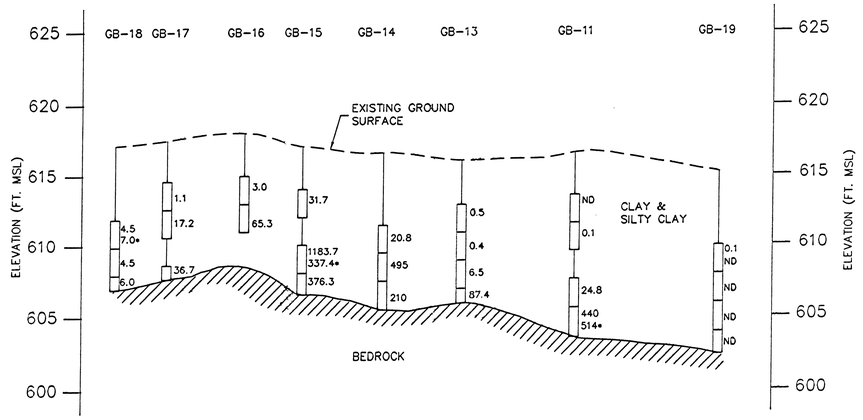

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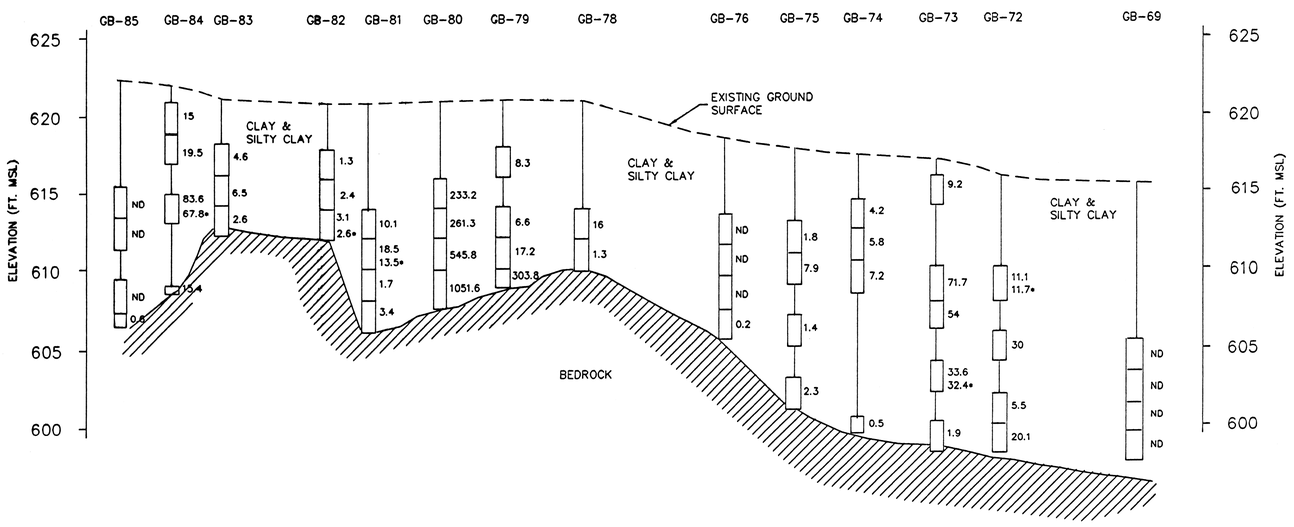


LEGEND

SOIL SAMPLE INTERVAL → [ ] 1.3 ← TOTAL VOLATILE ORGANIC COMPOUND CONCENTRATION IN mg/kg

NOTES:

ND–NOT DETECTED

* – INDICATES DUPLICATE SAMPLE ANALYSES RESULTS

HORIZONTAL SCALE
0 20 40 80 FEET

VERTICAL SCALE
0 2.5 5 10 FEET

MAP REFERENCE:

SOIL BORING GRID AND SAMPLING DATA WERE PREPARED FROM SOIL SAMPLING PROGRAM PERFORMED BY ECOLOGY AND ENVIRONMENT ENGINEERS, DATED DECEMBER 1992.

ISSUE	DATE	DESCRIPTION	APPROVED
5	10/05/94	AS-BUILTS	McP
4	08/27/93	AGENCY REVIEW	J.P.
3	07/30/93	PRELIMINARY CLIENT REVIEW	J.P.
1	06/15/93	PRELIMINARY CLIENT REVIEW	J.P.

BP OIL COMPANY
CARBORUNDUM COMPANY FACILITY
WHEATFIELD, NEW YORK

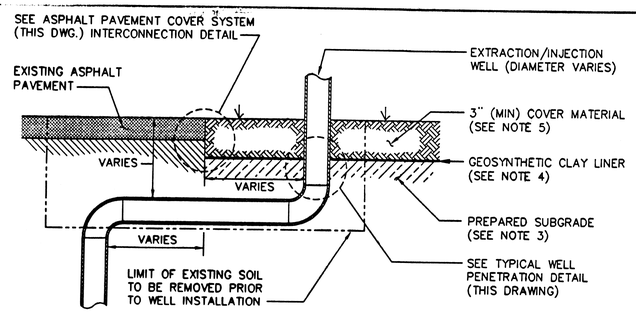
SOIL PROFILES

CHECKED BY / DATE: S.D.C. 07/29/93	SCALE: AS SHOWN	DRAWN BY: J.M.C.
APPROVED BY / DATE: J.P. 07/29/93	DESIGNED BY: D.O.	DATE: 07/28/93

McLaren Hart SM
M/H ENGINEERS EAST, P.C.

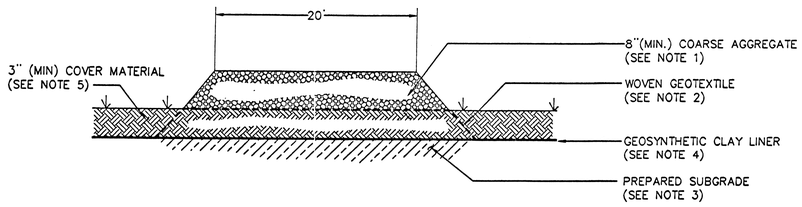
DRAWING NUMBER: 1056D051
SHEET NUMBER: C004

DRAWING NUMBER 1056D063 | SHEET NUMBER C006 | SHEET # 5



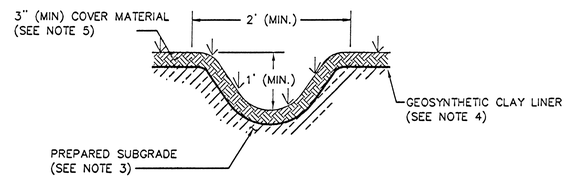
SECTION A–A'

SCALE: AS SHOWN



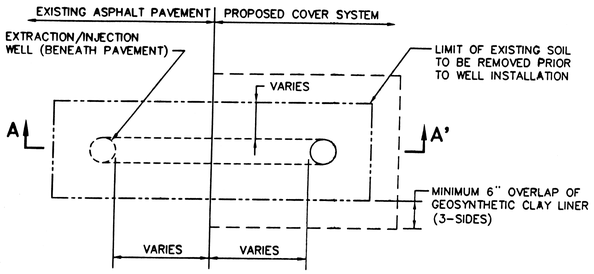
TYPICAL ACCESS ROAD ABOVE COVER SYSTEM

SCALE: AS SHOWN



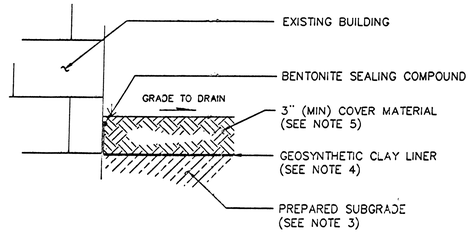
TYPICAL STORMWATER DRAINAGE DITCH

SCALE: AS SHOWN



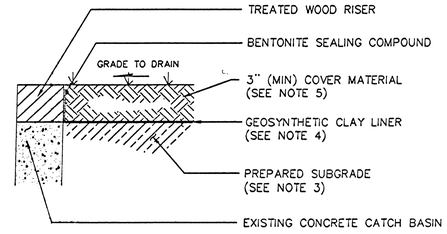
TYPICAL WELL INSTALLATION BENEATH EXISTING ASPHALT PAVEMENT DETAIL

SCALE: AS SHOWN



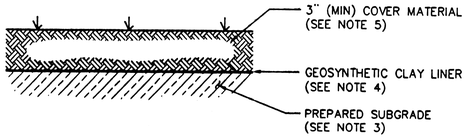
TYPICAL COVER SYSTEM/ BUILDING INTERCONNECTION

SCALE: AS SHOWN



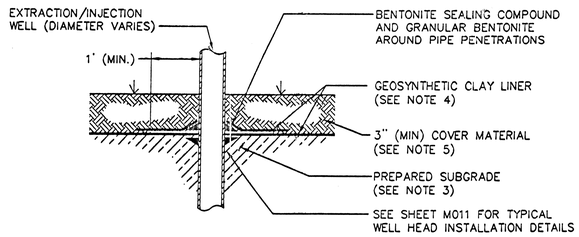
TYPICAL COVER SYSTEM/ CATCH BASIN INTERCONNECTION

SCALE: AS SHOWN



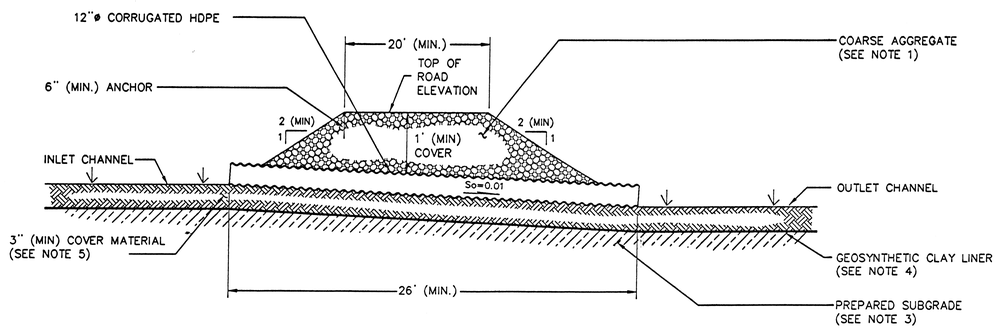
TYPICAL COVER SYSTEM DETAIL

SCALE: AS SHOWN



TYPICAL WELL PENETRATION DETAIL

SCALE: AS SHOWN



TYPICAL CULVERT ABOVE COVER SYSTEM

SCALE: AS SHOWN

NOTES:

1. COARSE AGGREGATE IS 2" RUN OF CRUSH STONE AND WAS COMPACTED TO GREATER THAN 90% MAXIMUM DENSITY.

2. WOVEN GEOTEXTILE IS MIRAFI 600X.

3. SUBGRADE WAS FREE OF DEBRIS, ROOTS, AND ANGULAR ROCKS LARGER THAN 1 INCH. SUBGRADE WAS SMOOTHED AND COMPACTED WITH A CAT D3 DOZER WHERE POSSIBLE. IN SOFT UNCOMPACTED AREAS, THE BENTOMAT WAS OVERLAPPED APPROXIMATELY 12 INCHES AT SEAMS.

4. GEOSYNTHETIC CLAY LINER IS BENTOMAT 5/CS/3.5 AS MANUFACTURED BY AMERICAN COLLOID COMPANY. WHEN PLACED ON SLOPES GREATER THAN 3:1, THE BENTOMAT WAS ANCHOR TRENCHED AS PER THE MANUFACTURER'S RECOMMENDATIONS.

5. COVER MATERIAL IS RUN OF CRUSH STONE LESS THAN 1 INCH IN SIZE AND WAS FREE FROM OTHER FOREIGN MATERIALS.

ISSUE	DATE	DESCRIPTION	APPROVED
5	10/05/94	AS-BUILTS	MCP
4	08/27/93	AGENCY REVIEW	M.C.P.
3	08/04/93	CLIENT REVIEW	J.P.
2	07/29/93	CLIENT REVIEW	J.P.

BP OIL COMPANY
CARBORUNDUM COMPANY FACILITY
WHEATFIELD, NEW YORK

SOIL COVER SYSTEM DETAILS

CHECKED BY / DATE: R.F.D. 07/29/93	SCALE: AS SHOWN	DRAWN BY: M.J.H.
APPROVED BY / DATE: J.P. 07/30/93	DESIGNED BY: M.E.A.	DATE: 07/29/93

McLaren Hart sm
M/H ENGINEERS EAST, P.C.

DRAWING NUMBER: 1056D063
SHEET NUMBER: C006

STATE OF NEW YORK — ROBERT S. WOODWARD — 10/1/94 — LICENSED PROFESSIONAL

HUMAN USER INTERFACE (HUI) INCLUDES DISPLAY, STATUS, ALARM, AND/OR SETPOINTS

REMOTE READ INSTRUMENT (E.G., SENSOR OR TRANSMITTER)

LOCAL READ INSTRUMENT (E.G., GAUGE)

LOCAL PANEL MOUNTED--EQUIPMENT (E.G., HAND--OFF--AUTO SWITCH, LIGHT)

PROGRAMMABLE LOGIC CONTROLLER INPUT/OUTPUT

B-3"-SW-HDPE-303

INSULATION TYPE
B=BARE
J=INSULATED JACKETED & HEAT TRACED

NOMINAL PIPE SIZE

STREAM DESCRIPTION
AA=ATMOSPHERIC AIR
CW=COLLECTED WATER
SW=STRIPPED WATER
TW=TREATED WATER

MATERIAL TYPE
CPVC8=CHLORINATED POLYVINYL CHLORIDE SCHEDULE 80
HDPE=HIGH DENSITY POLYETHYLENE
SS=STAINLESS STEEL

LINE NUMBER

TO PERMITTED AIR DISCHARGE

VAPOR PHASE CARBON FILTER

FLEX CONNECTION

LOW PROFILE AIR STRIPPER

FROM CARBON FILTER LC-801, SEE DETAIL

FROM SUMP PUMPS, SEE DETAIL

FROM PW-3

FROM P-2

FROM P-3, P-4

FROM PW-1

T-801 EQUALIZATION TANK

B-3"-CW-CPVC8-201

B-3"-CW-CPVC8-202

P-803A

P-803B

F-801A

F-802A

F-801B

F-802B

B-3"-SW-CPVC8-303

B-16"-AA-SS-302

B-10"-AA-SS-301

FROM PLANT ATMOSPHERE

BLOWER B-801A

T-802 EFFLUENT TANK

B-3"-SW-CPVC8-305

B-6"-TW-CPVC8-402

B-4"-TW-CPVC8-403

B-4"-TW-CPVC8-404

P-810A

P-810B

B-4"-TW-CPVC8-407

LC-801A & LC-801B LIQUID PHASE CARBON FILTER

SEE LC-801 DETAIL BELOW

P-807A

P-807B

B-3"-SW-CPVC8-304

SYPHON BREAKER

B-6"-TW-CPVC8-408

B-6"-TW-CPVC8-409

PERMITTED SPDES DISCHARGE OF TREATED WATER 50-150 GPM

NOTE: DRAWING BASED ON HALEY & ALDRICH PROCESS AND INSTRUMENTATION DIAGRAM, DATED SEPTEMBER 2004.

VENTSORB CARBON CANISTER VC-801 DETAIL

TO OUTSIDE AIR VENT

VENTSORB CARBON CANISTER VC-801

EQUALIZATION TANK T-801

MAKE UP WATER FROM CITY WATER SUPPLY

B-2"-SLA-CPVC8-8145

B-3"-CW-CU-602

SUMP PUMP DETAIL

FROM HEAT EXCHANGER CONDENSATION DRAIN, SEE REF. SHEET NO. P005

B-1"-CW-CPVC8-750

TO EQUALIZATION TANK T-801

B-2"-RW-CPVC8-805

FROM PARTICULATE FILTER DRAIN, SEE REF. SHEET NO. P005

B-½"-CW-C4-711

B-½"-CW-C4-710

B-2"-RW-CPVC8-737

B-2"-RW-CPVC8-738

CONTAINMENT AREA DRAIN SUMP

SUMP PUMP P-804A

SUMP PUMP P-804B

BUILDING DRAIN SUMP

CARBON FILTER LC-801 DETAIL

FROM CITY WATER SUPPLY, SEE REF. SHEET NO. P009

B-1½" CTW-CPVC8-604

FROM S-801 A & B SEE REF SHEET NO. P007

B-6" SW-CPVC8-829

LC-801A LIQUID PHASE CARBON FILTER

LC-801B LIQUID PHASE CARBON FILTER

SAMPLE CANISTER

FRESH CARBON IN

SPENT CARBON OUT

TO EQUALIZATION TANK T-801, SEE REF. SHEET NO. P006

TO EFFLUENT TANK T-802, SEE ABOVE

B-6" TW-CPVC8-833

FROM AIR COMPRESSOR E-601, SEE REF. SHEET NO. P009

B-1½" CA-C4-603

LETTER [ALL POSITIONS]	FIRST POSITION [MEASURED VARIABLE]	SUCCEEDING LETTERS [MODIFIERS]
A	ANALYSIS	ALARM OR ACTIVATE
C	CONDUCTIVITY	CONTROL OR CLOSE
D	DIFFERENTIAL	DRIVE
E	VOLTAGE	ELEMENT
F	FLOW	FRACTION
H	HAND	HIGH
I	CURRENT	INDICATOR
L	LEVEL	LOW OR LIGHT
O	ORIFICE	OPEN
P	PRESSURE OR VACUUM	POINT
Q	QUANTITY	TOTALIZER
S	STRAIN OR LIMIT	SWITCH OR STATUS
T	TEMPERATURE	TRANSMITTER
V	VARIABLE	VALVE
W	WATER	WELL
X	ELECTRICAL SWITCH	RELAY
Y	EVENT OR PROCESS	COMPUTE
Z	POSITION	FINAL CONTROL

PIPING SYMBOLS:
- CONCENTRIC REDUCER
- FLEXIBLE HOSE COUPLING
- STRAINER
- ATMOSPHERIC VENT
- DIRECTION OF FLOW

MISC. SYMBOLS:
- INSTRUMENT INTERLOCK
- MOTOR

VALVE SYMBOLS:
- GATE VALVE
- BALL VALVE (NORMALLY OPEN)
- BALL VALVE (NORMALLY CLOSED)
- BUTTERFLY VALVE
- MOTOR OPERATED VALVE
- CHECK VALVE
- WAFER CHECK VALVE
- SAMPLE VALVE (NORMALLY CLOSED)
- BLOCK AND BLEED VALVE

NOT TO SCALE

PARSONS
40 LA RIVIERE DRIVE, SUITE 350
BUFFALO, NEW YORK 14202
716-541-0730

(New P006) FIGURE 4

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY

GROUNDWATER TREATMENT SYSTEM

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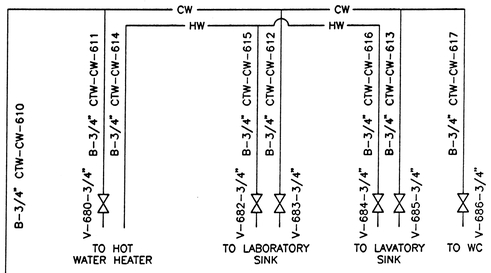
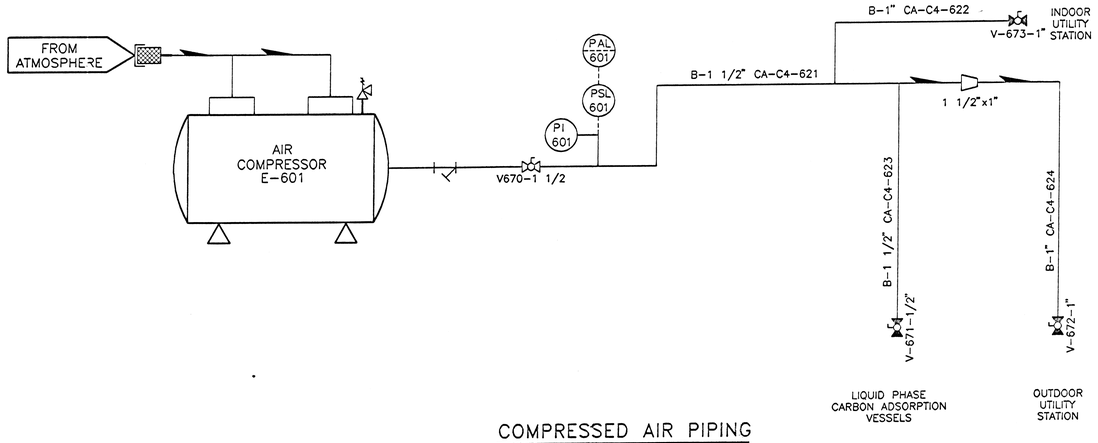
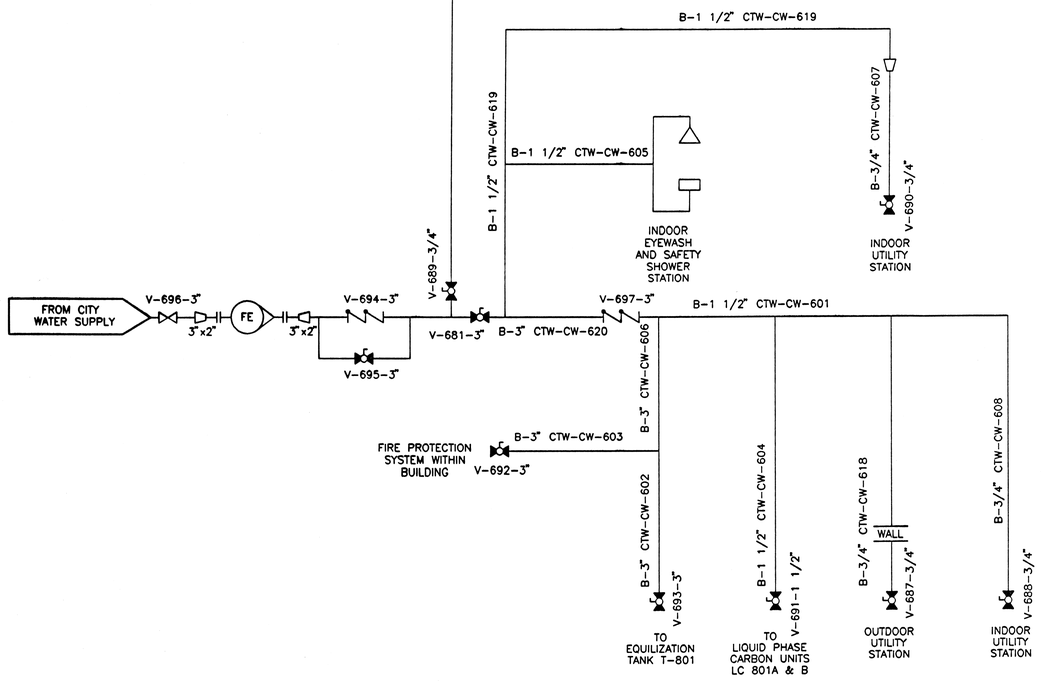
No XREFs

DRAWING NUMBER: 1056D024 | SHEET NUMBER: P009 | ISSUE #: F

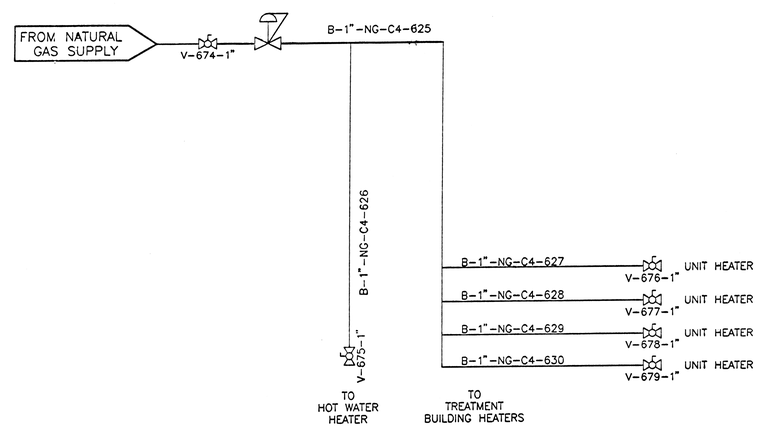




COMPRESSED AIR PIPING
SCALE: NONE



WATER PIPING
SCALE: NONE



NATURAL GAS PIPING
SCALE: NONE

EQUIPMENT SCHEDULE		
EQUIPMENT NAME		AIR COMPRESSOR
EQUIPMENT NUMBER		E-601
WORK ORDER NUMBER		
MODEL NUMBER		APKRM
DESCRIPTION	MATERIAL	Steel
	SIZE	32.7 cfm @ 175 psig
	hp/v/rpm	10/240/NA
	WEIGHT	675 LBS
	CAPACITY	80 GAL TANK
	VENDOR	GARDNER-DENVER

ISSUE	DATE	DESCRIPTION	APPROVED
6	10/05/94	AS-BUILTS	MH
5	01/20/94	CONSTRUCTION REVISIONS	M.C.P.
4	08/27/93	AGENCY REVIEW	J.P.
3	07/30/93	CLIENT REVIEW	J.P.

BP OIL COMPANY
CARBORUNDUM COMPANY FACILITY
WHEATFIELD, NEW YORK

PIPING AND INSTRUMATION DIAGRAM
UTILITY STATIONS

CHECKED BY / DATE: L.N. 07/29/93 | SCALE: AS SHOWN | DRAWN BY: ERM
APPROVED BY / DATE: J.P. 07/30/93 | DESIGNED BY: S.O.F. | DATE: 5/26/93

McLaren Hart
M/H ENGINEERS EAST, P.C.

DRAWING NUMBER: 1056D024
SHEET NUMBER: P009

V.A. Wisniewski 10/7/94

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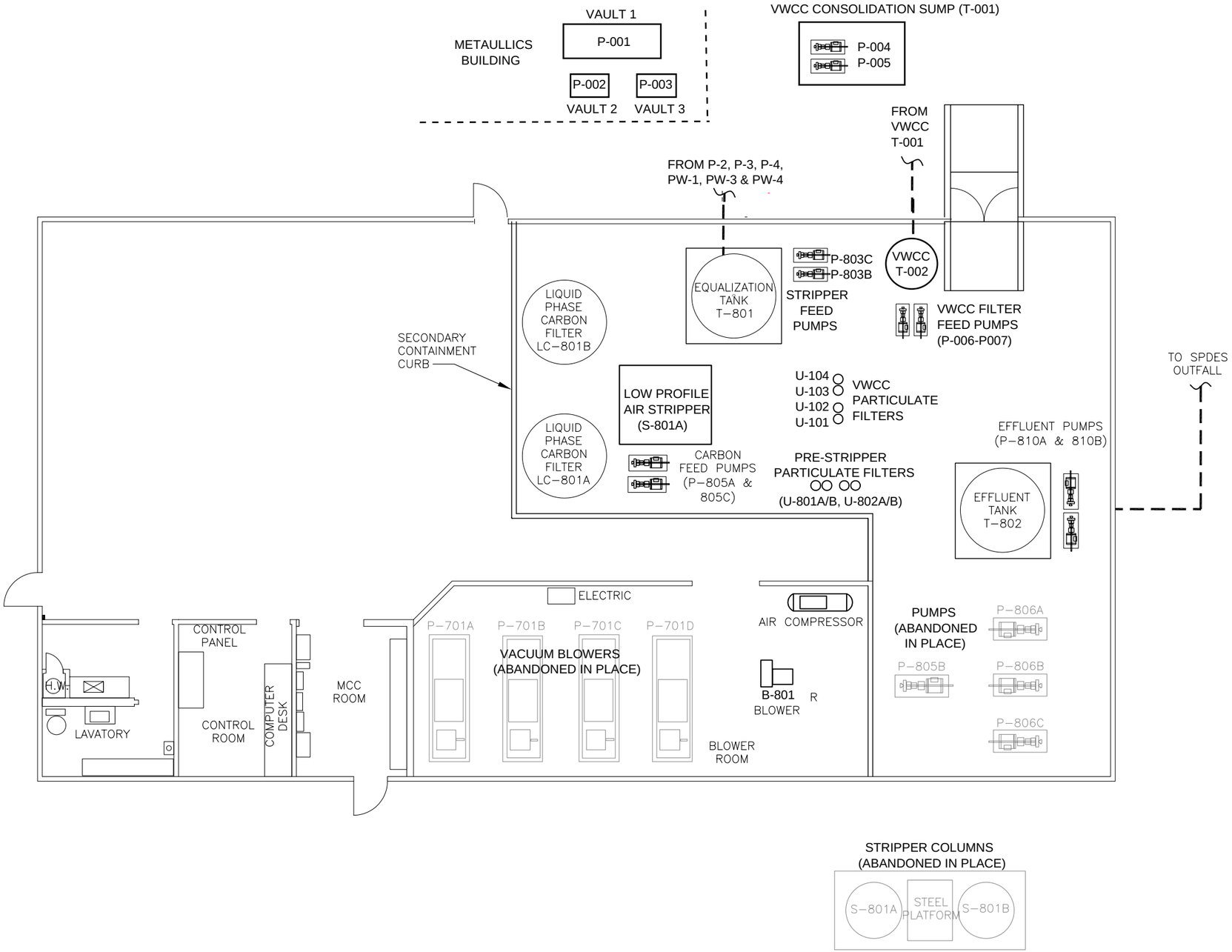

STRIPPER COLUMNS
(ABANDONED IN PLACE)

(New M001) FIGURE 5

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY

EQUIPMENT LAYOUT

PARSONS
40 La Riviere Dr., Suite 350
Buffalo, NY 14202
(716) 541-0730

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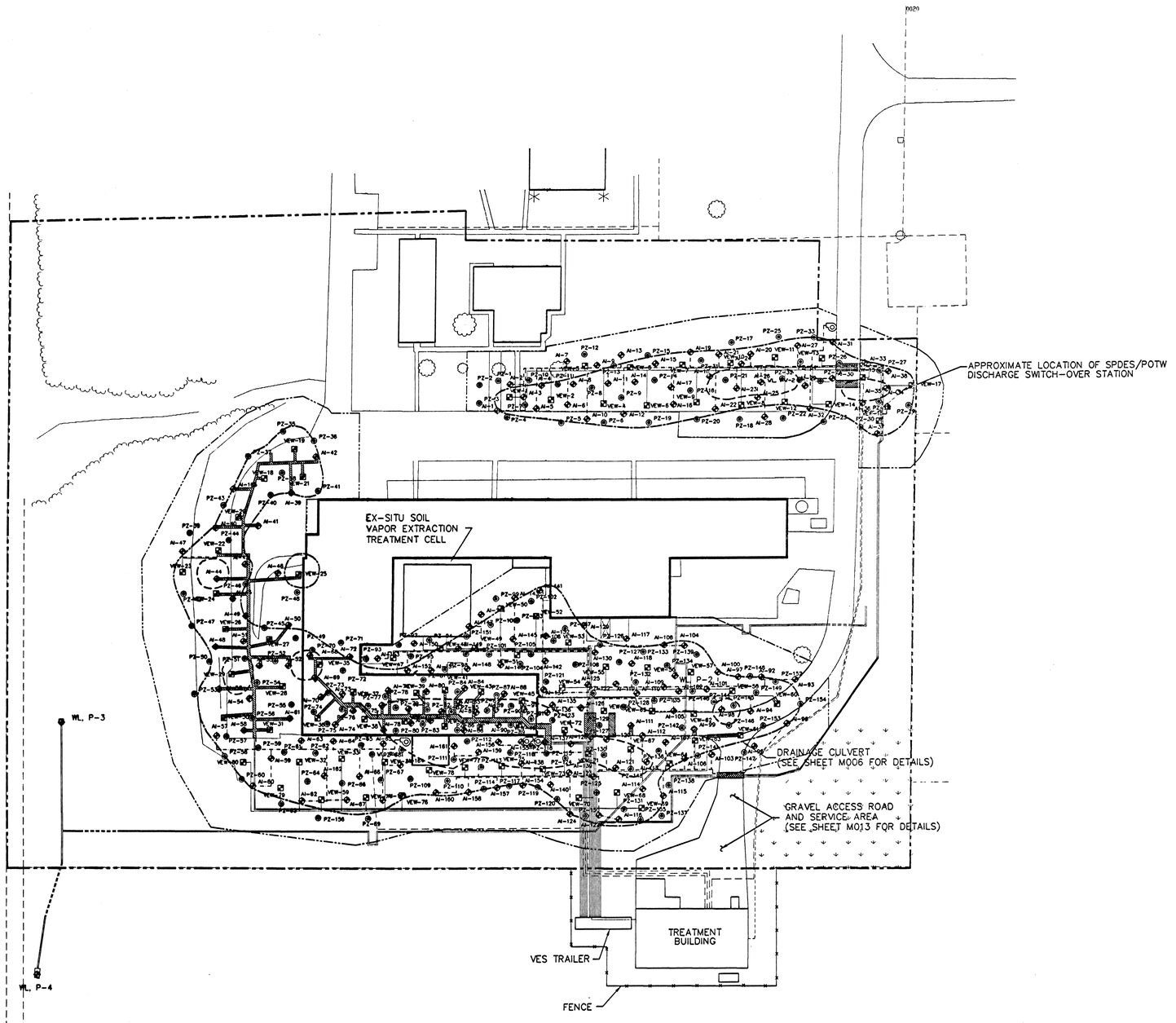
DRAWING NUMBER: 1056D044 | SHEET NUMBER: M003 | REV.: 5



NOTE:

1. SEE SHEET M004–M007 FOR AIR INJECTION/VACUUM EXTRACTION WELL AND PIPING LOCATIONS.

LEGEND:

- VEW–50 — VAPOR EXTRACTION WELL
- AI–25 — AIR INJECTION WELL
- PZ–60 — PNEUMATIC PIEZOMETER
- 100 PPM TOTAL VOCs CONTOUR
- 3 PPM TOTAL VOCs CONTOUR
- LIMITS OF IMPERMEABLE COVER
- AIR INJECTION PIPING SCH 40 PVC OR CARBON STEEL
- VAPOR EXTRACTION PIPING 4" DIA. SCH 80 PVC
- GROUNDWATER PUMPING HEADER
- SPDES DISCHARGE LINE
- PIPE TRENCH

SCALE
0 50 100 150 FEET

STATE OF NEW YORK — RICHARD S. HERRIOTT — 10/7/94 — LICENSED PROFESSIONAL ENGINEER

ISSUE	DATE	DESCRIPTION	APPROVED
5	10/05/94	AS-BUILTS	MKP
5	01/20/94	CONSTRUCTION REVISIONS	J.P.
4	08/27/93	AGENCY REVIEW	J.P.
3	07/30/93	CLIENT REVIEW	J.P.

BP OIL COMPANY
CARBORUNDUM COMPANY FACILITY
WHEATFIELD, NEW YORK

SITE PLAN
WELLS AND PIPING LOCATION

CHECKED BY / DATE: R.F.D. 07/30/93	SCALE: AS SHOWN	DRAWN BY: G.R.J.
APPROVED BY / DATE: J.P. 07/30/93	DESIGNED BY: R.F.D.	DATE: 07/13/93

McLaren Hart sm
M/H ENGINEERS EAST, P.C.

DRAWING NUMBER: 1056D044
SHEET NUMBER: M003

DRAWING NUMBER 056D046 | SHEET NUMBER M008 | SCALE # 8

CONCRETE PAD
SLOPE TO DRAIN
CONCRETE PAD
SLOPE TO DRAIN
CHAIN OPERATED ROLL UP DOOR (TYP.)
H
FIRE PROTECTION
TO WATER SUPPLY (SEE SHEET M018)
WASH
EXIT
U.H.
B
C
RAMP
EXIT
RAMP
P-808
CHEMICAL FEED DRUM
C
CHEMICAL STORAGE AREA
VC-702B
VC-701B
30"
TO EX-SITU SOIL VAPOR EXTRACTION SYSTEM
4"
6" HIGH x 6" WIDE REINFORCED CONCRETE CURBING (TYP.)
A
P-807
T-801
P-803C
P-803B
P-803A
LC-801B
U-701
VC-801
14"
2 1/2"
2"
6"
WASH DOWN STATION (TYP.)
3'x4'x3' SUMP
P-804B
LC-801A
F-701
F-702
4'x4'x3' SUMP
P-804A
F-801A
F-801B
F-802A
F-802B
PDI
DELUGE SHOWER AND EMERGENCY EYEWASH STAND
P-810A
T-802
TO SPDES DISCHARGE
VC-702A
VC-701A
WINCH(TYP. OF 2)
8" CONCRETE BLOCK WALL (2 hr. FIRE RATING)
H-701
G
J
ELECTRIC U
BLOWER ROOM
P-701A
P-701B
P-701C
P-701D
E-601
P-810B
S-805A
S-806C
S-805B
S-806B
S-805C
S-806A
B-801A
B-801B
DAMPER (TYP.)
E
F
I
LABORATORY
H W
CONTROL PANEL
CONTROL ROOM
COMPUTER DESK
LAVATORY
GAS STORAGE
VOC ANALYZER
MCC ROOM
120/208v DISTRIBUTION PANEL
480v-120/208v STEP DOWN TRANSFORMER
MCC
℄ ROOF BEAM
AIR CONDITIONER
AIR CONDITIONER
℄ ROOF BEAM
36"x48" AIR INTAKE LOUVER WITH INSECT SCREENS (TYP.)
℄ ROOF BEAM
D
℄ ROOF BEAM
℄ ROOF BEAM
S-801A
S-801B
STEEL PLATFORM

STATE OF NEW YORK — RICHARD S. WRONSKI — 10/7/94 — PROFESSIONAL ENGINEER

SCALE
0 4 8 12 FEET

ISSUE	DATE	DESCRIPTION	APPROVED
8	10/05/94	AS-BUILTS	MCP
7	01/20/94	CONSTRUCTION REVISIONS	M.C.P.
6	08/27/93	AGENCY REVIEW	J.P.
5	08/06/93	CLIENT REVIEW	J.P.

BP OIL COMPANY
CARBORUNDUM COMPANY FACILITY
WHEATFIELD, NEW YORK

PIPING PLAN

CHECKED BY / DATE:	L.N. 08/23/93	SCALE: AS SHOWN	DRAWN BY: M.J.H.
APPROVED BY / DATE:	J.P. 08/24/93	DESIGNED BY: L.N.	DATE: 07/29/93

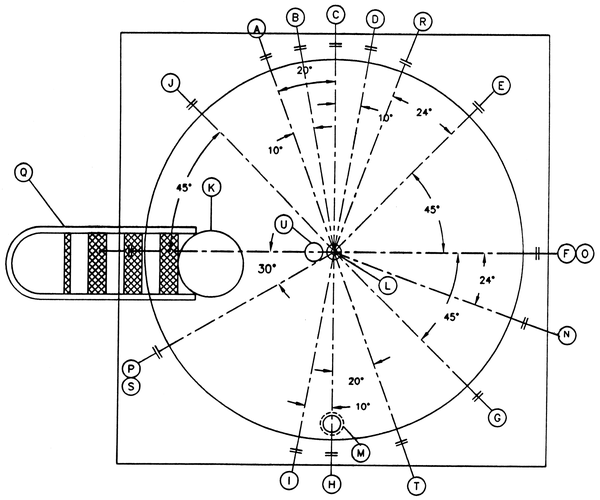
McLaren Hart sm
M/H ENGINEERS EAST, P.C.

DRAWING NUMBER: 1056D046
SHEET NUMBER: M008

NOTE:

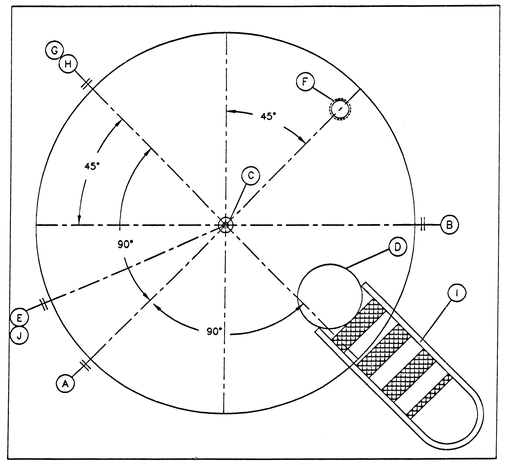
1. LIQUID PHASE CARBON PACKAGE SYSTEM PIPING LAYOUT IS NOT SHOWN FOR CLARITY.

DRAWING NUMBER: 1056D069 | SHEET NUMBER: M010 | ISSUE #: 6



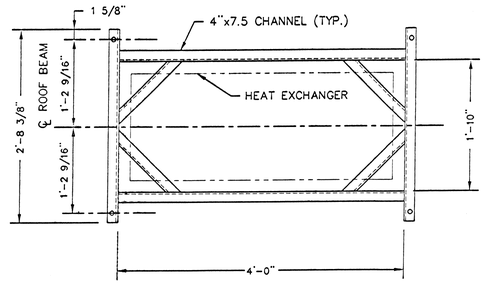
TANK T-801 PLAN VIEW

SCALE: NONE



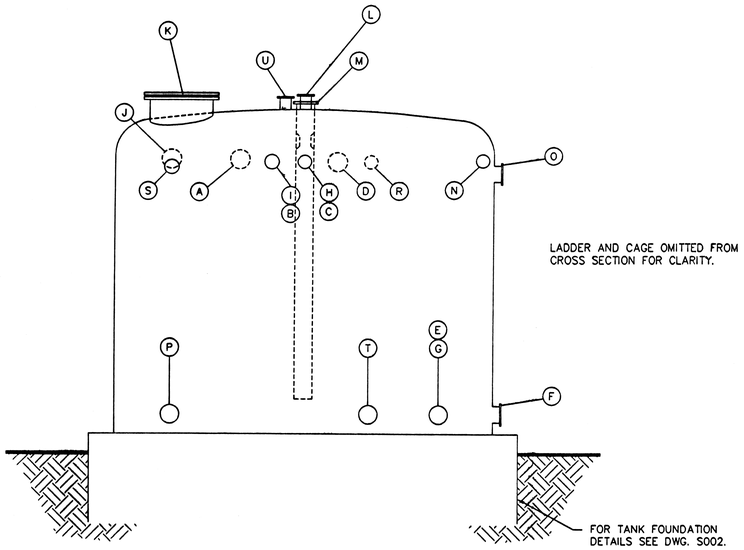
TANK T-802 PLAN VIEW

SCALE: NONE



HEAT EXCHANGER SUPPORT FRAME - PLAN

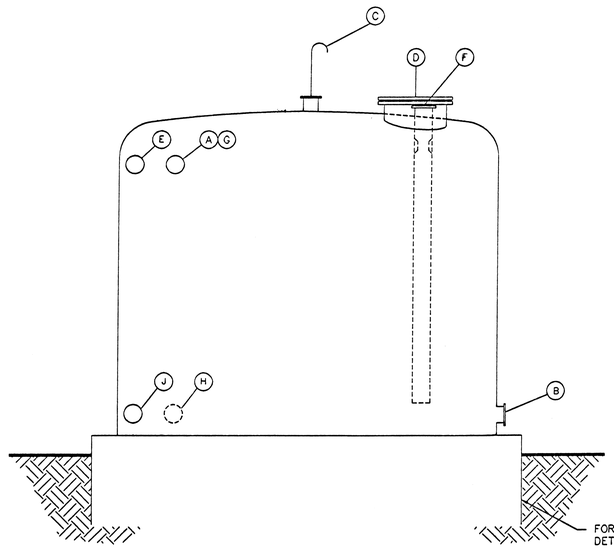
SCALE: NONE



LADDER AND CAGE OMITTED FROM CROSS SECTION FOR CLARITY.

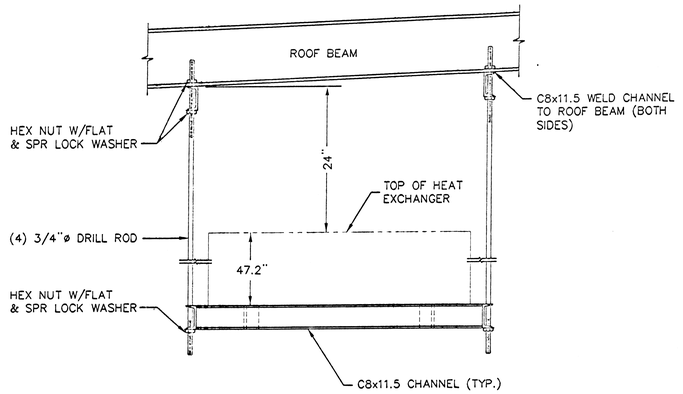
TANK T-801 FRONT ELEVATION

SCALE: NONE



TANK T-802 FRONT ELEVATION

SCALE: NONE



HEAT EXCHANGER SUPPORT FRAME - ELEVATION

SCALE: NONE

EQUALIZATION TANK T-801 SCHEDULE

ITEM	REQD	SIZE	DESCRIPTION	TYPE	DESIGN DATA
A	1	3"	INFLUENT	FLG.	SIZE: 7.5' x 10'-2" NOMINAL
B	1	3"	INFLUENT	FLG.	CAPACITY: 3,000 GALLON
C	1	3"	INFLUENT	FLG.	LIQUID HEIGHT: 8'-9"
D	1	3"	INFLUENT	FLG.	FREEBOARD: 6"
E	1	3"	EFFLUENT SIPHON	FLG.	OPER. TEMP.: AMBIENT
F	1	3"	EFFLUENT SIPHON	FLG.	MATERIAL: HDPE
G	1	3"	EFFLUENT SIPHON	FLG.	DESIGN TEMP.: AMBIENT
H	1	2"	INFLUENT (SUMP)	FLG.	DESIGN PRESS.: 4 OZ
I	1	3"	INFLUENT (HEAT EXCHANGER)	FLG.	FLUID: GROUNDWATER
J	1	2"	INFLUENT (AIR/WATER SEPARATOR)	FLG.	% SOLIDS: N/A
K	1	21"	MANHOLE, TOP	FLG.	Sp. Gr.: 1+
L	1	8"	EXHAUST	FLG.	LINING: N/A
M	1	6"	LEVEL GAUGE (INTERNAL DOWN PIPE)	FLG	TO MEET OSHA REQUIREMENTS
N	1	4"	SPARE	FLG.	CORROSION ALLOWANCE: 1/16"
O	1	6"	EFFLUENT OVERFLOW	FLG.	
P	1	3"	LEVEL TRANSMITTER	FLG.	
Q	1		LADDER W/ SAFETY CAGE	PER MANUF. STD.	APPLICABLE CODE: SEE SPECIFICATION
R	1	3"	CITY WATER	FLG.	
S	1	6"	INFLUENT (LIQUID PHASE CARBON)	FLG.	
T	1	4"	DRAIN	FLG.	
U	1	2"	EXHAUST	FLG.	

EQUALIZATION TANK T-802 SCHEDULE

ITEM	REQD	SIZE	DESCRIPTION	TYPE	DESIGN DATA
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J	1	2"	DRAIN	FLG.	% SOLIDS: N/A
					Sp. Gr.: 1+
					LINING: N/A
					TO MEET OSHA REQUIREMENTS
					CORROSION ALLOWANCE: 1/16"
					APPLICABLE CODE: SEE SPECIFICATION

STATE OF NEW YORK — ROBERT K. WINNER — 10/7/94 — PROFESSIONAL ENGINEER

ISSUE	DATE	DESCRIPTION	APPROVED
6	10/05/94	AS-BUILTS	MCP
5	01/20/94	CONSTRUCTION REVISIONS	M.C.P.
4	08/27/93	AGENCY REVIEW	J.P.
1	08/06/93	CLIENT REVIEW	J.P.

BP OIL COMPANY
CARBORUNDUM COMPANY FACILITY
WHEATFIELD, NEW YORK

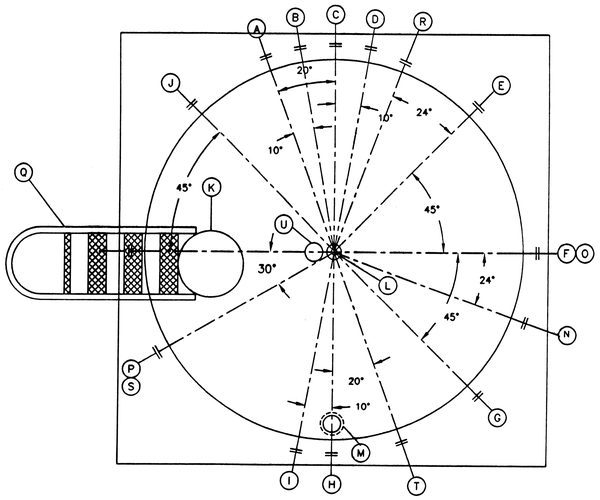
VESSEL SCHEDULE

CHECKED BY / DATE: R.F.D. 08/06/93 | SCALE: AS SHOWN | DRAWN BY: R.F.D.
APPROVED BY / DATE: J.P. 08/06/93 | DESIGNED BY: S.O.F. | DATE: 07/12/93

McLaren Hart sm
M/H ENGINEERS EAST, P.C.

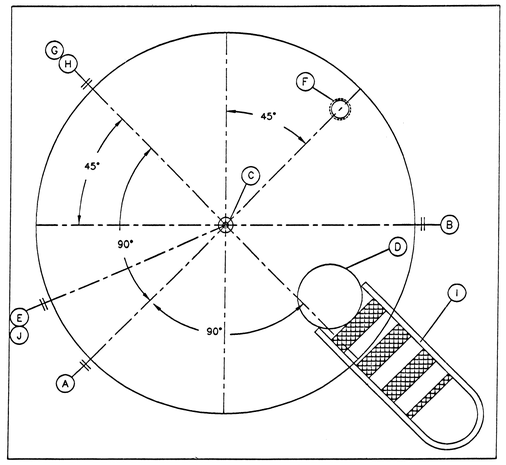
DRAWING NUMBER: 1056D069
SHEET NUMBER: M010

DRAWING NUMBER: 1056D069 | SHEET NUMBER: M010 | ISSUE #: 6



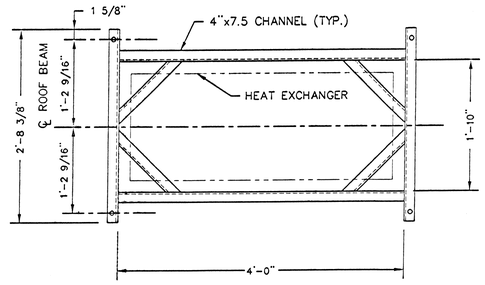
TANK T-801 PLAN VIEW

SCALE: NONE



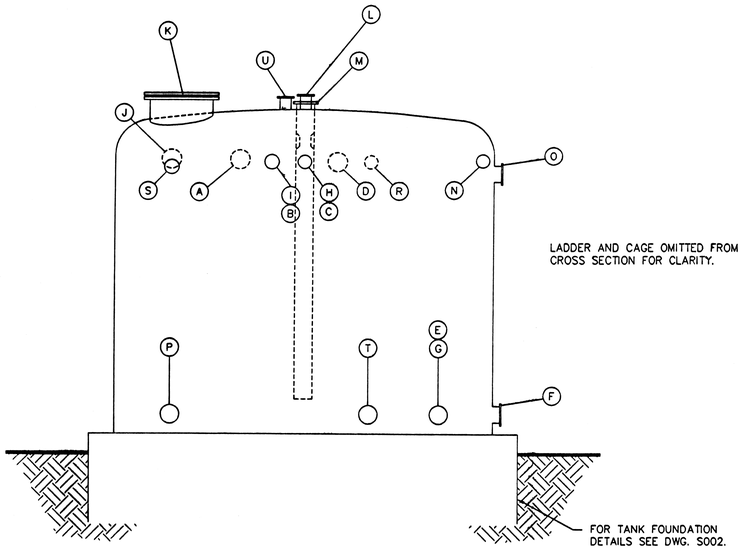
TANK T-802 PLAN VIEW

SCALE: NONE



HEAT EXCHANGER SUPPORT FRAME - PLAN

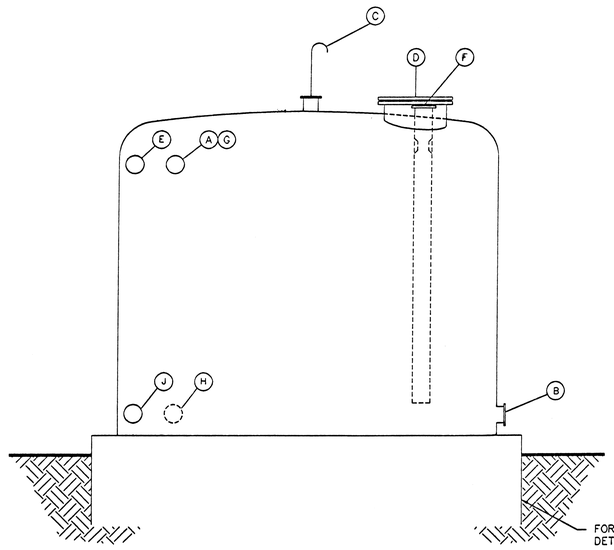
SCALE: NONE



LADDER AND CAGE OMITTED FROM CROSS SECTION FOR CLARITY.

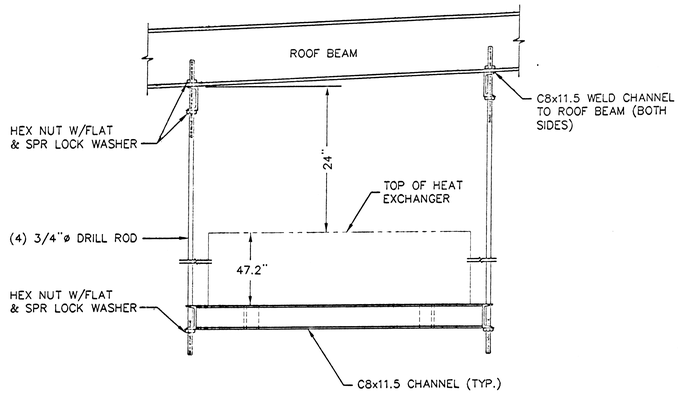
TANK T-801 FRONT ELEVATION

SCALE: NONE



TANK T-802 FRONT ELEVATION

SCALE: NONE



HEAT EXCHANGER SUPPORT FRAME - ELEVATION

SCALE: NONE

EQUALIZATION TANK T-801 SCHEDULE

ITEM	REQD	SIZE	DESCRIPTION	TYPE	DESIGN DATA
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D	1	3"	INFLUENT	FLG.	FREEBOARD: 6"
E	1	3"	EFFLUENT SIPHON	FLG.	OPER. TEMP.: AMBIENT
F	1	3"	EFFLUENT SIPHON	FLG.	MATERIAL: HDPE
G	1	3"	EFFLUENT SIPHON	FLG.	DESIGN TEMP.: AMBIENT
H	1	2"	INFLUENT (SUMP)	FLG.	DESIGN PRESS.: 4 OZ
I	1	3"	INFLUENT (HEAT EXCHANGER)	FLG.	FLUID: GROUNDWATER
J	1	2"	INFLUENT (AIR/WATER SEPARATOR)	FLG.	% SOLIDS: N/A
K	1	21"	MANHOLE, TOP	FLG.	Sp. Gr.: 1+
L	1	8"	EXHAUST	FLG.	LINING: N/A
M	1	6"	LEVEL GAUGE (INTERNAL DOWN PIPE)	FLG	TO MEET OSHA REQUIREMENTS
N	1	4"	SPARE	FLG.	CORROSION ALLOWANCE: 1/16"
O	1	6"	EFFLUENT OVERFLOW	FLG.	
P	1	3"	LEVEL TRANSMITTER	FLG.	
Q	1		LADDER W/ SAFETY CAGE	PER MANUF. STD.	APPLICABLE CODE: SEE SPECIFICATION
R	1	3"	CITY WATER	FLG.	
S	1	6"	INFLUENT (LIQUID PHASE CARBON)	FLG.	
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U	1	2"	EXHAUST	FLG.	

EQUALIZATION TANK T-802 SCHEDULE

ITEM	REQD	SIZE	DESCRIPTION	TYPE	DESIGN DATA
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D	1	21"	MANHOLE, TOP	FLG.	FREEBOARD: 6"
E	1	4"	SPARE	FLG.	OPER. TEMP.: AMBIENT
F	1	6"	LEVEL GAUGE (INTERNAL DOWN PIPE)	FLG.	MATERIAL: HDPE
G	1	6"	EFFLUENT OVERFLOW	FLG.	DESIGN TEMP.: AMBIENT
H	1	3"	LEVEL TRANSMITTER	FLG	DESIGN PRESS.: 4 OZ
I	1		LADDER W/ SAFETY CAGE	PER MANUF. STD.	FLUID: GROUNDWATER
J	1	2"	DRAIN	FLG.	% SOLIDS: N/A
					Sp. Gr.: 1+
					LINING: N/A
					TO MEET OSHA REQUIREMENTS
					CORROSION ALLOWANCE: 1/16"
					APPLICABLE CODE: SEE SPECIFICATION

STATE OF NEW YORK — ROBERT K. WINNER — 10/7/94 — PROFESSIONAL ENGINEER

ISSUE	DATE	DESCRIPTION	APPROVED
6	10/05/94	AS-BUILTS	MCP
5	01/20/94	CONSTRUCTION REVISIONS	M.C.P.
4	08/27/93	AGENCY REVIEW	J.P.
1	08/06/93	CLIENT REVIEW	J.P.

BP OIL COMPANY
CARBORUNDUM COMPANY FACILITY
WHEATFIELD, NEW YORK

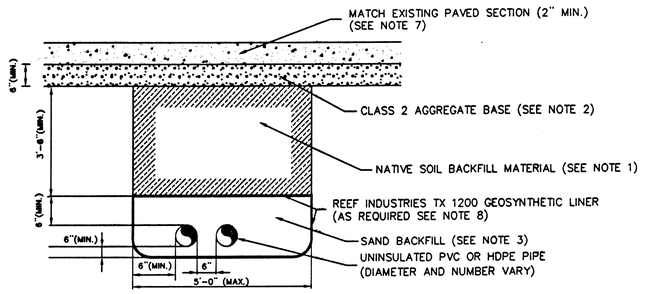
VESSEL SCHEDULE

CHECKED BY / DATE: R.F.D. 08/06/93 | SCALE: AS SHOWN | DRAWN BY: R.F.D.
APPROVED BY / DATE: J.P. 08/06/93 | DESIGNED BY: S.O.F. | DATE: 07/12/93

McLaren Hart sm
M/H ENGINEERS EAST, P.C.

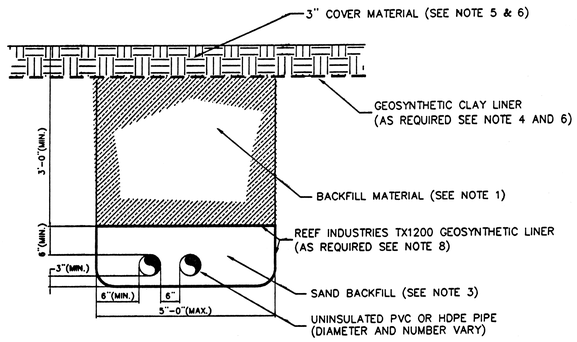
DRAWING NUMBER: 1056D069
SHEET NUMBER: M010

DRAWING NUMBER: 1056D058 | SHEET NUMBER: M014 | REV. 6



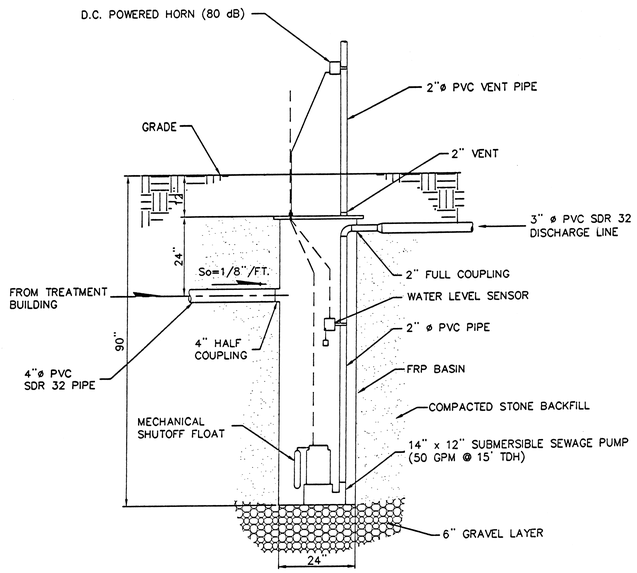
TRENCH DETAIL–PAVED/GRAVEL ROAD AREAS

SCALE: 1" = 1'-0"



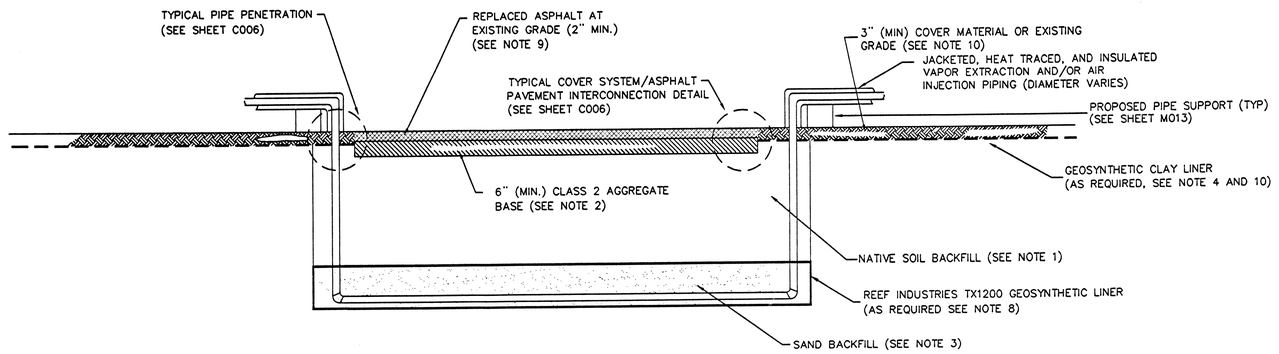
TRENCH DETAIL–UNPAVED AREAS

SCALE: 1" = 1'-0"



SEWAGE LIFT STATION DETAIL

N.T.S.



PAVED/GRAVEL ROADWAY CROSSING DETAIL

N.T.S.

NOTES:

1. BACKFILL MATERIAL WAS NATIVE SOILS THAT WERE APPROVED BY THE FIELD ENGINEER AFTER EXCAVATION. BACKFILL MATERIAL WAS COMPACTED TO GREATER THAN 90% OF THE MAXIMUM DRY DENSITY.
2. AGGREGATE BASE WAS MATCHED TO EXISTING SECTION OR WAS 6 INCHES AND WAS COMPACTED TO GREATER THAN 90% MAXIMUM DRY DENSITY.
3. SAND BACKFILL CONSISTED OF MATERIAL CLASSIFIED ACCORDING TO THE UNIFIED SOIL CLASSIFICATION SYSTEM AS SW, SP, SM, OR SC AND WAS COMPACTED TO 85& RELATIVE DENSITY.
4. GEOSYNTHETIC CLAY LINER WAS BENTOMAT 5/CS/3.5 AS MANUFACTURED BY AMERICAN COLLOID COMPANY. WHEN PLACED ON SLOPED GREATER THAN 3:1, THE LINER WAS ANCHOR TRENCHED AS PER MANUFACTURER'S SPECIFICATIONS.
5. COVER MATERIAL WAS RUN OF CRUSH STONE LESS THAN 1 INCH IN DIAMETER AND WAS FREE OF OTHER FOREIGN MATERIALS.
6. BENTOMAT AND COVER MATERIAL WAS ONLY PLACED IN AREAS WHERE TRENCHING OCCURRED UNDER THE SOIL COVER SYSTEM. IN AREAS WHERE NO SOIL COVER SYSTEM WAS INSTALLED, BACKFILL MATERIAL AS DESCRIBED IN NOTE 1 WAS PLACED TO MATCH EXISTING GRADE.
7. FOR GRAVEL ACCESS ROAD TRENCHING, 2" RUN OF CRUSH STONE WAS USED IN PLACE OF THE NATIVE SOIL BACKFILL, THE ASPHALT LAYER, AND THE AGGREGATE BASE AS SHOWN ON THE TRENCH DETAIL THIS SHEET. SEE SHEET M013 FOR TYPICAL ACCESS ROAD DETAIL AND SHEET C006 FOR TYPICAL ACCESS ROAD OVER SOIL COVER SYSTEM DETAIL.
8. REEF INDUSTRIES TX1200 GEOSYNTHETIC LINER WAS USED TO LINE TRENCHES IN AREAS THAT WERE LOCATED WITHIN THE EXTENT OF THE SOIL COVER. TRENCHES LOCATED OUTSIDE THE EXTENT OF THE SOIL COVER WERE NOT LINED.
9. FOR GRAVEL ACCESS ROAD CROSSING, AN 8 INCH LAYER OF 2' RUN OF CRUSH UNDERLAIN BY MIRAFI 600X GEOTEXTILE WAS PLACED ON TOP OF THE BENTOMAT LINER/COVER SYSTEM OR THE EXISTING GRADE.
10. FOR ROADWAY CROSSING WITHIN THE EXTENT OF THE SOIL COVER SYSTEM, COVER SOIL AND GEOSYNTHETIC LINER WAS THAT AS SPECIFIED IN NOTE 5 AND NOTE 4 FOR ROADWAY CROSSING OUTSIDE THE EXTENT OF THE SOIL COVER SYSTEM, NO COVER SOIL AND GEOSYNTHETIC CLAY LINER WERE INSTALLED.

STATE OF NEW YORK — V. K. Winneweser — 10/7/94

ISSUE	DATE	DESCRIPTION	APPROVED
6	10/05/94	AS-BUILTS	MCP
5	01/20/94	CONSTRUCTION REVISION	M.C.P.
4	08/27/93	AGENCY REVIEW	J.P.
3	08/04/93	CLIENT REVIEW	J.P.

BP OIL COMPANY
CARBORUNDUM FACILITY
WHEATFIELD, NEW YORK

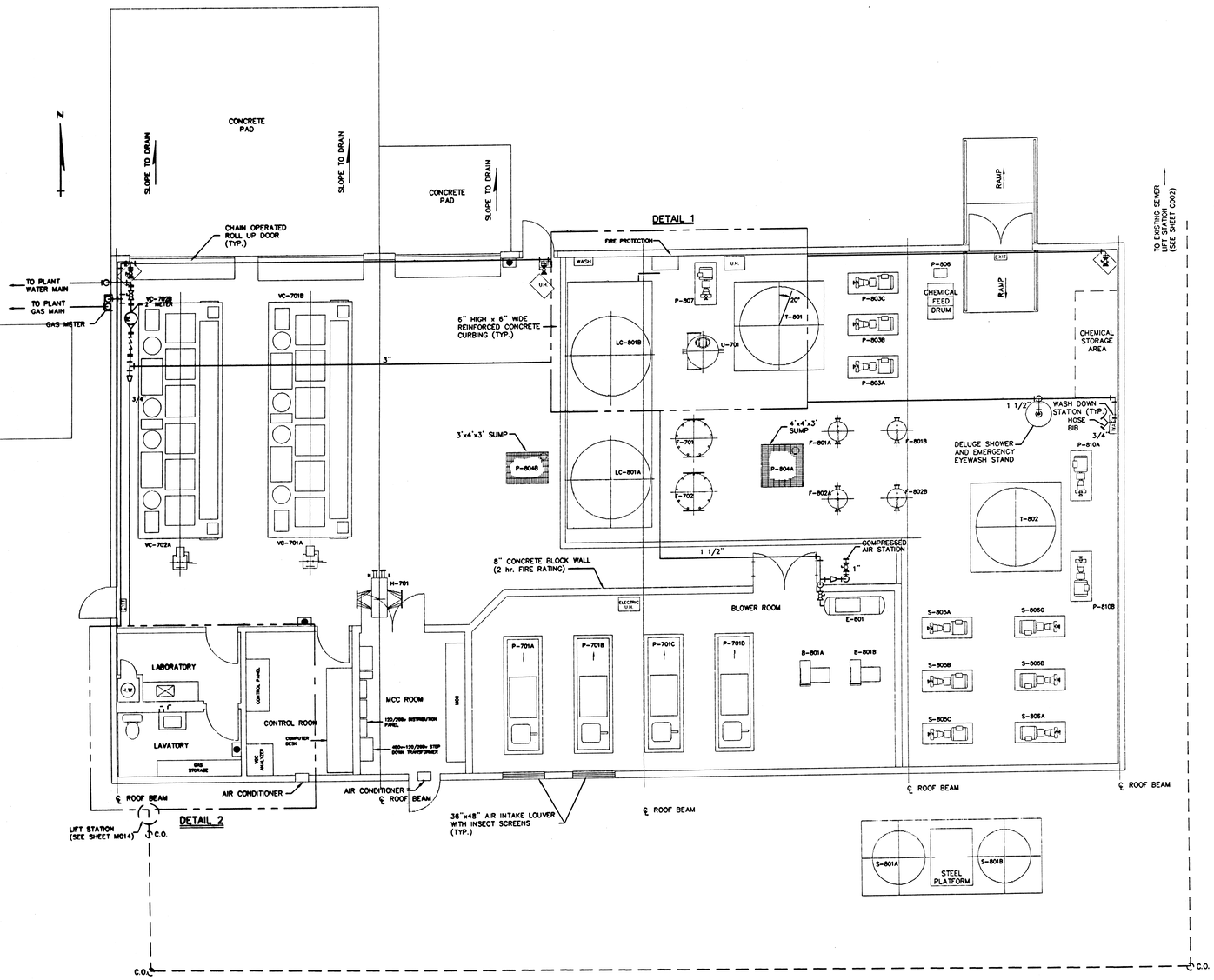
SITE DETAILS II

CHECKED BY / DATE: R.F.D. 07/30/93	SCALE: AS SHOWN	DRAWN BY: G.R.J	
APPROVED BY / DATE: J.P. 07/30/93	DESIGNED BY: R.F.D.	DATE: 08/03/93	

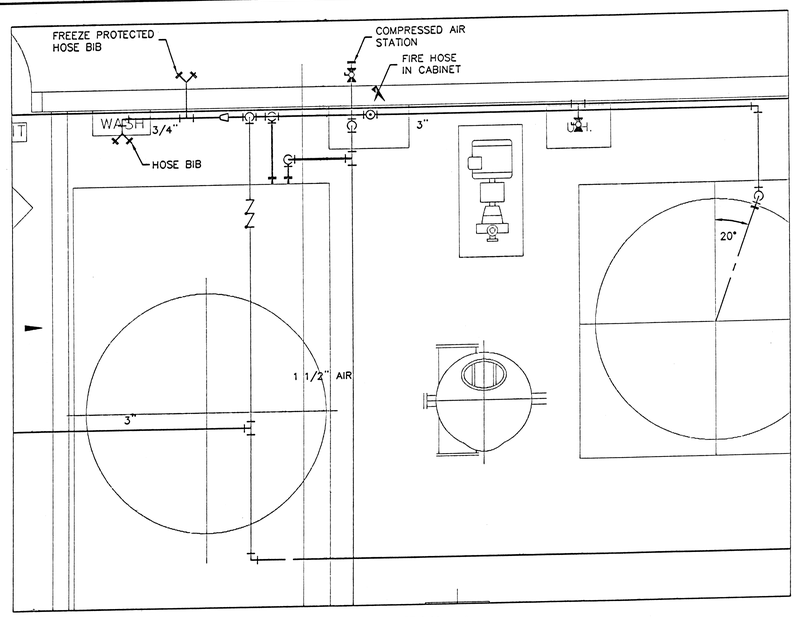
McLaren Hart ENVIRONMENTAL ENGINEERING
M/H ENGINEERS EAST, P.C.

DRAWING NUMBER: 1056D058
SHEET NUMBER: M014

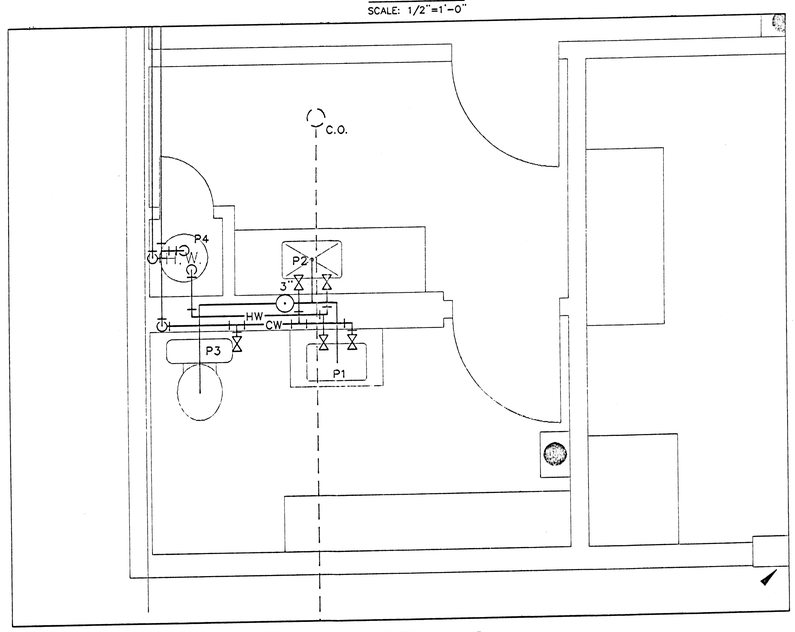
DRAWING NUMBER: 1056D073 | SHEET NUMBER: M018 | ISSUE: 3



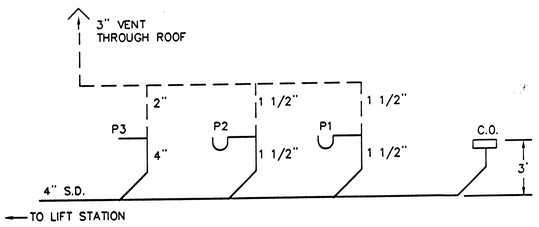
UTILITY PIPING PLAN
SCALE: 1"=6'



DETAIL 1
SCALE: 1/2"=1'-0"



DETAIL 2
SCALE: 1/2"=1'-0"



SANITARY SEWER RISER DIAGRAM
N.T.S.

ISSUE	DATE	DESCRIPTION	APPROVED
3	10/05/94	AS-BUILTS	M/P
2	01/20/94	CONSTRUCTION REVISIONS	M.C.P.
1	08/27/93	AGENCY REVIEW	J.P.

BP OIL COMPANY
CARBORUNDUM COMPANY FACILITY
WHEATFIELD, NEW YORK

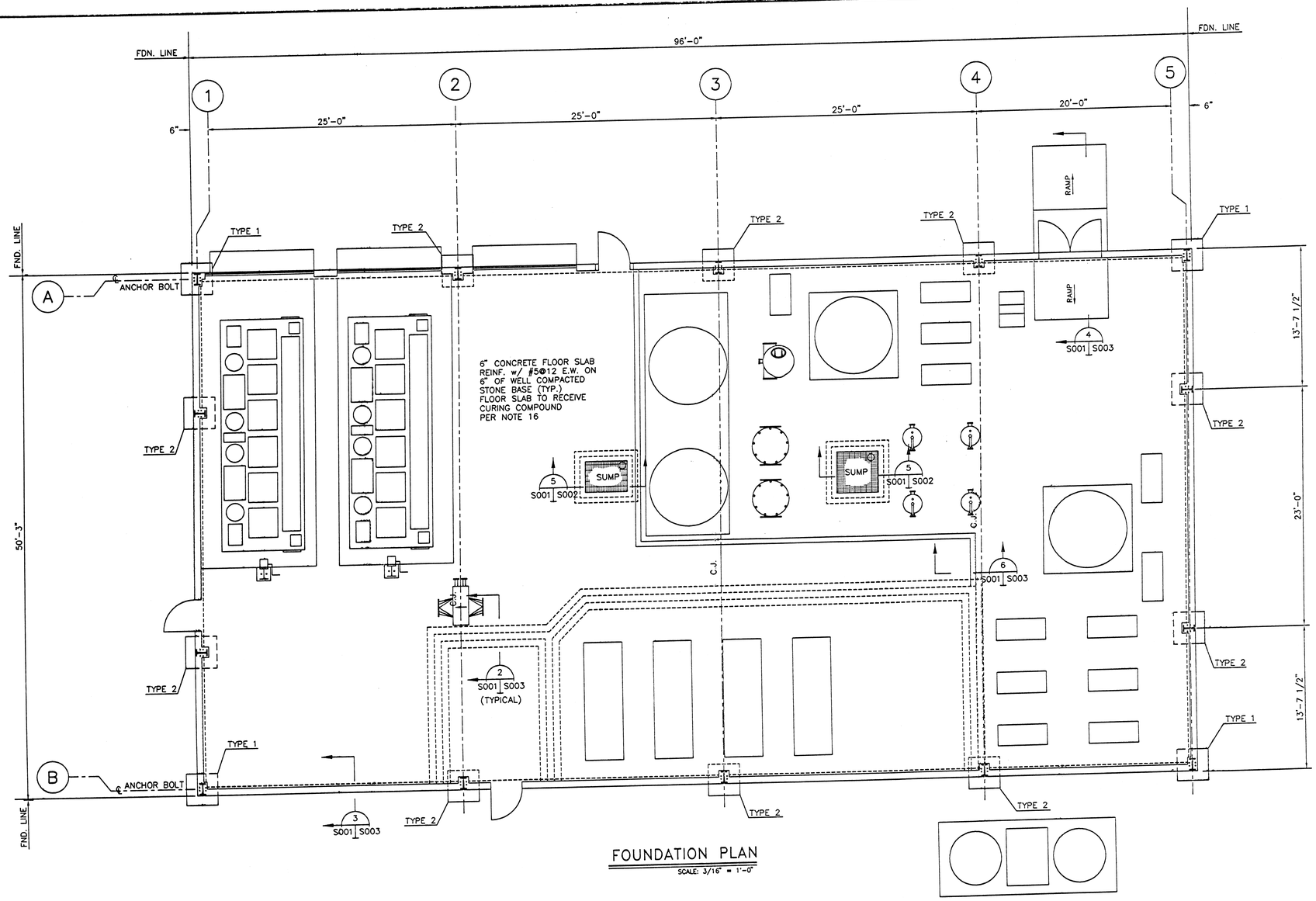
UTILITY PIPING PLAN

CHECKED BY / DATE: L.N. 08/26/93	SCALE: AS SHOWN	DRAWN BY: M.J.H.
APPROVED BY / DATE: J.P. 08/27/93	DESIGNED BY: L.N.	DATE: 08/25/93

McLaren Hart — M/H ENGINEERS EAST, P.C.

DRAWING NUMBER: 1056D073
SHEET NUMBER: M018

DRAWING NUMBER: 1056D070 | SHEET NUMBER: S001 | ISSUE #: 3



FOUNDATION PLAN

SCALE: 3/16" = 1'-0"

NOTES:

1. FOR PIER/FOOTING DETAIL TYPE 1 & 2 SEE DWG. NO. S002
2. FOR ALL PAD DETAILS SEE DWG. S003
3. CONTROL JOINT (C.J.) SEE NOTE 11, DWG. S001

NOTES:

1. ALL STRUCTURAL CONCRETE IN INDIVIDUAL AND CONTINUOUS FOOTINGS HAD A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS AND CONFORMED TO THE BEST PRACTICE ACCORDING TO THE LATEST A.C.I. CODE.
2. ALL FOOTINGS WERE DESIGNED ON AN ASSUMED SOIL BEARING VALUE OF 4500 P.S.F. THIS ENGINEER MUST BE NOTIFIED BY THE BUILDER FOR REDESIGN OF FOOTINGS WHEN THIS SOIL BEARING VALUE CANNOT BE ATTAINED IN THE FIELD. BUILDER WAS RESPONSIBLE FOR VERIFYING ALLOWABLE SOIL BEARING VALUE. BOTTOM OF FOOTINGS WERE INSPECTED AND APPROVED BY THE FIELD ENGINEER BEFORE PLACING ANY CONCRETE.
3. NO CONCRETE WAS POURED WHEN THE TEMPERATURE IS 40°F AND FALLING. ALL CONCRETE WAS CURED IN ACCORDANCE WITH THE LATEST SPECIFICATIONS OF THE A.C.I. CODE AND THE RECOMMENDATIONS OF THE P.C.A. PROCEDURES FOR HOT WEATHER CONCRETING.
4. THE BOTTOM OF ALL EXTERIOR FOOTINGS EXTENDED A MINIMUM OF 36 INCHES BELOW FINISH GRADE, AND ALL FOOTINGS WERE PLACED ON UNDISTURBED SOIL. CONTRACTOR MAINTAINED A TRUE AND SQUARE CROSS SECTION IN ALL AREAS EXCAVATED FOR FOOTINGS AND KEPT EXCAVATIONS FREE OF LOOSE SOIL, WATER, AND OTHER DEBRIS IMMEDIATELY PRIOR TO PLACEMENT OF CONCRETE.
5. ALL REINFORCING BARS MET ASTM A-615 GRADE 60 HIGH STRENGTH BILLET STEEL. DEFORMATIONS MET ASTM A-305.
6. ALL BARS WERE LAPPED A MINIMUM OF 40 DIAMETERS AT SPLICES, UNLESS NOTED OTHERWISE ON THESE DRAWINGS.
7. WELDED WIRE FABRIC CONFORMED TO ASTM A-185. END AND SIDE LAPS OVERLAPPED 8" MINIMUM, AND WERE PROPERLY SUPPORTED TO REMAIN IN LOCATION AS SHOWN ON DETAILS.
8. ALL SLABS ON GRADE BEARED ON CONTROLLED COMPACTED SUBGRADE.
9. THE SUBGRADE IMMEDIATELY BENEATH ALL SLABS ON GRADE CONSISTED OF A MINIMUM OF 6 INCHES OF COMPACTED STRUCTURAL FILL.
10. ALL STRUCTURAL CONCRETE IN FLOOR SLABS WAS PLACED WITH A MAXIMUM SLUMP OF 3" AND HAD A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS.
11. CONCRETE IN FLOOR SLABS WAS BROUGHT TO ITS INITIAL LEVEL AND SURFACE BY USING A VIBRATING STRIKE-OFF. CONCRETE FLOOR SLABS HAVE CONTROL JOINTS (FORMED OR SAW-CUT) INSTALLED SO THAT THE AREA BETWEEN CONTROL JOINTS IS 576 SQUARE FEET MAX.
12. SLAB REINFORCEMENT FOR CONC. SLABS ON GRADE WAS PLACED 2" BELOW THE SURFACE OF THE SLAB BY LAYING MESH ON WIRE CMU BRICK TO PROVIDE TOTAL SUPPORT DURING CONCRETING OPERATIONS.
13. SAW CUTTING WAS DONE AS SOON AS POSSIBLE AFTER CONCRETE WAS FIRM ENOUGH TO PREVENT RAVELLING OF CONCRETE DUE TO SAW BLADE. SAW CUTTING DONE THE FOLLOWING MORNING WAS ALLOWED TO SUFFICIENTLY "WARM UP" TO PREVENT TENSION TEARING DURING SAWING.
14. CONTROL JOINTS WERE FILLED WITH A SEMI-RIGID FILLER WITH A SHORE A-SCALE HARDNESS NUMBER OF 80 (ASTM-D2240).
15. ALL INDOOR SLABS RECEIVED A POWER STEEL TROWEL FINISH.
16. ALL SLABS RECEIVED AN APPROVED, LIQUID MEMBRANE FORMING CURING AND SEALING COMPOUND APPLIED IN STRICT ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS. THIS COMPOUND LEFT NO PERMANENT DISCOLORATION ON THE SURFACE AND DID NOT INTERFERE WITH ANY SUBSEQUENT SURFACE TREATMENT.

ISSUE	DATE	DESCRIPTION	APPROVED
3	10/05/94	AS-BUILTS	MH
2	08/27/93	AGENCY REVIEW	J.P.
1	08/09/93	CLIENT REVIEW	J.P.

BP OIL COMPANY
CARBORUNDUM COMPANY FACILITY
WHEATFIELD, NEW YORK

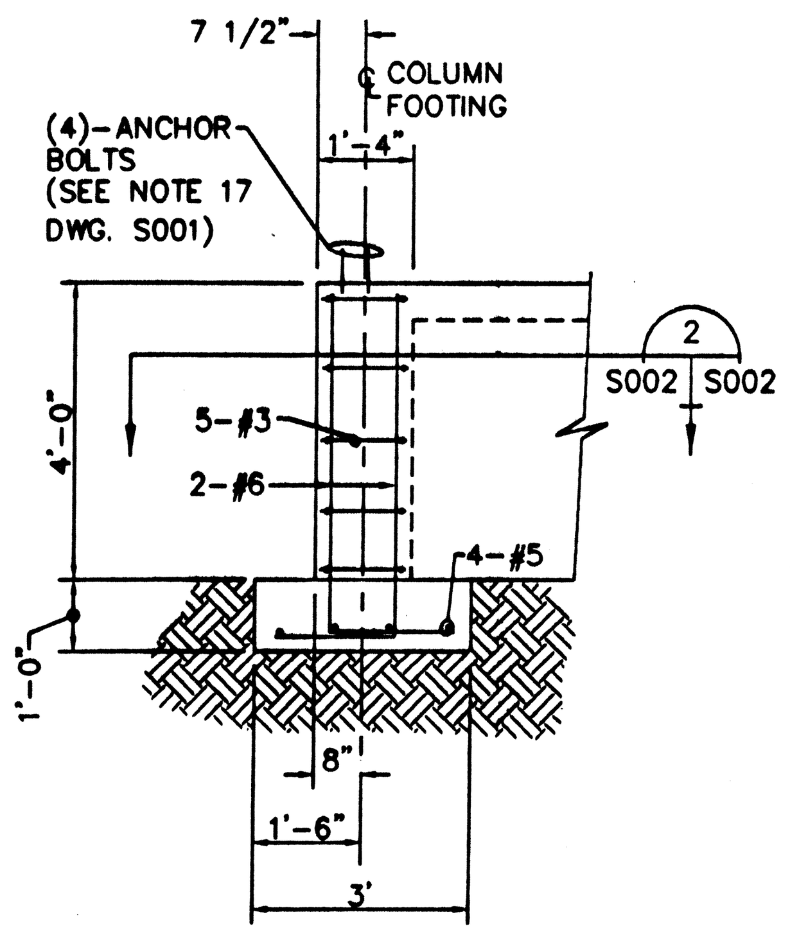
TREATMENT PLANT
FOUNDATION PLAN

CHECKED BY / DATE: L.N. 08/23/93	SCALE: AS SHOWN	DRAWN BY: R.D.F.
APPROVED BY / DATE: J.P. 08/24/93	DESIGNED BY: B.K.	DATE: 08/05/93

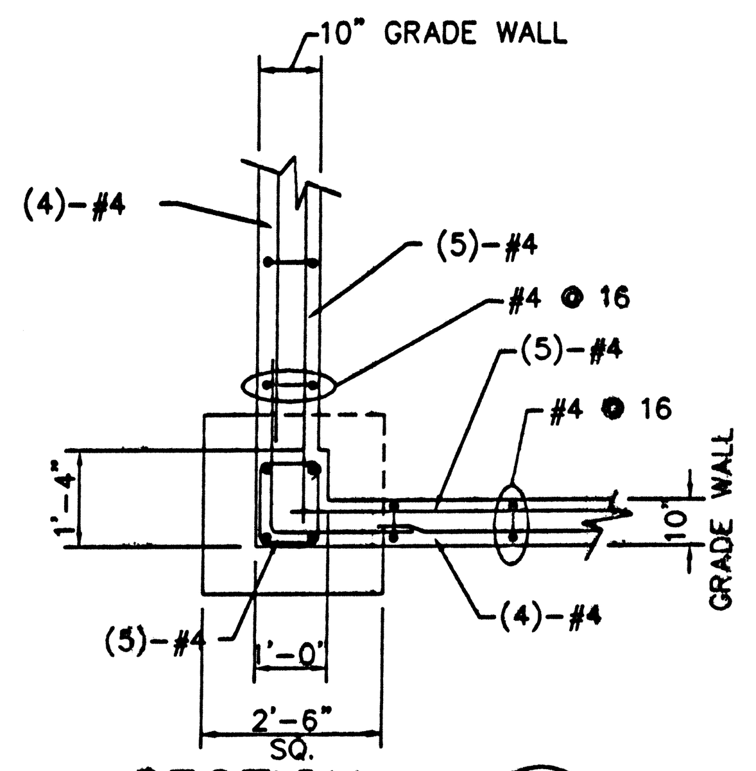
McLaren Hart sm
M/H ENGINEERS EAST, P.C.

DRAWING NUMBER: 1056D070
SHEET NUMBER: S001

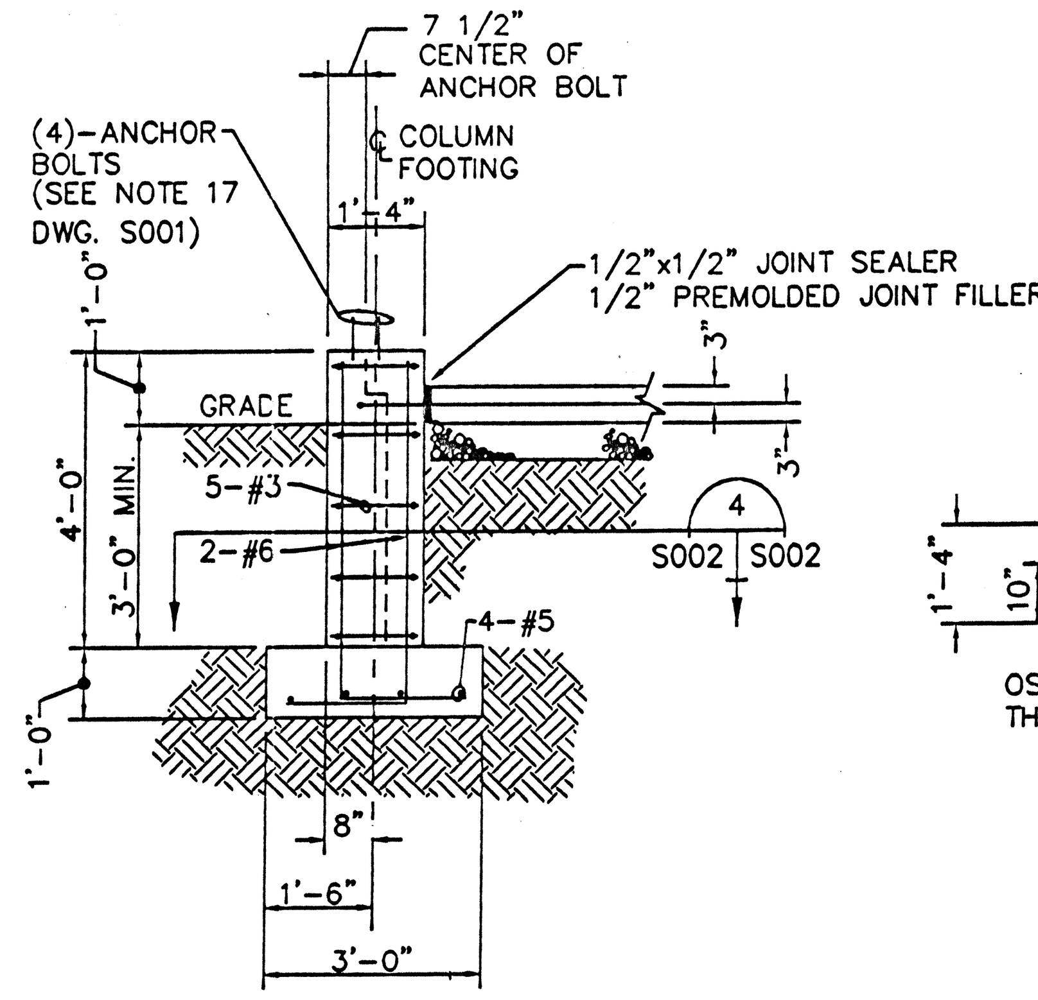
DRAWING NUMBER: 1056D071 | SHEET NUMBER: S002 | ISSUE: 3



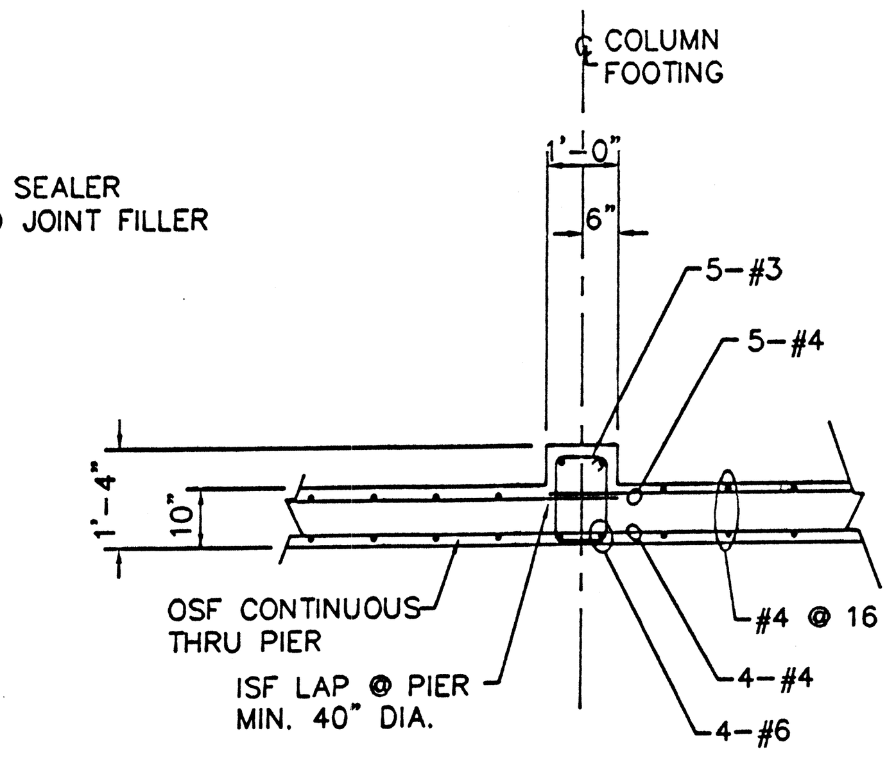
SECTION 1
SCALE: 3/8"=1'-0" S002 | S002



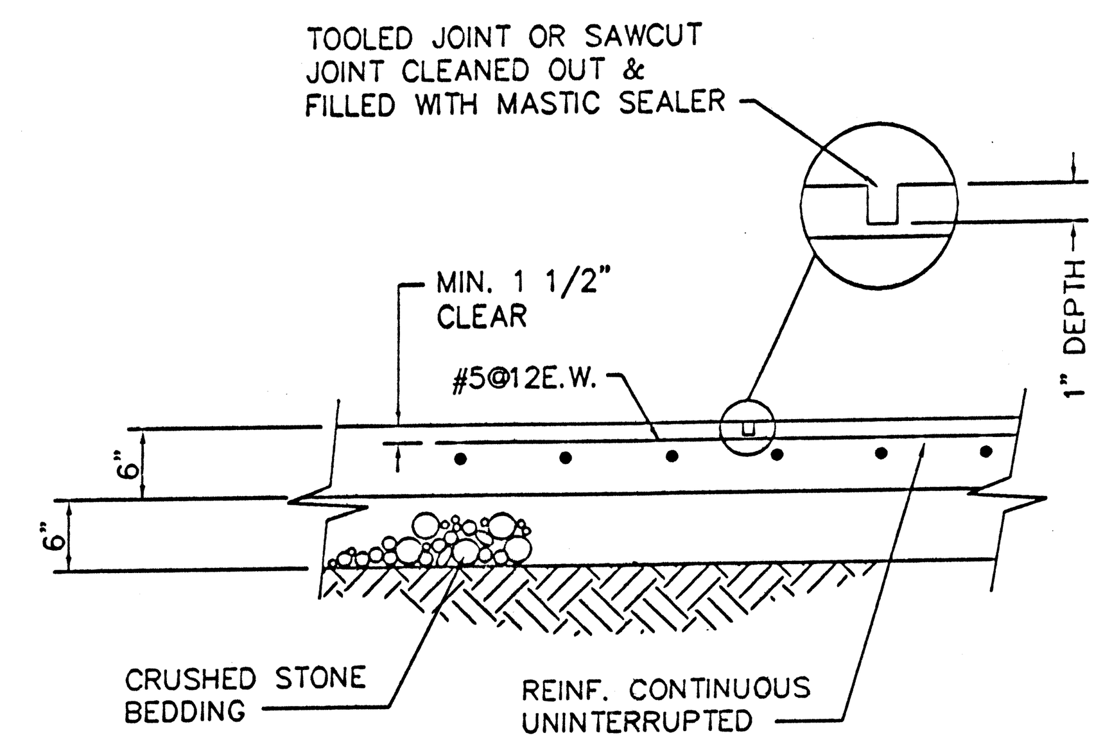
SECTION 2
SCALE: 3/8"=1'-0" S002 | S002



SECTION 3
SCALE: 3/8"=1'-0" S002 | S002

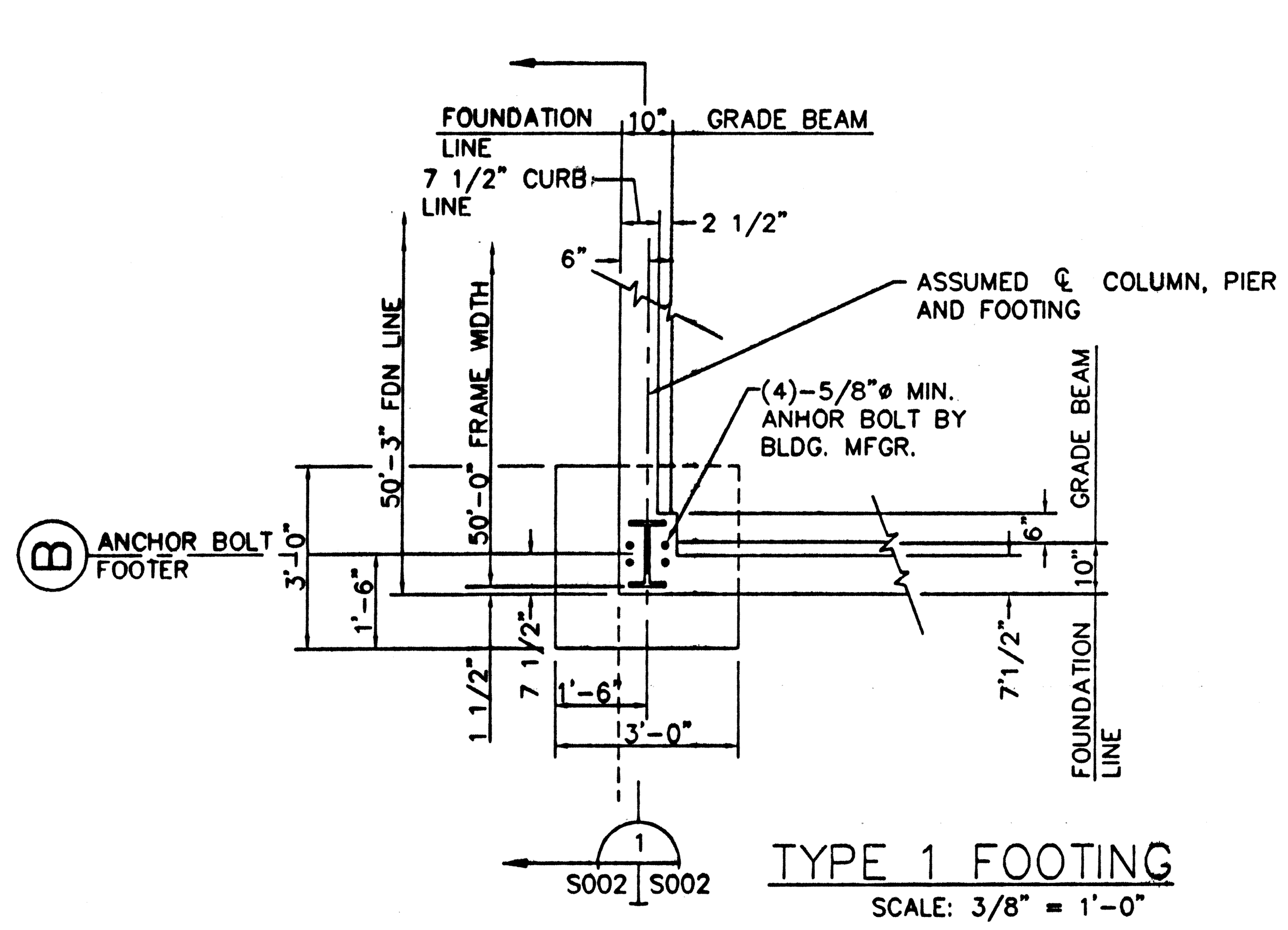


SECTION 4
SCALE: 3/8"=1'-0" S002 | S002

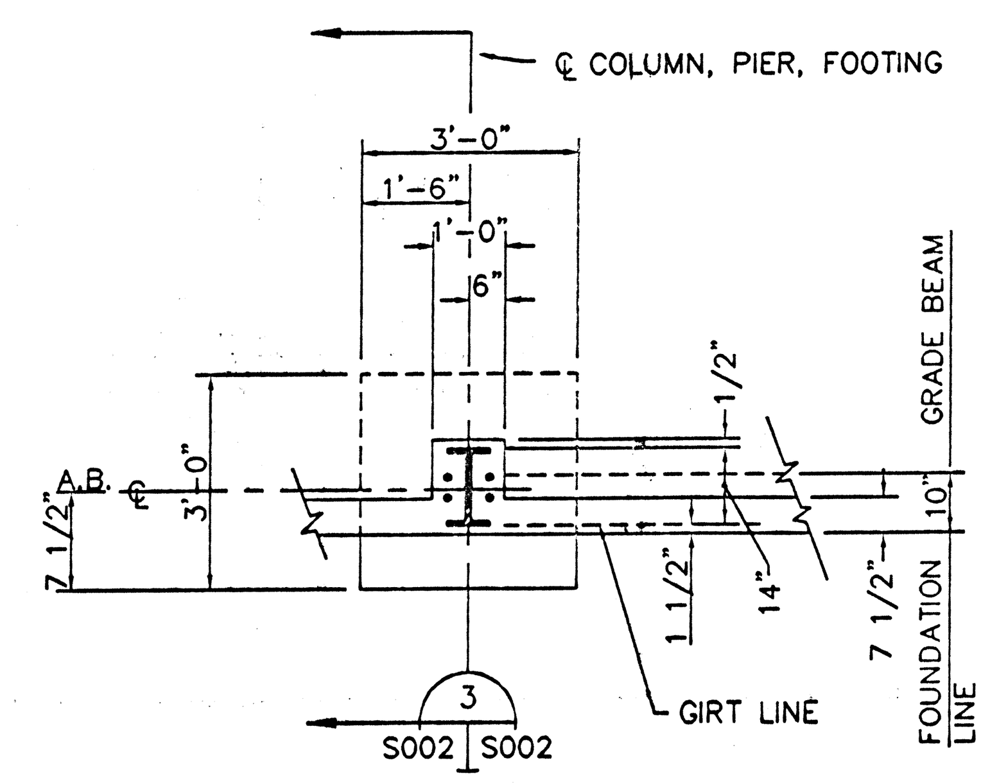


SEE NOTE 11

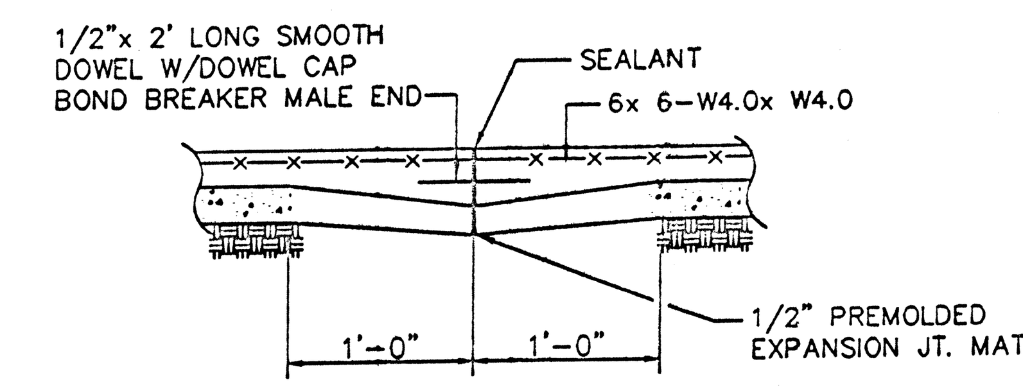
TYPICAL CONTROL JOINT
SCALE: 3/4" = 1'-0"



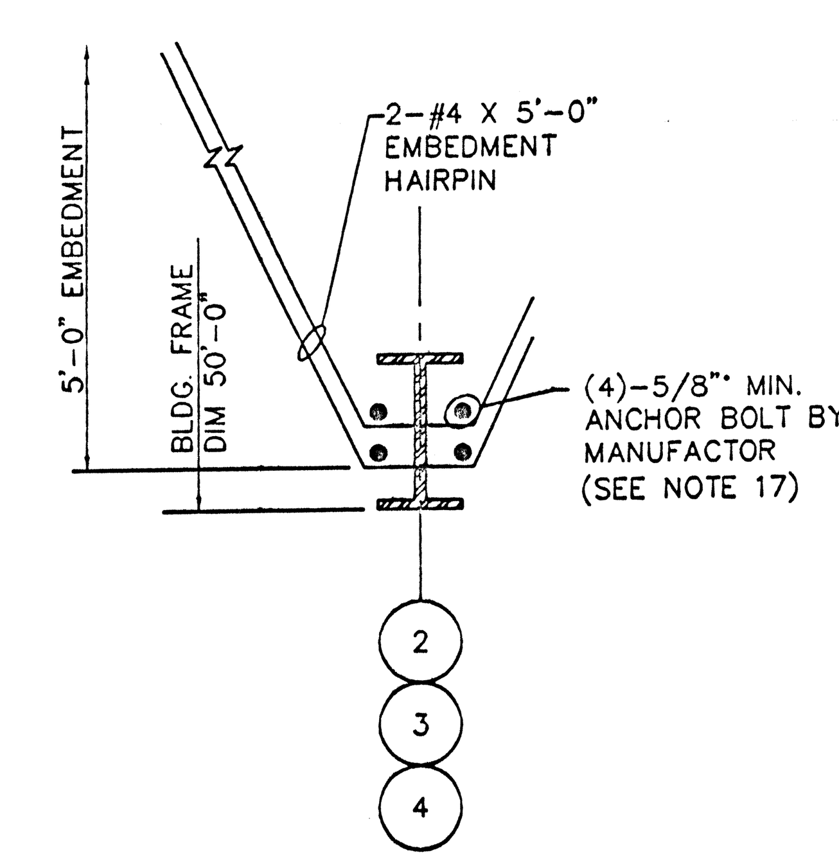
TYPE 1 FOOTING
SCALE: 3/8" = 1'-0"



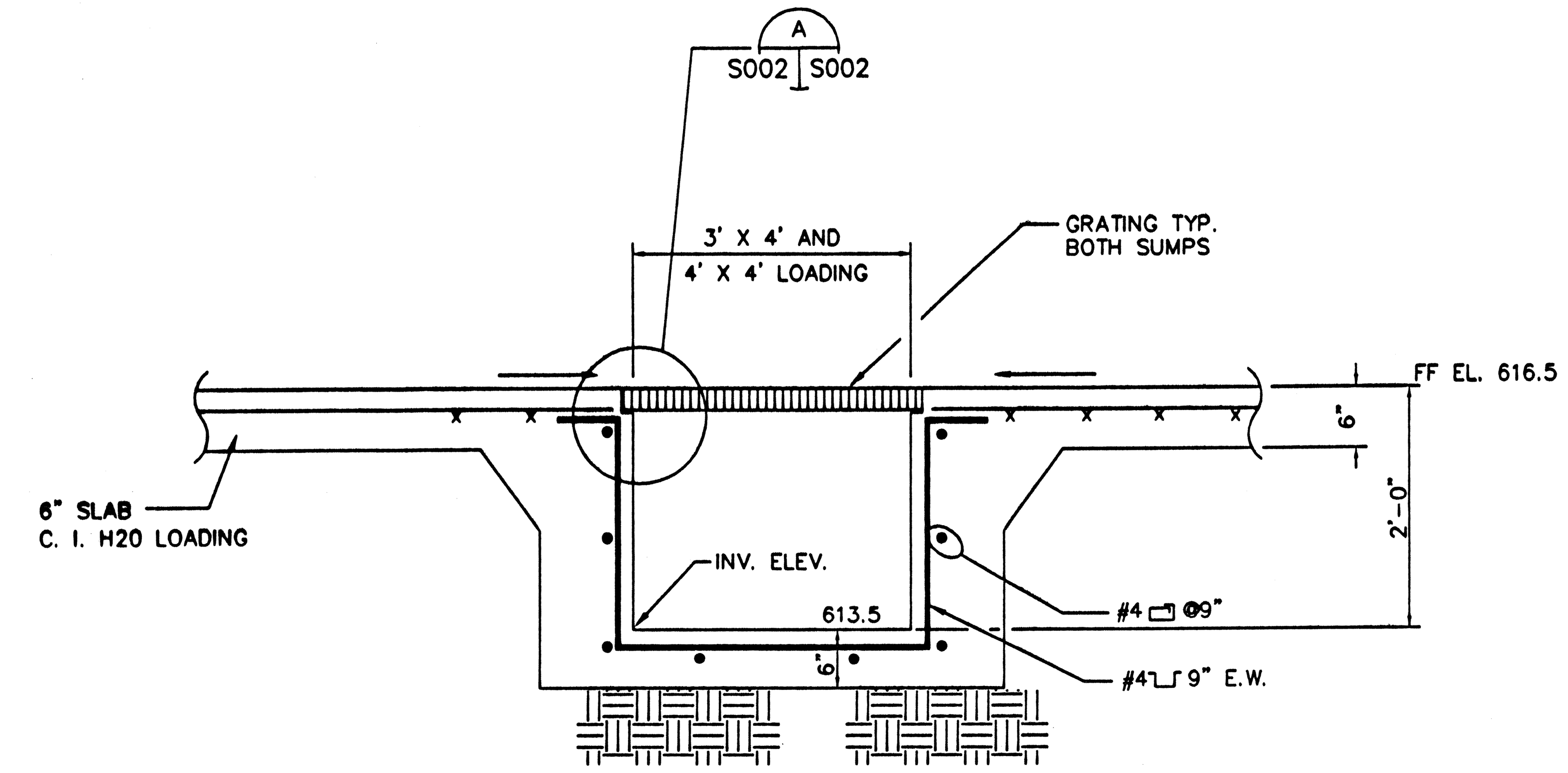
TYPE 2 FOOTING
SCALE: 3/8" = 1'-0"



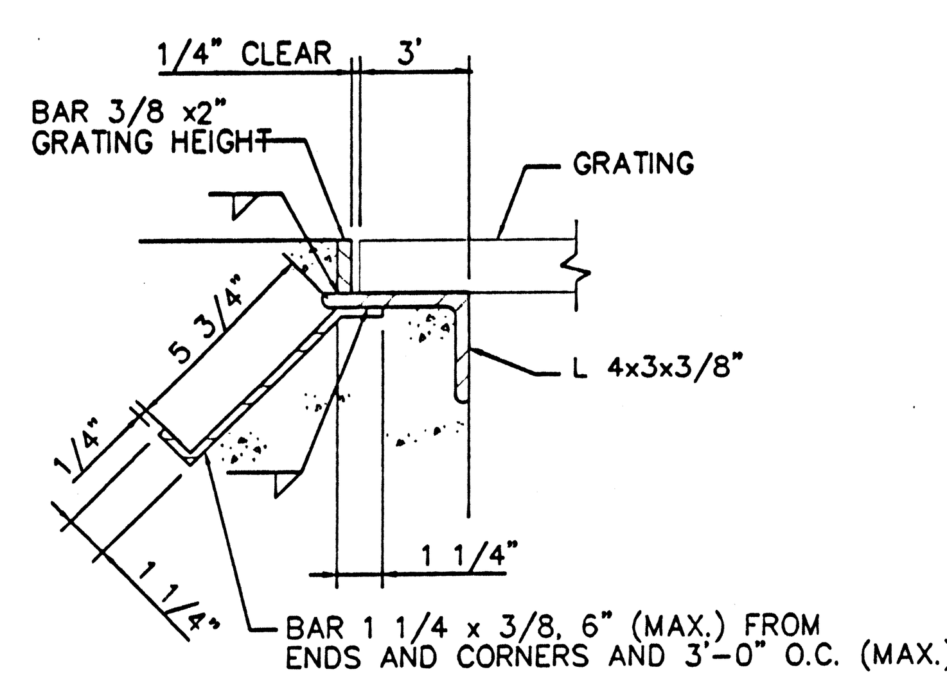
EXPANSION JT. (EJ)
SCALE: NONE



TYP. ANCHOR BOLT DETAIL
SCALE: 3/4" = 1'-0"



SECTION 5
SCALE: NONE S001 | S002



DETAIL A
SCALE: N.T.S. S002 | S002

PIER FOOTING NOTES:

1. DIMENSION ASSUMED TO BE SUPERSTRUCTURE COLUMN AND PIER & FOOTING; CONTRACTOR VERIFIED TO SUIT BLDG. INSTALLATION.
2. REFERENCE DIMENSION TO ASSUMED COLUMN & BASE PLATE ℄ WERE VERIFIED BY CONTRACTOR TO SUIT BLDG. SUPERSTRUCTURE PROVIDED & INSTALLED.

ISSUE	DATE	DESCRIPTION	APPROVED
3	10/05/94	AS-BUILTS	MG
2	08/27/93	AGENCY REVIEW	J.P.
1	08/09/93	CLIENT REVIEW	J.P.

BP OIL COMPANY
CARBORUNDUM COMPANY FACILITY
WHEATFIELD, NEW YORK

FOUNDATION DETAILS I

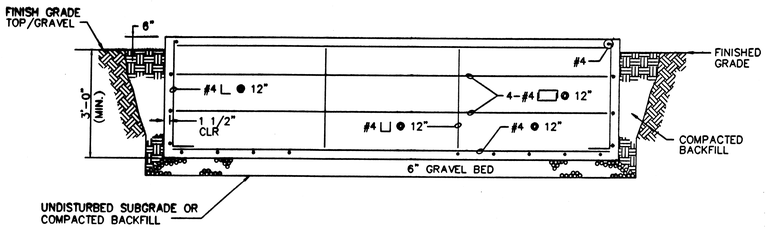
CHECKED BY / DATE: L.N. 08/23/93	SCALE: AS SHOWN	DRAWN BY: R.D.F.	
APPROVED BY / DATE: J.P. 08/24/93	DESIGNED BY: B.K.	DATE: 08/24/93	

McLaren Hart
M/H ENGINEERS EAST, P.C.

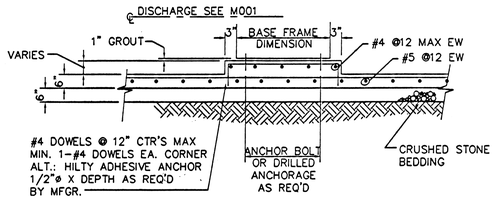
DRAWING NUMBER: 1056D071
SHEET NUMBER: S002

STATE OF NEW YORK — PROFESSIONAL ENGINEER (seal) 10/7/94

DRAWING NUMBER: 1056D072 | SHEET NUMBER: S003 | ISSUE #: 3

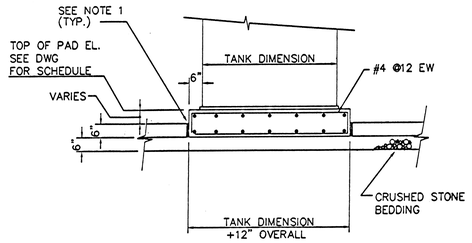


SECTION 1
SCALE: 1/2"=1'-0" S003 | S003



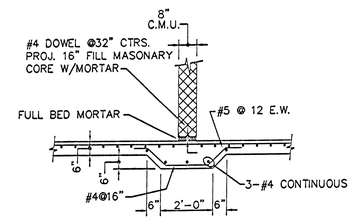
NOTE:
ANCHOR BOLT REQUIREMENTS AS REQUIRED TO SUIT EQUIPMENT INSTALLED AS SPEC. BY UNIT MFGR.
CONTRACTOR TO VERIFY PRIOR TO PLACEMENT OF CONCRETE.

TYPICAL EQUIPMENT PAD DETAIL
SCALE: 3/8"=1'-0"



LC-801A, LC-801B, T-801, T-802, F-701, F-702
F-101A, F-101B, F-102A, F-102B, S-801A, S-801B

TYPICAL TANK PAD DETAIL
SCALE: 3/8"=1'-0"

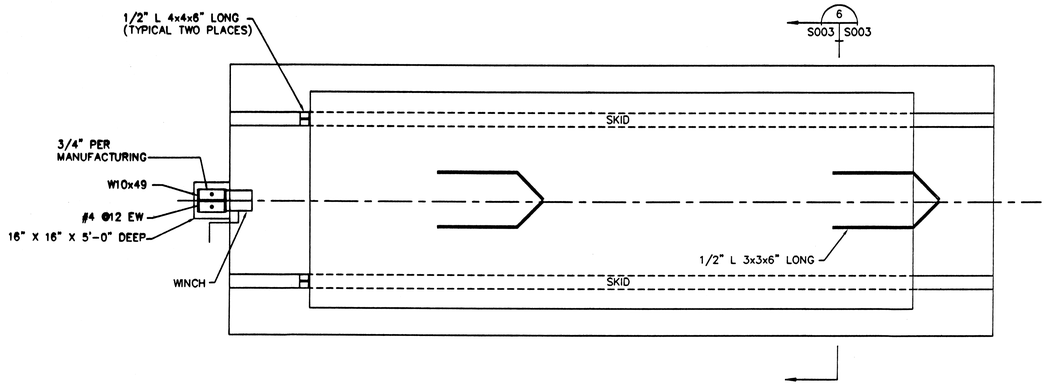


SECTION 2
SCALE: 3/8"=1'-0" S001 | S003

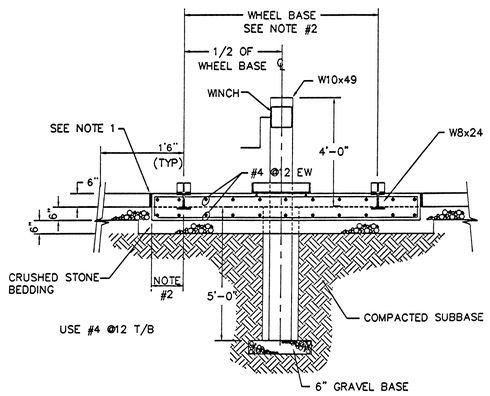
AIR STRIPPER FOUNDATION PLAN
SCALE: 1/2"=1'-0"

SECTION 3
SCALE: 3/8"=1'-0" S001 | S003

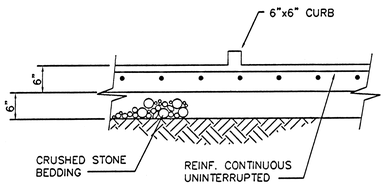
SECTION 4
SCALE: 1/2"=1'-0" S001 | S003



SKID PAD DETAIL
SCALE: 3/8"=1'-0"



SECTION 6
SCALE: 3/8"=1'-0" S003 | S003



SECTION 7
SCALE: 3/8"=1'-0" S001 | S003

NOTES:
1. 1/2"x1/2" JOINT SEALER 1/2" PREMOLDED JOINT FILLER
2. CONTRACTOR VERIFIED EQUIPMENT MANUFACTOR DIMENSIONS FOR LOCATION.

ISSUE	DATE	DESCRIPTION	APPROVED
3	10/05/94	AS-BUILTS	
2	08/27/93	AGENCY REVIEW	J.P.
1	08/09/93	CLIENT REVIEW	J.P.

BP OIL COMPANY
CARBORUNDUM COMPANY FACILITY
WHEATFIELD, NEW YORK

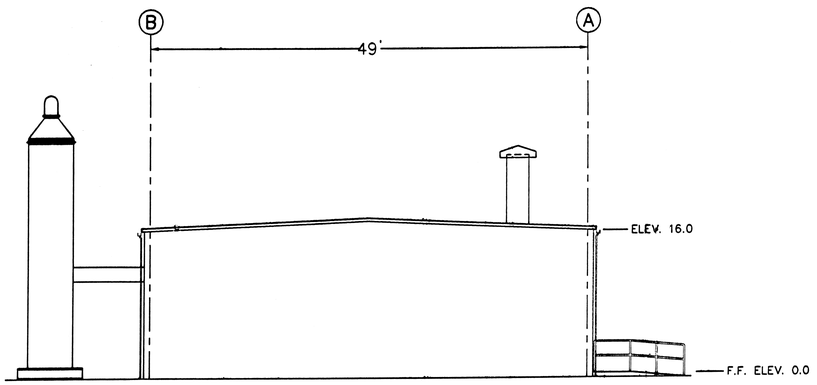
FOUNDATION DETAILS II

CHECKED BY / DATE: L.N. 08/23/93		SCALE: AS SHOWN	DRAWN BY: R.D.F.
APPROVED BY / DATE: J.P. 08/24/93		DESIGNED BY: B.K.	DATE: 08/05/93

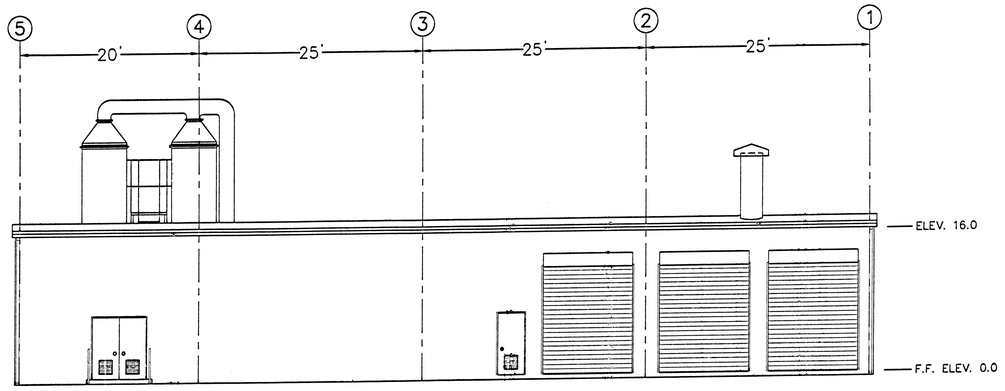
McLaren Hart sm
M/H ENGINEERS EAST, P.C.

DRAWING NUMBER: 1056D072
SHEET NUMBER: S003

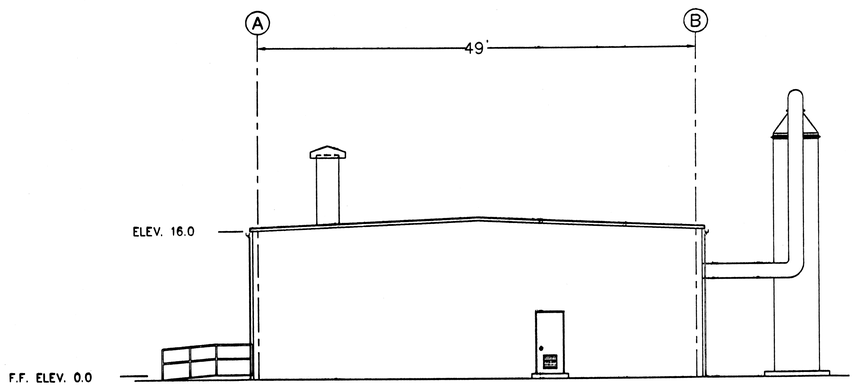
DRAWING NUMBER: 1056D042 | SHEET NUMBER: S004 | ISSUE: 5



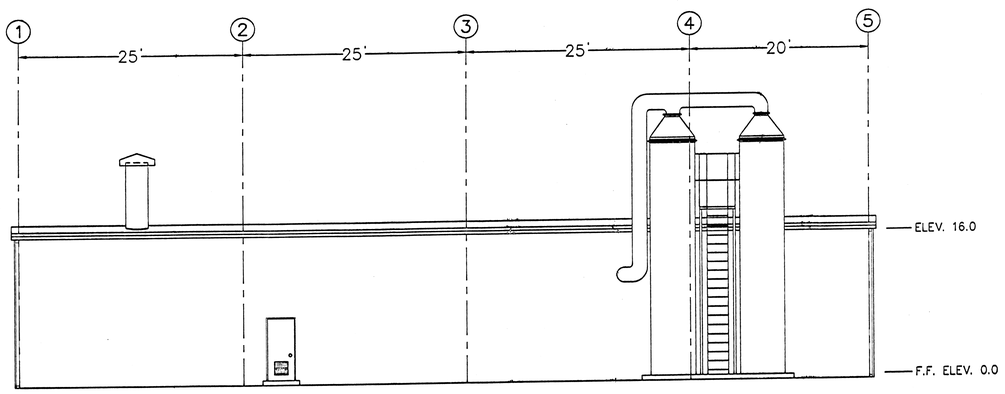
EAST ELEVATION
SCALE: AS SHOWN



NORTH ELEVATION
SCALE: AS SHOWN



WEST ELEVATION
SCALE: AS SHOWN



SOUTH ELEVATION
SCALE: AS SHOWN

SCALE
0 8 16 24 FEET

STATE OF NEW YORK — WILLIAM R. WRIGHT — LICENSED PROFESSIONAL ENGINEER
12/7/94

ISSUE	DATE	DESCRIPTION	APPROVED
			MJP
5	10/05/94	AS-BUILTS	MJP
4	08/27/93	AGENCY REVIEW	J.P.
3	07/30/93	CLIENT REVIEW	J.P.

BP OIL COMPANY
CARBORUNDUM COMPANY FACILITY
WHEATFIELD, NEW YORK

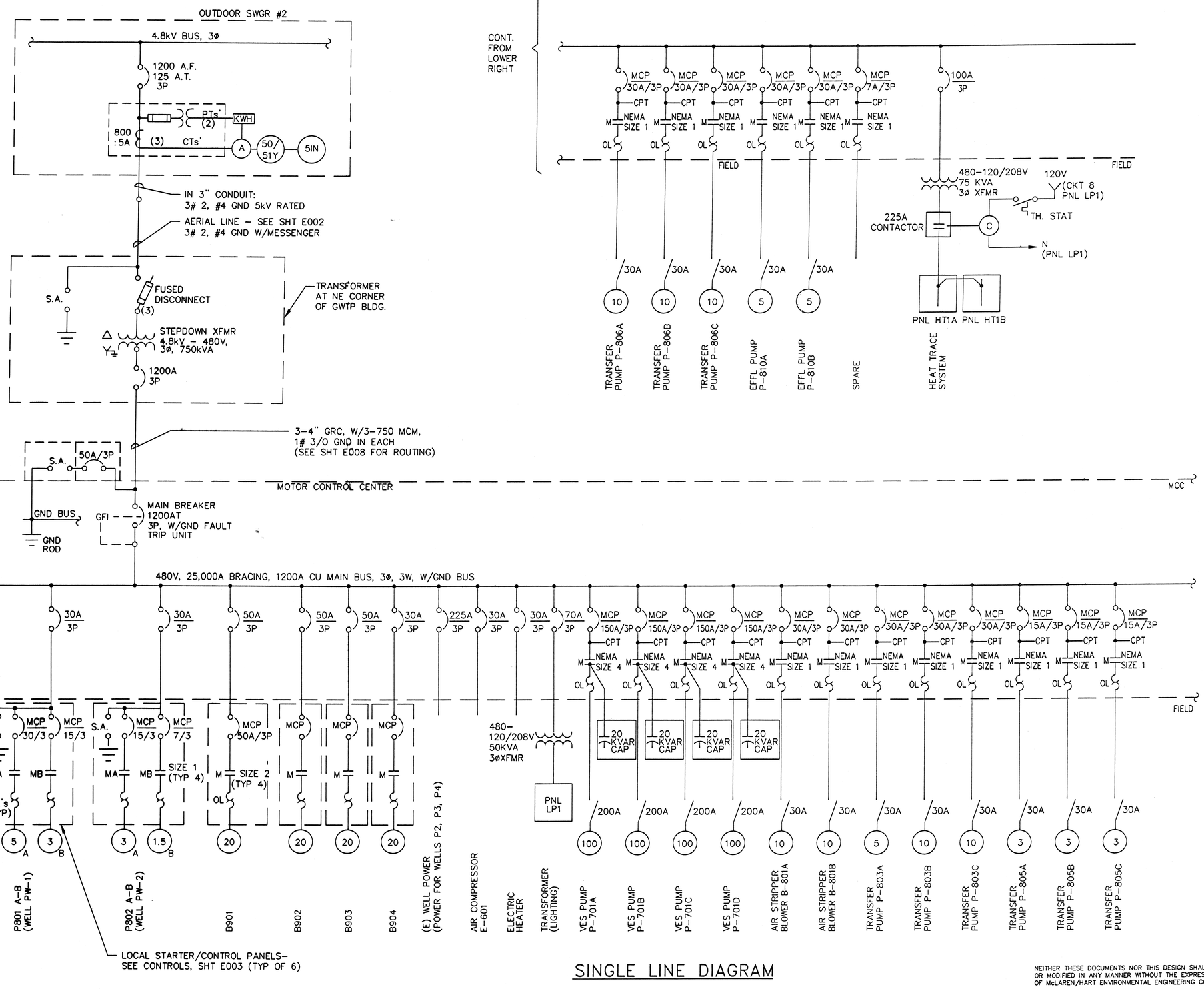
TREATMENT BUILDING
ELEVATIONS

CHECKED BY / DATE: L.N. 08/25/93	SCALE: AS SHOWN	DRAWN BY: M.J.H.
APPROVED BY / DATE: J.P. 08/26/93	DESIGNED BY: L.N.	DATE: 07/19/93

McLaren Hart SM
M/H ENGINEERS EAST, P.C.

DRAWING NUMBER: 1056D042
SHEET NUMBER: S004

DRAWING NUMBER: 1056D059 | SHEET NUMBER: E001 | ISSUE #: 3



SINGLE LINE DIAGRAM

ELECTRICAL NOTES:

1. ELECTRICAL WORK WAS DONE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NFPA 70–1993) AND ALL PERTINENT STATE, LOCAL, AND OWNER REQUIREMENTS. ANY CONFLICTS WITH THE DESIGNS WERE RESOLVED BY THE ENGINEER.
2. ALL UNDERGROUND CONDUIT RUNS WERE A MINIMUM OF 2'–0" BELOW FINISHED GRADE. CONDUIT TYPES WERE AS FOLLOWS, EXCEPT AS NOTED ON THE DRAWINGS:
   A. UNDERGROUND, HORIZONTAL: PVC SCHEDULE 40, WITH A MINIMUM 3 INCHES SAND ALL AROUND.
   B. UNDERGROUND, ELBOWS AND RISERS: RIGID GALVANIZED STEEL CONDUIT (GRC) WITH FACTORY APPLIED PVC COATING OR WRAPPED WITH 50 MIL SCOTCHRAP, OR EQUAL.
   C. ABOVE GRADE CONDUIT: GRC, WITH LIQUIDTIGHT FLEXIBLE METALLIC CONDUIT TO MOTORS AND FIELD INSTRUMENTS SUBJECT TO VIBRATION.
3. CONDUCTORS WERE MINIMUM #12 AWG STRANDED COPPER, 600 V INSULATION, TYPE THWN, EXCEPT AS NOTED:
   A. INSTRUMENT DISCRETE SIGNALS: #14 AWG MINIMUM.
   B. SIGNAL CONDUCTORS: TWISTED SHIELDED PAIR (TSP) SHALL BE #16 AWG, TWO CONDUCTOR, WITH DRAIN WIRE AND FOIL SHIELD.
4. ALL EQUIPMENT AND DEVICES WERE PERMANENTLY GROUNDED. GROUNDS WERE CONTINUOUS TO THE TREATMENT PLANT GROUND, WITH A CODE SIZED GROUND CONDUCTOR, OR AS INDICATED ON THE DRAWINGS.
5. EQUIPMENT INCLUDES NAMEPLATES. NAMEPLATES INCLUDE EQUIPMENT ID NUMBERS AND EQUIPMENT NAME.
6. CONDUCTORS WERE LABELED WITH PERMANENT PRINTED MYLAR OR HEAT SHRINK PLASTIC MARKERS.
7. ALL WIRING ENTERING AND LEAVING CONTROL PANELS WAS TERMINATED AT TERMINAL BLOCKS INSIDE THE PANEL RATED 600 V, 10 A. EXCEPTIONS:
   A. MOTOR LOAD–SIDE POWER CONDUCTORS, LEAVING THERMAL OVERLOAD TERMINALS.
   B. SIGNAL WIRES FROM REMOTE DEVICES RATED 24 VDC OR LESS.
8. CONDUITS WERESUPPORTED ON UNISTRUT CHANNEL FOR ALL EXPOSED CONDUIT RUNS. CHANNEL WAS SECURELY BOLTED TO CONCRETE PAD.
9. UNDERGROUND SPLICES WERE WATERPROOF TYPE WITH SPLIT BOLT OR COMPRESSION CONNECTOR, SCOTCH 69 GLASS CLOTH TAPE WRAP, AND SCOTCH 2210/2200 VINYL MASTIC SEALANT.
10. MAIN 480V PANEL, MAIN CONTROL AND WELL PANELS, AND ALL ELECTRICAL EQUIPMENT ARE UL LISTED. MANUFACTURERS OF CIRCUIT BREAKERS AND 480V PANEL WERE SQUARE D, I–LINE, GENERAL ELECTRIC, OR APPROVED EQUAL.

STATE OF NEW YORK — V. K. Wilmunen — 12/7/94 — LICENSED PROFESSIONAL ENGINEER

ISSUE	DATE	DESCRIPTION	APPROVED
3	10/05/94	AS–BUILTS	MCP
2	08/27/93	AGENCY REVIEW	J.P.
1	07/29/93	CLIENT REVIEW	J.P.

BP OIL COMPANY
CARBORUNDUM COMPANY FACILITY
WHEATFIELD, NEW YORK

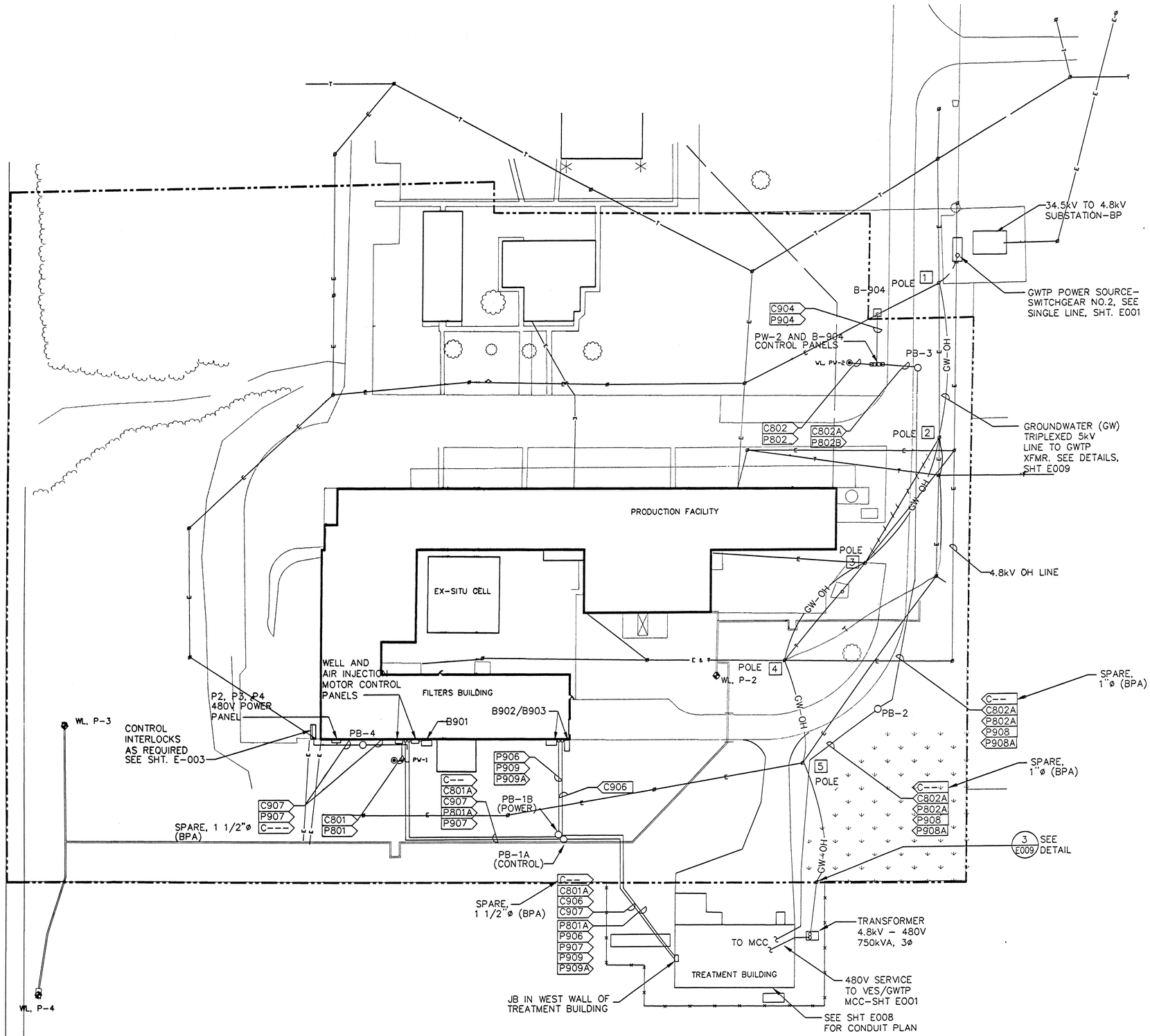
SINGLE LINE DIAGRAM

CHECKED BY / DATE: L.N. 07/29/93	SCALE: AS SHOWN	DRAWN BY: D.D.M.
APPROVED BY / DATE: L.N. 07/29/93	DESIGNED BY: S.S.K.	DATE: 07/28/93

McLaren Hart sm
M/H ENGINEERS EAST, P.C.

DRAWING NUMBER: 1056D059
SHEET NUMBER: E001

DRAWING NUMBER: 1056D060 | SHEET NUMBER: E002 | ISSUE: 5



CONDUIT/CABLE SCHEDULE	
C801	1", 5#14, 3TSP#16, #12 GND, PW-1 TO MCP (VIA C801A)
P801	1", 6#10, 2#10 GND, 2#12, #12 GND, PW-1 TO MCC (VIA P801A)
C801A	1 1/2", 18#14, 2TSP#16, #12 GND, CONTROL PANELS TO MCP
P801A	1 1/2", 3#6, 5#10, 2#10 GND, CONTROL PANELS TO MCC
C802	1", 3TSP#16, (SIGNAL); 5#14, #14 GND, PW-2 TO MCP (VIA C802A)
P802	1 1/2", 6#10, #12 GND; 4#12 (VALVE); 2#12 (120V), PW-2 TO MCC (VIA P802B)
C802A	1 1/2", 18#14, 2TSP#16, #12 GND, CONTROL PANELS TO MCP
P802A	1 1/2", 3#6, 3#8, 2#10 GND, PB-3 TO MCC
P802B	1 1/2", 3#6, 3#8, 10#10, 3#10 GND, CONTROL PANELS TO MCC (VIA P802A)
~~C901~~	~~1", 8#14, #12 GND, B901 TO MCP (VIA C801A)~~
~~P901~~	~~1", 3#6, #10 GND, B901 TO MCC (VIA P801A)~~
~~C902~~	~~1", 8#14, #12 GND, B902 TO MCP (VIA C906)~~
~~P902~~	~~1", 3#8, #10 GND, B902 TO MCC (VIA P906)~~
~~C903~~	~~1", 8#14, #12 GND, B903 TO MCP (VIA C906)~~
~~P903~~	~~1", 3#8, #10 GND, B903 TO MCC (VIA P906)~~
C904	1", 2#14, #12 GND, B904 TO MCP (VIA C802A)
P904	1", 3#8, #10 GND, B904 TO MCC (VIA P802B)
C905	1", 16#14, #12 GND, PB-1 TO MCP
P906	1 1/2", 6#8, 2#10 GND, PB-1 TO MCC
C907	1 1/2", 12#14, 2TSP#16, #12 GND, (E) CP TO MCP
P907	2 1/2", 3#4/0, #4 GND, (E) POWER PANEL TO MCC
P908	1", 10#10, #10 GND, PANEL 1A TO HEAT TRACING
P908A	1", MT SPARE, MCC ROOM TO PB-3
P909	1", 10#10, #10 GND, PANEL 1A TO HEAT TRACING
P909A	1 1/2", MT SPARE, JB WEST WALL TO HEAT TRACING

NOTE:

1. ALL UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE. EXACT LOCATIONS SHALL BE VERIFIED IN THE FIELD PRIOR TO DRILLING, AND REGRADING, AND EXCAVATING.

LEGEND

—E—	OVERHEAD ELECTRIC LINE
—T—	OVERHEAD TELEPHONE LINE
Ø P.	UTILITY POLE
-x- - -x-	EXISTING FENCE
— · —	PROPERTY LINE
GW-OH	GWTP SOURCE, 5kV OVERHEAD LINE, TRIPLEX W/MESSENGER
- - - - -	UG CONDUIT FOR GWTP

STATE OF NEW YORK — WILLIAM S. WYNN — 10/7/94 — PROFESSIONAL

ISSUE	DATE	DESCRIPTION	APPROVED
5	10/05/94	AS-BUILTS	MCP
4	08/27/93	AGENCY REVIEW	J.P.
3	07/29/93	CLIENT REVIEW	J.P.

BP OIL COMPANY
CARBORUNDUM COMPANY FACILITY
WHEATFIELD, NEW YORK

ELECTRICAL SITE PLAN

CHECKED BY / DATE: L.N. 08/26/93	SCALE: AS SHOWN	DRAWN BY: D.D.M.
APPROVED BY / DATE: J.P. 08/27/93	DESIGNED BY: S.S.K.	DATE: 07/28/93

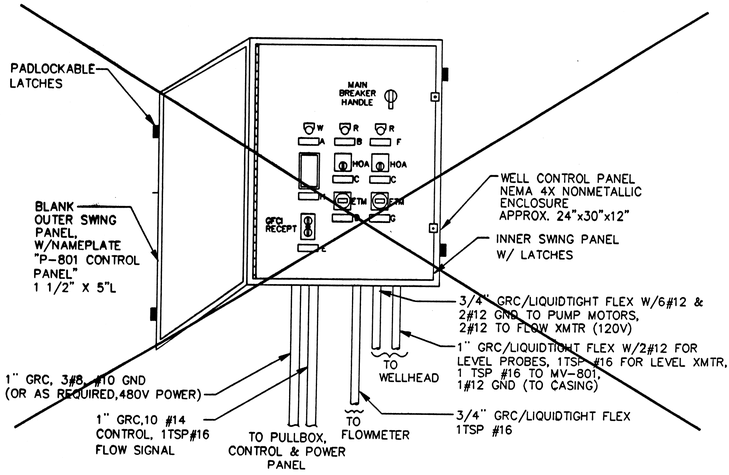
McLaren Hart sm
M/H ENGINEERS EAST, P.C.

DRAWING NUMBER: 1056D060
SHEET NUMBER: E002

SCALE
0 40 80 120 FEET

MAP REFERENCE:
1. EXISTING TOPOGRAPHY AND SITE PLAN PREPARED FROM GROUND SURVEY PERFORMED BY NIAGARA BOUNDARY, NIAGARA FALLS, NEW YORK, DATED 5/25/93.
2. UNDERGROUND UTILITY INFORMATION PREPARED FROM DRAWINGS BY MESCH ENGINEERING (REF. #D-171-118, MARCH 1,1993)

DRAWING NUMBER: 1056D065 | SHEET NUMBER: E005 | ISSUE #: 5



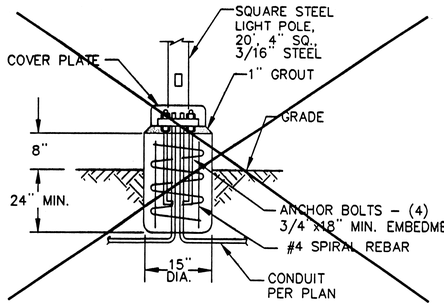
WELL CONTROL PANEL ELEVATION (1)

(TYP OF 2)

NOT TO SCALE

WELL CONTROL PANEL NAMEPLATE SCHEDULE

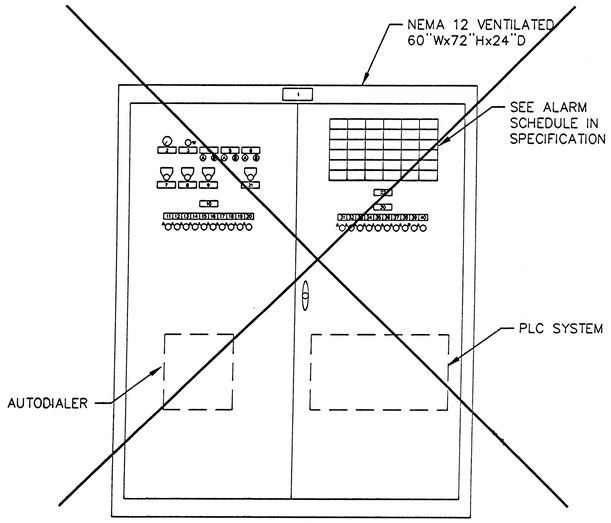
NO.	1ST LINE	2ND LINE	SIZE (L X H)
A	CONTROL POWER	ON	1" x 2 1/2"
B	PUMP 801A	RUNNING	1" x 2 1/2"
C	CONTROL	MODE SELECT	1" x 2 1/2"
D	PUMP 801A	RUNNING TIME	1" x 2 1/2"
E	GFCI	RECEPTACLE	1" x 2 1/2"
F	PUMP 801B	RUNNING	1" x 2 1/2"
G	PUMP 801B	RUNNING TIME	1" x 2 1/2"
H	WELL LEVEL	CONTROLLER	1" x 2 1/2"



LIGHTING POLE DETAIL (3)

NOT TO SCALE

PANEL DRAWINGS SUPERSEDED BY BCS DWG. NO. SI93-0002-01 TO 09

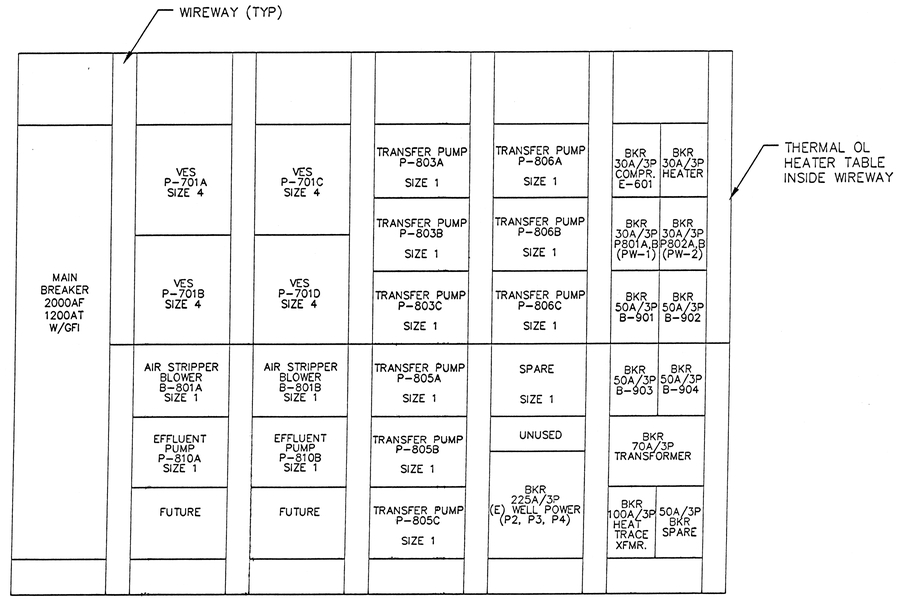


PLANT MAIN CONTROL PANEL (2)

APPROX. SCALE: 1"=1'-0"

PLANT MAIN CONTROL PANEL NAMEPLATE SCHEDULE

NO.	1ST LINE	2ND LINE	SIZE (L X H)
1	VES/GROUNDWATER	MAIN CONTROL PANEL	1" X 3"
2	CONTROL POWER	DISCONNECT	1" X 3"
3	CONTROL POWER	ON	1" X 3"
4	SYSTEM MODE	MANUAL/AUTO	1" X 3"
5	VAPOR SYSTEM	MANUAL/AUTO	1" X 3"
6	AIR STRIPPING SYSTEM	MANUAL/AUTO	1" X 3"
7	SYSTEM MODE	SELECT	1" X 3"
8	VAPOR SYSTEM	MODE SELECT	1" X 3"
9	AIR STRIPPING	MODE SELECT	1" X 3"
10	MAIN EQUIPMENT	STATUS	1" X 3"
11	VES PUMP	P701A RNG	1" X 1-1/2"
12	VES PUMP	P701B RNG	1" X 1-1/2"
13	VES PUMP	P701C RNG	1" X 1-1/2"
14	VES PUMP	P701D RNG	1" X 1-1/2"
15	AIR INJECTION	B901 RNG	1" X 1-1/2"
16	AIR INJECTION	B902 RNG	1" X 1-1/2"
17	AIR INJECTION	B903 RNG	1" X 1-1/2"
18	AIR INJECTION	B904 RNG	1" X 1-1/2"
19	SPARE		1" X 1-1/2"
20	SPARE		1" X 1-1/2"
21	A/W SEPARATOR PUMP	P807 MAN/AUTO	1" X 3"
22	TREATMENT SYSTEM	ANNUNCIATOR	1" X 3"
30	EXTRACTION WELL	STATUS	1" X 3"
31	WELL PUMP	P2 RNG	1" X 1-1/2"
32	WELL PUMP	P3 RNG	1" X 1-1/2"
33	WELL PUMP	P4 RNG	1" X 1-1/2"
34	WELL PUMP	P801A RNG	1" X 1-1/2"
35	WELL PUMP	P801B RNG	1" X 1-1/2"
36	WELL PUMP	P802A RNG	1" X 1-1/2"
37	WELL PUMP	P802B RNG	1" X 1-1/2"
38	SPARE		1" X 1-1/2"
39	SPARE		1" X 1-1/2"
40	SPARE		1" X 1-1/2"



MCC ELEVATION

SCALE: 1"=1'-0"

PANEL: A — FEEDER ENTRANCE: BOTTOM

VOLTS: 120/208V, 4 WIRE — PHASE: THREE — MOUNTING: WALL

BUS: COPPER, 225A — MAIN: 225A — AIC: 10,000

CIR NO	BRKR TRIP	REMARKS	LOAD IN WATTS ø A	ø B	ø C	REMARKS	BRKR TRIP	CIR NO
1	20A	LIGHTING-TRTMT AREA 1	900 / 595			LIGHTING-CONTROL ROOMS	20A	2
3	20A	LIGHTING-TRTMT AREA 2		1050 / 1440		RECEPTACLES-LAB GFI	20A	4
5	20A	RECEPTACLES-MCC			540 / 900	MAIN CONTROL PANEL	15A	6
7	20A	RECEPTACLES-TRTMT AREA	1620 / 500			HEAT TRACE THERMOSTAT	20A	8
9	20A	VOC ANALYZER		2000 / –		SPARE	20A	10
11 / 13	30A / 2P	P804A-SUMP PUMP, 1/3 HP	150 / 150		150 / 150	P804B-SUMP PUMP, 1/3 HP	30A / 2P	12 / 14
15 / 17	30A / 2P	SPARE		– / –	– / –	SPARE	30A / 2P	16 / 18
19	20A	SPARE	– / –			SPARE	20A	20
21	15A	FLOW METERS		500 / 2000		WALL HEATER	20A	22
23 / 25	30A / 2P	MCC ROOM A/C UNIT	2500 / –		2500 / 2000	A/C UNIT MCP ROOM / SPARE	20A / 15A	24 / 26
27	20A	METERING PUMP P-808		100 / –		SPARE	15A	28
29	20A	P807-A/W SEPARATOR, 3/4 HP			560 / 2000	WALL HEATER	20A	30
31 / 33	15A / 20A	SPARE / P809-SEWER LIFT PUMP	– / 440	500 / 440		TO VES TRAILER	40A / 2P	32 / 34
35	20A	SPARE			– / –	SPACE		36
CONNECTED LOAD (WATTS)			6855	8030	8800	TOTAL CONNECTED LOAD: 23.69 KW		

120/208V PANEL LP1 SCHEDULE (4)

NOT TO SCALE

ISSUE	DATE	DESCRIPTION	APPROVED
5	10/05/94	AS-BUILTS	MJP
4	08/27/93	AGENCY REVIEW	J.P.
3	07/30/93	CLIENT REVIEW	J.P.

BP OIL COMPANY
CARBORUNDUM COMPANY FACILITY
WHEATFIELD, NEW YORK

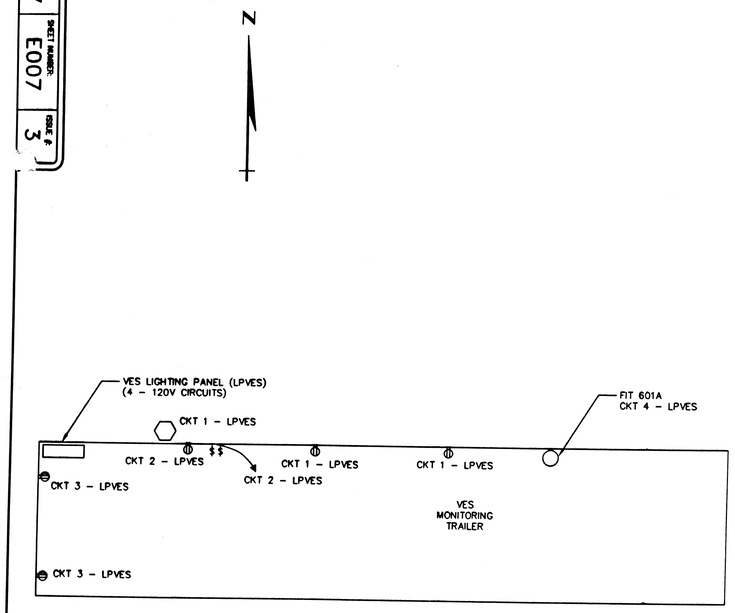
ELECTRICAL DETAILS

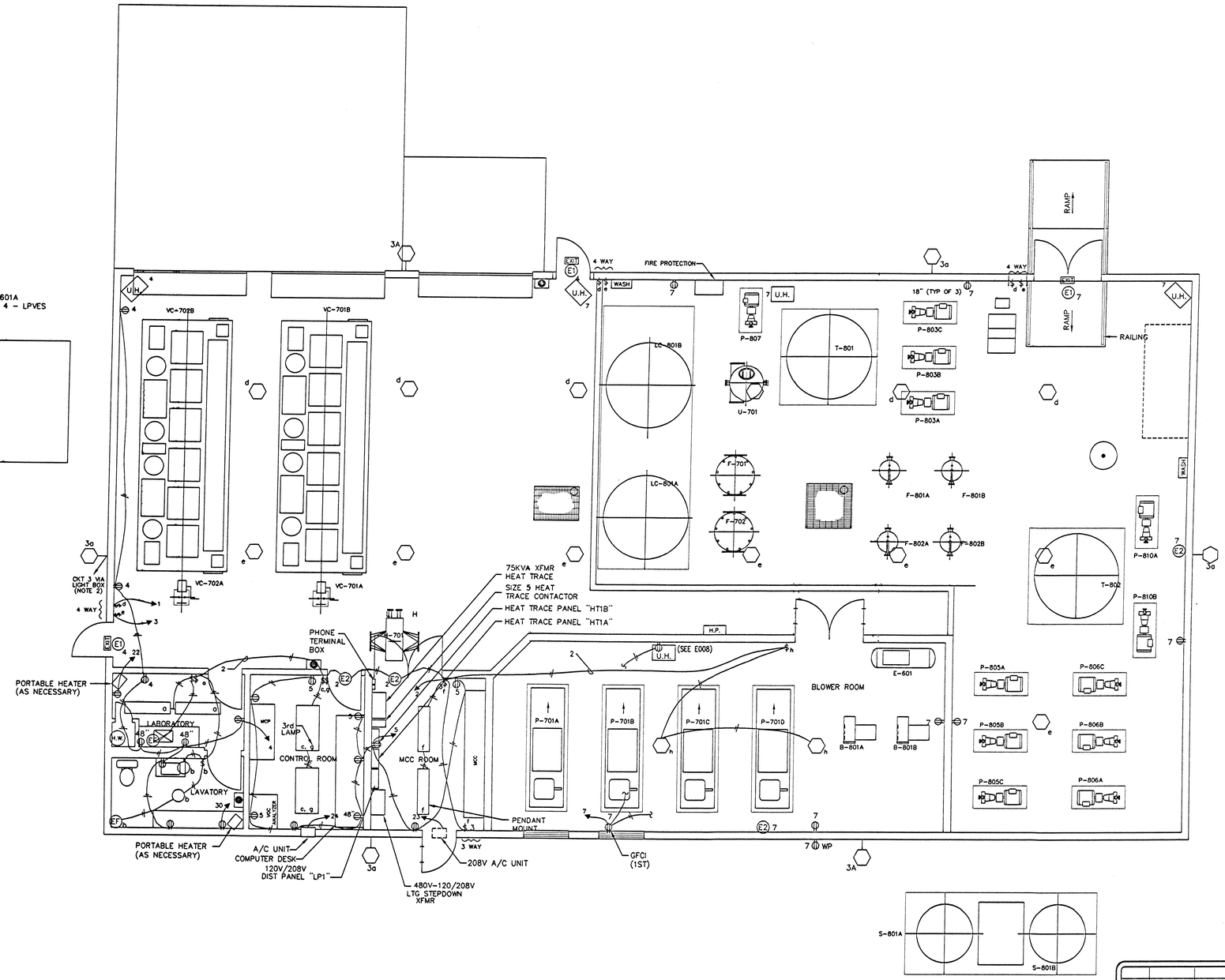
CHECKED BY / DATE: LN. 08/26/93	SCALE: AS SHOWN	DRAWN BY: D.D.M.
APPROVED BY / DATE: J.P. 08/27/93	DESIGNED BY: S.S.K.	DATE: 07/30/93

McLaren Hart SM
M/H ENGINEERS EAST, P.C.

DRAWING NUMBER: 1056D065
SHEET NUMBER: E005

DRAWING NUMBER	SHEET NUMBER	ISSUE #
1056D067	E007	3





NOTES:

1. SEE SHEET E001 FOR GENERAL ELECTRICAL NOTES.
2. CIRCUIT 3 WAS RUN TO A LIGHTING JBOX FOR PHOTOCELL CONTROL OF OUTDOOR WALL LIGHTS , CREATING SWITCHED CIRCUIT 3a.
3. LOCATION OF SWITCHES AND RECEPTACLES ARE SHOWN IN THEIR APPROXIMATE LOCATION FOR DRAWING CLARITY. EXACT LOCATIONS SHOULD BE VERIFIED IN THE FIELD.

LEGEND:

- DUPLEX RECEPTACLE WP-OUTDOOR , WEATHERPROOF (NUMBER IDENTIFIES CIRCUIT)
- INCANDESCENT , CEILING MOUNTED , 75W.
- HPS FIXTURE , PENDANT MOUNTED , 150W , 120V , GE LOWMOUNT 150, OR APPROVED EQUAL. MOUNT ON CEILING PENDANTS
- FLUORESCENT FIXTURES , CEILING MOUNTED , 2 X 40W , 120V , DAYBRITE R-4125ZW-4 , OR APPROVED EQUAL (3 X 40W WITH 2' WIDTH)
- HPS FIXTURE , WALL MOUNTED , 100W , 120V , GE WL -175 , OR APPROVED EQUAL
- (E1) EMERGENCY EXIT LIGHT W/EXIT SIGN, 6V MAINTENANCE FREE 15 YEAR BATTERY, 120V, EXQUISITE RG SERIES, WESCO STOCK No. 78-2520-82312
- (E2) EMERGENCY LIGHT, W/O SIGN, 4V 15 YEAR BATTERY, TWO 7.2W ADJUSTABLE LAMPS, DUAL-LITE EZ-2 SERIES, WESCO STOCK No. 78-2520-43002

SCALE

0 5 10 15 FEET

ISSUE	DATE	DESCRIPTION	APPROVED
3	10/05/94	AS-BUILTS	M&H
2	08/27/93	AGENCY REVIEW	J.P.
1	08/04/93	CLIENT REVIEW	J.P.

STATE OF NEW YORK — LICENSED PROFESSIONAL ENGINEER — 10/7/94

BP OIL COMPANY
CARBORUNDUM COMPANY FACILITY
WHEATFIELD, NEW YORK

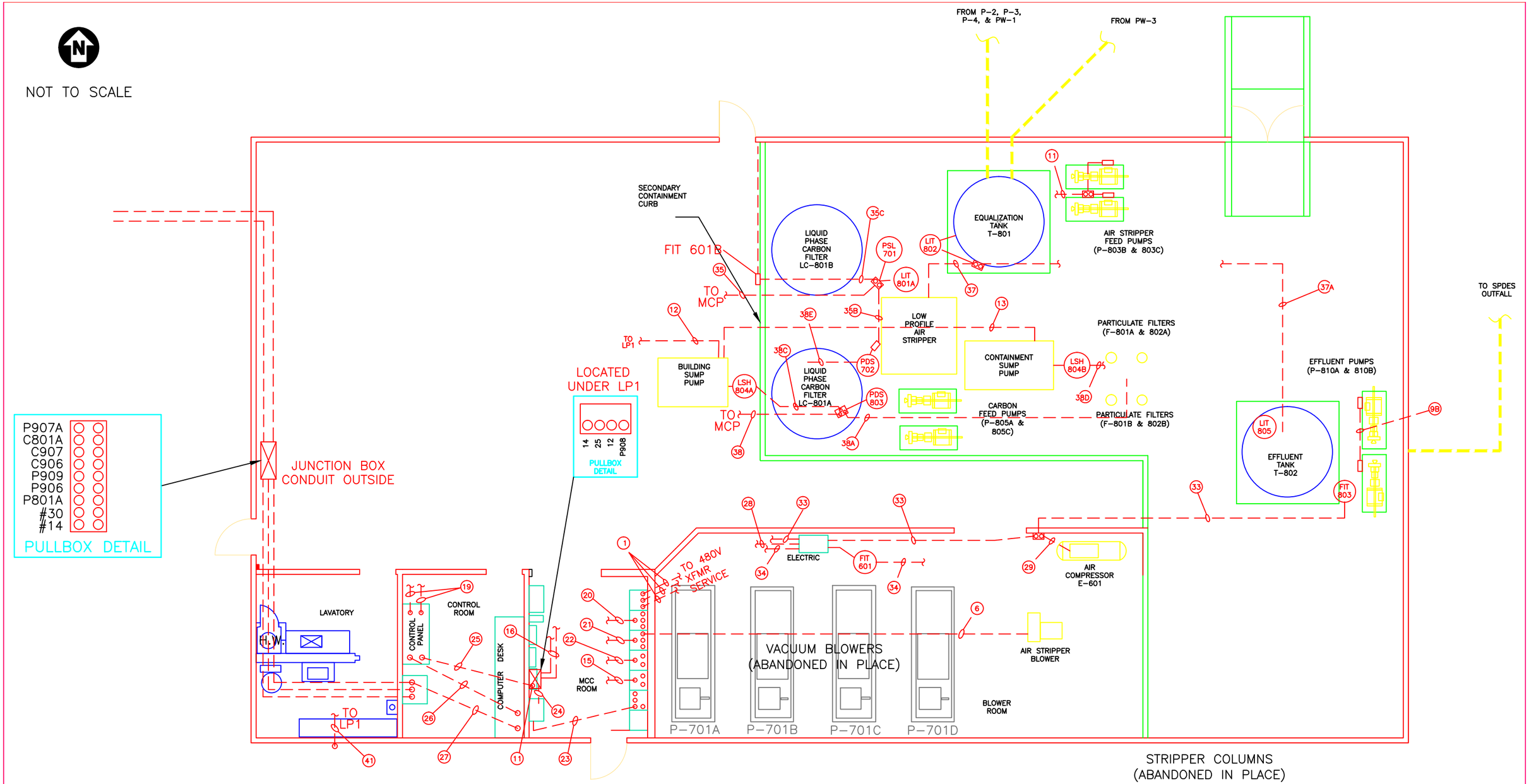
TREATMENT PLANT LIGHTING PLAN

CHECKED BY / DATE: L.N. 08/26/93	SCALE: AS SHOWN	DRAWN BY: D.D.M.
APPROVED BY / DATE: J.P. 08/27/93	DESIGNED BY: S.S.K.	DATE: 08/04/93

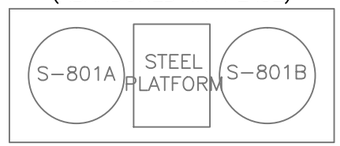
McLaren Hart sm
M/H ENGINEERS EAST, P.C.

DRAWING NUMBER: 1056D067
SHEET NUMBER: E007

NOT TO SCALE



STRIPPER COLUMNS
(ABANDONED IN PLACE)



CONDUIT SCHEDULE

1A 4", 3#750 MCM, #3/0 GND, 750kVA XFMR TO MCC	21 1", 16#14, #14 GND, MCC TO MCP (CONTROL)	37 MCP TO LIT 802, LIT 805, FIT 803
1B 4", 3#750 MCM, #3/0 GND, 750kVA XFMR TO MCC	22 1", 18#14, #14 GND, MCC TO MCP (CONTROL)	37A 3/4", 1 TSP #16, JB TO LIT 805, FIT 803
1C 4", 3#750 MCM, #3/0 GND, 750kVA XFMR TO MCC	23 1", 3#6, #8 GND, MCC TO 480-120/208V XFMR FOR LP1 MAINFEED	37B 3/4", 1 TSP #16, JB TO FIT 803
6 1 1/2", 6#12, #2/12 GND, MCC TO B-801A/B	24 2", 3#4/0, #4 GND, XFMR TO 120/208V PANEL LP1	38 1", MCP TO JB801A, TSP #16, 2#12, 1#12GND
9A 6#12, #12 GND, TO P-810A/B	25 1", 4#12, 4#12(CONTROL), #12 GND, MCP TO 120V LP1 BREAKER #6	38A 3/4", 3 TSP #16, 2#12, #12 GND
9B 3/4", 3#12, #12 GND, TO P-810A	27 1", DATA CABLES, MCP TO PC	38B EMPTY
11 1", 9#12, #3/12 GND, MCC TO PUMPS P-803B/C	28 3/4", 3#10, #10 GND, MCC TO HEATER	38C 3/4", 2#14GND
12 1", 4#12, #12 GND, MCP TO SUMP PUMPS P-804A/B	29 3/4", 3#10, 2#12(PSL), #10 GND, MCC TO E-601	38D 3/4", 2#14, #14 GND
13 3/4", 2#12, #12 GND, P-804A JB TO P-804B	30 1", 3#10BLK, 2#10 GND	38E 3/4", 1 TSP #16, 2#14, #14 GND, JB801A TO PDS702
15 1", 10#14, #14 GND, MCC TO MCP (CONTROL)	33 3/4", 2#12, #12 GND, MCP TO FIT 803	41 2#12, #12 GND, LP1 TO LIFT PUMP (SEPTIC)
16 SEE E-002: P801A, P906, P907	35 1", 1 TSP #16, MCP TO JB701 - LIT801A	
17 SEE E-002: P802A	35A EMPTY	
18 SEE E-002: P908, P909	35B EMPTY	
19 SEE E-002: C801A, C802A, C906, C907	35C 3/4", 1TSP #16 TO FIT 601B	
20 1", 16#14, #14 GND, MCC TO MCP (CONTROL)		

PARSONS
40 LA RIVIERE DRIVE, SUITE 350
BUFFALO, NEW YORK 14202
716-541-0730

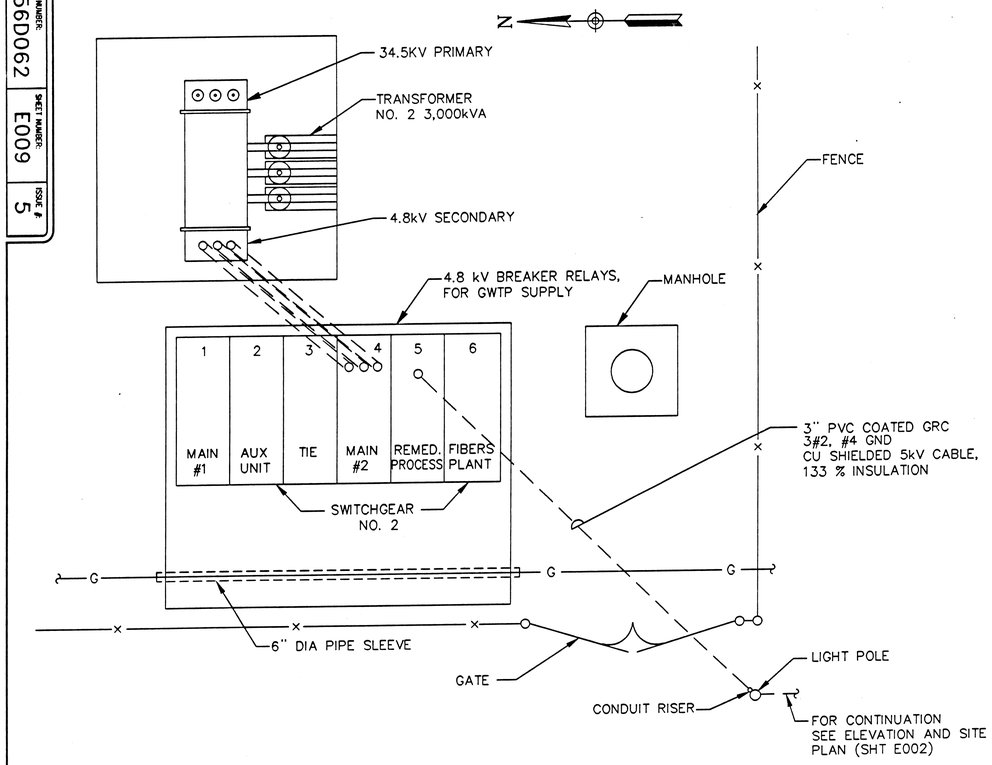
E008

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY

EQUIPMENT LAYOUT/CONDUIT SCHEDULE

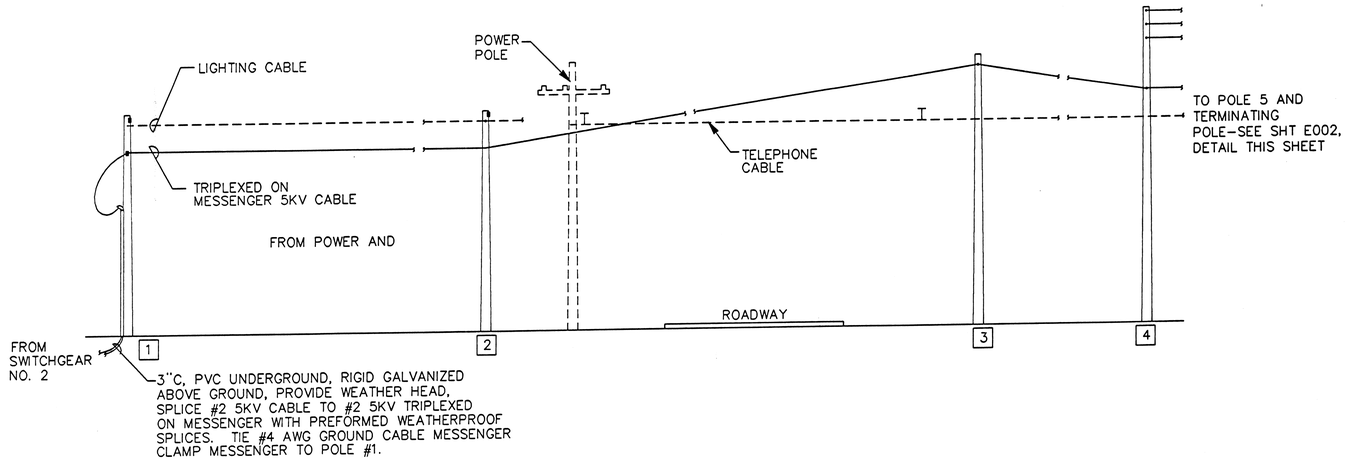
P:\Sanborn\\447601\Record Drawings\SK-442156-c14_Fig5.dwg
No XREFs

DRAWING NUMBER 1056D062 | SHEET NUMBER E009 | ISSUE # 5



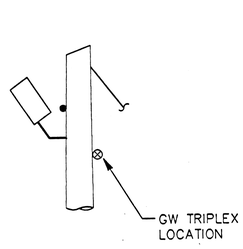
34.5kV–4.8kV SUBSTATION PLAN (1/–)

N.T.S.



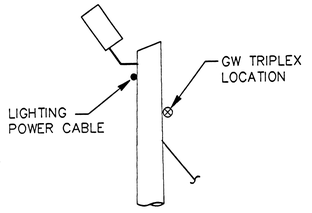
POLE LINE ELEVATION (2/–)

NTS



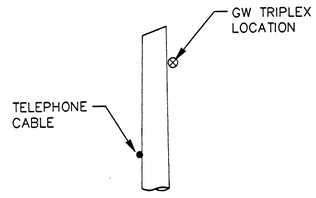
POLE 1 DETAIL

NTS



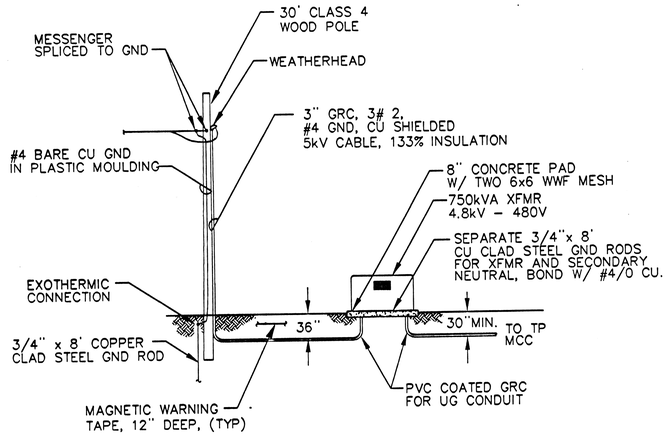
POLES 2 & 5 DETAIL

NTS

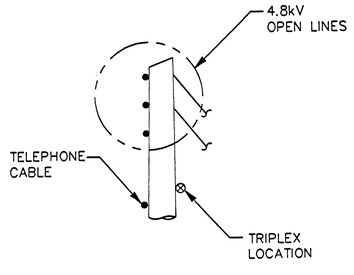


POLE 3 DETAIL

NTS

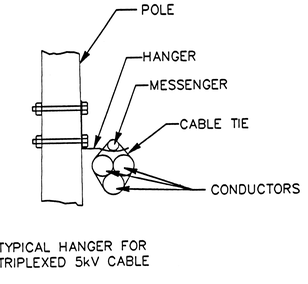


TERMINATING POLE/STEPDOWN TRANSFORMER ELEVATION (3/–)



POLE 4 DETAIL

NTS



TYPICAL HANGER FOR
TRIPLEXED 5kV CABLE

HANGER DETAIL–TYP

NTS

ISSUE	DATE	DESCRIPTION	APPROVED
5	10/05/94	AS-BUILTS	MG
4	08/27/93	AGENCY REVIEW	J.P.
3	07/27/93	CLIENT REVIEW	J.P.

BP OIL COMPANY
CARBORUNDUM COMPANY FACILITY
WHEATFIELD, NEW YORK

5KV POWER DISTRIBUTION DETAILS

CHECKED BY / DATE: L.N. 08/26/93	SCALE: AS SHOWN	DRAWN BY: JN/DM
APPROVED BY / DATE: J.P. 08/27/93	DESIGNED BY: S.S.K.	DATE: 07/27/93

McLaren Hart M/H ENGINEERS EAST, P.C.

DRAWING NUMBER: 1056D062
SHEET NUMBER: E009

APPENDIX B

HEALTH, SAFETY, SECURITY, AND ENVIRONMENT PLAN

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PROJECT SAFETY PLAN (PSP)
FORMER CARBORUNDUM FACILITY
WHEATFIELD, NY
(SANBORN)

Prepared by:

PARSONS
40 La Riviere Dr., Suite 350
Buffalo, New York 14202

May 2013

Project Manager:	**George Hermance**	**05/07/2013**
	Name	Date

DOCUMENT REVISION HISTORY

Revision Number	Date	Description
3	4/4/13	Updated contact list and scope of work
2	3/14/12	Updated contacts list for new BP Program Safety Mgr
1	1/3/12	Added proper revision control.

SITE EMERGENCY RESPONSE PLAN

FORMER CARBORUNDUM FACILITY, WHEATFIELD, NY

I. PURPOSE & SCOPE OF PLAN

The Site Emergency Response Plan (SERP) provides the on-site user with critical information to be used in the event of an emergency. A copy of the SERP must be posted in the support zone at the work site and a copy should be with all on-site personnel during field activities. In the event of any situation or unplanned occurrence requiring assistance, (e.g., fire, major injury, crime, major release), **CALL 911 FIRST** and then notify the Site Safety Officer (SSO).

II. EMERGENCY CONTACTS

In an emergency, **CALL 911 FIRST,** and then notify the SSO. Once the SSO is notified, the SSO will call the emergency contacts included in the attached Emergency Contacts List in the order they are listed until the SSO speaks to someone live. In the event field personnel are injured and are chemically contaminated, the SSO must contact the emergency room director ahead of time so hospital personnel can prepare for the situation. The emergency contacts list, included on Page SERP-5, must be in an easily accessible location at the site.

III. EMERGENCY ROUTE/MAPS

The nearest occupational clinic within the Parsons Workers Compensation Network is Comprehensive Occupational Medicine.

Comprehensive Occupational Medicine
51 Webster St.
North Tonawanda, NY 14120

The clinic location, directions from the Site, and a driving map are shown below.

- Start out going towards Walmore Road
- Turn right onto Walmore Road
- Turn right onto Cayuga Drive
- Turn left onto Williams Road
- Turn left at NY-265 S/NY S/River Road
- Slight right at Webster St.
- End at Comprehensive Occupational Medicine, 51 Webster St.

Approximate Travel Time: 21 minutes
Approximate Travel Distance: 10 miles
Main Phone Number: (716) 692-6541

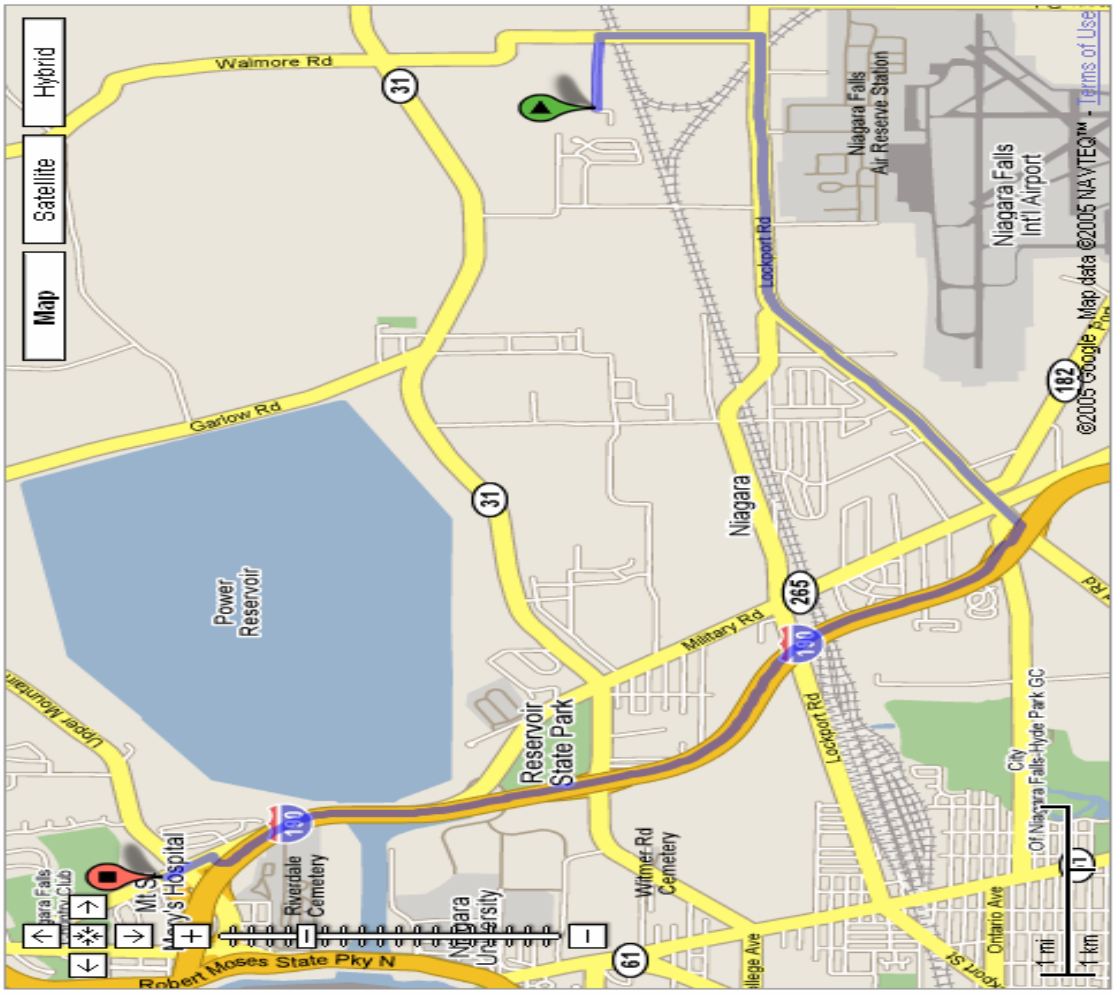
Full Route View

The nearest hospital/emergency room is MT ST MARY'S HOSPITAL OF NIAGARA FALLS, 5300 Military Rd., Lewiston NY 14092. The hospital location, directions from the Site, and a driving map are shown below.

- Start out going EAST on CORY DR. toward WALMORE RD.
- Turn RIGHT onto WALMORE RD.
- Turn RIGHT onto LOCKPORT RD.
- Bear LEFT at PACKARD RD.
- Turn RIGHT at NIAGARA EXWY.
- Bear LEFT into the I-190 NORTH Ramp.
- Take the RT-265 exit- EXIT 25A- toward LEWISTON.
- Turn LEFT onto MILITARY RD / NY-265.
- End at 5300 Military Rd, Lewiston, NY 14092.

Approximate Travel Time: 13 minutes
Approximate Travel Distance: 8.4 miles
Emergency Room: (716) 298-2325
Main Phone Number: (716) 297-4800

Full Route View



Start address:	Cory Dr Sanborn, NY 14132
End address:	5300 Military Rd Lewiston, NY 14092
Distance:	8.4 mi (about 13 mins)

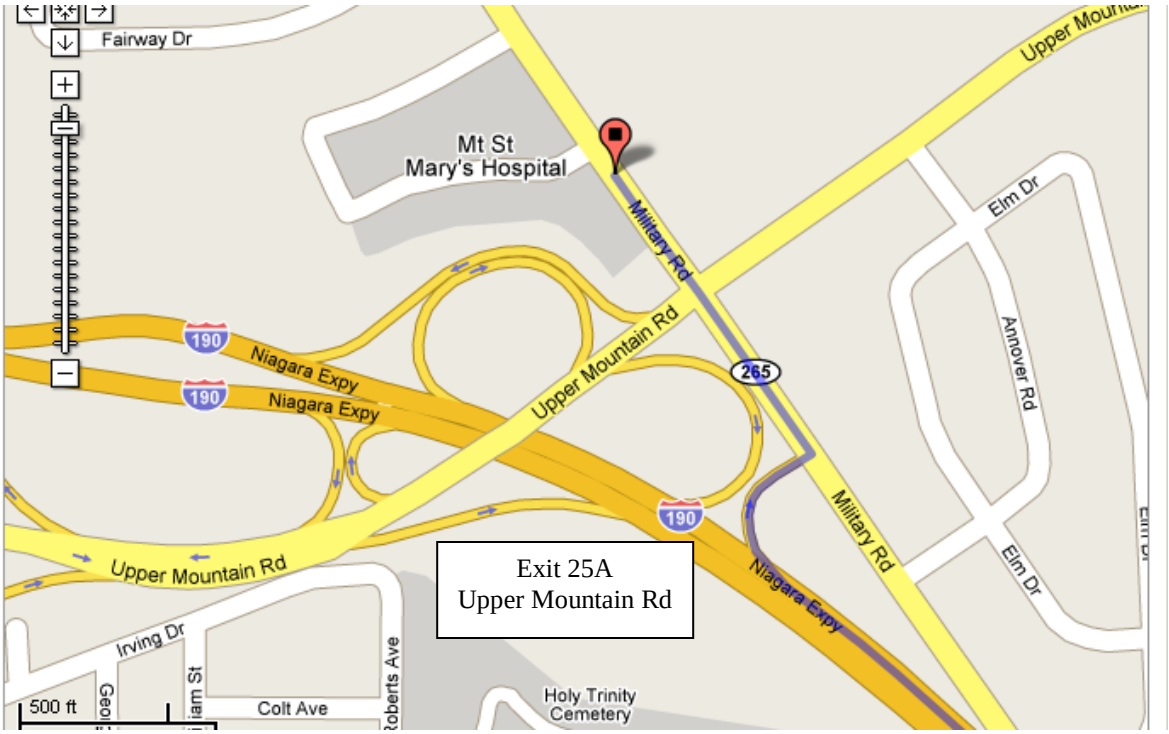
Reverse directions

1. Head **east** from **Cory Dr** - go **0.4 mi**
2. Turn **right** at **Walmore Rd** - go **0.6 mi**
3. Turn **right** at **Lockport Rd** - go **1.6 mi**
4. Bear **left** at **Packard Rd** - go **1.6 mi**
5. Turn **right** at **Niagara Expy** - go **0.1 mi**
6. Bear **left** into the **I-190 N** entry ramp - go **3.7 mi**
7. Take the **RT-265** exit **25A** to **Lewiston** - go **0.1 mi**
8. Turn **left** at **Military Rd** - go **0.2 mi**

These directions are for planning purposes only. You may find that construction projects, traffic, or other events may cause road conditions to differ from the map results.

Map data ©2005 NAVTEQ™, Tele Atlas

End: 5300 Military Rd, Lewiston NY



IV. EXTERNAL CONTACT/EMERGENCY INFORMATION

The area code for local emergency telephone numbers is (716). The 911 call service can be used at the Sanborn Site.

Other phone numbers:

Fire Department	911 (Emergency)
Police Department	911 (Emergency)
Ambulance	911 (Emergency)
Poison Control Center	1.800.222.1222
National Response Center (Reporting Oil and Chemical Spills)	1.800.424.8802
Parsons Contract Physician (Workcare)	1.800.455.6155
OSHA (Nationwide)	1.800.321.6742
UFPO (NYS One call system)	1.800.962.7962

V. EVACUATION AND CONTINGENCY PLAN

In the event of an emergency:

- **Leave area if danger exists, move to parking area or other safe location.**
- **Call 911 if warranted, communicate emergency to co-workers and other site personnel.**
- **Exit the building through the nearest exit.**
- **All on-site personnel will meet at parking area in front of the treatment Plant.**
- **If evacuation of the site is necessary, all on-site personnel will proceed to the entrance at the end of Cory Dr.**
- **Field health and safety person (or team leader) will conduct a role call and confirm all persons are accounted for.**
- **Await fire and/or police teams, prepare to guide them and /or inform them of site conditions.**
- **Use the following page to for reporting contact numbers.**

VI. PLAN MAINTENANCE

The project manager will update this SERP at least annually, or more frequently in warranted by changes in Site conditions. On-site personnel will be responsible for proposing modifications to the project manager, as needed.

VII. TRAINING AND EXERCISE

All personnel must read and understand this SSP prior to arrival on site.

VIII. NON-REGULATORY REPORTING GUIDELINES

For non-regulatory reporting guidelines, see the client's "Remediation Management Incident & Near-Miss Notification and Reporting Guidance Manual." These reporting documents are located in the "*Health, Safety, Security, and Environment Plan for Parsons Program Site Operations (Program HSSE Plan)"*

IX. DISTRIBUTION

This PSP will be distributed to the following personnel:

PARCOMM Safety Manager;

Project Manager;

Project Safety Manager;

Site Safety Officer; and

Field Team.

Remediation Management Incident Reporting List - Sanborn					
All incidents occurring on an RM project or site shall be reported according the HSSE Expectations found on www.gemhse.com					
As a minimum, all injuries, spills greater than 1 barrel and all property damage greater than $500 should be reported to RM management **immediately**.					
Additionally, Notices of Violation and any incident which could be reported in the media should be reported immediately.					
Reporting must be done to a person and not via voice message, email or fax. One must ensure contact is made.					
If you unable to contact the first contact on the list, then you should attempt to call the next person on the list.					
Remediation Management Organization Notification					
Position	**Person**	**Office**	**Cell Phone**	**Pager**	**Home**
Project Manager	William Barber	216-416-1234	216-408-1660		330-296-8498
Deputy Operations Manager	Chuck Stilwell	907-771-8083	406-491-1129		
Operations Manager	Alan Delisle	281-504-4284	281-995-4583		
VP Global Operations	Pat King	281-366-8172	409-771-3006		
HSSE Advisor	Dan Hardisty	630-836-7124	219-545-4725		
BP Naperville 24 Hour Notification Center		800-321-8642			
Supplier Organization Notification					
Company & Position	**Person**	**Office**	**Cell Phone**	**Pager**	**Home**
Parsons Project Manager	George Hermance	716-407-4990	716-861-7882		716-741-8155
Parsons Program Manager	Scott Hartsough	513-552-7001	513-368-9861		513-759-2588
Parsons Program Safety Manager	Greg Ertel		585-353-2574		
Parsons Project Safety Officer	James Schuetz	716-541-0757	716-523-8293		
Parsons O&M Operator	Doug Taylor	716-541-0763	716-239-0899		585-589-9286
Other useful numbers for this portfolio					
Company & Position	**Person**	**Office**	**Cell Phone**	**Pager**	**Home**
BP Gov't and Public Affairs	Maria Antonieta Viso	281-366-4744	281-901-4737		
BP Gov't and Public Affairs	Neil Geary	281-504-8782	281-513-9727		
Price-Miner Creative Strategies	Bob Miner	314-367-8082	314-280-3768		
BP Legal Attorney	Vilia Drazdys	630-420-5918	630-991-8014		
BP Legal Attorney	James Lucari	630-420-5204	630-815-8973		
BP Legal Attorney	Charles Pinzone	281-366-5184	312-231-3606		
BP Legal Attorney	Doug Reinhart	630-420-5457	630-815-2658		
Hospital	Emergency	716-297-4800	716-298-2325		

		(main)	(ER)		
Metaullics	Kevin Scott	716-731-3221	716-628-1245		
O & M Enterprises	Rick Becken	716-731-5322	716-435-8500		716-694-3221

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APPENDICES

SECTION 1 – INTRODUCTION

1.1 PARSONS WORKPLACE HEALTH & SAFETY POLICY

Exhibit 1-1 – Parsons Workplace Health and Safety Policy

CORPORATE POLICY
Workplace Health & Safety

POLICY: WORKPLACE HEALTH AND SAFETY

STATEMENT OF POLICY:

As an industry-leading engineering, construction and technical services firm, Parsons is firmly committed to maintaining a safe and healthy working environment at all its offices and project facilities. We share the National Safety Council's Safety and Health Code of Ethics as the principles guiding our commitment to safety.

- We will hold safety and health as our highest core value.
- Executive management will lead the safety improvement process.
- Safety will be a responsibility shared by everyone in our organization.
- Safety performance will be a key indicator of our organizational excellence and will be incorporated into our business processes.
- We will communicate safety performance openly with employees.
- All employees will be given the knowledge and skills necessary to safely perform their jobs.
- We will extend our safety efforts beyond the workplace to include transportation, homes and communities.
- We will continually strive to improve our safety and health processes.

To meet its health and safety objectives, all Parsons employees are expected to act proactively with regard to health and safety issues. This requires the combined efforts of a concerned management, responsible and knowledgeable supervision, and conscientious, well-trained employees.

Parsons will take all reasonable action to meet or exceed the applicable occupational health and safety requirements, domestically and internationally, and will continuously monitor and improve operations, procedures, technologies and programs that are conducive to maintaining a safe and healthy working environment.

RESPONSIBILITIES:

Parsons GBU management and supervisory personnel are responsible to:

- Comply with this policy and ensure that the applicable health and safety requirements at each domestic and international office and project facility are effectively implemented and monitored at all times.

1 of 3

The Company may change, rescind or add to any policies, benefits or practices described on the PWEB, other than employment-at-will policies, from time to time in its sole and absolute discretion with or without prior notice. The Company will advise employees of material changes within a reasonable time.

RESPONSIBILITIES: (cont'd.)

- Ensure that the applicable health and safety requirements at each domestic and international project facility are effectively integrated with the preparation of proposals, project planning, and project execution.
- Monitor subcontractor safety performance in accordance with contract specifications as required by the contract with client.
- Ensure that safety information and statistics are reported to Parsons Corporate Safety Manager on a consistent and regular basis, as shown in Appendix.1, *Safety Monthly Report*.

Parsons Corporate Safety personnel are responsible to:

- Develop, communicate, and oversee Parsons health and safety programs at all Parsons business units.
- Provide assistance to Parsons business unit managers regarding health and safety regulations, reporting requirements, safety training, and other related issues.
- Monitor the effectiveness of Parsons health and safety programs, conduct investigations, develop OSHA reporting and worker's compensation claim procedures.
- Collect and maintain safety information and statistics for all Parsons business units and operations, as shown in corporate policy Workplace Health and Safety, Appendix.2, *OSHA Safety and Health Statistics*.
- Keep senior management informed of significant internal and external developments regarding health and safety.

Parsons employees are responsible to:

- Exercise maximum appropriate care and good judgment at all times regarding health and safety, and adhere to safety procedures to prevent accidents and injuries.
- Promptly report all accidents and injuries to supervisory personnel.
- Promptly report any near misses, unsafe conditions, equipment, or practices to supervisory personnel.

REFERENCES:

National Safety Council Safety and Health Code of Ethics
Parsons Construction Health and Safety Manual
Parsons Injury and Illness Prevention Program (Cal-OSHA IIPP)
Parsons Safety Monthly Reports, Workplace Health and Safety - Appendix.1
Parsons Health and Safety Statistics, Workplace Health and Safety – Appendix 2

DATE: 7/23/04

1.2 THE PROJECT SAFETY PLAN (PSP)

Parsons goal is zero accidents and zero injuries with work tasks designed to minimize or eliminate hazards to personnel, process, equipment, and the general public. No employees should ever perform tasks that may endanger their own safety and health or that of others.

This Project Safety Plan (PSP) outlines safety and health requirements and guidelines developed by Parsons for project work. When implemented, these requirements will help protect site personnel, visitors, and the public from exposure to potential safety and health hazards.

This Plan will be updated as conditions change or situations change, usually by addenda inserted into Appendix A. All Parsons and subcontractor personnel must understand and implement the PSP and any addenda. Parsons documents this by having employees sign an acknowledgement form stating that they understand the plan and its requirements. This PSP should be bound in a three-ring binder so that numbered addenda may be added as needed.

This PSP must be used in conjunction with the Health, Safety, Security, and Environment Plan for Parsons Program Site Operations (Program HSSE Plan). Both this PSP and the Program HSSE Plan must be present on site whenever field personnel are conducting work. This PSP provides standard Parsons requirements plus necessary site-specific information. The Program HSSE Plan provides standard client requirements, and is available on ParShare at the following address:

https://projects.parsons.com/sites/bpretailscope/BP Health and Safety/HSSE_Plans/Program_HSSE_Plan/Program HSSE Plan PDF

Alternatively, the project manager will provide a copy of the Program HSSE Plan.

1.3 SUBCONTRACTOR SAFETY PLANS

Parsons' subcontractors must establish a safety program for their work and employees. Contract specifications require all subcontractors to accept Parsons PSP, but also prepare their own Subcontractor Safety Plan (SSP) for presentation to Parsons Project Manager and Division Safety Manager at least 10 days before site mobilization. At a minimum, subcontractor safety and health plans must meet the requirements of this PSP and provide safety equipment and safeguards suitable for the hazards involved. This PSP may not cover all potential hazards on the project and subcontractors must ensure that appropriate safety and health information is available for all project tasks. The subcontractors listed below will be directly hired by Parsons.

All PSP requirements for Parsons personnel (e.g., training, substance abuse screening, and incident reporting) also apply to subcontractor personnel and should be spelled out in the subcontractor's safety plan (SSP).

If a subcontractor is performing activities that require specialized training (i.e. confined space entry, excavation/trenching, scaffold use, HAZWOPER, etc.), then copies of training certifications must be provided for applicable employees AND the supervisor.

SUBCONTRACTOR	WORK ACTIVITIES	EVALUATION GRADE
O&M Enterprises (subcontractor) Rick Becken	**Treatment Plant Operations Other O&M**	**B**

1.4 MANAGEMENT OF CHANGE (MOC)

Field modifications may be made to this HASP document after discussion and approval by the Parsons Division Safety Manager. Make note of any pertinent notations in the comment section below (insert additional rows as necessary). The client uses an electronic management of change process which can be found in the defined practices located at https://projects.parsons.com/sites/bpretailscope/vpp/Defined%20Practices/Forms/AllItems.aspx?RootFolder=%2fsites%2fbpretailscope%2fvpp%2fDefined%20Practices%2fManagement%20of%20Change&FolderCTID=&View=%7bF537A769%2d7117%2d46B9%2d96F6%2d2560230DCC59%7d

HASP Section	SSO Initials	Date	Comments

SECTION 2 – SCOPE OF WORK

2.1 SCOPE OF WORK

Parsons, in their contracted role with Atlantic Richfield Company is providing operations and maintenance activity services for the work as specified in the Contract # GEM-2005-0006 PETT2005-01 (Project Management, general contracting, monitoring, regulatory consulting).

Routine operations, maintenance and monitoring (OM&M) includes day-to-day operations of the groundwater treatment plant, normal maintenance of the water recovery and treatment equipment, maintenance of the Vault Water Collection & Conveyance (VWCC) system, collection of weekly SPDES outfall samples and quarterly and annual groundwater sampling from monitoring wells. Monthly discharge monitoring reports will be provided to the client for review, signature, and submittal to the NYSDEC.

The following items are typical onsite activities:

- An onsite operator completing routine treatment plant activities.
- Collection of weekly SPDES outfall samples, and submittal to an analytical laboratory.
- Completion of monthly discharge monitoring report (DMR) and submittal to Atlantic Richfield for review, signature, and submittal. Parsons completes the DMR for review and signature by Atlantic Richfield followed by submittal to the NYSDEC.
- Changing treatment system and VWCC bag filters, maintaining treatment system, VWCC and groundwater recovery well pumps, maintaining instrumentation and programmable logic controller (PLC), backwashing activated carbon, and other routine maintenance items as required.
- Routine system inspections and site maintenance including all scheduled inspections required by the BP Integrity Management Program Inspection & Maintenance Plan (see Appendix E of the OM&M Manual.
- System upgrades and changes to the system including:
    - Installation of new wells. This item will be completed by a to be determined Parsons subcontractor.
    - Excavation of trenches to install/replace pipe from wells to the treatment system. This item will be completed by a to be determined Parsons subcontractor.
- Vault Water Collection & Conveyance (VWCC) System to include pumps, instrumentation, and filters.
- Groundwater Monitoring, including opening wells, measuring water levels, purging wells and collecting groundwater samples.
- Waste Management including sampling of waste streams and preparation of waste profiles and as provided by a annual delegation of authority, execution of profiles and manifests as required.

- Site maintenance (snow plowing, mowing, grading etc.) in areas not maintained by Metaullics/Pyrotek including maintenance of site security (fences/gates).

For further details regarding the scope of work please refer to the Operations and Maintenance Manual.

2.2 PROJECT SAFETY PLAN APPLICATION

This PSP and referenced documents applies to all locations, facilities, operations, and projects associated with contract work performed by Parsons and its subcontractors. Locations/sites covered under this contract include the former Carborundum Facility in Wheatfield, New York.

SECTION 3 – PROJECT SAFETY MANAGEMENT RESPONSIBILITIES AND AUTHORITY

3.1 SAFETY RESPONSIBILITY MATRIX

Exhibit 3-1 summarizes the responsibilities of selected roles for Parsons Project, Division, GBU and Corporate personnel related to the primary safety activities identified in this PSP.

Exhibit 3-1 – Roles and Responsibilities

	Work Elements	Project Manager	Project Safety Manager	Project Controls Manager	Project HR Manager	Sector Manager	Division Manager	GBU Safety Manager	GBU QC Manager	GBU Risk Manager	GBU President	Corporate Workers Compensation Analyst	Corporate Safety	Resident Engineer/ Superintendent	GBU BD Manager	Parsons CEO/President
	1. Zero Incident Techniques and SHARP Management	X	D	P	P	R	R	R	E	S	E		E	S	S	E
	2. Business Development Phase	X	P	P	P	R	E	S		S	E		E	P	D	E
Startup Phase	3. Initial Hazards Analysis and Planning	X	P	P	P	R	E	R	E	P	E	P		P		
Startup Phase	4. Project Safety Plan (PSP)	X	D		P	R	E	R		R	E		C			E
Startup Phase	5. Stakeholder PSP Alignment Meeting	X	D			E	E	P					C	P		
Administration/ Design Phase	6. Awareness Campaign	X	D	P	P	E	A	R					C	P		
Administration/ Design Phase	7. Employee Orientation	P	P	P	D	R	A	E					C	P		
Administration/ Design Phase	8. Training	X	D	P	P	R	A	E					C			E
Administration/ Design Phase	9. Health and Safety Committee	X	D	P	P	R	A	R					C			
Administration/ Design Phase	10. Incident Investigations	X	P	P	P	R	R	A				P	E			E
Administration/ Design Phase	11. Measurement and Reporting	X	D	P	P	R	R	S				P	E			E
Administration/ Design Phase	12. Audits, Inspections and Record Keeping	X	X	P	P	R	R	S	R	R			E			E
Construction or Field Phase	13. Preconstruction Safety Activities	X	X			E	E	R					C			
Construction or Field Phase	14. Project Site Orientation	X	D	P	P	E	E	S					C			
Construction or Field Phase	15. Meet Local OSHA, Building Trades, and Other Agencies	X	D			E	E	S					C			
Construction or Field Phase	16. Review Contractor/Subcontractor Safety Programs	E	X			E	E	S					C	P		
Construction or Field Phase	17. Subcontractor Premobilization Meeting	X	P	P		E	E	S					C	P		
Construction or Field Phase	18. Risk Mitigation Planning (Two-week Look-ahead)	P	P			E	E	S					E	X		
Construction or Field Phase	19. Activity Hazard Analysis	E	P			E	E	S					E	X		
Construction or Field Phase	20. Recurring Field Safety Meetings/Training	X	D	P	P			S					E	P		
Construction or Field Phase	21. Project Management Site Safety Inspections	X	D					S					E	P		
	Testing, Commissioning, Operations, and Decommissioning Phases	(to be developed)														
Closeout Phase	22. Lessons Learned and Final Safety Report	E	X		X	E	E	S	R				E	P		
Closeout Phase	23. Records Retention	E	X		P	A	A	R					E			

Legend:

A – Approves tools, plans, etc. established by the project.

C – Consultant providing expert advice to the development leader.

D – Development leader tasked to establish the tools, plans, etc. needed for the work element.

E – Sponsor responsible to reinforce the need to comply with the established requirements.

P – Participants in team or group implementation efforts, supporting the implementation leader.

R – Reviews and comments on tools, plans, etc. established by the project to achieve the goal of the work element.

S – Establishes requirements applicable to the project.

X – Accountable and responsible to ensure that the project develops and implements the work element in accordance with established requirements.

SECTION 4 – ADMINISTRATIVE PHASE

4.1 PROJECT SAFETY COMMITTEE

Depending on the size and type of project, a safety committee that includes representation from all project stakeholders shall be formed. If the project has less than five (5) Parsons employees or 25 subcontractors, then a Project Safety Committee will be handled at the Program or Facility level. The Program or Facility H&S Representative is responsible for communicating information from the Division Safety Manager conference call with the project personnel on a monthly basis. Review of the meeting minutes from the Division Safety Manager conference call will take place at times and locations to be determined and posted by the Project Manager on the safety billboard at least one week in advance.

For this project, there will not be a Project Safety Committee.

4.2 PROJECT ORIENTATION

The Project Safety Representative meets with new workers to review site procedures and requirements listed in the PSP Orientation. Topics covered in the PSP orientation include:

- Names of personnel responsible for site safety and health.
- Reporting emergencies, incidents and unsafe conditions.
- Emergency/evacuation plans.
- Safety, health and other hazards at the site.
- Review of all activities on site and related Activity Hazard Analyses (AHAs), which are also refer to as Job Safety Analysis (JSA).
- Proper use of personal protective equipment.
- Work practices by which a worker can minimize risk from hazards.
- Safe use of engineering controls and equipment on site.
- Acute effects of compounds at the site.
- Decontamination procedures.

All personnel, including subcontractors and visitors, on a project must receive a PSP orientation prior to starting work or accessing the site and sign an acknowledgment form indicating they received and understood the orientation. Any individual who is unsure of any information presented in the orientation must request clarification. Individuals who do not participate in the orientation or refuse to sign the acknowledgment cannot work on or access the site.

4.3 AWARENESS CAMPAIGN

The project has established an awareness program consistent with the Parsons safety awareness campaign and its various elements (e.g., signs, posters, banners, and focus briefings). This program promotes worker awareness of safety goals and daily risks, hazards, and exposures in the field. In addition to topics selected by corporate safety each month, the project will supplement the awareness program with information specifically applicable to the scope of work.

The Project Safety Representative may also provide training, presentations, or informational materials as part of the awareness campaign. *(See SHARP Management Manual Section 6.3 for an example of a typical layout for a Safety Billboard).*

For this project, there will be a field Awareness Campaign. A Safety bulletin board maintained by the Project Safety Representative are primary information points for the project awareness campaign. The Bulletin board is located in the treatment plant office.

4.4 STAKEHOLDER PSP ALIGNMENT MEETING

A stakeholder PSP alignment meeting was held prior to Parsons and the client's current Project Manager (PM) involvement in the Site. Parsons and the client continually update and refine the approach and elements of control appropriate to project risks.

4.5 TRAINING

The project has a comprehensive health and safety training program tailored to the scope of work. All employees receive a Project Orientation as outlined in Section 4.2 upon assignment to the project. All Parsons new hires shall receive a facility Employee Orientation within the first 7 days of employment, provided by Human Resources, Facility Manager, Safety Representative and Staff Coordinator or their designee.

In addition to the training mentioned above, field employees undergo a specific training referred to as Control of Work training.

All personnel shall be listed in the PSP Training-Medical Records spreadsheet (see Appendix), which will identify the site-specific training requirements and expiration dates for applicable certifications. Safety training for project personnel will be based primarily on their work activities and corresponding exposure to hazardous substances and health hazards. The Parsons Corporate Safety and Health Manual (CSHM) and applicable sections will be used as a reference for determining minimum training requirements based on the project scope of work.

Applicable	Corporate Safety and Health Manual Section/Topic
Yes No	CSHM-2 First Aid - list all site personnel in the PSP Training-Medical spreadsheet that will be a first responder due to the insufficient response time of EMS personnel. See Section 6.9 of the PSP for additional information on first responders.
Yes No	CSHM-5 Field and Office Facilities
Yes No	CSHM-6 Personal Protective Equipment
Yes No	CSHM-9 Air Monitoring – complete Exhibit 6-1 that identifies chemicals of concern, air monitoring equipment, action levels (based on OSHA PELs) and corresponding PPE/Action Taken.
Yes No	CSHM-10 Hazard Communication
Yes No	CSHM-11 Emergency Procedures
Yes No	CSHM-12 Fire Protection

Yes No CSHM-13 Hazardous Waste Operations – list all site personnel in the PSP Training-Medical spreadsheet that will be engaged in hazardous substance removal or other activities that expose or potentially expose them to hazardous substances or health hazards (such as entering an exclusion zone), which are required to receive appropriate training as required by 29 CFR 1910.120, including, but not limited to, initial 40-hour, 8-hour Supervisor and annual 8-hour refresher training.

Yes No CSHM-16 Signs, Barricades and Traffic Control

Yes No CSHM-17 Hazardous Materials Handling, Transportation, Storage and Disposal – list all site personnel in the PSP Training-Medical spreadsheet that will be involved with handling or preparing (i.e. package, label, sign shipping papers, etc.) or packaging (i.e. soil and water samples, compressed gases or chemicals) materials listed in the DOT Hazardous Materials Table (49 CFR 172.101), which are required to receive DOT training every three years in accordance with HM126F, or annual RCRA training in accordance with 40 CFR 265.16 (small or large quantity generators of hazardous waste). **NOTE:** Samples being sent for analysis to determine whether they are hazardous are considered non-hazardous, but classified as "Other Regulated Material" in the Hazardous Materials Table.

Yes No CSHM-18 Walking/Working Surfaces

Yes No CSHM-24 Electrical

Yes No CSHM-25 Motor Vehicles and Equipment – list all Parsons site personnel in the PSP Training-Medical spreadsheet that will operate a Parsons company vehicle, which are required to complete the online ParsonsU module on the Vehicle Safety Policy - Fleet Drivers. List all site personnel that are required by the client to complete a hands-on/behind-the-wheel Defensive Driving training course.

Yes No CSHM-29 Tools

Yes No CSHM-36 Temperature Extremes – see Section 9.2 for mandatory information on all projects in California that must be reviewed prior to starting work

Yes No CSHM-37 Ventilation

Yes No CSHM-39 Bloodborne Pathogens - see Section 6.9 for additional information

Yes No CSHM-40 Recordkeeping

4.6 AUDITS AND INSPECTIONS

The Project Safety Representative has implemented an audit and inspection program in conjunction with the GBU and corporate safety and quality assurance departments. The Project Manager, together with the Project Safety Representative or their designee, conduct a safety inspection each month. Office work areas (including trailers) are audited according to the corporate office audit standard attached below.

Additional information on audits and inspections during field activities is detailed in Section 6.5 of this PSP.

4.7 MEETINGS

All project meetings of three or more people must begin with a safety topic. The meeting chairperson may present the safety topic or ask for a volunteer to open the discussion. In general, the "safety moment" is only one or two minutes long and is directly relevant to the work at hand or applicable to most individuals outside the workplace.

Daily toolbox safety/TSEA meetings are held with all personnel at the beginning of each shift to review current site conditions, incidents or injuries from the previous shift activities, safe or at-risk observations from the previous shift, activities planned for the current shift, anticipated hazards, engineering controls-work practices-PPE to protect against hazards and any additional safety topic or comments. Toolbox safety meetings shall be documented and signed by all individuals accessing the site using the BP required Authorization to Work form, shown as Exhibit 4-7.

4.8 REPORTING AND MEASUREMENT

4.8.1 Reporting

To accurately measure performance and comply with corporate and regulatory requirements, Parsons utilizes an online safety reporting system https://www.industrysafe.com/parsons/index.asp? to report monthly work hours, near-miss incidents, first aid cases, property damage and personal injuries for its employees and subcontractors.

4.8.2 Measurement

The Safety Manager and Project Manager establish and post a measurement system to provide indicators of safety performance, including the following metrics for the project:

- Project start date
- Days without a recordable injury – updated every Monday
- Date of last OSHA recordable injury (if applicable)
- Percent of safe observations from each monthly audit

Subcontractors must submit a monthly report of exposure hours (hours worked on the project, paid or unpaid) to the Parsons Project Manager within three (3) days after the end of each month. The Project Manager compiles the figures and submits them to the Program Manager (or via the online safety reporting system if instructed by the Program Manager) by the first Friday of each month. Where necessary, estimated figures are acceptable. If a project involves air monitoring or personnel wearing any type of respirator, a monthly Field Project Report is also completed and submitted to the Division Safety Manager by the 3rd calendar day after the end of each month.

4.8.3 Incident Notification

Employees involved in or witnessing an incident or near-miss incident must immediately report it to the responsible supervisor or foreman, who in turn immediately relays the report to Parsons

Project Manager, George Hermance. Near-miss incidents that could cause significant injury or loss of life must be immediately reported, in the same manner as an actual incident. No supervisor may decline to accept or relay a report of injury or significant near-miss incident from a subordinate.

The Project Manager must ensure that all incidents are reported to the Global Business Unit (GBU) Safety Manager and other management personnel (as required) within four hours. The Project Manager (who has been trained on Parsons' reporting requirements and Online Safety Reporting System) then prepares and submits the incident information.

The GBU Safety Manager or their designee must notify the local OSHA office immediately if an accident involves the death of an employee or hospitalization of three or more workers.

A wallet card containing Incident Reporting Guidelines is available online and shown below.

PARSONS (PE&I) Rev1/12

Incident Definition: any unexpected or unplanned event that involves personal injury, property damage, environmental spill or release, or a near miss.

Any incident that results in onsite medical treatment or prior to taking an employee to a medical facility requires the immediate notification of a Safety Mgr or WorkCare.

GBU Safety Director – Anthony Miller; (704) 264-6159
PE&I Env Div Safety Mgr – Greg Beck (908) 887-1973
OSS SE Safety Mgr – West Turner (662) 549-4120
OSS NE Safety Mgr – Mark Ulmer (412) 526-7708
OSS NW Safety Mgr – Mike Nelson (253) 606-2640
OSS SW Safety Mgr – Brady Harnish (786) 447-8640
OSS Central Safety Mgr – Kenny Coke (312) 659-982

PARSONS (PE&I) Rev1/12

Procedures following a Parsons/Subcontractor Incident

If the incident results in a lost workday case or worse:

- The Project Manager contacts the Division Manager and Operations Director immediately.

Within four (4) hours of any incident:

- The Project Manager ensures the incident is entered into the PWeb online Safety Reporting System (PE&I Home Page)

Within 48/72 hours (Contractor/Parsons) of an incident:

- Complete an incident investigation report to determine root causes and corrective actions to prevent recurrence.

PARSONS Emergency Contact Numbers:

- WorkCare: (888) 449-7787 (prior to medical treatment)
- US/Canada: (866) 727-1411; International: (775) 326-4594

4.9 INCIDENT INVESTIGATIONS

All incidents and significant near-miss incidents are investigated by an individual or team with training in accident investigation and root cause analysis. Subcontractors (if applicable) must investigate incidents involving their employees or activities and submit an investigation report to the Parsons Project Manager within 48 hours of an incident.

In Parsons, the GBU Safety Manager investigates or assigns an investigator to each significant incident. The investigator submits a final investigation report using the online safety reporting system within 72 hours of the incident. The Project Safety Manager maintains the investigation file.

4.10 RESPONSIBILITY/IDENTIFICATION OF KEY LINE PERSONNEL

A listing of the personnel that have the authority and responsibility for implementing the provisions of the Safety, Health, and Risk Program (SHARP) Management program are provided below.

Project Name/Office:	"Sanborn", Former Carborundum Facility, Wheatfield NY	
Address:	2040 Cory Drive, Wheatfield, NY.	
Telephone	Fax	Email

(716) 731-5322	(716) 731-5424	
Company Executive responsible for project		Contact No. (office)
Scott Hartsough		(513) 552-7001
Project Manager		Contact No.
George Hermance		(716) 407-4990
Site Health & Safety Representatives (depending on staffing and tasks) with First Aid and CPR		Contact No.
Jim Schuetz		(716) 541-0757
Field Team Leader		Contact No.
Task Dependent		TBD
Client - Project Management		Contact No.
William Barber		see emergency contact list

4.11 MEDICAL REQUIREMENTS AND WORKERS COMPENSATION

In accordance with corporate requirements the Division Safety Manager has established and implemented the following medical requirements for the project:

4.11.1 Medical Surveillance and/or Functional Capacity Exams (FCEs)

All personnel engaged in activities that results in the exposure to chemicals at or above the OSHA Permissible Exposure Limit (PEL) or wear a respirator for more than 30 days in a year, must comply with 29 CFR 1910.120(f) – Medical Surveillance. All personnel who wear a respirator must be medically qualified by a physician, trained and fit-tested on an annual basis, even if they are not required to participate in a medical surveillance program under 29 CFR 1910.120(f).

FCEs are not applicable for this project at this time, nor in the foreseeable future.

4.11.2 Substance Abuse and Alcohol Testing

The Division Safety Manager administers required substance abuse tests, including random drug and alcohol testing. A link to the corporate policy follows:

http://parsharesites.parsons.com/corp/Policies/Documents/Substance%20Abuse.pdf

The project/client requires the following types of drug and/or alcohol testing:

- Annual.
- Post-incident – including property damage.
- Reasonable suspicion.

For further details regarding the substance abuse program please refer to the HSSE Program Plan.

4.11.3 Medical Services and Panel of Physicians

The Project Manager in conjunction with the Parsons Workers Compensation Analyst establishes a panel of medical providers for the project and selects medical facilities to treat non-emergency work-related injuries and illnesses, as follows:

Non-Emergency

Comprehensive Occupational Medicine
51 Webster St
North Tonawanda, NY 14120
(716) 692-6541

NOTE: Transportation to a medical facility for non-emergencies must be done by at least two (2) individuals (i.e. driver and observer).

Emergency

Mt. St. Mary's Hospital of Niagara Falls
5300 Military Rd
Lewiston, NY 14092
716-298-2325

(see Emergency Response Plan, Section III for directions and map)

4.11.4 Emergency Medical Response

The project shall display posters/signs with emergency telephone numbers and locations of facilities in visible locations and at selected phone locations throughout the project area (including subcontractor facilities). See, "Site Emergency Response Plan" at the beginning of this PSP.

4.11.5 Workers Compensation Program

The Corporate Risk Management department establishes the appropriate workers compensation carrier. If a workers compensation loss occurs, the Corporate Workers Compensation Analyst (Donna Miller, 661-904-0978) handles all communication with the carrier.

This project does not participate in an OCIP or project-specific insurance program. The workers compensation policy covering Parsons employees on this project is as follows:

Chartis

P.O. Box 1830
Alpharetta, GA 30023
(646) 857-1537
(212) 770-0101 (fax)
WC policy: WC 206-35-110

4.11.6 Medical Monitoring

Based on the activities listed in Section 2.1, the following potential hazards or activities are associated with this project. As a result, medical surveillance will be required as listed below:

Name/Job Classification	Hazard/Activity	Medical Surveillance/Training
All on-site employees	Noise –	If noise exposures exceed 85 decibels over an 8-hour time weighted average, an employee must participate in a Hearing Conservation Program.
Treatment Plant operations and sampling	Chemical exposures –	If an employee is exposed at or above the Permissible Exposure Limit (PEL) of a chemical for more than 30 days in a year, they must participate in a Medical Surveillance Program.

Gregory H. Beck, Safety Manager, (908) 887-1973 administers the medical surveillance program.

SECTION 5 – PRE-FIELD WORK PHASE

5.1 RISK ANALYSIS AND SAFETY SPECIFICATION DEVELOPMENT

Procurement procedures require that a site-specific risk analysis be conducted before issuance of investigation and remediation RFPs. Using the pre-bid risk analysis checklist (attached), the Project Manager leads this analysis, which documents existing exposures that may impact the work, surrounding facilities, equipment, workers, or the public at large. The analysis includes locating, documenting, and photographing the following items:

- Overhead and underground power lines
- Other underground utilities
- Sewer and water utilities
- Existing building interferences
- Simultaneous Operations
- Crane access ways
- Traffic
- Security
- Fences
- Existing geographical and environmental conditions
- Investigation Derived Waste (IDW) Disposal
- Disposal of treatment plant hazardous waste (spent filter bags)
- Disposal of treatment plant non-hazardous waste (carbon)
- Confined spaces

Upon completion of the site risk analysis, high-risk activities are listed in the RFPs (as applicable), and bidders must describe controls and mitigation strategies in their proposals. The RFP notes that the list is representative and that the selected contractor must identify and control all work-related hazards.

Pre-field work activities include a detailed analysis of the scope of work and safety specifications in the prime contract, Parsons' project schedule and PSP, draft RFPs, and proposed subcontractor agreements. The Project's standard safety specifications are given below.

- Pre-Field Work Safety Meeting – *See Exhibit 5-1*
- Project Technical and General Conditions Specification Review – *Exhibit 5-2*
- Mobilization/Kickoff Safety Meeting Checklist - Exhibit 5-3
- Site Specific Risk Review Checklist – *Exhibit 5-4*

For further details see Section 6.3 - Job Safety Analysis

5.2 DESIGN AND REMEDIAL ACTION REVIEW

Periodic remedial action reviews are held in accordance with the project management plan. The Project Safety Manager participates in the review to ensure that safety issues are adequately addressed. During the remedial action review, the discussion focuses on how work is sequenced, interferences with continuing operations, and safe work approaches. Specific activity hazards analyses conducted before the scheduled work can mitigate identified/presumed risks.

Remedial action reviews are scheduled as follows:

- Yearly- date TBD.

5.3 PRE-BID MEETING

Pre-bid meetings are required to ensure that bidders understand the RFP, including expectations for safety and health performance. Subcontractors must complete a Parsons Contractor Safety Evaluation Form prior to attending a pre-bid meeting. During the pre-bid meeting, the Project Manager uses the Pre-Field Work Safety Meeting Checklist (Exhibit 5-1) to review project safety philosophy, principles, and Parsons requirements with all prospective bidders. Although this information is included in the RFP, the meeting reinforces the message.

5.4 CONTRACTOR SAFETY EVALUATION

Project procurement procedures require that all contractors (and their subcontractors) submit prequalification documentation for evaluation. The Procurement Manager or Division Safety Manager conducts the safety evaluation in accordance with the Parsons Contractor Safety Evaluation process and package posted on ParShare.

http://parsharesites.parsons.com/corp/oss/Safety/pei/env/CSE%20%20Contractor%20Safety%20Evaluation/Contractor%20Safety%20Evaluation%20Process/Contractor%20Safety%20Evaluation%20Process%20(Admin-User).pptx

5.5 PRE-FIELD WORK MEETING

The Project Manager holds a pre-field work safety meeting before the subcontractor begins work. The meeting includes subcontractor representatives, contracts manager, and representatives from all disciplines, including safety. During the safety review, the meeting participants review specific safety site/area, pre-bid risk analysis, and competent person and site-specific safety plan requirements. In addition, the Project Manager obtains a safety point of contact and emergency management information. The attached Mobilization/Kickoff Safety Meeting *(Exhibit 5-5)* is used by the Project Manager to document the meeting.

5.6 COMPETENT PERSON SUBMISSION REVIEW

Parsons and its subcontractors must identify OSHA-regulated and certified competent persons for work or tasks requiring that level of supervision. Certificates of Competency and applicable records

for Parsons employees working on BP projects are found on the Parsons BP Program portal at the link identified below.

https://projects.parsons.com/sites/bpretailscope/vpp/Employee%20Certification%20and%20Training/Forms/AllItems.aspx

Exhibit 5-1 – Standard Pre-Field Work Safety Meeting Checklist

PARSONS

Pre-Field Work Safety Meeting

Date:		Project/Location:	
Subcontractor Representative:		Parsons Project Manager:	
Phone:		Phone:	
Subcontractor Safety Rep:		Parsons Safety Manager:	
Phone:		Phone:	

The following items were identified and reviewed with the subcontractor.

Health & Safety		Medical	
Site-Specific Safety Plans/Model Program		Substance Abuse Screening	
Competent/Qualified Person Documentation		Emergency Procedures	
Safety Audits/Inspections		Site Security	
Subcontractor Responsibilities		Smoking Policy	
Site Orientation Requirements		Medical Services Requirements	
Mobilization/Kickoff Safety Meeting/Date		Treatment Locations/Addresses/Phone List	
Crane Inspection Certification		Other	
Personal Protective Equipment (PPE)			
Environmental Hazards			
Other			

Additional Notes/Comments:

WRAT to be completed prior to field work, TSEA and tailgate meeting documents must be completed a minimum of each day or change in conditions warrant.

Exhibit 5-2 – Project Technical and General Conditions Specification Review

Date: Project/Location:

Project Manager: Safety Manager:

The project specification review has revealed the following high-risk activities. Activities checked must be followed up during the construction phase with training, written plans and/or a specific Activity Hazard Analysis. This list should be reviewed with prospective bidders during the pre-bid meeting.

Steel Erection (SENRAC Requirements)		Demolition	
Excavations/Trenching		Marine Work/Liveboating	
Powered Industrial Trucks, Fork Lifts		Heavy Hauling	
Crane Work/Heavy Lifts, Rigging		Concrete	
Work Involving Hazardous Materials		Diving	
Electrical Tie-ins/Lockout–Tagout		Work Adjacent to Production Areas	
Aerial Lift Work – scissor lifts, extendable boom, etc.		Site Security/Visitor Control/Public Exposure	
Underground, Caissons, Cofferdams		Process Safety Management (PSM)	
Scaffold Erection/Work		Permits (Excavation/Scaffolding/Demolition/Traffic/Confined Space/Hot Work/Line breaking, etc.)	

High Risk Activities and Other Project Concerns:

5.7 SUBCONTRACTOR SAFETY PLAN (SSP) SUBMISSION REVIEW

All subcontractors must submit safety programs to the Parsons Project Manager and Division Safety Manager for review before they begin work on site. The Plan will be reviewed for adequacy in accordance with the SSP template located in Appendix A2 of the eSHARP Guidebook.

5.7.1 Contractor Site-Specific Safety Plans

At least 10 days before work begins, each contractor must submit two copies of its subcontractor safety program (SSP) to the Parsons Project Manager and Division Safety Manager for review. The Project Manager and Division Safety Manager review the SSP to ensure that it meets Parsons' requirements.

If a contractor needs assistance developing an SSP, an electronic copy of Parsons' HAZWOPER Model SSP template is posted on ParShare.

The SSP must address the following elements:

- Responsibility
- Compliance
- Communication
- Hazard assessment
- Accident exposure and investigation
- Hazard correction
- Training and instruction
- Recordkeeping

The SSP must include applicable requirements of Parsons PSP and OSHA CFR 1910/1926:

- Scope of work evaluation that describes the sequence of work and associated hazardous activities.
- Specific activity hazards analysis (AHA).
- A project site employee orientation program that addresses location specific issues relative to safety and health.
- A site-specific emergency action plan that includes a list of key management contacts with home office, project site, home, and cellular telephone numbers.
- A site-specific medical emergency plan that lists qualified first aid personnel by name and includes copies of their current certificates.
- Key line management personnel, by name and position, who will enforce the SSP.
- Key competent or qualified personnel by name and copy of current documentation identifying specific certified competency (e.g., scaffolding, excavations, and fall protection).
- Written progressive disciplinary program for violations of safety procedures.
- Trenching and shoring plan (if applicable).
- HAZWOPER training documentation (if applicable).
- Contractor task hazard planning.

- Subcontractor weekly safety planning submission.
- Contractor workers daily task safety planning.

5.8 MOBILIZATION/KICKOFF SAFETY MEETING

Project Managers conduct the Mobilization/Kickoff Safety Meeting on the first day of subcontractor mobilization in the field and at the work site. *(See* eSHARP Manual*.)* Exhibit 5-3 shows the checklist used for the safety portion of this meeting. The meeting includes the completion of a Site-Specific Risk Review Checklist *(Exhibit 5-4)* combined with a walkthrough of the work area to locate items on the pre-bid risk analysis checklist.

Exhibit 5-3 – Mobilization/Kickoff Safety Meeting Checklist

PARSONS

Mobilization/Kickoff Safety Meeting

Date: _____ Project/Location: _____

Parsons Representative: _____Subcontractor Representative: _____

The following project site safety, health and security requirements, procedures, and hazards have been identified and reviewed with the Subcontractor.

SSP/Emergency Planning/Response Plan			Demolition	
Competent/Qualified Person			Personal Protective Equipment	
Hazardous Materials/Waste			Cranes/Hoists/Annual Inspection Certificate	
Vehicle/Heavy Equipment			Overhead Power Lines	
Lockout/Tagout			Confined Spaces (Permit/Non-Permit)	
Electrical			Excavations/Trenching	
Fire Protection			Site Security/Visitor Control/Public Exposure	
Hot Work/Welding/Cutting			Process Safety Management (PSM)	
Fall Protection/Guardrails/ Scaffolding/Ladders			Permits (Excavation/Scaffolding/Demolition/Traffic/ Confined Space/etc.)	

Additional Project Concerns:

_____

_____

_____

_____

_____

Other Attendees:

Name	Title	Company

SECTION 6 – REMEDIATION PHASE

6.1 SITE RISK ANALYSIS

Before work begins, Project Managers lead a team that performs a risk analysis at each work site to identify hazards that require specific control measures. During weekly progress meetings, the Project Engineer and subcontractors submit written summaries of upcoming work tasks and associated risks and control measures to the Project Manager using *Exhibit 6-1*. The weekly summaries identify upcoming mobilization or demobilizations tasks, audits and inspections, competent person changes, training and new activities requiring an Activity Hazard Analysis (AHA) which are know in the client's program Task Safety Environmental Analysis (TSEA). Subcontractors add activities to these summaries at least two weeks in advance of the work. Potential hazards are listed below.

6.1.1 Chemical Hazards

Health hazards and the exposure limits associated with chemicals of concern are presented in Table 1 in Appendix B6. These hazards can be encountered during work activities. Based on previous investigation and sediment sampling, monitoring will be conducted in the workers breathing zone using a photoionization detector during intrusive activities.

Chemicals of Concern

Chemical of Concern	***Monitoring Equipment***	***Action Levels***	***PPE/Action Taken***
Chloroethane	*PID*	**<1 ppm**: Level D/ None. **1-5 ppm**: Level D/ Implement engineering controls to suppress vapor levels. **5-50 ppm**: Level C (qualitative fit test)/ Take 3 consecutive readings. If confirmed, wear half or full facepiece respirator. Continue engineering controls to suppress vapor levels. **50 – 200 ppm**: Level C (qualitative fit test)/ Take 3 consecutive readings. If confirmed, wear full facepiece respirator. Continue engineering controls to suppress vapor levels. **> 200 ppm**: / Stop work activities until engineering controls are implemented to suppress vapor levels.	
Trans-1,2-DCE	*PID*		
Cis-1,2-DCE	*PID*		
Ethane	*PID*		
Ethene	*PID*		
Tetrachloroethene	*PID*		
TCE	*PID*		
1,1,1-TCA	*PID*		
1,1-DCA	*PID*		
Methane	*PID*		
Vinyl Chloride	*PID*		
1,1-DCE	*PID*		

6.1.2 Physical Hazards

Physical hazards that may be encountered but are not limited to heat stress, cold-related illness, ultra-violet radiation and noise hazards.

Heat Stress:

Heat stress is one of the most common (and potentially serious) illnesses that affect field personnel. When site personnel are engaged in operations involving hot environments, a number of physiological responses can occur which may seriously affect the health and safety of the workers. Heat stress can result in health effects ranging from transient heat fatigue to serious illness or death. Heat stress can be eliminated or controlled through the use of a comprehensive heat stress prevention and monitoring program.

Cold-Related Illness:

Cold-related illness, like heat stress, is very common and can seriously affect field personnel if the appropriate controls are not established. Exposure to low temperatures presents a risk to employee safety and health, in the form of hypothermia and frostbite. Both can be controlled or eliminated by implementing employee training, periodic physiological screening, establishment of administrative controls, selecting proper work clothing, and wind-chill monitoring which all contribute to the prevention of hypothermia and frostbite.

Ultraviolet Radiation:

The sun emits ultraviolet radiation (UV) as heat and light. The skin's natural defense mechanisms attempt to reject the UV by distributing melanin pigmentation where needed. However, overexposure to direct sunlight can cause inflammation or blistering of the skin (sunburn). The use of sunscreen, long sleeve shirts, and wide brim hats can help prevent sunburn. Chronic exposure to UV radiation is known to cause skin cancer. In case of sunburn, do not apply burn ointment, cold cream, or butter to relieve pain. Use a dry dressing and get medical attention for severe, extensive sunburns.

Noise:

Operating heavy equipment can be a potential noise source. Hearing protection will be worn by personnel operating heavy equipment, or other personnel in close proximity to the equipment. If noise hazards are of concern for a particular project, appropriate hearing protection should be used.

6.1.3 Biological Hazards

Biological hazards can result from encounters with mammals, insects, snakes, spiders, ticks, plants, parasites, and pathogens. Mammals can bite or scratch when cornered or surprised. The bite or scratch can result in local infection or infection with systemic pathogens or parasites. Insect and spider bites can result in severe allergic reactions in sensitive individuals. Exposure to poison ivy, poison oak or poison sumac results in skin rash. Ticks carry a number of serious diseases. Dead animals, organic wastes, and contaminated soil and water can harbor parasites and pathogens. Most of the field activities will occur out on the Lake; however, there may be the possibility to encounter biological hazards surrounding the shoreline.

Poison Ivy:

Some of the most common and severe allergic reactions result from contact with poison ivy, poison oak, and poison sumac. Contact with the poisonous sap of these plants produces a severe rash characterized by redness, blisters, swelling, and intense burning and itching. The victim also may develop a high fever and may be very ill. Ordinarily, the rash begins within a few hours after exposure, but it may be delayed for 24 to 48 hours.

Ticks:

Ticks may be common during the spring and summer in the high grass areas on the Site. Two types of ticks may be encountered: the dog tick and the deer tick. The dog tick is the larger, more common tick. After biting, the dog tick will remain attached to the victim until engorged with blood. Dog ticks may transmit rocky mountain spotted fever and other diseases. The deer tick is much smaller, ranging from poppy seed to grape seed size, and does not remain attached to the skin for very long after biting. Deer ticks can transmit Lyme disease, which can have serious, long-term health effects if left untreated. Lyme disease is characterized by a bulls-eye type rash; light in the center with an outer red area. Flu-like symptoms may also occur. These signs may occur at different times and the rash may not appear. If you discover any bites on the skin, wash the affected area and seek medical attention if a rash or flu-like symptoms appear.

Bees, Wasps, Hornets, and Other Insects:

Symptoms of an insect bite are normally a sharp, immediate pain in the body part bitten. The following poisonous insects and insect-like creatures may be encountered:

- Bees (honeybees, bumble bees, wasps, and hornets);
- Caterpillars; and
- Beetles/Bugs

Spiders:

The two poisonous spiders that may be encountered are the Brown Recluse and the Black Widow. The Brown Recluse is up to one inch long with a violin or "fiddle" shaped mark on the top of the head. The Black Widow is a smaller, bulbous black spider with a red hourglass-shaped mark on the underside.

Reactions to a Brown Recluse spider bite include mild to severe pain within two to eight hours and a star shaped area around the bite within three to four days. Significant tissue death and loss accompanies a Brown Recluse spider bite. Reactions to a Black Widow spider include intense pain at the site of the bite after approximately 15 to 60 minutes, followed by profuse sweating, rigid abdominal muscles, muscle spasms, breathing difficulty, slurred speech, poor coordination, dilated pupils, and generalized swelling of face and extremities.

Persons that have been bitten by a Brown Recluse or Black Widow spider should be immediately transported to a hospital. The spider should be collected (if possible) for confirmation of the species.

Bloodborne Pathogens:

Blood borne pathogens enter the human body and blood circulation system through punctures, cuts or abrasions of the skin or mucous membranes. They are not transmitted through ingestion (swallowing), through the lungs (breathing), or by contact with whole, healthy skin. However, under the principle of universal precautions, all blood should be considered infectious, and all skin and mucous membranes should be considered to have possible points of entry for pathogens.

6.1.4 Environmental Hazards

Slip, Trip, and Fall Hazards:

The site may contain slip, trip, and fall hazards for site workers, such as:

- Holes, pits, tree roots, or ditches.
- Slippery surfaces.
- Steep grades.
- Uneven grades.
- Sharp objects, such as nails, metal shards, and broken glass.

Wet conditions may contribute to the possibility for field personnel to trip or slip and either injure themselves or fall.

Thunderstorm Hazards:

During the course of field operations, severe weather may be encountered, including thunderstorms, lightning, rainstorms, and other unsafe weather conditions (i.e., high winds and tornadoes). Criteria indicating that severe weather conditions may exist include:

- High winds (greater than 40 miles per hour – depending on the tree cover and other site specific conditions);
- Tornado watch or warning in place for the area including the site;
- Audible Thunder or Visible lightning;
- Extreme temperatures (e.g., greater than 100 degrees F); or
- Heavy rainfall that makes footing treacherous and visibility difficult.

If severe weather is approaching, while conducting outside activities, personnel will stop all work and move indoors. If thunder is heard, move indoors.

6.1.5 Fire Hazards

Although fires and explosions may arise spontaneously, they are more commonly the result of carelessness during the conduct of site activities, such as moving drums, mixing/bulking of site chemicals and during refueling of heavy or hand held equipment. Some potential causes of explosions and fires include:

- Mixing of incompatible chemicals, which cause reactions that spontaneously ignite due to the production of both flammable vapors and heat;

- Ignition of explosive or flammable chemical gases or vapors by external ignition sources;
- Ignition of materials due to oxygen enrichment;
- Agitation of shock or friction-sensitive compounds;
- Sudden release of materials under pressure.
- Chemical exposures – include Hazardous Substances of Concern table, etc.
- Environmental – cold/heat stress, animals, insects, poisonous plants/vegetation
- Falls – working at heights greater than six feet
- Hazardous material handling
- Heavy equipment operation
- Overhead and underground electrical
- Traffic

6.2 FIVE HAZARD CONTROL MEASURES – ORDER OF PRECEDENCE

Site hazards and hazards resulting from investigation and remediation activities are controlled using one or more of the control measures listed below. The order of precedence is as follows:

1. **Engineer/design to eliminate or minimize hazards.** A major component of the design phase is to select appropriate safety features to eliminate a hazard and render it fail-safe or provide redundancy using backup components.

   To reduce the spread of hazardous materials by workers from the contaminated areas to the clean areas, work zones will be delineated at the site. The flow of personnel between the zones will be controlled. The establishment of the work zones will help ensure that personnel are properly protected against the hazards present where they are working, work activities and contamination are confined to the appropriate areas, and personnel can be located and evacuated in an emergency.

EXCLUSION ZONE

Exclusion zones will be established at the site for all drilling and excavation activities; unprotected onlookers should be located 50 feet upwind of drilling, excavation or soil sampling activities. In the event that volatile organics are detected in the breathing zone as discussed later in this section, all personnel within the exclusion zone must don Level C protection. Exclusion zones will also be established during any activity when Level C protection is established as a result of conditions discussed later in this section.
All personnel within the exclusion zone will be required to use the specified level of protection. No food, drink, or smoking will be allowed in the exclusion or decontamination zones. Contact lenses and cosmetics are not permitted on-site.

DECONTAMINATION ZONE

Should it be necessary to establish an exclusion zone, a decontamination zone will be utilized. This zone will be established between the exclusion zone and the support zone, and will include the personnel and equipment necessary for decontamination of equipment and personnel (discussed below). Personnel and equipment in the exclusion zone must pass through this zone before entering the support zone. This zone should always be located upwind of the exclusion zone. Personnel and equipment coming through this zone will be scrubbed using a brush, water, and soap for appropriate equipment, boot covers, and other heavily contaminated surface. Other equipment will be wiped down with a moistened disposable towel until clean. All disposable PPE will be removed and placed in a trash bag.

SUPPORT ZONE

The support zone will include the remaining areas of the job site. Break areas, operational direction and support facilities (to include supplies, equipment storage and maintenance areas) will be located in this area. No equipment or personnel will be permitted to enter the support zone from the exclusion zone without passing through the personnel or equipment decontamination station. Eating, smoking, and drinking will be allowed only in this area.

2. **Guard the hazard.** Hazards that cannot be eliminated by design must be reduced to an acceptable risk level by safety guards or isolation devices that render them inactive.

3. **Provide warnings.** Hazards that cannot be totally eliminated by design or guarding are controlled through using a warning or alarm device.

   Appropriate warning signage is located in the field and the treatment plant.

4. **Provide special procedures or training.** When design, guarding, or warnings cannot eliminate hazards, subcontractors must develop procedures, training, and audits to ensure safe completion of work. Training cannot be a substitute for hazard elimination when life-threatening hazards are present.

   All personnel are trained for their appropriate activity. Task Safety Environmental Analysis (TSEAs), also referred to as Activity Hazard Analysis (AHA) are complete for each task. Appendix A is a complete list of TSEAs. If a task is not covered in one the current TSEA a new TSEA will be written.

   Prior to each day's field activity appropriate the Control of Work policies will be implemented. Appendix C contains details regarding Control of Work. These procedures include TSEA forms and permits..

5. **Provide personal protective equipment.** To protect workers from injury, the last method in the order of precedence is the use of personal protective equipment, such

as hard hats, gloves, eye protection, life jackets, and other protective equipment with the understanding that bulky, cumbersome, and heavy personal protective equipment is often discarded or not used, rendering this method ineffective without proper controls.

OSHA Requirements for Personal Protective Equipment

All personal protective equipment used during the course of the Operations, Maintenance, and Monitoring must meet the following OSHA standards:

Type of Protection	Regulation	Source
Eye and Face	29 CFR 1910.133	ANSI Z87.1-1968
Respiratory	29 CFR 1910.134	ANSI Z88.1-1980
Head	29 CFR 1910.135	ANSI Z89.1-1969
Foot	29 CFR 1910.136	ANSI Z41.1-1967

ANSI = American National Standards Institute

All individuals wearing a respirator must be fit-tested prior to use in accordance with OSHA regulations (29 CFR 1910.1025; 29 CFR 1910.134).
Air purifying respirators cannot be worn under the following conditions:

- Oxygen deficiency
- IDLH concentrations
- High relative humidity
- If contaminant levels exceed designated use concentrations.

  Note: If respiratory protection is used the appropriate respirator usage log(s) must be completed and returned to the Office Health and Safety Officer (Appendix B)

6.3 Activity Hazards Analysis – Task Safety Environmental Analysis (TSEA)

Parsons and its subcontractors are required to conduct an activity hazards analysis, also call Task Safety Environmental Analysis (TSEA) for all aspects of the work. The activity hazards analyses consist of the following three steps:

- Identify the task and break it down into steps.
- Identify the hazards associated with each step.
- Identify the specific hazard control measure used for each step in accordance with the order-of-precedence method of control.

The complete versions of TSEAs for the Site are in Appendix A

Additionally, the US Army Corps of Engineers website contains a library of sample AHAs that may be useful on projects. The Parsons PWeb should also be checked for AHAs and TSEAs.

The Project Managers may use uses the following list as a guide in determining the investigation and remediation activity hazards analyses for various high-hazard operations and critical tasks.

- **Confined Spaces**. Confined space work requires special consideration, evaluation, controls and applicable training for the entrant, attendant, supervisor and rescue personnel. Each space should be reviewed for regulatory compliance.
- **Crane Operations**. Consider special requirements for operations, maintenance, and heavy lifting operation. All lifts must be planned in accordance with the limitations of cranes being used. Critical lift plans are required when two cranes are used simultaneously. Crane operator certification is required when the boom length exceeds 100 feet.
- **Fall Protection**. Fall protection is required when employees are working more than six (6) feet above the normal work surface level. Consider how and where ladders, scaffold, work platforms, or lifts (including scissors or aerial lifts), roofing work and leading edges are used. Evaluate protective measures such as fall protection plans, use of personal fall arrest systems, and the work surfaces for slip and fall hazards and protection.
- **Field Activities**. Many different types of activities occur in the field from excavations, groundwater sampling, soil sampling, liner installation, well installation and monitoring, and pump tests. A variety of hazards could be incurred with each activity such as biological, slip/trips/falls and lacerations. An activity hazard analysis is required for each different field activity to identify the hazards and controls.
- **Field Visit**. When a field visit occurs, it may be before any field activities are taking place. However, there may still be hazards present such as walking or driving in fields with uneven terrain, poisonous vegetation, etc. Personal protective equipment such as a hard hat and safety glasses, sturdy work boots, long pants, long sleeve shirts and sunscreen are necessary.
- **Heavy Equipment Operation**. Evaluate the use of heavy equipment in operations such as site clearing, grading, drilling and excavation or lifting. Controls should include equipment alarms, use of qualified operators, equipment inspections, and any specific OSHA regulatory requirements.
- **Material Handling**. Consider the size and weight of loads, the equipment to be used, how the equipment is set up and protected, and safety and maintenance inspections of material handling and rigging equipment. Also consider employee training in the use of the equipment or personal body mechanics when engaged in manual material handling activities.
- **Material Storage**. Consider where materials and equipment will be stored on site. Implement measures to protect against chemical spills/releases, fire, vandalism and theft of tools, equipment, or materials. Also consider the hazards that may exist for workers when they are storing or retrieving those materials.
- **Mobilization/Demobilization**. Conduct an initial site inspection for pre-job planning. The inspection should cover potential exposures such as the location of electrical lines,

underground utilities, nearby structures, traffic conditions, site security needs, public exposures general liability, and other potential exposures.

- **Portable Hand and Power Tools**. Evaluate the tools to be used and the ways that workers are protected from the hazards associated with the use of tools. Consider tool maintenance requirements; electrical requirements; the use of ground fault circuit interrupters, grounding, extension cords, and tool inspection procedures; and employee training and PPE requirements.
- **Process Safety Management**. At process sites where highly hazardous chemicals are stored or used, comply with special considerations and process safety management OSHA regulations.
- **Traffic Controls**. Control measures include warning signs, flagmen, traffic stoppage and control, and unloading procedures. Internal traffic control plans should include ways to restrict the number of vehicles on site, the flow of vehicles accessing the site and driving through the site, haul roads, speed controls, subcontractor employee parking areas, merging of site traffic with local vehicle traffic, pedestrian controls in traffic zones, access by emergency and rescue vehicles and operator controls.
- **Vehicle Operation**. Although driving a vehicle may be second nature to many individuals, there are many hazards and controls that need to be identified. Fatigue and distractions are two hazards that many individuals do not think about on a regular basis. Operating off-road vehicles such as an All-Terrain Vehicle (ATV) also require training.

Exhibit 6-1 is a sample Task Safety Environmental Analysis (TSEA) form. Exhibit 6-2 shows a training record to be completed and kept on file for each activity hazards analysis.

Task Safety Environmental Analysis

Contractor:		Date:		JSA No:	
Supervisor:		Permit to work required?	N	Permit No:	
Location of worksite:		TSEA team members:	Name / Initials / Name / Initials		
Description					

Activity	Hazards	Risk control measures	Who is responsible?
List the tasks required to perform the activity in the sequence they are carried out.	Against each task list the hazards that could cause injury when the task is performed.	List the control measures required to eliminate or minimize the risk of injury arising from the identified hazard.	Write the name of the person responsible (supervisor or above) to implement the control measure identified.

Exhibit 6-2

PARSONS

Task Safety Environmental Analysis Training Record

JOB NUMBER_____

AHA NUMBER_____

JOB LOCATION_____

DATE:_____

NAME OF TRAINER:_____

SUBJECTS COVERED:_____

_____

_____

_____

TRAINING AIDS USED:_____

_____

_____

ATTENDEES (PLEASE SIGN NAME LEGIBLY):

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

(Use additional sheets if necessary)

6.4 SAFETY SYSTEMS ANALYSIS

GBU Safety Managers use the safety systems analysis for field staff and subcontractors whose work requires that they be on site for over six months. The analysis provides management with a rating that reflects the safety and health program effectiveness. Appendix B1 to the SHARP Management manual provides the program, protocol, and methodology.

6.5 REMEDIATION SITE INSPECTION

The remediation site inspection is a protocol designed to identify and correct unsafe acts and conditions, as well as recognize safe work practices and accomplishments, in Parsons or subcontractors' scope of work. The Project Manager or Project Safety Manager should develop standard safety checklists appropriate to the work being performed. *Exhibit 6-3* is an example of a simple checklist to evaluate a project's status. Additionally a copy of the "SAFE" audit form is located in Appendix B.

Inspections involve a daily or weekly walkaround of a project site that focuses on safety. The Project Manager or Project Engineer responsible for the work conduct inspections, accompanied by the Project Safety Manager as necessary. Daily walkarounds do not have to be documented, but once a week the Project Manager prepares an inspection report using *Exhibit 6-3* and forwards it to the Project Safety Manager for maintaining in the project file. Items found to be out of compliance must be assigned to the responsible party for corrective action and the corrective action tracked to completion. Subcontractors shall be advised of noncompliance items using a Notice of Subcontractor Violation, included as *Exhibit 6-4*.

6.6 DAILY SITE WALK CHECKLIST

Depending on the scope of work, type of activities (i.e. low risk versus high risk) and duration of the project, the Project Manager or their designee shall conduct a daily safety site walk using the Remediation Safety and Health Inspection Checklist in Exhibit 6-3 to identify problem areas. Items found to be out of compliance must be assigned corrective action and the corrective action tracked to completion.

Exhibit 6-3: Remediation Safety and Health Inspection Checklist

Project: _____ Date: __

Inspector: _____ Time: __

Any items that have been found deficient must be corrected before work or use.

This checklist includes, but is not limited to, the following:

	Yes	*No*
Safe Access and Workspace		
Are safe access and adequate space for movement available for:		
Emergencies		
Work area		
Walkways and passageways		
Are ladders, stairways, and elevators properly located and functioning?		
Is protection provided for excavations and trenches?		
Is overhead protection provided for all areas of exposure?		
Is lighting adequate?		
Planning Work for Safety		
Are employees provided with all required personal protective equipment (PPE)?		
Have other contractors and trades been coordinated with to prevent congestion and avoid hazards?		
Is air monitoring necessary to determine whether any chemical exposure exists?		
Utilities and Services Identification		
Has the Parsons Drilling Protocol been followed?		
Have all utilities been identified by signs/markout?		
Have high voltage lines been moved or de-energized, or barriers erected to prevent employee contact?		
Sanitary Facilities		
Is drinking water available?		
Are toilet facilities adequate?		
Work Procedures – Materials Handling		
Is material handling space adequate?		
Is material handling equipment adequate and proper?		
Is material handling equipment in good condition?		
Are workers properly trained to operate equipment and handle hazardous materials?		

Comments:

6.7 SAFETY AND HEALTH ENFORCEMENT

Parsons and its subcontractors enforce all applicable requirements of OSHA 1910 and 1926 as well as EM 385.1, where applicable. In addition, subcontractors must comply with and enforce Parsons site requirements.

Parsons and its subcontractors have written progressive disciplinary systems available for review in the respective Human Resources departments.

6.8 NOTICE OF VIOLATION OF SAFETY AND HEALTH REGULATIONS

The project has a formal notice of subcontractor violation of safety and health regulations program to ensure that violations are issued in an immediately dangerous to life and health (IDLH) situation or when the subcontractor repeatedly fails to comply with safety and health requirements.

The notice (Exhibit 6-4) documents poor performance and requires a response from subcontractor senior management. The notice contains five distinct levels of discipline, from submission of a recovery plan to contract termination.

6.9 COMPETENT FIRST AID PERSON

The OSHA Regulations (29 CFR 1910.151 and 1926.50) state the employer shall ensure the ready availability of medical personnel for advice and consultation on matters of occupational health. In the absence of an infirmary, clinic, hospital, or physician, that is reasonably accessible in terms of time and distance to the worksite (i.e. 4 minutes for activities that can be expected to result in an accident involving suffocation, severe bleeding, or other life threatening or permanently disabling injury or illness and 15 minutes for other types of injuries), which is available for the treatment of injured employees, a person who has a valid certificate in first-aid training from the U.S. Bureau of Mines, the American Red Cross, or equivalent training that can be verified by documentary evidence, shall be available at the worksite to render first aid. First-aid supplies must be accessible for immediate use and be of sufficient size and number to handle common first aid incidents.

The response time for Emergency Medical Services (EMS) when dialing 911 has been determined to be 5-10 minutes. Based on the activities provided in the Scope of Work (Section 2.1) and the list of Activity Hazard Analysis (AHA) included in Section 6.4, the project "does not" expect to have an accident involving suffocation, severe bleeding, or other life threatening or permanently disabling injury or illness. If EMS cannot respond to the project in less than 15 minutes (or 4 minutes based on the statement above), then the project will require at least one individual on site at all times that work is being performed to have a valid certificate in CPR and first aid.

6.10 PPE PLAN

Project Name: Sanborn-Former Carborundum Facility
Project Location: Wheatfield, New York
Project Start Date: _____

Introduction

The purpose of the Personal Protective Equipment Plan (PPE Plan) is to protect the employees at Sanborn from exposure to workplace hazards and the risk of injury through the use of PPE.

PPE cannot be used as a substitute for engineering, work practice, and/or administrative controls; it is used in conjunction with these controls to ensure employee safety and health in all Parsons operations. PPE does not eliminate a hazard; if PPE fails, exposure may occur.

Parsons provides PPE when it is determined that PPE use is required to ensure the safety and health of our employees and that such use will lessen the likelihood of occupational injury and/or illness. PPE is not used for any purpose other than employee protection.

This section addresses general PPE requirements, including eye and face, head, foot and leg, hand and arm, body protection, and protection from drowning. Separate programs exist for respiratory, fall, and hearing protection.

The Sanborn PPE Plan includes:

- Required PPE
- PPE selection
- Use and maintenance of PPE

Required PPE

PPE cannot be used as a substitute for engineering, work practice, and/or administrative controls. PPE is used with these controls to ensure employee safety and health among all Parsons operations. PPE does not eliminate the hazard; if PPE fails, exposure will occur.

The following minimum PPE is required for all persons on this project site:

1. ANSI-approved safety glasses with side shields
2. ANSI-approved hard hats (company logo recommended)
3. All-leather, above-the-ankle, lace-up work boots
4. High-visibility vest or shirt (company logo recommended)
5. Long sleeved shirt
6. Long pants

7. Ear protection for activities that exceed 85 dBA.

Employees are required to wear the following PPE for the following jobs on this project. TSEAs for each job are available from the safety representative.

If the work activity requires an upgrade in PPE, work will be stopped and the appropriate PPE will be selected. During the process of selecting PPE this PSP will be updated.

PPE Selection

The safety representative selects the appropriate PPE for each potential hazard presented in the TSEAs. The superintendent and project manager assist in determining the appropriate PPE.

Appropriate protection is selected based on an evaluation of the performance characteristics of the PPE relative to the task(s) to be performed, conditions present, duration of use and hazards and potential hazards identified.

- PPE must not interfere with work or create additional hazards (e.g., fogged lenses, trip hazard, loose materials).
- All PPE must be of safe design and construction for the work to be performed.
- Where feasible, PPE provides a level of protection greater than the minimum required to protect employees from hazards.
- If several different types of PPE are worn together, they must be compatible.
- Consider the fit and comfort of PPE when selecting appropriate items to encourage employee use of PPE. Multiple styles and sizes of PPE are available to accommodate employees. Select size-adjustable PPE when available (e.g., hard hats, lanyards).

Consider the chemical resistance properties of the PPE material.

Use and Maintenance of PPE

Parsons provides PPE to employees at no cost to the employee if the PPE is required by the TSEA or is of a type that would not reasonably or normally be worn away from the workplace, (e.g., single use or disposable PPE).

- The (foreman or supervisor) provides appropriate PPE to employees before the start of work.
- When employees provide their own PPE, Parsons is responsible for ensuring its adequacy, including determining that it is maintained in clean and reliable condition. The foreman/supervisor reviews any employee-owned PPE at the start of work.

The safety representative determines provisions for cleaning and storing PPE throughout the project. The superintendent provides secure storage facilities and personnel to maintain PPE accordingly. All PPE must be used and maintained in a clean and reliable condition as described below:

- Keep face and eye protection clean and in good condition. Cleaning is particularly important for eye and face protection: dirty or fogged lenses could impair vision.
- Disinfect goggles, gloves, respirators, and other protectors that have been previously used before they are issued to another employee.
- If contaminated PPE cannot be decontaminated, dispose of it in a manner that protects employees from exposure to hazards.
- If employees provide their own PPE, the foreman/supervisor must ensure that it is maintained in a clean and reliable condition.

The project manager must ensure that employees use PPE identified for their protection on the job:

- Before and after each use, employees must inspect PPE for defects and to ensure that defective PPE is not used.
- Defective and damaged PPE cannot be used.

6.11 AIR MONITORING PLAN DESCRIPTION

This element of the PSP details the guidelines for air monitoring and sampling of potential chemical to employees. This element applies to all Parsons' personnel and subcontractors working on the Former Carborundum Site, Sanborn, NY Project.

This element does not apply to noise, temperature extremes, asbestos, or lead. For further information, refer to CSHM-7, Hearing Conservation, CSHM-35, Asbestos and Lead, and CSHM-36, Temperature Extremes.

This element does not include all regulations for listed hazardous chemicals.

6.11.1 Definitions

Term	Description
Action Level	Indicates the level of a harmful or toxic substance/activity that requires medical surveillance, increased industrial hygiene monitoring, or biological monitoring.
American Conference of Governmental Industrial Hygienists (ACGIH)	A professional organization that sets recommended employee exposure guidelines called threshold limit values (TLVs).
Authorized Person	Any person authorized by Parsons and required by work duties to be present in regulated areas.
Building Facility Owner	The legal entity (including a lessee) that exercises control over management and recordkeeping functions relating to a building and/or facility in which activities covered by this procedure take place.
Clean Room	An uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment.
Competent Person	One who is capable of identifying existing asbestos or lead hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, and who has the authority to take prompt corrective measures to eliminate them.
Critical Barrier	One or more layers of plastic sealed over all openings into a work area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a work area from migrating to an adjacent area.
Decontamination	An area in an enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower area, and clean room, which is used for the decontamination of workers, materials, and equipment contaminated with asbestos.
Demolition	Wrecking or taking out any load-supporting structural member and any related razing, removal, or stripping of asbestos.
Disturbance	Contact that releases fibers from ACM or PACM or debris containing ACM or PACM. This term includes activities that disrupt the matrix of ACM or PACM, render ACM and PACM friable, or generate visible debris. Disturbance includes cutting away small amounts of ACM and PACM, no greater than the amount that can be contained in one standard-size glove bag or waste bag, in order to access a building component. In no event may the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or waste bag, measuring no more than 60 by 60 inches.

Term	Description
Dose	The quantity of ionizing radiation absorbed, per unit of mass, by the body or by any portion of the body. When the provisions in this section specify a dose during a period of time, the dose is the total quantity of radiation absorbed, per unit of mass, by the body or by any portion of the body during such period of time.
Excursion Limit	The employer ensures that no employee is exposed to an airborne concentration of asbestos in excess of 1.0 fiber per cubic centimeter of air (1 f/cc) as averaged over a sampling period of 30 minutes.
Fiber	A particulate form of asbestos 5 micrometers (μ) or longer, with a length-to-diameter ratio of at least 3 to 1.
Fume	Tiny solid (metal) particles condensed from a vapor, normally in the presence of intense heat such as welding, cutting, soldering, or brazing.
Glove Bag	An impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which material and tools may be handled.
Heat Stress	The total heat burden to which the body is subjected by both external and internal factors.
High-Efficiency Particulate Air (HEPA)	A filter capable of trapping and retaining at least 99.97% of all monodispersed particles of 0.3 μ in diameter or larger.
Homogeneous Area	An area of surfacing material or thermal system insulation that is uniform in color and texture.
Immediately Dangerous to Life or Health (IDLH)	Any atmosphere that poses an immediate hazard to life or poses immediate irreversible debilitating effects on health.
Industrial Hygienist (IH)	A professional qualified by education, training, and experience to anticipate, recognize, evaluate, and develop controls for occupational health hazards. A certified industrial hygienist is accredited by the American Board of Industrial Hygienists (ABIH).
National Institute for Occupational Safety and Health (NIOSH)	A federal agency under the Department of Health and Human Services CDC. NIOSH sets recommended employee exposure limits called recommended exposure limits (RELs).
Negative Initial Exposure Assessment	A demonstration by the employer that employee exposure during and operation is expected to be consistently below the PELs.
Negative Pressure	A local exhaust system capable of maintaining a minimum pressure differential of minus 0.02 inch of water column relative to adjacent unsealed areas.
Objective Data	Information demonstrating that a particular product or material containing lead or a specific process, operation, or activity involving lead cannot release dust or fumes in concentrations at or above the action level under any expected conditions of use. Objective data can be obtained from an industry-wide study or from laboratory product test results from manufacturers of lead containing products or materials. The data used from an industry-wide survey must be obtained under workplace conditions that closely resemble the processes, types of material, control methods, work practices, and environmental conditions in the anticipated operation.
Overexposure	Employee exposure to a chemical, physical, or biological hazard by means inhalation, dermal, or consumption at a level greater than PEL/TLVs.

Term	Description
Oxygen-deficient atmosphere	Atmosphere that contains less than 19.5% oxygen by volume (conversely, an oxygen-enriched atmosphere contains 23.5% or greater oxygen by volume)
Permissible Exposure Limits (PELs)	Regulatory limits on the amount or concentration of a substance in the air. They may also contain a skin designation. PELs are enforceable by the Occupational Safety and Health Administration (OSHA). Maximum concentration of asbestos that a worker may be exposed to an airborne concentration as an 8-hour TWA in excess of 0.1 f/cc.
PEL/Threshold Limit Value (TLV)	Used as a general acronym in this manual, referring to applicable employee exposure limits such as OSHA PELs, ACGIH TLVs, and/or NIOSH RELs. May refer to TWA, ceiling, short-term, or action limits, as applicable.
Personnel Monitoring Equipment	Devices designed to be worn or carried by an individual for the purpose of measuring the dose received (e.g., film badges, pocket chambers, pocket dosimeters, film rings, etc.
Project Designer	A person who has successfully completed the training requirements for an abatement project designer established by the governing regulatory agency.
Regulated Area	An area established by the employer to demarcate areas in which Classes I, II, and III asbestos work is conducted, and any adjoining area in which debris and waste from such asbestos work accumulate; and a work area within which airborne concentrations of asbestos exceed, or can reasonably be expected to exceed, the PEL.
Removal	Taking out or stripping asbestos (ACM or PACM).
Renovation	The modification of any existing structure, or portion thereof, where exposure to airborne asbestos may result.
Restricted Area	Any area access to which is controlled by the employer for purposes of protection of individuals from exposure to radiation or radioactive materials.
Surfacing Material	Material that is sprayed, troweled on, or otherwise applied to surfaces (e.g., acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, and other purposes).
Survey	An evaluation of the radiation hazards incident to the production, use, release, disposal, or presence of radioactive materials or other sources of radiation under a specific set of conditions. When appropriate, such evaluation includes a physical survey of the location of materials and equipment, and measurements of levels of radiation or concentrations of radioactive material present.
Thermal System Insulation (TSI)	ACM applied to pipes, fittings, boilers, breeching, tasks, ducts, or other structural components to prevent heat loss or gain.
Time-Weighted Average (TWA) Limit	Average value of exposure over the course of an 8-hour work shift. Thus, a worker may be exposed to a level higher than the PEL for part of the day as long as he is exposed to levels below the PEL for the rest of the day.
Unrestricted Area	Any area access to which is not controlled by the employer for purposes of protection of individuals from exposure to radiation or radioactive materials.
Vapor	The gaseous phase of matter that normally exists in a liquid (or solid) state at room temperature.

6.11.2 Responsibilities

Role	Responsibility
Corporate Health and Safety	• Reinforce the need to comply with requirements. • Provide structure and training for safety programs.
GBU Safety Director	• Responsible for providing support to ensure the success of project exposure control plan. • Collect applicable documentation at the close of the project. • Review instrumentation requirements and recommend equipment. • Provide expertise and guidance necessary to ensure that exposure assessments are performed properly.
Project Manager	• Review, approve, implement, and enforce project exposure control plan. • Designate competent persons to conduct project exposure control plan activities. • Designate standby employees for IDLH work.
Records Custodian	• Document employee training and maintain training documentation.
Superintendent	• Review subcontractor's radiation control documentation with subcontractor. • Facilitate compliance with, and enforce, the project exposure control plan.
Site Safety and Health Officer (SSHO)	• Lead development of, assist in implementation of, and oversee the project exposure control plan. • Conduct orientations, including details of the project exposure control plan, for all Parsons employees. • Exchange relevant radiation control and exposure assessment documentation with subcontractors. • Review subcontractor radiation control documentation and provide comments. • Coordinate training. • Establish procedures for, and oversee, the issue, control, and accountability of field safety and health instrumentation. • Identify and evaluate potential exposure hazards and determine appropriate controls. • Monitor program effectiveness.
Competent Person(s)	• Conduct direct-read monitoring. • Maintain calibration and routine maintenance of air monitoring equipment. • Conduct health and safety instrumentation inventory and inspection.
Standby Employees	• Monitor employees in the IDLH area. • Implement communication. • Initiate rescue duties.
Radiation Safety Officer (RSO)	• Ensure compliance with radiation protection standards.

Role	Responsibility
Radiography Personnel	• Demarcate restricted areas. • Conduct radiation monitoring surveys. • Report radiation incidents.
Foreman/Supervisor	• Confirm that jobs are properly evaluated for exposure hazards and that hazards are properly eliminated or controlled. • Review exposure hazards and controls with employees during daily huddles. • Ensure that employees adhere to the exposure control plan.
Employees	• Be knowledgeable of exposure hazards and control requirements. • Wear personal sampling equipment as instructed. • Report potential overexposures.
Subcontractors	• Comply with Parsons project exposure control plan. • Submit subcontractor radiation control documentation. • Train subcontractor employees.

6.11.3 Project Exposure Control Plan

This project exposure control plan is included in the project safety plan in accordance with Parsons SHARP Manual, Section 4. The project manager facilitates implementation and compliance with this plan, designating competent person(s) to conduct monitoring, and maintenance and calibration of air monitoring equipment.

6.11.4 Direct-Read Air Monitoring

The competent person conducts representative direct-read air monitoring to identify any IDLH condition, overexposure, or other dangerous condition (e.g., the presence of flammable or oxygen-deficient environments) in the following circumstances:

- Confined space entry
- Discovery of contaminants other than those previously identified
- Initiation of a different type of operation (e.g., drum opening as opposed to exploratory well drilling)

Direct-read air monitoring will be completed with a PID with an 11.7 ev lamp or FID at a minimum. For confined space entry or any ground breaking activities a three gas meter will also be used to monitor for explosive gas levels and oxygen deficient environments. Measurements will be collected continuously while ground breaking activities are taking place or a confined space has been entered. Readings will be documented in five minute intervals. Situations may arise when it is necessary to perform perimeter monitoring around active work areas to determine if site operations are impacting air quality in the surrounding community. Such air monitoring is identified and described on the Perimeter Air Monitoring Sheet (See CSHM-9-03). Perimeter air monitoring is generally performed by:

- Establishing background levels by either samples or measurements taken upwind of the site
- Taking representative samples or measurements from locations downwind of the operation

6.11.5 Engineering Controls

Engineering control is the most effective means of controlling atmospheric contaminants in the workplace. The ambition of controls is to reach concentrations that are as low as reasonably achievable (ALARA) in the following order of precedence:

- Engineering controls are instituted to limit exposure to hazardous substances, agents, and environments within acceptable limits (refer to CSHM-37, Ventilation).
- When engineering controls are not feasible or are not sufficient to limit exposure to hazardous substances, agents, and environments to within acceptable limits, work practice controls (e.g., wetting hazardous dusts) are instituted.
- When engineering or work practice controls are not feasible or are not sufficient to limit exposure to hazardous substances, agents, and environments to within acceptable limits, PPE programs are instituted in accordance with CSHM-6, Personal Protective Equipment; and CSHM-8, Respiratory Protection.

Ventilation systems are designed to prevent contaminants from dispersing into the air or drawing through the work area, of dusts, fumes, mists, vapors, and gases in concentrations that could cause harmful exposure.

6.11.6 Monitoring Equipment

At the SSHO's request, the GBU Safety Manager recommends arrangements for necessary monitoring equipment.

The designated competent person is responsible for maintenance and calibration of any direct-read monitoring equipment that is assigned to the project.

The competent person calibrates the air sampling instruments before and after sampling and documents the calibration of direct-read monitors is documented on the Monitor Calibration Log (Attachment CSHM-9-04).

The competent person also conducts quarterly instrumentation inventory and inspections. All instrumentation not in the field is inspected, receives routine maintenance, and is calibrated to ensure that it is in proper working order and available for use. The competent person records the inspection information in a monitoring instrumentation log and includes the date, person performing inspection, necessary maintenance performed, repairs required, calibration gas or other standard value, instrument response, and any adjustments, if required. Instruments that are identified as requiring repairs beyond routine maintenance (e.g., cleaning or replacement of consumables) are shipped to a qualified vendor or to the manufacturer for repair.

6.11.7 Training

Provisions for training are included in the project exposure control plan. Subcontractors must train for their own employees.

The SSHO arranges employee training at the time of initial assignment and when a new hazard is introduced to the jobsite. This training can be organized and presented to groups or on a work area by work area basis, depending on the operation.

Supervisors brief employees on air monitoring during daily huddles before beginning work.

At a minimum, the following information and training is provided:

- Employees conducting air monitoring are trained to use and read the monitors and to recognize monitor alarms.
- Competent persons maintaining air monitoring instruments are trained to calibrate, charge, and conduct routine maintenance of the instruments.
- Employees wearing personal air sampling instruments are informed of instructions to comply with air sampling. For example, employees will conduct duties as normal to provide a representative sample of exposure.

Using an acceptable training form, the records custodian maintains a record of all training or instruction given to employees.

6.12 HAZARDOUS MATERIALS HANDLING, TRANSPORTING & SHIPPING DESCRIPTION

This element of the PSP describes Parsons requirements for handling, transportation, storage, and disposal of hazardous materials. This element applies to all Parsons personnel and subcontractors working on Parsons projects at any location worldwide, regardless of country of operation and/or GBU.

This element is not all inclusive of applicable regulations; it does not address shipping or environmental regulations. This element also does not address liquefied petroleum (LP) bulk storage or specific hazardous waste regulations. PSM systems are covered in CSHM-14, Process Safety Management.

6.12.1 Definitions

Term	Description
Bonding	The process of connecting two or more conductive objects together by means of a conductor.
Combustible Liquid	Any liquid having a flash point at or above 100°F. Combustible liquids are designated as Class II and Class III liquids as follows: • Class II: Flash point ≥100°F and <140°F. • Class III: Flash point ≥140°F. Class III liquids are divided into two groups: ▪ Class IIIA: Flash point ≥140°F and <200°F. ▪ Class IIIB: Flashpoint ≥ 200°F.
Daily Toolbox Meeting Record	The documentation describing the activities taking place on site and the potential hazards associated with the Site. Includes a "Post Daily Review" to incorporate any possible incidences, stop work or first aid occurrences throughout the day. Also serves as a "sign-in/sign-out" sheet for workers on-site and visitors.
Flammable Gas	A gas that is flammable when mixed with air in concentrations of 13% or less by volume in air.
Flammable Liquid	Any liquid having a flash point below 100°F. Flammable liquids are designated as Class I liquids, which are divided into three groups: • Class IA: Flash point <73°F and boiling point <100°F. • Class IB: Flash point <73°F and boiling point ≥100°F. • Class IC: Flash point ≥73°F and boiling point <100°F.
Flammable (Explosive) Limits	The term "lower flammable limit (LFL)" or "lower explosive limit (LEL)" describes the concentration of vapor to air below which propagation of a flame or an explosion will not occur in the presence of an ignition source. The term "upper flammable limit (UFL)" or "upper explosive limit (UEL)" is the vapor-to-air concentration above which propagation of flame or an explosion will not occur. If a vapor-to-air mixture is below the LFL or LEL, it is described as being "too lean" to burn; if it is above the UFL or UEL, it is "too rich" to burn. When the vapor-to-air ratio is between the LFL or LEL and the UFL or UEL, fires and/or explosions can occur.
Grounding	The process of connecting one or more conductive objects to the ground; a specific form of bonding.

Term	Description
Inert Gas	A simple asphyxiant gas that displaces oxygen in the air necessary to sustain life. Inert gases can cause rapid suffocation because of a resultant oxygen deficiency.
Material Safety Data Sheet (MSDS)	The written document that sets forth the specific information about a toxic or hazardous substance.
NFPA Small Compressed Gas Cylinder	A National Fire Protection Association-approved cylinder having a maximum water capacity of 1,000 pounds (i.e., 120 gallons) or less.
Task Safety Environmental Analysis (TSEA)	A written document completed while in the field that outlines the job tasks, biological or energy sources, possible hazards, mitigation measures and who is considered responsible.

6.12.2 Responsibilities

Role	Responsibility
Corporate Health and Safety	• Reinforce the need to comply with requirements. • Provide structure for safety programs and training.
GBU Safety Director	• Responsible for providing support to ensure the success of this element. • Audit effectiveness of this element.
Project Manager	• Responsible for implementing and enforcing this element. Designate person(s) to oversee all storage, handling, and use of flammable and combustible liquids.
Records Custodian	• Document employee training and maintain training documentation.
Superintendent	• Facilitate compliance with and enforce this element.
Site Safety and Health Officer (SSHO)	• Develop, monitor, and assist in implementation of this element. • Conduct orientations for subcontractors and new employees. • Determine training needs and coordinates employee training. • Provide the regulatory expertise to ensure that activities are conducted in compliance with the applicable codes, standards, and regulations. • Ensure that AHAs are conducted to evaluate hazards. • Determine PPE requirements in addition to minimum requirements.
Foreman/Supervisor	• Supervise work and enforce this element. • Conduct daily safety huddles emphasizing hot work safety.
Designated Person(s)	• Oversee all storage, handling, and use of flammable and combustible liquids. • Attend tank cars/trucks during load and unload of flammable and combustible materials. • Conduct inspections of storage areas.
Employees	• Comply with material handling, storage, and transportation requirements.
Subcontractors	• Comply with all Parsons requirements. • Train subcontractor employees.

6.12.3 General Handling

- Where practical, site personnel will avoid manual material handling tasks.
- Superintendents ensure that material handling equipment (mechanical and/or powered) is available when practical.
- Instruct site personnel in the proper techniques and practices for manual material handling before beginning work.
- When assigning manual material handling tasks consider personal physical limitations that vary among individuals. Take care to not exceed these limitations.
- When heavy or bulky material is to be moved, evaluate the material handling requirements in terms of weight, size, distance, and path of movement. Observe the following hierarchy when selecting a means for material handling:
    - Eliminate material handling needs by engineering
    - Move by mechanical device (e.g., lift truck, overhead crane, or conveyor)
    - Move by manual means with handling aid (e.g., dolly or cart)
    - Move using safe lifting techniques. Refer to safe lifting procedures in CSHM-3, Ergonomics.
- Ensure that material handling devices suit the material handling needs of an activity. Provide the proper tools for the job to be performed.
- Wear PPE as prescribed.
- In all instances, personnel must seek assistance when performing manual material handling tasks that appear to be beyond their physical capabilities.
- Two or more personnel lifting one item coordinate the movement of materials in unison.
- Use additional planning for such problems as sharp edges, odd sizes of shapes of loads, hazards of fragile material, uneven weight distribution, and routes of travel while handling material.
- When using jacks, remove the handles when they are not in use. Jacks must be level and set on a firm surface and are operated by hand, not by foot.
- Do not hoist bagged material, lumber, bricks, masonry blocks, and similar unsecured type materials by slings unless they are secured against falling by straps, sideboards, nets, or other suitable devices that fully secure the load.
- Use tag lines to control loads when hoisting materials near personnel, structures, or equipment. Exceptions to this requirement can be considered when it is shown that use of tag lines creates undue hazards.

6.12.4 General Storage

Handling and storage requirements must be in accordance with product MSDSs (described in CSHM-10, Hazard Communication).

Store materials in a planned and orderly manner to avoid endangering the safety of employees:

- Do not store materials under overhead power lines.
- Stack combustible materials securely. Do not allow stacks or piles to exceed 16 feet in height. Do not store combustible material within 10 feet of a building or structure.
- Do not place or store materials so as to interfere with accessways, doorways, or hoistways. Ensure that the aisle width is adequate to accommodate the firefighting equipment.
- Maintain a clearance of 44 inches around the path of travel of fire doors.
- Do not place materials stored inside buildings under construction within 6 feet of any hoistway, or inside floor openings, or within 10 feet of an exterior wall that does not extend above the top of the material stored.
- Ensure that driveways between and around combustible storage piles all at least 15 feet wide and are maintained free of accumulations of material or rubbish. For driveways in an open yard, plan for combustible material storage areas.
- To prevent tripping hazards, each tool must have a designated storage place when not in use. Subcontractors will not leave loose tools and materials on stairways, poles, ladders, or other elevated locations.
- Do not allow accumulations of scrap or materials to obstruct accessways and exits. Separate material and store it in piles of similar sizes and types.
- Store and maintain office supplies in neat and orderly piles with similar materials stacked together.
- Do not leave boxes and/or materials unattended on the floor, and do not allow them to block access to any area.
- Do not store or leave loose or light materials on roofs unless they are safely tied down or secured.
- Avoid running hoses, power cords, welding leads, ropes, and other tripping hazards across traffic areas.
- Secure cords, hoses, and leads 7 feet above walkways and work areas.
- Provide containers for storing or carrying rivets, bolts, and similar items.
- Ensure that stacks, tiers, and piles are stable and stacked to facilitate safe handling and loading.

- Stack bagged materials by stepping back the layers and cross-keying the bags at least every 10 bags high, except when restrained by walls or partitions of adequate strength.
- Ensure that all nails are removed from reusable lumber before it is stacked for storage. Place scrap lumber in containers; do not allow it to accumulate in work areas.
- Stock brick and blocks on an even, solid surface.

Except for floors or slabs on grade, post the maximum safe load limits in pounds per square foot in conspicuous locations in all indoor storage areas. Do not exceed these maximum safe loads.

Display weight limits prominently on all pallet racks throughout the storage facility. Materials stored on pallet racks cannot exceed the recommended weight limits set by the manufacturer. Use shrink-wrap or other adequate means to contain all materials stored at or above 84 inches from floor level.

Maintain a clearance of at least 36 inches between stored materials and sprinkler heads.

Portable fire extinguishing equipment rated 2A40B:C is provided at accessible, marked locations in the yard. Portable fire extinguishers are placed so that maximum travel distance to the nearest unit does not exceed 100 feet.

Store, handle, and pile materials with consideration for their fire characteristics, according to CSHM-12, Fire Protection:

- Separate incompatible materials that may create a fire hazard by a distance of at least 25 feet or isolate them by a barrier having at least a 1-hour fire rating.
- Pile material to minimize the spread of fire internally and to provide convenient access for firefighting.
- Ensure that portable fire extinguishers have a minimum rating of 2A40B:C and are stored at accessible marked locations in the building.
- Place portable fire extinguishers so that the maximum travel distance to the nearest unit does not exceed 75 feet.
- Do not store flammable liquids, paints, and thinners unless they are required for operation. If storage is necessary, keep flammable liquids in a metal cabinet approved for storage of flammable liquids.

6.12.5 Compressed Gas Storage

- Store all compressed gas cylinders in an upright position.
- Secure cylinders by a chain to ensure that they will not be accidentally knocked over.
- Ensure that storage locations are well ventilated, in accordance with CSHM-37, Ventilation. Do not allow ambient room storage temperatures to exceed 125°F.

- When rigs are not in use, turn off valves, and bleed down and disconnect hoses, remove regulators, and place safety caps on bottles.
- Ensure that cylinder storage locations are distinctly marked with the names of each compressed gas maintained at the location. Post "NO SMOKING — FLAMMABLE GAS" signs at all entrances to locations where flammable gases are stored.
- Ensure that each compressed gas cylinder maintained at a storage location is labeled with proper identification of its contents.
- All cylinders in storage require valve protection caps at all times except when the cylinder contents are being dispensed.
- Ensure that storage locations for oxidizing gas (i.e., oxygen) and flammable gas (e.g., acetylene) cylinders maintain a minimum distance of 20 feet to separate the oxidizing and flammable gas cylinders.
- Store cylinder storage areas containing flammable gases to avoid contact with a possible ignition source. Walls of the storage area must have a fire rating resistance of at least 1 hour, and doors must be in accordance with NFPA 80.
- Heat flammable gas storage areas by indirect means (i.e., steam or hot water).
- Electrical equipment within a flammable storage area must be in accordance with CSHM-24, Electrical, and NFPA 70.
- Ensure that portable fire extinguishers consisting of carbon dioxide and/or dry chemical are available at the storage locations.

6.12.6 Compressed Gas Transportation

- When transporting gas bottles, securely mount them in a rack.
- Do not roll, slide, or drag compressed gas cylinders from one location to another. Do not roll cylinders onto a forklift.
- If cylinders are to be hauled by a powered vehicle, secure them in a vertical position. Do not use chokers to haul cylinders.
- Use only an approved handtruck to transport cylinders.
- Before moving any cylinders, remove all pressure regulators and install valve protection caps.
- Do not hoist compressed gas bottles by a sling.
- Do not use protective caps to lift cylinders.

6.12.7 Compressed Gas Handling

- Before using a compressed gas cylinder, inspect all cylinder connections, hoses, valves, regulators, and torches. All connections must be tight with no leaks. Do not use damaged and/or deteriorated cylinder, valves, couplings, hoses, etc.

- Do not lubricate compressed gas-cylinder valves, couplings, hoses, etc., or allow them to come into contact with oil and/or grease. Ensure that regulators are kept free of oil. Do not place cylinders of compressed gases in areas where there may be oil and/or grease; do not handle these cylinders with oily and/or greasy hands.
- If the contents of a compressed gas cylinder are depleted, fully close the cylinder valve and reinstall the valve protection cap. Mark the cylinder tank appropriately with an "EMPTY TANK" sign and store the tank in a secured upright position.
- Tag cylinder valve leaks and remove leaking cylinders from service. If a fuse plug leaks, leave the cylinders in service and apply tags stating "DO NOT USE."
- Do not use compressed gas cylinders in areas where the cylinder tank may come in contact with any sparks or flames.
- Compressed gases contained within a cylinder are under extremely high pressure. Therefore, whenever gas is to be withdrawn from a cylinder, use pressure-reducing valves. Under no circumstances is gas to be removed from a cylinder without the use of a pressure-reducing valve.
- When opening cylinder valves, point the gas outlets away from the user and any other facility personnel standing in the immediate usage area.
- Open all cylinder valves slowly using only approved wrenches for the cylinder as provided by the supplier. When using a compressed gas cylinder, ensure that the operating wrench remains on the cylinder valve at all times.
- After each use of a compressed gas, fully close the cylinder valve and slowly purge all gas remaining in the regulator valve. Remove the regulator valve, install, the cylinder valve cap, and remove the cylinder tank from the work area and return it to its proper storage location.
- Use cylinder trucks to secure cylinders in a vertical position while in use.
- Ensure that cylinders are never placed where they can become part of an electrical circuit.
- Keep cylinders away from actual work so that no sparks, hot slag, or flame can reach them. If cylinders cannot be isolated, provide fire-resistant shields for them.
- Use flashback safety valves on all lines at the gauges. Torches must have flashback protection built into the torch body or check valves between hose and torch.

6.12.8 Flammable and Combustible Liquid Storage

- The project manager designates a qualified person to oversee all storage, handling, and use of flammable and combustible liquids in accordance with NFPA 30.
- Smoking is prohibited within 50 feet of areas used for flammable and combustible material storage and handling. Use signs to designate no smoking areas.

- Only approved containers and portable tanks may be used to store flammable and combustible liquids:
    - Use approved metal safety cans for flammable liquids in quantities greater than 1 gallon.
    - For quantities of 1 gallon or less, use only the original container or approved metal safety cans.
    - Label containers in accordance with CSHM-10, Hazard Communication.
- Lubricating, linseed, and motor oils in small quantities need not be stored in safety cans. However, never store these oils in open containers (e.g., cans or buckets), and always tag, label, or otherwise indicate the contents on the outside of each container.
- Do not store flammable or combustible liquids in areas used for exits, stairways, or normally used for the safe passage of people.
- Store flammable and combustible liquids in excess of 25 gallons in an acceptable or approved cabinet meeting the requirements of the governing regulatory agency.
    - Do not store more than 25 gallons of flammable/combustible liquids in a room outside of an approved storage cabinet.
    - Label storage cabinets in conspicuous lettering: "FLAMMABLE — KEEP FIRE AWAY."
    - Do not store more than 60 gallons of flammable liquids or 120 gallons of combustible liquids in any one storage cabinet. Do not locate more than three cabinets in a single storage area.
- Store large containers (55-gallon drums) of oils or solvents outside in specially designed and diked areas.
- For storage of flammable and combustible liquids outdoors, containers (no more than 60 gallons each) cannot exceed 1,100 gallons in any one pile or area. Separate piles or groups of containers by a 5-foot clearance and a distance of 20 feet from any building or structure.
- Within 200 feet of each pile of containers, provide a 12-foot-wide access way to permit approach of fire control apparatus.
- Grade the storage area to divert possible spills away from buildings or other exposures, or surround it by a curb or earth dike at least 12 inches high. When curbs or dikes are used, make provisions to drain off accumulations of groundwater or rainwater, or spills of flammable or combustible liquids.
- Take precautions to prevent the ignition of flammable/combustible vapors. Sources of ignition include:
    - Cutting and welding
    - Frictional heat

- Hot surfaces
- Lightning
- Open flames
- Radiant heat
- Smoking
- Spontaneous ignition, including heat-producing chemical reactions
- Static, electrical, and mechanical sparks

- To prevent accumulation of static charge, ensure that containers are electrically bonded and grounded according to CSHM-24, Electrical.
- Locate at least one portable fire extinguisher (with a rating of no less than 20-B units) between 25 and 75 feet from any flammable/combustible liquid storage area located outdoors.
- Provide ventilation to prevent vapor accumulations in enclosed chemical storage areas in accordance with CSHM-37, Ventilation:

  - Vapors released by solvents without adequate ventilation will be explosive if concentrated in sufficient volume in closed or restricted areas.
  - Where flammability is not of concern, inhalation toxicity protection can be afforded by breathing air equipment, in accordance with CSHM-8, Respiratory Protection. Skin contact, skin absorption, and oral ingestion protection must be considered as part of the protection ensemble.

- Employees must guard carefully against any part of their clothing becoming contaminated with flammable or combustible fluids. Employees cannot continue work if their clothing becomes contaminated; they must remove or wet down the clothing as soon as possible.
- Hot work such as welding, cutting, and brazing operations, use of spark-producing power tools, and chipping operations is permitted only under the conditions of a hot work permit, in accordance with CSHM-28, Welding, Cutting, and Brazing.
- Tank cars/trucks must be spotted and not loaded or unloaded until brakes are set and wheels chocked, precautions are taken against fire or other hazards, and cars/trucks are properly bonded and grounded. Tank cars/trucks must be attended by a designated person during loading or unloading.

6.12.9 Explosives Transportation, Handling and Disposal

Explosives are not expected to be transported, handled or disposed of on Site.

6.12.10 Periodic Inspection

Superintendents and supervisors notify the project manager of any non-routine storage and handling during the 2-week look-ahead. The project manager adds the work to the schedule. The project manager ensures that storage areas are inspected at least weekly.

6.12.11 Training

Parsons trains employees in the proper handling and storage procedures to be used on the worksite. Subcontractors must train their own employees.

The SSHO arranges employee training at the time of initial assignment. Supervisors are responsible for identifying additional employee training needs during risk mitigation planning (2-week look ahead) in accordance with the SHARP Manual. Training can be organized and presented to groups or on a work area by work area basis, depending on the operation.

Employees are trained in safe lifting techniques in accordance with CSHM-3, Ergonomics.

Additional retraining is conducted whenever there are deviations from, or inadequacies in, the employee's knowledge or use of proper procedures. The retraining re-establishes employee proficiency and introduces new or revised control methods and procedures, as necessary.

Using an acceptable training form, the records custodian maintains a record of all training or instruction given to employees.

PARSONS

Notice of Subcontractor Violation of Safety and Health Regulations

Date: _____

Contractor Name: _____
Address: _____

_____

_____

_____

Attention: _____

This letter officially notifies you that you have been found to be in violation of the following Safety Regulations:

_____

on (date) _____, by _____.

Confined Space Entry	___	Lockout/Tagout	___	Hot Work	___	Personal Protective Equipment	___
Knowledge of the environment	___	Awareness of warning alarms	___	Evacuation routes	___	Back-up Alarms	___
Assembly locations	___	Fall Protection	___	Scaffolding	___	Environmental/Hazardous Material Storage	___
Trenching	___	Safe Work Practices	___	Security Practices	___		

Other: _____

_____

_____

This/These violations occurred at the following locations: _____

_____

at the following times _____ and dates _____

The name of the employees was/were _____

under the supervision of _____.

PARSONS

Notice of Noncompliance with Safety and Health Regulations

Under conditions of this enforcement procedure check all items that apply:

_____ 1. You are being notified of this violation and should take corrective action to prevent a reoccurrence. The corrective action shall be documented to the Parsons Construction Management representative immediately.

_____ 2. You must submit a plan for compliance to your Parsons Construction Management representative and the Construction Safety Manager within two days of receipt of this letter. The compliance plan must include the means or methods of compliance and the date that the requirements for compliance will be completed. Once compliance has been achieved, a follow up letter must be sent to the Parsons Construction Management representative and Construction Safety Manager. Failure to comply will result in disciplinary action against your Company.

_____ 3. You are required to review the stated procedures with your Parsons Construction Management representative. Work may not commence on the site until the review is complete and the Subcontractor responds formally that the procedure is understood and will comply.

_____ 4. You are required to review the stated procedures with your Parsons Construction Management representative. Work may not commence on the site until the review is complete and you must confirm formally the disciplinary action to be taken against the supervisor and employees.

_____ 5. All work on the site will stop until the Parsons Construction Management representative reviews all the facts with the Subcontractor and determines if the contract between the parties will be terminated.

Sincerely,

_____
Parsons Representative

cc: Issuing Construction Manager Representative
Job File
GBU Safety Manager
Project Manager

SECTION 7 – SAFETY TRAINING

7.1 PROJECT SAFETY ORIENTATION

The Parsons Project Manager, Project Engineer, or Project Safety Manager conducts the site-specific orientation for all new Parsons staff and subcontractor management personnel.

The Orientation takes approximately *one hour to complete* and consists of applicable owner, Parsons, and regulatory reference material, including:

- Owner – Contractor Safety Program and Manual of Safety Regulations Handbook and security requirements
- Applicable OSHA 1910 General Industry and 1926 Construction Regulations and others as required
- Parsons applicable requirements, including items covered in Section 4.2
- Subcontractor requirements

All visitors must receive a brief orientation as described in Section 4.2, and be escorted by the Project Manager, Project Engineer, Project Safety Manager or a designee familiar with the potential hazards on the project.

Subcontractors must conduct similar orientations for their staff and craft employees and must document all orientations using the Employee/Subcontractor Training Acknowledgement and sample form (Exhibit 7-1). The Project Manager maintains the orientation documents and acknowledgement forms.

7.2 PARSONSU SAFETY MODULES AND START TRAINING – ZERO INCIDENT TECHNIQUES

Consistent with Parsons corporate initiatives in safety training, the Project Manager will identify all applicable personnel (i.e. managers, engineers and supervisors, including subcontractor personnel), that shall be current in the completion of safety modules on ParsonsU and that should receive START training to further Parsons' goal of zero incidents

The GBU and Division Safety Manager serve as the certified trainers for periodic START training sessions for new personnel. They should be contacted if personnel need to receive training.

7.3 DAILY TOOLBOX SAFETY MEETINGS

Parsons and its subcontractors conduct daily toolbox safety meetings at the beginning of each week. These meetings include topics relevant to upcoming work and may include reviews of recent incidents on the project. The Project Manager is responsible for the toolbox safety training content and documenting and retaining attendance records using Exhibit 7-2..

7.4 ACTIVITY HAZARDS ANALYSIS TRAINING

When the activity hazards analysis is complete, the Parsons Project Manager/Engineer/Supervisor or subcontractor conducts a training session with all employees involved with the analyzed task. The training may be informal and at the site where the task is performed. Employees should be given an opportunity to provide input regarding task steps, hazards identified, and appropriate control measures.

The Project Manager documents and maintains the activity hazards analyses using Exhibit 6-2.

7.5 REGULATORY TRAINING PROGRAMS

OSHA regulations require specific training in certain circumstances. Based on the scope of work and meetings with regulatory officials, the following training topics are provided on the project:

- Hazard Communication – as per 29 CFR 1910.1200
- General – all workers engaged in activities which are potentially exposed to hazardous substances and health hazards must be trained to meet 1910.120(e)(1). Annual 8-hour refresher training as per 29 CFR 1910.120(e)(3) is required for workers and supervisors must be trained to meet 29 CFR 1910.120(e)(4).
- CPR/AED/First aid – provided to personnel based on project activities identified in the Scope of Work (i.e. life threatening) and EMS response time (i.e. less than 15 minutes). See Section 6.9.
- Powder-operated hand tools
- Gas welding and cutting
- Confined space entry – Supervisor must be trained to meet 29 CFR 1926.651(j).
- Lockout/tagout – as per 29 CFR 1910.147.
- Excavation/trenching – as per 29 CFR 1926.651.

The Project Manager determines the necessary training and coordinates the training with the Project Safety Manager. *(See SHARP Management Manual Section 8 for further details.)*

7.6 OSHA OUTREACH PROGRAMS

When applicable, the project may use qualified instructors and online courses to conduct OSHA 10-hour construction safety training. If applicable, supervisory staff must complete the 30-hour course. Depending on the scope of work, similar requirements may be included in all subcontracts. Participants successfully completing the course receive a certificate of completion from OSHA.

7.7 SPECIALIZED TRAINING AND ORIENTATIONS

Project personnel receive specialized training on client rules and requirements as well as the unique tools, equipment, and procedures used to perform the work. The project budget includes funding for the following training:

Description	Attendees	Schedule
General rules and safety requirements	*All workers assigned to the site*	*Half-hour training session, provided to new employee on the first day of work at the site.*

Exhibit 7-1

PARSONS

Employee/Subcontractor Training Acknowledgement

Name of Trainer: _____

Training Subject: _____

Training materials used: _____

Name of employee: _____

Date of hire/assignment: _____

I, _____, hereby certify that I have received training as described above in the following areas:

- Names of personnel responsible for site safety and health.
- Safety, health or other hazards at the site.
- The proper use of personal protective equipment.
- The potential occupational hazards in general in the work area and associated with my job assignment.
- Work practices by which a worker can minimize risks from hazards.
- Safe use of engineering controls and equipment on the site.
- Acute effects of compounds on the site.
- Decontamination procedures.
- General safety requirements indicate the safe work conditions, safe work practices and personal protective equipment required for my work.
- The hazards of any chemicals to which I may be exposed and my right to information contained on material safety data sheets for those chemicals, and how to understand this information.
- My right to ask questions, or provide any information to the employer on safety either directly or anonymously without any fear of reprisal.
- Disciplinary procedures the employer will use to enforce compliance with general safety requirements.

I understand this training and agree to comply with general safety requirements for my work area.

_____ _____

Employee Signature Date

Exhibit 7-2 - Safety Meeting Sign-In Sheet

Safety Meeting Presenter: _____ Date: _____
Current Weather Conditions:

Temperature (^{o}F) = _____ Wind Direction = _____ Wind Speed = _____
Clear - Sunny – Cloudy – Rain - Snow Forecast = _____
Current Site Conditions (circle as appropriate):

Dry - Wet - Muddy - Frozen - Snow Covered - Other (describe) _____

1. Incidents or Injuries to report from Previous Day Activities: No □ Yes □ - explain below:
_____

2. Safe and/or At-Risk Observations from Previous Day Activities:_____

_____

3. Activities Taking Place Today: _____

_____

3. Anticipated Hazards: _____

_____

4. Engineering Controls-Work Practices-PPE to Protect Against Hazards: _____

_____

5. Additional Safety Topic or Comments: _____

PRINTED NAME	SIGNATURE	COMPANY	LAST 4 DIGITS OF SS #

SECTION 8 – RECORDKEEPING AND POSTING

Parsons and its subcontractors must comply with the recordkeeping requirements of OSHA, Owner, Parsons Corporation, and this safety program, including:

- OSHA 300 logs
- Medical treatment and follow-up
- Cranes
- Heavy equipment inspection logs
- Fall protection
- Training
- Inspections
- Audits
- Others as required

The Project Manager is the official record keeper for files relating to Parsons employees. Each subcontractor maintains its files.

The project displays OSHA posters in conspicuous places as required by OSHA, including one poster on the main bulletin board located in the treatment plant office. The OSHA 300 log for the project or the GBU shall be posted from February 1 – April 30 of each calendar year.

SECTION 9 – SAFETY AND HEALTH REQUIREMENTS

9.1 SAFETY AND HEALTH REQUIREMENTS

Table 9-1 represents OSHA, owner, and Parsons corporate regulations and requirements applicable to the project. Based on the most recent risk assessments, Parsons Project Manager and Project Safety Manager update the listed topics periodically. Training and other requirements are updated in this PSP as required by changes to Exhibit 9-1.

Parsons and its subcontractors are individually responsible for training their respective employees and for complying with all project requirements. Failure to comply could lead to disciplinary actions against Parsons employees and subcontractors or their employees.

Exhibit 9-1 – Competent Person and Job Safety Analysis Requirements

Safety and Health Requirement	OSHA Regulation	EM 385-1-1 Regulation	Competent Qualified Person-Supv	Training Required	AHA Required
1. General Safety & Health	1926.20	01.A	*Yes*	*N/A*	*N/A*
2. Safety Training	1926.21	01.B.01	*Yes*	*N/A*	*N/A*
3. Confined Spaces	1910.146; 1926.21	06.01	*Yes; Supv*	*N/A*	*N/A*
4. Confined Space Permit System	1910.146	06.01	*Yes*	*N/A*	*N/A*
5. First Aid and Medical	1926.23, 50	03.A	*Yes*	*N/A*	*N/A*
6. Fire Protection and Prevention	1926.24, 150-155, 352	09.A	*Yes*	*N/A*	*N/A*
7. Housekeeping	1926.25	14.C	*N/A*	*N/A*	*N/A*
8. Illumination	1926.26, 56	07.A	*Recommended*	*N/A*	*N/A*
9. Sanitation	1926.27, 51	02.A	*N/A*	*N/A*	*N/A*
10. Personal Protective Equipment	1926.28, 95-98, 100-107	05.A	*Yes*	*N/A*	*N/A*
11. Acceptable Certifications	1926.29		*Yes*	*N/A*	*N/A*
12. Incorporation by Reference	1926.31	Preamble	*N/A*	*N/A*	*N/A*
13. Emergency Employee Action Plans	1926.35	01.E	*Recommended*	*N/A*	*N/A*
14. Noise Exposure	1910.95; 1926.52	05.C	*Yes*	*N/A*	*N/A*
15. Radiation Protection	1926.53, 54		*Yes*	*N/A*	*N/A*
16. Gases, Vapors, Dusts and Mists	1926.1926.55		*Yes*	*N/A*	*N/A*
17. Ventilation	1926.57, 353		*Recommended*	*N/A*	*N/A*
18. Hazard Communication	1926.59	1.B.06	*Yes*	*N/A*	*N/A*
19. Process Safety Management	1910.119; 1926.64		*Yes*	*N/A*	*N/A*
20. Hazardous Waste Operations and Emergency Response	1910.120; 1926.65	28.A	*Yes* *Supv – 8 hr*	*Yes*	*Yes*
21. Accident prevention signs and tags	1926.200	08.A	*N/A*	*N/A*	*N/A*
22. Signaling	1926.201	08.B	*Recommended*	*N/A*	*N/A*
23. Barricades	1926.202		*N/A*	*N/A*	*N/A*
24. Material Storage	1926.250	14.B	*N/A*	*N/A*	*N/A*

Exhibit 9-1 – Competent Person and Activity Hazards Analysis Requirements (Cont'd)

Safety and Health Requirement	OSHA Regulation	EM 385-1-1 Regulation	Competent Qualified Person	Training Required	AHA Required
25. Rigging	1926.251	15.A	*Yes*	*N/A*	*N/A*
26. Waste Disposal	1926.252	14.D	*Yes*	*N/A*	*N/A*
27. Tools	1926.300-307	13.A	*N/A*	*N/A*	*Yes*
28. Gas Welding and Cutting	1926.350	10.A	*Recommended*	*N/A*	*N/A*
29. Arc Welding	1926.351	10.E	*Recommended*	*N/A*	*N/A*
30. Electrical	1926.400-415	11.E	*Yes*	*N/A*	*N/A*
31. General Electrical	1926.416	11.A	*Yes*	*N/A*	*N/A*
32. Lockout Tagout	1910.147; 1926.417	12.A	*Yes*	*N/A*	*N/A*
33. Lockout Tagout Permit System	1910.147	12.A	*Yes*	*N/A*	*N/A*
34. Maintenance of Electrical Equipment	1926.431	11A	*Yes*	*N/A*	*N/A*
35. Environmental Deterioration of Electrical Equipment	1926.432		*Yes*	*N/A*	*N/A*
36. Batteries/Battery Charging Equipment	1926.441	11.E	*N/A*	*N/A*	*N/A*
37. Scaffolding	1926.450-454	22.A	*Yes*	*N/A*	*N/A*
38. Aerial Lifts	1926.453	22.J and K	*Yes*	*N/A*	*N/A*
39. Fall Protection	1926.500-503	21.A	*Yes*	*N/A*	*N/A*
40. Cranes, Derricks, Hoists, Elevators and Conveyors	1926.550	16.A	*Yes*	*N/A*	*N/A*
41. Motor Vehicles, Mechanized Equipment	1926.600-603	18.A	*Yes*	*Yes*	*Yes*
42. Powered Industrial Trucks (forklifts)	1910.178		*Yes*	*N/A*	*N/A*
43. Site Clearing	1926.604	31.A	*N/A*	*N/A*	*N/A*
44. Marine Operations and Equipment	1926.606	16.F	*Yes*	*N/A*	*N/A*
45. Excavations	1926.650-652	25.A	*Yes*	*N/A*	*N/A*
46. Excavation Permit	N/A	N/A	*Yes*	*N/A*	*N/A*
47. Concrete and Masonry Construction	1926.700-706	27.A	*Yes*	*N/A*	*N/A*
48. Steel Erection	1926.750-761 and SENRAC		*Yes*	*N/A*	*N/A*
49. Underground Construction	1926.800	26.A	*Yes*	*N/A*	*N/A*
50. Caissons	1926.801	26.H	*Yes*	*N/A*	*N/A*
51. Cofferdams	1926.802		*Yes*	*N/A*	*N/A*
52. Compressed Air	1926.803	26.I	*Yes*	*N/A*	*N/A*
53. Demolition	1926.850-860 inclusive	23.A	*Yes*	*N/A*	*N/A*
54. Power Transmission and Distribution	1926.950-960 inclusive	11.H	*Yes*	*N/A*	*N/A*
55. Rollover Protective Structures; Overhead Protection	1926.1000-1003 inclusive		*N/A*	*N/A*	*N/A*
56. Stairways and Ladders Scope	1926.1050	21.A	*N/A*	*N/A*	*N/A*
57. S/L General Requirements	1926.1051		*Yes*	*N/A*	*N/A*
58. Stairways	1926.1052	21.E	*Recommended*	*N/A*	*N/A*
59. Ladders	1926.1053	21.D	*Yes*	*N/A*	*N/A*

Exhibit 9-1 – Competent Person and Activity Hazards Analysis Requirements (Cont'd)

Safety and Health Requirement	OSHA Regulation	EM 385-1-1 Regulation	Competent Qualified Person	Training Required	AHA Required
25. Rigging	1926.251	15.A	*Yes*	*N/A*	*N/A*
26. Waste Disposal	1926.252	14.D	*Yes*	*N/A*	*N/A*
27. Tools	1926.300-307	13.A	*N/A*	*N/A*	*Yes*
28. Gas Welding and Cutting	1926.350	10.A	*Recommended*	*N/A*	*N/A*
29. Arc Welding	1926.351	10.E	*Recommended*	*N/A*	*N/A*
30. Electrical	1926.400-415	11.E	*Yes*	*N/A*	*N/A*
31. General Electrical	1926.416	11.A	*Yes*	*N/A*	*N/A*
32. Lockout Tagout	1910.147; 1926.417	12.A	*Yes*	*N/A*	*N/A*
33. Lockout Tagout Permit System	1910.147	12.A	*Yes*	*N/A*	*N/A*
34. Maintenance of Electrical Equipment	1926.431	11A	*Yes*	*N/A*	*N/A*
35. Environmental Deterioration of Electrical Equipment	1926.432		*Yes*	*N/A*	*N/A*
36. Batteries/Battery Charging Equipment	1926.441	11.E	*N/A*	*N/A*	*N/A*
37. Scaffolding	1926.450-454	22.A	*Yes*	*N/A*	*N/A*
38. Aerial Lifts	1926.453	22.J and K	*Yes*	*N/A*	*N/A*
39. Fall Protection	1926.500-503	21.A	*Yes*	*N/A*	*N/A*
40. Cranes, Derricks, Hoists, Elevators and Conveyors	1926.550	16.A	*Yes*	*N/A*	*N/A*
41. Motor Vehicles, Mechanized Equipment	1926.600-603	18.A	*Yes*	*Yes*	*Yes*
42. Powered Industrial Trucks (forklifts)	1910.178		*Yes*	*N/A*	*N/A*
43. Site Clearing	1926.604	31.A	*N/A*	*N/A*	*N/A*
44. Marine Operations and Equipment	1926.606	16.F	*Yes*	*N/A*	*N/A*
45. Excavations	1926.650-652	25.A	*Yes*	*N/A*	*N/A*
46. Excavation Permit	N/A	N/A	*Yes*	*N/A*	*N/A*
47. Concrete and Masonry Construction	1926.700-706	27.A	*Yes*	*N/A*	*N/A*
48. Steel Erection	1926.750-761 and SENRAC		*Yes*	*N/A*	*N/A*
49. Underground Construction	1926.800	26.A	*Yes*	*N/A*	*N/A*
50. Caissons	1926.801	26.H	*Yes*	*N/A*	*N/A*
51. Cofferdams	1926.802		*Yes*	*N/A*	*N/A*
52. Compressed Air	1926.803	26.I	*Yes*	*N/A*	*N/A*
53. Demolition	1926.850-860 inclusive	23.A	*Yes*	*N/A*	*N/A*
54. Power Transmission and Distribution	1926.950-960 inclusive	11.H	*Yes*	*N/A*	*N/A*
55. Rollover Protective Structures; Overhead Protection	1926.1000-1003 inclusive		*N/A*	*N/A*	*N/A*
56. Stairways and Ladders Scope	1926.1050	21.A	*N/A*	*N/A*	*N/A*
57. S/L General Requirements	1926.1051		*Yes*	*N/A*	*N/A*
58. Stairways	1926.1052	21.E	*Recommended*	*N/A*	*N/A*
59. Ladders	1926.1053	21.D	*Yes*	*N/A*	*N/A*

APPENDIX A TASK SAFETY ENVIRONMENTAL ANALYSIS

TASK SAFETY ENVIRONMENTAL ANALYSIS

Document Control Number_____ Page of

Date Form Completed:	Person Competent in hazard recognition:
Work Location:	Person Competent in the TSEA process:
State the Job:	Member of workforce participating in the TSEA:

Definition of a Hazard: The potential for an uncontrolled release of, or unwanted contact with, a biological or energy source.

Activity/Sequence of Job Tasks List all tasks required to perform a job in the sequence they are carried out. NOTE: IF a valid and accurate TSEA or SOP already exists in an acceptable format that meets RM requirements for hazard recognition and participation, then simply note below and attach it to this form and the signature page.	**Energy or Biological Sources** (circle all that apply)	**What** would be the result of exposure to a biological or energy source? (e.g., slip, trip, fall, exposures, electrocution, injury, death, etc.). **How, where, or when** could an uncontrolled release or unwanted contact with a biological or energy source occur?	**Environmental Impacts** Could there be a release to the air, soil or water? Will a waste be generated?	**Energy/Biological/Waste Management Plan** Eliminate-Control-Protect **Risk Control Measures** List control measures required to eliminate, control or protect against unwanted contact with an uncontrolled biological or energy source to minimize the risk of injury or environmental impact.	**Who is responsible?** Write the name of the person responsible for implementing the control measure identified.
	Motion Gravity Chemical Radiation Electrical Heat/Cold Biological Pressure				
	Motion Gravity Chemical Radiation Electrical Heat/Cold Biological Pressure				

TASK SAFETY ENVIRONMENTAL ANALYSIS

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TASK SAFETY ENVIRONMENTAL ANALYSIS

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	Motion Gravity Chemical Radiation Electrical Heat/Cold Biological Pressure				

APPENDIX B PARSONS REQUIREMENTS

B1 – Daily Field Report

DAILY FIELD REPORT

Date:_____ Page _____ of _____

Were there any incidents or near miss incidents?	Yes:		No:	
Incident Report Submitted?	Yes:		No:	

Job Name:		Parsons Contact:	
Job Number:		Weather	
Client:		Temperature	
Client Contact:		Time/Hours	
PRISM Project:			

On-Site:

Name	Company	Position	Activity	Total Field Hours

Company	Equipment/Vehicle	Model/Type	Quantity	Total Mileage*	
				Light	Heavy

AIR MONITORING:

Equipment	Hazards/Chemicals	Exceeded Actions Levels/ Permissable Exposure Limits		PPE Level (D,MD,C,B,A)
		Yes	No	

SUMMARY:

Notes: * Light: personal/rental cars (<3.5 tons) mileage Heavy: Equipment/Machinery (>3.5 tons) mileage

Entered into PARCOMM and BP forms

DFR:_____
(initials)

DAILY FIELD REPORT INSTRUCTIONS

Daily Field Report

The Daily Field Report (DFR) is intended to provide a means of reporting data outside of the field logbook in a precise and organized manner. Any field notes must include a DFR and be routed to file as normal. The DFR is designed to facilitate monthly project reporting by initiating up to date record keeping.

The DFR will be maintained by the Field Team Leader (or their designee). The procedures for completing the DFR are described below.

1. Indicate if incident(s) or near-miss(es) occurred on-site (e.g., yes, no) including:
    - Light or heavy vehicle incidents;
    - OSHA incidents: any unplanned or unexpected event including first aid cases, personal injuries requiring medical treatment, property damage, or environmental release; and
    - Near-Miss Incidents (NI): an incident that has the potential for personal injury, property damage, or environmental release, but does not occur.

    Note: Parsons and BP procedures must be followed when reporting incidents in accordance with the Parsons BP Program and site-specific Health, Safety, Security, and Environmental Plans and as described herein. An incident is any unexpected or unplanned event including near-misses, personal injuries, property damage, or environmental releases. Personal injuries involving medical treatment and incidents resulting in more than $1,000 will be verbally reported and submitted on the PWeb within **four hours**. Specifically, the Field Team Leader will verbally notify the Program Manager, the Project Manager, and the Safety Manager within **four hours** and will enter the incident information on the PWeb (PARCOMM home page) using the Online Safety Reporting System. Additionally, an incident investigation report will be completed to identify root causes and corrective actions to prevent recurrence.

    BP requires that all incidents/accidents be reported within **one hour** to the HSSE Manager, Regional Manager, and the EBM/HSSE Coordinator and a report completed within **24 hours** by the Regional Manager. Additionally, and investigation and root cause analysis must be completed within 10 days of the incident and a final report submitted within 30 days. For near misses, BP requires that the Project Manager notify the BP Regional Manager within **72 hours**. The Regional Manager will be responsible for completing a HSE Incident or Near Miss Report with relevant investigations within 14 days of the incident. Parsons and BP incident reporting forms are available in the HSSE Plan for Parsons BP Program Site Operations and in Livelink.

2. Complete general information:
    - Date (e.g., Wednesday, March 3, 2005, Wed, 3/03/05);
    - Job name (e.g. BP 04808 SOM & Wilson Mills);
    - Job number (e.g., 441247.05210);
    - Client (e.g., BP Remediation Management);

- Client Contact (e.g., Bruno Mancini);
- PRSIM Project (e.g. BP Retail RM) (see attached list);
- Parsons Contact (e.g., Paul Zahrte);
- Weather (e.g., overcast, cloudy);
- Temperature (e.g., ~60^{o}F); and
- Time/hours: List the total hours that Parsons and/or subcontractors were at the site (e.g., 0700-1530).

3. Record on-site information related to personnel:
    - Name of all on-site personnel and their affiliated company (e.g., Chuck Burkert - Parsons, John Doe – Well Drilling Inc). Include Parsons and subcontractors;
    - Position (e.g., Field Team Leader, oversight);
    - Activity (e.g., abatement); and
    - Hours worked by individuals in field (e.g., 10 hours). Only subcontractor hours are needed. Parsons hours will be obtained from PRISM by Kelly Miller as long as the appropriate Cost Types are utilized by Parsons personnel.
4. Record information related to equipment and vehicles at the site:
    - Equipment/Vehicle Type – list type of equipment (e.g., backhoe, drill rig) or vehicle (e.g., personal car, delivery van).
    - Description – enter equipment/vehicle details (e.g., owner, model, etc.)
    - Quantity is represented as the total for the day (e.g., 3 rental vehicles and 4 backhoes), even if a unit is on-site for only a portion of the day; and
    - Total mileage reported as light or heavy (e.g., 50 miles).
        - Light miles: personal, rental, or company cars; light trucks; and vans.
        - Heavy miles: equipment and machinery.
        - Equipment and/or machinery arriving and leaving the site: represent the total miles as the amount it has traveled to arrive on-site and the total miles it has traveled during departure from the site to its next location. For equipment that remains on-site more than one day, "Not Applicable (NA)" applies for those days.
        - Parsons employee's personal, rental, or company vehicles; light trucks, or vans: record the total miles for the entire trip, to be reported at the end of the work duration or week (which ever comes first). Use "NA" for days in between.
        - Subcontractor's total light miles will be reported daily.

5. Record air monitoring performed on-site including:
    - Type of monitoring equipment (e.g., PID, 4-gas, Draeger tubes, etc.);

- Chemicals and hazards that were monitored (e.g., O^2, LEL, dust, volatiles, etc.); and
- Action Levels (AL) or Permissible Exposure Limits (PEL) that were exceeded (e.g., yes-X or no-X). The AL or PEL values exceeded will be listed in the summary section of the DFR.

6. Record the level of PPE worn based on the following categories:
    - Level D (D) - work clothes;
    - Level D Modified (DM) - coveralls (e.g. Tyvek);
    - Level C (C) - chemical resistant suit and/or air-purifying respirator;
    - Level B (B) - chemical resistant suit and/or supplied air; and
    - Level (A) -full encapsulating suit with SCBA.

    If an AL or PEL is exceeded, or if PPE above Level D is worn, a Supplemental Information Form (Attachment C) must be completed for each Parsons employee. This form includes the employee name, job title, and facility (office location). The Supplemental Information Form will be used to record the chemical exposure (date, project, chemical, exposure duration, and chemical concentration) and the Personal Protective Equipment (date, project, level of PPE, and length of use). This form is used for evaluation for annual or bi-annual baseline physicals and other Parsons health and safety requirements.

7. Summary:
    - Brief description of the day's activities;
    - Identify the event that lead to any incidents or near misses for the day; and
    - Record the limits and the exceeded values for any ALs or PELs exceeded during the day.

If more space is required, attach a second DFR form with the continuation of information.

Once the DFR is completed, a copy must be provided to the designated administrative staff, and the original must be routed to the project files with any other field notes as usual.

PARCOMM and BP Monthly Forms

On a monthly basis the DFR information will be entered into the PARCOMM Field/Project Monthly Report Form and the BP Monthly Hours and Mileage Form by the designated administrative staff. Once completed, the administrative personnel will initial the DFR and route each DFR to a designated BP monthly reporting file.

B2 – Incident Reporting Guidelines

PARSONS INCIDENT REPORTING POLICY

Incidents Reporting Guidelines

- Incident Definition - any unexpected or unplanned event involving a Parsons' employee or subcontractor. This includes near-losses, personal injuries, property damage or environmental releases. Issue wallet card on "Incident Reporting Guidelines" from LiveLink.
- Incidents that are known or believed to be **life threatening** must be verbally reported immediately to the PARCOMM: President, Division Manager, Safety Director and Human Resource Director.
- **Personal injuries requiring medical treatment and incidents resulting in more than $1K** costs shall be orally reported within **four hours** to the Parsons Program Manager, Project Manager and Safety Manager, and entered into the Online Safety Reporting System (PWeb – PARCOMM Home Page).
- **Near-misses, first aid cases and other incidents resulting in less than $1K** costs shall be reported within **24 hours** to the Safety Manager (Greg Beck) and entered into the Online Safety Reporting System on the PWeb (PARCOMM Home Page).
- An **incident investigation report must be completed within 72 hours** to determine root causes and corrective actions to prevent recurrence. Procedures for completing an incident investigation report can be found in the SHARP Manual – Section 14.4.

Oral Reporting: A listing of phone numbers is provided below. Reporting is to be done immediately after tending to the first response of the incident by the responsible party. Assistance will be requested by the Parsons staffer initiating the incident reporting to facilitate the notification and documentation process. In order of communication (starting at the top of the list and working down as directed):

1. Greg Beck — 908-887-1973 cell PARCOMM Safety Manager (Env. Div.)
   (Bill Bradford — Parsons Program Safety Mgr (315) 546-5146 cell)
2. Anthony Miller — 704-558-4386 [(704) 264-6159 cell] PARCOMM Safety Director
3. Peter Marrocco — (905) 944-8877 PARCOMM Division Manager
4. Debra Fiori — (704)558-4008 PARCOMM Human Resources
5. Mike Walsh — (704)307-6924 PARCOMM President

In the event none of the aforementioned people cannot be reached, please call the following phone numbers.

PARSONS Emergency Contact Numbers:

US/Canada 866-727-1411; International 775-326-4594

Online Incident Report: In addition to the verbal communication requirement, the PROJECT MANAGER must submit online an incident report at https://pwebtools.parsons.com/safety/IncidentSelect.aspx.

B3 – Job Clearance Form

Job Clearance Form

CONTRACTOR INSTRUCTIONS PRIOR TO START OF WORK: 1. Review form, check appropriate boxes, read and sign at the bottom of this form. 2. Inform dealer, manager or site representative of the job to be performed and potential safety concerns and obtain signature.

Station #:	Station Address:	Work Order Number:	Date:

Contractor Company Name:	Contractor person in charge (print name):	Number of Workers:	JSA Reference Number: (if required)	Start Time:	End Time:	Labor:	Travel Time:	Travel Distance:

Problem/Work Description:

Return Call: Yes / No

Damage Claim: Yes / No

PRE REQUIRED (CHECK AND/OR FILL BLANK SPACE)

- ☐ SAFETY VEST
- ☐ HARD HAT
- ☐ SHOES & BOOTS
- ☐ HEARING PROTECTION
- ☐ RESPIRATOR
- ☐ PROTECTIVE CLOTHING
- ☐ GLOVES
- ☐ SAFETY GLASSES/GOGGLES
- ☐ WELDING PIPE
- ☐ OTHER _____

Contractor to complete this section below if circumstances on site or specific to this job may generate additional hazards that are not described in the JSA (also see back of page for additional guidance and if more space required to document)

Task Step	Hazards not covered by JSA	How to reduce or eliminate risk - Include PPE to be Worn

Work documentation requirements — Lower Risk - no JSA required — Medium Risk / Higher Risk tasks - JSA required — Higher Risk - JSA required & appropriate check list completed (see below)

Examples of Higher / Medium tasks:

- ☐ Works at heights: in all cases on open sites - on closed sites if no JSA present
- ☐ Trenching or excavation related to underground tank: product lines
- ☐ Heavy lifting
- ☐ Work in confined spaces (e.g. tank, interceptor or ceep manhole entry)
- ☐ Hot work with risk of product of vapour ignition
- ☐ LPG system degassing, installation or maintenance

This form must be completed for each job and updated and re-signed if circumstances change or additional hazards identified.

SIGN IN

Operating sites: to be signed by the Site Representative

Non-operating sites: to be signed by Contractor Representative only

GENERAL SAFETY CHECKS

- Have all site personnel been informed?
- Has fuel delivery service been informed?
- Is a fuel delivery due?
- Have isolation procedures been agreed - lock out/tag out?
- Are work areas cordoned off to protect workers, site staff & public?
- Other

Contractor representative name	Signature

Site representative name	Signature

I have discussed job clearance form with contractor

SIGN OUT AND OPERATOR VERIFICATION OF WORK

GENERAL SAFETY CHECKS

- Has the work area been left tidy and safe?
- Are site personnel aware of status of work including remaining isolation?
- Are chances to equipment documented and communicated?
- All incidents, near incidents, unsafe situations reported?
- Other

Contrator signature

Site representative name	Signature

Site representative comments

PARTS - Ordered, Replaced and/or Disposed Of (include model and serial #s as apporpriate)

The contractor through its authorized representative shall sign, issue and be solely responsible for all job clearance forms and the obligations arising there under applicable to the work.
This form covers important reminders and is not intended to releave the contractor from safely performing the work in compliance with all applicable laws and regulations.
The store operator may require the contractor to stop work if it appears that the contractor or any of its workers are failing to comply with the requirements in the applicable items of this form or other applicable safety requirements.

B4 – Site Security Checklist

PARSONS

SITE SECURITY CHECKLIST FOR BP SITES

Company: **Location:**

Parsons SSO: **PM:** **BP EPM:**

Inspected by:

Inspection Date: _____

	Task	Sat.	Unsat.	Comment
1.	**Notifications**			
	Site guard or manager notified of arrival	☐	☐	
	Site guard or manager notified of departure	☐	☐	
	Parsons PM notified (describe any deviations)	☐	☐	
	EBM notified	☐	☐	
	Site owner notified	☐	☐	
	Left Parsons business card or equivalent with site personnel	☐	☐	
2.	**On-Site Survey**			
	Evidence of possible trespassers (describe)	☐	☐	
	Lighting around facility	☐	☐	
	Work area barricaded	☐	☐	
	Gates /fences locked and chained	☐	☐	
	Work zone within view of facility operations	☐	☐	
	General housekeeping practices	☐	☐	
	Areas of retreat available	☐	☐	
	Remote locations (describe)	☐	☐	
3.	**Off-Site Survey**			
	Evidence of possible criminal activity nearby (specify)	☐	☐	
	Potentially-threatening persons noted in vicinity	☐	☐	
	General condition of adjacent neighborhood (specify)	☐	☐	

4.	**Security Threat Mitigation Measures**	**Implement**	
	Be aware of surrounding off-site/traffic/personnel	☐	
	Increase awareness of vehicle placement during sampling	☐	
	Increase awareness of work zone location	☐	
	Use buddy system	☐	
	Hire security guards	☐	
	Check chain / locks	☐	
	Avoid leaving equipment unattended	☐	
	Carry whistle / blow horn	☐	
	Carry flashlight / extra bulbs	☐	
	Lock car doors and keep keys on your person	☐	
	Avoid use of uncovered pick ups	☐	
	Store valuables in locked container	☐	
	Use hazard lights	☐	
	Maintain fire extinguisher nearby	☐	
	Carry mobile phone on your person	☐	
	Perform activities during daylight hours only	☐	

INSTRUCTIONS: Check box as appropriate: “Sat” = Satisfactory; “Unsat” = Unsatisfactory; or enter “NA” for not applicable. Attach additional sheets, if needed, to provide more details. Attach a site plan, and mark points of interest, if appropriate.

B5 – Vehicle Checklist

PRE-DRIVING CHECKLIST **PARSONS BP PROGRAM**

The person driving the vehicle is to complete this form before driving the vehicle. For Parsons-owned/leased vehicles, submit the form to equipment manager. For rental and personal vehicles, place it in the project file.

Year:	Make & Model:			VIN#:		
Mileage:	Contract No. (Rentals Only):					
Driver's Name (Print):						
Items:	Freq.	Date	Date	Date	Date	Date
Tires: Visual Inspection	Daily					
Mirrors adjusted and adequate for blind spots	Daily					
Horn	Daily					
Body of Vehicle	Daily					
Fuel Tank Over 1/2 Full	Daily					
Equipment & Load Properly Secured	Daily					
Wipers and Fluid Reservoir	Weekly					
Tires: Condition & Air Pressure	Weekly					
Turn Signal Lights	Weekly					
Brake Lights	Weekly					
Emergency Flasher Lights	Weekly					
State Inspection Valid	Monthly					
State Registration Valid	Monthly					
Vehicle Insurance Card Valid	Monthly					
Oil Level on Dipstick	Monthly					
Coolant Level	Monthly					
Brake Fluid Level	Monthly					
Transmission Fluid Level	Monthly					
Power Steering Fluid Level	Monthly					
Belts and Hoses	Monthly					
Low & High Beam Headlights	Monthly					
Fire Extinguisher	Monthly					
Wash Vehicle	Monthly					
I agree to read and follow the Checklist Instructions on page 2 of this form.						
Driver's Signature:				Date:		

Conduct all items below in a safe manner. If you are uncertain how to complete the item safely, seek the assistance of a qualified person. Enter "N/A" (not applicable) for any items that do not apply.

1. Complete all information within the first three rows. VIN #: Is the "vehicle identification number" found on a metal plate just below the driver's side windshield or inside the doorframe of the driver's door.
2. Verify that the owner's manual is present in the glove box of the vehicle. This is required for all vehicles except rentals. Refer to the owner's manual where needed for specific items.
3. For each day you inspect the vehicle, enter the date for that column. Below the date, place an "X" under each item checked and found to be okay.
4. Tires: Condition & Air Pressure. Inspect the tread on the tire by observing the minimum-tread indicators between treads on the tire or by using a tread wear gauge. If tire tread depth does not extend above tread wear indicators and/or is less than 3/16 inch the vehicle should not be driven until the tire is replaced. Check the air pressure in the tires using a pressure gauge when the tire is cold, adjust per manufacturer specifications (e.g., sticker on driver's side door frame). Check the condition of the spare, including the air pressure. Make sure there is a jack in the vehicle.
5. Mirrors adjusted and adequate for blind spots. Are the mirrors adjusted properly for the driver? Are blind spot mirrors needed, especially for vans, larger vehicles or for towing? Mirror adjustments must be made prior to vehicle operation.
6. Horn. Test vehicle's horn
7. Wipers and Fluid Reservoir. Check wiper blades on windshield. Replace if worn or damaged. Add washer fluid as needed.
8. Fuel Supply Adequate. Is the fuel tank above ½ full? Add fuel, if needed. **Do not overfill.**
9. Turn Signal Lights. Check functioning. If signal light is out replace bulb or fuse as needed.
10. State Inspection Valid. If the state of origin requires inspections, confirm that the vehicle has passed inspection and has the required documentation (e.g., windshield sticker).
11. State Registration Valid. Make sure the vehicle is properly registered, and has the required documentation (e.g., windshield sticker and/or documentation in glove box).
12. Vehicle Insurance Card Valid. Is the vehicle's insurance card valid?
13. Body of Vehicle. Check body of vehicle for damage. Document any damage found on vehicle.
14. Oil Level on Dipstick. Run the vehicle long enough to achieve operating temperature, then shut off vehicle. Wait 5 minutes, then check the oil dipstick in the vehicle. If oil is not at the full mark add the appropriate amount. **Do not overfill.**
15. Coolant Level. Check the coolant level in the overflow reservoir when the engine is cool. If coolant is not at the full mark add the appropriate amount to the reservoir (**NOT TO THE RADIATOR**).
16. Brake fluid level. Check the brake fluid reservoir. If fluid is outside the minimum or maximum line have the brake system checked by a qualified mechanic before driving the vehicle.
17. Transmission Fluid Level. Applies to automatic transmissions only. Warm the engine to operating temperature. **Place the gear selector in "Park," and engage the parking brake.** Open hood. Depress brake pedal, and move the gear selector to each position, holding for 2 seconds each. Return the gear selector to Park. Check the transmission fluid dipstick with the engine running. Add transmission fluid as needed. **Avoid contacting moving and/or hot components.**
18. Power Steering Fluid Level. Check the power steering dipstick in the vehicle per owner's manual. If the fluid is not at the full mark add the appropriate amount. **Significant loss of fluid may indicate a serious problem: check with a qualified mechanic.**
19. Belts and Hoses. Visually inspect all belts and hoses. Replace worn or damaged belts and/or hoses as needed.
20. Low & High Beam Headlights. Check high and low beams on headlights. Replace lamps as needed.
21. Brake lights. Check brake lights. If brake light is out replace bulb or fuse as needed.
22. Emergency Flashers Lights. Check emergency flashers. If flasher is out, replace bulb or fuse as needed.
23. Fire Extinguisher. If provided, is extinguisher fully charged?
24. Wash Vehicle. Wash vehicle in appropriate car wash or other suitable manner.
25. Sign and date checklist.

The driver conducting the inspection may correct simple problems, complete the inspection, and drive the vehicle. However, the driver must arrange for service by a qualified mechanic for more serious problems. Notify the equipment manager of any problems.

08/14/00

Table 1

Compound	PEL [a/] / TLV [b/] (ppm) 1	IDLH [c/] (ppm)	Odor Threshold[d/] (ppm)	Ionization Potential[e/] (eV)	Physical Description/Health Effects/Symptoms
Aniline	2 (skin)	100	0.5-70	7.70	Colorless to brown, oily liquid (solid<21o F) with an aromatic, amine-like odor. Irritates eyes. Causes headaches, weakness, dizziness, blue skin, incoordination, shortness of breath on effort, tachycardia, methemoglobinemiamm/, and cirrhosis. In animals, causes tumors of the spleen. Carcinogen.
Naphthalene	10	250	0.3	8.12	Colorless to brown solid (shipped as a molten liquid) with a mothball-like odor. Irritates eyes, skin, and bladder. Causes headaches, confusion, excitement, convulsions, coma, vague discomfort, nausea, vomiting, abdominal pain, profuse sweating, jaundice, hematoma, hemoglobin in the urine, renal shutdown, dermatitis, optic nerve disorders, and corneal and liver damage. Experimental teratogen and questionable carcinogen.
1,2-Dichloroethene (DCE) (cis- and trans-isomers)	200	1,000	0.085-500	9.65	Colorless liquid (usually a mixture of cis- and trans- isomers), with a slightly acrid, chloroform-like odor. Irritates eyes and respiratory system. CNS depressant. Cis- isomer is a mutagen.
Bis(2-Ethylhexyl)Phthalate	5 mg/m^3	5,000 mg/m^3	NA	NA	Colorless to light-colored, oily liquid with slight odor. Irritates eyes and mucous membranes. Also affects respiratory system, CNS, and gastrointestinal tract. In animals, causes liver damage, liver tumors, and teratogenic effects. Carcinogen.
Tetrachloroethene (PCE)	25 [z/]	150	5-50	9.32	Colorless liquid with a mild chloroform odor. Eye, nose, skin and throat irritant. Causes nausea, flushed face and neck, vertigo, dizziness, headaches, hallucinations, in coordination, drowsiness, coma, pulmonary changes, and skin redness. Cumulative liver, kidney, and CNS damage. In animals, causes liver tumors. Mutagen, experimental teratogen, and carcinogen.

Table 1 (continued)

1,2,4-Trichlorobenzene	5 ceiling	NA	NA	9.04	Colorless liquid or crystalline solid (<63°F) with an aromatic odor. Irritates eyes, skin, and mucous membranes. In animals, causes liver and kidney damage and possible teratogenic effects. Experimental teratogen.
Trichloroethene (TCE)	50	1,000	21.4-400	9.45	Clear, colorless or blue liquid with chloroform-like odor. Irritates skin and eyes. Causes fatigue, giddiness, headaches, vertigo, visual disturbances, tremors, nausea, vomiting, drowsiness, dermatitis, skin tingling, cardiac arrhythmia, and liver injury. In animals, causes liver and kidney cancer. Mutagen, experimental teratogen, and carcinogen.
1,1,1-Trichloroethane (TCA)	350 / 350	700	20-500	11.00	Colorless liquid with a mild chloroform-like odor. Irritates eyes and skin. Causes headaches, exhaustion, CNS depression, poor equilibrium, dermatitis, liver damage, cardiac arrhythmia, hallucinations or distorted perceptions, motor activity changes, aggression, diarrhea, and nausea or vomiting. Mutagen, experimental teratogen, and questionable carcinogen.
Vinyl Chloride	1 STEL = 5 (29 CFR 1910.1017) dd/	NA	260	9.99	Colorless gas (liquid<7°F) with a pleasant odor at high concentrations. Severe irritant to skin, eyes, and mucous membranes. Causes weakness, abdominal pain, gastrointestinal bleeding, enlarged liver, pallor or blue skin on the extremities, liver cancer, and frostbite (liquid). Also attacks lymphatic system. Mutagen, experimental teratogen, and carcinogen.

1: PEL and TLV value are the same
2: Operations will cease when action level is reached.
d/ When a range is given, use the highest concentration.
in the *NIOSH Pocket Guide to Chemical Hazards*, June 1997.
h/ NA = Not available.
dd/ Refer to expanded rules for this compound.
z/ NIOSH recommends reducing exposure to the lowest feasible concentration, and limiting the number of workers exposed.

B7 – Daily Toolbox Meeting Record

DAILY TOOLBOX MEETING RECORD

Document Control Number_____

Job(s) Location(s) _____ **Date:** _____

Name of AA or project oversight: _____

SIMOPS or Multi-Crew Activity ☐ Yes ☐ No If yes, describe. SIMOPS_____

Has the SIMOPS work plan been communicated to all workforce? ☐ Yes ☐ No

Name of SIMOPS PIC: _____**Company:**_____

Does the work activity require an MoC?	☐ Yes	☐ No
If yes, has it been authorized by BP management for start-up?	☐ Yes	☐ No (If No, Stop Work and consult BP management.)
Does a valid risk-assessed SOP for this job exist?	☐ Yes	☐ No
If yes, have person(s) performing work been trained in that procedure?	☐ Yes	☐ No (If No, conduct TSEA.)

List any safety discussion topics covered:_____

List all jobs to be performed today (Scope of work for day):_____

Identify if there are any permitted activities and document the permit number:_____

Does each job and task have a valid, associated risk assessment assigned to each listed job above?	☐ Yes	☐ No	
Have job and task risk assessments been validated on site?	☐ Yes	☐ No	
Have newly identified risks been documented in the TSEA?	☐ Yes	☐ No	
Has a member of the workforce conducting each task participated in the Risk Assessment for that task?	☐ Yes	☐ No	
Have all members of the workforce confirmed understanding of the work scope, hazards, risk controls and mitigation?	☐ Yes	☐ No	
Was a competent person involved in this or any other risk assessment pertaining to these tasks?	☐ Yes	☐ No	
Has everyone reviewed the current Emergency Response Plan?	☐ Yes	☐ No	
Have equipment checks been completed, documented and reviewed?	☐ Yes	☐ No	☐ N/A

(Do not proceed unless the answer to all of the above questions is Yes or N/A)

Will any conditions change the muster points for today? ☐ Yes ☐ No If yes, describe and discuss with crew:_____

_____

Post Daily Review:

Best practice/activity(s) observed: ☐ Yes ☐ No (If Yes, describe them)_____

_____

Were there any Incidents or First Aid Reports for the day? ☐ Yes ☐ No (If Yes, name them)

_____

Were there any 'Stop Work' interventions? ☐ Yes ☐ No (If Yes, describe them)

_____

Area for improvement Practice/Activity(s) Observed: ☐ Yes ☐ No (If Yes, name them)_____

DAILY TOOLBOX MEETING RECORD

Document Control Number_____

Signature Page

I know the hazards:

By signing here, you are stating the following:

1. You have been involved in the Task Safety Environmental Analysis and understand the hazards and risk control actions associated with each task you are about to perform.
2. You understand the permit to work requirements applicable to the work you are about to perform (if it includes permitted activities).
3. You are aware that no tasks or work (that is not risk-assessed) is to be performed.
4. You also are aware of your obligation to '**Stop Work'** *(See Stop Work Section).*

I arrived and departed fit for duty:

5. You are physically and mentally fit for duty.
6. You are not under the influence of any type of medication, drugs or alcohol that could affect your ability to work safely.
7. You are aware of your responsibility to bring any illness, injury (regardless of where or when it occurred) or fatigue issue you may have to the attention of the Work Crew Leader.
8. You signed out uninjured unless you have otherwise informed the Work Crew Leader.

SIMOPS NOTE:

SIGNATURES ARE REQUIRED BY ALL PERSONS INVOLVED IN A WORK TASK OR WHO MAY BECOME AFFECTED BY A SIMOPS SITUATION.

Individual Name/Company Name/Signature	Initials & Sign in time	Initials & Sign out Time
	In & Fit	Out & Fit
_____	_____ In & Fit	_____ Out & Fit
_____	_____ In & Fit	_____ Out & Fit
_____	_____ In & Fit	_____ Out & Fit
_____	_____ In & Fit	_____ Out & Fit
_____	_____ In & Fit	_____ Out & Fit
_____	_____ In & Fit	_____ Out & Fit
_____	_____ In & Fit	_____ Out & Fit
_____	_____ In & Fit	_____ Out & Fit
_____	_____ In & Fit	_____ Out & Fit
_____	_____	_____

At the conclusion of the day, I certify that the job site is being left in a safe condition and there were no reports of injury or first aid.

☐ Yes ☐ No

Signature of Work Crew Leader:

_____

(If above answer is No, inform the AA or PO, when applicable.)

I will STOP the job any time anyone is concerned or uncertain about safety.

I will STOP the job if anyone identifies a hazard or additional mitigation not recorded on the TSEA.

I will be alert to any changes in personnel, conditions at the work site or hazards not covered by the original TSEA.

If it is necessary to **STOP THE JOB**, I will reassess the task, hazards and mitigations; and then amend the TSEA as needed.

Names of site visitors not involved in the work activities:

_____ In / Out

_____ In / Out

_____ In / Out

_____ In / Out

_____ In / Out

Definitions: **Project** – A planned set of interrelated jobs to be executed over a period of time. **Job** – A general activity, including several different tasks that occur when working on a project. **Task** – One of several potential specific actions that occur as part of the process to complete a job. **Hazard** – The potential for an uncontrolled release of, or unwanted contact with, a biological or energy source.

B8 – Work Risk Assessment Tool (WRAT)

Site Risk Assessment

This tool is to be used for pre-project planning.

Date Assessment Completed:	**Name of Assessment Leader:**	**Risk Assessment No**.:
Location:	**Project Description:**	**Definitions:** **Job:** A general activity, including several different tasks when working on a project. **Task:** One of potentially several specific actions that occur as part of the processes to complete an overall job. **Hazard:** The potential for an uncontrolled release of, or unwanted contact with a biological or an energy source.
Name(s) of Competent Risk Assessor(s) participating in this Risk Assessment:		
Name(s) of Risk Assessment Team Member(s) that will be on the job site:		
Name(s) of any other Risk Assessment Team Members:	**If SIMOP, Name Person in Charge:**	

Work Plan Sequence of Job Steps/Observations List the jobs required to complete the project scope in the sequence they are carried out.	**Are any tools or heavy equipment needed for this job?** If YES, What Type of Tools or Equipment?	Is this a SIMOP? If YES, Include in Mitigation Plan.	Do any of the ***Golden Rules of Safety*** apply to any task involved in this job step? If YES, Which of the 8?	Which of the 8 energy or biological root sources could possibly be involved in this job?	**What** would be the result of exposure to a biological or energy source? (e.g., Bites, Slips, trips, falls, exposures, electrocution, injury, death, etc.); and **How, where, or when** could an uncontrolled release or unwanted contact with a biological or energy source occur? **Note:** Humans are biological sources, and their physical abilities, competency, and training should also be considered here.	Environmental Impacts Could there be a release to the air, soil or water, and or, will a waste be generated? If YES, What?	**Pre-Mitigation Risk Evaluation**				Permit(s) Required? If YES, What kind?	Energy / Biological / Waste Management Plan Elimination, Substitution, Isolation, Engineering and Administrative Controls, PPE Hierarchy of Controls - Risk control measures List control measures required to eliminate, control, or protect against unwanted contact with an uncontrolled biological or energy source to minimize the risk of injury or environmental Impact.	Who is responsible for Hazard Mitigation? Write the name of the person responsible to implement the control measure identified.	**Post-Mitigation Risk Evaluation**			
							Frequency	Consequence	Likelihood	Risk Score				Frequency	Consequence	Likelihood	Risk Score
										Minimal Risk							Minimal Risk
										Minimal Risk							Minimal Risk
										Minimal Risk							Minimal Risk
										Minimal Risk							Minimal Risk
										Minimal Risk							Minimal Risk
										Minimal Risk							Minimal Risk
										Minimal Risk							Minimal Risk

Project Risk Assessment

This tool is to be used for pre-project planning.

Date Assessment Completed:	**Name of Assessment Leader:**	**Risk Assessment No.:**
Location:	**Project Description:**	**Definitions:**
Name(s) of Competent Risk Assessor(s) participating in this Risk Assessment:		**Job:** A general activity, including several different tasks when working on a project.
Name(s) of Risk Assessment Team Member(s) that will be on the job site:		**Task:** One of potentially several specific actions that occur as part of the processes to complete an overall job.
Name(s) of any other Risk Assessment Team Members:	**If SIMOP, Name Person in Charge:**	**Hazard:** The potential for an uncontrolled release of, or unwanted contact with a biological or an energy source.

Work Plan Sequence of Job Steps/Observation: List the jobs required to complete the project scope in the sequence they are carried out.	**Are any tools or heavy equipment needed for this job?** If YES, What Type of Tools or Equipment?	Is this a SIMOP? If YES, Include in Mitigation Plan.	Do any of the ***Golden Rules of Safety*** apply to any task involved in this job step? If YES, Which of the 8?	Which of the 8 energy or biological root sources could possibly be involved in this job?	**What** would be the result of exposure to a biological or energy source? (e.g., Bites, Slips, trips, falls, exposures, electrocution, injury, death, etc.); and **How, where, or when** could an uncontrolled release or unwanted contact with a biological or energy source occur? **Note:** Humans are biological sources, and their physical abilities, competency, and training should also be considered here.	Environmental Impacts Could there be a release to the air, soil or water, and or, will a waste be generated? If YES, What?	**Pre-Mitigation Risk Evaluation**				Permit(s) Required? If YES, What kind?	Energy / Biological / Waste Management Plan Elimination, Substitution, Isolation, Engineering and Administrative Controls, PPE Hierarchy of Controls - Risk control measures List control measures required to eliminate, control, or protect against unwanted contact with an uncontrolled biological or energy source to minimize the risk of injury or environmental Impact.	Who is responsible for Hazard Mitigation? Write the name of the person responsible to implement the control measure identified.	**Post-Mitigation Risk Evaluation**			
							Frequency	Consequence	Likelihood	Risk Score				Frequency	Consequence	Likelihood	Risk Score
										Minimal Risk							Minimal Risk
										Minimal Risk							Minimal Risk
										Minimal Risk							Minimal Risk
										Minimal Risk							Minimal Risk
										Minimal Risk							Minimal Risk
										Minimal Risk							Minimal Risk

Job Risk Assessment

This tool is to be used for pre-project planning.

Date Assessment Completed:	**Name of Assessment Leader:**	**Risk Assessment No.:**
Location:	**Project Description:**	**Definitions:** **Job:** A general activity, including several different tasks when working on a project. **Task:** One of potentially several specific actions that occur as part of the processes to complete an overall job. **Hazard:** The potential for an uncontrolled release of, or unwanted contact with a biological or an energy source.
Name(s) of Competent Risk Assessor(s) participating in this Risk Assessment:		
Name(s) of Risk Assessment Team Member(s) that will be on the job site:		
Name(s) of any other Risk Assessment Team Members:	**If SIMOP, Name Person in Charge:**	

Work Plan Sequence of Job Steps/Observation: List the jobs required to complete the project scope in the sequence they are carried out.	**Are any tools or heavy equipment needed for this job?** If YES, What Type of Tools or Equipment?	Is this a SIMOP? If YES, Include in Mitigation Plan.	Do any of the ***Golden Rules of Safety*** apply to any task involved in this job step? If YES, Which of the 8?	Which of the 8 energy or biological root sources could possibly be involved in this job?	**What** would be the result of exposure to a biological or energy source? (e.g., Bites, Slips, trips, falls, exposures, electrocution, injury, death, etc.); and **How, where, or when** could an uncontrolled release or unwanted contact with a biological or energy source occur? **Note:** Humans are biological sources, and their physical abilities, competency, and training should also be considered here.	Environmental Impacts Could there be a release to the air, soil or water, and or, will a waste be generated? If YES, What?	**Pre-Mitigation Risk Evaluation**				Permit(s) Required? If YES, What kind?	Energy / Biological / Waste Management Plan Elimination, Substitution, Isolation, Engineering and Administrative Controls, PPE Hierarchy of Controls - Risk control measures List control measures required to eliminate, control, or protect against unwanted contact with an uncontrolled biological or energy source to minimize the risk of injury or environmental Impact.	Who is responsible for Hazard Mitigation? Write the name of the person responsible to implement the control measure identified.	**Post-Mitigation Risk Evaluation**			
							Frequency	Consequence	Likelihood	Risk Score				Frequency	Consequence	Likelihood	Risk Score
										Minimal Risk							Minimal Risk
										Minimal Risk							Minimal Risk
										Minimal Risk							Minimal Risk
										Minimal Risk							Minimal Risk
										Minimal Risk							Minimal Risk
										Minimal Risk							Minimal Risk

APPENDIX C MATERIAL DATA SAFETY SHEETS (MSDS)

MSDS Number: **H3880** * * * * * *Effective Date:* ***05/07/03*** * * * * * *Supercedes:* ***05/10/01***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

HYDROCHLORIC ACID, 33 - 40%

1. Product Identification

Synonyms: Muriatic acid; hydrogen chloride, aqueous
CAS No.: 7647-01-0
Molecular Weight: 36.46
Chemical Formula: HCl
Product Codes:
J.T. Baker: 5367, 5537, 5575, 5800, 5814, 5821, 5839, 5861, 5894, 5962, 5972, 5994, 6900, 7831, 9529, 9530, 9534, 9535, 9536, 9537, 9538, 9539, 9540, 9544, 9548
Mallinckrodt: 2062, 2515, 2612, 2624, 2626, 3861, 5583, 5587, H611, H613, H992, H999, V078, V628

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Hydrogen Chloride	7647-01-0	33 - 40%	Yes
Water	7732-18-5	60 - 67%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Corrosive! Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death.
Ingestion:
Corrosive! Swallowing hydrochloric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract. May cause nausea, vomiting, and diarrhea. Swallowing may be fatal.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and discolor skin.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Extreme heat or contact with metals can release flammable hydrogen gas.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
If involved in a fire, use water spray. Neutralize with soda ash or slaked lime.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving hydrochloric acid. Stay away from ends of tanks. Cool tanks with water spray until well after fire is out.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® or TEAM® 'Low Na+' acid neutralizers are recommended for spills of this product.

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7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Hydrochloric acid:
- OSHA Permissible Exposure Limit (PEL):
5 ppm (Ceiling)
- ACGIH Threshold Limit Value (TLV):
2 ppm (Ceiling), A4 Not classifiable as a human carcinogen

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a full facepiece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless, fuming liquid.

Odor:
Pungent odor of hydrogen chloride.

Solubility:
Infinite in water with slight evolution of heat.

Density:
1.18

pH:
For HCL solutions: 0.1 (1.0 N), 1.1 (0.1 N), 2.02 (0.01 N)

% Volatiles by volume @ 21C (70F):
100

Boiling Point:
53C (127F) Azeotrope (20.2%) boils at 109C (228F)

Melting Point:
-74C (-101F)

Vapor Density (Air=1):
No information found.

Vapor Pressure (mm Hg):
190 @ 25C (77F)
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic hydrogen chloride fumes and will react with water or steam to produce heat and toxic and corrosive fumes. Thermal oxidative decomposition produces toxic chlorine fumes and explosive hydrogen gas.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A strong mineral acid, concentrated hydrochloric acid is incompatible with many substances and highly reactive with strong bases, metals, metal oxides, hydroxides, amines, carbonates and other alkaline materials. Incompatible with materials such as cyanides, sulfides, sulfites, and formaldehyde.
Conditions to Avoid:
Heat, direct sunlight.

---

11. Toxicological Information

Inhalation rat LC50: 3124 ppm/1H; oral rabbit LD50: 900 mg/kg (Hydrochloric acid concentrated); investigated as a tumorigen, mutagen, reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Hydrogen Chloride (7647-01-0)	No	No	3
Water (7732-18-5)	No	No	None

---

12. Ecological Information

Environmental Fate:
When released into the soil, this material is not expected to biodegrade. When released into the soil, this material may leach into groundwater.
Environmental Toxicity:
This material is expected to be toxic to aquatic life.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: HYDROCHLORIC ACID
Hazard Class: 8
UN/NA: UN1789
Packing Group: II
Information reported for product/size: 475LB

International (Water, I.M.O.)

Proper Shipping Name: HYDROCHLORIC ACID
Hazard Class: 8
UN/NA: UN1789
Packing Group: II
Information reported for product/size: 475LB

---

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Hydrogen Chloride (7647-01-0)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Hydrogen Chloride (7647-01-0)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Hydrogen Chloride (7647-01-0)	5000	500*	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)

Hydrogen Chloride (7647-01-0)	5000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2R
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.
Disclaimer:
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Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED,

INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **S8234** * * * * * *Effective Date:* ***02/04/05*** * * * * * *Supercedes:* ***11/04/04***

MSDS Material Safety Data Sheet

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

SULFURIC ACID, 52 - 100 %

1. Product Identification

Synonyms: Oil of vitriol; Babcock acid; sulphuric acid
CAS No.: 7664-93-9
Molecular Weight: 98.08
Chemical Formula: H2SO4 in H2O
Product Codes:
J.T. Baker: 5030, 5137, 5374, 5802, 5815, 5858, 5859, 5868, 5889, 5897, 5961, 5971, 5997, 6902, 9671, 9673, 9674, 9675, 9676, 9679, 9680, 9681, 9682, 9684, 9687, 9691, 9693, 9694
Mallinckrodt: 21201, 2468, 2876, 2878, 2900, 2904, 3780, 4222, 5524, 5557, H644, H850, H976, H996, V651, XL003

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sulfuric Acid	7664-93-9	52 - 100%	Yes
Water	7732-18-5	0 - 48%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. May cause lung edema, a medical emergency.
Ingestion:
Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow ingestion or skin contact. Circulatory shock is often the immediate cause of death.
Skin Contact:
Corrosive. Symptoms of redness, pain, and severe burn can occur. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow skin contact or ingestion. Circulatory shock is often the immediate cause of death.
Eye Contact:
Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.
Chronic Exposure:
Long-term exposure to mist or vapors may cause damage to teeth. Chronic exposure to mists containing sulfuric acid is a cancer hazard.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.
Ingestion:

DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Excess acid on skin can be neutralized with a 2% solution of bicarbonate of soda. Call a physician immediately.

Eye Contact:

Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Call a physician immediately.

---

5. Fire Fighting Measures

Fire:

Concentrated material is a strong dehydrating agent. Reacts with organic materials and may cause ignition of finely divided materials on contact.

Explosion:

Contact with most metals causes formation of flammable and explosive hydrogen gas.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Do not use water on material. However, water spray may be used to keep fire exposed containers cool.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving this material. Stay away from sealed containers.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this product.

---

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When

diluting, always add the acid to water; never add water to the acid. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Sulfuric Acid:
- OSHA Permissible Exposure Limit (PEL) -
1 mg/m3 (TWA)
- ACGIH Threshold Limit Value (TLV) -
0.2 mg/m3(T) (TWA) for sulfuric acid - A2 Suspected Human Carcinogen for sulfuric acid contained in strong inorganic mists.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece respirator with an acid gas cartridge and particulate filter (NIOSH type N100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P particulate filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Clear oily liquid.
Odor:
Odorless.
Solubility:
Miscible with water, liberates much heat.
Specific Gravity:

1.84 (98%), 1.40 (50%), 1.07 (10%)
pH:
1 N solution (ca. 5% w/w) = 0.3; 0.1 N solution (ca. 0.5% w/w) = 1.2; 0.01 N solution (ca. 0.05% w/w) = 2.1.
% Volatiles by volume @ 21C (70F):
No information found.
Boiling Point:
ca. 290C (ca. 554F) (decomposes at 340C)
Melting Point:
3C (100%), -32C (93%), -38C (78%), -64C (65%).
Vapor Density (Air=1):
3.4
Vapor Pressure (mm Hg):
1 @ 145.8C (295F)
Evaporation Rate (BuAc=1):
No information found.

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Concentrated solutions react violently with water, spattering and liberating heat.
Hazardous Decomposition Products:
Toxic fumes of oxides of sulfur when heated to decomposition. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas, and with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Water, potassium chlorate, potassium perchlorate, potassium permanganate, sodium, lithium, bases, organic material, halogens, metal acetylides, oxides and hydrides, metals (yields hydrogen gas), strong oxidizing and reducing agents and many other reactive substances.
Conditions to Avoid:
Heat, moisture, incompatibles.

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11. Toxicological Information

Toxicological Data:
Oral rat LD50: 2140 mg/kg; inhalation rat LC50: 510 mg/m3/2H; standard Draize, eye rabbit, 250 ug (severe); investigated as a tumorigen, mutagen, reproductive effector.
Carcinogenicity:
Cancer Status: The International Agency for Research on Cancer (IARC) has classified "strong inorganic acid mists containing sulfuric acid" as a known human carcinogen, (IARC category 1). This classification applies only to mists containing sulfuric acid and not to sulfuric acid or sulfuric acid solutions.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Sulfuric Acid (7664-93-9)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition. When released into the air, this material may be removed from the atmosphere to a moderate extent by dry deposition.
Environmental Toxicity:
LC50 Flounder 100 to 330 mg/l/48 hr aerated water/Conditions of bioassay not specified; LC50 Shrimp 80 to 90 mg/l/48 hr aerated water /Conditions of bioassay not specified; LC50 Prawn 42.5 ppm/48 hr salt water /Conditions of bioassay not specified.
This material may be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: SULFURIC ACID (WITH MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN1830
Packing Group: II
Information reported for product/size: 440LB

International (Water, I.M.O.)

Proper Shipping Name: SULFURIC ACID (WITH MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN1830
Packing Group: II
Information reported for product/size: 440LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Sulfuric Acid (7664-93-9)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Sulfuric Acid (7664-93-9)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Sulfuric Acid (7664-93-9)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Sulfuric Acid (7664-93-9)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: Yes (Pure / Liquid)

Australian Hazchem Code: 2P
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **2** Other: **Water reactive**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe mist.
Keep container closed.

Use only with adequate ventilation.
Wash thoroughly after handling.
Do not contact with water.

Label First Aid:

In all cases call a physician immediately. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use. Excess acid on skin can be neutralized with a 2% bicarbonate of soda solution. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 8.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **N3662** * * * * * *Effective Date:* ***09/19/02*** * * * * * *Supercedes:* ***11/02/01***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

NITRIC ACID FUMING

1. Product Identification

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 90%; Red fuming nitric acid
CAS No.: 7697-37-2
Molecular Weight: 63
Chemical Formula: HNO3
Product Codes:
J.T. Baker: 9624
Mallinckrodt: 2713

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE

SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Oxidizer)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison.

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Symptoms may disappear only to return in a few hours and more severely. Onset of symptoms may be delayed for 4-30 hours.

Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:
Corrosive! Vapors are irritating and may cause severe damage to the eyes. Splashes may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

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4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:

Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.

Explosion:

Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.

Fire Extinguishing Media:

Water spray may be used to keep fire exposed containers cool. Do not get water inside container.

Special Information:

Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

---

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Containers of this material may be hazardous when empty since they

retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA), 4 ppm (STEL)
-ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134). Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal. Canister-type respirators using sorbents are ineffective.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Yellow to brownish-red fuming liquid.
Odor:
Suffocating, acrid.
Solubility:
Infinitely soluble.
Density:
1.5
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100 (as water and acid)
Boiling Point:
85C (185F)
Melting Point:
ca. -50C (ca. -58F)

Vapor Density (Air=1):
2-3
Vapor Pressure (mm Hg):
48 @ 20C (68F)
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A dangerously powerful oxidizing agent, fuming nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Heat, light, moisture.

---

11. Toxicological Information

For Nitric Acid: Oral (human) LDLo: 430 mg/kg; Inhalation,rat, LC50: 67 ppm (NO2)/4H.; Investigated as a mutagen and reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Nitric Acid (7697-37-2)	No	No	None

---

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID, RED FUMING
Hazard Class: 8, 5.1, 6.1
UN/NA: UN2032
Packing Group: I
Information reported for product/size: 2.5L

International (Water, I.M.O.)

Proper Shipping Name: NITRIC ACID, RED FUMING
Hazard Class: 8, 5.1, 6.1
UN/NA: UN2032
Packing Group: I
Information reported for product/size: 2.5L

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Nitric Acid (7697-37-2)	1000	1000	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Nitric Acid (7697-37-2)	1000	No	No

```
Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: Yes Pressure: No
Reactivity: Yes         (Pure / Liquid)
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Australian Hazchem Code: 2PE
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **4** Flammability: **0** Reactivity: **1** Other: **Oxidizer**
Label Hazard Warning:
POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Do not store near combustible materials.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases call a physician.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3.
Disclaimer:
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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MATERIAL SAFETY DATA SHEET

Date Printed: 06/10/2008
Date Updated: 03/21/2007
Version 1.8

Section 1 - Product and Company Information

Product Name	SODIUM BROMIDE, 99+%, A.C.S. REAGENT
Product Number	310506
Brand	SIAL
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
SODIUM BROMIDE	7647-15-6	No

Formula	NaBr
Synonyms	Bromide salt of sodium * Bromnatrium (German) * Sedoneural
RTECS Number:	VZ3150000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Caution: Avoid contact and inhalation. Target organ(s): Central nervous system.

HMIS RATING

HEALTH: 1*
FLAMMABILITY: 0
REACTIVITY: 0

NFPA RATING

HEALTH: 1
FLAMMABILITY: 0
REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE

If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.

DERMAL EXPOSURE
In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
N/A

AUTOIGNITION TEMP
N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Exercise appropriate precautions to minimize direct contact with skin or eyes and prevent inhalation of dust.

METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Avoid inhalation. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed. Store in a dry area.

SPECIAL REQUIREMENTS
Hygroscopic.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or

type P1 (EN 143) dust masks.
Hand: Protective gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash thoroughly after handling.

Section 9 - Physical/Chemical Properties

Appearance	Physical State: Solid Color: Colorless Form: Crystals Odor: Odorless	
Property	**Value**	**At Temperature or Pressure**
Molecular Weight	102.9 AMU	
pH	5.4	20 °C Concentration: 50 g/l
BP/BP Range	1,393 °C	
MP/MP Range	747 °C	
Freezing Point	N/A	
Vapor Pressure	1 mmHg	806 °C
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
SG/Density	1 g/cm3	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	N/A	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	N/A	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	Solubility in Water:soluble	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Conditions to Avoid: Moisture. Heat.
Materials to Avoid: Strong acids, Strong oxidizing agents, Alkali metals, Halogens.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Hydrogen bromide gas.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

ROUTE OF EXPOSURE
Skin Contact: May cause skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: May cause eye irritation.
Inhalation: May be harmful if inhaled. Material may be irritating to mucous membranes and upper respiratory tract.
Ingestion: May be harmful if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Central nervous system.

SIGNS AND SYMPTOMS OF EXPOSURE
Bromide rashes, especially of the face, and resembling acne and furunculosis, often occur when bromide inhalation or administration is prolonged. Circulatory collapse. Exposure can cause: To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

TOXICITY DATA
Skin
Rabbit
> 2,000 mg/kg
LD50

Oral
Rat
3500 mg/kg
LD50

Subcutaneous
Rat
2900 MG/KG
LD50
Remarks: Skin and Appendages: Other: Hair.

Oral
Mouse
7000 mg/kg
LD50

Intraperitoneal
Mouse
5 GM/KG
LD50

Subcutaneous
Mouse
5020 MG/KG
LD50

IRRITATION DATA
Eyes
Rabbit
Remarks: Mild irritation effect
Skin
Rabbit
Remarks: No irritation effect

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Species: Rat
Dose: 47520 MG/KG
Route of Application: Oral
Exposure Time: (90D MALE/90D PRE)
Result: Effects on Fertility: Mating performance (e.g., # sperm positive females per # females mated; # copulations per # estrus cycles). Effects on Newborn: Viability index (e.g., # alive at day 4 per # born alive). Effects on Newborn: Weaning or lactation index (e.g., # alive at weaning per # alive at day 4).

Species: Rat
Dose: 3600 MG/KG
Route of Application: Oral
Exposure Time: (3-20D PREG)
Result: Effects on Newborn: Weaning or lactation index (e.g., # alive at weaning per # alive at day 4).

Species: Rat
Dose: 720 MG/KG
Route of Application: Oral
Exposure Time: (3-20D PREG)
Result: Effects on Newborn: Behavioral.

Species: Rat
Dose: 1620 MG/KG
Route of Application: Oral
Exposure Time: (90D MALE)
Result: Paternal Effects: Testes, epididymis, sperm duct.

Section 12 - Ecological Information

No data available.

ACUTE ECOTOXICITY TESTS
Test Type: LC50 Fish
Species: Poecilia reticulata
Time: 96 h
Value: 160,000 mg/l

Test Type: EC50 Daphnia
Species: Daphnia magna
Time: 48 h
Value: 5,800 mg/l

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: None
Non-Hazardous for Transport: This substance is considered to be non-hazardous for transport.

IATA
Non-Hazardous for Air Transport: Non-hazardous for air

transport.

Section 15 - Regulatory Information

US CLASSIFICATION AND LABEL TEXT
US Statements: Caution: Avoid contact and inhalation. Target organ(s): Central nervous system.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: No
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

SLOW RELEASE SUBSTRATE (SRS) MSDS

Effective Date: 5/2/07

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1. Product Identification

Synonyms: Slow Release Substrate (SRS™)
CAS No.: Mixture
Molecular Weight: Not applicable.
Chemical Formula: Not applicable.
Supplier: Terra Systems, Inc.

1035 Philadelphia Pike
Suite E
Wilmington DE 19809
Telephone (302) 798-9553
Facsimile: (302) 798-9554

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2. Composition/Information on Ingredients

Ingredient	CAS #	Percent	Hazardous
Food grade edible oil & emulsifiers	Mixture	50-70	No
Sodium Lactate	72-17-3	<5	Yes
Yeast Extract	8013-01-2	<1	No
Ammonium Phosphate Dibasic	7783-28-0	<1	No
Water	7732-18-5	30-50	No

---

3. Hazards Identification

Emergency Overview

CAUTION! MAY CAUSE EYE IRRITATION.

Health Rating: 1 - Slight
Flammability Rating: 1 - Slight
Reactivity Rating: 1 - Slight
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; PROPER GLOVES
Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:
Not expected to be a health hazard. If heated, may produce vapors or mists that irritate the mucous membranes and cause irritation, dizziness, and nausea. Remove to fresh air.
Ingestion:
Not expected to be a health hazard via ingestion. Large doses may produce abdominal spasms, diarrhea.
Skin Contact:
No adverse effects expected. May cause irritation or sensitization in sensitive individuals.
Eye Contact:
May cause mild irritation, possible reddening.
Chronic Exposure:
No information found.
Aggravation of Pre-existing Conditions:
No information found.

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4. First Aid Measures

Inhalation:
Not expected to require first aid measures. Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:
If large amounts were swallowed, give water to drink and get medical advice.
Skin Contact:
Not expected to require first aid measures. Wash exposed area with soap and water. Get medical advice if irritation develops.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

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5. Fire Fighting Measures

Fire:
Flash point: >200 ^{o}C (>392 ^{o}F)
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Clean-up personnel may require protective clothing. Absorb in sand, paper towels, “Oil Dry”, or other inert material. Scoop up and containerize for disposal. Flush trace residues to sewer with soap and water. Containerized waste may be sent to an approved waste disposal facility.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material are not hazardous when empty since they do vapors or harmful substances; observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
None established.
Ventilation System:
Not expected to require any special ventilation.
Personal Respirators (NIOSH Approved):
Not expected to require personal respirator usage.
Skin Protection:
Wear protective gloves and clean body-covering clothing.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible.

9. Physical and Chemical Properties

Appearance:
White liquid.
Odor:
Vegetable oil.
Solubility:
Soluble in water.
Specific Gravity:
0.95-0.98 g/mL
pH:
6-8 (60% aqueous solution)
% Volatiles by volume @ 21C (70F):
Negligible.
Boiling Point:

≥ 100C (≥ 212F)
Melting Point:
No information found.
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
< 1.0 @ 20C (68F)
Evaporation Rate (BuAc=1):
No information found.

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizers, acids.
Conditions to Avoid:
Incompatibles.

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11. Toxicological Information

Sodium Lactate. Oral rat LD50: 2,000 mg/kg. 100 mg caused mild irritation to rabbit eye in Draize test.

Sodium Bicarbonate. Oral rat LD50 unknown.

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12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may

differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

OSHA STATUS: This product is not hazardous under the criteria of the Federal OSHA hazard Communication Standard 29 CFR 1910.1200. However, thermal processing and decomposition fumes from this product may be hazardous as noted in Section 10.

TSCA STATUS: No component of this product is listed on the TSCA inventory.

CERCLA (Comprehensive Response Compensation, and Liability Act): Not reportable.

SARA TITLE III (Superfund Amendments and Reauthorization Act)
Section 312 Extremely Hazardous Substances: None
Section 311/312 Hazard Categories: Non-hazardous Under Section 311/312
Section 313 Toxic Chemicals: None

RCRA STATUS: If discarded in its purchased form, this product would not be a hazardous waste either by listing or by characteristic. However, under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product should be classified as a hazardous waste. (40 CFR 261.20-24)

CALIFORNIA PROPOSITION 65: The following statement is made in order to comply with the California safe Drinking Water and Toxic Enforcement Act of 1986. The product contains no chemicals known to the State of California to cause cancer.

16. Other Information

NFPA Ratings: Health: **1** Flammability: **1** Reactivity: **0**
Revision Information:
MSDS Section(s) changed since last revision of document include: None.
Disclaimer:
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****

Prepared by: Terra Systems, Inc.
Phone Number: (302) 798-9553 (U.S.A.)

World Headquarters
Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Date Printed 5/16/08
MSDS No: M00337

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Sulfuric Acid 0.1600 ± 0.0008 N
Catalog Number: 1438801

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00337
Chemical Name: Not applicable.
CAS No.: Not applicable.
Chemical Formula: Not applicable.
Chemical Family: Not applicable
Hazard: May cause eye irritation.
Date of MSDS Preparation:
Day: 03
Month: May
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

Demineralized Water
CAS No.: 7732-18-5
TSCA CAS Number: 7732-18-5
Percent Range: >98
Percent Range Units: weight / volume
LD50: None reported
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: No effects anticipated.

Other components, each
CAS No.: Not applicable
TSCA CAS Number: Not applicable
Percent Range: 0.01 - 0.1
Percent Range Units: weight / weight
LD50: Not applicable
LC50: Not applicable
TLV: Not established
PEL: Not established
Hazard: Any ingredient(s) of this product listed as "Other component(s)" is not considered a health hazard to the user of this product.

Sulfuric acid
CAS No.: 7664-93-9
TSCA CAS Number: 7664-93-9

Percent Range: 0.1 - 1.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 2140 mg/kg.
LC50: Inhalation rat LC50 = 87 ppm/4 hr
TLV: 1 mg/m³ (TWA); 3 mg/m³ (STEL)
PEL: 1 mg/m³
Hazard: Causes severe burns. Harmful if inhaled. Recognized carcinogen.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: Clear, colorless liquid
Odor: None
MAY CAUSE EYE IRRITATION

HMIS:
Health: 1
Flammability: 0
Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 1
Flammability: 0
Reactivity: 0
Symbol: Not applicable
Potential Health Effects:
Eye Contact: May cause irritiation
Skin Contact: No effects are anticipated
Skin Absorption: None reported
Target Organs: Not applicable
Ingestion: Practically non-toxic
Target Organs: None reported
Inhalation: No data reported.
Target Organs: None reported
Medical Conditions Aggravated: None reported
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
This product does NOT contain any OSHA listed carcinogens.

An ingredient of this mixture is: IARC Group 1: Recognized Carcinogen
Sulfuric Acid - The IARC evaluation was based on exposure to the mist or vapor of concentrated sulfuric acid generated during chemical processes.
This product does NOT contain any NTP listed chemicals.

Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with plenty of water. Call physician if irritation develops.
Ingestion (First Aid): Give large quantities of water. Call physician immediately.
Inhalation: None required.

5. FIRE FIGHTING MEASURES

Flammable Properties: Material will not burn.
Flash Point: Not applicable.
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable.
Upper Explosion Limits: Not applicable.
Autoignition Temperature: Not applicable.
Hazardous Combustion Products: This material will not burn.
Fire / Explosion Hazards: This product will not burn or explode.
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Use media appropriate to surrounding fire conditions
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Absorb spilled liquid with non-reactive sorbent material. Stop spilled material from being released to the environment.
Clean-up Technique: Cover spilled material with an alkali, such as soda ash or sodium bicarbonate. Scoop up slurry into a large beaker. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Dispose of material in an E.P.A. approved hazardous waste facility. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate as needed to perform spill clean-up. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Mixture contains a component which is regulated as a water pollutant. Mixture contains a component which is regulated as hazardous waste.
304 EHS RQ (40 CFR 355): Sulfuric Acid - RQ 1000 lbs.
D.O.T. Emergency Response Guide Number: Not applicable.

7. HANDLING / STORAGE

Handling: Avoid contact with eyes Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Store between 10° and 25°C.
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Have an eyewash station nearby. Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves lab coat
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes Wash thoroughly after handling. Use with adequate ventilation. Protect from: heat
TLV: Not established.
PEL: Not established.

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: Clear, colorless liquid
Physical State: Liquid
Molecular Weight: Not applicable.
Odor: None
pH: 1.1
Vapor Pressure: Not determined.
Vapor Density (air = 1): Not determined.
Boiling Point: ~ 100° C (~ 212° F)
Melting Point: Not determined.
Specific Gravity (water = 1): 0.990
Evaporation Rate (water = 1): 0.56
Volatile Organic Compounds Content: Not applicable.
Partition Coefficient (n-octanol / water): Not applicable.
Solubility:
Water: Miscible.
Acid: Miscible.
Other: Not determined.
Metal Corrosivity:
Steel: 0.027 in/yr (0.689 mm/yr)
Aluminum: 0.124 in/yr (3.150 mm/yr)

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Extreme temperatures Evaporation
Reactivity / Incompatibility: Incompatible with: caustics
Hazardous Decomposition: None reported
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported.
LC50: None reported.
Dermal Toxicity Data: None reported.
Skin and Eye Irritation Data: None reported.
Mutation Data: None reported.
Reproductive Effects Data: None reported.

Ingredient Toxicological Data: Sulfuric Acid: Oral rat LD_{50} = 2140 mg/kg; Inhalation rat LC_{50} = 347 ppm/1 hr.

12. ECOLOGICAL INFORMATION

Product Ecological Information: No specific ecological information available for this product.

Ingredient Ecological Information: Sulfuric Acid: The 48-Hour TLm in flounder is 100-300 ppm.

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: D002
Special Instructions (Disposal): Dilute to 3 to 5 times the volume with cold water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Open cold water tap completely, slowly pour the reacted material to the drain. Flush system with plenty of water.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Not Currently Regulated
--
DOT Hazard Class: NA
DOT Subsidiary Risk: NA
DOT ID Number: NA
DOT Packing Group: NA
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Not Currently Regulated
--
ICAO Hazard Class: NA
ICAO Subsidiary Risk: NA
ICAO ID Number: NA
ICAO Packing Group: NA
I.M.O.:
I.M.O. Proper Shipping Name: Not Currently Regulated
--
I.M.O. Hazard Class: NA
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: NA
I.M.O. Packing Group: NA
Additional Information: This product may be shipped as part of a chemical kit composed of various compatible dangerous goods for analytical or testing purposes. This kit would have the following classification: Proper Shipping Name: Chemical Kit
Hazard Class: 9 UN Number 3316.

15. REGULATORY INFORMATION

U.S. Federal Regulations:

O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)

E.P.A.:

S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard Delayed (Chronic) Health Hazard

S.A.R.A. Title III Section 313 (40 CFR 372): This product contains a chemical(s) subject to the reporting requirements of Section 313 of Title III of SARA.

Sulfuric acid (acid aerosols including mists, vapors, gas, fog, and other airborne forms of any particle size.)

302 (EHS) TPQ (40 CFR 355): Sulfuric Acid 1000 lbs.

304 CERCLA RQ (40 CFR 302.4): Sulfuric Acid 1000 lbs.

304 EHS RQ (40 CFR 355): Sulfuric Acid - RQ 1000 lbs.

Clean Water Act (40 CFR 116.4): Sulfuric acid - RQ 1000 lbs.

RCRA: Contains RCRA regulated substances. See Section 13, EPA Waste ID Number.

C.P.S.C.: Not applicable

State Regulations:

California Prop. 65: No Prop. 65 listed chemicals are present in this product.

Identification of Prop. 65 Ingredient(s): None

California Perchlorate Rule CCR Title 22 Chap 33:

Trade Secret Registry: Not applicable

National Inventories:

U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).

TSCA CAS Number: Not applicable.

16. OTHER INFORMATION

Intended Use: Alkalinity determination

References: 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor). CCINFO RTECS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Association, 1991. IARC Monographs on the Evaluation of the Carcinogenic Risks to Humans. World Health Organization (Volumes 1-42) Supplement 7. France: 1987. List of Dangerous Substances Classified in Annex I of the EEC Directive (67/548) - Classification, Packaging and Labeling of Dangerous Substances, Amended July 1992. Sixth Annual Report on Carcinogens, 1991. U.S. Department of Health and Human Services. Rockville, MD: Technical Resources, Inc. 1991. Technical Judgment. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. Verschueren, Karel. Handbook of Environmental Data on Organic Chemicals. New York: Van Nostrand Reinhold Co., 1977.

Revision Summary: Updates in Section(s) 15,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

World Headquarters
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Loveland, CO USA 80539
(970) 669-3050

Date Printed 4/16/08
MSDS No: M00299

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Sulfuric Acid 1.600 ± 0.008 N
Catalog Number: 1438901

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00299
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: Carcinogen. Causes eye burns.
Date of MSDS Preparation:
Day: 10
Month: May
Year: 2008

2. COMPOSITION / INFORMATION ON INGREDIENTS

Demineralized Water
CAS No.: 7732-18-5
TSCA CAS Number: 7732-18-5
Percent Range: 90.0 - 100.0
Percent Range Units: volume / volume
LD50: None reported
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: No effects anticipated.

Other component
CAS No.: Not applicable
TSCA CAS Number: Not applicable
Percent Range: 0.01 - 0.1
Percent Range Units: weight / weight
LD50: Not applicable
LC50: Not applicable
TLV: Not established
PEL: Not established
Hazard: Any ingredient(s) of this product listed as "Other component(s)" is not considered a health hazard to the user of this product.

Sulfuric Acid
CAS No.: 7664-93-9
TSCA CAS Number: 7664-93-9

Percent Range: 1.0 - 10.0
Percent Range Units: volume / volume
LD50: Oral rat LD50 = 2140 mg/kg.
LC50: Inhalation rat LC50 = 87 ppm/4 hr
TLV: 1 mg/m³ (TWA); 3 mg/m³ (STEL)
PEL: 1 mg/m³
Hazard: Causes severe burns. Harmful if inhaled. Recognized carcinogen.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: Clear, colorless
Odor: Acidic
CAUSES EYE BURNS MAY CAUSE RESPIRATORY TRACT IRRITATION

HMIS:
Health: 3
Flammability: 0
Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 3
Flammability: 0
Reactivity: 0
Symbol: Not applicable
Potential Health Effects:
Eye Contact: Causes eye burns.
Skin Contact: No effects are anticipated
Skin Absorption: None reported
Target Organs: None reported
Ingestion: Causes: irritation of the mouth and esophagus May cause: vomiting diarrhea
Target Organs: None reported
Inhalation: May cause: respiratory tract irritation teeth erosion mouth soreness difficult breathing
Target Organs: Lungs
Medical Conditions Aggravated: Pre-existing: Eye conditions Respiratory conditions
Chronic Effects: Chronic overexposure may cause erosion of the teeth chronic irritation or inflammation of the lungs cancer
Cancer / Reproductive Toxicity Information:
This product does NOT contain any OSHA listed carcinogens.

An ingredient of this mixture is: IARC Group 1: Recognized Carcinogen
Sulfuric Acid - The IARC evaluation was based on exposure to the mist or vapor of concentrated sulfuric acid generated during chemical processes.
NTP Listed Group 1: Recognized Carcinogen
Sulfuric Acid Mist or Vapor
Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with plenty of water.
Ingestion (First Aid): Do not induce vomiting. Give 1-2 glasses of water. Call physician immediately. Never give anything by mouth to an unconscious person.
Inhalation: Remove to fresh air.

5. FIRE FIGHTING MEASURES

Flammable Properties: Material will not burn. During a fire, irritating and highly toxic gases may be generated by thermal decomposition.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not applicable
Hazardous Combustion Products: This material will not burn.
Fire / Explosion Hazards: This product will not burn or explode.
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Use media appropriate to surrounding fire conditions
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Absorb spilled liquid with non-reactive sorbent material. Stop spilled material from being released to the environment.
Clean-up Technique: Cover spilled material with an alkali, such as soda ash or sodium bicarbonate. Scoop up slurry into a large beaker. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Flush reacted material to the drain with a large excess of water. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate local area (15 foot radius or as directed by your facility's emergency response plan) when: any quantity is spilled. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Mixture contains a component which is regulated as a water pollutant. Product is regulated as RCRA hazardous waste.
304 EHS RQ (40 CFR 355): Sulfuric Acid - RQ 1000 lbs.
D.O.T. Emergency Response Guide Number: none

7. HANDLING / STORAGE

Handling: Avoid contact with eyes Do not breathe mist or vapors. Use with adequate ventilation. Maintain general industrial hygiene practices when using this product. Wash thoroughly after handling.
Storage: Store between 10° and 25°C.
Flammability Class: Class IIIB

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Have an eyewash station nearby. Use general ventilation to minimize exposure to mist, vapor or dust. Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves lab coat
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes skin Do not breathe: mist/vapor Use with adequate ventilation. Protect from: heat
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: Clear, colorless
Physical State: Liquid
Molecular Weight: Not applicable
Odor: Acidic
pH: <0.5
Vapor Pressure: Not determined
Vapor Density (air = 1): Not determined
Boiling Point: ~ 100 °C (212 °F)
Melting Point: Not determined
Specific Gravity (water = 1): 1.047
Evaporation Rate (water = 1): 0.53
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): Not applicable
Solubility:
Water: Soluble
Acid: Soluble
Other: Not determined
Metal Corrosivity:
Steel: 0.096 in/yr
Aluminum: Not determined

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Extreme temperatures Exposure to air. Heating to decomposition.
Reactivity / Incompatibility: Incompatible with: alkalies oxidizers reducers
Hazardous Decomposition: Heating to decomposition releases toxic and/or corrosive fumes of: sulfur oxides
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: Skin testing with 10% solution shows no irritation.
Mutation Data: None reported

Reproductive Effects Data: None reported
Ingredient Toxicological Data: Sulfuric Acid: Oral rat LD50 = 2140 mg/kg, Inhalation rat LC50 87 ppm/4Hours

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: Sulfuric Acid: The 48-Hour TLm in flounder is 100-300 ppm.

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: D002
Special Instructions (Disposal): Work in an approved fume hood. Dilute to 3 to 5 times the volume with cold water. Adjust to a pH between 6 and 9 with an alkali, such as soda ash or sodium bicarbonate. Open cold water tap completely, slowly pour the reacted material to the drain. Allow cold water to run for 5 minutes to completely flush the system.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Not Currently Regulated
--
DOT Hazard Class: NA
DOT Subsidiary Risk: NA
DOT ID Number: NA
DOT Packing Group: NA
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Not Currently Regulated
--
ICAO Hazard Class: NA
ICAO Subsidiary Risk: NA
ICAO ID Number: NA
ICAO Packing Group: NA
I.M.O.:
I.M.O. Proper Shipping Name: Not Currently Regulated
--
I.M.O. Hazard Class: NA
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: NA
I.M.O. Packing Group: NA
Additional Information: This product may be shipped as part of a chemical kit composed of various compatible dangerous goods for analytical or testing purposes. This kit would have the following classification: Proper Shipping Name: Chemical Kit
Hazard Class: 9 UN Number 3316.

15. REGULATORY INFORMATION

U.S. Federal Regulations:

O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)

E.P.A.:

S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard
Delayed (Chronic) Health Hazard

S.A.R.A. Title III Section 313 (40 CFR 372): This product contains a chemical(s) subject to the reporting requirements of Section 313 of Title III of SARA.
Sulfuric acid (acid aerosols including mists, vapors, gas, fog, and other airborne forms of any particle size.)

302 (EHS) TPQ (40 CFR 355): Sulfuric Acid 1000 lbs.

304 CERCLA RQ (40 CFR 302.4): Sulfuric Acid 1000 lbs.

304 EHS RQ (40 CFR 355): Sulfuric Acid - RQ 1000 lbs.

Clean Water Act (40 CFR 116.4): Sulfuric acid - RQ 1000 lbs.

RCRA: Contains RCRA regulated substances. See Section 13, EPA Waste ID Number.

C.P.S.C.: Not applicable

State Regulations:

California Prop. 65: No Prop. 65 listed chemicals are present in this product.

Identification of Prop. 65 Ingredient(s): None

California Perchlorate Rule CCR Title 22 Chap 33:

Trade Secret Registry: Not applicable

National Inventories:

U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).

TSCA CAS Number: Not applicable

16. OTHER INFORMATION

Intended Use: Alkalinity determination

References: TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. In-house information. Technical Judgment. Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. Vendor Information. IARC Monographs on the Evaluation of the Carcinogenic Risks to Humans. World Health Organization (Volumes 1-42) Supplement 7. France: 1987.

Revision Summary: Updates in Section(s) 15,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

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Date Printed 5/31/07
MSDS No: M00008

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Phenolphthalein Indicator Powder
Catalog Number: 94299

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00008
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: May cause eye irritation. Experimental carcinogen.
Date of MSDS Preparation:
Day: 06
Month: February
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

Phenolphthalein
CAS No.: 77-09-8
TSCA CAS Number: 77-09-8
Percent Range: <2
Percent Range Units: weight / weight
LD50: None reported
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause allergic reaction. May cause irritation. Suspected carcinogen.

Other component
CAS No.: Not applicable
TSCA CAS Number: Not applicable
Percent Range: < 1.0
Percent Range Units: weight / weight
LD50: Not applicable
LC50: Not applicable
TLV: Not established
PEL: Not established
Hazard: Any ingredient(s) of this product listed as "Other component(s)" is not considered a health hazard to the user of this product.

Sodium Chloride
CAS No.: 7647-14-5
TSCA CAS Number: 7647-14-5

Percent Range: >95.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 3000 mg/kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: Causes moderate eye irritation.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White or light pink powder
Odor: None
MAY CAUSE EYE IRRITATION
CONTAINS MATERIAL WHICH MAY CAUSE CANCER BASED ON ANIMAL DATA

HMIS:
Health: 2*
Flammability: 0
Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 1
Flammability: 0
Reactivity: 0
Symbol: Not applicable
Potential Health Effects:
Eye Contact: Causes moderate irritation
Skin Contact: Causes mild irritation
Skin Absorption: No effects anticipated
Target Organs: Not applicable
Ingestion: May cause: dehydration vomiting blood pressure changes muscular twitching rigidity
Target Organs: None reported
Inhalation: No effects anticipated
Target Organs: Not applicable
Medical Conditions Aggravated: Pre-existing: Eye conditions
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
This product does NOT contain any OSHA listed carcinogens.

An ingredient of this mixture is: IARC Group 2B: Experimental Carcinogen
Phenolphthalein
An ingredient of this mixture is: NTP Listed Group 2B: Experimental Carcinogen
Phenolphthalein
Additional Cancer / Reproductive Toxicity Information: Contains: a suspected mutagen.
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Flush eyes with water. Call physician if irritation develops.

Skin Contact (First Aid): Wash skin with plenty of water.
Ingestion (First Aid): Give large quantities of water. Call physician immediately.
Inhalation: Remove to fresh air.

5. FIRE FIGHTING MEASURES

Flammable Properties: During a fire, this product decomposes to form toxic gases.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not applicable
Hazardous Combustion Products: Toxic fumes of: chlorides sodium oxides
Fire / Explosion Hazards: May react violently with: bromine trifluoride
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Use media appropriate to surrounding fire conditions
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment.
Clean-up Technique: Scoop up spilled material into a large beaker and dissolve with water. Dilute with a large excess of water. Flush the spilled material to the drain with a large excess of water. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate as needed to perform spill clean-up. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: None

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Keep container tightly closed when not in use.
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves lab coat
Inhalation Protection: adequate ventilation

Precautionary Measures: Avoid contact with: eyes skin Wash thoroughly after handling.
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White or light pink powder
Physical State: Solid
Molecular Weight: Not applicable
Odor: None
pH: of 5% solution = 6.2
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable
Boiling Point: Not applicable
Melting Point: 258°-262°C (496°-504°F)
Specific Gravity (water = 1): 2.10
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): Not determined
Solubility:
Water: Soluble
Acid: Soluble
Other: Not determined
Metal Corrosivity:
Steel: Not determined
Aluminum: Not determined

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Heating to decomposition. Excess moisture
Reactivity / Incompatibility: Incompatible with: bromine trifluoride lithium
Hazardous Decomposition: Toxic fumes of: chlorides sodium oxides
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: None reported
Mutation Data: None reported
Reproductive Effects Data: In a laboratory test, single subcutaneous injection of sodium chloride into pregnant mice at the level of 2500 mg/kg caused fetal deaths and malformations.
Ingredient Toxicological Data: Sodium Chloride: Oral rat LD50 = 3000 mg/kg

12. ECOLOGICAL INFORMATION

Product Ecological Information: --

No ecological data available for this product.
Ingredient Ecological Information: --
No ecological data available for the ingredients of this product.

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: None
Special Instructions (Disposal): Dilute material with excess water making a weaker than 5% solution. Open cold water tap completely, slowly pour the material to the drain. Flush system with plenty of water.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Not Currently Regulated
--
DOT Hazard Class: NA
DOT Subsidiary Risk: NA
DOT ID Number: NA
DOT Packing Group: NA
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Not Currently Regulated
--
ICAO Hazard Class: NA
ICAO Subsidiary Risk: NA
ICAO ID Number: NA
ICAO Packing Group: NA
I.M.O.:
I.M.O. Proper Shipping Name: Not Currently Regulated
--
I.M.O. Hazard Class: NA
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: NA
I.M.O. Packing Group: NA
Additional Information: This product may be shipped as part of a chemical kit composed of various compatible dangerous goods for analytical or testing purposes. This kit would have the following classification: Proper Shipping Name: Chemical Kit
Hazard Class: 9 UN Number 3316.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard
Delayed (Chronic) Health Hazard

S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.

--

302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
Clean Water Act (40 CFR 116.4): Not applicable
RCRA: Contains no RCRA regulated substances.
C.P.S.C.: Not applicable
State Regulations:
California Prop. 65: WARNING - This product contains a chemical known to the State of California to cause cancer.
Identification of Prop. 65 Ingredient(s): Phenolphthalein
Trade Secret Registry: Not applicable
National Inventories:
U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).
TSCA CAS Number: Not applicable

16. OTHER INFORMATION

Intended Use: Indicator for pH
References: 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor). Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. Technical Judgment. Journal of Clinical Investigations 41: 710-714 (1962). Acta Anat. 74: 121-124 (1969). Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Association, 1991. In-house information.
Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

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(970) 669-3050

Date Printed 5/16/08
MSDS No: M00024

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Ferrous Iron Reagent
Catalog Number: 103769

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00024
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: May cause irritation.
Date of MSDS Preparation:
Day: 05
Month: October
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

1, 10-Phenanthroline
CAS No.: 5144-89-8
TSCA CAS Number: 66-71-7
Percent Range: 1.0 - 10.0
Percent Range Units: weight / weight
LD50: Oral Rat LD_{50} = 132 mg/kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

Sodium Bicarbonate
CAS No.: 144-55-8
TSCA CAS Number: 144-55-8
Percent Range: 90.0 - 100.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 4220 mg/kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

3. HAZARDS IDENTIFICATION

Emergency Overview:

Appearance: White powder
Odor: Not determined
MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION

HMIS:
Health: 1
Flammability: 0
Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 1
Flammability: 0
Reactivity: 0
Symbol: Not applicable
Potential Health Effects:
Eye Contact: May cause irritiation
Skin Contact: May cause irritiation
Skin Absorption: None reported
Target Organs: None reported
Ingestion: Very large doses may cause: abdominal pain gastrointestinal disturbances alkalosis which causes abnormally high alkali reserve of the blood and other body fluids hypotension
Target Organs: None reported
Inhalation: May cause: respiratory tract irritation
Target Organs: None reported
Medical Conditions Aggravated: Pre-existing: Kidney conditions
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
This product does NOT contain any OSHA listed carcinogens.

This product does NOT contain any IARC listed chemicals.

This product does NOT contain any NTP listed chemicals.

Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with soap and plenty of water. Call physician if irritation develops.
Ingestion (First Aid): Give large quantities of water. Call physician immediately.
Inhalation: Remove to fresh air.

5. FIRE FIGHTING MEASURES

Flammable Properties: Does not burn, but may melt in a fire, releasing toxic fumes.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable

Upper Explosion Limits: Not applicable
Autoignition Temperature: Not applicable
Hazardous Combustion Products: Toxic fumes of: sodium monoxide nitrogen oxides. carbon monoxide, carbon dioxide.
Fire / Explosion Hazards: None reported
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Water. Carbon dioxide Dry chemical.
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment.
Clean-up Technique: Scoop up spilled material into a large beaker and dissolve with water. Flush the spilled material to the drain with a large excess of water. Decontaminate the area of the spill with a weak acid solution.
Evacuation Procedure: Evacuate as needed to perform spill clean-up. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: None

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin Do not breathe dust. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Keep container tightly closed when not in use. Protect from: moisture oxidizers
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Have an eyewash station nearby. Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: disposable latex gloves
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes skin Do not breathe: dust Wash thoroughly after handling. Keep away from: oxidizers
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White powder
Physical State: Solid

Molecular Weight: Not applicable
Odor: Not determined
pH: Not determined
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable
Boiling Point: Not applicable
Melting Point: Not determined
Specific Gravity (water = 1): 2.10
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): Not applicable
Solubility:
Water: Slightly soluble
Acid: Slightly soluble
Other: Not determined
Metal Corrosivity:
Steel: Not determined
Aluminum: Not determined

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Excess moisture Heating to decomposition.
Reactivity / Incompatibility: Incompatible with: oxidizers
Hazardous Decomposition: Toxic fumes of: nitrogen oxides sodium oxides carbon monoxide carbon dioxide
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: Sodium Bicarbonate: Eye - rabbit - 100 mg/30 seconds - MILD; Skin - Human - 30 mg/3 days intermittent - MILD
Mutation Data: None reported
Reproductive Effects Data: None reported
Ingredient Toxicological Data: Sodium Bicarbonate: Oral rat LD_{50} = 4220 mg/kg; 1, 10-Phenanthroline: Oral rat LD_{50} = 132 mg/kg

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
No ecological data available for the ingredients of this product.

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: None
Special Instructions (Disposal): Dilute material with excess water making a weaker than 5% solution. Open cold water tap completely, slowly pour the material to the drain.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Not Currently Regulated
--
DOT Hazard Class: NA
DOT Subsidiary Risk: NA
DOT ID Number: NA
DOT Packing Group: NA
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Not Currently Regulated
--
ICAO Hazard Class: NA
ICAO Subsidiary Risk: NA
ICAO ID Number: NA
ICAO Packing Group: NA
I.M.O.:
I.M.O. Proper Shipping Name: Not Currently Regulated
--
I.M.O. Hazard Class: NA
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: NA
I.M.O. Packing Group: NA
Additional Information: This product may be shipped as part of a chemical kit composed of various compatible dangerous goods for analytical or testing purposes. This kit would have the following classification: Proper Shipping Name: Chemical Kit Hazard Class: 9 UN Number 3316. ALSO NOTE: If the National Competent Authority declares this product an environmental hazard by Special Provision 909 (IMDG) and Special Provision A97 (IATA) the classification may be UN3077 or UN3082.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard
S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.
--
302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Not applicable
304 EHS RQ (40 CFR 355): Not applicable

Clean Water Act (40 CFR 116.4): Not applicable
RCRA: Contains no RCRA regulated substances.
C.P.S.C.: Not applicable
State Regulations:
California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): None
California Perchlorate Rule CCR Title 22 Chap 33:
Trade Secret Registry: Not applicable
National Inventories:
U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).
TSCA CAS Number: Not applicable

16. OTHER INFORMATION

Intended Use: Iron determination
References: TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor). In-house information. Technical Judgment. Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Association, 1991.
Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

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Date Printed 5/16/08
MSDS No: M00588

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Sodium Hydroxide 0.3636 ± 0.0020 N
Catalog Number: 1437801

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00588
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: Causes burns.
Date of MSDS Preparation:
Day: 27
Month: February
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

Sodium Hydroxide
CAS No.: 1310-73-2
TSCA CAS Number: 1310-73-2
Percent Range: 0.5 - 3.0
Percent Range Units: weight / volume
LD50: Oral rat LDLo = 500 mg/kg.
LC50: None reported
TLV: 2 mg/m³ Ceiling/STEL
PEL: 2 mg/m³
Hazard: Causes severe burns. Toxic.

Demineralized Water
CAS No.: 7732-18-5
TSCA CAS Number: 7732-18-5
Percent Range: >95.0
Percent Range Units: volume / volume
LD50: None reported
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: No effects anticipated.

3. HAZARDS IDENTIFICATION

Emergency Overview:

Appearance: Clear, colorless liquid
Odor: Odorless
CAUSES BURNS

HMIS:
Health: 3
Flammability: 0
Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 3
Flammability: 0
Reactivity: 0
Symbol: Not applicable
Potential Health Effects:
Eye Contact: Causes eye burns.
Skin Contact: Causes burns.
Skin Absorption: None reported
Target Organs: None reported
Ingestion: May cause: burns of the mouth and esophagus vomiting rapid pulse and respirations shock collapse
Target Organs: None reported
Inhalation: May cause: respiratory tract irritation
Target Organs: None reported
Medical Conditions Aggravated: Pre-existing: Eye conditions Skin conditions
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
This product does NOT contain any OSHA listed carcinogens.

This product does NOT contain any IARC listed chemicals.

This product does NOT contain any NTP listed chemicals.

Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with plenty of water for 15 minutes. Call physician immediately. Remove contaminated clothing.
Ingestion (First Aid): Do not induce vomiting. Give 1-2 glasses of water. Call physician immediately. Never give anything by mouth to an unconscious person.
Inhalation: Remove to fresh air.

5. FIRE FIGHTING MEASURES

Flammable Properties: Material will not burn.
Flash Point: Not applicable
Method: Not applicable

Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not applicable
Hazardous Combustion Products: This material will not burn.
Fire / Explosion Hazards: May react violently with: acids
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Use media appropriate to surrounding fire conditions
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Absorb spilled liquid with non-reactive sorbent material. Stop spilled material from being released to the environment.
Clean-up Technique: Cover spilled material with a dry acid, such as citric or boric. Scoop up slurry into a large beaker. Dilute with a large excess of water. Adjust to a pH between 6 and 9 with an acid, such as sulfuric or citric. Flush reacted material to the drain with a large excess of water. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate local area (15 foot radius or as directed by your facility's emergency response plan) when: any quantity is spilled. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Product is regulated as a hazardous water pollutant. Product is regulated as RCRA hazardous waste.
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: 154

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin clothing Do not breathe mist or vapors. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Protect from: heat Keep away from: acids
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Have a safety shower nearby. Have an eyewash station nearby. Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: chemical splash goggles
Skin Protection: disposable latex gloves lab coat
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes skin clothing Do not breathe: mist/vapor Wash thoroughly after handling. Protect from: heat Keep away from: acids/acid fumes
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: Clear, colorless liquid
Physical State: Liquid
Molecular Weight: Not available
Odor: Odorless
pH: 13.5
Vapor Pressure: Not available
Vapor Density (air = 1): Not available
Boiling Point: 100°C; 212°F
Melting Point: Not available
Specific Gravity (water = 1): 1.0
Evaporation Rate (water = 1): 0.41
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): Not applicable
Solubility:
Water: Miscible
Acid: Miscible
Other: Not determined
Metal Corrosivity:
Steel: 0.00 in/yr
Aluminum: 4.5 in/yr

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Heat Evaporation
Reactivity / Incompatibility: May react violently in contact with: strong acids
Hazardous Decomposition: No hazardous decomposition products known.
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: None reported
Mutation Data: None reported
Reproductive Effects Data: None reported
Ingredient Toxicological Data: Sodium Hydroxide: Oral rabbit LDLo = 500 mg/kg

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
No ecological data available for the ingredients of this product.

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: D002
Special Instructions (Disposal): Dilute to 3 to 5 times the volume with cold water. Adjust to a pH between 6 and 9 with an acid, such as sulfuric or citric. Open cold water tap completely, slowly pour the reacted material to the drain. Allow cold water to run for 5 minutes to completely flush the system.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Sodium Hydroxide Solution
--
DOT Hazard Class: 8
DOT Subsidiary Risk: NA
DOT ID Number: UN1824
DOT Packing Group: II
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Sodium Hydroxide Solution
--
ICAO Hazard Class: 8
ICAO Subsidiary Risk: NA
ICAO ID Number: UN1824
ICAO Packing Group: II
I.M.O.:
I.M.O. Proper Shipping Name: Sodium Hydroxide Solution
--
I.M.O. Hazard Class: 8
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: UN1824
I.M.O. Packing Group: II
Additional Information: This product may be shipped as part of a chemical kit composed of various compatible dangerous goods for analytical or testing purposes. This kit would have the following classification: Proper Shipping Name: Chemical Kit Hazard Class: 9 UN Number 3316.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard
S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.
--
302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Sodium Hydroxide 1000 lbs.
304 EHS RQ (40 CFR 355): Not applicable

Clean Water Act (40 CFR 116.4): Sodium Hydroxide - RQ = 1000 lbs. (454 kgs.)
RCRA: Contains RCRA regulated substances. See Section 13, EPA Waste ID Number.
C.P.S.C.: Not applicable
State Regulations:
California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): None
California Perchlorate Rule CCR Title 22 Chap 33:
Trade Secret Registry: Not applicable
National Inventories:
U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).
TSCA CAS Number: Not applicable

16. OTHER INFORMATION

Intended Use: Standard solution
References: 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor). Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. In-house information. Technical Judgment. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989.
Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

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Date Printed 5/16/08
MSDS No: M00554

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Sodium Hydroxide 3.636 ± 0.020 N
Catalog Number: 1438001

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00554
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: Causes burns.
Date of MSDS Preparation:
Day: 07
Month: December
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

Sodium Hydroxide
CAS No.: 1310-73-2
TSCA CAS Number: 1310-73-2
Percent Range: 5.0 - 15.0
Percent Range Units: weight / weight
LD50: Oral rat LDLo = 500 mg/kg.
LC50: None reported
TLV: 2 mg/m³ Ceiling/STEL
PEL: 2 mg/m³
Hazard: Causes severe burns. Toxic.

Demineralized Water
CAS No.: 7732-18-5
TSCA CAS Number: 7732-18-5
Percent Range: 80.0 - 90.0
Percent Range Units: volume / volume
LD50: None reported
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: No effects anticipated.

3. HAZARDS IDENTIFICATION

Emergency Overview:

Appearance: Clear, colorless liquid
Odor: None
CAUSES SEVERE BURNS HARMFUL IF SWALLOWED

HMIS:
Health: 3
Flammability: 0
Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 3
Flammability: 0
Reactivity: 0
Symbol: Not applicable
Potential Health Effects:
Eye Contact: Causes severe burns
Skin Contact: Causes burns.
Skin Absorption: None reported
Target Organs: None reported
Ingestion: Toxic Causes: severe burns Can cause: rapid pulse and respirations vomiting shock collapse
Target Organs: None reported
Inhalation: Causes: burns
Target Organs: None reported
Medical Conditions Aggravated: Pre-existing: Eye conditions Skin conditions Respiratory conditions
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
This product does NOT contain any OSHA listed carcinogens.

This product does NOT contain any IARC listed chemicals.

This product does NOT contain any NTP listed chemicals.

Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with plenty of water for 15 minutes. Remove contaminated clothing. Call physician immediately.
Ingestion (First Aid): Do not induce vomiting. Give 1-2 glasses of water. Call physician immediately. Never give anything by mouth to an unconscious person.
Inhalation: Remove to fresh air. Give artificial respiration if necessary. Call physician.

5. FIRE FIGHTING MEASURES

Flammable Properties: Material will not burn.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:

Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not applicable
Hazardous Combustion Products: None reported
Fire / Explosion Hazards: May react violently with: strong acids flammable liquids organic materials
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Use media appropriate to surrounding fire conditions
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Releases of this material may contaminate the environment. Absorb spilled liquid with non-reactive sorbent material. Stop spilled material from being released to the environment. Dike the spill to contain material for later disposal.
Clean-up Technique: Cover spilled material with a dry acid, such as citric or boric. Scoop up slurry into a large beaker. Adjust to a pH between 6 and 9 with an acid, such as sulfuric or citric. Flush reacted material to the drain with a large excess of water. Decontaminate the area of the spill with a weak acid solution.
Evacuation Procedure: Evacuate local area (15 foot radius or as directed by your facility's emergency response plan) when: any quantity is spilled. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Mixture contains a component which is regulated as hazardous waste. Mixture contains a component which is regulated as a water pollutant.
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: 154

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin clothing Do not breathe mist or vapors. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Keep away from: acids flammable liquids organic material Store in a cool, dry place.
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Have an eyewash station nearby. Have a safety shower nearby. Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: chemical splash goggles
Skin Protection: disposable latex gloves lab coat
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes skin clothing Do not breathe: mist/vapor Wash thoroughly after handling. Keep away from: acids/acid fumes organic materials
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: Clear, colorless liquid
Physical State: Liquid
Molecular Weight: Not applicable
Odor: None
pH: >14
Vapor Pressure: Not determined
Vapor Density (air = 1): Not determined
Boiling Point: ~100°C (212°F)
Melting Point: Not determined
Specific Gravity (water = 1): 1.136
Evaporation Rate (water = 1): 0.26
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): Not applicable
Solubility:
Water: Soluble
Acid: Soluble
Other: Not determined
Metal Corrosivity:
Steel: 0.00 in/yr
Aluminum: >20 in/yr

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Heat Evaporation Extreme temperatures
Reactivity / Incompatibility: May react violently in contact with: strong acids flammable liquids aluminum tin zinc nitromethane nitro compounds halogenated organic compounds
Hazardous Decomposition: None reported
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: None reported
Mutation Data: None reported
Reproductive Effects Data: None reported
Ingredient Toxicological Data: Sodium Hydroxide: Oral rat LD_{Lo} = 500 mg/kg

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
No ecological data available for the ingredients of this product.

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: D002
Special Instructions (Disposal): Dilute to 3 to 5 times the volume with cold water. Adjust to a pH between 6 and 9 with an acid, such as sulfuric or citric. Open cold water tap completely, slowly pour the reacted material to the drain. Flush system with plenty of water.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Sodium Hydroxide Solution
--
DOT Hazard Class: 8
DOT Subsidiary Risk: NA
DOT ID Number: UN1824
DOT Packing Group: II
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Sodium Hydroxide Solution
--
ICAO Hazard Class: 8
ICAO Subsidiary Risk: NA
ICAO ID Number: UN1824
ICAO Packing Group: II
I.M.O.:
I.M.O. Proper Shipping Name: Sodium Hydroxide Solution
--
I.M.O. Hazard Class: 8
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: UN1824
I.M.O. Packing Group: II
Additional Information: This product may be shipped as part of a chemical kit composed of various compatible dangerous goods for analytical or testing purposes. This kit would have the following classification: Proper Shipping Name: Chemical Kit
Hazard Class: 9 UN Number 3316.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard
S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.
--
302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Sodium Hydroxide
304 EHS RQ (40 CFR 355): Not applicable

Clean Water Act (40 CFR 116.4): Sodium Hydroxide - RQ = 1000 lbs. (454 kgs.)
RCRA: Contains RCRA regulated substances. See Section 13, EPA Waste ID Number.
C.P.S.C.: The label for this product bears the signal word "POISON" because the concentration of Sodium Hydroxide in the product is greater than/equal to 10%.
State Regulations:
California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): None
California Perchlorate Rule CCR Title 22 Chap 33:
Trade Secret Registry: Not applicable
National Inventories:
U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).
TSCA CAS Number: Not applicable

16. OTHER INFORMATION

Intended Use: Laboratory Reagent
References: 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor). Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. Technical Judgment. In-house information. Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Association, 1991. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989.
Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

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World Headquarters
Hach Company
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Loveland, CO USA 80539
(970) 669-3050

Date Printed 6/11/08
MSDS No: M00558

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Alka-Seltzer Without Asprin
Catalog Number: 1453300

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00558
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: No effects anticipated.
Date of MSDS Preparation:
Day: 27
Month: April
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

Potassium Bicarbonate
CAS No.: 298-14-6
TSCA CAS Number: 298-14-6
Percent Range: 10.0 - 20.0
Percent Range Units: weight / weight
LD50: None reported
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

Citric Acid
CAS No.: 77-92-9
TSCA CAS Number: 77-92-9
Percent Range: 35.0 - 45.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 6730 mg/Kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: Causes severe eye irritation.

Sodium Bicarbonate
CAS No.: 144-55-8
TSCA CAS Number: 144-55-8
Percent Range: 40.0 - 50.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 4220 mg/kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White tablets
Odor: None

HMIS:
Health: 1
Flammability: 1
Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 1
Flammability: 1
Reactivity: 0
Symbol: Not applicable
Potential Health Effects:
Eye Contact: No effects are anticipated
Skin Contact: No effects are anticipated
Skin Absorption: No effects anticipated
Target Organs: Not applicable
Ingestion: Very large doses may cause: gastrointestinal disturbances alkalosis which causes abnormally high alkali reserve of the blood and other body fluids
Target Organs: Blood
Inhalation: No effects anticipated
Target Organs: Not applicable
Medical Conditions Aggravated: None reported
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
This product does NOT contain any OSHA listed carcinogens.

This product does NOT contain any IARC listed chemicals.

This product does NOT contain any NTP listed chemicals.

Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Flush eyes with water. Call physician if irritation develops.
Skin Contact (First Aid): Wash skin with plenty of water.
Ingestion (First Aid): Give large quantities of water. Call physician immediately.
Inhalation: None required.

5. FIRE FIGHTING MEASURES

Flammable Properties: During a fire, this product decomposes to form toxic gases.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not applicable

Hazardous Combustion Products: None reported
Fire / Explosion Hazards: None reported
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Use media appropriate to surrounding fire conditions
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear. Evacuate area and fight fire from a safe distance.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment.
Clean-up Technique: Scoop up spilled material into a large beaker and dissolve with water. Flush reacted material to the drain with a large excess of water. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate as needed to perform spill clean-up. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: Not applicable

7. HANDLING / STORAGE

Handling: Maintain general industrial hygiene practices when using this product.
Storage: Store in a cool, dry place.
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: Not applicable
Skin Protection: Not applicable
Inhalation Protection: Not applicable
Precautionary Measures: Not applicable
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White tablets
Physical State: Solid
Molecular Weight: Not applicable
Odor: None
pH: Not applicable
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable
Boiling Point: Not applicable
Melting Point: Not determined
Specific Gravity (water = 1): Not determined
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: None
Partitian Coefficient (n-octanol / water): Not applicable
Solubility:
Water: Soluble
Acid: Not determined

Other: Not determined
Metal Corrosivity:
Steel: Not determined
Aluminum: Not determined

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Excess moisture Extreme temperatures
Reactivity / Incompatibility: None reported
Hazardous Decomposition: No hazardous decomposition products known.
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: None reported
Mutation Data: None reported
Reproductive Effects Data: None reported
Ingredient Toxicological Data: Sodium Bicarbonate: Oral rat LD_{50} = 4220 mg/kg. Citric Acid: Oral rat LD_{50} = 6730 mg/kg.

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
No ecological data available for the ingredients of this product.

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: Not applicable
Special Instructions (Disposal): Working in a large container, cautiously add small portions of the material to cold water with agitation. Open cold water tap completely, slowly pour the reacted material to the drain. Flush system with plenty of water.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Not Currently Regulated
--
DOT Hazard Class: NA
DOT Subsidiary Risk: NA
DOT ID Number: NA
DOT Packing Group: NA
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Not Currently Regulated
--
ICAO Hazard Class: NA
ICAO Subsidiary Risk: NA

ICAO ID Number: NA
ICAO Packing Group: NA
I.M.O.:
I.M.O. Proper Shipping Name: Not Currently Regulated
--
I.M.O. Hazard Class: NA
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: NA
I.M.O. Packing Group: NA
Additional Information: This product may be shipped as part of a chemical kit composed of various compatible dangerous goods for analytical or testing purposes. This kit would have the following classification:
Proper Shipping Name: Chemical Kit Hazard Class: 9 UN Number 3316.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product does not meet the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): This product is not hazardous under 29 CFR.1910.1200 and therefore is not covered by Title III under SARA.
S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.
--
302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Not applicable
304 EHS RQ (40 CFR 355): Not applicable
Clean Water Act (40 CFR 116.4): Not applicable
RCRA: Not applicable
C.P.S.C.: Not applicable
State Regulations:
California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): None
California Perchlorate Rule CCR Title 22 Chap 33:
Trade Secret Registry: Not applicable
National Inventories:
U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).
TSCA CAS Number: Not applicable

16. OTHER INFORMATION

Intended Use: Laboratory Reagent
References: 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor). CCINFO RTECS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Fire Protection Guide on Hazardous Materials, 10th Ed. Quincy, MA: National Fire Protection Association, 1991. List of Dangerous Substances Classified in Annex I of the EEC Directive (67/548) - Classification, Packaging and Labeling of Dangerous Substances, Amended July 1992. Technical Judgment. Vendor Information.
Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

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Date Printed 5/6/08
MSDS No: M00818

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Hydrogen Sulfide Test Paper
Catalog Number: 2537733

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00818
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: Harmful if swallowed May cause irritation.
Date of MSDS Preparation:
Day: 06
Month: October
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

Paper saturated with Copper Sulfate
CAS No.: 7758-99-8
TSCA CAS Number: 7758-98-7
Percent Range: 100.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 300 mg/kg
LC50: None reported
TLV: 1 mg/m^3 (Cu)
PEL: 1 mg/m^3 (Cu)
Hazard: Harmful if swallowed Harmful if inhaled. May cause irritation.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: Pale blue paper discs
Odor: Odorless
HARMFUL IF SWALLOWED MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION

HMIS:
Health: 3
Flammability: 0
Reactivity: 0

Protective Equipment: X - See protective equipment, Section 8.

NFPA:

Health: 2

Flammability: 0

Reactivity: 0

Symbol: Not applicable

Potential Health Effects:

Eye Contact: May cause irritiation

Skin Contact: May cause irritiation

Skin Absorption: None reported

Target Organs: None reported

Ingestion: Toxic May cause: abdominal pain nausea vomiting metallic taste diarrhea headache central nervous system effects convulsions coma liver damage kidney damage death

Target Organs: Liver Kidneys Central nervous system

Inhalation: Not applicable

Target Organs: Not applicable

Medical Conditions Aggravated: Wilson's disease Pre-existing: Skin conditions Respiratory conditions Liver conditions Kidney conditions

Chronic Effects: Chronic overexposure may cause dermatitis greenish discoloration of the skin or hair metallic taste

Cancer / Reproductive Toxicity Information:

O.S.H.A. Listed: No

IARC Listed: No

NTP Listed: No

Additional Cancer / Reproductive Toxicity Information: None reported

Toxicologically Synergistic Products: Not applicable

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.

Skin Contact (First Aid): Wash skin with plenty of water. Call physician if irritation develops.

Ingestion (First Aid): Induce vomiting using syrup of ipecac or by sticking finger down throat. Never give anything by mouth to an unconscious person. Call physician immediately.

Inhalation: Remove to fresh air.

5. FIRE FIGHTING MEASURES

Flammable Properties: Can burn in fire, releasing toxic vapors.

Flash Point: Not applicable

Method: Not applicable

Flammability Limits:

Lower Explosion Limits: Not applicable

Upper Explosion Limits: Not applicable

Autoignition Temperature: Not determined

Hazardous Combustion Products: Toxic fumes of: sulfur oxides.

Fire / Explosion Hazards: Do not expose to flames.

Static Discharge: None reported.

Mechanical Impact: None reported

Extinguishing Media: Use media appropriate to surrounding fire conditions

Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment. Releases of this material may contaminate the environment.
Clean-up Technique: Sweep up material. Place material in a plastic bag. Mark bag 'Non-hazardous trash', and dispose of as normal refuse.
Evacuation Procedure: Evacuate as needed to perform spill clean-up. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Product is regulated as a hazardous water pollutant.
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: Not applicable

7. HANDLING / STORAGE

Handling: Avoid contact with eyes skin clothing Do not breathe dust. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Keep container tightly closed when not in use.
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Maintain adequate ventilation to keep vapor level below TWA for chemicals in this product. Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields
Skin Protection: lab coat disposable latex gloves
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes skin clothing Do not breathe: dust Wash thoroughly after handling.
TLV: 1 mg/M³ (Cu)
PEL: 1 mg/M³ (Cu)

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: Pale blue paper discs
Physical State: Solid
Molecular Weight: Not applicable
Odor: Odorless
pH: Not applicable
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable
Boiling Point: Not applicable
Melting Point: Not applicable
Specific Gravity (water = 1): Not applicable

Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not applicable
Partition Coefficient (n-octanol / water): Not applicable
Solubility:
Water: Not applicable
Acid: Not applicable
Other: Not applicable
Metal Corrosivity:
Steel: Not determined
Aluminum: Not determined

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Heating to decomposition.
Reactivity / Incompatibility: Incompatible with: hydroxylamine magnesium
Hazardous Decomposition: Heating to decomposition releases toxic and/or corrosive fumes of: sulfur oxides
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: None reported
Mutation Data: Copper sulfate: DNA inhibition - human lymphocytes - 76 µmol/l
Reproductive Effects Data: None reported
Ingredient Toxicological Data: Copper sulfate: Oral rat LD50 = 300 mg/kg

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: --
No ecological data available for the ingredients of this product.

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: None
Special Instructions (Disposal): Place material in a plastic bag. Add a non-reactive absorbant material if waste contains free liquid and seal bag. Mark bag 'Non-hazardous trash', and dispose of as normal refuse.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Not Currently Regulated
--
DOT Hazard Class: NA
DOT Subsidiary Risk: NA
DOT ID Number: NA
DOT Packing Group: NA
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Not Currently Regulated
--
ICAO Hazard Class: NA
ICAO Subsidiary Risk: NA
ICAO ID Number: NA
ICAO Packing Group: NA
I.M.O.:
I.M.O. Proper Shipping Name: Not Currently Regulated
--
I.M.O. Hazard Class: NA
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: NA
I.M.O. Packing Group: NA
Additional Information: This product may be shipped as part of a chemical kit composed of various compatible dangerous goods for analytical or testing purposes. This kit would have the following classification: Proper Shipping Name: Chemical Kit Hazard Class: 9 UN Number 3316. ALSO NOTE: If the National Competent Authority declares this product an environmental hazard by Special Provision 909 (IMDG) and Special Provision A97 (IATA) the classification may be UN3077 or UN3082.

15. REGULATORY INFORMATION

U.S. Federal Regulations:
O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)
E.P.A.:
S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard
S.A.R.A. Title III Section 313 (40 CFR 372): This product contains a chemical(s) subject to the reporting requirements of Section 313 of Title III of SARA.
Copper compounds
302 (EHS) TPQ (40 CFR 355): Not applicable
304 CERCLA RQ (40 CFR 302.4): Cupric sulfate 10 lbs.
304 EHS RQ (40 CFR 355): Not applicable
Clean Water Act (40 CFR 116.4): Cupric Sulfate - RQ 10 lbs.
RCRA: Contains no RCRA regulated substances.
C.P.S.C.: Not applicable
State Regulations:
California Prop. 65: No Prop. 65 listed chemicals are present in this product.
Identification of Prop. 65 Ingredient(s): Not applicable
California Perchlorate Rule CCR Title 22 Chap 33:
Trade Secret Registry: Not applicable
National Inventories:
U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).
TSCA CAS Number: Copper sulfate (7758-98-7)

16. OTHER INFORMATION

Intended Use: Determination of hydrogen sulfide
References: 29 CFR 1900 - 1910 (Code of Federal Regulations - Labor). Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992. The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989. Sax, N. Irving. Dangerous Properties of Industrial Materials, 7th Ed. New York: Van Nostrand Reinhold Co., 1989. CCINFO RTECS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. Gosselin, R. E. et al. Clinical Toxicology of Commercial Products, 5th Ed. Baltimore: The Williams and Wilkins Co., 1984. Vendor Information. Technical Judgment.
Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

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(970) 669-3050

Date Printed 10/8/07
MSDS No: M00023

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Buffer Powder, Citrate Type, for Manganese
Catalog Number: 98399

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00023
Chemical Name: Not applicable
CAS No.: Not applicable
Chemical Formula: Not applicable
Chemical Family: Not applicable
Hazard: Causes moderate eye irritation.
Date of MSDS Preparation:
Day: 21
Month: September
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

Citric Acid
CAS No.: 77-92-9
TSCA CAS Number: 77-92-9
Percent Range: 15.0 - 25.0
Percent Range Units: weight / weight
LD50: Oral rat LD50 = 6730 mg/Kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: Causes severe eye irritation.

Sodium Phosphate Monobasic
CAS No.: 7782-85-6
TSCA CAS Number: 7558-79-4
Percent Range: 45.0 - 55.0
Percent Range Units: weight / weight
LD50: Oral rat LD_{50} = 12930 mg/kg.
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

Sodium Sulfate
CAS No.: 7757-82-6
TSCA CAS Number: 7757-82-6
Percent Range: 30.0 - 40.0

Percent Range Units: weight / weight
LD50: Oral mouse LD50 = 5989 mg/kg
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: May cause irritation.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White powder
Odor: None
CAUSES EYE IRRITATION MAY CAUSE SKIN AND RESPIRATORY TRACT IRRITATION

HMIS:
Health: 1
Flammability: 0
Reactivity: 0
Protective Equipment: X - See protective equipment, Section 8.
NFPA:
Health: 1
Flammability: 0
Reactivity: 0
Symbol: Not applicable
Potential Health Effects:
Eye Contact: Causes irritation
Skin Contact: May cause irritiation
Skin Absorption: No effects anticipated
Target Organs: Not applicable
Ingestion: Very large doses may cause: nausea vomiting diarrhea lethargy muscular cramps fever
Target Organs: None reported
Inhalation: May cause: respiratory tract irritation
Target Organs: None reported
Medical Conditions Aggravated: Pre-existing: Eye conditions
Chronic Effects: Citric acid chronic overexposure may cause effects due to the ability of citric acid to chelate metals, which could impair the body's ability to absorb calcium and iron.
Cancer / Reproductive Toxicity Information:
This product does NOT contain any OSHA listed carcinogens.

This product does NOT contain any IARC listed chemicals.

This product does NOT contain any NTP listed chemicals.

Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.

Skin Contact (First Aid): Wash skin with plenty of water. Call physician if irritation develops.
Ingestion (First Aid): Give large quantities of water. Call physician immediately.
Inhalation: Remove to fresh air.

5. FIRE FIGHTING MEASURES

Flammable Properties: Can burn in fire, releasing toxic vapors.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not determined
Hazardous Combustion Products: Toxic fumes of: phosphorus oxides sodium monoxide sulfur oxides. carbon monoxide, carbon dioxide.
Fire / Explosion Hazards: May react violently with: aluminum / aluminum compounds metal nitrates
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Water.
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Spill Response Notice:
Only persons properly qualified to respond to an emergency involving hazardous substances may respond to a spill according to federal regulations (OSHA 29 CFR 1910.120(a)(v)) and per your company's emergency response plan and guidelines/procedures. See Section 13, Special Instructions for disposal assistance.
Containment Technique: Stop spilled material from being released to the environment.
Clean-up Technique: Scoop up spilled material into a large beaker and dissolve with water. Flush the spilled material to the drain with a large excess of water. Decontaminate the area of the spill with a soap solution.
Evacuation Procedure: Evacuate as needed to perform spill clean-up. If conditions warrant, increase the size of the evacuation.
Special Instructions (for accidental release): Mixture contains a component which is regulated as a water pollutant.
304 EHS RQ (40 CFR 355): Not applicable
D.O.T. Emergency Response Guide Number: Not applicable

7. HANDLING / STORAGE

Handling: Avoid contact with eyes Do not breathe dust. Wash thoroughly after handling. Maintain general industrial hygiene practices when using this product.
Storage: Store at 10 - 30°C. Keep container tightly closed when not in use. Protect from: moisture
Flammability Class: Not applicable

8. EXPOSURE CONTROLS / PROTECTIVE EQUIPMENT

Engineering Controls: Have an eyewash station nearby. Maintain general industrial hygiene practices when using this product.
Personal Protective Equipment:
Eye Protection: safety glasses with top and side shields

Skin Protection: disposable latex gloves lab coat
Inhalation Protection: adequate ventilation
Precautionary Measures: Avoid contact with: eyes Do not breathe: dust Wash thoroughly after handling. Protect from: moisture
TLV: Not established
PEL: Not established

9. PHYSICAL / CHEMICAL PROPERTIES

Appearance: White powder
Physical State: Solid
Molecular Weight: Not applicable
Odor: None
pH: of 1% solution at 23 °C = 6.35
Vapor Pressure: Not applicable
Vapor Density (air = 1): Not applicable
Boiling Point: Not applicable
Melting Point: 160 °C 320 °F
Specific Gravity (water = 1): 2.30
Evaporation Rate (water = 1): Not applicable
Volatile Organic Compounds Content: Not determined
Partition Coefficient (n-octanol / water): Not determined
Solubility:
Water: Soluble
Acid: Not determined
Other: Not determined
Metal Corrosivity:
Steel: Not determined
Aluminum: Not determined

10. STABILITY / REACTIVITY

Chemical Stability: Stable when stored under proper conditions.
Conditions to Avoid: Excess moisture Heating to decomposition.
Reactivity / Incompatibility: Incompatible with: metal nitrates aluminum
Hazardous Decomposition: Toxic fumes of: phosphorus oxides sulfur oxides carbon monoxide carbon dioxide
Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Product Toxicological Data:
LD50: None reported
LC50: None reported
Dermal Toxicity Data: None reported
Skin and Eye Irritation Data: Citric Acid Skin rabbit 500 mg/24 hour: MODERATE. Citric Acid Eye rabbit 750 µg/24 hour: SEVERE.
Mutation Data: None reported
Reproductive Effects Data: None reported
Ingredient Toxicological Data: Citric acid Oral rat LD50 = 6730 mg/kg; Sodium Sulfate Oral mouse LD50 = 5989 mg/kg; Sodium Phosphate Oral rat LD50 = 17 g/kg

12. ECOLOGICAL INFORMATION

Product Ecological Information: --
No ecological data available for this product.
Ingredient Ecological Information: Sodium Sulfate: Aquatic Toxicity: TLm 13500 mg/L bluegill sunfish / 96 hours, TLm 16500 mg/L mosquito fish / 96 hours

13. DISPOSAL CONSIDERATIONS

EPA Waste ID Number: Not applicable
Special Instructions (Disposal): Dilute to 3 to 5 times the volume with cold water. Open cold water tap completely, slowly pour the material to the drain. Flush system with plenty of water.
Empty Containers: Rinse three times with an appropriate solvent. Dispose of empty container as normal trash.
NOTICE (Disposal): These disposal guidelines are based on federal regulations and may be superseded by more stringent state or local requirements. Please consult your local environmental regulators for more information.

14. TRANSPORT INFORMATION

D.O.T.:
D.O.T. Proper Shipping Name: Not Currently Regulated
--
DOT Hazard Class: NA
DOT Subsidiary Risk: NA
DOT ID Number: NA
DOT Packing Group: NA
I.C.A.O.:
I.C.A.O. Proper Shipping Name: Not Currently Regulated
--
ICAO Hazard Class: NA
ICAO Subsidiary Risk: NA
ICAO ID Number: NA
ICAO Packing Group: NA
I.M.O.:
I.M.O. Proper Shipping Name: Not Currently Regulated
--
I.M.O. Hazard Class: NA
I.M.O. Subsidiary Risk: NA
I.M.O. ID Number: NA
I.M.O. Packing Group: NA
Additional Information: This product may be shipped as part of a chemical kit composed of various compatible dangerous goods for analytical or testing purposes. This kit would have the following classification: Proper Shipping Name: Chemical Kit
Hazard Class: 9 UN Number 3316.

15. REGULATORY INFORMATION

U.S. Federal Regulations:

O.S.H.A.: This product meets the criteria for a hazardous substance as defined in the Hazard Communication Standard. (29 CFR 1910.1200)

E.P.A.:

S.A.R.A. Title III Section 311/312 Categorization (40 CFR 370): Immediate (Acute) Health Hazard

S.A.R.A. Title III Section 313 (40 CFR 372): This product does NOT contain any chemical subject to the reporting requirements of Section 313 of Title III of SARA.

--

302 (EHS) TPQ (40 CFR 355): Not applicable

304 CERCLA RQ (40 CFR 302.4): Sodium phosphate, dibasic 5000 lbs.

304 EHS RQ (40 CFR 355): Not applicable

Clean Water Act (40 CFR 116.4): Sodium phosphate, dibasic - RQ 5000 lbs.

RCRA: Contains no RCRA regulated substances.

C.P.S.C.: Not applicable

State Regulations:

California Prop. 65: No Prop. 65 listed chemicals are present in this product.

Identification of Prop. 65 Ingredient(s): None

Trade Secret Registry: Not applicable

National Inventories:

U.S. Inventory Status: All ingredients in this product are listed on the TSCA 8(b) Inventory (40 CFR 710).

TSCA CAS Number: Not applicable

16. OTHER INFORMATION

Intended Use: Determination of manganese

References: NIOSH Registry of Toxic Effects of Chemical Substances, 1985-86. Cincinnati: U.S. Department of Health and Human Services, April, 1987. CCINFO MSDS/FTSS. Canadian Centre for Occupational Health and Safety. Hamilton, Ontario Canada: 30 June 1993. The Merck Index, 11th Ed. Rahway, New Jersey: Merck and Co., Inc., 1989. Technical Judgment. In-house information. Air Contaminants, Federal Register, Vol. 54, No. 12. Thursday, January 19, 1989. pp. 2332-2983. TLV's Threshold Limit Values and Biological Exposure Indices for 1992-1993. American Conference of Governmental Industrial Hygienists, 1992.

Revision Summary: Updates in Section(s) 14,

Legend:

NA - Not Applicable	w/w - weight/weight
ND - Not Determined	w/v - weight/volume
NV - Not Available	v/v - volume/volume

USER RESPONSIBILITY: Each user should read and understand this information and incorporate it in individual site safety programs in accordance with applicable hazard communication standards and regulations.

THE INFORMATION CONTAINED HEREIN IS BASED ON DATA CONSIDERED TO BE ACCURATE. HOWEVER, NO WARRANTY IS EXPRESSED OR IMPLIED REGARDING THE ACCURACY OF THESE DATA OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF.

World Headquarters
Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Date Printed 5/2/07
MSDS No: M00021

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Sodium Periodate
Catalog Number: 98499

Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

Emergency Telephone Numbers:
(Medical and Transportation)
(303) 623-5716 24 Hour Service
(515)232-2533 8am - 4pm CST

MSDS Number: M00021
Chemical Name: Sodium Periodate
CAS No.: 7790-28-5
Chemical Formula: $NaIO_4$
Chemical Family: Oxidizing Agents
Hazard: Causes irritation. Oxidizer.
Date of MSDS Preparation:
Day: 01
Month: May
Year: 2007

2. COMPOSITION / INFORMATION ON INGREDIENTS

Sodium m-Periodate
CAS No.: 7790-28-5
TSCA CAS Number: 7790-28-5
Percent Range: 100.0
Percent Range Units: weight / weight
LD50: None reported
LC50: None reported
TLV: Not established
PEL: Not established
Hazard: Causes irritation. Oxidizer.

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: White powder
Odor: None
CAUSES EYE, SKIN AND RESPIRATORY TRACT IRRITATION

STRONG OXIDIZER: CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE OR EXPLOSION

HMIS:
Health: 2
Flammability: 0
Reactivity: 2
Protective Equipment: X - See protective equipment, Section 8.

NFPA:
Health: 2
Flammability: 0
Reactivity: 2
Symbol: oxy
Potential Health Effects:
Eye Contact: Causes severe irritation
Skin Contact: Causes moderate irritation
Skin Absorption: None reported
Target Organs: None reported
Ingestion: May cause: abdominal pain vomiting diarrhea
Target Organs: None reported
Inhalation: Causes: irritation of nose and throat
Target Organs: None reported
Medical Conditions Aggravated: Pre-existing: Eye conditions Skin conditions
Chronic Effects: None reported
Cancer / Reproductive Toxicity Information:
O.S.H.A. Listed: No

IARC Listed: No

NTP Listed: No

Additional Cancer / Reproductive Toxicity Information: None reported
Toxicologically Synergistic Products: None reported

4. FIRST AID

Eye Contact: Immediately flush eyes with water for 15 minutes. Call physician.
Skin Contact (First Aid): Wash skin with plenty of water for 15 minutes. Remove contaminated clothing. Call physician immediately.
Ingestion (First Aid): Give large quantities of water. Call physician immediately.
Inhalation: Remove to fresh air.

5. FIRE FIGHTING MEASURES

Flammable Properties: Strong oxidizer. Contact with combustible materials may cause a fire.
Flash Point: Not applicable
Method: Not applicable
Flammability Limits:
Lower Explosion Limits: Not applicable
Upper Explosion Limits: Not applicable
Autoignition Temperature: Not determined
Hazardous Combustion Products: Toxic fumes of: iodine iodine compounds sodium monoxide
Fire / Explosion Hazards: May react violently with: strong reducers
Static Discharge: None reported.
Mechanical Impact: None reported
Extinguishing Media: Water. Carbon dioxide Dry chemical.
Fire Fighting Instruction: As in any fire, wear self-contained breathing apparatus pressure-demand and full protective gear. Evacuate area and fight fire from a safe distance.

6. ACCIDENTAL RELEASE MEASURES

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APPENDIX C

RECORDS AND FORMS

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PARSONS
MONITORING WELL SAMPLING FIELD FORM
Former Carborundum Sanborn Facility
Wheatfield, NY

Monitoring Well I.D.:	Date:	Time Started:	Field Personnel: RC Becken
Weather Conditions:			
Comments:			

Initial Readings

Measured Well Bottom (TOR - ft)	Riser Pipe Diameter (in) 2 in.			
Measured Water Level (TOR - ft)	Conversion Factor (gal/lineal ft)	1.25" = 0.08	2" = 0.17	3" = 0.38
Calculated Water Column Height (ft)	(Circle One)	4" = 0.66	6" = 1.50	8" = 2.60
One Well Volume (gals.)	Three Well Volumes (gals.)			
Notes:				

Well Conditions

Well Riser Type (Circle one): Stainless Steel Carbon Steel PVC

Casing Condition:	OK	Repair Required:
Cap Condition:	OK	Repair Required:
Paint Condition:	OK	Repair Required:
Lock Condition:	OK	Repair Required:
Inner Casing Condition:	OK	Repair Required:
Surface Seal Condition:	OK	Repair Required:

Other:

Purge Information

Purging Method (Circle one): Stainless Steel Bailer Peristaltic Pump Sample Port (Pumping Wells Only)
Teflon Bailer Polyethylene Bailer Other:

Well Volume	Gallons Purged (gal)	Temperature (deg C)	Specific Conductivity (mS/cm)	Turbidity (NTU's)	Comments

Water Level After Purging (TOR ft):	Calculated 95% Recovery Water Level:
Comments:	

Sampling Information

Date:	Time Sampled:	Field Personnel: R C Becken
Measured Water Level (TOR ft.):		

Sampling Method (Circle one): Stainless Steel Bailer Peristaltic Pump Sample Port (Pumping Wells Only)
Teflon Bailer Polyethylene Bailer Other:

Sample I.D.	Temperature (deg C)	pH (S.U.)	Specific Conductivity (mS/cm)	Turbidity (NTU's)	Comments

QA/QC Samples Taken:
Comments:

Signature

Sampler (Print): Richard C. Becken	*Sampler (signature):*	Date:

GROUNDWATER ELEVATION DATA
PARSONS
FORMER CARBORUNDUM SANBRON FACILITY
WHEATFIELD, NEW YORK

Monitoring Well I.D.	Date	Top of Riser Elevation (ft)	Water Level (ft)	Groundwater Elevation (ft)	Remarks
P-2		619.67			
P-3		627.35			
P-4		624.45			
PW-1		619.78			
PW-3		618.28			
PW-4		620.84			
B-3M		625.59			
B-4M		622.24			
B-5M		620.83			
B-6M		615.69			
B-7M		616.22			
B-8M		618.57			
B-9M		623.03			
B-10M		626.05			
B-11M		622.81			
B-12M		622.17			
B-13M		626.70			
B-14M		618.25			
B-15M		623.98			
B-16M		626.08			
B-17M		622.07			
B-18M		618.69			
B-19M		626.01			
B-20M		615.32			
B-21M		622.56			
B-22M		622.29			
B-23M		617.71			
B-24M		617.24			
B-25M		619.31			
B-26M		618.06			
B-27M		626.04			
B-28M		622.62			
B-29M		618.31			
B-31M		613.78			
B-32M		619.35			
B-33M		612.43			
B-37M		616.90			
B-38M		609.81			
B-39M		626.12			
B-40M		626.23			
B-41M		626.31			
B-42M		623.76			
B-43M		623.64			
B-44M		623.29			
B-45M		612.12			
B-46M		613.46			
B-48M		625.40			
B-49M		625.56			
B-50M		616.47			
B-51M		616.48			
B-52M		616.26			
B-53M		616.14			
B-54M		616.00			
B-55M		615.59			
B-56M		617.78			
B-57M		617.80			
B-58M		617.99			
B-59M		625.53			
B-60M		625.67			
B-61M		625.72			
B-62M		623.89			
B-63M		624.14			
B-64M		623.95			
B-65M		624.19			
B-66M		625.37			
B-67M		625.51			

LOW-FLOW SAMPLING FIELD FORM
PARSONS
Former Carborundum Sanborn Facility
Wheatfield, NY

Monitoring Well I.D.:	Date:	Time Started:	Field Personnel:
Weather Conditions:		Time Ended:	
Comments:			

Initial Readings

Measured Well Bottom (TOR-ft)	Riser Pipe Diameter (in.)
Measured Water Level (TOR-ft)	One Well Volume (gal.)
Notes:	

Well Condition

Well Riser Type		Stainless Steel	Carbon Steel	PVC	
Casing Condition:		OK		Repair Required:	
Cap Condition:		OK		Repair Required:	
Paint Condition:		OK		Repair Required:	
Lock Condition:		OK		Repair Required:	
Inner Casing Condition:		OK		Repair Required:	
Surface Seal Condition:		OK		Repair Required:	
Other:		OK		Repair Required:	

Purge Information

Purging Method:	Stainless Steel Bailer	Peristaltic Pump	Grundfos Pump	Teflon Bailer
Place an X in one box	Polyethylene Bailer	Bladder Pump	Other:	
Amount Purged:		Flow Rate (mL per minute:		
Water Level after Purging (TOR ft.)				
Comments:				

Sampling Information

Date:	Time Sampled:		Field Personnel:	
Measured Water Level (TOR ft)				
Sampling Method	Stainless Steel Bailer	Peristaltic Pump	Grundfos Pump	Teflon Bailer
place an X in box	Polyethylene Bailer	Bladder Pump	Other:	

Time Elapsed min.	Temperature	pH	Conductivity	Dissolved Oxygen	Redox	Water Level	Turbidity	Flow Rate

QA/QC Samples Taken:		
Comments:		

Signature

Sampler (Print)	*Sampler (signature):*	
		Date:

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APPENDIX D

PERMITS AND REGISTRATIONS

SPDES Permit Renewal
SPDES Permit
Air Registration Renewal
Air Permit
Water Withdrawal Report
Backflow Preventer Inspection Sheet

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SPDES PERMIT RENEWAL

New York State Department of Environmental Conservation
Division of Environmental Permits, 4th Floor
625 Broadway, Albany, NY 12233-1750
Phone: (518) 402-9167 • **Fax:** (518) 402-9168
Website: www.dec.ny.gov

DEC - 7 2011

Joe Martens
Commissioner

William B. Barber
Elm Holdings Inc c/o BP Exploration
4850 E 49th St Rm MBC3-147
Cuyahoga Heights, OH 44125

FACILITY INFORMATION

NAME: Former Carborundum Complex – Cory Rd
LOCATION: Wheatfield (T)
COUNTY: Niagara
SPDES NO: NY 000 1988
DEC ID NO.: 9-2940-00059/00003

Dear SPDES Permittee:

Enclosed please find a validated NOTICE/RENEWAL APPLICATION/PERMIT form renewing your State Pollutant Discharge Elimination System (SPDES) permit for the referenced facility. This validated form, together with the previously issued permit (see issuance date of this permit in Part 3 of the NOTICE/RENEWAL APPLICATION/PERMIT form), and any subsequent permit modifications constitute authorization to discharge wastewater in accordance with all terms, conditions and limitations specified therein.

The instructions and other information that you received with the NOTICE/RENEWAL APPLICATION/PERMIT package fully described procedures for renewal and modification of your SPDES permit under the Environmental Benefit Permit Strategy (EBPS). As a reminder, SPDES permits are renewed at a central location in Albany in order to make the process more efficient. All other concerns with your permit such as applications for permit modifications, permit transfers to a new owner, name changes, and other questions should be directed to the Regional Permit Administrator at the following address:

Dave Denk
NYSDEC-Region 9
270 Michigan Avenue
Buffalo, NY 14203-2999
(716)851-7165

If you have already filed an application for modification of your permit, it will be processed separately through our regional office. If you have questions concerning this permit renewal, please contact Lindy Sue Czubernat at (518) 402-9165.

Sincerely,

Lindy Sue Czubernat

Agency Program Aide

Enclosure

cc: RPA
RWE
BWP

91-20-5 (5/97)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
State Pollutant Discharge Elimination System (SPDES)
NOTICE / RENEWAL APPLICATION / PERMIT

Please read **ALL** instructions on the back before completing this application form. Please **TYPE** or **PRINT** clearly in ink.

PART 1 - NOTICE 05/10/2011

Permittee Contact Name, Title Address

ELM HOLDINGS INC C/O BP EXPLORATION
WILLIAM B. BARBER
4850 E 49TH ST, RM MBC3-147
CUYAHOGA HEIGHTSOH 44125

Facility and SPDES Permit Information

Name: FORMER CARBORUNDUM COMPLEX - CORY
Ind. Code: 9511 County: NIAGARA
DEC No.: 9-2940-00059/00003
SPDES No.: NY 000 1988
Expiration Date: 03/31/2012
Application Due By: 10/03/2011

Are these name(s) & address(es) correct? if not, please write corrections above

The State Pollutant Discharge Elimination System Permit for the facility referenced above expires on the date indicated. You are required by law to file a complete renewal application **at least 180 days prior to expiration of your current permit**. **Note the "Application Due By" date above**

CAUTION: This short application form and attached questionnaire are the only forms acceptable for permit renewal. Sign Part 2 below and mail only this form and the completed questionnaire using the enclosed envelope *Effective April 1, 1994 the Department no longer assesses SPDES application fees*

If there are changes to your discharge, or to operations affecting the discharge, then in addition to this renewal application, you must also submit a separate permit modification application to the Regional Permit Administrator for the DEC region in which the facility is located, as required by your current permit See the reverse side of this page for instructions on filing a modification request.

PART 2 - RENEWAL APPLICATION

CERTIFICATION: I hereby affirm that under penalty of perjury that the information provided on this form and all attachments submitted herewith is true to the best of my knowledge and belief. False statements made herein are punishable as a Class A misdemeanor pursuant to section 210 45 of the Penal Law.

William B. Barber — Project Manager

Name of person signing application (see instructions on back) — **Title**

Signature — Sept. 28, 2011 — **Date**

PART 3 - PERMIT (Below this line - Official Use Only)

Effective Date: 4/1/12 **Expiration Date:** 3/31/17

Stuart Fox

Permit Administrator

Address: NYSDEC - Division of Environmental Permits
Bureau of Environmental Analysis
625 Broadway, Albany, NY 12233-1750

Stuart M. Fox — DEC - 7 2011

Signature — **Date**

This permit together with the previous valid permit for this facility issued 4/1/07 and subsequent modifications constitute authorization to discharge wastewater in accordance with all terms, conditions and limitations specified in the previously issued valid permit, modifications thereof or issued as part of this permit, including any special or general conditions attached hereto. Nothing in this permit shall be deemed to waive the Department's authority to initiate a modification of this permit on the grounds specified in 6NYCRR §621 14, 6NYCRR §754 4 or 6NYCRR §757 1 existing at the time this permit is issued or which arise thereafter.

~~Attachments: General Conditions dated ___/___~~

11 SEP 29 PM 2:22

RECEIVED NYSDEC

91-20-5a (5/97)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Please enter the numbers from your current permit: DEC Number 9 - 2940 - 00059 / 0000 - 3

SPDES Number NY 000 1988

SPDES RENEWAL APPLICATION QUESTIONNAIRE

THIS PAGE MUST BE COMPLETED AND RETURNED WITH YOUR COMPLETED APPLICATION

Please TYPE or PRINT neatly using adequate pressure to make ALL copies legible Keep a copy for your records

1 Has the SPDES permit for your facility been modified in the past 5 years ☒ YES ☐ NO

2 Dischargers who use, manufacture, store, handle or discharge toxic or hazardous pollutants are subject to Industrial Best Management Practices (BMP) plan requirements for toxic or hazardous substances. A BMP plan prevents or minimizes the potential for release of pollutants to receiving waters from such ancillary industrial activities, including material storage areas; plant site runoff; in-plant transfer; process and material storage areas; loading and unloading operations, and sludge and waste disposal areas

Does your facility conduct ancillary activities as described above, which are not covered by BMP requirements in your current permit? ☐ YES ☒ NO

Please indicate which of the following best describes the situation at your facility:

☐ None of the concerns on the "Self Evaluation List" seem to apply to my facility at this time and I will not be applying for a modification of the SPDES permit in the foreseeable future

☐ Yes, some of the items on the "Self Evaluation List" have led me to believe that the permit for this facility needs to be modified I already have a complete modification application pending with the Department

☐ Yes, some of the items on the "Self Evaluation List" have led me to believe that the SPDES permit for this facility may need to be Modified I have requested the appropriate forms by phone OR I have completed and attached the "Request For SPDES Application Forms" (included in this renewal package) to allow me to submit a permittee-initiated Modification application See The "Request For SPDES Application Forms" page for a toll free 800 number

☒ The items on the "Self Evaluation List" have left me unable to conclude whether my permit needs to be modified at this time I am reporting the following general concerns about my permit:

A vault water collection and conveyance system was approved by the NYSDEC in July 2011. The vault water collection and conveyance piping will route the collected water to the current groundwater treatment system. A copy of the approved system design can be transmitted to NYSDEC if requested. Operation of the vault water collection system is estimated to begin in the spring of 2012. After vault water collection system installation the operating parameters of the recovery system will be evaluated to determine if permit modifications are warranted. At present flow is anticipated to remain within current permit limits and no changes in water chemistry are anticipated.

DISTRIBUTION: Regional Water Engineer
Regional Permit Administrator
Central Office (BWP)

SPDES PERMIT

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

State Pollutant Discharge Elimination System (SPDES)
DISCHARGE PERMIT

Industrial Code:	9511	SPDES Number:	NY0001988
Discharge Class (CL):	03	DEC Number:	9-2940-00059/00003
Toxic Class (TX):	T	Effective Date (EDP):	04/01/2007
Major Drainage Basin:	01	Expiration Date (ExDP):	03/31/2012
Sub Drainage Basin:	01	Modification Dates:(EDPM)	04/01/2010
Water Index Number:	O-158-8		
Compact Area:	IJC		

This SPDES permit is issued in compliance with Title 8 of Article 17 of the Environmental Conservation Law of New York State and in compliance with the Clean Water Act, as amended, (33 U.S.C. §1251 et.seq.)(hereinafter referred to as "the Act") and in the Water Quality Regulations of the Interstate Environmental Commission at 21 NYCRR Part 550.

PERMITTEE NAME AND ADDRESS

Name: **Elm Holdings, Inc.** Attention: **William B. Barber**

Street: **c/o BP, 4850 East 49th St., MBC3-147**

City: **Cleveland** State: **OH** Zip Code: **44125**

is authorized to discharge from the facility described below:

FACILITY NAME AND ADDRESS

Name: **Former Carborundum Complex**

Location (C,T,V): **Wheatfield (T)** County: **Niagara**

Facility Address: **2040 Cory Drive**

City: **Sanborn** State: **NY** Zip Code: **14132**

NYTM -E: 179.4 NYTM - N: 4782.5

From Outfall No.: **01A** at Latitude: **43 ° 07 ′ 07 ″** & Longitude: **78 ° 56 ′ 24 ″**

into receiving waters known as: **Cayuga Creek** Class: **C**

and; (list other Outfalls, Receiving Waters & Water Classifications)

in accordance with: effluent limitations; monitoring and reporting requirements; other provisions and conditions set forth in this permit; and 6 NYCRR Part 750-1.2(a) and 750-2.

DISCHARGE MONITORING REPORT (DMR) MAILING ADDRESS

Mailing Name: **Former Carborundum Complex - Attn: William Barber**

Street: **c/o BP, 4850 East 49th St., MBC3-147**

City: **Cuyahoga Heights** State: **OH** Zip Code: **44125**

Responsible Official or Agent: **William B. Barber - Project Manager** Phone: **(216) 271-8038**

This permit and the authorization to discharge shall expire on midnight of the expiration date shown above and the permittee shall not discharge after the expiration date unless this permit has been renewed, or extended pursuant to law. To be authorized to discharge beyond the expiration date, the permittee shall apply for permit renewal not less than 180 days prior to the expiration date shown above.

Distribution
CO BWP - Permit Coordinator
RWE/RPA
EPA Region II - Jeffrey Gratz
NYSEFC
IJC

Deputy Chief Permit Administrator: Stuart M. Fox

Address: NYS Department of Environmental Conservation
Division of Environmental Permits
625 Broadway
Albany, NY 12233-1750

Signature: Stuart M. Fox Date: 2/23/10

ERMIT LIMITS, LEVELS AND MONITORING DEFINITIONS

\Documents and Settings\cahardis\My Documents\draftPermits\0001988 - ELM Holdings\permit0001988_08-05-2009_v3.wpd

OUTFALL	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
	This cell describes the type of wastewater authorized for discharge. Examples include process or sanitary wastewater, storm water, non-contact cooling water.	This cell lists classified waters of the state to which the listed outfall discharges.	The date this page starts in effect. (e.g. EDP or EDPM)	The date this page is no longer in effect. (e.g. ExDP)

PARAMETER	MINIMUM	MAXIMUM	UNITS	SAMPLE FREQ.	SAMPLE TYPE
e.g. pH, TRC, Temperature, D.O.	The minimum level that must be maintained at all instants in time.	The maximum level that may not be exceeded at any instant in time.	SU, °F, mg/l, etc.		

PARA-METER	EFFLUENT LIMIT	PRACTICAL QUANTITATION LIMIT (PQL)	ACTION LEVEL	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE
	Limit types are defined below in Note 1. The effluent limit is developed based on the more stringent of technology-based standards, required under the Clean Water Act, or New York State water quality standards. The limit has been derived based on existing assumptions and rules. These assumptions include receiving water hardness, pH and temperature; rates of this and other discharges to the receiving stream; etc. If assumptions or rules change the limit may, after due process and modification of this permit, change.	For the purposes of compliance assessment, the analytical method specified in the permit shall be used to monitor the amount of the pollutant in the outfall to this level, provided that the laboratory analyst has complied with the specified quality assurance/quality control procedures in the relevant method. Monitoring results that are lower than this level must be reported, but shall not be used to determine compliance with the calculated limit. This PQL can be neither lowered nor raised without a modification of this permit.	Type I or Type II Action Levels are monitoring requirements, as defined below in Note 2, that trigger additional monitoring and permit review when exceeded.	This can include units of flow, pH, mass, Temperature, concentration. Examples include µg/l, lbs/d, etc.	Examples include Daily, 3/week, weekly, 2/month, monthly, quarterly, 2/yr and yearly.	Examples include grab, 24 hour composite and 3 grab samples collected over a 6 hour period.

ote 1: DAILY DISCHARGE: The discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar ay for the purposes of sampling. For pollutants expressed in units of mass, the 'daily discharge' is calculated as the total mass of the pollutant discharged ver the day. For pollutants with limitations expressed in other units of measurement, the 'daily discharge' is calculated as the average measurement of the ollutant over the day. DAILY MAX: The highest allowable daily discharge. DAILY MIN: The lowest allowable daily discharge. MONTHLY AVG (daily vg): The highest allowable average of daily discharges over a calendar month, calculated as the sum of each of the daily discharges measured during a alendar month divided by the number of daily discharges measured during that month. RANGE: The minimum and maximum instantaneous measurements or the reporting period must remain between the two values shown. 7 DAY ARITHMETIC MEAN (7 day average): The highest allowable average of daily ischarges over a calendar week. 12 MRA (twelve month rolling avg): The average of the most recent twelve month's monthly averages. 30 DAY EOMETRIC MEAN (30 d geo mean): The highest allowable geometric mean of daily discharges over a calendar month, calculated as the antilog of : the um of the log of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month. 7 AY GEOMETRIC MEAN (7 d geo mean): The highest allowable geometric mean of daily discharges over a calendar week.

ote 2: ACTION LEVELS: Routine Action Level monitoring results, if not provided for on the Discharge Monitoring Report (DMR) form, shall be ppended to the DMR for the period during which the sampling was conducted. If the additional monitoring requirement is triggered as noted below, the ermittee shall undertake a short-term, high-intensity monitoring program for the parameter(s). Samples identical to those required for routine monitoring urposes shall be taken on each of at least three consecutive operating and discharging days and analyzed. Results shall be expressed in terms of both oncentration and mass, and shall be submitted no later than the end of the third month following the month when the additional monitoring requirement was riggered. Results may be appended to the DMR or transmitted under separate cover to the same address. If levels higher than the Action Levels are onfirmed, the permit may be reopened by the Department for consideration of revised Action Levels or effluent limits. The permittee is not authorized to ischarge any of the listed parameters at levels which may cause or contribute to a violation of water quality standards. TYPE I : The additional monitoring equirement is triggered upon receipt by the permittee of any monitoring results in excess of the stated Action Level. TYPE II: The additional monitoring equirement is triggered upon receipt by the permittee of any monitoring results that show the stated action level exceeded for four of six consecutive samples, r for two of six consecutive samples by 20 % or more, or for any one sample by 50 % or more.

PERMIT LIMITS, LEVELS AND MONITORING

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OUTFALL No.	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
01A	Groundwater Treatment System Effluent	Cayuga Creek, Class C	04/01/2010	03/31/2012

PARAMETER	MINIMUM	MAXIMUM	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FOOTNOTES (FN)
pH	6.5	8.5	SU	Weekly	Grab	

PARAMETER	'COMPLIANCE LIMIT		MONITORING ACTION LEVEL		UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FN
	Daily Avg.	Daily Max.	TYPE I	TYPE II				
Flow	Monitor	144,000			gpd	Continuous	Meter	
BOD_5	Monitor	5			mg/L	2/month	24-hr. Comp.	
Solids, Total Suspended	20	40			mg/L	2/month	24-hr. Comp.	
Oil & Grease	Monitor	15			mg/L	2/month	Grab	
Temperature	-----	90			°F	Monthly	Grab	
Chlorine, Total Residual	-----	0.1			mg/L	Monthly	Grab	1, 2
Phenols, Total	Monitor	5.0			µg/L	2/month	24-hr. Comp.	
Iron, Total	-----	1.0			mg/L	Monthly	24-hr. Comp.	
Cadmium, Total	-----	3.9			µg/L	Monthly	24-hr. Comp.	2
Chromium, Total	-----	50			µg/L	Monthly	24-hr. Comp.	
Copper, Total	-----	19			µg/L	Monthly	24-hr. Comp.	2
Copper, Dissolved	-----	Monitor			µg/L	Monthly	24-hr. Comp.	
Lead, Total	-----	25			µg/L	Monthly	24-hr. Comp.	2
Arsenic, Total	-----	150			µg/L	Monthly	24-hr. Comp.	
Zinc, Total	-----	2.0			mg/L	Monthly	24-hr. Comp.	2
Zinc, Dissolved	-----	Monitor			mg/L	Monthly	24-hr. Comp.	
Chloroform	Monitor	10			µg/L	Weekly	8-hr. Comp.	3
1,1-Dichloroethane	Monitor	10			µg/L	Weekly	8-hr. Comp.	3
1,2-Dichloroethane	Monitor	10			µg/L	Weekly	8-hr. Comp.	3
1,1-Dichloroethene	Monitor	10			µg/L	Weekly	8-hr. Comp.	3
cis-1,2-Dichloroethene	Monitor	10			µg/L	Weekly	8-hr. Comp.	3
trans-1,2-Dichloroethene	Monitor	10			µg/L	Weekly	8-hr. Comp.	3
Methylene Chloride	Monitor	10			µg/L	Weekly	8-hr. Comp.	3
1,1,1-Trichloroethane	Monitor	10			µg/L	Weekly	8-hr. Comp.	3

PERMIT LIMITS, LEVELS AND MONITORING (continued)

PARAMETER	COMPLIANCE LIMIT		MONITORING ACTION LEVEL		UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FN
	Daily Avg.	Daily Max.	TYPE I	TYPE II				
Trichloroethene	Monitor	10			µg/L	Weekly	8-hr. Comp.	3
Vinyl Chloride	Monitor	10			µg/L	2/month	8-hr. Comp.	3
Nickel, Total			0.026		lb/d	Quarterly	24-hr. Comp.	
Nickel, Total	-----	Monitor			µg/L	Quarterly	24-hr. Comp.	
Silver, Total			0.006		lb/d	Quarterly	24-hr. Comp.	
Silver, Total	-----	Monitor			µg/L	Quarterly	24-hr. Comp.	

Footnotes:

1. Total Residual Chlorine (TRC) - All TRC analysis shall be performed in the field.

2. Compliance Schedule items have been added for these parameters. Consult Page 7 of this permit for further guidance.

3. As per 40 CFR 136 when analysis of volatile organics are required, grab samples must be collected. Individual grab samples must be collected at prescribed time intervals (e.g., 4 samples over the course of a day, at 2-hour intervals). Grab samples must be analyzed separately and the concentrations averaged. Alternatively, grab samples may be collected in the field and composited in the laboratory if the compositing procedure produces results equivalent to results produced by arithmetic averaging of the results of analysis of individual grab samples. Analytical results comparing individual grab samples and composited grab samples must be submitted to the Department if alternative monitoring (i.e., composited grab samples) is to be used.

SPECIAL CONDITIONS

Analyses for the following parameters shall be performed using the following specified methods:

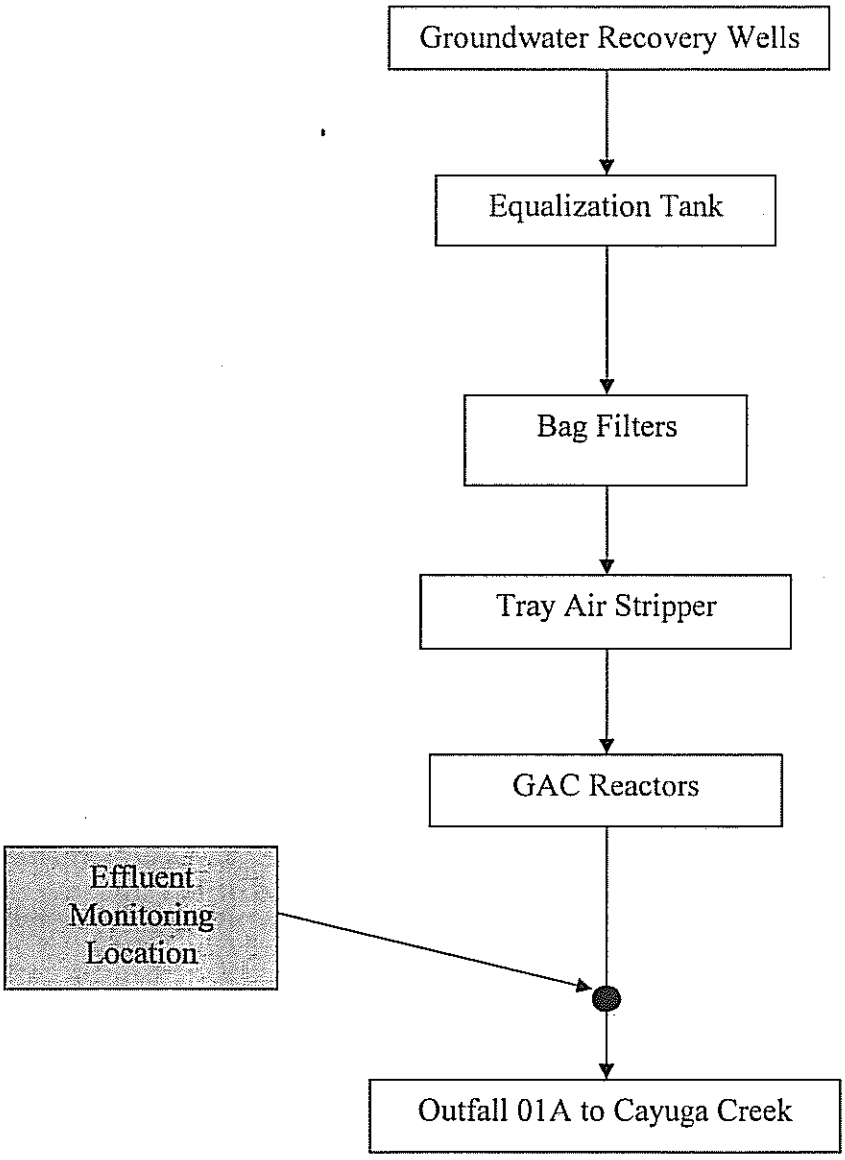
EPA Method 200.8
Cadmium, Total - 2 µg/L
Lead, Total - 2 µg/L
Copper, Total - 2 µg/L
Silver, Total - 0.2 µg/L

EPA Method 420.4
Phenols, Total - 5 µg/L

As more sensitive methods become available and approved by the USEPA for the analysis of the above parameters, those approved methods shall be used for laboratory analysis.

MONITORING LOCATIONS

The permittee shall take samples and measurements, to comply with the monitoring requirements specified in this permit, at the location(s) specified below:



DISCHARGE NOTIFICATION REQUIREMENTS

(a) Except as provided in (c) of these Discharge Notification Act requirements, the permittee shall install and maintain identification signs at all outfalls to surface waters listed in this permit. Such signs shall be installed within 90 days of the Effective Date of this Modification.

Subsequent modifications to or renewal of this permit does not reset or revise the deadline set forth in (a) above, unless a new deadline is set explicitly by such permit modification or renewal.

The Discharge Notification Requirements described herein do not apply to outfalls from which the discharge is composed exclusively of storm water, or discharges to ground water.

(d) The sign(s) shall be conspicuous, legible and in as close proximity to the point of discharge as is reasonably possible while ensuring the maximum visibility from the surface water and shore. The signs shall be installed in such a manner to pose minimal hazard to navigation, bathing or other water related activities. If the public has access to the water from the land in the vicinity of the outfall, an identical sign shall be posted to be visible from the direction approaching the surface water.

The signs shall have **minimum** dimensions of eighteen inches by twenty four inches (18" x 24") and shall have white letters on a green background and contain the following information:

N.Y.S. PERMITTED DISCHARGE POINT

SPDES PERMIT No.: NY_____

OUTFALL No. :____

For information about this permitted discharge contact:

Permittee Name: _____

Permittee Contact: _____

Permittee Phone: ( ) - ### - ####

OR:

NYSDEC Division of Water Regional Office Address:

NYSDEC Division of Water Regional Phone: ( ) - ### -####

(e) For each discharge required to have a sign in accordance with a), the permittee shall, concurrent with the installation of the sign, provide a repository of copies of the Discharge Monitoring Reports (DMRs), as required by the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of this permit. This repository shall be open to the public, at a minimum, during normal daytime business hours. The repository may be at the business office repository of the permittee or at an off-premises location of its choice (such location shall be the village, town, city or county clerk's office, the local library or other location as approved by the Department). In accordance with the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of your permit, each DMR shall be maintained on record for a period of five years.

(f) The permittee shall periodically inspect the outfall identification signs in order to ensure that they are maintained, are still visible and contain information that is current and factually correct.

SCHEDULE OF COMPLIANCE

a) The permittee shall comply with the following schedule.

Action Code	Outfall Number(s)	Compliance Action	Due Date
92699	01A	The permittee shall submit the results of 3 months of monthly monitoring for: MERCURY Total mercury shall be monitored using grab samples. The samples shall be analyzed using EPA Method 1631 and the results provided in ng/l along with the recorded flow for the day each sample was collected.	08/01/2010
96299	01A	The permittee shall submit the results of 3 months of monthly monitoring for: CYANIDE Total cyanide shall be monitored using 24-hour composite samples. The samples shall be analyzed using EPA Method 335.4 and the results provided in μg/l along with the recorded flow for the day each sample was collected.	08/01/2010
96299	01A	The permittee shall submit the results of 3 months of weekly monitoring for: LEAD Total lead shall be monitored using 24-hour composite samples. The samples shall be analyzed using EPA Method 200.8 and the results provided in μg/l along with the recorded flow for the day each sample was collected.	08/01/2010
96299	01A	The permittee shall submit the results of 3 months of weekly monitoring for: TOTAL DISSOLVED SOLIDS Total dissolved solids shall be monitored using 24-hour composite samples. The results shall be provided in mg/l along with the recorded flow for the day each sample was collected.	08/01/2010
	01A	The permittee shall submit an approvable engineering report which contains methods for improving metals removal without a major capital upgrade of the permittee's treatment process. The goal is to reduce effluent concentrations of Total Cadmium, Total Copper, Total Lead, and Total Zinc to their respective Water Quality-based Effluent Limits (WQBELs). The WQBELs may not be achievable, but metals concentrations should be reduced as much as practicable. All reports shall be prepared and signed by a professional engineer currently licensed and registered by New York State. These methods to improve metals removal shall be implemented as soon as practicable and no later than **10/01/2010**.	07/01/2010 10/01/2010

SCHEDULE OF COMPLIANCE (continued)

Action Code	Outfall Number(s)	Compliance Action	Due Date
53599	01A	The following parameter shall be "Monitor Only" at the **Effective Date of Permit Modification:** TOTAL RESIDUAL CHLORINE	04/01/2010
		The permittee shall submit an approvable engineering report, signed and stamped by a professional engineer licensed to practice engineering in New York State, detailing the methods to be used to reduce the effluent concentration of Total Residual Chlorine to bring it into compliance with the revised final effluent limit. Once approved, the permittee shall have **6 months** to implement the approved engineering report.	10/01/2010
		By **Date of Approval + 3 months,** the permittee shall submit a 3-month progress report. By **Date of Approval + 6 months,** the permittee shall be in compliance with the following final effluent limit: TOTAL RESIDUAL CHLORINE - 0.1 mg/L	DATE OF APPROVAL + 3 months DATE OF APPROVAL + 6 months

The above compliance actions are one time requirements. The permittee shall comply with the above compliance actions to the Department's satisfaction once. When this permit is administratively renewed by NYSDEC letter entitled "SPDES NOTICE/RENEWAL APPLICATION/PERMIT", the permittee is not required to repeat the submission. The above due dates are independent from the effective date of the permit stated in the letter of "SPDES NOTICE/RENEWAL APPLICATION/PERMIT."

b) The permittee shall submit a written notice of compliance or non-compliance with each of the above schedule dates no later than 14 days following each elapsed date, unless conditions require more immediate notice as prescribed in 6 NYCRR Part 750-1.2(a) and 750-2. All such compliance or non-compliance notification shall be sent to the locations listed under the section of this permit entitled RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS. Each notice of non-compliance shall include the following information:

1. A short description of the non-compliance;
2. A description of any actions taken or proposed by the permittee to comply with the elapsed schedule requirements without further delay and to limit environmental impact associated with the non-compliance;
3. A description or any factors which tend to explain or mitigate the non-compliance; and
4. An estimate of the date the permittee will comply with the elapsed schedule requirement and an assessment of the probability that the permittee will meet the next scheduled requirement on time.

c) The permittee shall submit copies of any document required by the above schedule of compliance to NYSDEC Regional Water Engineer at the location listed under the section of this permit entitled RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS **and to the Bureau of Water Permits, 625 Broadway, Albany, N.Y. 12233-3505,** unless otherwise specified in this permit or in writing by the Department.

RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS

a) The permittee shall also refer to 6 NYCRR Part 750-1.2(a) and 750-2 for additional information concerning monitoring and reporting requirements and conditions.

b) The monitoring information required by this permit shall be summarized, signed and retained for a period of three years from the date of the sampling for subsequent inspection by the Department or its designated agent. **Also, monitoring information required by this permit shall be summarized and reported by submitting;**

[X] (if box is checked) completed and signed Discharge Monitoring Report (DMR) forms for each 1 month reporting period to the locations specified below. Blank forms are available at the Department's Albany office listed below. The first reporting period begins on the effective date of this permit and the reports will be due no later than the 28th day of the month following the end of each reporting period.

[ ] (if box is checked) an annual report to the Regional Water Engineer at the address specified below. The annual report is due by February 1 and must summarize information for January to December of the previous year in a format acceptable to the Department.

[ ] (if box is checked) a monthly "Wastewater Facility Operation Report..." (form 92-15-7) to the:
[ ] Regional Water Engineer and/or [ ] County Health Department or Environmental Control Agency specified below

Send the **original** (top sheet) of each DMR page to:

Department of Environmental Conservation
Division of Water
Bureau of Watershed Compliance Programs
625 Broadway
Albany, New York 12233-3506
Phone: (518) 402-8177

Send the **first copy** (second sheet) of each DMR page to:

Department of Environmental Conservation
Regional Water Engineer
Region 9
270 Michigan Ave.
Buffalo, NY 14203-2999
Phone: (716) 851-7165

Send an **additional copy** of each DMR page to:

Niagara County Health Department
5467 Upper Mountain Road
Lockport, NY 14094
Phone: (716) 439-7440

c) Noncompliance with the provisions of this permit shall be reported to the Department as prescribed in 6 NYCRR Part 750-1.2(a) and 750-2.

d) Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

e) If the permittee monitors any pollutant more frequently than required by the permit, using test procedures approved under 40 CFR Part 136 or as specified in this permit, the results of this monitoring shall be included in the calculations and recording of the data on the Discharge Monitoring Reports.

f) Calculation for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this permit.

g) Unless otherwise specified, all information recorded on the Discharge Monitoring Report shall be based upon measurements and sampling carried out during the most recently completed reporting period.

h) Any laboratory test or sample analysis required by this permit for which the State Commissioner of Health issues certificates of approval pursuant to section five hundred two of the Public Health Law shall be conducted by a laboratory which has been issued a certificate of approval. Inquiries regarding laboratory certification should be sent to the Environmental Laboratory Accreditation Program, New York State Health Department Center for Laboratories and Research, Division of Environmental Sciences , The Nelson A. Rockefeller Empire State Plaza, Albany, New York 12201.

AIR REGISTRATION RENEWAL

PARSONS

40 La Riviere Drive, Suite 350 • Buffalo, New York, 14202 • (716) 541-0730 • Fax (716) 541-0760• www.parsons.com

November 24, 2009

Mr. Timothy Dieffenbach
New York State Department of Environmental Conservation
Division of Environmental Remediation
270 Michigan Avenue
Buffalo, New York 14203

Re: **BP Former Carborundum Facility – Sanborn, New York**
Revised Air Facility Registration

Dear Mr. Dieffenbach:

On behalf of Elm Holdings, Inc., attached please find the revised air facility registration for the Former Carborundum Facility in Sanborn, New York. The revised registration documents the NYSDEC-approved (June 22, 2009) modifications to the air emission control and discharge configuration at the Facility. The modifications were implemented November 23 through November 25, 2009.

Please contact Bill Barber of Atlantic Richfield at (216) 271-8038 if you have any questions or comments.

Sincerely,

George W. Hermance

George W. Hermance
Project Coordinator

Attachments

cc: W. Barber, Atlantic Richfield
File (445032, No. 9)

New York State Department of Environmental Conservation
Air Facility Registration

DEC ID
9 - 2 4 9 0 - 0 0 0 5 9

Owner/Firm			Taxpayer ID
Name Elm Holdings, Inc.			
Street Address 4850 East 49th Street MBC3-147			
City / Town / Village Cuyahoga Heights	State or Province Ohio	Country USA	Zip 44125

Owner/Firm Contact	
Name William B. Barber, Atlantic Richfield Company for Elm Holdings, Inc	Phone No. (216) 271-8038

Facility	
Name Elm Holdings, Inc. c/o BP Exploration	
Location Address 2040 Cory Road Groundwater Treatment Building	
☐ City / ☒ Town / ☐ Village Sanborn, NY	Zip 14132

Facility Information	
Total Number of Emission Points: One	☐ Cap by Rule Not applicable

Description

Groundwater treated for chlorinated volatile organics using a shallow tray air stripper. Exhaust from the air stripper is vented through a 12-inch diameter stack at a height of 27 - feet above ground surface.

The May 19, 2009 request to modify the configuration and operation of the Groundwater Treatment System - Air Stripper and Discharge component, NYSDEC approval for the change, a description of the change in location of the stack,and the stack as-built are attached.

Standard Industrial Classification Codes					
9999	Non classifiable	establishment			

HAP CAS Numbers					
75 - 01 - 4	75 - 09 -2	75 - 34 - 3	67 - 66 - 3	107 -06 -2	75 - 35 - 4
156 . 60 . 5	156. 59 .2	71 . 55 . 6	79 . 01 . 6	- -	- -

Applicable Federal and New York State Requirements (Part Nos.)					
200	201-4	212	212.3	212.6	212.9

Certification

I certify that this facility will be operated in conformance with all provisions of existing regulations.

Responsible Official William B. Barber	Title Project Manager
Signature	Date 11 / 20 / 2009

Atlantic Richfield Company for Elm Holdings, Inc.

7/29/96

PARSONS

40 La Riviere Drive, Suite 350 • Buffalo, New York, 14202 • (716) 541-0730 • Fax (716) 541-0760• www.parsons.com

May 19, 2009

Mr. Timothy Dieffenbach
New York State Department of Environmental Conservation
Division of Environmental Remediation
270 Michigan Avenue
Buffalo, New York 14203

Re: **BP Former Carborundum Facility – Sanborn, New York**
Groundwater Treatment System (GWTS)
Request for Modification to Air Emission Control & Discharge Configuration

Dear Mr. Dieffenbach:

Parsons, on behalf of the Atlantic Richfield Company, currently operates a Groundwater Collection and Treatment System as part of a remediation program at the site of the former Carborundum Facility in Sanborn, New York.

Currently, the system includes a tray air stripper to remove chlorinated volatile organic compounds (VOCs) from collected groundwater streams. The stripper air exhaust is then passed through a Calgon VAPOR PAC 10™ Granular Activated Carbon (GAC) control system to further reduce quantities of VOCs emitted to the atmosphere.

Based on original air emission calculations, the carbon control air exhaust system is classified as a minor source and operates under registration status with the New York State Department of Environmental Conservation (NYSDEC).

1.0 PROPOSED MODIFICATION

Atlantic Richfield is proposing to make a modification to the configuration and operation of the Groundwater Treatment System – Air Stripper and Discharge component. The original groundwater treatment system was constructed to treat 600 gallons per minute (GPM) of impacted groundwater. Currently the system operates at less than 100 GPM. Results for recent pre- and post-air stripper water samples, collected with the system operating between 90 and 100 GPM, indicate that pollutant loading to the VAPOR PAC 10™ GAC from the stripper is low enough to allow air stripper operation without carbon controls on the exhaust. Accordingly, Atlantic Richfield is proposing to eliminate the post-air stripper VAPOR PAC 10™ GAC control system and discharge the air stripper exhaust stream directly to the atmosphere.

The proposed modification replaces the existing VAPOR PAC 10™ carbon control system, associated exhaust ductwork, and 30-inch diameter stack with a 12-inch diameter vent installed over the air stripper. The 12-inch vent will discharge stripper exhaust at a height of 27 feet above ground level.

The modification is proposed based on a dispersion modeling analysis. The dispersion modeling analysis demonstrates that ambient impacts of emissions attributable to the proposed new operating configuration and emission scenario will be in compliance with the NYSDEC Division of Air Resources (DAR) Policy and Guidelines for the Control of Toxic Air Contaminants.

2.0 MODELING ANALYSIS

The NYSDEC DAR-1 (Air Guide1) policy requires that emissions of toxic air pollutants be evaluated for compliance with a set of ambient air concentration guidelines. These guidelines include sets of ambient air quality standards, or threshold concentration values that are not to be exceeded in the ambient air. These standards include a series of Short-Term Guideline Concentrations (SGCs) applicable to 1-hour average ambient concentrations, and a series of Annual Guideline Concentrations (AGCs) applicable to annual average levels of various contaminants.

2.1 MODELING APPROACH

The modeling was conducted using the DAR-1 "Ambient Air Quality Impact Screening Analysis" software package developed by NYSDEC specifically for the purpose of assessing ambient impacts of toxic air emissions from one or more sources based on site-specific input data. NYSDEC considers the DAR-1 analysis to be an appropriate initial screening technique which can be used to satisfy their policy.

As indicated in Section IV.A of the DAR-1 Guidelines, ambient impacts predicted via this screening tool are considered to be conservative, thereby providing additional assurance that predicted concentrations below established thresholds are protective of human health.

The DAR-1 assessment approach requires that emissions from a source be assessed on a contaminant by contaminant basis. The model predicts both a maximum 1-hour and a maximum annual average concentration for each compound. The peak predicted 1-hour (i.e., short-term) concentrations are assessed relative to the SGC values and the maximum annual average (i.e., long-term) concentrations are assessed relative to the AGC values for each compound.

Consistent with the stated objective of this analysis, impacts were assessed for the proposed operating configuration, wherein air emissions from the tray stripper are exhausted directly (i.e., with no carbon control) through a new vent to be constructed over the stripper. This new vent will be a vertical stack, such that emissions are modeled as being exhausted from a vertically-discharged point source. Figure 1 is a conceptual model used for the modeling exercise.

2.2 MODEL INPUT DATA

Emissions Data

There are a total of ten (10) compounds of interest associated with the Sanborn groundwater remediation program. Based on the March 11, 2009 pre- and post air stripper influent water sampling and analyses results, **Table 1** lists the compounds sampled, the VOC concentrations in the combined influent water samples were used to calculate the post-stripper mass loadings, and the corresponding post-stripper air emission rates for these compounds in grams per hour (g/hour). Based on the data, there are four compounds with "zero" emission rates. The analytical results of the influent water sample used to calculate emission rates are consistent and representative of the expected groundwater impacts.

The g/hour rates were converted to lb/hour rates for use in determining maximum model predicted short-term (i.e., maximum 1-hour average) impacts. For this analysis, it was conservatively assumed that the short-term lb/hour emission rates remain constant throughout all 8,760 hours per year. Thus, model calculations of maximum long-term annual average impacts are based on contaminants being continuously emitted at the same lb/hour rates during each hour in the year.

Source and Stack Data

Figure 2 is an aerial photograph of the Sanborn site depicting the facility property line, the GWTS building location, and proposed new exhaust stack location atop the center of the structure. The building is located within controlled property providing a buffer zone between the source and the property line, or "ambient air". **Figure 2** also delineates the shortest distance between the stack and the property line, which is 41.4 meters (136 feet). This is the point at which the first model receptor point is placed. The shortest distance between the trailing edge of the building and the property boundary is 30.5 meters (100 feet).

The proposed new stack top of 27 feet is modeled at 10 feet above the building height of 17 feet (average of 18-foot peak and 16-foot eave heights). The building height, along with the length and width dimensions (approx 95' by 50') were entered into the DAR-1 model for assessment of any potential building cavity and aerodynamic downwash impacts.

2.3 MODELING ANALYSIS AND RESULTS

Based on the source and emissions data presented herein and the proposed source configuration for the Sanborn Facility GWTS, the proposed new physical and operating configuration (without carbon control) will operate in compliance with the NYSDEC air toxics guidelines.

Table 2 provides a comprehensive summary of the model inputs and outputs comprising the DAR-1 analysis for the proposed new stack. Data provided in Table 2 includes input parameters and appropriate 1-hour SGC and Annual AGC regulatory values to assess compliance. Parameters listed include the compounds of concern, compound abbreviations and CAS numbers, the base hourly emission rates in pounds per hour (lb/hr), the annual emissions in pounds per years (lb/yr), and the predicted maximum 1-hour and maximum annual average concentrations for each compound in micrograms per cubic meter (µg/m3). The predicted maximum annual impacts are expressed as percentages of the applicable AGC concentration values. It should be noted that AGC values have been established for all listed compounds. However, SGC values have not been established for all the compounds.

For this analysis for a single point source, the model was executed for a "Unit Emission Rate" of one pound per hour (1 lb/hour), or 0.126 grams per second (g/sec). The 1-hour and annual average concentration values predicted for the 1 lb/hour rate were then scaled based on the actual lb/hour emission rates for each compound to obtain the predicted concentration values for each individual compound.

A review of the source configuration input to the model (i.e., building dimensions and distance to property line) and the DAR-1 model output indicated that the building cavity region does not extend off-site. Therefore, there are no cavity impacts to be assessed, and the peak impacts calculated by the model are those that occur under more conventional dispersion conditions at receptor points at and beyond the property line.

As shown in Table 2, the maximum predicted 1-hour and annual average concentrations ($\mu g/m^3$) for all compounds examined in the analysis are below the applicable SCG and AGC values. The maximum predicted 1-hour concentrations are generally several orders of magnitude below the applicable SGC thresholds. With the exception of TCE, the maximum predicted annual average concentrations comprise only about 3 percent or less of the AGC values. TCE concentration is 57% of the AGC value

Potential Increases in COC Concentrations

The results of the model suggest that a shorter (i.e., less than 27 feet) 12-inch diameter vent installed over the air stripper with no carbon controls could be operated and meet SGC and AGC criteria. However, using the proposed 12-inch diameter stack to 27 feet above grade will allow for increased emissions that could result from increased TCE concentration in the influent, if any.

- SGC: Using the modeled emission rate developed from the March '09 sampling data and the 27 foot stack height, the maximum predicted 1-hour impact of TCE is approximately three orders of magnitude lower than the SGC threshold value. Thus, a short-term increase of the influent concentration of TCE (up to 3,000 times its modeled value) would not exceed the short-term SGC threshold.

- AGC: An increase in emissions, resulting from an increase in TCE concentration (from other possible sources) in the influent, would have to persist throughout all 8,760 hours per year. Based on the modeled margin of compliance with the AGC for a TCE emission rate of 7.64419 g/hr, a 75% increase of TCE in the influent, even if it persisted all 8,760 hours per year, would not yield an increase in the annual average ambient TCE concentration that would exceed the AGC value at the 27-foot stack height.

3.0 REQUEST FOR NYSDEC CONCURRENCE

The results of the groundwater sample analysis and the DAR-1 air modeling analysis described above indicate that the Sanborn GWTS could be operated in a revised configuration. This revised configuration would meet the SGC and AGC values for the compounds examined and would include (1) taking the VAPOR PAC 10 carbon control system taken off line and (2) directing the air stripper emissions through a new vent directly to the atmosphere

Accordingly, Atlantic Richfield respectfully requests that NYSDEC review the proposed modification and formally approve this request to implement this modification. Upon receipt of verbal concurrence with our findings, Atlantic Richfield will submit a revised Source Registration application to document the proposed changes.

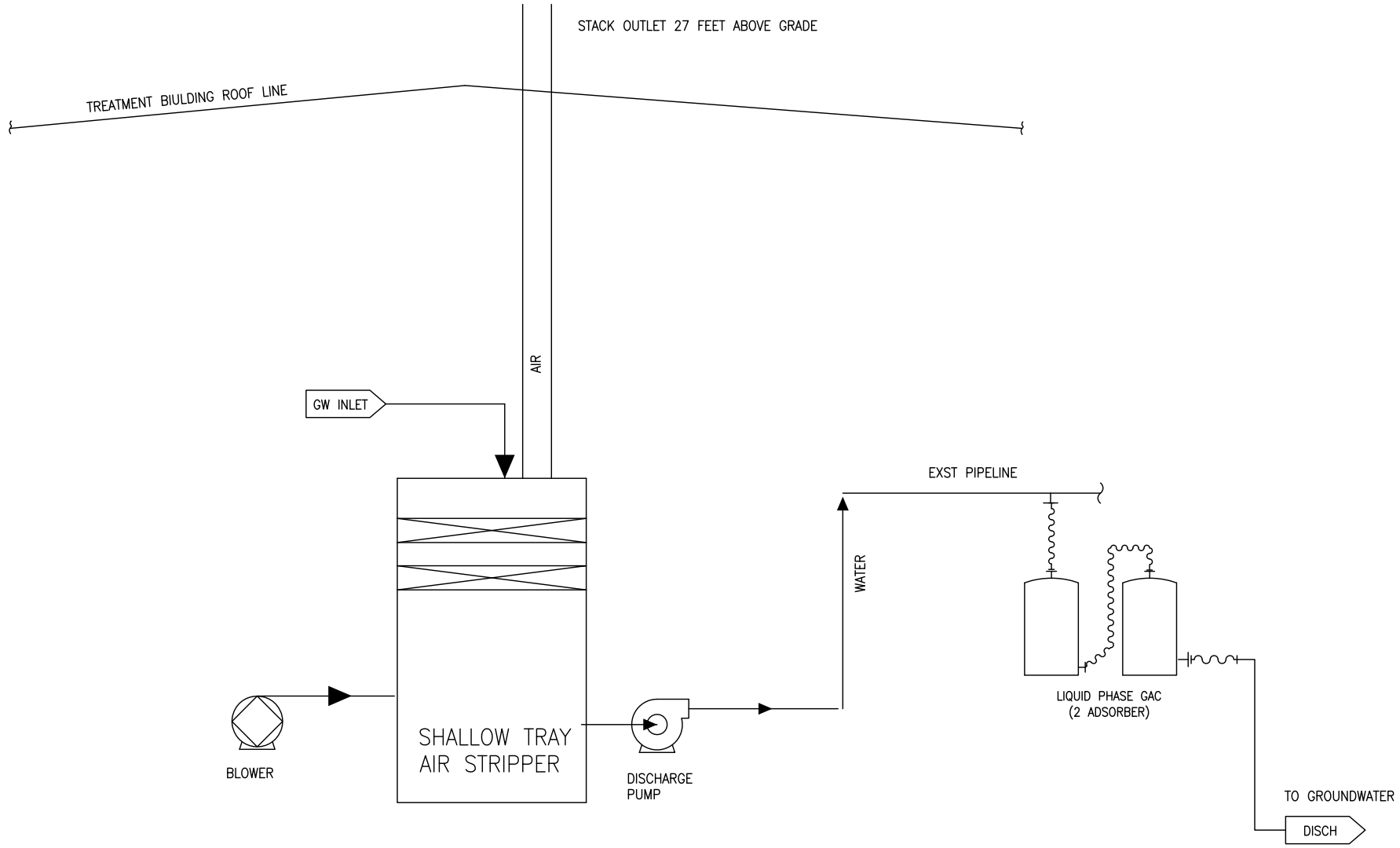
Please do not hesitate to contact William B. Barber at 216.271.8038 if you have any questions or need any additional information regarding this request. A meeting could be arranged to review the model and results if that would be of use.

Sincerely,

Mark S. Raybuck

Mark Raybuck
Project Manager

cc: William B. Barber, Atlantic Richfield Company
File (445032, No. 9)



FILE NAME: P:\445032\O&M\STACK REVISION\AIR MODEL 2009\SANBN-STACKREV-001.DWG

PARSONS
40 LA RIVIERE DR., SUITE 350
BUFFALO, NY
(716) 541-0730

FIGURE 1

BP SANBORN
CONCEPTUAL MODEL FOR STACK REVISION

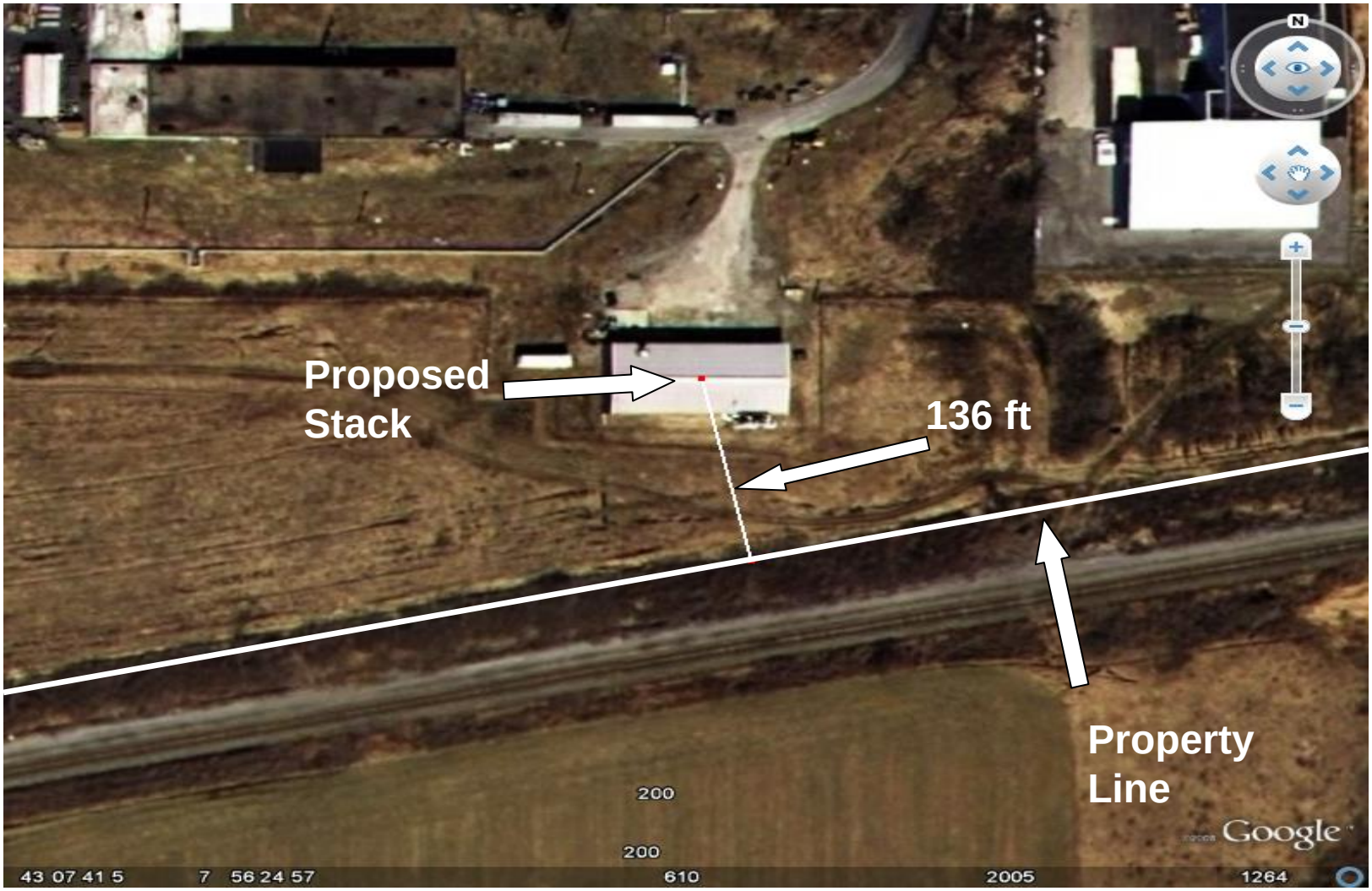


FIGURE 2

Former Carborundum Facility, Sanborn, NY

Center Stack and Distance to Property Line

PARSONS
40 La Riviere Dr., Suite 350 Buffalo, NY 14202 (716) 541-0730

Table 1
Air Stripping of GWTS Influent Water
Former Carborundum Facility, Sanborn, New York

	Sanborn Site Data			
Parameter	Influent Concentrations, ug/l	Post-stripper Concentrations, ug/l	% Removal	VOC Vapor Phase, g/hr
vinly clhoride	3.3	0	100.00%	**0.074943**
1,1 DCE	0	0	NA	**0**
MC	0	0	NA	**0**
t-1,2 DCE	1.2	0	100.00%	**0.027252**
1,1 DCA	3.3	0	100.00%	**0.074943**
c-1,2 DCE	130	2.3	98.23%	**2.900067**
chloroform	0	0	NA	**0**
1,1,1 TCA	3.7	0	100.00%	**0.084027**
1,2 DCA	0	0	NA	**0**
TCE	340	3.4	99.00%	**7.644186**
Total VOC	481.5	5.7		10.81

* Based on an actual 100 gpm flowrate to the stripper and an actual air flowrate of 750 cfm (1274 m^3/hr)

Table 2
Sanborn GWT Facility - DAR-1 Air Modeling Analysis - Emissions and Impacts Summary

New Stack - No Carbon Control - Stack Height = 27 Feet

Source Parameters:

Stack Height	**27 feet**
Stack Diameter	12 inches
Volume Flow Rate:	750 cfm (actual)
Exit Velocity	15.92 ft/sec
Exit Temperature	59 Deg F

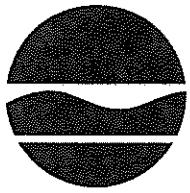
DAR - 1 Modeling Results
For Unit Emission Rate of 1 lb/hr (0.126 g/sec):

Max 1-hour Impact =	1024.62	ug/m3
Max Annual Avg Impact =	16.94	ug/m3

Compound	Abb.	CAS No.	Mass Loadings From Air Stripper[1] (g/hour)	Corresponding Maximum Short-Term Emission Rate (lb/hour)	Max Annual Emissions (ST X 8,760) (lb/yr)	Max Modeled 1-Hour Impact[2] (ug/m3)	1-Hour SGC Value[3] (ug/m3)	Max Modeled Annual Avg Impact (ug/m3)	Annual AGC Value (ug/m3)	Annual Impact as % of AGC
Vinyl Chloride	VC	75-01-4	0.07494	1.65E-04	1.45	0.16928	*180000*	0.0028	*0.11*	2.54%
1,1 dichloroethene	1,1-DCE	75-35-4	0	0.00E+00	0.00	0.00000	-	0.0000	*70.0*	0.00%
Methylene Chloride	MeCl	75-09-2	0	0.00E+00	0.00	0.00000	*14000*	0.0000	*2.1*	0.00%
trans 1,2 Dichloroethene	t-1,2-DCE	156-60-5	0.02725	6.01E-05	0.53	0.06155	-	0.0010	*63.0*	0.00%
1,1 dichloroethane	1,1 DCA	75-34-3	0.07494	1.65E-04	1.45	0.16928	-	0.0028	*0.63*	0.44%
cis-1,2 Dichloroethene	c-1,2-DCE	156-59-2	2.90007	6.39E-03	56.01	6.55086	-	0.1083	*63.0*	0.17%
Chloroform	CF	67-66-3	0	0.00E+00	0.00	0.00000	*150*	0.0000	*0.043*	0.00%
1,1,1-Trichloroethane	1,1,1-TCA	71-55-6	0.08403	1.85E-04	1.62	0.18981	*68000*	0.0031	*1000*	0.00%
1,2 Dichloroethane	1,2-DCA	107-06-2	0	0.00E+00	0.00	0.00000	-	0.0000	*0.038*	0.00%
Trichloroethene	TCE	79-01-6	7.64419	1.69E-02	147.63	17.26717	*54000*	0.2855	*0.5*	57.10%

Notes:
(1) "Mass Loadings From Air Stripper" values are based on March 11, 2009 influent concentration test data, GW flow rates and assumed air stripper control efficiencies.
(2) Compound-Specific impact values are based on model results for "Unit Emission Rate" (1 lb/hr) multiplied by actual lb/hr rates for each compound.
(3) A "-" indicates no SGC values have been established

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 9
270 Michigan Avenue, Buffalo, New York, 14203-2915
Phone: (716) 851-7220 • **FAX:** (716) 851-7226
Website: www.dec.ny.gov



Alexander B. Grannis
Commissioner

June 22, 2009

Mr. William Barber
Atlantic Richfield Company
4850 East 49th Street
MBC3-147
Cuyahoga Heights, Ohio 44125-1014

Dear Mr. Barber:

Modification to Air Emission Control & Discharge
Carborundum Specialty Products
Site Registry #932102
Wheatfield (T), Niagara County

The Department has reviewed the May 19, 2009 Request for Modification to Air Emission Control & Discharge Configuration and the June 18, 2009 additional data set submitted by Parsons. Based on review of the data presented, the Department has no objection to the removing the carbon treatment control system and replacing the vent stack.

If you have any questions, please contact me at (716) 851-7220.

Sincerely,

Tim Dieffenbach

Tim Dieffenbach
Engineering Geologist II

TD:sz

cc: Mr. Gregory Sutton - NYSDEC
Mr. Matthew Forcucci - NYSDOH
Mr. Mark Raybuck - Parsons

PARSONS

40 La Riviere Drive, Suite 350 • Buffalo, New York, 14202 • (716) 541-0730 • Fax (716) 541-0760• www.parsons.com

October 15, 2009

Mr. Timothy Dieffenbach
New York State Department of Environmental Conservation
Division of Environmental Remediation
270 Michigan Avenue
Buffalo, New York 14203

Re: **BP Former Carborundum Facility – Sanborn, New York**
Groundwater Treatment System (GWTS)
Revision to NYSDEC-approved Air Emission Control & Discharge Configuration

Dear Mr. Dieffenbach:

As discussed with Bill Barber, this follow up letter is to inform you that the location for the new stack at the referenced facility must be changed. In the NYSDEC-approved (June 22, 2009) modification to the air emission control and discharge configuration, Atlantic Richfield had intended to install the 12-inch diameter fiberglass reinforced plastic (FRP) vent directly over the air stripper. Recent structural analysis of the building has determined that the new stack must be supported from the ground rather than the roof. Thus, the location of the stack has been changed from directly over the air stripper (supported by the roof) to a location outside the building (supported from the ground).

The new stack is anticipated to be installed along the north side of the building, approximately 25 feet from the original location (see attached photo). The height of the stack (27-feet) will remain the same. The conceptual plan for the new stack installation is attached. The modeling used for the original placement of the stack through the roof remains valid for the stack placement along the outside of the building.

Please contact Bill Barber of Atlantic Richfield at (216) 271-8038 if you have any questions or comments.

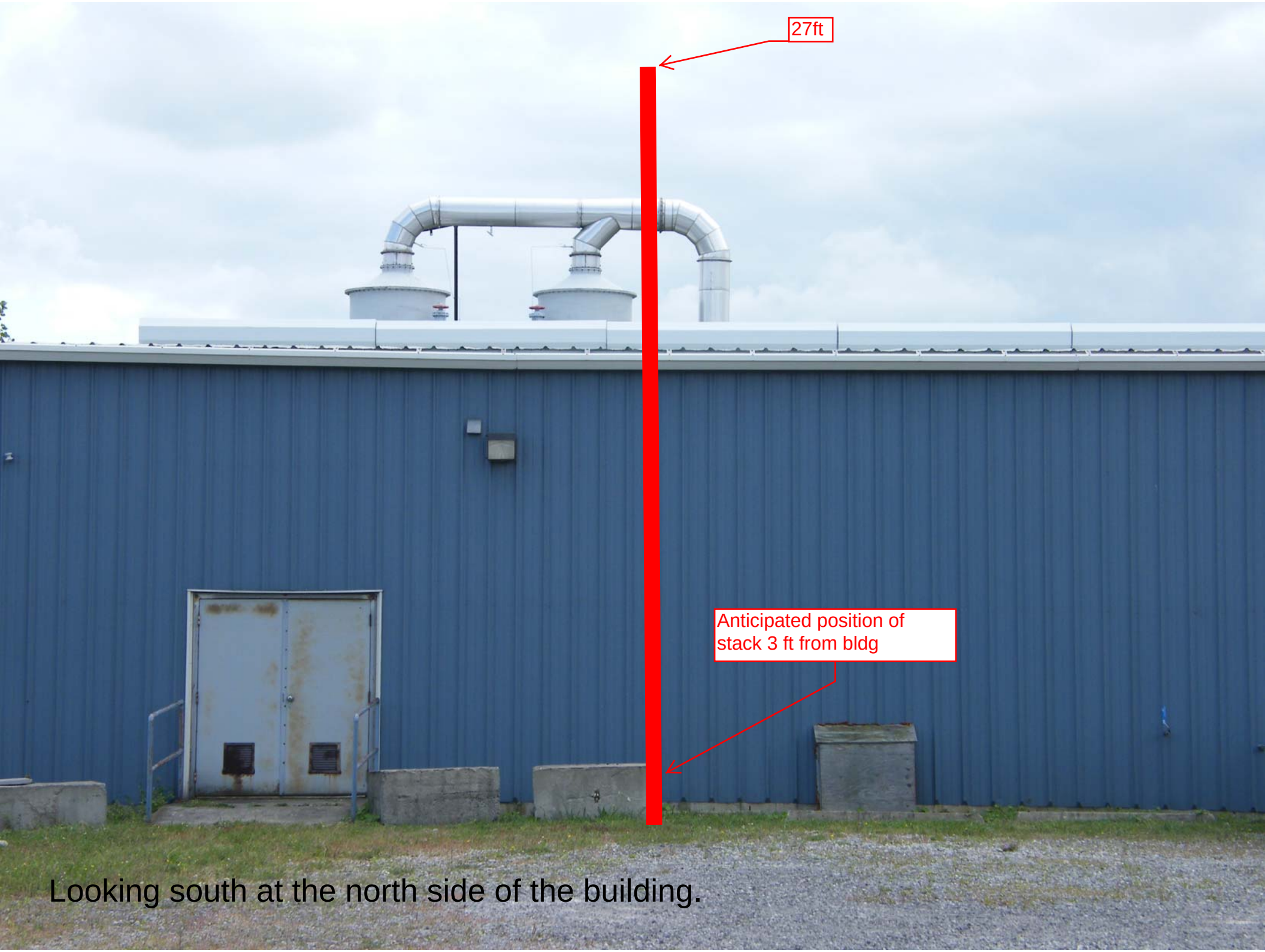
Sincerely,

George W. Hermance

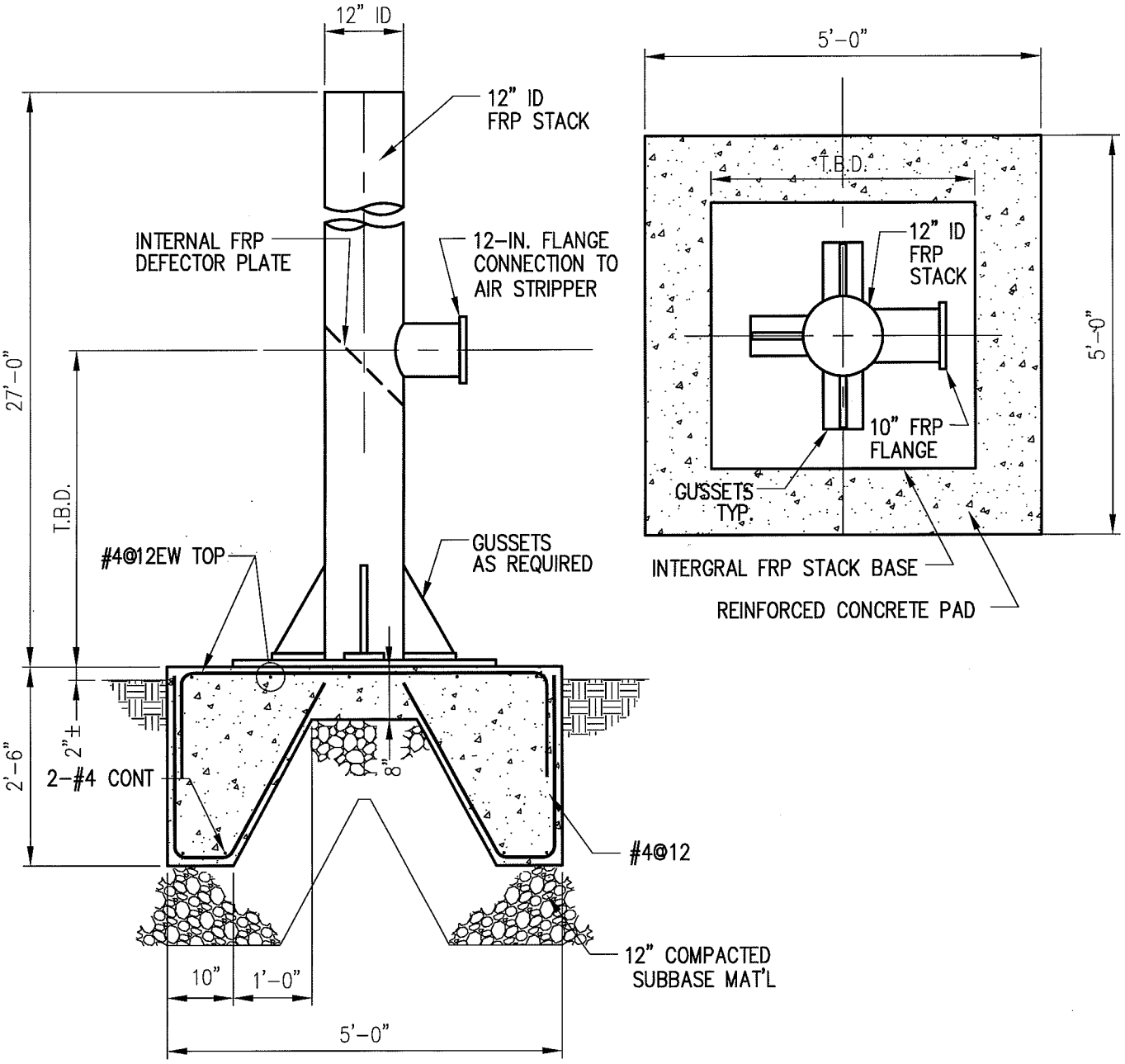
George W. Hermance
Project Coordinator

Attachments

cc: W. Barber, Atlantic Richfield
File (445032, No. 9)



Looking south at the north side of the building.



NOTES:

1. CONTRACTOR SHALL CONTACT DIGSAFE OR OTHER GOVERNMENT AGENCIES RESPONSIBLE FOR LOCATING UNDERGROUND UTILITIES AND VERIFY LOCATION AND DEPTH OF ALL UTILITIES IN THE WORK AREA PRIOR TO THE START OF WORK.
2. SOFT OR YIELDING SOILS SHALL BE OVER EXCAVATED AND REPLACED WITH IMPORTED GRAVEL FILL, COMPACTED TO 98% OF ITS MODIFIED PROCTOR DRY DENSITY (MPD) AND WITHIN 2% OF OPTIMUM MOISTURE CONTENT AS DETERMINED IN ACCORDANCE WITH ASTM D1557.
3. NO CONCRETE SHALL BE PLACED IN WATER OR ON FROZEN GROUND.
4. CONCRETE SHALL ATTAIN A MINIMUM AVERAGE COMPRESSIVE STRENGTH (F'c) OF 3,000 PSI AT 28 DAYS' AGE.
5. REINFORCING STEEL SHALL HAVE NEW BILLET STEEL ASTM A-615 GRADE 60 DEFORMATIONS CONFORMING TO ASTM A-305. ALL DETAILS SHALL BE IN ACCORDANCE WITH ACI DETAIL STANDARD ACI 315.
6. ANCHOR BOLT SPECIFICS (SIZE, SPACING, PATTERN, ETC.) TO BE PROVIDED BY THE STACK MANUFACTURER.

FOUNDATION DESIGN FOR FREE STANDING FRP STACK

SCALE:1/2"=1'-0"

PARSONS

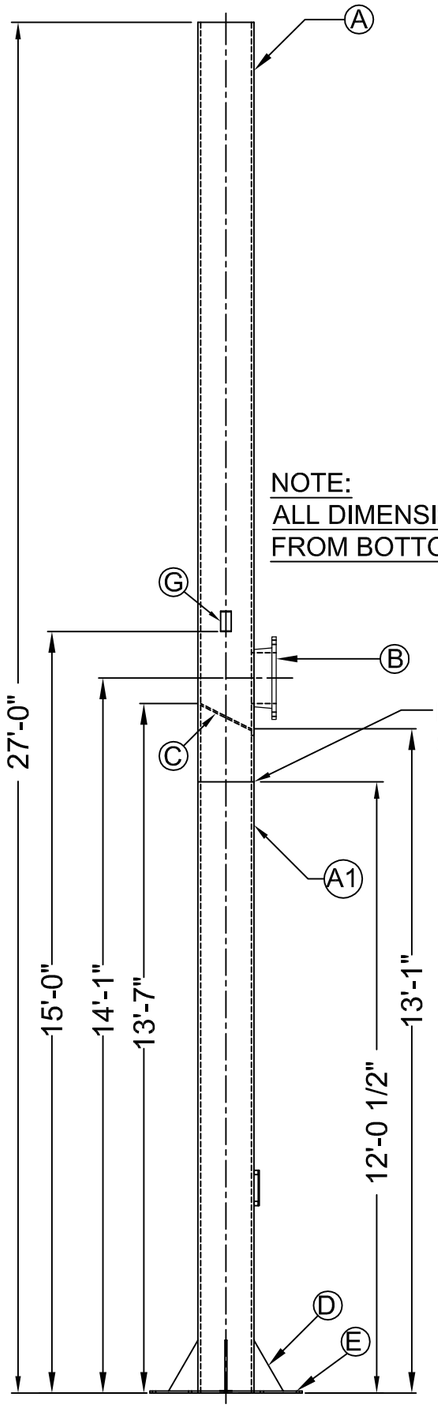
STANDARD DETAIL

S-01

REVISION DATE: 9/2/09

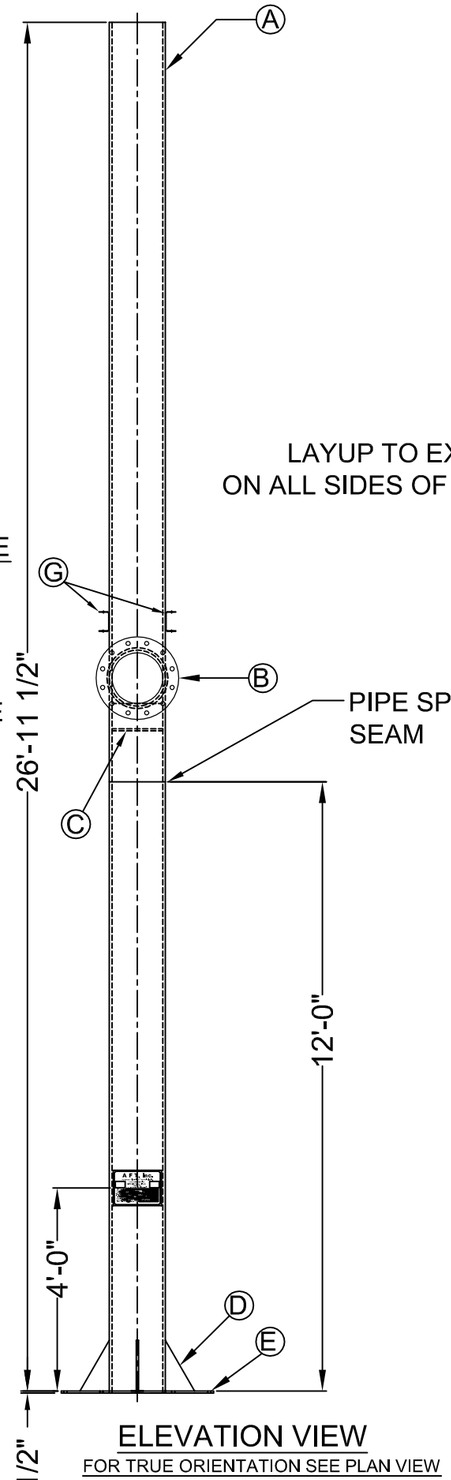
UNLESS OTHERWISE SPECIFIED, DIMENSIONAL TOLERANCES ARE:
FRACTIONAL +/-1/8", DECIMAL +/-.125", ANGULAR +/-2°

BILL OF MATERIAL						
ITEM	QTY	PART_#	DESCRIPTION/SERVICE	GUSSET_TYPE	NZL._PROJ.	MATL.
A	1	60-12FWP150470	12"ø 150PSI FILAMENT WOUND PIPE (15' TALL)	N/A	N/A	FRP
A1	1	60-12FWP150470	12"ø 150PSI FILAMENT WOUND PIPE (12' TALL)	N/A	N/A	FRP
B	1	50-12FLA50470	12"ø 50 PSI NOZZLE	N/A	6"	FRP
C	1	———	3/8" THK. INTERIOR DEFLECTOR PLATE	N/A	N/A	FRP
D	4	———	GUSSET PLATE w/ BOTTOM PLATE (SEE GUSSET DETAIL D)	N/A	N/A	FRP
E	1	———	1/2" THK. x 3' SQ. WIDE PLATE	N/A	N/A	FRP
F	1	10-099	NAME PLATE w/ BRACKET	N/A	N/A	ALUM.
G	2	10-072-#2	#2 LIFT LUG	N/A	N/A	CS

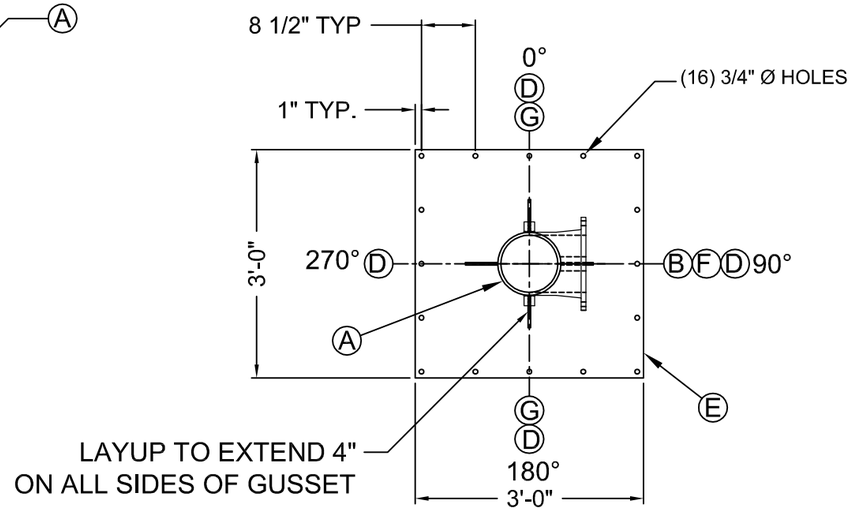


NOTE:
ALL DIMENSIONS TO BE
FROM BOTTOM OF PLATE

ELEVATION VIEW
FOR TRUE ORIENTATION SEE PLAN VIEW

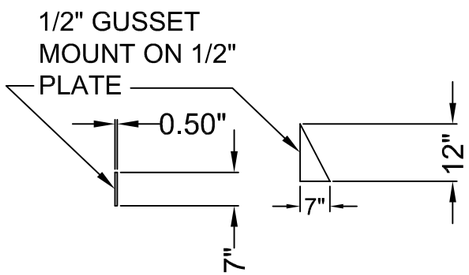


ELEVATION VIEW
FOR TRUE ORIENTATION SEE PLAN VIEW



PLAN VIEW

MATERIALS OF CONSTRUCTION			
	RESIN SYSTEM		CURE SYSTEM
LINER	100 MIL. DERAKANE 470-300		CHP
STRUCTURAL	DERAKANE 470-300		CHP
EXTERIOR COAT	–		
REINFORCEMENTS	THK./LAYER	SYMBOL	REMARKS
"C"-GLASS SURFACING VEIL	0.010"	V	–
NEXUS SURFACING VEIL	0.010"	N	SINGLE C-VEIL
1 1/2 oz. CHOP STRAND MAT	0.043"	M	1 1/2 oz./SQ. FT.
3/4 oz. CHOP STRAND MAT	0.022"	Z	3/4 oz./SQ. FT.
24 oz. WOVEN ROVING	0.033"	R	24 oz./SQ. YD.
WEFT UNIDIRECTIONAL FABRIC	0.025"	U	1.67 oz./SQ. FT.
CHOP STRAND GLASS	0.030"	CP	1 oz./SQ. FT.
HELICAL FILAMENT WIND	0.046"	FW	1.84 oz./SQ. FT.
STRAIGHT FILAMENT WIND	0.022"	SW	0.92 oz./SQ. FT.
COMPONENT	LAMINATE THK.	LAMINATE TYPE	REMARKS
TOP HEAD	–	TYP. II	N/A
SHELL	0.375	TYP. X	FW@77°
BOTTOM	0.50	TYP. II	CHOP



GUSSET DETAIL (D)

DESIGN CONDITIONS		
DESIGN PRESS.	ATM.	°F
DESIGN TEMP.	AMBIENT	VAC.
OPERATING PRESS.	ATM.	F
OPERATING TEMP.	AMBIENT	VAC.
HYDRO TEST	N	
POST CURE	Y	
SP.GR. CONTENTS	1.2	
WIND LOAD	90 MPH	
SEISMIC ZONE	N/A	
ROOF LOAD	N/A	
VISUAL INSPECTION	ASTM D-3299	
PRODUCT	–	
DESIGN PER.	ASTM D-3299	

REV	REVISION	DATE	INT
4	AS BUILT	11-12-09	KR
3	APPROVED FOR FABRICATION	10-27-09	KR
2	REVISED PER CUSTOMER REQ.	10-21-09-	KR
1	ADDED WIND LOAD TO DESGN COND.	10-16-09	MM
0	NEW DRAWING	10-12-09	KR

CUSTOMER: PARSONS COMMERCIAL TECH.

TITLE: AIR STRIPPER
12" FRP x 27' TALL STACK
EMISSIONS STACK
ASSEMBLY DRAWING

SCALE: NONE
DR: KMR DATE: 10-12-09
CK: - DATE: -

MATERIAL: FRP
SERIAL NO: 0081870
QTY REQ'D: 1
DWG NO: 81870-1
OF: 2
REV: 4

ADVANCEDFIBERGLASSTECHNOLOGIES INC.
An Energy Composites Company

4400 Commerce Drive
Wisconsin Rapids, WI 54494
P(715) 421-2060 F(715) 421-2048

AIR PERMIT

FROM :O&M Enterprises Inc. FAX NO. :7167315424 Sep. 23 2004 08:15AM P5

OP LOCATION FACILITY EMISSION POINT
1 3 9 4 0 0 0 0 7 8 0 0 0 0 0 1

A ADD
C CHANGE
D DELETE

READ INSTRUCTIONS CONTAINED IN FORM 76-15-12 BEFORE ANSWERING ANY QUESTION

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

COPIES
WHITE - ORIGINAL
GREEN - DIVISION OF AIR
WHITE - REGIONAL OFFICE
WHITE - FIELD REP
YELLOW - APPLICANT

PROCESS, EXHAUST OR VENTILATION SYSTEM

APPLICATION FOR PERMIT TO CONSTRUCT OR CERTIFICATE TO OPERATE

59 01

SECTION A

1. NAME OF OWNER/FIRM: The Carborundum Company
2. NUMBER AND STREET ADDRESS: 1625 Buffalo Avenue
3. CITY - TOWN - VILLAGE: Niagara Falls
4. STATE: NY
5. ZIP: 14303
6. OWNER CLASSIFICATION: A ☐ COMMERCIAL B ☒ INDUSTRIAL C ☐ UTILITY D ☐ FEDERAL E ☐ STATE F ☐ MUNICIPAL G ☐ EDUC. INST H ☐ HOSPITAL I ☐ RESIDENTIAL J ☐ OTHER
7. NAME & TITLE OF OWNERS REPRESENTATIVE: Donald F. Spears, Jr. Senior Environmental Specialist
8. TELEPHONE: 716-278-2250
9. NAME OF AUTHORIZED AGENT
10. TELEPHONE
11. NUMBER AND STREET ADDRESS
12. CITY - TOWN - VILLAGE
13. STATE
14. ZIP
15. NAME OF P.E. OR ARCHITECT PREPARING APPLICATION
16. N.Y.S. P.E. OR ARCHITECT LICENSE NO.
17. TELEPHONE
18. SIGNATURE OF OWNERS REPRESENTATIVE OR AGENT WHEN APPLYING FOR A PERMIT TO CONSTRUCT
19. FACILITY NAME (IF DIFFERENT FROM OWNER/FIRM)
20. FACILITY LOCATION (NUMBER AND STREET ADDRESS)
21. CITY - TOWN - VILLAGE
22. ZIP
23. BUILDING NAME OR NUMBER
24. FLOOR NAME OR NUMBER
25. START UP DATE: MO 10 / YR 93
26. DRAWING NUMBERS OF PLANS SUBMITTED
27. PERMIT TO CONSTRUCT: A ☐ NEW SOURCE B ☐ MODIFICATION
28. CERTIFICATE TO OPERATE: A ☐ NEW SOURCE B ☐ MODIFICATION C ☒ EXISTING SOURCE

SEC. B

29. EMISSION POINT ID.	30. GROUND ELEVATION (FT.)	31 HEIGHT ABOVE STRUCTURES (FT.)	32 STACK HEIGHT (FT.)	33 INSIDE DIMENSIONS (IN.)	34 EXIT TEMP. (°F.)	35 EXIT VELOCITY (FT/SEC.)	36 EXH. FLOW RATE (ACFM)	37 SOURCE CODE	38 HRS/DAY	39 DAYS/YR	40. % OPERATION BY SEASON (Winter / Spring / Summer / Fall)
0 0 0 0 1	610.7	7.5	22.5	30	90-100	17	9000				

SEC. C

41. DESCRIBE PROCESS OR UNIT
1. 2. 3. 4. 5. 6. 7. 8.

SEC. D

42. EMISSION CONTROL EQUIPMENT I.D.	43. CONTROL TYPE	44. MANUFACTURER'S NAME AND MODEL NUMBER	45. DISPOSAL METHOD	46. DATE INSTALLED MONTH / YEAR	47. USEFUL LIFE
01	17	Calgon Carbon Vapor Pac-10	9	10 / 93	2
48.	49.	50.	51.	52. /	53.

SECTION E

CALCULATIONS

See Separate Unit I.D. Forms 01 and 02.

The emissions below are the sum of Unit I.D. Forms 01 and 02.

* Other Chlorinated Organics may include 1,1,1-trichloroethane, carbon tetrachloride and methylene chloride

SECTION E

The emissions below are the sum of Unit I.D. Forms 01 and 02.

* Other Chlorinated Organics may include 1,1,1-trichloroethane, carbon tetrachloride and methylene chloride

SECTION F

CONTAMINANT NAME	CAS NUMBER	INPUT OR PRODUCTION	UNIT	ENV. RATING	EMISSIONS ACTUAL	EMISSIONS UNIT	HOW DET	EMISSIONS PERMISSIBLE	% CONTROL EFFIC'CY	HOURLY EMISSIONS (LBS/HR) ERP	HOURLY EMISSIONS (LBS/HR) ACTUAL	ANNUAL EMISSIONS (LBS/YR) ACTUAL	IQ*	ANNUAL EMISSIONS (LBS/YR) PERMISSIBLE
Trichloroethylene	79-01-6			B	1.2	1		1.2	90	12.0	1.2	10512	0	10512
Dichloroethylene	540-59-0			B	0.282	1		.282	90	2.82	0.282	2470.32	0	2471
Vinyl Chloride	75-01-4			A	0.004	1		.004	90	0.04	0.004	35.04	0	35
Other Chlorinated Organ*	68476-39-1			B	Trace	94			90	Trace	Trace	Trace		

SEC. G

SOLID FUEL TYPE	SOLID FUEL TONS/YR	%S	OIL TYPE	OIL THOUSANDS OF GALLONS/YR	%S	GAS TYPE	GAS THOUSANDS OF CF/YR	BTU/CF	APPLICABLE RULE	APPLICABLE RULE
									212	

Upon completion of construction sign the statement listed below and forward to the appropriate field representative

THE PROCESS, EXHAUST OR VENTILATION SYSTEM HAS BEEN CONSTRUCTED AND WILL BE OPERATED IN ACCORDANCE WITH STATED SPECIFICATIONS AND IN CONFORMANCE WITH ALL PROVISIONS OF EXISTING REGULATIONS.

SIGNATURE OF AUTHORIZED REPRESENTATIVE OR AGENT: [signature] DATE: 5/18/85

AGENCY USE ONLY

LOCATION CODE	FACILITY ID. NO.	U.T.M. (E)	U.T.M. (N)	SIC NUMBER	DATE APPL. RECEIVED	DATE APPL. REVIEWED	REVIEWED BY
140400	0578	1744	7827	1705	/ /	7/12/96	[signature]

PERMIT TO CONSTRUCT

DATE ISSUED	EXPIRATION DATE	SIGNATURE OF APPROVAL	FEE
/ /	/ /		

1. DEVIATION FROM APPROVED APPLICATION SHALL VOID THIS PERMIT
2. THIS IS NOT A CERTIFICATE TO OPERATE
3. TESTS AND/OR ADDITIONAL EMISSION CONTROL EQUIPMENT MAY BE REQUIRED PRIOR TO THE ISSUANCE OF A CERTIFICATE TO OPERATE

RECOMMENDED ACTION RE: C.O.

DATE ISSUED	EXPIRATION DATE	SIGNATURE OF APPROVAL	FEE
07 20 95	07 01 2000	[signature]	—

1. [X] INSPECTED BY D. Pasco DATE 10/6/94
2. [ ] INSPECTION DISCLOSED DIFFERENCES AS BUILT VS. PERMIT, CHANGES INDICATED ON FORM
3. [X] ISSUE CERTIFICATE TO OPERATE FOR SOURCE AS BUILT
4. [ ] APPLICATION FOR C.O. DENIED ____ DATE ____ INITIALED

SPECIAL CONDITIONS:

When 50% breakthrough has been detected at the intermediate sampling point, carbon change-out is to be scheduled to occur prior to 100% exhaustion of the carbon bed.

LOCATION	FACILITY	EMISSION POINT	UNIT I.D.
		P	00001 I 01

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROCESS, EXHAUST OR VENTILATION SYSTEM
UNIT OR PROCESS DATA

COPIES
WHITE - ORIGINAL
GREEN - DIVISION OF AIR
WHITE - REGIONAL OFFICE
WHITE - FIELD REP
YELLOW - APPLICANT

PLEASE PRINT OR TYPE

SEC H	175 EMISSION POINT I.D.	176 UNIT I.D.
	0 0 0 0 1	0 1

177 SOURCE CODE	178 HRS/DAY	179 DAYS/YR	180 % OPERATION BY SEASON Winter	Spring	Summer	Fall
	24	365	25	25	25	25

SEC I — 181 DESCRIBE PROCESS OR UNIT

1. Contaminated air containing chlorinated organics from a soils vacuum extraction remediation system, are
3. vented to an activated carbon absorption unit for removal of the organics. Spent carbon is sent to the
5. supplier for regeneration and reuse.
7.
2.
4.
6.
8.

SEC J

EMISSION CONTROL EQUIPMENT I.D. 182	CONTROL TYPE 183	MANUFACTURER'S NAME AND MODEL NUMBER 184	DISPOSAL METHOD 185	DATE INSTALLED 186	USEFUL LIFE 187
01	17	Calgon Carbon Vapor Pac-10	9	10 / 93	2
188	189	190	191	192 /	193

SECTION K — CALCULATIONS

See attached.

SECTION L

CONTAMINANT NAME 194	CAS NUMBER 195	INPUT OR PRODUCTION 196	UNIT 197	EMISSIONS ACTUAL 198	UNIT 199	HOW DET. 200	% CONTROL EFFICIENCY 201	HOURLY EMISSIONS (LBS/HR) ERP 202	ACTUAL 203	ANNUAL EMISSIONS (LBS/YR) ACTUAL 204	% 205
Trichloroethylene	79016			1.12	1		90	11.2	1.12	9811.2	0
Dichloroethylene	540590			0.25	1		90	2.5	0.25	2190.0	0
Vinyl Chloride	75014			0.003	1		90	0.03	0.003	26.28	0
Other Chlorinated Organics	68476391			Trace	%		90	Trace	Trace	Trace	0

LOCATION	FACILITY	EMISSION POINT	UNIT I.D.
		00001	102

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROCESS, EXHAUST OR VENTILATION SYSTEM

UNIT OR PROCESS DATA

COPIES
WHITE - ORIGINAL
GREEN - DIVISION OF AIR
WHITE - REGIONAL OFFICE
WHITE - FIELD REP
YELLOW - APPLICANT

PLEASE PRINT OR TYPE

SECTION H

175 EMISSION POINT I.D.	176 UNIT I.D.
00001	02

177 SOURCE CODE	178 HRS/DAY	179 DAYS/YR	180 % OPERATION BY SEASON Winter	Spring	Summer	Fall
	24	365	25	25	25	25

SECTION I

181. DESCRIBE PROCESS OR UNIT

1. Contaminated groundwater is treated by two air stripping towers in series to remove chlorinated VOCs.
3. The stripped chlorinated VOCs are exhausted from the two towers and removed from the air stream by an
5. activated carbon absorption unit. Spent carbon is sent to supplier for regeneration and reuse.
7.
8.

SECTION J

EMISSION CONTROL EQUIPMENT I.D.	CONTROL TYPE	MANUFACTURER'S NAME AND MODEL NUMBER	DISPOSAL METHOD	DATE INSTALLED	USEFUL LIFE
182 01	183 17	184 Calgon Carbon Vapor Pac-10	185 9	186 10/93	187 2
188	189	190	191	192 /	193

SECTION K

CALCULATIONS

See Attached.

SECTION L

CONTAMINANT NAME	CAS NUMBER	INPUT OR PRODUCTION	UNIT	EMISSIONS ACTUAL	EMISSIONS UNIT	HOW DET	% CONTROL EFFICIENCY	HOURLY EMISSIONS (LBS/HR) ERP	HOURLY EMISSIONS (LBS/HR) ACTUAL	ANNUAL EMISSIONS (LBS/YR) ACTUAL	10ⁿ
194 Trichloroethylene	195 79-01-6	196	197	198 0.08	199 1	200	201 90	202 0.8	203 0.08	204 700.8	205 0
206 Dichloroethylene	207 540-59-0	208	209	210 0.032	211 1	212	213 90	214 0.32	215 0.032	216 280.32	217 0
218 Vinyl Chloride	219 75-01-4	220	221	222 0.001	223 1	224	225 90	226 0.01	227 0.001	228 8.76	229 0
230 Other Chlorinated Organics	231 684763-9-1	232	233	234 Trace	235 9A	236	237 90	238 Trace	239 Trace	240 Trace	241 0
242	243	244	245	246	247	248	249	250	251	252	253
254	255	256	257	258	259	260	261	262	263	264	265

WATER WITHDRAWL CERTIFICATE

New York State Department of Environmental Conservation
Division of Water
Bureau of Water Resource Management, 4th Floor
625 Broadway, Albany, New York 12233-3508
Phone: (518) 402-8086 • **Fax:** (518) 402-9029
Website: www.dec.ny.gov

3/3/2009

George W. Hermance
Metaullics Systems Company (Former Carborundum)
2040 Cory Road
Sanborn, NY 14132

Re: NYGLWWR -7512
Metaullics Systems Company (Former C

Dear Facility Operator:

Enclosed is the Great Lakes Water Withdrawal Registration Certificate for the above-referenced withdrawal facility. A copy of this certificate should be kept at the facility. This registration covers the period from: **3/4/2009** to **3/4/2011** . Please make a note of the registration ID # and refer to it when making inquiries regarding your registration.

It is requested that the annual water use data be submitted to the Department annually, by March 31 of the following year. For example, calendar year 2008 data should be submitted by March 31, 2009. You should continue to use form number 93-15-6-4a by only filling out Year 1 on the form.

The registration renewal process is on a two-year cycle and you will receive a reminder letter a few months before your registration is due to expire. You do not need to include the water use data with the application as long as you have already submitted it for the past calendar year.

Any correspondence you have regarding this registration should be sent to me at the above address; or, if you need further assistance, I can be reached at (518) 402-8099. Information and forms relating to this program can also be found on our website at:
www.dec.ny.gov/lands/25581.html

Thank you for your cooperation in helping New York State manage the water resources of the Great Lakes Basin.

Sincerely,

Michael Holt

Michael Holt, P.E.
Environmental Engineer II

Enc.
cc: Elm Holdings, Inc.
4850 East 49th Street, MBC3-146
Cleveland, OH 44125

NYS Department of Environmental Conservation

Great Lakes Water Withdrawal Registration

Facility: Metaullics Systems Company (Former Carborundum)

Owners: Elm Holdings, Inc.

The above-named facility and its water withdrawal points have been duly registered, pursuant to Part 675 of the Environmental Conservation Law.

Mailing Correspondence: Metaullics Systems Company (Former Carborundum)
Attention: George W. Hermance
2040 Cory Road
Sanborn, NY 14132

Registration ID: NYGLWR- 7512

Registration Date: 3/4/2009

Expiration Date: 3/4/2011

Commissioner of Environmental Conservation

By: Michael Holt

Title: Environmental Engineer II

BACKFLOW PREVENTER INSPECTION CERTIFICATE

JOB # 3633-516

NEW YORK STATE DEPARTMENT OF HEALTH
Bureau of Public Water Supply Protection
Flanigan Square, 547 River Street, Room 400
Troy, New York 12180-2216

Report on Test and Maintenance of Backflow Prevention Device

PART A

Please use a separate form for each device.

For the year 2012
☐ Initial test - *Complete entire form*
☒ Annual test - *Complete Part A only*

Public Water Supply	Account No.	County	Block	Lot
NIAGARA CO WA		NIAGARA		

Facility Name: BP GROUNDWATER
Address: 2040 CORY SANBORN (Street / City / Zip)

Location of Device: WEST WALL TREATMENT PLANT

Device Information	Manufacturer	Type	Model	Size (in inches)	Serial Number
	WATTS	☒ RPZ ☐ DCV	909M00	3	143189

	Check Valve No. 1	Check Valve No. 2	Differential Pressure Relief Valve	Line Pressure 60 psi
Test before repair	Leaked ☒ Closed tight ☐ Pressure drop across first check valve ___ psid	Leaked ☒ Closed tight ☐	Opened at ___ psid	Date 05 12 12 (M D Y)
Describe repairs and materials used	COMPLETE OVERHAUL KIT INSTALLED (CLEANED AND REGREASE-G)			Repaired by Name TOM POCCO Lic # 6158 Date repaired: 05 15 12 (M D Y)
Final test	Closed tight ☒ Pressure drop across first check valve 6.4 psid	Closed tight ☒	Opened at 2.4 psid	Date 05 15 12 (M D Y)

Water Meter Number	Meter Reading	Type of Service: (check one)
93956950	00106.800	• (Domestic) • Fire • Other ______

Remarks (Describe deficiencies: bypasses, outlets before the device, connections between the device and point of entry, missing or inadequate airgaps, etc.)
2" COPPER BYPASS OVER DEVICE - NOT OPERATING

Certification: This device ☒ meets, • ☒ does NOT meet, the requirements of an acceptable containment device at the time of testing.
I hereby certify the foregoing data to be correct.

Print Name	Certified Tester No.	Signature	Expiration Date
TOM POCCO	6158	[signature]	6/30/2014

Property owner's (or owner's agent) certification that test was performed:

Print Name	Title	Signature	Telephone
Doug Taylor	Field PM	[signature]	716-239-0899

PART B Certification that installation is in accordance with the approved plans. (To be completed by the design engineer or architect or water supplier.)

I hereby certify that this installation is in accordance with the approved plans.

Name	Title	Date ☐☐☐☐☐☐ (m d y)	NYS DOH Log #
License Number	Phone ( )		

Representing
Address
City · State · Zip
Signature ________

Describe minor installation changes

NOTE: Send one completed copy to the designated health department representative and one copy to the water supplier within 30 days of the testing device.
Notify owner and water supplier immediately if device fails test and repairs cannot immediately be made.

DOH-1013(9/91)

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APPENDIX E

BP INSPECTION AND MAINTENANCE SITE TECHNICAL PRACTICAL MANUAL

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INSPECTION AND MAINTENANCE SITE TECHNICAL PRACTICE MANUAL

Former Carborundum Facility
2040 Cory Drive
Village of Sanborn, Town of Wheatfield, Niagara County, New York

Prepared for:

Atlantic Richfield Company

A BP affiliated company

4850 East 49th Street
MBC 3-147
Cuyahoga Heights, Ohio 44125

Prepared by:

PARSONS

40 LA RIVIERE DRIVE, SUITE 350,

BUFFALO, NY 14214

Revised November 2012

Table of Contents

Document Revision History

Revision Number	Date	Description
1	11/28/2012	Update 2011 manual to include Vault Water Collection and Conveyance System.

Project Background

The Atlantic Richfield Company, on behalf of BP manages an environmental remediation system at the former Carborundum Facility at 2040 Cory Drive in Sanborn, NY. The system was designed, built, and commissioned in mid-1993. The Groundwater Remediation System (GRS) runs with goals to provide onsite migration control and to prevent offsite migration of groundwater containing volatile organic compounds (VOCs).

Purpose of Integrity Management Manual

The integrity management manual includes implementation of a Site Technical Practice (STP) for the Inspection and Maintenance Requirements for Remediation Systems (REMED-GP 35-0001). Compliance with this STP for existing systems is scheduled to be implemented in a step-wise manner. This manual focuses on Protective Systems Devices (PSDs) and Operating Permit Requirements. The following sections are included in the manual:

1. Site Plot Plan
2. Protective Safety Device (PSD) Equipment Register
3. Cause and Effect Charts
4. PSD Inspection and Maintenance Plans
5. Operating Permits List
6. Permit and Regulation Required Inspection and Maintenance Plans

Site Plot Plan

The Site Plot Plan includes a scaled and surveyed plan indicating site features for groundwater remediation systems such as above and below grade utilities, buildings, sewage systems, topography, property boundaries, etc.

The site plot plan is a pdf drawing and an AutoCAD drawing in 11 X 17” plots. Additionally, a map of all the wells on and offsite (monitoring as well as recovery) is provided.

Please see Attachment I for Site Plot Plan.

Protective Safety Device (PSD) Equipment Register

PSD Equipment Register includes the following for each PSD on site.

- Device Name (P&ID label)
- Type of Device (e.g., switch, sensor, buttons)
- Description of Device (how and what it is used to protect)
- Manufacturer of Device
- Model Number
- Serial Number
- Set Point
- Service
- Material of Construction
- Elastomer Material
- Fail Position

Device name for the PSDs have been left blank as the P&ID for the site are being revised to bring them up to date. The P&IDs will be updated with nomenclature assigned to each PSD.

Please see Attachment II, PSD Equipment Register table.

Cause and Effect Charts

The cause and effect charts for PSDs include the following information for each PSD onsite:

- Device Name (P&ID label)
- Common Name
- Point Tag (the identification on the P&ID and/or field label for the PSD)
- Set Point
- Time Delay
- Dead Band
- Cause
- Effect (multiple columns, system specific)

Device Name and Point Tags for the PSDs have been left blank as the P&ID for the site are being revised to bring them up to date. The P&IDs will be updated and a nomenclature assigned to each PSD.

Please see Attachment III, PSD Cause and Effect Chart.

PSD Inspection and Maintenance Plan

A PSD Inspection and Maintenance Plan (IMP) covers all of the PSDs provided for the system. The IMP is based on applicable regulatory, code, or industry requirements, BP-RM minimum standard of care requirements, Generic Maintenance Standards (GMS's), and manufacturer's recommendations.

The IMP includes a PSD inspection and maintenance schedule/log that cross references the PSD register, the cause and effect chart, and the generic maintenance standards.

Please see Attachment IV for the PSD IMP.

Operating Permits List

Name of Permit:

State Pollutant Discharge Elimination System (SPDES) Discharge Permit # NY0001988

Purpose of Permit:

The SPDES permit is issued in compliance with Title 8 of Article 17 of the Environmental Conservation Law of New York State and in compliance with the Clean Water Act, as amended, (33U.S.C. §1251 et.seq.) and in the Water Quality Regulations of the Interstate Environmental Commission at 21 NYCRR Part 550.

Date Permit Issued: 4/1/2007

Date Permit Renewed: 4/1/2012

Date Permit Expires: 3/31/2017

Date Renewal Application Due:

Not less than 180 days prior to the expiration date shown above.

Highlights of Permit Requirements:

- Permit Specifics
- Recording
- Reporting
- Additional Monitoring Requirements

Please see Attachment V for a copy of the permit.

Permit and Regulation Required Inspection and Maintenance Plans

On completion of a review of operating permits, permit required Inspection and Maintenance Procedures (IMPs) were developed.

SPDES Permit Required Equipment Calibration

NYSDEC Regulation Chapter X Article 2 Part 750-2.5(a)(5) states:

For instrumentation that is not used by a certified laboratory, but which is used to measure discharges to the environment as specified in a SPDES permit, the permittee shall periodically calibrate and perform maintenance procedures to ensure accuracy of measurements. Verification of maintenance shall be logged into the record book(s) of the facility. The permittee shall notify the department's regional office in the Discharge Monitoring Report if any required instrumentation becomes inoperable. In addition, the permittee shall verify the accuracy of its measuring equipment to the department's regional office or its designated field office upon request.

The NYSDEC Facilities Operations Assistance Section (FOAS), gives guidance to calibrate devices that measure SPDES specified parameters by the recommendation of the manufacturer of the device. The SPDES reportable parameters that are measured in the field at the Sanborn facility are:

Effluent Flow

Temperature

pH

Residual Chlorine

Please see Attachment VI for Permit Required IMP.

In addition to permit required IMPs, there are also building codes and workplace regulations that require inspection and maintenance procedures at the Sanborn facility:

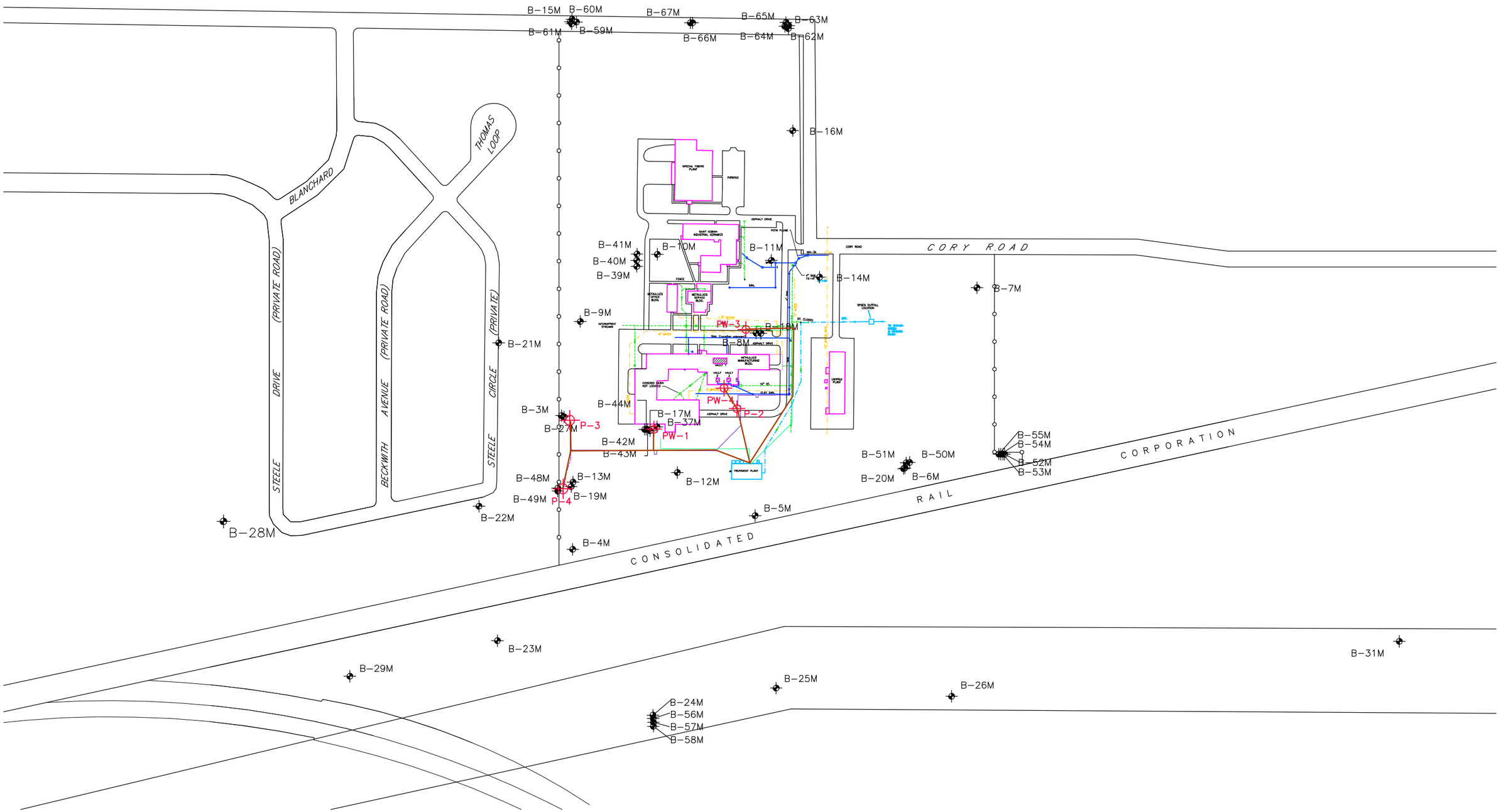
1) New York State Department of Health (NYSDOH) requires annual certification of the potable water backflow preventer. This IMP can be found in Attachment VI.

2) Occupational Safety and Health Administration (OSHA) requires inspection and maintenance of emergency lighting and eye bath/safety showers. The IMP for emergency lighting can be found in Attachment III while the eye bath/safety shower IMP is included in Attachment VI.

3) The system includes a tray air stripper to remove chlorinated volatile organic compounds (VOCs) from collected groundwater streams. The stripper air exhaust is classified as a minor source and operates under registration status with New York State. No analytical testing or reporting is required with the registration status. Air registration documentation is included in Attachment V.

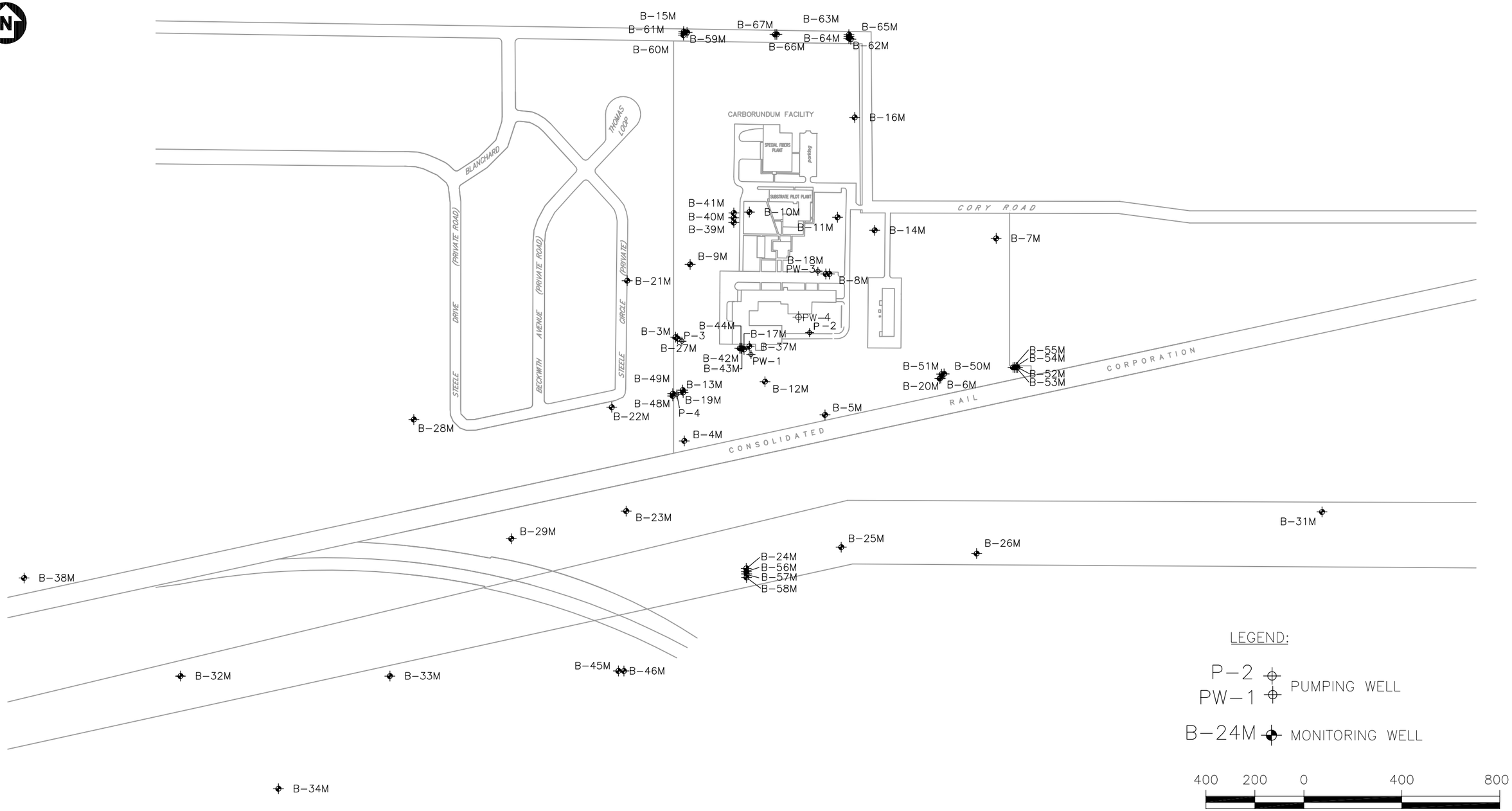
Attachment I

Site Plot Plans



PARSONS
40 LA RIVIERE DRIVE, SUITE 350
BUFFALO, NEW YORK 14202
716-541-0730

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY
SITE PLAN



LEGEND:

P-2 PW-1 PUMPING WELL

B-24M MONITORING WELL

400 200 0 400 800

SCALE: 1"=400'

FIGURE 2

ATLANTIC RICHFIELD COMPANY
FORMER CARBORUNDUM FACILITY
WELL MAP

PARSONS
180 LAWRENCE BELL DRIVE, SUITE 104, WILLIAMSVILLE, N.Y. 14221, PHONE: 716-633-7074

P:\440867\CAD\SK-440867-C001.dwg, 04/23/04 at 16:14, mab, 1=1
No XREFs

Attachment II

PSD Equipment Register

Former Carborundum Facility

Groundwater Remediation System

2040 Cory Drive
Village of Sanborn
Town of Wheatfield
Niagara County, New York

Register of Protective System Devices

Protective System Device Register

DEVICE NAME[1]	TYPE	DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	SETPOINT	SERVICE	MATERIAL OF CONSTRUCTION	ELASTOMER MATERIAL	FAIL POSITION
	Level Switch	Level Switch for pump operation for well P-3 and Hi-Hi Level alarm - Pressure Actuated	GE Druck	1730	Z811008	Pump ON: 7.5 ft; Pump OFF: 3.7 ft; High Level Alarm: 16 ft Low Level Alarm: 1.5 ft	Liquid	Stainless Steel	Polyurethane (Cable)/EPDM (Nose cone)	Open Circuit
	Disconnect	Electrical disconnect for pump power in the P-3 well shed	Westinghouse	Heavy Duty Safety Switches 30 amp 600 volt Type 12			Air	Stainless Steel		Open Circuit
	Level Switch	Level Switch for pump operation of well PW-1 - Pressure Actuated	GE Druck	1730	Z811007	Pump ON: 8 ft; Pump OFF : 5 ft; High Level Alarm: 30 ft Low Level Alarm: 3.5 ft	Liquid	Stainless Steel	Polyurethane (Cable)/EPDM (Nose cone)	Open Circuit
	Disconnect	Electrical starter for pump power in the PW-1 well shed					Air	Stainless Steel		Open Circuit
	Level Switch	Level Switch for pump operation of well P-2 - Pressure Actuated	GE Druck	1730	Z811006	Pump ON: 7.5 ft; Pump OFF : 4.5 ft; High Level Alarm: 14 ft Low Level Alarm: 3 ft	Liquid	Stainless Steel	Polyurethane (Cable)/EPDM (Nose cone)	Open Circuit
	Disconnect	Electrical disconnect for pump power in the P-2 well shed	Cutler Hammer	Heavy Duty Safety Switches 30 amp 600 volt model DH361UDK			Air	Stainless Steel		Open Circuit
	Level Switch	Level Switch for pump operation of well PW-4 - Pressure Actuated	Mercoid/Dwyer	SBLT2-15-60		Pump ON: 10 ft; Pump OFF : 7.5 ft; High Level Alarm: 30 ft; Low Level Alarm: 6 ft	Liquid	Stainless Steel	Polyurethane (Cable)	Open Circuit
	Disconnect	Electrical disconnect for pump power in the PW-4 well shed	Westinghouse	Heavy Duty Safety Switches 30 amp 600 volt Type 12			Air	Stainless Steel		Open Circuit
	Level Switch	Level Switch for pump operation of well P-4 - Pressure Actuated	GE Druck	1730	Z811005	Pump ON: 7.5 ft; Pump OFF : 4 ft; High Level Alarm: 30ft; Low Level Alarm: 2 ft	Liquid	Stainless Steel	Polyurethane (Cable)/EPDM (Nose cone)	Open Circuit
	Disconnect	Electrical disconnect for pump power in the P-4 well shed	Cutler Hammer	Heavy Duty Safety Switches 30 amp 600 volt model DH361UDK			Air	Stainless Steel		Oopen Circuit
	Level Switch	Level Switch for pump operation of well PW-3 - Pressure Actuated	GE Druck	1830	Z879036	Pump ON: 8 ft; Pump OFF : 4 ft; Hgh Level Alarm: 16 ft; Low Level Alarm: 2.5 ft	Liquid	Stainless Steel	Polyurethane (Cable)/EPDM (Nose cone)	Open Circuit
	Disconnect	Electrical starter for pump power in the PW-3 well shed					Air	Stainless Steel		Open Circuit
LIT-803	Level Switch	Level Switch for EQ Tank (T-801) - operation of pumps P-803A/B (Air Stripper Feed Pump)- pressure actuated	Rosemount	3051	1701109	High Level Alarm: 6 ft; Lead Pump ON: 2.5 ft; Lag Pump ON: 4 ft; Both Pumps OFF: 2 ft; Low Level Alarm: 1.5 ft	Liquid			Open Circuit
	Disconnect	Local electrical disconnect for P-803A pump power	Westinghouse				Air	Stainless Steel		Open Circuit
	Disconnect	Local electrical disconnect for P-803B pump power	Westinghouse				Air	Stainless Steel		Open Circuit
	Level Switch	Level switch for air stripper (S-801) - operation of pumps P-805A/C (Carbon Feed Pump)- pressure actuated	Rosemount	3051	1496290	High Level Alarm: 23 in; Lead Pump ON: 17 in; Lag Pump ON: 8 in; Both Pumps OFF: 8 in; Low Level Alarm: 3 in	Liquid		Fill Fluid Silicone oil or inert fill; Nuts and Bolts: Plated carbon steel; Blank flange (GP and AP only):Plated carbon steel; Electronics Housing aluminum, NEMA 4X; Cover O-rings: Buna-N; Paint: Polyurethane;	Open Circuit
	Disconnect	Local electrical disconnect for P-805A pump power	Westinghouse				Air	Stainless Steel		Open Circuit
	Disconnect	Local electrical disconnect for P-805C pump power	Westinghouse				Air	Stainless Steel		Open Circuit
PSL- 801 A	Pressure Switch	Blower air pressure (low) for air stripper. Shuts off pump P803A/B	Dwyer	1950-5-6F	S02328302	1.4 to 5.5 in of Water Column	Liquid	Stainless Steel		Open Circuit
HS-301	Disconnect	Local electrical disconnect for B-801 blower power	Westinghouse			N/A	Air			Open Circuit
LIT- 805	Level Switch	Level Switch for Effluent Tank (T-802) - operation of pumps P-810A/B (Air Stripper Feed Pump)- pressure actuated	Rosemount	3051	1701112	High Level Alarm: 8 ft; Lead Pump ON: 5.5 ft; Lag Pump ON: 4 ft; Both Pumps OFF: 2 ft; Low Level Alarm: 1.5 ft	Liquid			Open Circuit
	Disconnect	Local electrical disconnect for P-810A pump power	Westinghouse			N/A	Air	Stainless Steel		Open Circuit
	Disconnect	Local electrical disconnect for P-810B pump power	Westinghouse			N/A	Air	Stainless Steel		Open Circuit
	Automatic Telephone Dialer- 1	Stripper- High level in stripper	Microtel	MCS-100	1233-1194	N/A	Air			N/A
	Automatic Telephone Dialer- 2	Stripper- Blower Shut Down	Microtel	MCS-100	1233-1194	N/A	Air			N/A
	Automatic Telephone Dialer- 3	High Level alarm for wells	Microtel	MCS-100	1233-1194	N/A	Air			N/A
	Automatic Telephone Dialer- 4	Power Failure	Microtel	MCS-100	1233-1194	N/A	Air			N/A
	Automatic Telephone Dialer-5	Autodialer- Containment Sump High Level	Microtel	MCS-100	1233-1194	N/A	Air			N/A
	Automatic Telephone Dialer-6	Autodialer- Building Sump High Level	Microtel	MCS-100	1233-1194	N/A	Air			N/A
	Uninterrupted Power Supply	Battery backup for DCS	APC	Back-UPS ES550		120 VAC, 60 Hz				N/A
	Electric Space Heater	Electric Space Heater- Well Shed P-3					Air			Open Circuit
	Electric Space Heater	Electric Space Heater- Well Shed PW-1					Air			Open Circuit
	Electric Space Heater	Electric Space Heater- Well Shed P-2					Air			Open Circuit
	Electric Space Heater	Electric Space Heater- Well Shed PW-4					Air			Open Circuit
	Electric Space Heater	Electric Space Heater- Well Shed P-4					Air			Open Circuit
	Electric Space Heater	Electric Space Heater- Well Shed PW-3					Air			Open Circuit
	Natural Gas Radiant Heater	Natural Gas Radiant Heater- Treatment Building					Air			Open Circuit
	Rupture Disc	3 in rupture disc for liquid phase carbon filter- 1	Zook	1MX3X75X72	1431-3	75 psig at 72 F	Liquid	Stainless steel with graphite disk		Fracture
	Rupture Disc	3 in rupture disc for liquid phase carbon filter- 2	Zook	1MX3X75X72	1400-3	75 psig at 72 F	Liquid	Stainless steel with graphite disk		Fracture
	Surge Protection	MCC transient voltage surge suppressor	MCG Surge Protection	MZC-480D		480V AC; 50/60 Hz	Electric			Closed Circuit
	Level Switch	Containment Sump level switch	Warwick Controls	3E2B		High Level: 20 inches	Liquid	Red Brass		Open Circuit
	Level Switch	Building Sump level switch	Warwick Controls	3E2B		High Level: 20 inches	Liquid	Red Brass		Open Circuit
	Emergency Lighting	Emergency lighting above north entrance door					Air			Closed Circuit
	Emergency Lighting	Emergency lighting above north double doors					Air			Closed Circuit
	Emergency Lighting	Emergency lighting above west entrance door					Air			Closed Circuit
	Emergency Lighting	Emergency lighting in office / control room					Air			Closed Circuit
	Emergency Lighting	Emergency lighting in motor control center					Air			Closed Circuit
	Emergency Lighting	Emergency lighting at effluent tank					Air			Closed Circuit
	Emergency Lighting	Emergency lighting in blower room					Air			Closed Circuit
	Safety Shower and Eye wash station	Safety shower and eyewash station for groundwater process area	Guardian Equipment			N/A	Water			Open
	Fire Extinguisher	Outside Control Room				N/A	Air			N/A

Former Carborundum Facility

Groundwater Remediation System

2040 Cory Drive
Village of Sanborn
Town of Wheatfield
Niagara County, New York

Register of Protective System Devices

Protective System Device Register

DEVICE NAME[(1)]	TYPE	DESCRIPTION	MANUFACTURER	MODEL	SERIAL NUMBER	SETPOINT	SERVICE	MATERIAL OF CONSTRUCTION	ELASTOMER MATERIAL	FAIL POSITION
	Fire Extinguisher	Inside Main Entrance				N/A	Air			N/A
	Fire Extinguisher	Laboratory				N/A	Air			N/A
LT-200	Level Sensor	Vault 1 Level Sensor (LT-200)	KPSI	705-S-1-4CBA		Hi-Hi Level Alarm (Dialer): 2.5 ft High Level Alarm (Local): 1.8 ft Low Level Alarm (Local): -10.0 ft Lo-Lo Level Alarm (local): -15.0 ft	Liquid	Stainless Steel	Teflon Coated Elastomer Diaphram, ETFE Cable	Open Circuit
LT-201	Level Sensor	Vault 2 Level Sensor (LT-201)	KPSI	705-S-1-4CBA		Hi-Hi Level Alarm (Dialer): 2.0 ft High Level Alarm (Local): 1.8 ft Low Level Alarm (Local): -10.0 ft Lo-Lo Level Alarm (local): -15.0 ft	Liquid	Stainless Steel	Teflon Coated Elastomer Diaphram, ETFE Cable	Open Circuit
LT-202	Level Sensor	Vault 3 Level Sensor (LT-202)	KPSI	705-S-1-4CBA		Hi-Hi Level Alarm (Dialer): 1.5 ft High Level Alarm (Local): 1.0 ft Low Level Alarm (Local): -10.0 ft Lo-Lo Level Alarm (local): -15.0 ft	Liquid	Stainless Steel	Teflon Coated Elastomer Diaphram, ETFE Cable	Open Circuit
HS-225	Disconnect	Vault 1 Pump (P-001) local disconnect (HS-225)	Hubbell	SETL3		N/A	Air	Brass Electrical Contacts	Plastic	Open Circuit
HS-226	Disconnect	Vault 2 Pump (P-002) local disconnect (HS-226)	Hubbell	SETL3		N/A	Air	Brass Electrical Contacts	Plastic	Open Circuit
HS-227	Disconnect	Vault 3 Pump (P-003) local disconnect (HS-227)	Hubbell	SETL3		N/A	Air	Brass Electrical Contacts	Plastic	Open Circuit
LT-203	Level Sensor	Tank 1 (T-001) Level Sensor (LT-203)	KPSI	705-S-1-4CBA		Hi-Hi Level Alarm (dialer): 4.0 ft High Level Alarm (local): 3.9 ft Lead Pump ON: 3.5 ft Lag Pump ON: 3.8 ft Both Pumps OFF: 2.0 ft Low Level Alarm (local): 0.5 ft Lo-Lo Level Alarm (dialer): 0.4 ft	Water	Stainless Steel	Teflon Coated Elastomer Diaphram, ETFE Cable	Open Circuit
LSHH-203	Level Switch (float)	Tank 1 (T-001) Level Switch (LSHH-203)	APG (KARI)	KA-M1C-15		On @ Approx. 6 ft	Water	Polyporpylene Float	PVC Cable	Open Circuit
HS-223	Disconnect	Tank 1 (T-001), Pump 4 (P-004) local disconnect (HS-223)	Square D	9422ATEN100		N/A	Air	Stainless Steel		Open Circuit
HS-224	Disconnect	Tank 1 (T-001), Pump 5 (P-005) local disconnect (HS-224)	Square D	9422ATEN100		N/A	Air	Stainless Steel		Open Circuit
LT-207	Level Sensor	Tank 2 (T-002) Level Sensor (LT-207)	Honeywell	STF128		Hi-Hi Level Alarm (dialer): 7.0 ft High Level Alarm (local): 4.5 ft Lead Pump ON: 3.0 ft Lag Pump ON: 3.5 ft Both Pumps OFF: 0.5 ft Low Level Alarm (local): 0.25 ft Lo-Lo Level Alarm (dialer): -15.0 ft	Water	Stainless Steel	Hastalloy or Monel Wetted Seal	Open Circuit
LSHH-222	Level Switch (float)	Tank 2 (T-002) Level Switch (LSHH-222)	GEMS	LS800-A		On @ Approx. 8 ft	Water	316 Stainless Steel		Open Circuit
HS-220	Disconnect	Tank 2 (T-002), Pump 6 (P-006) local disconnect (HS-220)	Hubbell	HBLD3S		N/A	Air	Plastic	Plastic	Open Circuit
HS-221	Disconnect	Tank 2 (T-002), Pump 7 (P-007) local disconnect (HS-221)	Hubbell	HBLD3S		N/A	Air	Plastic	Plastic	Open Circuit
	Rupture Disk	Tank 2 (T-002) Rupture Disk	Fike	LO-V BT		5" Water Column Vac	Air	Stainless steel	FEP Disk	Fracture
	Rupture Disk	Tank 2 (T-002) Rupture Disk	Fike	LO-V BT		9" Water Column Pressure		Stainless steel	FEP Disk	Fracture
	Flexible Fitting Security Cables	Tank 2 (T-002) Bottom Outlet Flexible Fitting	PolyProcessing	Flexiloint		N/A	Air	Stainless Steel Cables	PTFE	N/A
	Differential Pressure Sensors	Bag Filters Differential Pressure Switching (PT-212, PT-218)	Honeywell	ST3000 STR93G		Hi-Hi Diff. Pressure Alarm (Dialer): 25 psi High Diff. Pressure Alarm (Local): 12 psi Low Diff. Pressure Alarm (Local): -15.0 ft Lo-Lo Diff. Pressure Alarm (Local): -25.0 ft	Water	Stainless Steel	Stainless Steel	Open Circuit
	Automatic Telephone Dialer-7	Autodialer- Vault 1 Hi-Hi Level	Microtel	MCS-100	1233-1194	N/A	Air			N/A
	Automatic Telephone Dialer-8	Autodialer- Vault 2 Hi-Hi Level	Microtel	MCS-100	1233-1194	N/A	Air			N/A
	Automatic Telephone Dialer-9	Autodialer- Vault 3 Hi-Hi Level	Microtel	MCS-100	1233-1194	N/A	Air			N/A
	Automatic Telephone Dialer-10	Autodialer- Tank 1 Hi-Hi Level (sensor)	Microtel	MCS-100	1233-1194	N/A	Air			N/A
	Automatic Telephone Dialer-11	Autodialer- Tank 1 Hi-Hi Level (float)	Microtel	MCS-100	1233-1194	N/A	Air			N/A
	Automatic Telephone Dialer-12	Autodialer- Tank 2 Hi-Hi Level (sensor)	Microtel	MCS-100	1233-1194	N/A	Air			N/A
	Automatic Telephone Dialer-13	Autodialer- Tank 2 Hi-Hi Level (float)	Microtel	MCS-100	1233-1194	N/A	Air			N/A
	Automatic Telephone Dialer-14	Autodialer- Tank 801 Hi-Hi Level (float)	Microtel	MCS-100	1233-1194	N/A	Air			N/A
	Freeze Protection	VWCC Piping Heat Trace Doghouse at Metaullics Bldg.	Environmental Technology Inc.	SST-2		Self-Limiting, Thermostat On @ 40F	Air			Open Circuit
	Freeze Protection	VWCC Piping Heat Trace Metaullics Bldg. Trench Under Doorway	Environmental Technology Inc.	SST-2		Self-Limiting, Thermostat On @ 40F	Air			Open Circuit
	Freeze Protection	VWCC Piping Heat Trace Doghouse at Treatment Bldg.	Environmental Technology Inc.	SST-2		Self-Limiting, Thermostat On @ 40F	Air			Open Circuit
LSHH-219	Level Float Switch	Tank 801 Level Switch (LSHH-219)	APG (KARI)	KA-M1C-15		On @ Approx. 12 ft	Water	Polyporpylene Float	PVC Cable	Open Circuit

TABLE NOTES
(1) - Device names shown are either compliant with the Engineering Integrity Manual for Site Remediation Technologies or were provided a unique identifier for the purposes of this Register.

GUIDANCE NOTES
Device Name - The device name corresponds to the identifiation on the Piping and Instrumentation Diagram (P&ID) and/or field label for the PSD.
Type - The type idenfies the PSD general category (e.g., switch, sensor)
Description - The decription further identifies the PSD by associated equipment/location and service use.
Manufacturer - The manufacturer refers to the primary manufacturer of the device and not the system manufacturer. If a PSD includes components from multiple manufacturers, the primary component manufacturer only can be listed.
Model - Each device typically has a model number provided by the manufacturer that further identifies the device by a manufacturer-developed alphanumeric system.
Serial Number - Many devices are marked with a device-specific serial number by the manufacturer that further identifies the device and is useful for troubleshooting, repair, or replacement. The serial number can identify the year of manufacture along with a specific component parts list.
Setpoint - The setpoint is established during the design and is documented in the Operation and Maintenance (O&M) Manual. The PSD setpoint may be visible on the PSD, but not all devices are supplied with a local setpoint.
Service - The service generally refers to liquid or gas and can be further described as warranted (e.g., LNAPL service, compressed air service) as needed.
Material of Construction - The material of construction indicated refers to the primary wetted component of the device (e.g., the body of a valve or the level float of a switch that is in contact with the process fluid). PSDs can consist of several materials and can be identified if deemed relevant.
Elastomer Material - PSDs may have elastomeric components (e.g., o-rings, gaskets, floats). The primary wetted elastomer should be identified.

Fail Position - The fail position is established during the design and is documented in the O&M Manual. As required by the Engineering Integrity Manual for Site Remediation Technologies, PSDs must be fail safe. The fail safe position can be a closed switch, an open valve, an off condition, or other safe failure mode.

Attachment III

PSD Cause and Effect Chart

Former Carborundum Facility

Groundwater Remediation System

2040 Corv Drive
Village of Sanborn
Town of Wheatfield
Niagara County, New York

Protective System Devices

Protective System Device Safe Chart

LEGEND

(n) = refer to note (n)
X = perform this action
DA = direct acting PID
G = global reset
L = allow local acknowledge and reset
R = require local acknowledge and reset
A = automatic reset
M = action manually performed
highlight = changed from previous rev
SP setpoint can adjustable from control system
NA = no action

DEVICE NAME	COMMON NAME	POINT TAG	SETPOINT[2]	TIME DELAY	DEAD BAND	CAUSE	EFFECT: Human User Interface (HUI) Indication	Human User Interface (HUI) Alarm	Local Reset	Telemetry System Alarm Dialout	Well Pump P-3	Well Pump PW-1	Well Pump P-2	Well Pump PW-4	Well Pump P-4	Well Pump PW-3	Air Stripper Feed Pump P-803 A	Air Stripper Feed Pump P-803 B	Carbon Feed Pump P-805 A	Carbon Feed Pump P-805C	Stripper Air Blower B- 801	Effluent Pump P-810 A	Effluent Pump P-810 B	Freeze Protection	Safety Shower	Fire Extinguisher	Rupture Disc	Emergency Lights	Vault 1 Pump P-001	Vault 2 Pump P-002	Vault 3 Pump P-003	Tank 1 Pump P-004	Tank 1 Pump P-005	Tank 2 Pump P-006	Tank 2 Pump P-007	Stay Cables
							Display	Display	Display	Activate	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	On/Off	Alert	Engage	Replace	On	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Inspect
			High Level Alarm: 16 ft	None	Mfr Std	Local, hardwired; Controlled through PLC	X	XMR			XMR																									
	Level Switch for pump operation for well P-3- Pressure Actuated		Low Level Alarm: 1.5 ft	None	Mfr Std	Local, hardwired; Controlled through PLC	X	XMR																												
	Electrical disconnect for pump power in the P-3 well shed		N/A	None	None	Manual activation	X					M																							
			High Level Level - 20 ft	None	Mfr Std	Local, hardwired; Controlled through PLC	X	XMR			XMR																									
	Level Switch for pump operation for well PW-1- Pressure Actuated		Low Level Alarm: 1.5 ft	None	Mfr Std	Local, hardwired; Controlled through PLC	X	XMR																												
	Electrical disconnect for pump power in the PW-1 well shed		N/A	None	None	Manual Activation	X					M																							
			High Level Level - 14 ft	None	N/A	Local, hardwired; Controlled through PLC	X	XMR			XMR																									
	Level Switch for pump operation for well P-2- Pressure Actuated		Low Level Alarm: 3 ft	None	N/A	Local, hardwired; Controlled through PLC	X	XMR																												
	Electrical disconnect for pump power in the P-2 well shed		N/A	None	None	Manual activation	X						M																							
			High Level Alarm: 20 ft	None	N/A	Local, hardwired; Controlled through PLC	X	XMR			XMR																									
	Level Switch for pump operation for well PW-4- Pressure Actuated		Low Level Alarm: 6 ft	None	N/A	Local, hardwired; Controlled through PLC	X	XMR																												
	Electrical disconnect for pump power in the PW-4 well shed		N/A	None	None	Manual Activation	X							M																						
			High Level Alarm: 20 ft	None	N/A	Local, hardwired; Controlled through PLC	X	XMR			XMR																									
	Level Switch for pump operation for well P-4- Pressure Actuated		Low Level Alarm: 6 ft	None	N/A	Local, hardwired; Controlled through PLC	X	XMR																												
	Electrical disconnect for pump power in the P-4 well shed		N/A	None	None	Manual Activation	X								M																					
			High Level Alarm : 16 ft	None	N/A	Local, hardwired; Controlled through PLC	X	XMR			XMR																									
	Level Switch for pump operation for well PW-3- Pressure Actuated		Low Level Alarm: 2.5 ft	None	N/A	Local, hardwired; Controlled through PLC	X	XMR																												
	Electrical disconnect for pump power in the PW-3 well shed		N/A	None	None	Manual Activation	X									M																				
			Hiah Level Alarm: 6 ft	None	N/A	Local, hardwired; Controlled through PLC	X	XMR				XMR	XMR	XMR	XMR	XMR																					
LIT-803	Level Switch for EQ Tank (T-801) - operation of pumps P-803A/B (Air Stripper Feed Pump)- pressure actuated		Low Level Alarm: 1.5 ft	None	N/A	Local, hardwired; Controlled through PLC	X	XMR									M																			
	Local electrical disconnect for P-803A pump power		N/A	None	None	Manual activation	X											M																		
	Local electrical disconnect for P-803B pump power		N/A	None	None	Manual activation	X												M																	
			High Level Alarm: 23 in	None	N/A	Local, hardwired; Controlled through PLC	X	XMR			XMR						XMR	XMR																		
	Level switch for air stripper (S-801) - operation of pumps P-805A/C (Carbon Feed Pumps)- pressure actuated		Low level Alarm: 3 in	None	N/A	Local, hardwired; Controlled through PLC	X	XMR																												
	Local electrical disconnect for P-805A pump power		N/A	None	None	Manual Activation	X												M																	
	Local electrical disconnect for P-805C pump power		N/A	None	None	Manual Activation	X													M																
PSL- 301 A	Blower air pressure (low) for air stripper. Shuts off pump P803A/B		1.4 to 5.5 inches of Water Column	None		Local, hardwired; Controlled through PLC	X				XMR						XMR	XMR																		
HS-301	Local electrical disconnect for B-801 blower power		N/A	None		Manual Activation	X														M														
			High Level Alarm: 8 ft	None	N/A	Local, hardwired; Controlled through PLC	X	XMR			XMR								XMR	XMR																
LIT- 805	Level Switch for Effluent Tank (T-802) - operation of pumps P-810A/B (Air Stripper Feed Pump)- pressure actuated		Low Level Alarm: 1.5 ft	None	N/A	Local, hardwired; Controlled through PLC																												
	Local electrical disconnect for P-810A pump power		N/A	None	None	Manual Activation	X																M												
	Local electrical disconnect for P-810C pump power		N/A	None	None	Manual Activation	X																	M											
	Autodialer- Stripper- High level in stripper		Stripper Sump Level >23 in	None		Local, hardwired; Controlled through PLC					XMR																									
	Autodialer- Stripper- Blower Shut Down		1.4 to 5.5 in of Water Column	None		Local, hardwired; Controlled through PLC					XMR																									
	Autodialer- High Level alarm for wells		Various setpoints - PW-1 and PW-4 not included due to continuous run status (can not achieve low level shut off status)	None		Local, hardwired; Controlled through PLC					XMR																									
	Autodialer- Power Failure		Loss of Power	None		Local, hardwired; Controlled through PLC					XMR																									
	Autodialer- Containment Sump High Level		Contact Probe	None		Local, hardwired; Controlled through PLC					XMR																									
	Autodialer- Building Sump High Level		Contact Probe	None		Local, hardwired; Controlled through PLC					XMR																									
	Battery backup for DCS (UPS)		120VAC, 60 Hz	None		Local, hardwired to DCS			X																										
	Electric Space Heater- Well Shed P-3		N/A	None		Manual operation																			M										
	Electric Space Heater- Well Shed PW-1		N/A	None		Manual operation																			M										
	Electric Space Heater- Well Shed P-2		N/A	None		Manual operation																			M										
	Electric Space Heater- Well Shed PW-4		N/A	None		Manual operation																			M										
	Electric Space Heater- Well Shed P-4		N/A	None		Manual operation																			M										
	Electric Space Heater- Well Shed PW-3		N/A	None		Manual operation																			M										
	Natural Gas Radiant Heater- Treatment Building		N/A	None		Manual operation																			M										
	3 in rupture disc for liquid phase carbon filter- 1		75 psig at 72 F	None		Mechanical; High pressure																					M								
	3 in rupture disc for liquid phase carbon filter- 2		75 psig at 72 F	None		Mechanical; High pressure																					M								
	MCC transient voltage surge suppressor		480V AC: 50/60 Hz	None		Local; Electrical																													
	Containment Sump level switch		High Level Alarm: 20 inches	None		Local, hardwired; controlled through PLC					XMR																									
	Buildine Sump level switch		Hiah Level Alarm: 20 inches	None		Local, hardwired; controlled through PLC					XMR																									
	Emergency lighting above north entrance door		N/A	None		Loss of electrical power to lighting circuits																							XA	XA						
	Emerencv lahtine above north double doors		N/A	None		Loss of electrical power to lahtine circuits																							XA	XA						
	Emerencv lahtine above west entrance door		N/A	None		Loss of electrical power to lahtine circuits																							XA	XA						
	Emergency lighting in office / control room		N/A	None		Loss of electrical power to lighting circuits																							XA	XA						
	Emergency lighting in motor control center		N/A	None		Loss of electrical power to lighting circuits																							XA	XA						
	Emergency lighting at effluent tank		N/A	None		Loss of electrical power to lighting circuits																							XA	XA						
	Emerencv lahtine in blower room		N/A	None		Loss of electrical power to lahtine circuits																							XA	XA						
	Safety shower and eyewash station		N/A	None		Manual activation																				X									
	Fire Extinguisher		N/A	None		Manual activation																					X								
	Fire Extinguisher		N/A	None		Manual activation																					X								
	Fire Extinguisher		N/A	None		Manual activation																					X								
LT-200	Vault 1 Level Sensor (LT-200)		Hi-Hi Level Alarm @ 2.5 ft	None		Local, hardwired; Controlled through PLC	X	XLR			XR																									
			Hiah Level Alarm @ 1.8 ft	None		Local, hardwired; Controlled through PLC	X	XLR																												
LT-201	Vault 2 Level Sensor (LT-201)		Hi-Hi Level Alarm @2.0 ft	None		Local, hardwired; Controlled through PLC	X	XLR			XR																									
			High Level Alarm @ 1.8 ft	None		Local, hardwired; Controlled through PLC	X	XLR																												
LT-202	Vault 3 Level Sensor (LT-202)		Hi-Hi Level Alarm @ 1.5 ft	None		Local, hardwired; Controlled through PLC	X	XLR			XR																									
			High Level Alarm @ 1.0 ft	None		Local, hardwired; Controlled through PLC	X	XLR																												
HS-225	Vault 1 Pump (P-001) local disconnect (HS-225)		N/A	None		Manual activation																									M				
HS-226	Vault 2 Pump (P-002) local disconnect (HS-226)		N/A	None		Manual activation																										M			
HS-227	Vault 3 Pump (P-003) local disconnect (HS-227)		N/A	None		Manual activation																											M		
LT-203	Tank 1 (T-001) Level Sensor (LT-203)		Hi-Hi Alarm @ 4.0 ft	None		Local, hardwired; Controlled through PLC	X	XLR			XR																						XMA		XMA		
			High Level Alarm @ 3.8 ft	None		Local, hardwired; Controlled through PLC	X	XLR																												
LSHH-203	Tank 1 (T-001) Level Switch (LSHH-203)		Redundant Hi-Hi Alarm @ approx. 6 ft	None		Local, hardwired; Controlled through PLC	X	XLR			XR																						XMA		XMA		
HS-223	Tank 1 (T-001), Pump 4 (P-004) local disconnect (HS-223)		N/A	None		Manual activation																												M	
HS-224	Tank 1 (T-001), Pump 5 (P-005) local disconnect (HS-224)		N/A	None		Manual activation																												M	
LT-207	Tank 2 (T-002) Level Sensor (LT-207)		Hi-Hi Alarm @ 7.0 ft	None		Local, hardwired; Controlled through PLC	X	XLR			XR																						XMA		XMA	M	
			Hiah Level Alarm @ 4.5 ft	None		Local, hardwired; Controlled through PLC	X	XLR																												
LSHH-222	Tank 2 (T-002) Level Switch (LSHH-222)		Redundant Hi-Hi Alarm @ approx. 8 ft	None		Local, hardwired; Controlled through PLC	X	XLR			XR																						XMA		XMA		
HS-220	Tank 2 (T-002), Pump 6 (P-006) local disconnect (HS-220)		N/A	None		Manual Activation																													M
HS-221	Tank 2 (T-002), Pump 7 (P-007) local disconnect (HS-221)		N/A	None		Manual Activation																													M
	Tank 2 (T-002) Rupture Disk			None		Overpressure or vacuum on Tank 2 (T-002)																						M								
	Tank 2 (T-002) Bottom Outlet Flexible Fitting		N/A	None		N/A																													M
	Bag Filters Differential Pressure Switching		Hi-Hi Diff Pressure 25 psi	None		Local, hardwired; Controlled through PLC	X	XLR																												
			High Diff Pressure 12 psi	None		Local, hardwired; Controlled through PLC	X	XLR																												
	Autodialer- Vault 1 Hi-Hi Level		2.5 ft	None		Local, hardwired; Controlled through PLC					XMR																									
	Autodialer- Vault 2 Hi-Hi Level		2.0 ft	None		Local, hardwired; Controlled through PLC					XMR																									

Former Carborundum Facility

Groundwater Remediation System

2040 Corv Drive
Village of Sanborn
Town of Wheatfield
Niagara County, New York

Protective System Devices

Protective System Device Safe Chart

LEGEND

(n) = refer to note (n)
X = perform this action
DA = direct acting PID
G = global reset
L = allow local acknowledge and reset
R = require local acknowledge and reset
A = automatic reset
M = action manually performed
highlight = changed from previous rev
SP setpoint can adjustable from control system
NA = no action

DEVICE NAME	COMMON NAME	POINT TAG	SETPOINT[1]	TIME DELAY	DEAD BAND	CAUSE	EFFECT: Human User Interface (HUI) Indication	Human User Interface (HUI) Alarm	Local Reset	Telemetry System Alarm Dialout	Well Pump P-3	Well Pump PW-1	Well Pump P-2	Well Pump PW-4	Well Pump P-4	Well Pump PW-3	Air Stripper Feed Pump P-603 A	Air Stripper Feed Pump P-603 B	Carbon Feed Pump P-305 A	Carbon Feed Pump P-305C	Stripper Air Blower B- 801	Effluent Pump P-610 A	Effluent Pump P-610 B	Freeze Protection	Safety Shower	Fire Extinguisher	Rupture Disc	Emergency Lights	Vault 1 Pump P-001	Vault 2 Pump P-002	Vault 3 Pump P-003	Tank 1 Pump P-004	Tank 1 Pump P-005	Tank 2 Pump P-006	Tank 2 Pump P-007	Stay Cables
							Display	Display	Display	Activate	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	On/Off	Start	Engage	Replace	On	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Start/Stop	Inspect
	Autodialer- Vault 3 Hi-Hi Level		1.5 ft.	None		Local, hardwired; Controlled through PLC				XMR																										
	Autodialer- Tank 1 Hi-Hi Level (sensor)		4.0 ft.	None		Local, hardwired; Controlled through PLC				XMR																										
	Autodialer- Tank 1 Hi-Hi Level (float)		Approx. 6 ft.	None		Local, hardwired; Controlled through PLC				XMR																										
	Autodialer- Tank 2 Hi-Hi Level (sensor)		7.0 ft.	None		Local, hardwired; Controlled through PLC				XMR																										
	Autodialer- Tank 2 Hi-Hi Level (float)		Approx. 8 ft.	None		Local, hardwired; Controlled through PLC				XMR																										
	Autodialer- Tank 801 Hi-Hi Level (float)		Approx. 12 ft.	None		Local, hardwired; Controlled through PLC				XMR																										
	VWCC Piping Heat Trace Doghouse at Metallics Bldg.		Self-Limiting Trace on @ 40F	None		Local, hardwired																		XA											
	VWCC Piping Heat Trace Metallics Bldg. Trench Under Doorway		Self-Limiting Trace on @ 40F	None		Local, hardwired																		XA											
	VWCC Piping Heat Trace Doghouse at Treatment Bldg.		Self-Limiting Trace on @ 40F	None		Local, hardwired																		XA											
LSHH-219	Tank 801 Hi-Hi Level Switch (LSHH-219)		On @ approx. 12 ft	None		Local, hardwired; Controlled through PLC	M	XLR		XR	XMA	XMA	XMA	XMA	XMA	XMA	XMA																		XMA	XMA	

TABLE NOTES
(1) - Setpoints indicated are representative values. The setpoint for each PSD is determined on a application-specific basis.

GUIDANCE NOTES
Device Name - The device name corresponds to the identification on the Piping and Instrumentation Diagram (P&ID) and/or field label for the PSD.
Common Name - The common name further identifies the PSD by type of device and service use.
Point Tag - The point tag corresponds to the identification on the P&ID and/or field label for the PSD.
Setpoint - The setpoint is established during the design and is documented in the Operation and Maintenance (O&M) Manual. The PSD setpoint may be visible on the PSD, but not all devices are supplied with a local setpoint.
Time Delay - The time delay is established during the design and is documented in the O&M Manual.
Dead Band - The dead band is determined for each PSD during equipment selection and documented in the O&M Manual. The dead band may be field adjustable or fixed for a given PSD. Dead bands are not applicable for all PSDs and also may not be applicable to all PSDs of the same type (e.g., not all pressure switches will have a dead band).
Cause - The cause refers to the electromechanical conditions and programmable logic controller (PLC) conditions that cause PSD activation.

Attachment IV

PSD Inspection and Maintenance Procedures

Former Carborundum Facility

Groundwater Remediation System

2040 Cory Drive
Village of Sanborn
Town of Wheatfield
Niagara County, New York

Protective Systems Devices Inspection and Maintenance Plan

PSD Name	Type	PSD Description	Manufacturer	Model	Setpoint	Inspection Frequency	Inspection Procedure
	Level Switch	Level Switch for pump operation for well P-3 and Hi-Hi Level alarm - Pressure Actuated	GE Druck	1730	Pump ON: 7.5 ft Pump OFF: 3.7 ft High Level Alarm: 16 ft Low Level Alarm: 1.5 ft	Annual Quarterly	PSD-1 PSD-2
	Disconnect	Electrical disconnect for pump power in the P-3 well shed	Westinghouse	Heavy Duty Safety Switches 30 amp 600 volt Type 12		Annual Triennial	PSD-3 PSD-4
	Level Switch	Level Switch for pump operation of well PW-1 - Pressure Actuated	GE Druck	1730	Pump ON: 8 ft Pump OFF : 5 ft High Level Alarm: 30 ft Low Level Alarm: 3.5 ft	Annual Quarterly	PSD-5 PSD-6
	Starter	Electrical starter for pump power in the PW-1 well shed				Annual Triennial	PSD-7 PSD-8
	Level Switch	Level Switch for pump operation of well P-2 - Pressure Actuated	GE Druck	1730	Pump ON: 7.5 ft Pump OFF : 4.5 ft High Level Alarm: 14 ft Low Level Alarm: 3 ft	Annual Quarterly	PSD-9 PSD-10
	Disconnect	Electrical disconnect for pump power in the P-2 well shed	Cutler Hammer	Heavy Duty Safety Switches 30 amp 600 volt model DH361UDK		Annual Triennial	PSD-11 PSD-12
	Level Switch	Level Switch for pump operation of well PW-4 - Pressure Actuated	Mercoid/Dwyer	SBLT2-15-60	Pump ON: 10 ft Pump OFF : 7.5 ft High Level Alarm: 30 ft Low Level Alarm: 6 ft	Annual Quarterly	PSD-13 PSD-14
	Disconnect	Electrical disconnect for pump power in the PW-4 well shed	Westinghouse	Heavy Duty Safety Switches 30 amp 600 volt Type 12		Annual Triennial	PSD-15 PSD-16
	Level Switch	Level Switch for pump operation of well P-4 - Pressure Actuated	GE Druck	1730	Pump ON: 7.5 ft Pump OFF : 4 ft High Level Alarm: 30ft Low Level Alarm: 2 ft	Annual Quarterly	PSD-17 PSD-18
	Disconnect	Electrical disconnect for pump power in the P-4 well shed	Cutler Hammer	Heavy Duty Safety Switches 30 amp 600 volt model DH361UDK		Annual Triennial	PSD-19 PSD-20
	Level Switch	Level Switch for pump operation of well PW-3 - Pressure Actuated	GE Druck	1830	Pump ON: 8 ft Pump OFF : 4 ft High Level Alarm: 16 ft Low Level Alarm: 2.5 ft	Annual Quarterly	PSD-21 PSD-22
	Starter	Electrical starter for pump power in the PW-3 well shed				Annual Triennial	PSD-23 PSD-24
	Level Switch	Level Switch for EQ Tank (T-801) - operation of pumps P-803A/B (Air Stripper Feed Pump)- pressure actuated	Rosemount	3051	High Level Alarm: 6 ft Lead Pump ON: 2.5 ft Lag Pump ON: 4 ft Both Pumps OFF: 2 ft Low Level Alarm: 1.5 ft	Annual Quarterly	PSD-25 PSD-26
	Disconnect	Local electrical disconnect for P-803A pump power	Westinghouse			Annual Triennial	PSD-27 PSD-28
	Disconnect	Local electrical disconnect for P-803B pump power	Westinghouse			Annual Triennial	PSD-29 PSD-30
	Level Switch	Level switch for air stripper (S-801) - operation of pumps P-805A/C (Carbon Feed Pump)- pressure actuated	Rosemount	3051	High Level Alarm: 23 in Lead Pump ON: 17 in Lag Pump ON: 8 in Both Pumps OFF: 8 in Low Level Alarm: 3 in	Annual Quarterly	PSD-31 PSD-32
	Disconnect	Local electrical disconnect for P-805A pump power	Westinghouse			Annual Triennial	PSD-33 PSD-34
	Disconnect	Local electrical disconnect for P-805C pump power	Westinghouse			Annual Triennial	PSD-35 PSD-36
	Pressure Switch	Blower air pressure (low) for air stripper. Shuts off pump P803A/B	Dwyer	1950-5-6F	1.4 to 5.5 in of Water Column	Annual Quarterly	PSD-37 PSD-38
	Disconnect	Local electrical disconnect for B-801 blower power	Westinghouse		N/A	Annual Triennial	PSD-39 PSD-40
	Level Switch	Level Switch for Effluent Tank (T-802) - operation of pumps P-810A/B (Air Stripper Feed Pump)- pressure actuated	Rosemount	3051	High Level Alarm: 8 ft Lead Pump ON: 5.5 ft Lag Pump ON: 4 ft Both Pumps OFF: 2 ft Low Level Alarm: 1.5 ft	Annual Quarterly	PSD-41 PSD-42
	Disconnect	Local electrical disconnect for P-810A pump power	Westinghouse			Annual Triennial	PSD-43 PSD-44
	Disconnect	Local electrical disconnect for P-810B pump power	Westinghouse			Annual Triennial	PSD-45 PSD-46
	Automatic Telephone Dialer- 1	Stripper- High level in stripper sump	Microtel	MCS-100	N/A	Annual	PSD-47
	Automatic Telephone Dialer- 2	Stripper- Blower Shut Down (low pressure)	Microtel	MCS-100	N/A	Annual	PSD-48
	Automatic Telephone Dialer- 3	High Level alarm for wells	Microtel	MCS-100	N/A	Annual	PSD-49
	Automatic Telephone Dialer- 4	Power Failure	Microtel	MCS-100	N/A	Annual	PSD-50
	Automatic Telephone Dialer-5	Containment Sump High Level	Microtel	MCS-100	N/A	Annual	PSD-51
	Automatic Telephone Dialer-6	Building Sump High Level	Microtel	MCS-100	N/A	Annual	PSD-52
	Uninterrupted Power Supply	Battery Backup for DCS	APC	Back-UPS ES-550		Annual Quarterly	PSD-53 PSD-54

Former Carborundum Facility

Groundwater Remediation System

2040 Cory Drive
Village of Sanborn
Town of Wheatfield
Niagara County, New York

Protective Systems Devices Inspection and Maintenance Plan

PSD Name	Type	PSD Description	Manufacturer	Model	Setpoint	Inspection Frequency	Inspection Procedure
	Electric Space Heater	Electric Space Heater- Well Shed P-3				[1]Annual Quarterly	PSD-55 PSD-56
	Electric Space Heater	Electric Space Heater- Well Shed PW-1				[1]Annual Quarterly	PSD-57 PSD-58
	Electric Space Heater	Electric Space Heater- Well Shed P-2				[1]Annual Quarterly	PSD-59 PSD-60
	Electric Space Heater	Electric Space Heater- Well Shed PW-4				[1]Annual Quarterly	PSD-61 PSD-62
	Electric Space Heater	Electric Space Heater- Well Shed P-4				[1]Annual Quarterly	PSD-63 PSD-64
	Electric Space Heater	Electric Space Heater- Well Shed PW-3				[1]Annual Quarterly	PSD-65 PSD-66
	Natural Gas Radiant Heater	Natural Gas Radiant Heater- Treatment Building				[1]Annual	PSD-67
	Rupture Disc	3 in rupture disc for liquid phase carbon filter- 1	Zook	1MX3X75X72	75 psig at 72 F	Annual Quarterly	PSD-68 PSD-69
	Rupture Disc	3 in rupture disc for liquid phase carbon filter- 2	Zook	1MX3X75X72	75 psig at 72 F	Annual Quarterly	PSD-70 PSD-71
	Surge Protection	MCC transient voltage surge suppressor	MCG Surge Protection	MZC-480D	480V AC; 50/60 Hz	Quarterly	PSD-72
	Level Switch	Containment Sump level switch	Warwick Controls	3E2B	High Level: 20 inches	Annual Quarterly	PSD-73 PSD-74
	Level Switch	Building Sump level switch	Warwick Controls	3E2B	High Level: 20 inches	Annual Quarterly	PSD-75 PSD-76
	Emergency Lighting	Emergency lighting above north entrance door			N/A	Monthly Annual	PSD-77 PSD-78
	Emergency Lighting	Emergency lighting above north double doors			N/A	Monthly Annual	PSD-79 PSD-80
	Emergency Lighting	Emergency lighting above west entrance door			N/A	Monthly Annual	PSD-81 PSD-82
	Emergency Lighting	Emergency lighting in office / control room			N/A	Monthly Annual	PSD-83 PSD-84
	Emergency Lighting	Emergency lighting in motor control center			N/A	Monthly Annual	PSD-85 PSD-86
	Emergency Lighting	Emergency lighting at effluent tank			N/A	Monthly Annual	PSD-87 PSD-88
	Emergency Lighting	Emergency lighting in blower room			N/A	Monthly Annual	PSD-89 PSD-90
	Fire Extinguisher	Outside Control Room	Amerex	A500	N/A	Monthly Annual	PSD-91 PSD-92
	Fire Extinguisher	Inside Main Entrance Door	Amerex	A501	N/A	Monthly Annual	PSD-93 PSD-94
	Fire Extinguisher	Laboratory	Amerex	A502	N/A	Monthly Annual	PSD-95 PSD-96
VWCC	Level Sensor	Vault 1 Level Sensor (LT-200)	KPSI	705-S-1-4CBA	Hi-Hi Level Alarm (Dialer): 2.5 ft High Level Alarm (Local): 1.8 ft Low Level Alarm (Local): -10.0 ft Lo-Lo Level Alarm (Local): -15.0 ft	Annual Quarterly	PSD-97 PSD-98
VWCC	Level Sensor	Vault 2 Level Sensor (LT-201)	KPSI	705-S-1-4CBA	Hi-Hi Level Alarm (Dialer): 2.0 ft High Level Alarm (Local): 1.8 ft Low Level Alarm (Local): -10.0 ft Lo-Lo Level Alarm (Local): -15.0 ft	Annual Quarterly	PSD-99 PSD-100
VWCC	Level Sensor	Vault 3 Level Sensor (LT-202)	KPSI	705-S-1-4CBA	Hi-Hi Level Alarm (Dialer): 1.5 ft High Level Alarm (Local): 1.0 ft Low Level Alarm (Local): -10.0 ft Lo-Lo Level Alarm (Local): -15.0 ft	Annual Quarterly	PSD-101 PSD-102
VWCC	Disconnect	Vault 1 Pump (P-001) local disconnect (HS-225)	Hubbell	SETL3	125VAC, 20 Amp	Annual Triennial	PSD-103 PSD-104
VWCC	Disconnect	Vault 2 Pump (P-002) local disconnect (HS-226)	Hubbell	SETL3	125VAC, 20 Amp	Annual Triennial	PSD-105 PSD-106
VWCC	Disconnect	Vault 3 Pump (P-003) local disconnect (HS-227)	Hubbell	SETL3	125VAC, 20 Amp	Annual Triennial	PSD-107 PSD-108
VWCC	Level Sensor	Tank 1 (T-001) Level Sensor (LT-203)	KPSI	705-S-1-4CBA	Hi-Hi Level Alarm (dialer): 4.0 ft High Level Alarm (local): 3.9 ft Lead Pump ON: 3.5 ft Lag Pump ON: 3.8 ft Both Pumps OFF: 2.0 ft Low Level Alarm (local): 0.5 ft Lo-Lo Level Alarm (dialer): 0.4 ft	Annual Quarterly	PSD-109 PSD-110
VWCC	Level Switch (float)	Tank 1 (T-001) Level Switch (LSHH-203)	APG (KARI)	KA-M1C-15	On @ Approx. 6 ft	Annual Quarterly	PSD-111 PSD-112
VWCC	Disconnect	Tank 1 (T-001), Pump 4 (P-004) local disconnect (HS-223)	Square D	9422ATEN100	100 Amp	Annual Triennial	PSD-113 PSD-114
VWCC	Disconnect	Tank 1 (T-001), Pump 5 (P-005) local disconnect (HS-224)	Square D	9422ATEN100	100 Amp	Annual Triennial	PSD-115 PSD-116
VWCC	Level Sensor	Tank 2 (T-002) Level Sensor (LT-207)	Honeywell	STF128	Hi-Hi Level Alarm (dialer): 7.0 ft High Level Alarm (local): 4.5 ft Lead Pump ON: 3.0 ft Lag Pump ON: 3.5 ft Both Pumps OFF: 0.5 ft Low Level Alarm (local): 0.25 ft Lo-Lo Level Alarm (dialer): -15.0 ft	Annual Quarterly	PSD-117 PSD-118

Former Carborundum Facility

Groundwater Remediation System

2040 Cory Drive
Village of Sanborn
Town of Wheatfield
Niagara County, New York

Protective Systems Devices Inspection and Maintenance Plan

PSD Name	Type	PSD Description	Manufacturer	Model	Setpoint	Inspection Frequency	Inspection Procedure
VWCC	Level Switch (float)	Tank 2 (T-002) Level Switch (LSHH-222)	GEMS	LS800-A	On @ Approx. 8 ft	Annual Quarterly	PSD-119 PSD-120
VWCC	Disconnect	Tank 2 (T-002), Pump 6 (P-006) local disconnect (HS-220)	Hubbell	HBLD3S	600VAC, 30 Amp	Annual Triennial	PSD-121 PSD-122
VWCC	Disconnect	Tank 2 (T-002), Pump 7 (P-007) local disconnect (HS-221)	Hubbell	HBLD3S	600VAC, 30 Amp	Annual Triennial	PSD-123 PSD-124
VWCC	Rupture Disk	Tank 2 (T-002) Rupture Disk	Fike	LO-V BT	5" Water Column Vac	Annual Quarterly	PSD-125 PSD-126
VWCC	Rupture Disk	Tank 2 (T-002) Rupture Disk	Fike	LO-V BT	9" Water Column Pressure	Annual Quarterly	PSD-127 PSD-128
VWCC	Flexible Fitting Security Cables	Tank 2 (T-002) Bottom Outlet Flexible Fitting	PolyProcessing	Flexijoint	N/A	Quarterly	PSD-129
VWCC	Differential Pressure Sensors	Bag Filters Differential Pressure Switching	Honeywell	ST3000 STR93G	Hi-Hi Diff. Pressure Alarm (Dialer): 25 psi High Diff. Pressure Alarm (Local): 12 psi Low Diff. Pressure Alarm (Local): -15.0 ft Lo-Lo Diff. Pressure Alarm (local): -25.0 ft	Annual Quarterly	PSD-130 PSD-131
VWCC	Level Float Switch	Tank 801 Level Switch (LSHH-219)	APG (KARI)	KA-M1C-15	On @ Approx. 12 ft	Annual Quarterly	PSD-132 PSD-133
VWCC	Automatic Telephone Dialer-7	Autodialer- Vault 1 Hi-Hi Level	Microtel	MCS-100	N/A	Annual	PSD-134
VWCC	Automatic Telephone Dialer-8	Autodialer- Vault 2 Hi-Hi Level	Microtel	MCS-100	N/A	Annual	PSD-135
VWCC	Automatic Telephone Dialer-9	Autodialer- Vault 3 Hi-Hi Level	Microtel	MCS-100	N/A	Annual	PSD-136
VWCC	Automatic Telephone Dialer-10	Autodialer- Tank 1 Hi-Hi Level (sensor)	Microtel	MCS-100	N/A	Annual	PSD-137
VWCC	Automatic Telephone Dialer-11	Autodialer- Tank 1 Hi-Hi Level (float)	Microtel	MCS-100	N/A	Annual	PSD-138
VWCC	Automatic Telephone Dialer-12	Autodialer- Tank 2 Hi-Hi Level (sensor)	Microtel	MCS-100	N/A	Annual	PSD-139
VWCC	Automatic Telephone Dialer-13	Autodialer- Tank 2 Hi-Hi Level (float)	Microtel	MCS-100	N/A	Annual	PSD-140
VWCC	Automatic Telephone Dialer-14	Autodialer- Tank 801 Hi-Hi Level (float)	Microtel	MCS-100	N/A	Annual	PSD-141
VWCC	Freeze Protection	VWCC Piping Heat Trace Doghouse at Metaullics Bldg.	Environmental Technology, Inc.	SST-2	Self-Limiting, Thermostat On @ 40F	[1]Annual Quarterly	PSD-142 PSD-143
VWCC	Freeze Protection	VWCC Piping Heat Trace Metaullics Bldg. Trench Under Doorway	Environmental Technology, Inc.	SST-2	Self-Limiting, Thermostat On @ 40F	[1]Annual Quarterly	PSD-144 PSD-145
VWCC	Freeze Protection	VWCC Piping Heat Trace Doghouse at Treatment Bldg.	Environmental Technology, Inc.	SST-2	Self-Limiting, Thermostat On @ 40F	[1]Annual Quarterly	PSD-146 PSD-147

Footnotes:

[1] Annual inspection to be conducted in fall well in advance of freezing weather.

Device Name	Common Name	Description	Setpoint
PSD-1	Level Switch	Level Switch for pump operation for well P-3 and High Level alarm - Pressure Actuated	Pump on: 7.5 ft Pump off : 3.7 ft High Level : 16 ft Low Level: 1.5 ft

Task	Function Test
Frequency	Annual

	Procedure
1	Set well P-3 pump ON setpoint to an elevation value below actual well water level. Verify pump starts.
2	Set well P-3 pump OFF setpoint to an elevation value above actual well water level. Verify pump stops.
3	Reset well P-3 pump on/off setpoints to values shown in table above.
4	Set High Level to an elevation value below the actual well water level. Verify High level alarm activates in the control system and on dialer.
5	Return High Level setpoint to the value prescribed above.
6	Set Low Level setpoint to an elevation value above the actual well water level. Verify that the Low Level alarm activates in the control system.
7	Return Low Level setpoint to the value prescribed above.
8	Record observations in table below.

Data Recorded	
Verify well P-3 pump ON response on control system screen and at well P-3 pump flow meter.	
Verify well P-3 pump OFF response on control system screen and at well P-3 pump flow meter.	
Verify High Level alarm comes in to control system and calls out on dialer.	
Verify Low Level alarm comes in to control system.	
Record date.	

Device Name	Common Name	Description	Setpoint
PSD-2	Level Switch	Level Switch for pump operation for well P-3 and High Level alarm - Pressure Actuated	Pump on: 7.5 ft Pump off : 3.7 ft High Level : 16 ft Low Level: 1.5 ft

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure	Data Recorded	
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.	Any leakage noted?	
2	Inspect for external damage, cracking, deformation, and discoloration.	Any external damage noted?	
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.	Any corrosion or scaling present?	
4	Record inspection date.	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-3	Disconnect	Local well P-3 disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

	Procedure
1	Shut down individual well disconnect.
2	Verify corresponding well pump shuts down.
3	Reset disconnect and verify power-up of corresponding equipment.
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.
5	Record Date

Data Recorded	
Record Well Disconnect Tested.	
Equipment powers down and comes back up on disconnect reset?	
Record physical condition observations.	
Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-4	Power Disconnect	Local well P-3 disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

	Procedure		Data Recorded	
1	Shut down individual well disconnect.			
2	Check wiring interconnection between field instrumentation and control center for physical damage.		Record physical condition observations.	
3	Record Date		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-5	Level Switch	Level Switch for pump operation for well PW-1 and High Level alarm - Pressure Actuated	Pump on: 8 ft Pump off : 5 ft High Level : 30 ft Low Level: 3.5 ft

Task	Function Test
Frequency	Annual

	Procedure
1	Set well PW-1 pump ON setpoint to an elevation value below actual well water level. Verify pump starts.
2	Set well PW-1 pump OFF setpoint to an elevation value above actual well water level. Verify pump stops.
3	Reset well PW-1 pump on/off setpoints to values shown in table above.
4	Set High Level to an elevation value below the actual well water level. Verify High level alarm activates in the control system and on dialer.
5	Return High Level setpoint to the value prescribed above.
6	Set Low Level setpoint to an elevation value above the actual well water level. Verify that the Low Level alarm activates in the control system.
7	Return Low Level setpoint to the value prescribed above.
8	Record observations in table below.

Data Recorded	
Verify well PW-1 pump ON response on control system screen and at well PW-1 pump flow meter.	
Verify well PW-1 pump OFF response on control system screen and at well PW-1 pump flow meter.	
Verify High Level alarm comes in to control system and calls out on dialer.	
Verify Low Level alarm comes in to control system.	
Record date.	

Device Name	Common Name	Description	Setpoint
PSD-6	Level Switch	Level Switch for pump operation for well PW-1 and High Level alarm - Pressure Actuated	Pump on: 8 ft Pump off : 5 ft High Level : 30 ft Low Level: 3.5 ft

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure	Data Recorded	
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.	Any leakage noted?	
2	Inspect for external damage, cracking, deformation, and discoloration.	Any external damage noted?	
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.	Any corrosion or scaling present?	
4	Record inspection date.	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-7	Starter	Local well PW-1 disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

	Procedure
1	Shut down individual well disconnect.
2	Verify corresponding well pump shuts down.
3	Reset disconnect and verify power-up of corresponding equipment.
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.
5	Record Date

Data Recorded	
Record Well Disconnect Tested.	
Equipment powers down and comes back up on disconnect reset?	
Record physical condition observations.	
Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-8	Starter	Local well PW-1 disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

	Procedure	Data Recorded	
1	Shut down individual well disconnect.		
2	Check wiring interconnection between field instrumentation and control center for physical damage.	Record physical condition observations.	
3	Record Date	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-9	Level Switch	Level Switch for pump operation for well P-2 and High Level alarm - Pressure Actuated	Pump ON: 7.5 ft Pump OFF: 4.5 ft High Level: 14 ft Low Level: 3 ft

Task	Function Test
Frequency	Annual

	Procedure
1	Set well P-2 pump ON setpoint to an elevation value below actual well water level. Verify pump starts.
2	Set well P-2 pump OFF setpoint to an elevation value above actual well water level. Verify pump stops.
3	Reset well P-2 pump on/off setpoints to values shown in table above.
4	Set High Level to an elevation value below the actual well water level. Verify High level alarm activates in the control system and on dialer.
5	Return High Level setpoint to the value prescribed above.
6	Set Low Level setpoint to an elevation value above the actual well water level. Verify that the Low Level alarm activates in the control system.
7	Return Low Level setpoint to the value prescribed above.
8	Record observations in table below.

Data Recorded	
Verify well P-2 pump ON response on control system screen and at well P-2 pump flow meter.	
Verify well P-2 pump OFF response on control system screen and at well P-2 pump flow meter.	
Verify High Level alarm comes in to control system and calls out on dialer.	
Verify Low Level alarm comes in to control system.	
Record date.	

Device Name	Common Name	Description	Setpoint
PSD-10	Level Switch	Level Switch for pump operation for well P-2 and High Level alarm - Pressure Actuated	Pump ON: 7.5 ft Pump OFF: 4.5 ft High Level: 14 ft Low Level: 3 ft

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure		Data Recorded	
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.		Any leakage noted?	
2	Inspect for external damage, cracking, deformation, and discoloration.		Any external damage noted?	
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.		Any corrosion or scaling present?	
4	Record inspection date.		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-11	Disconnect	Local well P-2 disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

	Procedure
1	Shut down individual well disconnect.
2	Verify corresponding well pump shuts down.
3	Reset disconnect and verify power-up of corresponding equipment.
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.
5	Record Date

Data Recorded	
Record Well Disconnect Tested.	
Equipment powers down and comes back up on disconnect reset?	
Record physical condition observations.	
Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-12	Disconnect	Local well P-2 disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

	Procedure	Data Recorded	
1	Shut down individual well disconnect.		
2	Check wiring interconnection between field instrumentation and control center for physical damage.	Record physical condition observations.	
3	Record Date	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-13	Level Switch	Level Switch for pump operation for well PW-4 and High Level alarm - Pressure Actuated	Pump ON: 10 ft Pump OFF: 7.5 ft High Level: 30 ft; Low Level: 6 ft

Task	Function Test
Frequency	Annual

	Procedure
1	Set well PW-4 pump ON setpoint to an elevation value below actual well water level. Verify pump starts.
2	Set well PW-4 pump OFF setpoint to an elevation value above actual well water level. Verify pump stops.
3	Reset well PW-4 pump on/off setpoints to values shown in table above.
4	Set High Level to an elevation value below the actual well water level. Verify High level alarm activates in the control system and on dialer.
5	Return High Level setpoint to the value prescribed above.
6	Set Low Level setpoint to an elevation value above the actual well water level. Verify that the Low Level alarm activates in the control system.
7	Return Low Level setpoint to the value prescribed above.
8	Record observations in table below.

Data Recorded	
Verify well PW-4 pump ON response on control system screen and at well PW-4 pump flow meter.	
Verify well PW-4 pump OFF response on control system screen and at well PW-4 pump flow meter.	
Verify High Level alarm comes in to control system and calls out on dialer.	
Verify Low Level alarm comes in to control system.	
Record date.	

Device Name	Common Name	Description	Setpoint
PSD-14	Level Switch	Level Switch for pump operation for well PW-4 and High Level alarm - Pressure Actuated	Pump ON: 10 ft Pump OFF: 7.5 ft High Level: 30 ft; Low Level: 6 ft

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure	Data Recorded	
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.	Any leakage noted?	
2	Inspect for external damage, cracking, deformation, and discoloration.	Any external damage noted?	
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.	Any corrosion or scaling present?	
4	Record inspection date.	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-15	Disconnect	Local well PW-4 disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

	Procedure		Data Recorded	
1	Shut down individual well disconnect.		Record Well Disconnect Tested.	
2	Verify corresponding well pump shuts down.		Equipment powers down and comes back up on disconnect reset?	
3	Reset disconnect and verify power-up of corresponding equipment.		Record physical condition observations.	
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.		Record date of inspection.	
5	Record Date			

Device Name	Common Name	Description	Setpoint
PSD-16	Disconnect	Local well PW-4 disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

	Procedure	Data Recorded	
1	Shut down individual well disconnect.		
2	Check wiring interconnection between field instrumentation and control center for physical damage.	Record physical condition observations.	
3	Record Date	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-17	Level Switch	Level Switch for pump operation for well P-4 and High Level alarm - Pressure Actuated	Pump ON: 7.5 ft Pump OFF: 4 ft High Level : 30ft Low Level: 2 ft

Task	Function Test
Frequency	Annual

Procedure	
1	Set well P-4 pump ON setpoint to an elevation value below actual well water level. Verify pump starts.
2	Set well P-4 pump OFF setpoint to an elevation value above actual well water level. Verify pump stops.
3	Reset well P-4 pump on/off setpoints to values shown in table above.
4	Set High Level to an elevation value below the actual well water level. Verify High level alarm activates in the control system and on dialer.
5	Return High Level setpoint to the value prescribed above.
6	Set Low Level setpoint to an elevation value above the actual well water level. Verify that the Low Level alarm activates in the control system.
7	Return Low Level setpoint to the value prescribed above.
8	Record observations in table below.

Data Recorded	
Verify well P-4 pump ON response on control system screen and at well P-4 pump flow meter.	
Verify well P-4 pump OFF response on control system screen and at well P-4 pump flow meter.	
Verify High Level alarm comes in to control system and calls out on dialer.	
Verify Low Level alarm comes in to control system.	
Record date.	

Device Name	Common Name	Description	Setpoint
PSD-18	Level Switch	Level Switch for pump operation for well P-4 and High Level alarm - Pressure Actuated	Pump ON: 7.5 ft Pump OFF: 4 ft High Level : 30ft Low Level: 2 ft

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure	Data Recorded	
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.	Any leakage noted?	
2	Inspect for external damage, cracking, deformation, and discoloration.	Any external damage noted?	
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.	Any corrosion or scaling present?	
4	Record inspection date.	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-19	Disconnect	Local well P-4 disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

	Procedure		Data Recorded	
1	Shut down individual well disconnect.		Record Well Disconnect Tested.	
2	Verify corresponding well pump shuts down.		Equipment powers down and comes back up on disconnect reset?	
3	Reset disconnect and verify power-up of corresponding equipment.		Record physical condition observations.	
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.		Record date of inspection.	
5	Record Date			

Device Name	Common Name	Description	Setpoint
PSD-20	Disconnect	Local well P-4 disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

	Procedure	Data Recorded	
1	Shut down individual well disconnect.		
2	Check wiring interconnection between field instrumentation and control center for physical damage.	Record physical condition observations.	
3	Record Date	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-21	Level Switch	Level Switch for pump operation for well PW-3 and High Level alarm - Pressure Actuated	Pump on: 7.5 ft Pump off : 3.7 ft High Level : 16 ft Low Level: 1.5 ft

Task	Function Test
Frequency	Annual

Procedure	
1	Set well PW-3 pump ON setpoint to an elevation value below actual well water level. Verify pump starts.
2	Set well PW-3 pump OFF setpoint to an elevation value above actual well water level. Verify pump stops.
3	Reset well PW-3 pump on/off setpoints to values shown in table above.
4	Set High Level to an elevation value below the actual well water level. Verify High level alarm activates in the control system and on dialer.
5	Return High Level setpoint to the value prescribed above.
6	Set Low Level setpoint to an elevation value above the actual well water level. Verify that the Low Level alarm activates in the control system.
7	Return Low Level setpoint to the value prescribed above.
8	Record observations in table below.

Data Recorded	
Verify well PW-3 pump ON response on control system screen and at well PW-3 pump flow meter.	
Verify well PW-3 pump OFF response on control system screen and at well PW-3 pump flow meter.	
Verify High Level alarm comes in to control system and calls out on dialer.	
Verify Low Level alarm comes in to control system.	
Record date.	

Device Name	Common Name	Description	Setpoint
PSD-22	Level Switch	Level Switch for pump operation for well PW-3 and High Level alarm - Pressure Actuated	Pump on: 7.5 ft Pump off : 3.7 ft High Level : 16 ft Low Level: 1.5 ft

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure	Data Recorded	
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.	Any leakage noted?	
2	Inspect for external damage, cracking, deformation, and discoloration.	Any external damage noted?	
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.	Any corrosion or scaling present?	
4	Record inspection date.	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-23	Starter	Local well PW-3 starter	N/A

Task	Function Test / External Inspection
Frequency	Annual

	Procedure		Data Recorded	
1	Shut down individual well disconnect.		Record Well Disconnect Tested.	
2	Verify corresponding well pump shuts down.		Equipment powers down and comes back up on disconnect reset?	
3	Reset disconnect and verify power-up of corresponding equipment.		Record physical condition observations.	
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.		Record date of inspection.	
5	Record Date			

Device Name	Common Name	Description	Setpoint
PSD-24	Starter	Local well PW-3 Starter	N/A

Task	Internal Inspection
Frequency	Every Three Years

	Procedure		Data Recorded	
1	Shut down individual well disconnect.			
2	Check wiring interconnection between field instrumentation and control center for physical damage.		Record physical condition observations.	
3	Record Date		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-25	Level Switch	Level Switch for EQ Tank (T-801) - operation of pumps P-803A/B (Air Stripper Feed Pump)- pressure actuated	High alarm: 6 ft Lead pump ON: 2.5 ft Lag Pump ON: 4 ft Both Pumps OFF: 2 ft Low level: 1.5 ft

Task	Function Test
Frequency	Annual

Procedure	
1	Set lead pump (P-803A) ON setpoint to an elevation value below actual tank (T-801) level. Verify pump starts.
2	Set lead pump (P-803A) OFF setpoint to an elevation value above actual EQ tank (T-801) level, but below the ON setpoint. Verify pump stops.
3	Set lag pump (P-803B) ON setpoint to an elevation value below actual tank (T-801) level. Verify pump starts.
4	Set lag pump (P-803B) OFF setpoint to an elevation value above actual EQ tank (T-801) level, but below the ON setpoint. Verify pump stops.
3	Reset lead (P-803A) and lag (P-803B) pumps ON/OFF setpoints to values shown in table above.
4	Set High Level setpoint to an elevation value below the actual EQ tank (T-801) level. Verify High level alarm activates in the control system and calls out on dialer.
5	Return High Level setpoint to the value prescribed above.
6	Set Low Level setpoint to an elevation value above the actual EQ tank (T-801) level. Verify that the Low Level alarm activates in the control system.
7	Return Low Level setpoint to the value prescribed above.
8	Record observations in table below.

Data Recorded	
Verify lead pump (P-803A) ON response on control system screen and at lead pump (P-803A).	
Verify lead pump (P-803A) OFF response on control system screen and at lead pump (P-803A).	
Verify lag pump (P-803B) ON response on control system screen and at lag pump (P-803B).	
Verify lag pump (P-803B) OFF response on control system screen and at lag pump (P-803B).	
Verify High Level alarm comes in to control system and calls out on dialer.	
Verify Low Level alarm comes in to control system.	
Record date.	

Device Name	Common Name	Description	Setpoint
PSD-26	Level Switch	Level Switch for EQ Tank (T-801) - operation of pumps P-803A/B (Air Stripper Feed Pump)- pressure actuated	High alarm: 6 ft Lead pump ON: 2.5 ft Lag Pump ON: 4 ft Both Pumps OFF: 2 ft Low level: 1.5 ft

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure		Data Recorded	
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.		Any leakage noted?	
2	Inspect for external damage, cracking, deformation, and discoloration.		Any external damage noted?	
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.		Any corrosion or scaling present?	
4	Record inspection date.		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-27	Disconnect	Pump P-803A disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

	Procedure
1	Shut down individual pump disconnect.
2	Verify corresponding pump shuts down.
3	Reset disconnect and verify power-up of corresponding equipment.
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.
5	Record Date

Data Recorded	
Record Pump Disconnect Tested.	
Equipment powers down and comes back up on disconnect reset?	
Record physical condition observations.	
Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-28	Disconnect	Pump P-803A disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

	Procedure		Data Recorded	
1	Shut down individual pump disconnect.			
2	Check wiring interconnection between field instrumentation and control center for physical damage.		Record physical condition observations.	
3	Record Date		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-29	Disconnect	Pump P-803B disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

	Procedure
1	Shut down individual pump disconnect.
2	Verify corresponding pump shuts down.
3	Reset disconnect and verify power-up of corresponding equipment.
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.
5	Record Date

Data Recorded	
Record Pump Disconnect Tested.	
Equipment powers down and comes back up on disconnect reset?	
Record physical condition observations.	
Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-30	Disconnect	Pump P-803B disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

	Procedure		Data Recorded	
1	Shut down individual pump disconnect.			
2	Check wiring interconnection between field instrumentation and control center for physical damage.		Record physical condition observations.	
3	Record Date		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-31	Level Switch	Level switch for air stripper (S-801) - operation of pumps P-805A/C (Carbon Feed Pump)- pressure actuated	High alarm: 23 in. Lead pump ON: 17 in. Lag Pump ON: 8 in. Both Pumps OFF: 8 in. Low level: 3 in.

Task	Function Test
Frequency	Annual

Procedure	
1	Set lead pump (P-805A) ON setpoint to an elevation value below actual air stripper sump (S-801) level. Verify pump starts.
2	Set lead pump (P-805A) OFF setpoint to an elevation value above actual air stripper sump (S-801) level, but below the ON setpoint. Verify pump stops.
3	Set lag pump (P-805C) ON setpoint to an elevation value below actual air stripper sump (S-801) level. Verify pump starts.
4	Set lag pump (P-805C) OFF setpoint to an elevation value above air stripper sump (S-801) level, but below the ON setpoint. Verify pump stops.
5	Reset lead (P-805A) and lag (P-805C) pumps ON/OFF setpoints to values shown in table above.
6	With air stripper feed pumps (P-803A/B) running, set High Level setpoint to an elevation value below the actual air stripper sump (S-801) level. Verify High level alarm activates in the control system, shuts down air stripper feed pumps P-803A/B and calls out on dialer.
7	Return High Level setpoint to the value prescribed above.
8	Set Low Level setpoint to an elevation value above the actual air stripper sump (S-801) level. Verify that the Low Level alarm activates in the control system.
9	Return Low Level setpoint to the value prescribed above.
10	Record observations in table below.

Data Recorded	
Verify lead pump (P-805A) ON response on control system screen and at lead pump (P-805A).	
Verify lead pump (P-805A) OFF response on control system screen and at lead pump (P-805A).	
Verify lag pump (P-805C) ON response on control system screen and at lag pump (P-805C).	
Verify lag pump (P-805C) OFF response on control system screen and at lag pump (P-805C).	
Verify High Level alarm comes in to control system.	
Verify Low Level alarm comes in to control system, shuts down air stripper feed pumps P-803A/B and calls out on dialer.	
Record date.	

Device Name	Common Name	Description	Setpoint
PSD-32	Level Switch	Level switch for air stripper (S-801) - operation of pumps P-805A/C (Carbon Feed Pump)- pressure actuated	High alarm: 23 in. Lead pump ON: 17 in. Lag Pump ON: 8 in. Both Pumps OFF: 8 in. Low level: 3 in.

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure		Data Recorded	
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.		Any leakage noted?	
2	Inspect for external damage, cracking, deformation, and discoloration.		Any external damage noted?	
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.		Any corrosion or scaling present?	
4	Record inspection date.		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-33	Disconnect	Pump P-805A disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

	Procedure		Data Recorded	
1	Shut down individual pump disconnect.		Record Pump Disconnect Tested.	
2	Verify corresponding pump shuts down.		Equipment powers down and comes back up on disconnect reset?	
3	Reset disconnect and verify power-up of corresponding equipment.		Record physical condition observations.	
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.		Record date of inspection.	
5	Record Date			

Device Name	Common Name	Description	Setpoint
PSD-34	Disconnect	Pump P-805A disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

Procedure		Data Recorded	
1	Shut down individual pump disconnect.		
2	Check wiring interconnection between field instrumentation and control center for physical damage.	Record physical condition observations.	
3	Record Date	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-35	Disconnect	Pump P-805C disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

	Procedure		Data Recorded	
1	Shut down individual pump disconnect.		Record Pump Disconnect Tested.	
2	Verify corresponding pump shuts down.		Equipment powers down and comes back up on disconnect reset?	
3	Reset disconnect and verify power-up of corresponding equipment.		Record physical condition observations.	
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.		Record date of inspection.	
5	Record Date			

Device Name	Common Name	Description	Setpoint
PSD-36	Disconnect	Pump P-805C disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

Procedure		Data Recorded	
1	Shut down individual pump disconnect.		
2	Check wiring interconnection between field instrumentation and control center for physical damage.	Record physical condition observations.	
3	Record Date	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-37	Pressure Switch	Blower air pressure (low) for air stripper. Shuts off pumps P-803A/B	1.4 to 5.5 in of Water Column

Task	Function Test
Frequency	Annual

Procedure	
1	With pumps P-803A/B running, change pressure switch setting in control system above blower operating pressure
2	Verify pumps P-803A/B shut off.
3	Verify that autodialer calls out with message that stripper blower is down.
4	Return pressure switch setting to value shown in table above.

Data Recorded	
Pumps P-803A/B shut off when low pressure air switch is activated?	
Autodialer calls out with proper message?	
Record Date	

Device Name	Common Name	Description	Setpoint
PSD-38	Pressure Switch	Blower air pressure (low) for air stripper. Shuts off pumps P-803A/B	1.4 to 5.5 in of Water Column

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure	Data Recorded	
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.	Any leakage noted?	
2	Inspect for external damage, cracking, deformation, and discoloration.	Any external damage noted?	
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.	Any corrosion or scaling present?	
4	Record inspection date.	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-39	Disconnect	Blower B-801 disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

Procedure		Data Recorded	
1	Shut down blower disconnect.	Record Pump Disconnect Tested.	
2	Verify corresponding blower shuts down.	Equipment powers down and comes back up on disconnect reset?	
3	Reset disconnect and verify power-up of corresponding equipment.	Record physical condition observations.	
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.	Record date of inspection.	
5	Record Date		

Device Name	Common Name	Description	Setpoint
PSD-40	Disconnect	Blower B-801 disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

	Procedure
1	Shut down individual pump disconnect.
2	Check wiring interconnection between field instrumentation and control center for physical damage.
3	Record Date

Data Recorded	
Record physical condition observations.	
Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-41	Level Switch	Level Switch for Effluent Tank (T-802) - operation of effluent pumps P-810A/B - pressure actuated	Hi-Hi alarm: 8 ft Lead pump ON: 5.5 ft Lag Pump ON: 4 ft Lead Pump OFF: 2 ft Low level: 1.5 ft

Task	Function Test
Frequency	Annual

	Procedure
1	Set lead pump (P-810A) ON setpoint to an elevation value below actual effluent tank (T-802) level. Verify pump starts.
2	Set lead pump (P-810A) OFF setpoint to an elevation value above actual effluent tank (T-802) level, but below the ON setpoint. Verify pump stops.
3	Set lag pump (P-810B) ON setpoint to an elevation value below actual effluent tank (T-802) level. Verify pump starts.
4	Set lag pump (P-810B) OFF setpoint to an elevation value above actual effluent tank (T-802) level, but below the ON setpoint. Verify pump stops.
5	Reset lead (P-810A) and lag (P-810B) pumps ON/OFF setpoints to values shown in table above.
6	With air stripper feed pumps (P-803A/B) running, set Hi-Hi Level setpoint to an elevation value below the actual effluent tank (T-802) level. Verify Hi-Hi level alarm activates in the control system, shuts down air stripper feed pumps P-803A/B and calls out on dialer.
7	Return Hi-Hi Level setpoint to the value prescribed above.
8	Set Low Level setpoint to an elevation value above the actual effluent tank (T-802) level. Verify that the Low Level alarm activates in the control system.
9	Return Low Level setpoint to the value prescribed above.
10	Record observations in table below.

Data Recorded	
Verify lead pump (P-810A) ON response on control system screen and at lead pump (P-810A).	
Verify lead pump (P-810A) OFF response on control system screen and at lead pump (P-810A).	
Verify lag pump (P-810B) ON response on control system screen and at lag pump (P-810B).	
Verify lag pump (P-810B) OFF response on control system screen and at lag pump (P-810B).	
Verify Hi-Hi Level alarm comes in to control system, shuts down air stripper feed pumps P-803A/B and calls out on dialer.	
Verify Low Level alarm comes in to control system.	
Record date.	

Device Name	Common Name	Description	Setpoint
PSD-42	Level Switch	Level Switch for Effluent Tank (T-802) - operation of effluent pumps P-810A/B - pressure actuated	Hi-Hi alarm: 8 ft Lead pump ON: 5.5 ft Lag Pump ON: 4 ft Lead Pump OFF: 2 ft Low level: 1.5 ft

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure	Data Recorded	
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.	Any leakage noted?	
2	Inspect for external damage, cracking, deformation, and discoloration.	Any external damage noted?	
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.	Any corrosion or scaling present?	
4	Record inspection date.	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-43	Disconnect	Pump P-810A disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

	Procedure		Data Recorded	
1	Shut down individual pump disconnect.		Record Pump Disconnect Tested.	
2	Verify corresponding pump shuts down.		Equipment powers down and comes back up on disconnect reset?	
3	Reset disconnect and verify power-up of corresponding equipment.		Record physical condition observations.	
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.		Record date of inspection.	
5	Record Date			

Device Name	Common Name	Description	Setpoint
PSD-44	Disconnect	Pump P-810A disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

Procedure		Data Recorded	
1	Shut down individual pump disconnect.		
2	Check wiring interconnection between field instrumentation and control center for physical damage.	Record physical condition observations.	
3	Record Date	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-45	Disconnect	Pump P-810B disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

	Procedure
1	Shut down individual pump disconnect.
2	Verify corresponding pump shuts down.
3	Reset disconnect and verify power-up of corresponding equipment.
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.
5	Record Date

Data Recorded	
Record Pump Disconnect Tested.	
Equipment powers down and comes back up on disconnect reset?	
Record physical condition observations.	
Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-46	Disconnect	Pump P-810B disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

Procedure		Data Recorded	
1	Shut down individual pump disconnect.		
2	Check wiring interconnection between field instrumentation and control center for physical damage.	Record physical condition observations.	
3	Record Date	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-47	Automatic Telephone Dialer- 1	Stripper- High level in stripper	N/A

Task	Function Test
Frequency	Annual

Procedure		Data Recorded	
1	See PSD-31		
		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-48	Automatic Telephone Dialer- 2	Stripper- Blower Shut Down	N/A

Task	Function Test
Frequency	Annual

Procedure		Data Recorded	
1	See PSD-37		
		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-49	Automatic Telephone Dialer- 3	High Level alarm for wells	N/A

Task	Function Test
Frequency	Annual

	Procedure		Data Recorded	
1	See PSD-1, 5, 9, 13, 17, 21			
			Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-50	Automatic Telephone Dialer- 4	Power Failure	N/A

Task	Function Test
Frequency	Quarterly

	Procedure
1	Check battery level
2	Replace battery if necessary
3	Unplug dialer from 120V outlet, see if call out for "power failure" follows.
4	Plug dialer back in to 120V power.

Data Recorded	
Battery Level?	
Dialer calls out on loss of power?	
Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-51	Automatic Telephone Dialer- 5	Autodialer- Containment Sump Hi-Hi Level	N/A

Task	Function Test
Frequency	Annual

Procedure		Data Recorded	
1	See PSD-74		
		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-78	Automatic Telephone Dialer- 5	Autodialer- Building Sump Hi-Hi Level	N/A

Task	Function Test
Frequency	Annual

	Procedure		Data Recorded	
1	See PSD-76			
			Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-53	UPS - Battery Backup	Battery Backup for DCS	N/A

Task	Failure Finding
Frequency	Annual

	Procedure		Data Recorded	
1	Verify and confirm integrity (e.g. condition, tightness) of electrical connections.		Good electrical connections?	
2	Verify and confirm adequate unit ventilation including internal fans and/or filters, if applicable.		Unit is capable of adequate ventilation?	
3	Disconnect power to UPS unit (pull cord from AC outlet). Enter “As Observed” uninterruptible power supply activation.		Record what unit does upon loss of AC power.	
4	Enter “As Observed” alarm notification.		What alarms come in?	
5	Verify system voltage, current, and frequency.		Record voltage, current and frequency.	
6	Verify uninterruptible power supply reset following utility power restoration.		Unit resets upon AC reconnection?	
7	Log system downtime due to testing procedure.		Record date of inspection and any system downtime.	

Device Name	Common Name	Description	Setpoint
PSD-54	UPS - Battery Backup	Battery Backup for DCS	N/A

Task	External Inspection
Frequency	Quarterly

	Procedure		Data Recorded	
1	Inspect for external damage, cracking, deformation, and discoloration.		Any external damage visible?	
2	Inspect for external corrosion.		Corrosion present?	
3	Verify and confirm integrity (e.g. condition, tightness) of electrical connections.		Electrical connections in good condition and tight?	
4	Verify operation of ventilation fans (if applicable).		Unit adequately ventilated?	

Device Name	Common Name	Description	Setpoint
PSD-55	Electric Space Heater	Electric Space Heater- Well Shed P-3	N/A

Task	Function Test
Frequency	Annual* *Note: Event should occur prior to commencement of seasonal freeze protection activation. Annual*

	Procedure		Data Recorded	
1	Check electric cord in good condition - no cracks, breaks in insulation.		Heater cord in good shape?	
2	Check for clearances from combustibles exceed manufacturers recommendations.		Heater clear from combustibles?	
3	Verify that thermostat works by turning it on/off an observing the heater response. Verify heater turns off via thermostat.		Heater thermostat functions correctly?	
			Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-56	Electric Space Heater	Electric Space Heater- Well Shed P-3	N/A

Task	External Inspection
Frequency	Quarterly* *Note: One quarterly event should occur prior to commencement of seasonal freeze protection activation.

	Procedure		Data Recorded	
1	Inspect for external damage, cracking, deformation, and discoloration.		Heater cord in good shape?	
2	Inspect for external corrosion.		Corrosion present on/in heater?	
3	Inspect electrical connections for flexibility and competency.		Electrical connections good?	
4	Inspect freeze protection device signage/placards for presence, damage, cracking, deformation, and discoloration.		Freeze protection signage/placards present and in good shape?	
5	Record date.		Record date.	

Device Name	Common Name	Description	Setpoint
PSD-57	Electric Space Heater	Electric Space Heater- Well Shed PW-1	N/A

Task	Function Test
Frequency	Annual* *Note: Event should occur prior to commencement of seasonal freeze protection activation. Annual*

	Procedure		Data Recorded	
1	Check electric cord in good condition - no cracks, breaks in insulation.		Heater cord in good shape?	
2	Check for clearances from combustibles exceed manufacturers recommendations.		Heater clear from combustibles?	
3	Verify that thermostat works by turning it on/off an observing the heater response. Verify heater turns off via thermostat.		Heater thermostat functions correctly?	
			Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-58	Electric Space Heater	Electric Space Heater- Well Shed PW-1	N/A

Task	External Inspection
Frequency	Quarterly* *Note: One quarterly event should occur prior to commencement of seasonal freeze protection activation.

	Procedure		Data Recorded	
1	Inspect for external damage, cracking, deformation, and discoloration.		Heater cord in good shape?	
2	Inspect for external corrosion.		Corrosion present on/in heater?	
3	Inspect electrical connections for flexibility and competency.		Electrical connections good?	
4	Inspect freeze protection device signage/placards for presence, damage, cracking, deformation, and discoloration.		Freeze protection signage/placards present and in good shape?	
5	Record date.		Record date.	

Device Name	Common Name	Description	Setpoint
PSD-59	Electric Space Heater	Electric Space Heater- Well Shed P-2	N/A

Task	Function Test
Frequency	Annual* *Note: Event should occur prior to commencement of seasonal freeze protection activation. Annual*

	Procedure		Data Recorded	
1	Check electric cord in good condition - no cracks, breaks in insulation.		Heater cord in good shape?	
2	Check for clearances from combustibles exceed manufacturers recommendations.		Heater clear from combustibles?	
3	Verify that thermostat works by turning it on/off an observing the heater response. Verify heater turns off via thermostat.		Heater thermostat functions correctly?	
			Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-60	Electric Space Heater	Electric Space Heater- Well Shed P-2	N/A

Task	External Inspection
Frequency	Quarterly* *Note: One quarterly event should occur prior to commencement of seasonal freeze protection activation.

	Procedure		Data Recorded	
1	Inspect for external damage, cracking, deformation, and discoloration.		Heater cord in good shape?	
2	Inspect for external corrosion.		Corrosion present on/in heater?	
3	Inspect electrical connections for flexibility and competency.		Electrical connections good?	
4	Inspect freeze protection device signage/placards for presence, damage, cracking, deformation, and discoloration.		Freeze protection signage/placards present and in good shape?	
5	Record date.		Record date.	

Device Name	Common Name	Description	Setpoint
PSD-61	Electric Space Heater	Electric Space Heater- Well Shed PW-4	N/A

Task	Function Test
Frequency	Annual* *Note: Event should occur prior to commencement of seasonal freeze protection activation. Annual*

	Procedure		Data Recorded	
1	Check electric cord in good condition - no cracks, breaks in insulation.		Heater cord in good shape?	
2	Check for clearances from combustibles exceed manufacturers recommendations.		Heater clear from combustibles?	
3	Verify that thermostat works by turning it on/off an observing the heater response. Verify heater turns off via thermostat.		Heater thermostat functions correctly?	
			Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-62	Electric Space Heater	Electric Space Heater- Well Shed PW-4	N/A

Task	External Inspection
Frequency	Quarterly* *Note: One quarterly event should occur prior to commencement of seasonal freeze protection activation.

	Procedure	Data Recorded	
1	Inspect for external damage, cracking, deformation, and discoloration.	Heater cord in good shape?	
2	Inspect for external corrosion.	Corrosion present on/in heater?	
3	Inspect electrical connections for flexibility and competency.	Electrical connections good?	
4	Inspect freeze protection device signage/placards for presence, damage, cracking, deformation, and discoloration.	Freeze protection signage/placards present and in good shape?	
5	Record date.	Record date.	

Device Name	Common Name	Description	Setpoint
PSD-63	Electric Space Heater	Electric Space Heater- Well Shed P-4	N/A

Task	Function Test
Frequency	Annual* *Note: Event should occur prior to commencement of seasonal freeze protection activation. Annual*

	Procedure		Data Recorded	
1	Check electric cord in good condition - no cracks, breaks in insulation.		Heater cord in good shape?	
2	Check for clearances from combustibles exceed manufacturers recommendations.		Heater clear from combustibles?	
3	Verify that thermostat works by turning it on/off an observing the heater response. Verify heater turns off via thermostat.		Heater thermostat functions correctly?	
			Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-64	Electric Space Heater	Electric Space Heater- Well Shed P-4	N/A

Task	External Inspection
Frequency	Quarterly* *Note: One quarterly event should occur prior to commencement of seasonal freeze protection activation.

Procedure		Data Recorded	
1	Inspect for external damage, cracking, deformation, and discoloration.	Heater cord in good shape?	
2	Inspect for external corrosion.	Corrosion present on/in heater?	
3	Inspect electrical connections for flexibility and competency.	Electrical connections good?	
4	Inspect freeze protection device signage/placards for presence, damage, cracking, deformation, and discoloration.	Freeze protection signage/placards present and in good shape?	
5	Record date.	Record date.	

Device Name	Common Name	Description	Setpoint
PSD-65	Electric Space Heater	Electric Space Heater- Well Shed PW-3	N/A

Task	Function Test
Frequency	Annual* *Note: Event should occur prior to commencement of seasonal freeze protection activation. Annual*

Procedure		Data Recorded	
1	Check electric cord in good condition - no cracks, breaks in insulation.	Heater cord in good shape?	
2	Check for clearances from combustibles exceed manufacturers recommendations.	Heater clear from combustibles?	
3	Verify that thermostat works by turning it on/off an observing the heater response. Verify heater turns off via thermostat.	Heater thermostat functions correctly?	
		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-66	Electric Space Heater	Electric Space Heater- Well Shed PW-3	N/A

Task	External Inspection
Frequency	Quarterly* *Note: One quarterly event should occur prior to commencement of seasonal freeze protection activation.

	Procedure		Data Recorded	
1	Inspect for external damage, cracking, deformation, and discoloration.		Heater cord in good shape?	
2	Inspect for external corrosion.		Corrosion present on/in heater?	
3	Inspect electrical connections for flexibility and competency.		Electrical connections good?	
4	Inspect freeze protection device signage/placards for presence, damage, cracking, deformation, and discoloration.		Freeze protection signage/placards present and in good shape?	
5	Record date.		Record date.	

Device Name	Common Name	Description	Setpoint
PSD-67	Natural Gas Radiant Heater /Thermostat	Natural Gas Radiant Heater / Thermostat - Treatment Building	N/A

Task	Function Test
Frequency	Annual* *Note: Event should occur prior to commencement of seasonal freeze protection activation.

	Procedure		Data Recorded	
1	Verify that thermostat works by turning it on/off an observing the heater response. Verify heater turns off via thermostat.		Heater thermostat functions correctly?	
			Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-68	Pressure Relief Device	3" rupture disc for liquid phase carbon filter- 1	75 psig at 72 F

Task	External Inspection
Frequency	Quarterly

	Procedure	Data Recorded	
1	Check for exterior of holder for leaks at inlet and outlet/vent connections, stem (if applicable), and mating surfaces with attention to o-rings and gaskets.	Leakage apparent?	
2	Inspect for external damage, cracking, deformation, and discoloration.	External damage, cracking, deformation, and discoloration present?	
3	Inspect for external corrosion.	External corrosion present?	
4	Record date.	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-69	Pressure Relief Device	3" rupture disc for liquid phase carbon filter- 1	75 psig at 72 F

Task	Internal Inspection
Frequency	Annual

	Procedure		Data Recorded	
1	Inspect for dents, scratches, dings, and/or thinning of the rupture disk.		Dents, scratches, dings, and/or thinning of the rupture disk present?	
2	Inspect for foreign material on the rupture disk.		Foreign material on the rupture disk?	
3	Inspect disk seat for scratches, dents, nicks, corrosion, deposits, or flaws that may adversely affect sealing and disk burst pressure.		Scratches, dents, nicks, corrosion, deposits, or flaws on disk seats that may adversely affect sealing and disk burst pressure?	
4	Inspect gaskets for flexibility and competency. Verify gasket faces are flat and not scored, nicked, or torn.		Gaskets flexible and competent? Verify gasket faces are flat and not scored, nicked, or torn.	
5	Record date.		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-70	Pressure Relief Device	3" rupture disc for liquid phase carbon filter- 2	75 psig at 72 F

Task	External Inspection
Frequency	Quarterly

	Procedure	Data Recorded	
1	Check for exterior of holder for leaks at inlet and outlet/vent connections, stem (if applicable), and mating surfaces with attention to o-rings and gaskets.	Leakage apparent?	
2	Inspect for external damage, cracking, deformation, and discoloration.	External damage, cracking, deformation, and discoloration present?	
3	Inspect for external corrosion.	External corrosion present?	
4	Record date.	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-71	Pressure Relief Device	3" rupture disc for liquid phase carbon filter- 2	75 psig at 72 F

Task	Internal Inspection
Frequency	Annual

	Procedure	Data Recorded	
1	Inspect for dents, scratches, dings, and/or thinning of the rupture disk.	Dents, scratches, dings, and/or thinning of the rupture disk present?	
2	Inspect for foreign material on the rupture disk.	Foreign material on the rupture disk?	
3	Inspect disk seat for scratches, dents, nicks, corrosion, deposits, or flaws that may adversely affect sealing and disk burst pressure.	Scratches, dents, nicks, corrosion, deposits, or flaws on disk seats that may adversely affect sealing and disk burst pressure?	
4	Inspect gaskets for flexibility and competency. Verify gasket faces are flat and not scored, nicked, or torn.	Gaskets flexible and competent? Verify gasket faces are flat and not scored, nicked, or torn.	
5	Record date.	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-59	Circuit Breaker	MCC- Surge Protector	480V AC; 50/60 Hz

Task	Function Test
Frequency	Quarterly

	Procedure
1	Check status lights on surge suppressor. Red or green light on?
2	Check LED readout for number of surges suppressed.
3	Record date.

Data Recorded	
Red or green light on?	
Record LED display read-out.	
Record date.	

Device Name	Common Name	Description	Setpoint
PSD-73	Level Switch	Containment Sump Hi-Hi Level Switch	Hi-Hi level: 20 inches

Task	Function Test
Frequency	Annual

	Procedure
1	Disconnect power to sump pump.
2	Using a water hose, fill sump until Hi-Hi Level alarm comes in to control system and calls out on dialer system.
3	Reconnect power to sump pump and verify the alarm clears in control system.
4	Record date.

Data Recorded	
Control system alarm comes on at Hi-Hi Level?	
Dialer calls out Hi-Hi Level alarm?	
Verify alarm clears as pump brings down sump level.	
Record date.	

Device Name	Common Name	Description	Setpoint
PSD-74	Level Switch	Containment Sump Hi-Hi Level Switch	Hi-Hi level: 20 inches

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure		Data Recorded	
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.		Any leakage noted?	
2	Inspect for external damage, cracking, deformation, and discoloration.		Any external damage noted?	
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.		Any corrosion or scaling present?	
4	Record inspection date.		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-75	Level Switch	Building Sump Hi-Hi Level switch	Hi-Hi level: 20 inches

Task	Function Test
Frequency	Annual

	Procedure
1	Disconnect power to sump pump.
2	Using a water hose, fill sump until Hi-Hi Level alarm comes in to control system and calls out on dialer system.
3	Reconnect power to sump pump and verify the alarm clears in control system.
4	Record date.

Data Recorded	
Control system alarm comes on at Hi-Hi Level?	
Dialer calls out Hi-Hi Level alarm?	
Verify alarm clears as pump brings down sump level.	
Record date.	

Device Name	Common Name	Description	Setpoint
PSD-76	Level Switch	Building Sump Hi-Hi Level Switch	Hi-Hi level: 20 inches

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure		Data Recorded	
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.		Any leakage noted?	
2	Inspect for external damage, cracking, deformation, and discoloration.		Any external damage noted?	
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.		Any corrosion or scaling present?	
4	Record inspection date.		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-77	Emergency Lighting	Emergency lighting above north entrance door	N/A

Task	Function Test
Frequency	Monthly

Procedure		Data Recorded	
1	Push the "TEST" button on emergency lighting unit and verify the lights come on.	Lights come on when test button is pushed?	
4	Record inspection date.	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-78	Emergency Lighting	Emergency lighting above north entrance door	N/A

Task	Function Test
Frequency	Annual

Procedure		Data Recorded	
1	Shut down power to emergency light unit. Verify lights come on and stay on for at least one hour.	Lights come on when power is shut off?	
2	Record inspection date.	Lights stay on for at least one hour?	
		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-79	Emergency Lighting	Emergency lighting above north double doors	N/A

Task	Function Test
Frequency	Monthly

	Procedure		Data Recorded	
1	Push the "TEST" button on emergency lighting unit and verify the lights come on.		Lights come on when test button is pushed?	
4	Record inspection date.		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-80	Emergency Lighting	Emergency lighting above north double doors	N/A

Task	Function Test
Frequency	Annual

Procedure		Data Recorded	
1	Shut down power to emergency light unit. Verify lights come on and stay on for at least one hour.	Lights come on when power is shut off?	
2	Record inspection date.	Lights stay on for at least one hour?	
		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-81	Emergency Lighting	Emergency lighting above west entrance door	N/A

Task	Function Test
Frequency	Monthly

	Procedure		Data Recorded	
1	Push the "TEST" button on emergency lighting unit and verify the lights come on.		Lights come on when test button is pushed?	
4	Record inspection date.		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-82	Emergency Lighting	Emergency lighting above west entrance door	N/A

Task	Function Test
Frequency	Annual

Procedure		Data Recorded	
1	Shut down power to emergency light unit. Verify lights come on and stay on for at least one hour.	Lights come on when power is shut off?	
2	Record inspection date.	Lights stay on for at least one hour?	
		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-83	Emergency Lighting	Emergency lighting in office/control room	N/A

Task	Function Test
Frequency	Monthly

	Procedure		Data Recorded	
1	Push the "TEST" button on emergency lighting unit and verify the lights come on.		Lights come on when test button is pushed?	
4	Record inspection date.		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-84	Emergency Lighting	Emergency lighting in office/control room	N/A

Task	Function Test
Frequency	Annual

Procedure		Data Recorded	
1	Shut down power to emergency light unit. Verify lights come on and stay on for at least one hour.	Lights come on when power is shut off?	
2	Record inspection date.	Lights stay on for at least one hour?	
		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-85	Emergency Lighting	Emergency lighting in motor control center	N/A

Task	Function Test
Frequency	Monthly

Procedure		Data Recorded	
1	Push the "TEST" button on emergency lighting unit and verify the lights come on.	Lights come on when test button is pushed?	
4	Record inspection date.	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-86	Emergency Lighting	Emergency lighting in motor control center	N/A

Task	Function Test
Frequency	Annual

Procedure		Data Recorded	
1	Shut down power to emergency light unit. Verify lights come on and stay on for at least one hour.	Lights come on when power is shut off?	
2	Record inspection date.	Lights stay on for at least one hour?	
		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-87	Emergency Lighting	Emergency lighting at effluent tank	N/A

Task	Function Test
Frequency	Monthly

	Procedure		Data Recorded	
1	Push the "TEST" button on emergency lighting unit and verify the lights come on.		Lights come on when test button is pushed?	
4	Record inspection date.		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-88	Emergency Lighting	Emergency lighting at effluent tank	N/A

Task	Function Test
Frequency	Annual

Procedure		Data Recorded	
1	Shut down power to emergency light unit. Verify lights come on and stay on for at least one hour.	Lights come on when power is shut off?	
2	Record inspection date.	Lights stay on for at least one hour?	
		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-89	Emergency Lighting	Emergency lighting in blower room	N/A

Task	Function Test
Frequency	Monthly

	Procedure		Data Recorded	
1	Push the "TEST" button on emergency lighting unit and verify the lights come on.		Lights come on when test button is pushed?	
4	Record inspection date.		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-90	Emergency Lighting	Emergency lighting in blower room	N/A

Task	Function Test
Frequency	Annual

Procedure		Data Recorded	
1	Shut down power to emergency light unit. Verify lights come on and stay on for at least one hour.	Lights come on when power is shut off?	
2	Record inspection date.	Lights stay on for at least one hour?	
		Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-91	Fire Extinguisher	Outside Control Room	N/A

Task	External Inspection
Frequency	Monthly

	Procedure	Data Recorded	
1	Check to make sure fire extinguisher access is open and unobstructed.	Extinguisher access unobstructed?	
2	Inspect for external damage, cracking, deformation, and discoloration.	External damage, cracking, deformation, corrosion and/or discoloration present?	
3	Inspect for external corrosion.	Adequate cylinder pressure?	
4	Inspect for adequate cylinder/cartridge pressure.	Record condition assessment on hang tag under correct month.	
5	Record fire extinguisher condition assessment on fire extinguisher tag under correct month.		

Device Name	Common Name	Description	Setpoint
PSD-92	Fire Extinguisher	Outside Control Room	N/A

Task	Statutory Inspection / Certification (Third Party)
Frequency	Annual

Procedure	
1	Inspect for external damage, cracking, deformation, and discoloration.
2	Inspect for missing components.
3	Inspect for external corrosion.
4	Inspect for adequate cylinder/cartridge pressure.
5	Inspect component seals and connections.
6	Record fire extinguisher condition assessment and (re)certification.

Data Recorded	
External damage, cracking, deformation, corrosion and/or discoloration present?	
Adequate cylinder pressure?	
Component seals and connections condition?	
Record fire extinguisher condition assessment and (re)certification. Provide new hang tag with correct year for monthly inspections	

Device Name	Common Name	Description	Setpoint
PSD-93	Fire Extinguisher	Inside Main Door	N/A

Task	External Inspection
Frequency	Monthly

Procedure		Data Recorded	
1	Check to make sure fire extinguisher access is open and unobstructed.	Extinguisher access unobstructed?	
2	Inspect for external damage, cracking, deformation, and discoloration.	External damage, cracking, deformation, corrosion and/or discoloration present?	
3	Inspect for external corrosion.	Adequate cylinder pressure?	
4	Inspect for adequate cylinder/cartridge pressure.	Record condition assessment on hang tag under correct month.	
5	Record fire extinguisher condition assessment on fire extinguisher tag under correct month.		

Device Name	Common Name	Description	Setpoint
PSD-94	Fire Extinguisher	Inside Main Door	N/A

Task	Statutory Inspection / Certification (Third Party)
Frequency	Annual

	Procedure
1	Inspect for external damage, cracking, deformation, and discoloration.
2	Inspect for missing components.
3	Inspect for external corrosion.
4	Inspect for adequate cylinder/cartridge pressure.
5	Inspect component seals and connections.
6	Record fire extinguisher condition assessment and (re)certification.

Data Recorded	
External damage, cracking, deformation, corrosion and/or discoloration present?	
Adequate cylinder pressure?	
Component seals and connections condition?	
Record fire extinguisher condition assessment and (re)certification. Provide new hang tag with correct year for monthly inspections	

Device Name	Common Name	Description	Setpoint
PSD-95	Fire Extinguisher	Lab	N/A

Task	External Inspection
Frequency	Monthly

Procedure		Data Recorded	
1	Check to make sure fire extinguisher access is open and unobstructed.	Extinguisher access unobstructed?	
2	Inspect for external damage, cracking, deformation, and discoloration.	External damage, cracking, deformation, corrosion and/or discoloration present?	
3	Inspect for external corrosion.	Adequate cylinder pressure?	
4	Inspect for adequate cylinder/cartridge pressure.	Record condition assessment on hang tag under correct month.	
5	Record fire extinguisher condition assessment on fire extinguisher tag under correct month.		

Device Name	Common Name	Description	Setpoint
PSD-96	Fire Extinguisher	Lab	N/A

Task	Statutory Inspection / Certification (Third Party)
Frequency	Annual

Procedure	
1	Inspect for external damage, cracking, deformation, and discoloration.
2	Inspect for missing components.
3	Inspect for external corrosion.
4	Inspect for adequate cylinder/cartridge pressure.
5	Inspect component seals and connections.
6	Record fire extinguisher condition assessment and (re)certification.

Data Recorded	
External damage, cracking, deformation, corrosion and/or discoloration present?	
Adequate cylinder pressure?	
Component seals and connections condition?	
Record fire extinguisher condition assessment and (re)certification. Provide new hang tag with correct year for monthly inspections	

Device Name	Common Name	Description	Setpoint
PSD-97	Vault 1 Level Sensor	Level Sensor for PLC level indication and alarm points for Vault 1 - Pressure Actuated	Hi-Hi Level Setpoint: 2.5 ft High Level Setpoint : 1.8 ft Low Level Setpoint : -10.0 ft Lo-Lo Level Setpoint: -15.0 ft

Task	Function Test
Frequency	Annual

	Procedure
1	Set Hi-Hi level setpoint below actual level indicated. Verify alarm comes in to PLC and calls out on dialer.
2	Acknowledge alarm and reset Hi-Hi Level setpoint in PLC back to values shown in table above. Reset alarm in PLC.
3	Set High level setpoint below actual level indicated. Verify alarm comes in to PLC.
4	Acknowledge alarm and reset High Level setpoint in PLC back to values shown in table above. Reset alarm in PLC.
5	Set Low level setpoint above actual level indicated. Verify alarm comes in to PLC.
6	Acknowledge alarm and reset Low Level setpoint in PLC back to values shown in table above. Reset alarm in PLC.
7	Set Lo-Lo level setpoint above actual level indicated. Verify alarm comes in to PLC.
8	Acknowledge alarm and reset Low Level setpoint in PLC back to values shown in table above. Reset alarm in PLC.

Data Recorded	
Hi-Hi Level alarm comes in to PLC and calls out on dialer?	
High Level alarm comes in to PLC?	
Low Level alarm comes in to PLC?	
Lo-Lo Alarm comes in to PLC?	
Date	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-98	Vault 1 Level Sensor	Level Sensor for PLC level indication and alarm points for Vault 1 - Pressure Actuated	Hi-Hi Level Setpoint: 2.5 ft High Level Setpoint : 1.8 ft Low Level Setpoint : -10.0 ft Lo-Lo Level Setpoint: -15.0 ft

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.
2	Inspect for external damage, cracking, deformation, and discoloration.
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.
4	Record inspection date.

Data Recorded	
Any leakage noted?	
Any external damage noted?	
Any corrosion or scaling present?	
Record date of inspection.	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-99	Vault 2 Level Sensor	Level Sensor for PLC level indication and alarm points for Vault 2 - Pressure Actuated	Hi-Hi Level Setpoint: 2.0 ft High Level Setpoint : 1.8 ft Low Level Setpoint : -10.0 ft Lo-Lo Level Setpoint: -15.0 ft

Task	Function Test
Frequency	Annual

	Procedure
1	Set Hi-Hi level setpoint below actual level indicated. Verify alarm comes in to PLC and calls out on dialer.
2	Acknowledge alarm and reset Hi-Hi Level setpoint in PLC back to values shown in table above. Reset alarm in PLC.
3	Set High level setpoint below actual level indicated. Verify alarm comes in to PLC.
4	Acknowledge alarm and reset High Level setpoint in PLC back to values shown in table above. Reset alarm in PLC.
5	Set Low level setpoint above actual level indicated. Verify alarm comes in to PLC.
6	Acknowledge alarm and reset Low Level setpoint in PLC back to values shown in table above. Reset alarm in PLC.
7	Set Lo-Lo level setpoint above actual level indicated. Verify alarm comes in to PLC.
8	Acknowledge alarm and reset Low Level setpoint in PLC back to values shown in table above. Reset alarm in PLC.

Data Recorded	
Hi-Hi Level alarm comes in to PLC and calls out on dialer?	
High Level alarm comes in to PLC?	
Low Level alarm comes in to PLC?	
Lo-Lo Alarm comes in to PLC?	
Date	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-100	Vault 2 Level Sensor	Level Sensor for PLC level indication and alarm points for Vault 2 - Pressure Actuated	Hi-Hi Level Setpoint: 2.0 ft High Level Setpoint : 1.8 ft Low Level Setpoint : -10.0 ft Lo-Lo Level Setpoint: -15.0 ft

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.
2	Inspect for external damage, cracking, deformation, and discoloration.
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.
4	Record inspection date.

Data Recorded	
Any leakage noted?	
Any external damage noted?	
Any corrosion or scaling present?	
Record date of inspection.	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-101	Vault 3 Level Sensor	Level Sensor for PLC level indication and alarm points for Vault 3 - Pressure Actuated	Hi-Hi Level Setpoint: 1.5 ft High Level Setpoint : 1.0 ft Low Level Setpoint : -10.0 ft Lo-Lo Level Setpoint: -15.0 ft

Task	Function Test
Frequency	Annual

	Procedure
1	Set Hi-Hi level setpoint below actual level indicated. Verify alarm comes in to PLC and calls out on dialer.
2	Acknowledge alarm and reset Hi-Hi Level setpoint in PLC back to values shown in table above. Reset alarm in PLC.
3	Set High level setpoint below actual level indicated. Verify alarm comes in to PLC.
4	Acknowledge alarm and reset High Level setpoint in PLC back to values shown in table above. Reset alarm in PLC.
5	Set Low level setpoint above actual level indicated. Verify alarm comes in to PLC.
6	Acknowledge alarm and reset Low Level setpoint in PLC back to values shown in table above. Reset alarm in PLC.
7	Set Lo-Lo level setpoint above actual level indicated. Verify alarm comes in to PLC.
8	Acknowledge alarm and reset Low Level setpoint in PLC back to values shown in table above. Reset alarm in PLC.

Data Recorded	
Hi-Hi Level alarm comes in to PLC and calls out on dialer?	
High Level alarm comes in to PLC?	
Low Level alarm comes in to PLC?	
Lo-Lo Alarm comes in to PLC?	
Date	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-102	Vault 3 Level Sensor	Level Sensor for PLC level indication and alarm points for Vault 3 - Pressure Actuated	Hi-Hi Level Setpoint: 1.5 ft High Level Setpoint : 1.0 ft Low Level Setpoint : -10.0 ft Lo-Lo Level Setpoint: -15.0 ft

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.
2	Inspect for external damage, cracking, deformation, and discoloration.
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.
4	Record inspection date.

Data Recorded	
Any leakage noted?	
Any external damage noted?	
Any corrosion or scaling present?	
Record date of inspection.	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-103	Power Disconnect	Local Vault 1 Pump Disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

	Procedure
1	With pump running, shut down pump disconnect.
2	Verify corresponding pump shuts down.
3	Reset disconnect and verify power-up of corresponding equipment.
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.
5	Record Date

Data Recorded	
Pump shuts down?	
Pump restarts when disconnect switched on?	
Record physical condition observations.	
Record date of inspection.	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-104	Power Disconnect	Local Vault 1 Pump Disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

Procedure		Data Recorded	
1	Shut down pump disconnect.		
2	Check wiring interconnection between field instrumentation and control center for physical damage.	Record physical condition observations.	
3	Record Date	Record date of inspection.	
		Technician	

Device Name	Common Name	Description	Setpoint
PSD-105	Power Disconnect	Local Vault 2 Pump Disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

	Procedure
1	With pump running, shut down pump disconnect.
2	Verify corresponding pump shuts down.
3	Reset disconnect and verify power-up of corresponding equipment.
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.
5	Record Date

Data Recorded	
Pump shuts down?	
Pump restarts when disconnect switched on?	
Record physical condition observations.	
Record date of inspection.	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-106	Power Disconnect	Local Vault 2 Pump Disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

Procedure		Data Recorded	
1	Shut down pump disconnect.		
2	Check wiring interconnection between field instrumentation and control center for physical damage.	Record physical condition observations.	
3	Record Date	Record date of inspection.	
		Technician	

Device Name	Common Name	Description	Setpoint
PSD-107	Power Disconnect	Local Vault 3 Pump Disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

	Procedure
1	With pump running, shut down pump disconnect.
2	Verify corresponding pump shuts down.
3	Reset disconnect and verify power-up of corresponding equipment.
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.
5	Record Date

Data Recorded	
Pump shuts down?	
Pump restarts when disconnect switched on?	
Record physical condition observations.	
Record date of inspection.	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-108	Power Disconnect	Local Vault 3 Pump Disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

Procedure		Data Recorded	
1	Shut down pump disconnect.		
2	Check wiring interconnection between field instrumentation and control center for physical damage.	Record physical condition observations.	
3	Record Date	Record date of inspection.	
		Technician	

Device Name	Common Name	Description	Setpoint
PSD-109	Level Sensor	Tank 1 (T-001) Level Sensor for P-004 and P-005 pump operation and alarm points - Pressure Actuated	Hi-Hi Level Alarm (dialer): 4.0 ft High Level Alarm (local): 3.9 ft Lead Pump ON: 3.5 ft Lag Pump ON: 3.8 ft Both Pumps OFF: 2.0 ft Low Level Alarm (local): 0.5 ft Lo-Lo Level Alarm (dialer): 0.4 ft

Task	Function Test
Frequency	Annual

	Procedure		Data Recorded	
1	Set Lead Pump ON setpoint to an elevation value below actual tank water level. Verify pump starts.		Verify Lead Pump ON response physically and on PLC.	
2	Set Lag Pump ON setpoint to a value slightly above the Lead Pump setpoint but below actual water level.		Verify Lag Pump ON response physically and on PLC.	
2	Verify both pumps stop at Both Pumps OFF setpoint.		Verify Both Lead and Lag Pump OFF response physically and on PLC.	
3	Reset Lead and Lag Pump on/off setpoints to values shown in table above.		Pump ON setpoints re-established to values in table above?	
4	Set Hi-Hi level setpoint below actual level indicated. Verify alarm comes in to PLC and calls out on dialer. Verify Vault Pumps P-001, P-002, P-003 are off and locked out.		Hi-Hi Level alarm comes in to PLC and calls out on dialer? Vault pumps locked-out?	
5	Acknowledge alarm and reset Hi-Hi Level setpoint in PLC back to values shown in table above. Reset alarm in PLC. Verify Vault Pumps restore to normal operation.		Alarm resets and Vault Pumps restore to normal operation?	
6	Set High level setpoint below actual level indicated. Verify alarm comes in to PLC.		High Level alarm comes in to PLC?	
7	Acknowledge alarm and reset High Level setpoint in PLC back to values shown in table above. Reset alarm in PLC.		Low Level alarm comes in to PLC?	
8	Set Low level setpoint above actual level indicated. Verify alarm comes in to PLC.		Lo-Lo Alarm comes in to PLC? Pumps P-004 and P-005 OFF/locked-out?	
9	Acknowledge alarm and reset Low Level setpoint in PLC back to values shown in table above. Reset alarm in PLC.		Alarm resets and Pumps P-004 and P-005 restore to normal operation?	
10	Set Lo-Lo level setpoint above actual level indicated. Verify alarm comes in to PLC. Verify Pumps P-004 and P-005 are locked out by PLC.		Date	
11	Acknowledge alarm and reset Low Level setpoint in PLC back to values shown in table above. Reset alarm in PLC.		Technician	

Device Name	Common Name	Description	Setpoint
PSD-110	Level Sensor	Tank 1 (T-001) Level Sensor for pumps P-004 and P-005 operation and alarm points - Pressure Actuated	Hi-Hi Level Alarm (dialer): 4.0 ft High Level Alarm (local): 3.9 ft Lead Pump ON: 3.5 ft Lag Pump ON: 3.8 ft Both Pumps OFF: 2.0 ft Low Level Alarm (local): 0.5 ft Lo-Lo Level Alarm (dialer): 0.4 ft

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.
2	Inspect for external damage, cracking, deformation, and discoloration.
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.
4	Record inspection date.

Data Recorded	
Any leakage noted?	
Any external damage noted?	
Any corrosion or scaling present?	
Record date of inspection.	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-111	Level Switch	Tank 1 (T-001) Hi-Hi Level Float Switch	Approx. 6' Depth

Task	Function Test
Frequency	Annual

Procedure	
1	Access the float either while mounted in place or remove from sump.
2	Push float up to mimic high water level. (Make switch contact)
3	Verify the Hi-Hi Level alarm comes in to PLC and shuts down Vault Pumps P-001, P-002 and P-003.
4	Verify telemetry system calls out to Technician and alarm can be acknowledged.
5	Return float switch to normal service in sump.
6	Record observations.

Data Recorded	
Hi-Hi Level Alarm comes in to PLC and Dialer calls out?	
Vault Pumps OFF/Locked-Out by PLC?	
Verify system resets when float switch is placed back in service.	
Record date.	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-112	Level Switch	Tank 1 (T-001) Hi-Hi Level Float Switch	Approx. 6' Depth

Task	Non-Intrusive External Inspection
Frequency	Quarterly

Procedure		Data Recorded	
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.	Any leakage noted?	
2	Inspect for external damage, cracking, deformation, and discoloration.	Any external damage noted?	
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.	Any corrosion or scaling present?	
4	Record inspection date.	Record date of inspection.	
		Technician	

Device Name	Common Name	Description	Setpoint
PSD-113	Power Disconnect	Local Pump P-004 Power Disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

Procedure	
1	With pump running, shut down pump disconnect.
2	Verify corresponding pump shuts down.
3	Reset disconnect and verify power-up of corresponding equipment.
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.
5	Record Date

Data Recorded	
Pump shuts down?	
Pump restarts when disconnect switched on?	
Record physical condition observations.	
Record date of inspection.	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-114	Power Disconnect	Local Pump P-004 Power Disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

Procedure	
1	Shut down pump disconnect.
2	Check wiring interconnection between field instrumentation and control center for physical damage.
3	Record Date

Data Recorded	
Record physical condition observations.	
Record date of inspection.	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-115	Power Disconnect	Local Pump P-005 Power Disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

	Procedure		Data Recorded	
1	With pump running, shut down pump disconnect.		Pump shuts down?	
2	Verify corresponding pump shuts down.		Pump restarts when disconnect switched on?	
3	Reset disconnect and verify power-up of corresponding equipment.		Record physical condition observations.	
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.		Record date of inspection.	
5	Record Date		Technician	

Device Name	Common Name	Description	Setpoint
PSD-116	Power Disconnect	Local Pump P-005 Power Disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

Procedure		Data Recorded	
1	Shut down pump disconnect.	Record physical condition observations.	
2	Check wiring interconnection between field instrumentation and control center for physical damage.	Record date of inspection.	
3	Record Date	Technician	

Device Name	Common Name	Description	Setpoint
PSD-117	Tank 2 (T-002) Level Sensor	Tank 2 (T-002) Level Sensor for P-006 and P-007 pump operation and alarm points - Pressure Actuated	Hi-Hi Level Alarm (dialer): 7.0 ft High Level Alarm (local): 4.5 ft Lead Pump ON: 3.0 ft Lag Pump ON: 3.5 ft Both Pumps OFF: 0.5 ft Low Level Alarm (local): 0.25 ft Lo-Lo Level Alarm (dialer): -15.0 ft

Task	Function Test
Frequency	Annual

	Procedure		Data Recorded	
1	Set Lead Pump ON setpoint to an elevation value below actual tank water level. Verify pump starts.		Verify Lead Pump ON response physically and on PLC.	
2	Set Lag Pump ON setpoint to a value slightly above the Lead Pump setpoint but below actual water level.		Verify Lag Pump ON response physically and on PLC.	
2	Verify both pumps stop at Both Pumps OFF setpoint.		Verify Both Lead and Lag Pump OFF response physically and on PLC.	
3	Reset Lead and Lag Pump on/off setpoints to values shown in table above.		Pump ON setpoints re-established to values in table above?	
4	Set Hi-Hi level setpoint below actual level indicated. Verify alarm comes in to PLC and calls out on dialer. Tank 1 (T-001) Pumps P-004 and P-005 are off and locked out.		Hi-Hi Level alarm comes in to PLC and calls out on dialer? Tank 1 (T-001) Pumps P-004 and P-005 locked-out?	
5	Acknowledge alarm and reset Hi-Hi Level setpoint in PLC back to values shown in table above. Reset alarm in PLC. Verify Tank 1 (T-001) Pumps P-004 and P-005 restore to normal operation.		Alarm resets and Pumps P-004 and P-005 restore to normal operation?	
6	Set High level setpoint below actual level indicated. Verify alarm comes in to PLC.		High Level alarm comes in to PLC?	
7	Acknowledge alarm and reset High Level setpoint in PLC back to values shown in table above. Reset alarm in PLC.		Low Level alarm comes in to PLC?	
8	Set Low level setpoint above actual level indicated. Verify alarm comes in to PLC.		Lo-Lo Alarm comes in to PLC? Pumps P-006 and P-007 OFF/locked-out?	
9	Acknowledge alarm and reset Low Level setpoint in PLC back to values shown in table above. Reset alarm in PLC.		Alarm resets and Pumps P-006 and P-007 restore to normal operation?	
10	Set Lo-Lo level setpoint above actual level indicated. Verify alarm comes in to PLC. Verify Tank 2 (T-002) Pumps P-006 and P-007 are locked out by PLC.		Date	
11	Acknowledge alarm and reset Low Level setpoint in PLC back to values shown in table above. Reset alarm in PLC. Verify Pumps P-006 and P-007 are returned to normal service.		Technician	

Device Name	Common Name	Description	Setpoint
PSD-118	Level Sensor	Tank 2 (T-002) Level Sensor for pumps P-006 and P-007 operation and alarm points - Pressure Actuated	Hi-Hi Level Alarm (dialer): 7.0 ft High Level Alarm (local): 4.5 ft Lead Pump ON: 3.0 ft Lag Pump ON: 3.5 ft Both Pumps OFF: 0.5 ft Low Level Alarm (local): 0.25 ft Lo-Lo Level Alarm (dialer): -15.0 ft

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.
2	Inspect for external damage, cracking, deformation, and discoloration.
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.
4	Record inspection date.

Data Recorded	
Any leakage noted?	
Any external damage noted?	
Any corrosion or scaling present?	
Record date of inspection.	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-119	Level Switch	Tank 2 (T-002) Hi-Hi Level Float Switch	Approx. 8' Depth

Task	Function Test
Frequency	Annual

	Procedure
1	Access the float either while mounted in place or remove from sump.
2	Push float up to mimic high water level. (Make switch contact)
3	Verify the Hi-Hi Level alarm comes in to PLC and shuts down Tank 1 (T-001) Pumps P-004 and P-005.
4	Verify telemetry system calls out to Technician and alarm can be acknowledged.
5	Return float switch to normal service in sump.
6	Record observations.

Data Recorded	
Hi-Hi Level Alarm comes in to PLC and Dialer calls out?	
Pumps P-004 and P-005 OFF/Locked-Out by PLC?	
Verify system resets when float switch is placed back in service.	
Record date.	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-120	Level Switch	Tank 2 (T-002) Hi-Hi Level Float Switch	Approx. 8' Depth

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.
2	Inspect for external damage, cracking, deformation, and discoloration.
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.
4	Record inspection date.

Data Recorded	
Any leakage noted?	
Any external damage noted?	
Any corrosion or scaling present?	
Record date of inspection.	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-121	Power Disconnect	Local Pump P-006 Power Disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

	Procedure		Data Recorded	
1	With pump running, shut down pump disconnect.		Pump shuts down?	
2	Verify corresponding pump shuts down.		Pump restarts when disconnect switched on?	
3	Reset disconnect and verify power-up of corresponding equipment.		Record physical condition observations.	
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.		Record date of inspection.	
5	Record Date		Technician	

Device Name	Common Name	Description	Setpoint
PSD-122	Power Disconnect	Local Pump P-006 Power Disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

Procedure		Data Recorded	
1	Shut down pump disconnect.	Record physical condition observations.	
2	Check wiring interconnection between field instrumentation and control center for physical damage.	Record date of inspection.	
3	Record Date	Technician	

Device Name	Common Name	Description	Setpoint
PSD-123	Power Disconnect	Local Pump P-007 Power Disconnect	N/A

Task	Function Test / External Inspection
Frequency	Annual

	Procedure		Data Recorded	
1	With pump running, shut down pump disconnect.		Pump shuts down?	
2	Verify corresponding pump shuts down.		Pump restarts when disconnect switched on?	
3	Reset disconnect and verify power-up of corresponding equipment.		Record physical condition observations.	
4	Inspect disconnect and associated conduit for external damage, cracking, deformation, discoloration and corrosion. Pay attention especially to wet areas.		Record date of inspection.	
5	Record Date		Technician	

Device Name	Common Name	Description	Setpoint
PSD-124	Power Disconnect	Local Pump P-007 Power Disconnect	N/A

Task	Internal Inspection
Frequency	Every Three Years

Procedure	
1	Shut down pump disconnect.
2	Check wiring interconnection between field instrumentation and control center for physical damage.

Data Recorded	
Record physical condition observations.	
Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-125	Vacuum Relief Device	3" Rupture Disc for Tank 2 (T-002)	5" Water Column Vac

Task	External Inspection
Frequency	Quarterly

	Procedure		Data Recorded	
1	Check for exterior of holder for leaks at inlet and outlet/vent connections, stem (if applicable), and mating surfaces with attention to o-rings and gaskets.		Leakage apparent?	
2	Inspect for external damage, cracking, deformation, and discoloration.		External damage, cracking, deformation, and discoloration present?	
3	Inspect for external corrosion.		External corrosion present?	
4	Record date.		Record date of inspection.	
			Technician	

Device Name	Common Name	Description	Setpoint
PSD-126	Vacuum Relief Device	3" Rupture Disc for Tank 2 (T-002)	5" Water Column Vac

Task	Internal Inspection
Frequency	Annual

	Procedure	Data Recorded	
1	Inspect for dents, scratches, dings, and/or thinning of the rupture disk.	Dents, scratches, dings, and/or thinning of the rupture disk present?	
2	Inspect for foreign material on the rupture disk.	Foreign material on the rupture disk?	
3	Inspect disk seat for scratches, dents, nicks, corrosion, deposits, or flaws that may adversely affect sealing and disk burst pressure.	Scratches, dents, nicks, corrosion, deposits, or flaws on disk seats that may adversely affect sealing and disk burst pressure?	
4	Inspect gaskets for flexibility and competency. Verify gasket faces are flat and not scored, nicked, or torn.	Gaskets flexible and competent? Verify gasket faces are flat and not scored, nicked, or torn.	
5	Record date.	Record date of inspection & technician.	

Device Name	Common Name	Description	Setpoint
PSD-127	Pressure Relief Device	3" Rupture Disc for Tank 2 (T-002)	9" Water Column Pressure

Task	External Inspection
Frequency	Quarterly

	Procedure
1	Check for exterior of holder for leaks at inlet and outlet/vent connections, stem (if applicable), and mating surfaces with attention to o-rings and gaskets.
2	Inspect for external damage, cracking, deformation, and discoloration.
3	Inspect for external corrosion.
4	Record date.

Data Recorded	
Leakage apparent?	
External damage, cracking, deformation, and discoloration present?	
External corrosion present?	
Record date of inspection.	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-128	Pressure Relief Device	3" Rupture Disc for Tank 2 (T-002)	9" Water Column Pressure

Task	Internal Inspection
Frequency	Annual

	Procedure	Data Recorded	
1	Inspect for dents, scratches, dings, and/or thinning of the rupture disk.	Dents, scratches, dings, and/or thinning of the rupture disk present?	
2	Inspect for foreign material on the rupture disk.	Foreign material on the rupture disk?	
3	Inspect disk seat for scratches, dents, nicks, corrosion, deposits, or flaws that may adversely affect sealing and disk burst pressure.	Scratches, dents, nicks, corrosion, deposits, or flaws on disk seats that may adversely affect sealing and disk burst pressure?	
4	Inspect gaskets for flexibility and competency. Verify gasket faces are flat and not scored, nicked, or torn.	Gaskets flexible and competent? Verify gasket faces are flat and not scored, nicked, or torn.	
5	Record date.	Record date of inspection & technician.	

Device Name	Common Name	Description	Setpoint
PSD-129	Flexible Coupling Security Cables	Tank 2 (T-002) Bottom Outlet Flexible Coupling	N/A

Task	External Inspection
Frequency	Quarterly

Procedure		Data Recorded	
1	Inspect for external damage, cracking, deformation, and discoloration of flexible connector.	External damage, cracking, deformation, corrosion and/or discoloration present?	
2	Inspect the four stainless security cables.	Are security cables intact and have some slack?	
3	Cables intact and have some slack.	Record date of inspection.	

Device Name	Common Name	Description	Setpoint
PSD-130	Differential Pressure Sensors	Differential Pressure Sensors for VWCC Bag Filter Operation	Hi-Hi Diff. Pressure Alarm (Dialer): 25 psi High Diff. Pressure Alarm (Local): 12 psi Low Diff. Pressure Alarm (Local): -15.0 ft Lo-Lo Diff. Pressure Alarm (Local): -25.0 ft

Task	Function Test
Frequency	Annual

	Procedure
1	With either Pump P-006 or P-007 running, close the outlet valve for the operational pair of bag filters through the PLC.
2	Verify high differential pressure alarm come activates in PLC and filter pair is switched.
3	Acknowledge and reset the high differential pressure alarm.
4	Open filter outlet valve closed in Step 1 above.
5	With either Pump P-006 or P-007 running, close the outlet valve for the operational pair of bag filters through the PLC.
6	Verify high differential pressure alarm come activates in PLC and filter pair is switched.
7	Acknowledge and reset the high differential pressure alarm.
8	Open filter outlet valve closed in Step 5 above.

Data Recorded	
High pressure alarm comes in to PLC and filter pair is switched?	
Alarm acknowledges and resets?	
High pressure alarm comes in to PLC and filter pair is switched?	
Alarm acknowledges and resets?	
Record date.	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-131	Differential Pressure Sensors	Differential Pressure Sensors for VWCC Bag Filter Operation	Hi-Hi Diff. Pressure Alarm (Dialer): 25 psi High Diff. Pressure Alarm (Local): 12 psi Low Diff. Pressure Alarm (Local): -15.0 ft Lo-Lo Diff. Pressure Alarm (Local): -25.0 ft

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure	Data Recorded	
1	Check for external pressure sensors (2) leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.	Any leakage noted?	
2	Inspect for external damage, cracking, deformation, and discoloration.	Any external damage noted?	
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.	Any corrosion or scaling present?	
4	Record inspection date.	Record date of inspection & technician.	

Device Name	Common Name	Description	Setpoint
PSD-132	Level Switch	Tank 801 (T-801) Hi-Hi Level Float Switch	Approx. 12' Depth

Task	Function Test
Frequency	Annual

	Procedure
1	Access the float either while mounted in place or remove from tank.
2	Push float up to mimic high water level. (Make switch contact)
3	Verify the Hi-Hi Level alarm comes in to PLC and shuts down Tank 2 (T-002) Pumps P-006 and P-007.
4	Verify telemetry system calls out to Technician and alarm can be acknowledged.
5	Return float switch to normal service in tank.
6	Record observations.

Data Recorded	
Hi-Hi Level Alarm comes in to PLC and Dialer calls out?	
Pumps P-006 and P-007 OFF/Locked-Out by PLC?	
Verify system resets when float switch is placed back in service.	
Record date.	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-133	Level Switch	Tank 801 (T-801) Hi-Hi Level Float Switch	Approx. 12' Depth

Task	Non-Intrusive External Inspection
Frequency	Quarterly

	Procedure
1	Check for external switch leaks at connections, diaphragm (if applicable), adjustment dial or handle (if applicable) with attention to metal to metal seats, o-rings, and gaskets.
2	Inspect for external damage, cracking, deformation, and discoloration.
3	Inspect for corrosion, fouling, and scaling with attention to free movement wetted parts.
4	Record inspection date.

Data Recorded	
Any leakage noted?	
Any external damage noted?	
Any corrosion or scaling present?	
Record date of inspection.	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-134	Automatic Telephone Dialer- 7	Vault 1 Hi-Hi Level Alarm	N/A

Task	Function Test
Frequency	Annual

Procedure		Data Recorded	
1	See PSD-97		
		Date PSD-97 Completed	
		Technician	

Device Name	Common Name	Description	Setpoint
PSD-135	Automatic Telephone Dialer- 8	Vault 2 Hi-Hi Level Alarm	N/A

Task	Function Test
Frequency	Annual

	Procedure
1	See PSD-99

Data Recorded	
Date PSD-99 Completed	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-136	Automatic Telephone Dialer- 9	Vault 3 Hi-Hi Level Alarm	N/A

Task	Function Test
Frequency	Annual

Procedure		Data Recorded	
1	See PSD-101		
		Date PSD-101 Completed	
		Technician	

Device Name	Common Name	Description	Setpoint
PSD-137	Automatic Telephone Dialer- 10	Tank 1 Hi-Hi Level Alarm (sensor)	N/A

Task	Function Test
Frequency	Annual

Procedure	
1	See PSD-109

Data Recorded	
Date PSD-109 Completed	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-138	Automatic Telephone Dialer- 11	Tank 1 Hi-Hi Level Alarm (float)	N/A

Task	Function Test
Frequency	Annual

Procedure	
1	See PSD-111

Data Recorded	
Date PSD-111 Completed	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-139	Automatic Telephone Dialer- 12	Tank 2 Hi-Hi Level Alarm (sensor)	N/A

Task	Function Test
Frequency	Annual

Procedure	
1	See PSD-117

Data Recorded	
Date PSD-117 Completed	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-140	Automatic Telephone Dialer- 13	Tank 2 Hi-Hi Level Alarm (float)	N/A

Task	Function Test
Frequency	Annual

Procedure	
1	See PSD-119

Data Recorded	
Date PSD-119 Completed	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-141	Automatic Telephone Dialer- 14	Tank 801 Hi-Hi Level Alarm (float)	N/A

Task	Function Test
Frequency	Annual

Procedure	
1	See PSD-119

Data Recorded	
Date PSD-119 Completed	
Technician	

Device Name	Common Name	Description	Setpoint
PSD-142	Electric Heat Trace	VWCC Piping Heat Trace Doghouse at Metaullics Bldg.	40F

Task	Function Test
Frequency	Annual* *Note: Event should occur prior to commencement of seasonal freeze protection activation. Annual*

	Procedure
1	Check heat trace indicator panel on outside of dog house. Green status light should be on to indicate circuit is powered-up.
2	Check heat trace indicator panel on outside of dog house. Red GFEP status light should NOT be on indicating circuit is energized and not experiencing any ground fault issues.
3	When temperatures are below 40F, periodically the yellow status light will come on to indicate power being applied to heat trace.

Data Recorded	
Green light indicating power on?	
Red GFEP ON?	
Yellow light cycles indicating trace is functioning?	
Record date of inspection and technician.	

Device Name	Common Name	Description	Setpoint
PSD-143	Electric Heat Trace	VWCC Piping Heat Trace Doghouse at Metaullics Bldg.	40F

Task	External Inspection
Frequency	Quarterly* *Note: One quarterly event should occur prior to commencement of seasonal freeze protection activation.

	Procedure		Data Recorded	
1	Inspect controller and connections for external damage, cracking, deformation, and discoloration.		Controller and connections in good shape?	
2	Inspect for external corrosion.		Corrosion present?	
3	Inspect electrical connections for flexibility and competency.		Electrical connections good?	
4	Inspect freeze protection device signage/placards for presence, damage, cracking, deformation, and discoloration.		Freeze protection signage/placards present and in good shape?	
5	Record date.		Record date and technician.	

Device Name	Common Name	Description	Setpoint
PSD-144	Electric Heat Trace	VWCC Piping Heat Trace Metaullics Bldg. Trench Under Doorway	40F

Task	Function Test
Frequency	Annual* *Note: Event should occur prior to commencement of seasonal freeze protection activation. Annual*

	Procedure
1	Check heat trace indicator panel located under tar melt tank. Green status light should be on to indicate circuit is powered-up.
2	Check heat trace indicator panel - red GFEP status light should NOT be on indicating circuit is energized and not experiencing any ground fault issues.
3	When temperatures are below 40F, periodically the yellow status light will come on to indicate power being applied to heat trace.

Data Recorded	
Green light indicating power on?	
Red GFEP ON? If yes, repairs are needed.	
Yellow light cycles indicating trace is functioning?	
Record date of inspection and technician.	

Device Name	Common Name	Description	Setpoint
PSD-145	Electric Heat Trace	VWCC Piping Heat Trace Metaullics Bldg. Trench Under Doorway	40F

Task	External Inspection
Frequency	Quarterly* *Note: One quarterly event should occur prior to commencement of seasonal freeze protection activation.

	Procedure		Data Recorded	
1	Inspect controller and connections for external damage, cracking, deformation, and discoloration.		Controller and connections in good shape?	
2	Inspect for external corrosion.		Corrosion present?	
3	Inspect electrical connections for flexibility and competency.		Electrical connections good?	
4	Inspect freeze protection device signage/placards for presence, damage, cracking, deformation, and discoloration.		Freeze protection signage/placards present and in good shape?	
5	Record date.		Record date and technician.	

Device Name	Common Name	Description	Setpoint
PSD-146	Electric Heat Trace	VWCC Piping Heat Trace Doghouse at Treatment Bldg.	40F

Task	Function Test
Frequency	Annual* *Note: Event should occur prior to commencement of seasonal freeze protection activation.

	Procedure
1	Check heat trace indicator panel located inside building at doghouse location. Green status light should be on to indicate circuit is powered-up.
2	Check heat trace indicator panel - red GFEP status light should NOT be on indicating circuit is energized and not experiencing any ground fault issues.
3	When temperatures are below 40F, periodically the yellow status light will come on to indicate power being applied to heat trace.

Data Recorded	
Green light indicating power on?	
Red GFEP ON? If yes, repairs are needed.	
Yellow light cycles indicating trace is functioning?	
Record date of inspection and technician.	

Device Name	Common Name	Description	Setpoint
PSD-147	Electric Heat Trace	VWCC Piping Heat Trace Metaullics Bldg. Trench Under Doorway	40F

Task	External Inspection
Frequency	Quarterly* *Note: One quarterly event should occur prior to commencement of seasonal freeze protection activation.

	Procedure	Data Recorded	
1	Inspect controller and connections for external damage, cracking, deformation, and discoloration.	Controller and connections in good shape?	
2	Inspect for external corrosion.	Corrosion present?	
3	Inspect electrical connections for flexibility and competency.	Electrical connections good?	
4	Inspect freeze protection device signage/placards for presence, damage, cracking, deformation, and discoloration.	Freeze protection signage/placards present and in good shape?	
5	Record date.	Record date and technician.	

Attachment V

Permits
Air Registration

New York State Department of Environmental Conservation
Division of Environmental Permits, 4th Floor
625 Broadway, Albany, NY 12233-1750
Phone: (518) 402-9167 • **Fax:** (518) 402-9168
Website: www.dec.ny.gov

DEC - 7 2011

Joe Martens
Commissioner

FACILITY INFORMATION

NAME: Former Carborundum Complex – Cory Rd
LOCATION: Wheatfield (T)
COUNTY: Niagara
SPDES NO: NY 000 1988
DEC ID NO.: 9-2940-00059/00003

William B. Barber
Elm Holdings Inc c/o BP Exploration
4850 E 49th St Rm MBC3-147
Cuyahoga Heights, OH 44125

Dear SPDES Permittee:

Enclosed please find a validated NOTICE/RENEWAL APPLICATION/PERMIT form renewing your State Pollutant Discharge Elimination System (SPDES) permit for the referenced facility. This validated form, together with the previously issued permit (see issuance date of this permit in Part 3 of the NOTICE/RENEWAL APPLICATION/PERMIT form), and any subsequent permit modifications constitute authorization to discharge wastewater in accordance with all terms, conditions and limitations specified therein.

The instructions and other information that you received with the NOTICE/RENEWAL APPLICATION/PERMIT package fully described procedures for renewal and modification of your SPDES permit under the Environmental Benefit Permit Strategy (EBPS). As a reminder, SPDES permits are renewed at a central location in Albany in order to make the process more efficient. All other concerns with your permit such as applications for permit modifications, permit transfers to a new owner, name changes, and other questions should be directed to the Regional Permit Administrator at the following address:

Dave Denk
NYSDEC-Region 9
270 Michigan Avenue
Buffalo, NY 14203-2999
(716)851-7165

If you have already filed an application for modification of your permit, it will be processed separately through our regional office. If you have questions concerning this permit renewal, please contact Lindy Sue Czubernat at (518) 402-9165.

Sincerely,

Lindy Sue Czubernat

Agency Program Aide

Enclosure

cc: RPA
RWE
BWP

91-20-5 (5/97)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
State Pollutant Discharge Elimination System (SPDES)
NOTICE / RENEWAL APPLICATION / PERMIT

Please read **ALL** instructions on the back before completing this application form. Please **TYPE** or **PRINT** clearly in ink.

PART 1 - NOTICE 05/10/2011

Permittee Contact Name, Title Address

ELM HOLDINGS INC C/O BP EXPLORATION
WILLIAM B. BARBER
4850 E 49TH ST, RM MBC3-147
CUYAHOGA HEIGHTSOH 44125

Facility and SPDES Permit Information

Name: FORMER CARBORUNDUM COMPLEX - CORY
Ind. Code: 9511 County: NIAGARA
DEC No.: 9-2940-00059/00003
SPDES No.: NY 000 1988
Expiration Date: 03/31/2012
Application Due By: 10/03/2011

Are these name(s) & address(es) correct? if not, please write corrections above

The State Pollutant Discharge Elimination System Permit for the facility referenced above expires on the date indicated. You are required by law to file a complete renewal application **at least 180 days prior to expiration of your current permit**. **Note the "Application Due By" date above**

CAUTION: This short application form and attached questionnaire are the only forms acceptable for permit renewal. Sign Part 2 below and mail only this form and the completed questionnaire using the enclosed envelope *Effective April 1, 1994 the Department no longer assesses SPDES application fees*

If there are changes to your discharge, or to operations affecting the discharge, then in addition to this renewal application, you must also submit a separate permit modification application to the Regional Permit Administrator for the DEC region in which the facility is located, as required by your current permit See the reverse side of this page for instructions on filing a modification request.

PART 2 - RENEWAL APPLICATION

CERTIFICATION: I hereby affirm that under penalty of perjury that the information provided on this form and all attachments submitted herewith is true to the best of my knowledge and belief. False statements made herein are punishable as a Class A misdemeanor pursuant to section 210 45 of the Penal Law.

William B. Barber — Project Manager

Name of person signing application (see instructions on back) — **Title**

Signature

Sept. 28, 2011

Date

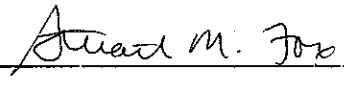
PART 3 - PERMIT (Below this line - Official Use Only)

Effective Date: 4/1/12 **Expiration Date:** 3/31/17

Stuart Fox

Permit Administrator

Address: NYSDEC - Division of Environmental Permits
Bureau of Environmental Analysis
625 Broadway, Albany, NY 12233-1750



Signature

DEC - 7 2011

Date

This permit together with the previous valid permit for this facility issued 4/1/07 and subsequent modifications constitute authorization to discharge wastewater in accordance with all terms, conditions and limitations specified in the previously issued valid permit, modifications thereof or issued as part of this permit, including any special or general conditions attached hereto. Nothing in this permit shall be deemed to waive the Department's authority to initiate a modification of this permit on the grounds specified in 6NYCRR §621 14, 6NYCRR §754 4 or 6NYCRR §757 1 existing at the time this permit is issued or which arise thereafter.

~~Attachments: General Conditions dated ___/___~~

11 SEP 29 PM 2:22

RECEIVED NYSDEC

91-20-5a (5/97)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Please enter the numbers from your current permit:

DEC Number 9 - 2940 - 00059 / 0000 - 3

SPDES Number NY 000 1988

SPDES RENEWAL APPLICATION QUESTIONNAIRE

THIS PAGE MUST BE COMPLETED AND RETURNED WITH YOUR COMPLETED APPLICATION

Please TYPE or PRINT neatly using adequate pressure to make ALL copies legible Keep a copy for your records

1 Has the SPDES permit for your facility been modified in the past 5 years ☒ YES ☐ NO

2 Dischargers who use, manufacture, store, handle or discharge toxic or hazardous pollutants are subject to Industrial Best Management Practices (BMP) plan requirements for toxic or hazardous substances. A BMP plan prevents or minimizes the potential for release of pollutants to receiving waters from such ancillary industrial activities, including material storage areas; plant site runoff; in-plant transfer; process and material storage areas; loading and unloading operations, and sludge and waste disposal areas

Does your facility conduct ancillary activities as described above, which are not covered by BMP requirements in your current permit? ☐ YES ☒ NO

Please indicate which of the following best describes the situation at your facility:

☐ None of the concerns on the "Self Evaluation List" seem to apply to my facility at this time and I will not be applying for a modification of the SPDES permit in the foreseeable future

☐ Yes, some of the items on the "Self Evaluation List" have led me to believe that the permit for this facility needs to be modified I already have a complete modification application pending with the Department

☐ Yes, some of the items on the "Self Evaluation List" have led me to believe that the SPDES permit for this facility may need to be Modified I have requested the appropriate forms by phone OR I have completed and attached the "Request For SPDES Application Forms" (included in this renewal package) to allow me to submit a permittee-initiated Modification application See The "Request For SPDES Application Forms" page for a toll free 800 number

☒ The items on the "Self Evaluation List" have left me unable to conclude whether my permit needs to be modified at this time I am reporting the following general concerns about my permit:

A vault water collection and conveyance system was approved by the NYSDEC in July 2011. The vault water collection and conveyance piping will route the collected water to the current groundwater treatment system. A copy of the approved system design can be transmitted to NYSDEC if requested. Operation of the vault water collection system is estimated to begin in the spring of 2012. After vault water collection system installation the operating parameters of the recovery system will be evaluated to determine if permit modifications are warranted. At present flow is anticipated to remain within current permit limits and no changes in water chemistry are anticipated.

DISTRIBUTION: Regional Water Engineer
Regional Permit Administrator
Central Office (BWP)

New York State Department of Environmental Conservation
Division of Environmental Permits, 4th Floor
625 Broadway, Albany, NY 12233-1750
Phone: (518) 402-9167 • **Fax:** (518) 402-9168
Website: www.dec.ny.gov

FEB 2 5 2010

Alexander B. Grannis
Commissioner

February 23, 2010

Mr. William B. Barber
Project Manager
Elm Holdings Inc., c/o BP
4850 E. 49th St., MBC3-147
Cleveland, OH 44125

Re: Former Carborundum Complex
DEC#: 9-2940-00059/00003 SPDES#: NY0001988

Dear Mr. Barber:

Enclosed is a final modified State Pollutant Discharge Elimination System (SPDES) permit for the above referenced facility. This permit has been modified in accordance with the Environmental Benefit Permit Strategy. Comments were received on this modification from you and are addressed in the enclosed response to comments.

Should you have questions on the administration of this modification, please feel free to contact me at the address or phone number listed above. Should you have technical questions on permit content, please contact the permit writer, Catherine Hardison, at (518) 402-8280, or the Regional Water Engineer, Gerry Palumbo, at (716) 851-7070.

Sincerely,

Teresa Diehsner
Division of Environmental Permits

Enclosure

c: S. Doleski, RPA
G. Palumbo, RWE
C. Hardison, Permit Writer
CO-BWP Permit Coordinator
M. Josilo, EPA Reg II
N. Regels, NYSEFC
B. Kirschner, IJC
NYSDOH County Office

NYSDEC Response to Comments
Former Carborundum Site (NY0001988)
December 15, 2009
Prepared by: Catherine Hardison

Comments submitted by: William B. Barber, Atlantic Richfield Company for Elm Holdings, Inc.

Background: The above referenced draft SPDES permit was developed as a Department initiated modification in accordance with New York State's Priority Ranking System, known as the Environmental Benefit Permit Strategy (EBPS). Modifications were made in accordance with New York State rules, regulations and guidance.

A Request for Information under the EBPS system was sent to Elm Holdings, Inc., (Permittee) on November 30, 2007. Based upon the review of this information, a revised SPDES permit was drafted. On November 10, 2008, a Notice of Intent to Modify was sent to the Permittee. The Notice was published in the Environmental Notice Bulletin and the Tonawanda News on November 26, 2008. A public comment period ensued, ending on December 26, 2008. As a result of comments received dated December 23, 2009, the permit was modified and a second Notice of Intent to Modify was sent to the Permittee on May 29, 2009. The second Notice was published in the Environmental Notice Bulletin on June 10, 2009 and the Tonawanda News on May 12, 2009 with the public comment period ending on July 10, 2009. Comments dated July 9, 2009 were received from the Permittee and are addressed below.

Comment 1: Our calculated values for the 99th percentile concentrations for these four [cadmium, copper, lead, and zinc] metals for May 2008 to February 2009 are as follows: cadmium at 6.4 µg/L; copper at 32 µg/L; lead at 44 µg/L; and zinc at 2.51 µg/L (Attachment 2). These 99th percentile concentrations differ, in some cases significantly, from the values reported in the Fact Sheet and used as the daily maximum permit limits for these metals. Elm Holdings respectfully requests that NYSDEC provide the calculations that it used to estimate the 99th percentile effluent concentrations shown in the Fact Sheet for these metals (and the other parameters regulated) to clarify how these values were determined.

> **DEC Response:** The guidance provided in Appendix E of the USEPA Technical Support Document for Water Quality-Based Toxics Control (March 1991) was used in calculating the 99th percentile of the metals in question. Lognormal analysis was performed on total zinc; delta-lognormal analysis was performed on total copper, total cadmium, and total lead. Some data used in analysis were determined to be outliers and were removed from analysis. Those data are as follows:
>
> Zinc: 2.41 mg/L (5-2008) – Removed because the elevated zinc concentration is believed to be the result of the new well (PW-4) coming online. Reviewing the DMR data prior to bringing the well online and the data afterwards provides evidence of this assessment.
>
> Copper: 27 µg/L (9-2008) – Removed because the value was determined to be an outlier according to the best professional judgment of the permit writer. This assessment was based on reviewing the DMR data submitted from May 2008 to October 2009.
>
> Cadmium: 6 µg/L (12-2008) – Removed because the value was determined to be an outlier according to the best professional judgment of the permit writer. This assessment was based on reviewing the DMR data submitted from May 2008 to October 2009.

Lead: 36 µg/L (5-2008) – Removed because the elevated lead concentration is believed to be the result of the new well (PW-4) coming online. Reviewing the DMR data prior to bringing the well online and the data afterwards provides evidence of this assessment.

The 99th percentiles for the aforementioned metals have been revised to be based on data from May 2008 to October 2009 and are as follows:

Total Zinc: 2.0 mg/L
Total Cadmium: 3.9 µg/L
Total Copper: 19 µg/L
Total Lead: 25 µg/L

As requested, the calculations used to determine these effluent limits are provided at the end of this responsiveness summary. The fact sheet and permit have been updated accordingly to account for outliers and typos.

Comments 2 and 3: Metals Engineering report: At the effective date of the permit modification (EDPM) plus three months an engineering report shall be submitted detailing methods to reduce as much as practicable (if any) the effluent concentrations of cadmium, copper, lead and zinc. Mercury: Elm Holdings shall comply with the monitoring defined in the schedule of compliance.

DEC Response: The comments have been noted.

Comment 4: Cyanide: Elm Holdings shall comply with the monitoring defined in the schedule of compliance. As a point of clarification, please provide the minimum detection limits required. Elm Holdings is interested in evaluating alternative analytical methodologies for this parameter.

DEC Response: In the reviewing the compliance schedule item for Total Cyanide monitoring, the incorrect EPA Method was stated. The appropriate method for Total Cyanide analysis is EPA Method 335.4 with a Practical Quantitation Limit (PQL) of 20 µg/L. Please be advised that alternative analytical methodologies need to be approved under 40 CFR Part 136 to be valid for permit reporting.

Comment 5: Total Dissolved Solids: A short-term high-intensity monitoring program will be implemented.

DEC Response: The comment has been noted.

Comment 6: The current SPDES permit has a level of 8 µg/L for phenols. NYSDEC initially proposed that the limit remain at 8 µg/L, and subsequently revised the limit to 5 µg/L. It is unclear why the permit level of phenols was lowered to 5 µg/L. Elm Holdings requests that the permit limit remain at 8 µg/L.

DEC Response: The Water Quality-based Effluent Limit (WQBEL) for Total Phenols is 5 µg/L. When the draft permit was first public noticed in November 2008, the permit limit was set at 8

µg/L, because this value was the PQL of EPA Method 420.2, the most sensitive applicable analytical method at the time, as required in 40 CFR Part 132. EPA Method 420.2 has been withdrawn by USEPA, and no longer meets the analysis requirements for SPDES permits. The current approved method for Total Phenols is EPA Method 420.4 with a PQL of 5.0 µg/L. Because this method has a PQL equal to the WQBEL, the permit limit was lowered and will remain in the permit.

Comment 7: Lead: Elm Holdings, Inc. shall comply with the monitoring defined in the schedule of compliance.

DEC Response: The comment has been noted.

Comment 8: Flow Rate: Elm Holdings, Inc. requests an increase in the maximum flow rate of the Groundwater Treatment System to 288,000 gallons per day (gpd). The groundwater treatment system uses a number of recovery wells. As such, flexibility is needed to accommodate system operations issues (e.g., variations in pumping rates at individual wells, maintenance activities) and potentially additional recovery actions.

DEC Response: The information provided in the NY-2C application submitted in February 2008 states a maximum design flow rate of 144,000 gpd (100 gpm). The three treatment processes stated in the application (i.e., bag filters, low profile air stripper, and GAC reactors) all have a design flow rate of 100 gpm. To increase the maximum flow rate of the Groundwater Treatment System to 288,000 gpd, Elm Holdings, Inc. needs to provide engineering design documentation that all three treatment processes are designed to treat the increase in flow rate. This request will be treated as a permittee initiated modification to the SPDES permit and will not be part of this department initiated modification.

In Elm Holding's argument for increasing the maximum flow rate to 288,000 gpd (200 gpm), influent data from March 2009 was used in the efficiency modeling. No reasoning was provided as to why this data set was chosen for modeling. The Department would prefer if a "worst case scenario" approach was used in the efficiency modeling to determine at which flow rate the air stripper becomes marginalized. For each VOC parameter requiring monitoring in the SPDES permit, the highest influent concentration over the past three years of data should be inputted into the efficiency model to determine the appropriate flow rate before marginalization occurs. This information will aid the Department in establishing a maximum flow rate for the Groundwater Treatment System.

Comment 9: Chlorine Residual: At the EDPM total residual chlorine will be monitored only. Total Residual chlorine will be measured in the field. An engineering report describing methods, if any, to reduce effluent concentrations to within the revised limit will be completed within 6 months of EDPM.

DEC Response: The comment has been noted.

Comment 10: Type I Monitoring Action Level (Silver and Nickel): All silver and nickel that is present in

the discharge is from natural occurrence. None of the silver or nickel is from current or historical site practices or from the groundwater treatment process.

Silver and nickel will frequently exceed the proposed monitoring action level. Nickel in discharge samples collected from December 2006 to March 2009 was between 6 µg/L and 10 µg/L. The calculated pounds per day in effluent would have been greater than the proposed level of 0.006 lbs/day on five occasions between December 2006 and March 2009. Between December 2006 and March 2009, all silver analyses were below the analytical detection limits (<5 µg/L). The resulting pounds per day in effluent were between <0.002 and <0.0061 lbs/day and would have been greater than the proposed level of 0.001 lbs/day on eight occasions between December 2006 and March 2009. Elm Holdings requests that the nickel and silver conditions in the permit be changed to monitoring only.

DEC Response: The Department recognizes that the silver and nickel in the discharge is from natural occurrence and not from site practices or from the groundwater treatment process. However, these metals are Priority Pollutants and the action levels provide the Department with a means to monitor the discharge and revisit the permit, if necessary, in the event the action level is exceeded.

The original draft action level for Total Nickel was based on the 95th percentile of data collected from June 2006 to December 2008. Because the action level is reported as a Daily Maximum value, the 99th percentile would be more appropriate. The revised action level is 0.026 lb/d and shall remain in the permit.

The action level for Total Silver will remain in the permit, but the value has been revised to be based on the 99th percentile of Discharge Monitoring Report data submitted between June 2006 and March 2009. Delta-lognormal analysis was used to calculate the Daily Maximum, and the new action level is 0.006 lb/d. Additionally, Total Silver has been added to the Special Conditions requiring the use of EPA Method 200.8.

Please be advised that exceedances of action levels do not constitute as a permit violation and only require the permittee to undertake a short-term, high-intensity monitoring program for the parameter, as specified on Page 2 of the permit.

Comment 11: Sample Type: For the non-volatile organic compounds modify the 24-hour sample type to an eight hour composite of four grab samples, one every two hours, over an eight hour period. The non-volatile organic compound grab samples would then be composited in the field.

DEC Response: The Sample Type for the non-volatile organic compounds shall remain as 24-hour composites. The Sample Type for volatile organic compounds (VOCs) was modified to 8-hour composites because sample collection is to be done manually onsite and the site is manned 8 hours a day. Elm Holdings also brought to the attention of the attention of the Department that the VOC automatic sampler was no longer an option. Since sample collection for VOCs requires grab samples as to not volatilize the target compounds, the modification of Sample Type was deemed reasonable.

Sampling for Total Metals, BOD_5, and Total Suspended Solids do not require grab samples to prevent volatilization prior to analysis, and samples can be obtained by the use of readily available

automatic compositors. The discharge from the groundwater treatment system is also continuous, discharging 24 hours a day. For the Department to get a full characterization of the daily effluent, 24-hour composites are necessary.

Comment 12: Special Conditions: What are NYSDEC's minimum required detection limits for these methodologies?

DEC Response: The PQLs (or Minimum Levels [MLs] for consistency with USEPA nomenclature) for the EPA Methods listed in the Special Conditions are based on the published Method Detection Limit (MDL) or ML published in 40 CFR Part 136 or the National Environmental Methods Index. For analytes where only a MDL is available, the ML is calculated using procedures developed by USEPA found at the following URL: http://www.epa.gov/waterscience/methods/det/faca/techworkgroup/EPAML.html.

The Special Conditions have been revised to take into account that monitoring using methods sensitive enough to meet permit limits is required. For EPA Method 200.8, the following parameters and their respective MLs/PQLs are:

- Total Cadmium – 2 µg/L
- Total Lead – 2 µg/L
- Total Copper – 2 µg/L
- Total Silver – 0.2 µg/L

For Total Phenols, the most sensitive method is EPA Method 420.4 with a ML/PQL of 5 µg/L.

Comment 13: Footnotes: Analytical results comparing the individual VOC grab samples to the laboratory composited VOC grab samples will be submitted to the department.

DEC Response: The comment has been noted.

Statistical Analysis Sheet for SPDES Permit Limits

Monthly Average and Daily Maximum Permit Limit Calculations, 95th and 99th Percentile

Based on guidance from USEPA "Technical Support Document for Water Quality Based Toxics Control," 3/91

Instructions

Enter the facility and outfall data, influent/effluent data, dates, number of samples per month, and existing limit into the unshaded cells below.
Wastewater data may be copy-pasted from the raw data obtained from ICIS.

For data with up to 3 nondetects ("<" code in DMR data), set the effluent concentration at the detection level and note the dates in the "Notes:" area below the limits.

If more than three nondetects are present, use the daily max calculations on page 2 of this spreadsheet, or the daily average calculations on page 3 of this spreadsheet.

For municipal plants subject to secondary treatment regs, the secondary limits must remain in the permit; see TOGS 1.3.3 for more information.

Permittee Name:	Elm Holdings, Inc.
SPDES No.:	NY 000 1988

Outfall No.:	001	
Parameter:	Zinc, total (as Zn)	
Limit Type:	Daily max	
Units:	mg/L	ln(mg/L)
5/31/2008	"2.41	
6/30/2008	1.34	0.2927
7/31/2008	1.36	0.3075
8/31/2008	1.56	0.4447
9/30/2008	1.62	0.4824
10/31/2008	1.81	0.5933
11/30/2008	1.89	0.6360
12/31/2008	1.76	0.5653
1/31/2009	1.36	0.3075
2/28/2009	1.49	0.3988
3/31/2009	1.41	0.3436
4/30/2009	1.46	0.3784
5/31/2009	1.25	0.2231
6/30/2009	1.43	0.3577
7/31/2009	1.61	0.4782
8/31/2009	1.62	0.4824
9/30/2009	1.43	0.3577
10/31/2009	1.73	0.5481

Minimum reported value	1.25	mg/L	
Average reported value	1.537058824	mg/L	
Maximum reported value	1.89	mg/L	
Number of data points	18		17
μ(y) (average of data set)	1.537058824		0.4233
s(y) (std deviation of data)	0.183158562		0.1178
t(y) (variance of data)	0.033547059		0.0139
Average + 3x std deviation	2.086534509		
n (number of samples/month)			1
E(X) (daily average variable)			1.5376
V(X) (variance variable)			0.0330
μ(n) (n-day monthly average)			0.4233
t(n) (variance of average)			0.0139
s(n) (std deviation of average)			0.1178
cv(n) (coeff of variation)			0.6108
Existing Effluent Limit:	5	mg/L	

Lognormal Analysis:	
Permit Limits for:	Zinc, total (as Zn)
Monthly Average Permit Limit:	
95% lognormal 30 DA	*1.9 mg/L*
Daily Maximum Permit Limit:	
99% lognormal DM	*2.0 mg/L*

Notes:	Data preceded with " (e.g., "2.41) denotes that the data are considered outliers and are removed from analysis. Data preceded with < (e.g., <1) denotes that the data are non-detect and are removed from analysis.

SPDES PERMIT FACT SHEET: Wastewater Data, Receiving Water Data, and, Permit Limit Derivation.

(see last pages of fact sheet for explanatory notes).

Date	December 8, 2009
Permit Writer	Catherine Hardison
WQ Engineer	Aslam Mirza

(1) General Permittee Data:

Permit Number	Permittee Name	Facility Name	Location (C, T, V)	County	Industrial Code	Major/Sub Basin
NY 000 1988	Elm Holdings, Inc. c/o BP Exploration	Former Carborundum Complex	Wheatfield (T)	Niagara	9999	01/01

(2) Summary of Final Outfall Flow Rate(s) and Receiving Water Data:

Outfall Information					**Receiving Water Information**									
	Latitude	Longitude	Flow Rate (MGD)					*For use by WQ Engineer* - Critical Data					
Outfall #	°, ', "	°, ', "	Average	Maximum or Design	Name	Class	Water Index Number	7Q10 (MGD)	30Q10 (MGD)	Dilution/ Mixing	pH (SU)	Temp (°F)	Hardness (mg/l)
01A	43, 07, 07	78, 56, 24	0.034	0.25	Cayuga Creek	C	O-158-8	0.0	-----	-----	7.5	77	144

(3) Individual Outfall Data Summaries and Permit Limit Development:

Outfall 01A

Source(s) of Wastewater	Groundwater Remediation
Existing Wastewater Treatment Facilities	Groundwater Recovery Wells -> Equalization Tank -> Bag Filters -> Tray Air Stripper -> GAC Reactors -> Outfall
EPA Point Source Category & Production Rate	N/A

Effluent Parameter (Units) (concentration units - mg/l, ug/l or ng/l; mass units - lbs/d or g/d)	Existing Effluent Quality				Technology Based Effluent Limit					Water Quality Based Effluent Limit				Permit Basis (T or WQ)
	concentration		mass					PQL		AWQC	Effluent			
	Avg/Max	95%/99%	Avg/Max	95%/99%	conc.	mass	Type	conc.	Basis	conc.	conc.	mass	Type	
WET TESTING					NA					Recommended?		NO		
Flow Rate, units = GPD	Average	33,700	Maximum	247,000	144,000		DM	NA	Reported on RFI					
pH (SU)	Minimum	6.5	Maximum	8.4	6.0 - 9.0		Range		R(BCT/BPJ)	6.5 - 8.5	6.5 - 8.5	-----		WQ
BOD_5 (mg/L)	3.5 / 18.7	6.0 / 9.0			5 / 30		DA/DM		R(WQ/BCT/BPJ)	-----	5.0	-----	DM	WQ
Total Suspended Solids (mg/L)	4.5 / 23	6.6 / 11			20 / 40		DA/DM		R(BCT/BPJ)	NO STANDARD / GUIDANCE VALUE				T
Oil and Grease (mg/L)	5.4 / 15	7.2 / 11			M / 15		DA/DM		R(BCT/BPJ)	NO STANDARD / GUIDANCE VALUE				T
Temperature (°F)	Minimum	54	Maximum	75	M / 90		DA/DM		R(T)					T
Total Residual Chlorine (mg/L)[1]	0.16 / 0.22	0.30 / 0.36			M / 0.5		DA/DM	0.1	R(T)	0.005	0.005	-----	DM	PQL
Total Phenols (µg/L)	7.2/ 10	------			M / 8.0		DA/DM	5.0	R(BAT/BPJ)	5.0	5.0	-----	MA	WQ
Iron, Total (mg/L)	0.09 / 0.5	0.21 / 0.26			M / 4.0		DA/DM	4.0 µg/L	R(BAT/BPJ)	1.0	1.0	-----	DM	WQ
Cadmium, Total (µg/L)[2]	1.9 / 6.0	2.6 / 3.9			M / 3.9		DA/DM	2.0	BPJ; 99%ile	2.79 (D)	3.07 (T)	-----	DM	T
Chromium, Total (µg/L)	4.6 / 5.0	5.5 / 5.9			M / 50		DA/DM	0.2	R(BAT/BPJ)	99.91	-----	-----	-----	T
Copper, Total (µg/L)[2]	12 / 27	15 / 19			M / 19		DA/DM	2.0	BPJ; 99%ile	12.23 (D)	12.74 (T)	-----	DM	T
Copper, Dissolved (µg/L)[3]	12 / 48	19 / 24			M / M		DA/DM	-----	R(BAT/BPJ)	12.23	12.23 (D)	-----	DM	T
Lead, Total (µg/L)[2]	17 / 36	— / 25			M / 25		DA/DM	2.0	BPJ; 99%ile	5.62	7.10 (T)	-----	DM	T/ STHMP

Effluent Parameter (Units) (concentration units - mg/l, ug/l or ng/l; mass units - lbs/d or g/d)	Existing Effluent Quality				Technology Based Effluent Limit					Water Quality Based Effluent Limit				Permit Basis (T or WQ)
	concentration		mass					PQL		AWQC	Effluent			
	Avg/Max	95%/99%	Avg/Max	95%/99%	conc.	mass	Type	conc.	Basis	conc.	conc.	mass	Type	
Mercury, Total (ng/L)	2.36 / 2.51 (from NY-2C)	----			M / 0.8 µg/L		DA/DM	0.5	R(BAT/BPJ)	0.7 ng/L	0.7 ng/L	-----	MA	STHIMP
Arsenic, Total (µg/L)	11 / 60	17 / 21			M / 190		DA/DM	2.0	R(BAT/BPJ)	150.0	150.0	-----	DM	WQ
Cyanide, Total (µg/L)	ND	ND			M / 60		DA/DM	20	R(BAT/BPJ)	5.2	5.2 *	-----	DM	STHIMP
Zinc, Total (mg/L)[4]	1.7 / 2.4	1.9 / 2.0			M / 2.0		DA/DM	0.2 µg/L	BPJ; 99%ile	114.26 µg/L	-----	-----	-----	T
Zinc, Dissolved (mg/L)	0.81 / 1.3	1.1 / 1.3			M / M		DA/DM	-----	R(BAT/BPJ)	112.66 µg/L	-----	-----	-----	T
Chloroform (µg/L)	0.10 / 5.0	1.3 / 2.6			M / 10		DA/DM	0.2	R(BAT/BPJ)	NO STANDARD / GUIDANCE VALUE				T
1,1-Dichloroethane (µg/L)	0.96 / 3.3	1.1 / 1.7			M / 10		DA/DM	0.3	R(BAT/BPJ)	NO STANDARD / GUIDANCE VALUE				T
1,2-Dichloroethane (µg/L)	0.96 / 3.4	1.1 / 1.8			M / 10		DA/DM	0.1	R(BAT/BPJ)	NO STANDARD / GUIDANCE VALUE				T
1,1-Dichloroethene (µg/L)	1.3 / 7.1	2.2 / 3.4			M / 10		DA/DM	0.5	R(BAT/BPJ)	NO STANDARD / GUIDANCE VALUE				T
cis-1,2-Dichloroethene (µg/L)	1.3 / 6.4	1.9 / 3.3			M / 10		DA/DM	-----	R(BAT/BPJ)	NO STANDARD / GUIDANCE VALUE				T
trans-1,2-Dichloroethene (µg/L)	1.2 / 6.0	1.8 / 2.8			M / 10		DA/DM	0.4	R(BAT/BPJ)	NO STANDARD / GUIDANCE VALUE				T
Methylene Chloride (µg/L)	3.1 / 16	5.0 / 13			M / 10		DA/DM	1.0	R(BAT/BPJ)	200.0	-----	-----	-----	T
1,1,1-Trichloroethane (µg/L)	1.1 / 5.2	1.5 / 2.4			M / 10		DA/DM	0.1	R(BAT/BPJ)	NO STANDARD / GUIDANCE VALUE				T
Trichloroethene (µg/L)	2.1 / 4.8	2.8 / 3.9			M / 10		DA/DM	0.5	R(BAT/BPJ)	40.0	-----	-----	-----	T
Vinyl chloride (µg/L)	1.2 / 5.7	1.6 / 2.6			M / 10		DA/DM	0.7	R(BAT/BPJ)	NO STANDARD / GUIDANCE VALUE				T
Nickel, Total (lb/d)			0.005 / 0.012	— / 0.026	M	0.026	DM	4 µg/L	AL; 99%ile	0.0708 mg/L	-----	-----	-----	T
Silver, Total (lb/d)			0.001 / 0.005	— / 0.006	M	0.006	DM	0.2 µg/L	AL; 99%ile	0.1 µg/L **	-----	-----	-----	T
Total Kjeldahl Nitrogen (mg/L)	0.4				-----			0.4	BPJ					N/A
Total Dissolved Solids (mg/L)	514				Monitor			10.0	Monitor	500	500	-----	-----	STHIMP

NOTES:

(1) - The enforceable effluent limit for Total Residual Chlorine will be 0.1 mg/L (DM) as compared to the Water Quality limit based on current Department policy.

(2) - Technical effluent limits are based on the 99th percentile of data provided when the new well came online (May 2008; per the permittee). These parameters are present in the groundwater at levels naturally occurring in the receiving stream.

(3) - Dissolved metals are to be monitored only, since they are measured in the analysis for total metals.

(4) - Current data for Total Lead are based on a PQL of 15 µg/L. The Short-Term High-Intensity Monitoring Program will aid in developing revised BPJ effluent limits.

* Sum of CN and HCN expressed as CN^-.

** Ionic; dissolved silver per TOGS 1.3.1.E

STHIMP - Short Term High Intensity Monitoring Program

(4) Additional Issues:

Water Quality Based Effluent Limits (WQBELs):

New York State water quality regulations (for surface waters) are implemented by applying the Total Maximum Daily Load (TMDL) process to watersheds, drainage basins or waterbody segments on a pollutant specific basis. The analysis determines if there is a "reasonable potential" that the discharge of a pollutant will result in exceedance of ambient water quality criteria (AWQC). If there is a reasonable potential for an exceedance of AWQC, the TMDL is used to establish waste load allocations for point sources and load allocations for nonpoint sources of the pollutant. For point sources, the waste load allocations are translated to WQBELs for inclusion in SPDES permits. Reference - TOGS 1.3.1, USEPA Guidance for Water Quality - Based Decisions: The TMDL Process, 40 CFR 130 and the Clean Water Act 303(d).

The following table has been completed only for those parameters for which WQBELs were determined to be necessary.

Parameter	Residual Chlorine (mg/L)	Phenols, Total (mg/L)	Iron (mg/L)	Arsenic (µg/L)	Cyanide, Total (µg/L)
Amount to be Allocated (TMDL)	0.005	5.0	1.0	150.0	5.2
Number of Sources	1	1	1	1	1
Allocation to this Permit	0.005	5.0	1.0	150.0	5.2

Statistics:

The statistical methods utilized are consistent with TOGS 1.2.1 and the USEPA, Office of Water, Technical Support Document For Water Quality-based Toxics Control, March 1991, Appendix E. Generally based on lognormal analysis. If other data distributions such as normal or delta-lognormal are utilized it is noted below. Statistical calculations were not performed for parameters with insufficient data. Generally, ten or more data points are needed to calculate percentiles. Two or more data points are necessary to calculate an average and a maximum. Non-detects were included in the statistical calculations at the reported detection limit unless otherwise noted.

Monitoring data collected during the following time period was used to calculate statistics: **For Total Cadmium, Total Copper, Total Lead, and Total Zinc, May 2008 - October 2009; for all other parameters, February 2005 - January 2008**

This data was taken from the following source(s): **Permittee-Submitted Discharge Monitoring Reports, Request for Information package**

Delta-lognormal analysis was used to evaluate and develop effluents limits and action levels for Total Copper, Total Lead, Total Cadmium, and Total Silver.

The following data were removed from analysis:

Zinc: 2.41 mg/L (5-2008) – Removed because the elevated zinc concentration is believed to be the result of the new well (PW-4) coming online. Reviewing the DMR data prior to bringing the well online and the data afterwards provides evidence of this assessment.

Copper: 27 µg/L (9-2008) – Removed because the value was determined to be an outlier according to the best professional judgment of the permit writer. This assessment was based on reviewing the DMR data submitted from May 2008 to October 2009.

Cadmium: 6 µg/L (12-2008) – Removed because the value was determined to be an outlier according to the best professional judgment of the permit writer. This assessment was based on reviewing the DMR data submitted from May 2008 to October 2009.

Lead: 36 µg/L (5-2008) – Removed because the elevated lead concentration is believed to be the result of the new well (PW-4) coming online. Reviewing the DMR data prior to bringing the well online and the data afterwards provides evidence of this assessment.

Schedule of Compliance:

Four compliance schedule items are included to implement Short Term High Intensity Monitoring Programs for Total Mercury, Total Lead, Total Dissolved Solids and Cyanide.

A compliance schedule item has been included to require the permittee to submit an approvable engineering report detailing the methods the facility will use to bring Total Residual Chlorine into compliance with the revised final effluent limit. In the interim, the parameter will be monitored, and compliance is to occur 6 months after the date of the report's approval.

(5) Summary of Proposed Permit Changes:

Compared to the issued permit this draft is intended to replace, the following significant changes are proposed -

Based on the NY-2C application submitted by the permittee, the maximum design flow rate has been decreased to 144,000 gpd. The Daily Maximum for flow has been changed accordingly.

All Daily Average reporting has been removed for parameters that require Monthly or less frequent sampling.

Based on Water Quality analysis, the effluent limits of the following parameters have been changed: pH (from a range of 6.0 - 9.0 to a range of 6.5- 8.5), BOD_5 (Daily Average [DA] will be monitored, Daily Maximum [DM] from 30 mg/L to 5 mg/L), Total Residual Chlorine (DM from 0.5 mg/L to 0.1 mg/L), Total Iron (DM from 4 mg/L to 1.0 mg/L), Total Phenols (DM from 8.0 µg/L to 5.0 µg/L) and Total Arsenic (DM from 190 µg/L to 150 µg/L).

Revised effluent limits for Total Cadmium (DM from 10 µg/L to 3.9 µg/L), Total Copper (DM from 32 µg/L to 19 µg/L), Total Lead (DM from 50 µg/L to 25 µg/L), and Total Zinc (DM from 5.0 mg/L to 2.0 mg/L). Because these parameters are present in the groundwater at levels naturally occurring in the stream, it has been determined that the application of WQBELs would not be appropriate. Instead, the revised effluent limits for Cadmium, Copper, and Zinc and Lead are based on the 99th percentile value from an evaluation of DMR data from May 2008 (when a new well came online) to October 2009.

The action level for the DM for Total Nickel has been changed from 0.07 lb/d to 0.026 lb/d. The new action level is the 99th percentile value based on the evaluation of the DMR data. Reporting the concentration of Total Nickel in the effluent with also be required.

The action level for the DM for Total Silver has been changed from 0.07 lb/d to 0.006 lb/d. The new action level is the 99th percentile value based on the evaluation of the DMR data. Reporting the concentration of Total Silver in the effluent with also be required.

The Special Conditions have been updated to require the most sensitive analytical method for the listed parameters. The PQLs of the parameters have also been added.

Footnotes have been included clarifying the sampling and analysis for Total Residual Chlorine, referencing the Schedule of Compliance, and clarifying sampling collection methods for VOCs.

The effluent limit for Total Mercury has been removed from the permit, since Total Mercury has not been detected in three years of monitoring data. Instead, a Short Term High Intensity Monitoring Program (STHIMP) is being implemented, requiring three (3) months of monthly sampling using EPA Method 1631. This analytical method is the most sensitive for Total Mercury.

The effluent limit for Total Cyanide has been removed from the permit, since Total Cyanide has not been detected in three years of monitoring data. Instead, a Short Term High Intensity Monitoring Program (STHIMP) is being implemented, requiring three (3) months of monthly sampling using EPA Method 335.4. This analytical method is the most sensitive for Total Cyanide.

A Short-Term High-Intensity Monitoring Program (STHIMP) has been implemented for both Total Dissolved Solids and Lead. Both require 3 months of weekly monitoring. The additional data acquired from the STHIMP will aid in developing effluent limits for these parameters.

A compliance schedule item has been included to require the permittee to submit an approvable engineering report detailing the methods the facility will use to bring Total Residual Chlorine into compliance with the revised final effluent limit. In the interim, the parameters will be monitored, and compliance is to occur 6 months after the date of the report's approval.

Discharge Notification Requirements page has been added to the permit.

(6) Explanatory Notes:

Please note that some of these terms are not applicable to every fact sheet.

AL -	Action level calculated in accordance with TOGS 1.2.1 (non POTWs) and TOGS 1.3.3 (POTWs). See the permit for a complete definition.
AVG or Av -	Average. The arithmetic mean.
AWQC -	Ambient water quality criteria for the receiving water. The applicable standard, guidance value or estimated value in accordance with TOGS 1.1.1, TOGS 1.3.1 and 6NYCRR 700-705.
Basis -	The technical analysis, internal guidance, regulation and/or law upon which an effluent limit or monitoring requirement is proposed.
BAT -	Best Available Technology Economically Achievable in accordance with TOGS 1.2.1 (non POTWs) and TOGS 1.3.3 (POTWs), 40 CFR 125, 6NYCRR 750, ECL 17-0811 and the Clean Water Act.
BCT -	Best Conventional Control Technology in accordance with TOGS 1.3.4, 40 CFR 125, 6NYCRR 750, ECL 17-0811 and the Clean Water Act.
BPJ -	Best Professional Judgement in accordance with TOGS 1.2.1 (non POTWs) and TOGS 1.3.3 (POTWs), 40 CFR 122 and 125, 6NYCRR 750, ECL 17-0811 and the Clean Water Act.
BPT -	Best Practicable Control Technology in accordance with TOGS 1.2.1, 40 CFR 125, 6NYCRR 750, ECL 17-0811 and the Clean Water Act.
Conc. -	Concentration in units of mg/l, ug/l or ng/l.
Design Flow -	Treatment system design capacity as noted in an approved engineering report.
Final -	Final permit period requirements. A level of performance that must be achieved according to a schedule specified in either the permit or a consent order.
g/d -	Grams per day discharged.
GW -	Groundwater effluent limitation developed in accordance with TOGS 1.2.1 (nonPOTWs), TOGS 1.3.3 (POTWs), TOGS 1.1.2 and 6NYCRR 703.
Ind -	Indicated parameter. See definition in section (4).
Interim -	Interim permit period requirements. A level of performance that must be achieved while improvements are being implemented in order to achieve final permit period requirements.
lbs/d or #/d -	Pounds per day discharged.
Mass -	Mass discharge in units of #/d or g/d discharge.
Max or Mx -	The maximum value.
MGD -	Million gallons per day.
mg/l -	Milligrams per liter.
Dilution/Mixing -	Used to determine dilution available in receiving waters. For lakes, estuaries and slowly flowing rivers and streams, mixing zone dilution is generally assumed to be 10:1 unless data is available to indicate otherwise.
Model -	Calibrated water quality model applied in accordance with TOGS 1.3.1.
Mon -	Monitor only.
NA -	The characteristics of this parameter and the reported discharge levels do not justify routine monitoring or a limit. Also indicates "not applicable".
ng/l -	Nanograms per liter. 1000 ng/l = 1 ug/l = 0.001 mg/l.
PQL -	The DEC published or site specific practical quantitation limit; the concentration in wastewater at which analytical results are thought to be accurate to within approximately plus or minus thirty percent.
R -	"Rolled Over", i.e. the specific requirement in this permit is equivalent to the previous permit. R(T) is roll over of a technology based requirement and R(WQ) is roll over of a WQBEL.
Range -	The discharge is limited to a range of effluent values, e.g. a pH limit of (6.0-9.0) SU.
RREL -	EPA's Risk Reduction Engineering Laboratory treatability database.
T -	Technology based effluent limit or requirement.
TOGS -	Technical and Operational Guidance Series. Internal guidance to permit drafters used by the NYSDEC Division of Water to aid in permit drafting. Copies of these guidance documents may be obtained from the internet at http://www.dec.state.ny.us/website/dow/togs/index.htm.
ug/l -	Micrograms per liter. 1000 ug/l = 1 mg/l.
WET-	Whole Effluent Toxicity (testing). See TOGS 1.3.2.
WQ -	Water quality.
WQBEL -	Water quality-based effluent limit. See information in section (4).
7Q10 -	The minimum average 7 consecutive day flow at a recurrence interval of 10 years. Applicable to evaluations involving aquatic health based AWQC.
30Q10 -	The minimum average 30 consecutive day flow at a recurrence interval of 10 years. Applicable to evaluations involving human health based AWQC.
95% -	The 95th percent confidence interval for the historical effluent data used to draft the permit.
99% -	The 99th percent confidence interval for the historical effluent data used to draft the permit.
133 -	Secondary treatment requirements in accordance with TOGS 1.3.3, 40 CFR 133, 6NYCRR 750, ECL 17-0509 and the Clean Water Act.
* -	These parameters represent scans. Detections vary among the compounds which are included in the scans. The listed value represent the maximum detected level of any compound in the scan.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

State Pollutant Discharge Elimination System (SPDES)
DISCHARGE PERMIT

Industrial Code:	9511	SPDES Number:	NY0001988
Discharge Class (CL):	03	DEC Number:	9-2940-00059/00003
Toxic Class (TX):	T	Effective Date (EDP):	04/01/2007
Major Drainage Basin:	01	Expiration Date (ExDP):	03/31/2012
Sub Drainage Basin:	01	Modification Dates:(EDPM)	04/01/2010
Water Index Number:	O-158-8		
Compact Area:	IJC		

This SPDES permit is issued in compliance with Title 8 of Article 17 of the Environmental Conservation Law of New York State and in compliance with the Clean Water Act, as amended, (33 U.S.C. §1251 et.seq.)(hereinafter referred to as "the Act") and in the Water Quality Regulations of the Interstate Environmental Commission at 21 NYCRR Part 550.

PERMITTEE NAME AND ADDRESS

Name: **Elm Holdings, Inc.** Attention: **William B. Barber**

Street: **c/o BP, 4850 East 49th St., MBC3-147**

City: **Cleveland** State: **OH** Zip Code: **44125**

is authorized to discharge from the facility described below:

FACILITY NAME AND ADDRESS

Name: **Former Carborundum Complex**

Location (C,T,V): **Wheatfield (T)** County: **Niagara**

Facility Address: **2040 Cory Drive**

City: **Sanborn** State: **NY** Zip Code: **14132**

NYTM -E: 179.4 NYTM - N: 4782.5

From Outfall No.: **01A** at Latitude: **43 ° 07 ′ 07 ″** & Longitude: **78 ° 56 ′ 24 ″**

into receiving waters known as: **Cayuga Creek** Class: **C**

and; (list other Outfalls, Receiving Waters & Water Classifications)

in accordance with: effluent limitations; monitoring and reporting requirements; other provisions and conditions set forth in this permit; and 6 NYCRR Part 750-1.2(a) and 750-2.

DISCHARGE MONITORING REPORT (DMR) MAILING ADDRESS

Mailing Name: **Former Carborundum Complex - Attn: William Barber**

Street: **c/o BP, 4850 East 49th St., MBC3-147**

City: **Cuyahoga Heights** State: **OH** Zip Code: **44125**

Responsible Official or Agent: **William B. Barber - Project Manager** Phone: **(216) 271-8038**

This permit and the authorization to discharge shall expire on midnight of the expiration date shown above and the permittee shall not discharge after the expiration date unless this permit has been renewed, or extended pursuant to law. To be authorized to discharge beyond the expiration date, the permittee shall apply for permit renewal not less than 180 days prior to the expiration date shown above.

Distribution
CO BWP - Permit Coordinator
RWE/RPA
EPA Region II - Jeffrey Gratz
NYSEFC
IJC

Deputy Chief Permit Administrator: Stuart M. Fox

Address: NYS Department of Environmental Conservation
Division of Environmental Permits
625 Broadway
Albany, NY 12233-1750

Signature: Stuart M. Fox Date: 2/23/10

ERMIT LIMITS, LEVELS AND MONITORING DEFINITIONS

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OUTFALL	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
	This cell describes the type of wastewater authorized for discharge. Examples include process or sanitary wastewater, storm water, non-contact cooling water.	This cell lists classified waters of the state to which the listed outfall discharges.	The date this page starts in effect. (e.g. EDP or EDPM)	The date this page is no longer in effect. (e.g. ExDP)

PARAMETER	MINIMUM	MAXIMUM	UNITS	SAMPLE FREQ.	SAMPLE TYPE
e.g. pH, TRC, Temperature, D.O.	The minimum level that must be maintained at all instants in time.	The maximum level that may not be exceeded at any instant in time.	SU, °F, mg/l, etc.		

PARA-METER	EFFLUENT LIMIT	PRACTICAL QUANTITATION LIMIT (PQL)	ACTION LEVEL	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE
	Limit types are defined below in Note 1. The effluent limit is developed based on the more stringent of technology-based standards, required under the Clean Water Act, or New York State water quality standards. The limit has been derived based on existing assumptions and rules. These assumptions include receiving water hardness, pH and temperature; rates of this and other discharges to the receiving stream; etc. If assumptions or rules change the limit may, after due process and modification of this permit, change.	For the purposes of compliance assessment, the analytical method specified in the permit shall be used to monitor the amount of the pollutant in the outfall to this level, provided that the laboratory analyst has complied with the specified quality assurance/quality control procedures in the relevant method. Monitoring results that are lower than this level must be reported, but shall not be used to determine compliance with the calculated limit. This PQL can be neither lowered nor raised without a modification of this permit.	Type I or Type II Action Levels are monitoring requirements, as defined below in Note 2, that trigger additional monitoring and permit review when exceeded.	This can include units of flow, pH, mass, Temperature, concentration. Examples include µg/l, lbs/d, etc.	Examples include Daily, 3/week, weekly, 2/month, monthly, quarterly, 2/yr and yearly.	Examples include grab, 24 hour composite and 3 grab samples collected over a 6 hour period.

ote 1: DAILY DISCHARGE: The discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar ay for the purposes of sampling. For pollutants expressed in units of mass, the 'daily discharge' is calculated as the total mass of the pollutant discharged ver the day. For pollutants with limitations expressed in other units of measurement, the 'daily discharge' is calculated as the average measurement of the ollutant over the day. DAILY MAX: The highest allowable daily discharge. DAILY MIN: The lowest allowable daily discharge. MONTHLY AVG (daily vg): The highest allowable average of daily discharges over a calendar month, calculated as the sum of each of the daily discharges measured during a alendar month divided by the number of daily discharges measured during that month. RANGE: The minimum and maximum instantaneous measurements or the reporting period must remain between the two values shown. 7 DAY ARITHMETIC MEAN (7 day average): The highest allowable average of daily ischarges over a calendar week. 12 MRA (twelve month rolling avg): The average of the most recent twelve month's monthly averages. 30 DAY EOMETRIC MEAN (30 d geo mean): The highest allowable geometric mean of daily discharges over a calendar month, calculated as the antilog of : the um of the log of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month. 7 AY GEOMETRIC MEAN (7 d geo mean): The highest allowable geometric mean of daily discharges over a calendar week.

ote 2: ACTION LEVELS: Routine Action Level monitoring results, if not provided for on the Discharge Monitoring Report (DMR) form, shall be ppended to the DMR for the period during which the sampling was conducted. If the additional monitoring requirement is triggered as noted below, the ermittee shall undertake a short-term, high-intensity monitoring program for the parameter(s). Samples identical to those required for routine monitoring urposes shall be taken on each of at least three consecutive operating and discharging days and analyzed. Results shall be expressed in terms of both oncentration and mass, and shall be submitted no later than the end of the third month following the month when the additional monitoring requirement was riggered. Results may be appended to the DMR or transmitted under separate cover to the same address. If levels higher than the Action Levels are onfirmed, the permit may be reopened by the Department for consideration of revised Action Levels or effluent limits. The permittee is not authorized to ischarge any of the listed parameters at levels which may cause or contribute to a violation of water quality standards. TYPE I : The additional monitoring equirement is triggered upon receipt by the permittee of any monitoring results in excess of the stated Action Level. TYPE II: The additional monitoring equirement is triggered upon receipt by the permittee of any monitoring results that show the stated action level exceeded for four of six consecutive samples, r for two of six consecutive samples by 20 % or more, or for any one sample by 50 % or more.

PERMIT LIMITS, LEVELS AND MONITORING

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OUTFALL No.	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
01A	Groundwater Treatment System Effluent	Cayuga Creek, Class C	04/01/2010	03/31/2012

PARAMETER	MINIMUM	MAXIMUM	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FOOTNOTES (FN)
pH	6.5	8.5	SU	Weekly	Grab	

PARAMETER	'COMPLIANCE LIMIT		MONITORING ACTION LEVEL		UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FN
	Daily Avg.	Daily Max.	TYPE I	TYPE II				
Flow	Monitor	144,000			gpd	Continuous	Meter	
BOD_5	Monitor	5			mg/L	2/month	24-hr. Comp.	
Solids, Total Suspended	20	40			mg/L	2/month	24-hr. Comp.	
Oil & Grease	Monitor	15			mg/L	2/month	Grab	
Temperature	-----	90			°F	Monthly	Grab	
Chlorine, Total Residual	-----	0.1			mg/L	Monthly	Grab	1, 2
Phenols, Total	Monitor	5.0			µg/L	2/month	24-hr. Comp.	
Iron, Total	-----	1.0			mg/L	Monthly	24-hr. Comp.	
Cadmium, Total	-----	3.9			µg/L	Monthly	24-hr. Comp.	2
Chromium, Total	-----	50			µg/L	Monthly	24-hr. Comp.	
Copper, Total	-----	19			µg/L	Monthly	24-hr. Comp.	2
Copper, Dissolved	-----	Monitor			µg/L	Monthly	24-hr. Comp.	
Lead, Total	-----	25			µg/L	Monthly	24-hr. Comp.	2
Arsenic, Total	-----	150			µg/L	Monthly	24-hr. Comp.	
Zinc, Total	-----	2.0			mg/L	Monthly	24-hr. Comp.	2
Zinc, Dissolved	-----	Monitor			mg/L	Monthly	24-hr. Comp.	
Chloroform	Monitor	10			µg/L	Weekly	8-hr. Comp.	3
1,1-Dichloroethane	Monitor	10			µg/L	Weekly	8-hr. Comp.	3
1,2-Dichloroethane	Monitor	10			µg/L	Weekly	8-hr. Comp.	3
1,1-Dichloroethene	Monitor	10			µg/L	Weekly	8-hr. Comp.	3
cis-1,2-Dichloroethene	Monitor	10			µg/L	Weekly	8-hr. Comp.	3
trans-1,2-Dichloroethene	Monitor	10			µg/L	Weekly	8-hr. Comp.	3
Methylene Chloride	Monitor	10			µg/L	Weekly	8-hr. Comp.	3
1,1,1-Trichloroethane	Monitor	10			µg/L	Weekly	8-hr. Comp.	3

PERMIT LIMITS, LEVELS AND MONITORING (continued)

PARAMETER	COMPLIANCE LIMIT		MONITORING ACTION LEVEL		UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FN
	Daily Avg.	Daily Max.	TYPE I	TYPE II				
Trichloroethene	Monitor	10			µg/L	Weekly	8-hr. Comp.	3
Vinyl Chloride	Monitor	10			µg/L	2/month	8-hr. Comp.	3
Nickel, Total			0.026		lb/d	Quarterly	24-hr. Comp.	
Nickel, Total	-----	Monitor			µg/L	Quarterly	24-hr. Comp.	
Silver, Total			0.006		lb/d	Quarterly	24-hr. Comp.	
Silver, Total	-----	Monitor			µg/L	Quarterly	24-hr. Comp.	

Footnotes:

1. Total Residual Chlorine (TRC) - All TRC analysis shall be performed in the field.

2. Compliance Schedule items have been added for these parameters. Consult Page 7 of this permit for further guidance.

3. As per 40 CFR 136 when analysis of volatile organics are required, grab samples must be collected. Individual grab samples must be collected at prescribed time intervals (e.g., 4 samples over the course of a day, at 2-hour intervals). Grab samples must be analyzed separately and the concentrations averaged. Alternatively, grab samples may be collected in the field and composited in the laboratory if the compositing procedure produces results equivalent to results produced by arithmetic averaging of the results of analysis of individual grab samples. Analytical results comparing individual grab samples and composited grab samples must be submitted to the Department if alternative monitoring (i.e., composited grab samples) is to be used.

SPECIAL CONDITIONS

Analyses for the following parameters shall be performed using the following specified methods:

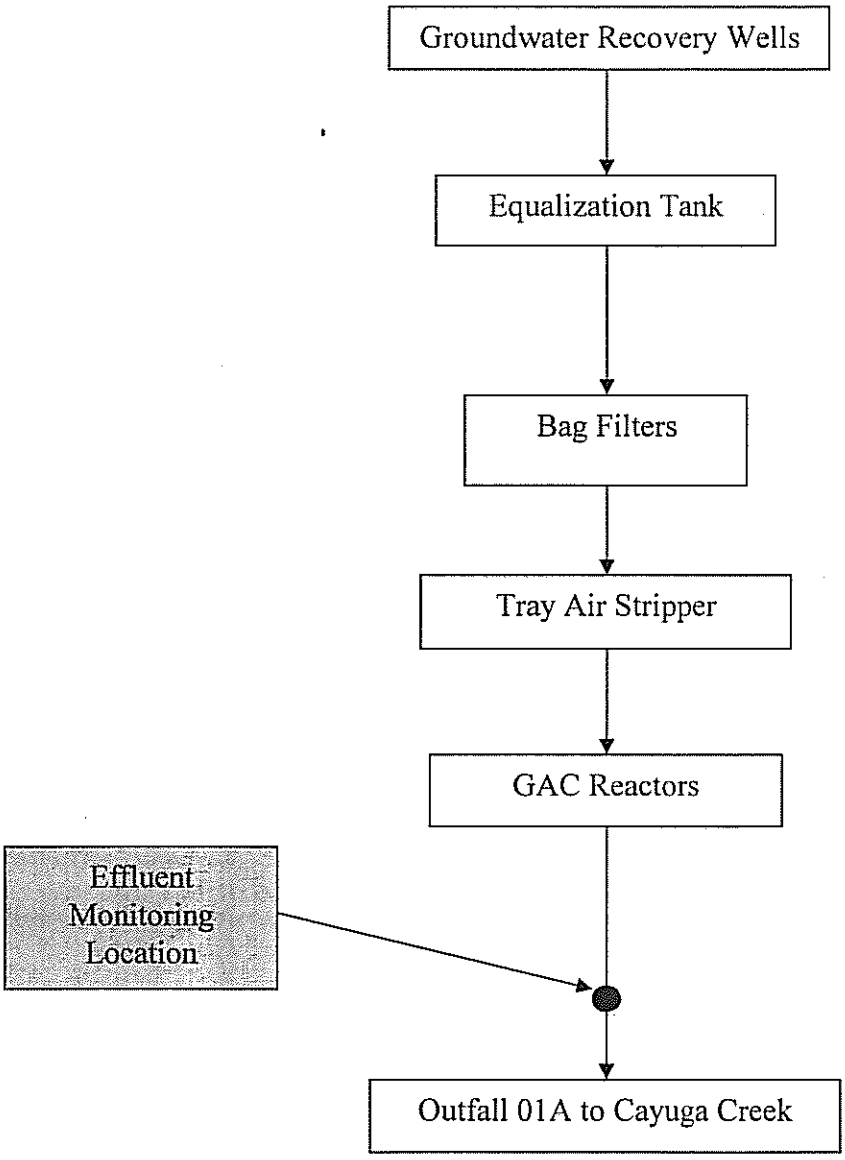
EPA Method 200.8
Cadmium, Total - 2 µg/L
Lead, Total - 2 µg/L
Copper, Total - 2 µg/L
Silver, Total - 0.2 µg/L

EPA Method 420.4
Phenols, Total - 5 µg/L

As more sensitive methods become available and approved by the USEPA for the analysis of the above parameters, those approved methods shall be used for laboratory analysis.

MONITORING LOCATIONS

The permittee shall take samples and measurements, to comply with the monitoring requirements specified in this permit, at the location(s) specified below:



DISCHARGE NOTIFICATION REQUIREMENTS

(a) Except as provided in (c) of these Discharge Notification Act requirements, the permittee shall install and maintain identification signs at all outfalls to surface waters listed in this permit. Such signs shall be installed within 90 days of the Effective Date of this Modification.

Subsequent modifications to or renewal of this permit does not reset or revise the deadline set forth in (a) above, unless a new deadline is set explicitly by such permit modification or renewal.

The Discharge Notification Requirements described herein do not apply to outfalls from which the discharge is composed exclusively of storm water, or discharges to ground water.

(d) The sign(s) shall be conspicuous, legible and in as close proximity to the point of discharge as is reasonably possible while ensuring the maximum visibility from the surface water and shore. The signs shall be installed in such a manner to pose minimal hazard to navigation, bathing or other water related activities. If the public has access to the water from the land in the vicinity of the outfall, an identical sign shall be posted to be visible from the direction approaching the surface water.

The signs shall have **minimum** dimensions of eighteen inches by twenty four inches (18" x 24") and shall have white letters on a green background and contain the following information:

N.Y.S. PERMITTED DISCHARGE POINT

SPDES PERMIT No.: NY_____

OUTFALL No. :____

For information about this permitted discharge contact:

Permittee Name: _____

Permittee Contact: _____

Permittee Phone: ( ) - ### - ####

OR:

NYSDEC Division of Water Regional Office Address:

NYSDEC Division of Water Regional Phone: ( ) - ### -####

(e) For each discharge required to have a sign in accordance with a), the permittee shall, concurrent with the installation of the sign, provide a repository of copies of the Discharge Monitoring Reports (DMRs), as required by the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of this permit. This repository shall be open to the public, at a minimum, during normal daytime business hours. The repository may be at the business office repository of the permittee or at an off-premises location of its choice (such location shall be the village, town, city or county clerk's office, the local library or other location as approved by the Department). In accordance with the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of your permit, each DMR shall be maintained on record for a period of five years.

(f) The permittee shall periodically inspect the outfall identification signs in order to ensure that they are maintained, are still visible and contain information that is current and factually correct.

SCHEDULE OF COMPLIANCE

a) The permittee shall comply with the following schedule.

Action Code	Outfall Number(s)	Compliance Action	Due Date
92699	01A	The permittee shall submit the results of 3 months of monthly monitoring for: MERCURY Total mercury shall be monitored using grab samples. The samples shall be analyzed using EPA Method 1631 and the results provided in ng/l along with the recorded flow for the day each sample was collected.	08/01/2010
96299	01A	The permittee shall submit the results of 3 months of monthly monitoring for: CYANIDE Total cyanide shall be monitored using 24-hour composite samples. The samples shall be analyzed using EPA Method 335.4 and the results provided in μg/l along with the recorded flow for the day each sample was collected.	08/01/2010
96299	01A	The permittee shall submit the results of 3 months of weekly monitoring for: LEAD Total lead shall be monitored using 24-hour composite samples. The samples shall be analyzed using EPA Method 200.8 and the results provided in μg/l along with the recorded flow for the day each sample was collected.	08/01/2010
96299	01A	The permittee shall submit the results of 3 months of weekly monitoring for: TOTAL DISSOLVED SOLIDS Total dissolved solids shall be monitored using 24-hour composite samples. The results shall be provided in mg/l along with the recorded flow for the day each sample was collected.	08/01/2010
	01A	The permittee shall submit an approvable engineering report which contains methods for improving metals removal without a major capital upgrade of the permittee's treatment process. The goal is to reduce effluent concentrations of Total Cadmium, Total Copper, Total Lead, and Total Zinc to their respective Water Quality-based Effluent Limits (WQBELs). The WQBELs may not be achievable, but metals concentrations should be reduced as much as practicable. All reports shall be prepared and signed by a professional engineer currently licensed and registered by New York State. These methods to improve metals removal shall be implemented as soon as practicable and no later than **10/01/2010**.	07/01/2010 10/01/2010

SCHEDULE OF COMPLIANCE (continued)

Action Code	Outfall Number(s)	Compliance Action	Due Date
53599	01A	The following parameter shall be "Monitor Only" at the **Effective Date of Permit Modification:** TOTAL RESIDUAL CHLORINE	04/01/2010
		The permittee shall submit an approvable engineering report, signed and stamped by a professional engineer licensed to practice engineering in New York State, detailing the methods to be used to reduce the effluent concentration of Total Residual Chlorine to bring it into compliance with the revised final effluent limit. Once approved, the permittee shall have **6 months** to implement the approved engineering report.	10/01/2010
		By **Date of Approval + 3 months,** the permittee shall submit a 3-month progress report. By **Date of Approval + 6 months,** the permittee shall be in compliance with the following final effluent limit: TOTAL RESIDUAL CHLORINE - 0.1 mg/L	DATE OF APPROVAL + 3 months DATE OF APPROVAL + 6 months

The above compliance actions are one time requirements. The permittee shall comply with the above compliance actions to the Department's satisfaction once. When this permit is administratively renewed by NYSDEC letter entitled "SPDES NOTICE/RENEWAL APPLICATION/PERMIT", the permittee is not required to repeat the submission. The above due dates are independent from the effective date of the permit stated in the letter of "SPDES NOTICE/RENEWAL APPLICATION/PERMIT."

b) The permittee shall submit a written notice of compliance or non-compliance with each of the above schedule dates no later than 14 days following each elapsed date, unless conditions require more immediate notice as prescribed in 6 NYCRR Part 750-1.2(a) and 750-2. All such compliance or non-compliance notification shall be sent to the locations listed under the section of this permit entitled RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS. Each notice of non-compliance shall include the following information:

1. A short description of the non-compliance;
2. A description of any actions taken or proposed by the permittee to comply with the elapsed schedule requirements without further delay and to limit environmental impact associated with the non-compliance;
3. A description or any factors which tend to explain or mitigate the non-compliance; and
4. An estimate of the date the permittee will comply with the elapsed schedule requirement and an assessment of the probability that the permittee will meet the next scheduled requirement on time.

c) The permittee shall submit copies of any document required by the above schedule of compliance to NYSDEC Regional Water Engineer at the location listed under the section of this permit entitled RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS **and to the Bureau of Water Permits, 625 Broadway, Albany, N.Y. 12233-3505,** unless otherwise specified in this permit or in writing by the Department.

RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS

a) The permittee shall also refer to 6 NYCRR Part 750-1.2(a) and 750-2 for additional information concerning monitoring and reporting requirements and conditions.

b) The monitoring information required by this permit shall be summarized, signed and retained for a period of three years from the date of the sampling for subsequent inspection by the Department or its designated agent. **Also, monitoring information required by this permit shall be summarized and reported by submitting;**

[X] (if box is checked) completed and signed Discharge Monitoring Report (DMR) forms for each 1 month reporting period to the locations specified below. Blank forms are available at the Department's Albany office listed below. The first reporting period begins on the effective date of this permit and the reports will be due no later than the 28th day of the month following the end of each reporting period.

[ ] (if box is checked) an annual report to the Regional Water Engineer at the address specified below. The annual report is due by February 1 and must summarize information for January to December of the previous year in a format acceptable to the Department.

[ ] (if box is checked) a monthly "Wastewater Facility Operation Report..." (form 92-15-7) to the:
[ ] Regional Water Engineer and/or [ ] County Health Department or Environmental Control Agency specified below

Send the **original** (top sheet) of each DMR page to:

Department of Environmental Conservation
Division of Water
Bureau of Watershed Compliance Programs
625 Broadway
Albany, New York 12233-3506
Phone: (518) 402-8177

Send the **first copy** (second sheet) of each DMR page to:

Department of Environmental Conservation
Regional Water Engineer
Region 9
270 Michigan Ave.
Buffalo, NY 14203-2999
Phone: (716) 851-7165

Send an **additional copy** of each DMR page to:

Niagara County Health Department
5467 Upper Mountain Road
Lockport, NY 14094
Phone: (716) 439-7440

c) Noncompliance with the provisions of this permit shall be reported to the Department as prescribed in 6 NYCRR Part 750-1.2(a) and 750-2.

d) Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

e) If the permittee monitors any pollutant more frequently than required by the permit, using test procedures approved under 40 CFR Part 136 or as specified in this permit, the results of this monitoring shall be included in the calculations and recording of the data on the Discharge Monitoring Reports.

f) Calculation for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this permit.

g) Unless otherwise specified, all information recorded on the Discharge Monitoring Report shall be based upon measurements and sampling carried out during the most recently completed reporting period.

h) Any laboratory test or sample analysis required by this permit for which the State Commissioner of Health issues certificates of approval pursuant to section five hundred two of the Public Health Law shall be conducted by a laboratory which has been issued a certificate of approval. Inquiries regarding laboratory certification should be sent to the Environmental Laboratory Accreditation Program, New York State Health Department Center for Laboratories and Research, Division of Environmental Sciences , The Nelson A. Rockefeller Empire State Plaza, Albany, New York 12201.

PARSONS

40 La Riviere Drive, Suite 350 • Buffalo, New York, 14202 • (716) 541-0730 • Fax (716) 541-0760• www.parsons.com

November 24, 2009

Mr. Timothy Dieffenbach
New York State Department of Environmental Conservation
Division of Environmental Remediation
270 Michigan Avenue
Buffalo, New York 14203

Re: **BP Former Carborundum Facility – Sanborn, New York**
Revised Air Facility Registration

Dear Mr. Dieffenbach:

On behalf of Elm Holdings, Inc., attached please find the revised air facility registration for the Former Carborundum Facility in Sanborn, New York. The revised registration documents the NYSDEC-approved (June 22, 2009) modifications to the air emission control and discharge configuration at the Facility. The modifications were implemented November 23 through November 25, 2009.

Please contact Bill Barber of Atlantic Richfield at (216) 271-8038 if you have any questions or comments.

Sincerely,

George W. Hermance

George W. Hermance
Project Coordinator

Attachments

cc: W. Barber, Atlantic Richfield
File (445032, No. 9)

New York State Department of Environmental Conservation
Air Facility Registration

DEC ID
9 - 2 4 9 0 - 0 0 0 5 9

Owner/Firm			Taxpayer ID
Name Elm Holdings, Inc.			
Street Address 4850 East 49th Street MBC3-147			
City / Town / Village Cuyahoga Heights	State or Province Ohio	Country USA	Zip 44125

Owner/Firm Contact	
Name William B. Barber, Atlantic Richfield Company for Elm Holdings, Inc	Phone No. (216) 271-8038

Facility	
Name Elm Holdings, Inc. c/o BP Exploration	
Location Address 2040 Cory Road Groundwater Treatment Building	
☐ City / ☒ Town / ☐ Village Sanborn, NY	Zip 14132

Facility Information	
Total Number of Emission Points: One	☐ Cap by Rule Not applicable

Description

Groundwater treated for chlorinated volatile organics using a shallow tray air stripper. Exhaust from the air stripper is vented through a 12-inch diameter stack at a height of 27 - feet above ground surface.

The May 19, 2009 request to modify the configuration and operation of the Groundwater Treatment System - Air Stripper and Discharge component, NYSDEC approval for the change, a description of the change in location of the stack,and the stack as-built are attached.

Standard Industrial Classification Codes					
9999	Non classifiable	establishment			

HAP CAS Numbers					
75 - 01 - 4	75 - 09 -2	75 - 34 - 3	67 - 66 - 3	107 -06 -2	75 - 35 - 4
156 . 60 . 5	156. 59 .2	71 . 55 . 6	79 . 01 . 6	- -	- -

Applicable Federal and New York State Requirements (Part Nos.)					
200	201-4	212	212.3	212.6	212.9

Certification

I certify that this facility will be operated in conformance with all provisions of existing regulations.

Responsible Official William B. Barber	Title Project Manager
Signature	Date 11 / 20 / 2009

Atlantic Richfield Company for Elm Holdings, Inc.

7/29/96

PARSONS

40 La Riviere Drive, Suite 350 • Buffalo, New York, 14202 • (716) 541-0730 • Fax (716) 541-0760• www.parsons.com

May 19, 2009

Mr. Timothy Dieffenbach
New York State Department of Environmental Conservation
Division of Environmental Remediation
270 Michigan Avenue
Buffalo, New York 14203

Re: **BP Former Carborundum Facility – Sanborn, New York**
Groundwater Treatment System (GWTS)
Request for Modification to Air Emission Control & Discharge Configuration

Dear Mr. Dieffenbach:

Parsons, on behalf of the Atlantic Richfield Company, currently operates a Groundwater Collection and Treatment System as part of a remediation program at the site of the former Carborundum Facility in Sanborn, New York.

Currently, the system includes a tray air stripper to remove chlorinated volatile organic compounds (VOCs) from collected groundwater streams. The stripper air exhaust is then passed through a Calgon VAPOR PAC 10™ Granular Activated Carbon (GAC) control system to further reduce quantities of VOCs emitted to the atmosphere.

Based on original air emission calculations, the carbon control air exhaust system is classified as a minor source and operates under registration status with the New York State Department of Environmental Conservation (NYSDEC).

1.0 PROPOSED MODIFICATION

Atlantic Richfield is proposing to make a modification to the configuration and operation of the Groundwater Treatment System – Air Stripper and Discharge component. The original groundwater treatment system was constructed to treat 600 gallons per minute (GPM) of impacted groundwater. Currently the system operates at less than 100 GPM. Results for recent pre- and post-air stripper water samples, collected with the system operating between 90 and 100 GPM, indicate that pollutant loading to the VAPOR PAC 10™ GAC from the stripper is low enough to allow air stripper operation without carbon controls on the exhaust. Accordingly, Atlantic Richfield is proposing to eliminate the post-air stripper VAPOR PAC 10™ GAC control system and discharge the air stripper exhaust stream directly to the atmosphere.

The proposed modification replaces the existing VAPOR PAC 10™ carbon control system, associated exhaust ductwork, and 30-inch diameter stack with a 12-inch diameter vent installed over the air stripper. The 12-inch vent will discharge stripper exhaust at a height of 27 feet above ground level.

The modification is proposed based on a dispersion modeling analysis. The dispersion modeling analysis demonstrates that ambient impacts of emissions attributable to the proposed new operating configuration and emission scenario will be in compliance with the NYSDEC Division of Air Resources (DAR) Policy and Guidelines for the Control of Toxic Air Contaminants.

2.0 MODELING ANALYSIS

The NYSDEC DAR-1 (Air Guide1) policy requires that emissions of toxic air pollutants be evaluated for compliance with a set of ambient air concentration guidelines. These guidelines include sets of ambient air quality standards, or threshold concentration values that are not to be exceeded in the ambient air. These standards include a series of Short-Term Guideline Concentrations (SGCs) applicable to 1-hour average ambient concentrations, and a series of Annual Guideline Concentrations (AGCs) applicable to annual average levels of various contaminants.

2.1 MODELING APPROACH

The modeling was conducted using the DAR-1 "Ambient Air Quality Impact Screening Analysis" software package developed by NYSDEC specifically for the purpose of assessing ambient impacts of toxic air emissions from one or more sources based on site-specific input data. NYSDEC considers the DAR-1 analysis to be an appropriate initial screening technique which can be used to satisfy their policy.

As indicated in Section IV.A of the DAR-1 Guidelines, ambient impacts predicted via this screening tool are considered to be conservative, thereby providing additional assurance that predicted concentrations below established thresholds are protective of human health.

The DAR-1 assessment approach requires that emissions from a source be assessed on a contaminant by contaminant basis. The model predicts both a maximum 1-hour and a maximum annual average concentration for each compound. The peak predicted 1-hour (i.e., short-term) concentrations are assessed relative to the SGC values and the maximum annual average (i.e., long-term) concentrations are assessed relative to the AGC values for each compound.

Consistent with the stated objective of this analysis, impacts were assessed for the proposed operating configuration, wherein air emissions from the tray stripper are exhausted directly (i.e., with no carbon control) through a new vent to be constructed over the stripper. This new vent will be a vertical stack, such that emissions are modeled as being exhausted from a vertically-discharged point source. Figure 1 is a conceptual model used for the modeling exercise.

2.2 MODEL INPUT DATA

Emissions Data

There are a total of ten (10) compounds of interest associated with the Sanborn groundwater remediation program. Based on the March 11, 2009 pre- and post air stripper influent water sampling and analyses results, **Table 1** lists the compounds sampled, the VOC concentrations in the combined influent water samples were used to calculate the post-stripper mass loadings, and the corresponding post-stripper air emission rates for these compounds in grams per hour (g/hour). Based on the data, there are four compounds with "zero" emission rates. The analytical results of the influent water sample used to calculate emission rates are consistent and representative of the expected groundwater impacts.

The g/hour rates were converted to lb/hour rates for use in determining maximum model predicted short-term (i.e., maximum 1-hour average) impacts. For this analysis, it was conservatively assumed that the short-term lb/hour emission rates remain constant throughout all 8,760 hours per year. Thus, model calculations of maximum long-term annual average impacts are based on contaminants being continuously emitted at the same lb/hour rates during each hour in the year.

Source and Stack Data

Figure 2 is an aerial photograph of the Sanborn site depicting the facility property line, the GWTS building location, and proposed new exhaust stack location atop the center of the structure. The building is located within controlled property providing a buffer zone between the source and the property line, or "ambient air". **Figure 2** also delineates the shortest distance between the stack and the property line, which is 41.4 meters (136 feet). This is the point at which the first model receptor point is placed. The shortest distance between the trailing edge of the building and the property boundary is 30.5 meters (100 feet).

The proposed new stack top of 27 feet is modeled at 10 feet above the building height of 17 feet (average of 18-foot peak and 16-foot eave heights). The building height, along with the length and width dimensions (approx 95' by 50') were entered into the DAR-1 model for assessment of any potential building cavity and aerodynamic downwash impacts.

2.3 MODELING ANALYSIS AND RESULTS

Based on the source and emissions data presented herein and the proposed source configuration for the Sanborn Facility GWTS, the proposed new physical and operating configuration (without carbon control) will operate in compliance with the NYSDEC air toxics guidelines.

Table 2 provides a comprehensive summary of the model inputs and outputs comprising the DAR-1 analysis for the proposed new stack. Data provided in Table 2 includes input parameters and appropriate 1-hour SGC and Annual AGC regulatory values to assess compliance. Parameters listed include the compounds of concern, compound abbreviations and CAS numbers, the base hourly emission rates in pounds per hour (lb/hr), the annual emissions in pounds per years (lb/yr), and the predicted maximum 1-hour and maximum annual average concentrations for each compound in micrograms per cubic meter (μg/m3). The predicted maximum annual impacts are expressed as percentages of the applicable AGC concentration values. It should be noted that AGC values have been established for all listed compounds. However, SGC values have not been established for all the compounds.

For this analysis for a single point source, the model was executed for a "Unit Emission Rate" of one pound per hour (1 lb/hour), or 0.126 grams per second (g/sec). The 1-hour and annual average concentration values predicted for the 1 lb/hour rate were then scaled based on the actual lb/hour emission rates for each compound to obtain the predicted concentration values for each individual compound.

A review of the source configuration input to the model (i.e., building dimensions and distance to property line) and the DAR-1 model output indicated that the building cavity region does not extend off-site. Therefore, there are no cavity impacts to be assessed, and the peak impacts calculated by the model are those that occur under more conventional dispersion conditions at receptor points at and beyond the property line.

As shown in Table 2, the maximum predicted 1-hour and annual average concentrations ($\mu g/m^3$) for all compounds examined in the analysis are below the applicable SCG and AGC values. The maximum predicted 1-hour concentrations are generally several orders of magnitude below the applicable SGC thresholds. With the exception of TCE, the maximum predicted annual average concentrations comprise only about 3 percent or less of the AGC values. TCE concentration is 57% of the AGC value

Potential Increases in COC Concentrations

The results of the model suggest that a shorter (i.e., less than 27 feet) 12-inch diameter vent installed over the air stripper with no carbon controls could be operated and meet SGC and AGC criteria. However, using the proposed 12-inch diameter stack to 27 feet above grade will allow for increased emissions that could result from increased TCE concentration in the influent, if any.

- SGC: Using the modeled emission rate developed from the March '09 sampling data and the 27 foot stack height, the maximum predicted 1-hour impact of TCE is approximately three orders of magnitude lower than the SGC threshold value. Thus, a short-term increase of the influent concentration of TCE (up to 3,000 times its modeled value) would not exceed the short-term SGC threshold.

- AGC: An increase in emissions, resulting from an increase in TCE concentration (from other possible sources) in the influent, would have to persist throughout all 8,760 hours per year. Based on the modeled margin of compliance with the AGC for a TCE emission rate of 7.64419 g/hr, a 75% increase of TCE in the influent, even if it persisted all 8,760 hours per year, would not yield an increase in the annual average ambient TCE concentration that would exceed the AGC value at the 27-foot stack height.

3.0 REQUEST FOR NYSDEC CONCURRENCE

The results of the groundwater sample analysis and the DAR-1 air modeling analysis described above indicate that the Sanborn GWTS could be operated in a revised configuration. This revised configuration would meet the SGC and AGC values for the compounds examined and would include (1) taking the VAPOR PAC 10 carbon control system taken off line and (2) directing the air stripper emissions through a new vent directly to the atmosphere

Accordingly, Atlantic Richfield respectfully requests that NYSDEC review the proposed modification and formally approve this request to implement this modification. Upon receipt of verbal concurrence with our findings, Atlantic Richfield will submit a revised Source Registration application to document the proposed changes.

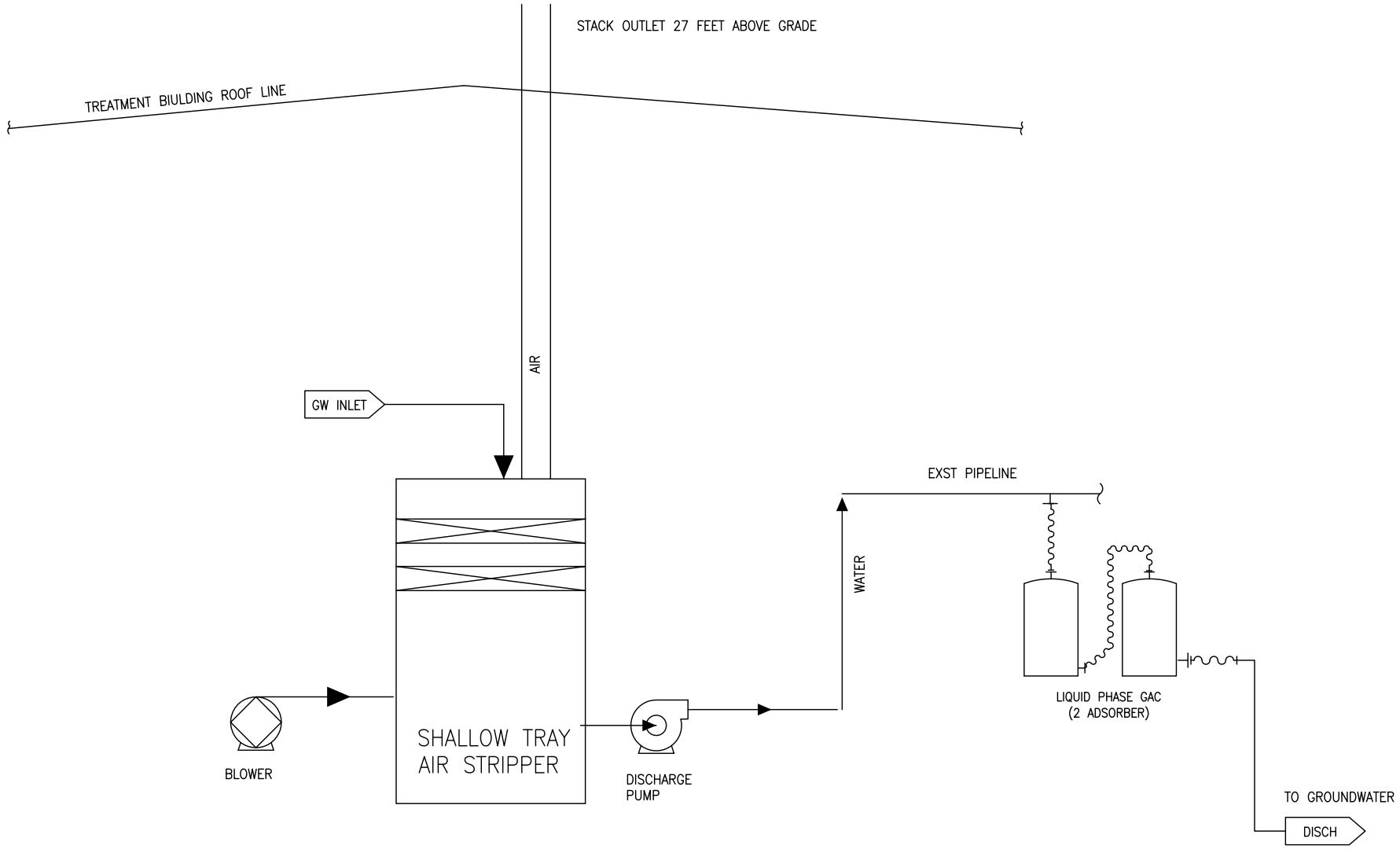
Please do not hesitate to contact William B. Barber at 216.271.8038 if you have any questions or need any additional information regarding this request. A meeting could be arranged to review the model and results if that would be of use.

Sincerely,

Mark S. Raybuck

Mark Raybuck
Project Manager

cc: William B. Barber, Atlantic Richfield Company
File (445032, No. 9)



FILE NAME: P:\445032\O&M\STACK REVISION\AIR MODEL 2009\SANBN-STACKREV-001.DWG

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40 LA RIVIERE DR., SUITE 350
BUFFALO, NY
(716) 541-0730

FIGURE 1

BP SANBORN
CONCEPTUAL MODEL FOR STACK REVISION

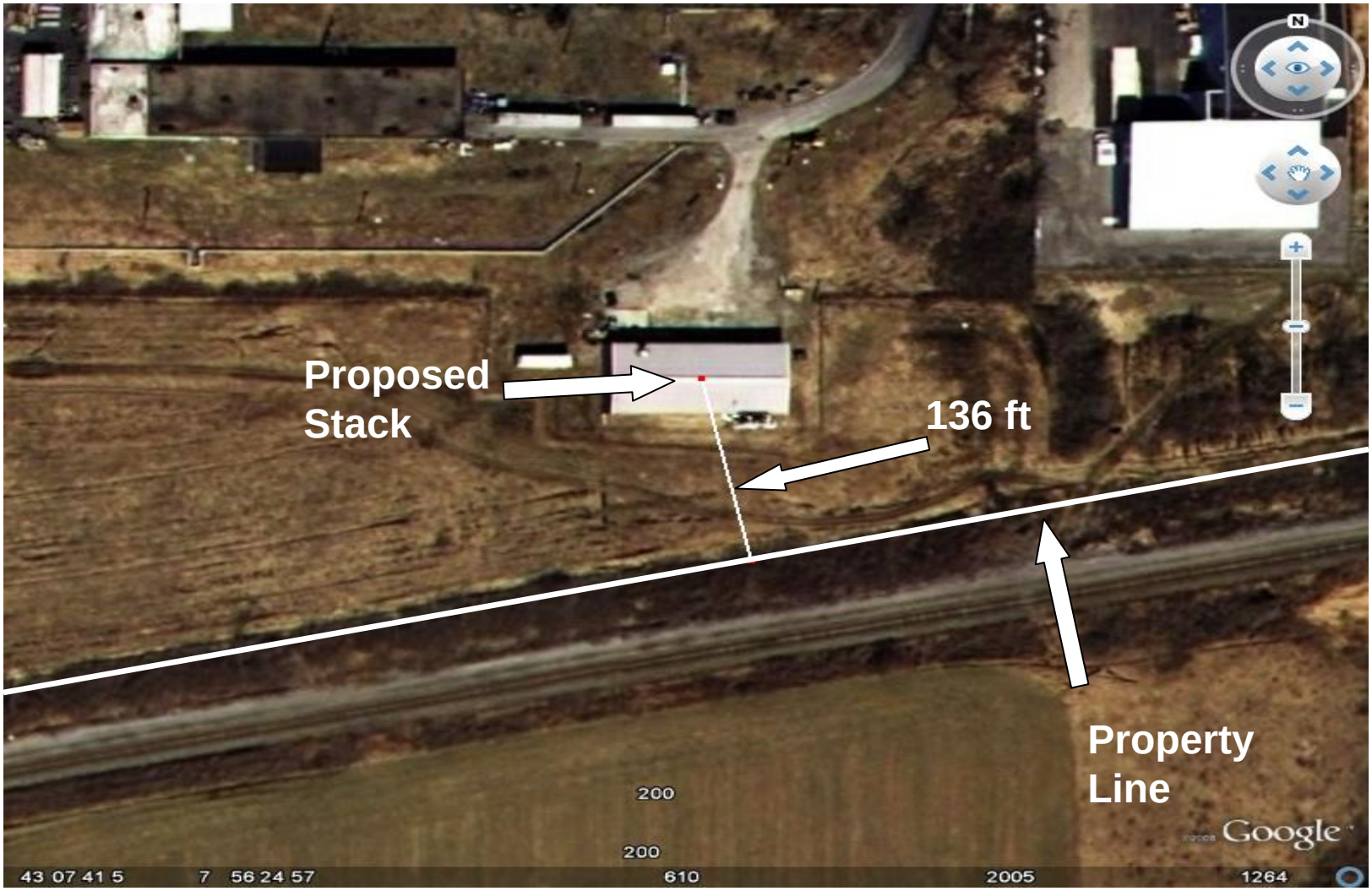

FIGURE 2

Former Carborundum Facility, Sanborn, NY

Center Stack and Distance to Property Line

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40 La Riviere Dr., Suite 350 Buffalo, NY 14202 (716) 541-0730

Table 1
Air Stripping of GWTS Influent Water
Former Carborundum Facility, Sanborn, New York

	Sanborn Site Data			
Parameter	Influent Concentrations, ug/l	Post-stripper Concentrations, ug/l	% Removal	VOC Vapor Phase, g/hr
vinly clhoride	3.3	0	100.00%	**0.074943**
1,1 DCE	0	0	NA	**0**
MC	0	0	NA	**0**
t-1,2 DCE	1.2	0	100.00%	**0.027252**
1,1 DCA	3.3	0	100.00%	**0.074943**
c-1,2 DCE	130	2.3	98.23%	**2.900067**
chloroform	0	0	NA	**0**
1,1,1 TCA	3.7	0	100.00%	**0.084027**
1,2 DCA	0	0	NA	**0**
TCE	340	3.4	99.00%	**7.644186**
Total VOC	481.5	5.7		10.81

* Based on an actual 100 gpm flowrate to the stripper and an actual air flowrate of 750 cfm (1274 m^3/hr)

Table 2
Sanborn GWT Facility - DAR-1 Air Modeling Analysis - Emissions and Impacts Summary

New Stack - No Carbon Control - Stack Height = 27 Feet

Source Parameters:

Stack Height	**27 feet**
Stack Diameter	12 inches
Volume Flow Rate:	750 cfm (actual)
Exit Velocity	15.92 ft/sec
Exit Temperature	59 Deg F

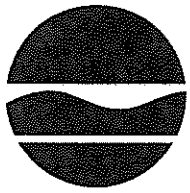
DAR - 1 Modeling Results
For Unit Emission Rate of 1 lb/hr (0.126 g/sec):

Max 1-hour Impact = 1024.62 ug/m3
Max Annual Avg Impact = 16.94 ug/m3

Compound	Abb.	CAS No.	Mass Loadings From Air Stripper[1] (g/hour)	Corresponding Maximum Short-Term Emission Rate (lb/hour)	Max Annual Emissions (ST X 8,760) (lb/yr)	Max Modeled 1-Hour Impact[2] (ug/m3)	1-Hour SGC Value[3] (ug/m3)	Max Modeled Annual Avg Impact (ug/m3)	Annual AGC Value (ug/m3)	Annual Impact as % of AGC
Vinyl Chloride	VC	75-01-4	0.07494	1.65E-04	1.45	0.16928	*180000*	0.0028	*0.11*	2.54%
1,1 dichloroethene	1,1-DCE	75-35-4	0	0.00E+00	0.00	0.00000	-	0.0000	*70.0*	0.00%
Methylene Chloride	MeCl	75-09-2	0	0.00E+00	0.00	0.00000	*14000*	0.0000	*2.1*	0.00%
trans 1,2 Dichloroethene	t-1,2-DCE	156-60-5	0.02725	6.01E-05	0.53	0.06155	-	0.0010	*63.0*	0.00%
1,1 dichloroethane	1,1 DCA	75-34-3	0.07494	1.65E-04	1.45	0.16928	-	0.0028	*0.63*	0.44%
cis-1,2 Dichloroethene	c-1,2-DCE	156-59-2	2.90007	6.39E-03	56.01	6.55086	-	0.1083	*63.0*	0.17%
Chloroform	CF	67-66-3	0	0.00E+00	0.00	0.00000	*150*	0.0000	*0.043*	0.00%
1,1,1-Trichloroethane	1,1,1-TCA	71-55-6	0.08403	1.85E-04	1.62	0.18981	*68000*	0.0031	*1000*	0.00%
1,2 Dichloroethane	1,2-DCA	107-06-2	0	0.00E+00	0.00	0.00000	-	0.0000	*0.038*	0.00%
Trichloroethene	TCE	79-01-6	7.64419	1.69E-02	147.63	17.26717	*54000*	0.2855	*0.5*	57.10%

Notes:
(1) "Mass Loadings From Air Stripper" values are based on March 11, 2009 influent concentration test data, GW flow rates and assumed air stripper control efficiencies.
(2) Compound-Specific impact values are based on model results for "Unit Emission Rate" (1 lb/hr) multiplied by actual lb/hr rates for each compound.
(3) A "-" indicates no SGC values have been established

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 9
270 Michigan Avenue, Buffalo, New York, 14203-2915
Phone: (716) 851-7220 • **FAX:** (716) 851-7226
Website: www.dec.ny.gov



Alexander B. Grannis
Commissioner

June 22, 2009

Mr. William Barber
Atlantic Richfield Company
4850 East 49th Street
MBC3-147
Cuyahoga Heights, Ohio 44125-1014

Dear Mr. Barber:

Modification to Air Emission Control & Discharge
Carborundum Specialty Products
Site Registry #932102
Wheatfield (T), Niagara County

The Department has reviewed the May 19, 2009 Request for Modification to Air Emission Control & Discharge Configuration and the June 18, 2009 additional data set submitted by Parsons. Based on review of the data presented, the Department has no objection to the removing the carbon treatment control system and replacing the vent stack.

If you have any questions, please contact me at (716) 851-7220.

Sincerely,

Tim Dieffenbach

Tim Dieffenbach
Engineering Geologist II

TD:sz

cc: Mr. Gregory Sutton - NYSDEC
Mr. Matthew Forcucci - NYSDOH
Mr. Mark Raybuck - Parsons

PARSONS

40 La Riviere Drive, Suite 350 • Buffalo, New York, 14202 • (716) 541-0730 • Fax (716) 541-0760• www.parsons.com

October 15, 2009

Mr. Timothy Dieffenbach
New York State Department of Environmental Conservation
Division of Environmental Remediation
270 Michigan Avenue
Buffalo, New York 14203

Re: **BP Former Carborundum Facility – Sanborn, New York**
Groundwater Treatment System (GWTS)
Revision to NYSDEC-approved Air Emission Control & Discharge Configuration

Dear Mr. Dieffenbach:

As discussed with Bill Barber, this follow up letter is to inform you that the location for the new stack at the referenced facility must be changed. In the NYSDEC-approved (June 22, 2009) modification to the air emission control and discharge configuration, Atlantic Richfield had intended to install the 12-inch diameter fiberglass reinforced plastic (FRP) vent directly over the air stripper. Recent structural analysis of the building has determined that the new stack must be supported from the ground rather than the roof. Thus, the location of the stack has been changed from directly over the air stripper (supported by the roof) to a location outside the building (supported from the ground).

The new stack is anticipated to be installed along the north side of the building, approximately 25 feet from the original location (see attached photo). The height of the stack (27-feet) will remain the same. The conceptual plan for the new stack installation is attached. The modeling used for the original placement of the stack through the roof remains valid for the stack placement along the outside of the building.

Please contact Bill Barber of Atlantic Richfield at (216) 271-8038 if you have any questions or comments.

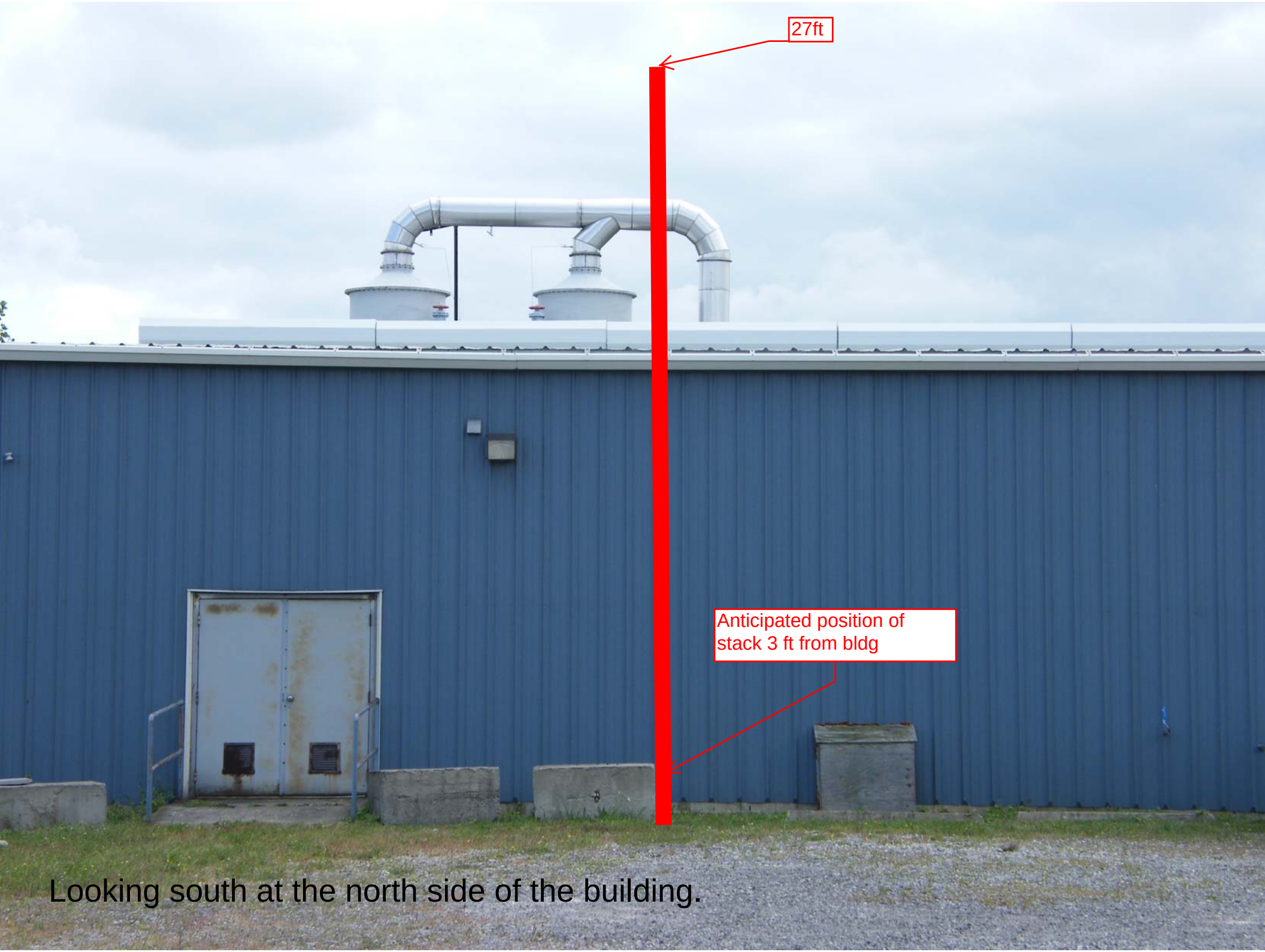
Sincerely,

George W. Hermance

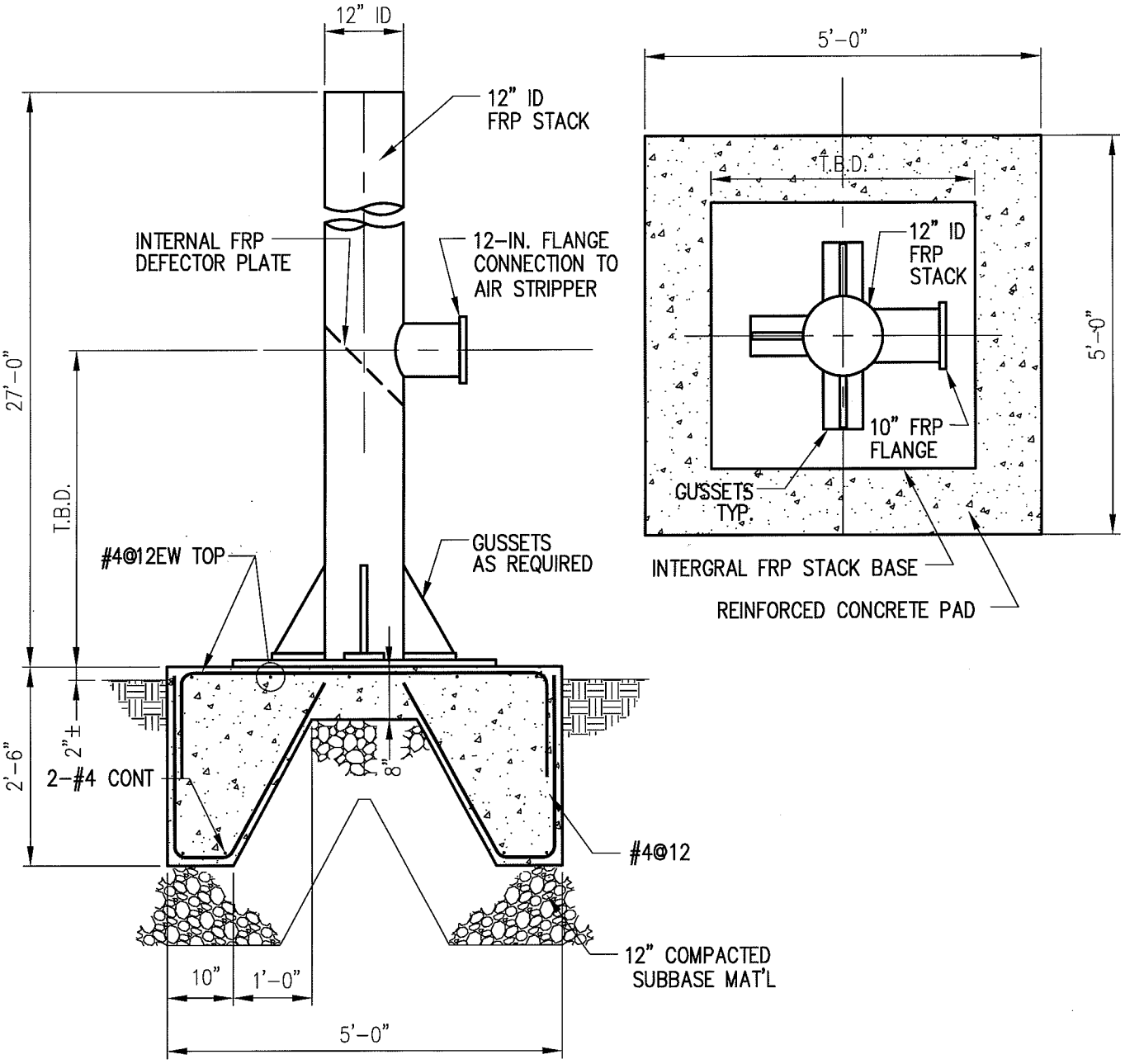
George W. Hermance
Project Coordinator

Attachments

cc: W. Barber, Atlantic Richfield
File (445032, No. 9)



Looking south at the north side of the building.



NOTES:

1. CONTRACTOR SHALL CONTACT DIGSAFE OR OTHER GOVERNMENT AGENCIES RESPONSIBLE FOR LOCATING UNDERGROUND UTILITIES AND VERIFY LOCATION AND DEPTH OF ALL UTILITIES IN THE WORK AREA PRIOR TO THE START OF WORK.
2. SOFT OR YIELDING SOILS SHALL BE OVER EXCAVATED AND REPLACED WITH IMPORTED GRAVEL FILL, COMPACTED TO 98% OF ITS MODIFIED PROCTOR DRY DENSITY (MPD) AND WITHIN 2% OF OPTIMUM MOISTURE CONTENT AS DETERMINED IN ACCORDANCE WITH ASTM D1557.
3. NO CONCRETE SHALL BE PLACED IN WATER OR ON FROZEN GROUND.
4. CONCRETE SHALL ATTAIN A MINIMUM AVERAGE COMPRESSIVE STRENGTH (F'c) OF 3,000 PSI AT 28 DAYS' AGE.
5. REINFORCING STEEL SHALL HAVE NEW BILLET STEEL ASTM A-615 GRADE 60 DEFORMATIONS CONFORMING TO ASTM A-305. ALL DETAILS SHALL BE IN ACCORDANCE WITH ACI DETAIL STANDARD ACI 315.
6. ANCHOR BOLT SPECIFICS (SIZE, SPACING, PATTERN, ETC.) TO BE PROVIDED BY THE STACK MANUFACTURER.

FOUNDATION DESIGN FOR FREE STANDING FRP STACK

SCALE:1/2"=1'-0"

PARSONS

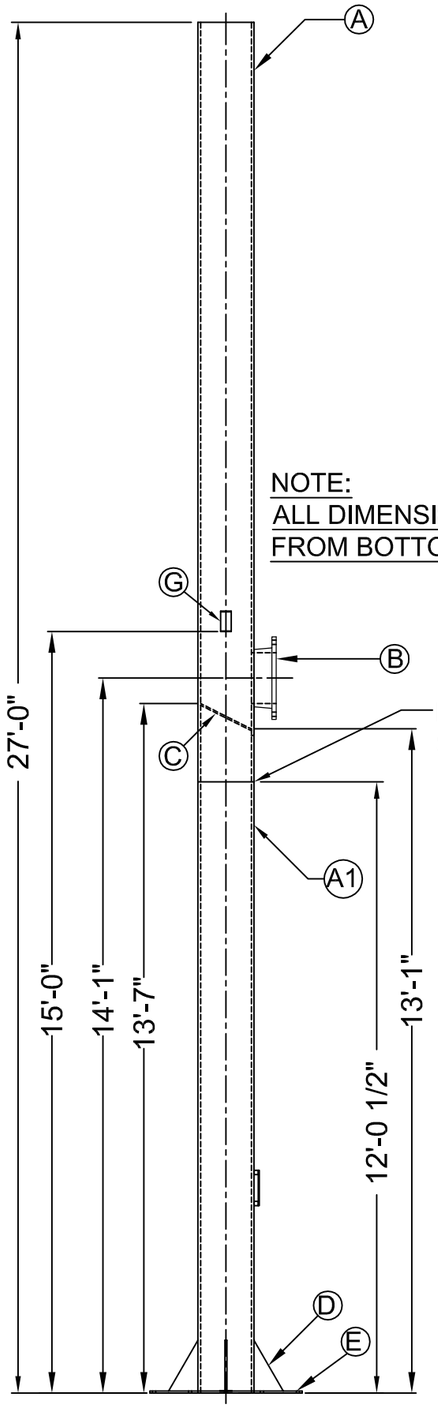
STANDARD DETAIL

S-01

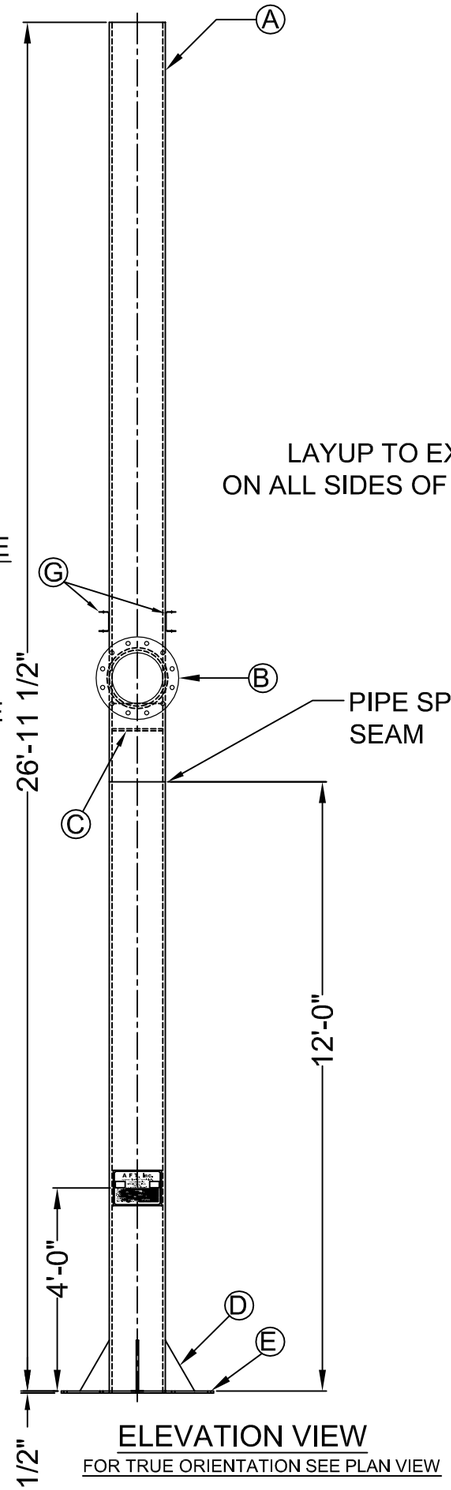
REVISION DATE: 9/2/09

UNLESS OTHERWISE SPECIFIED, DIMENSIONAL TOLERANCES ARE:
FRACTIONAL +/-1/8", DECIMAL +/-.125", ANGULAR +/-2°

BILL OF MATERIAL						
ITEM	QTY	PART_#	DESCRIPTION/SERVICE	GUSSET_TYPE	NZL_PROJ.	MATL.
A	1	60-12FWP150470	12"ø 150PSI FILAMENT WOUND PIPE (15' TALL)	N/A	N/A	FRP
A1	1	60-12FWP150470	12"ø 150PSI FILAMENT WOUND PIPE (12' TALL)	N/A	N/A	FRP
B	1	50-12FLA50470	12"ø 50 PSI NOZZLE	N/A	6"	FRP
C	1	———	3/8" THK. INTERIOR DEFLECTOR PLATE	N/A	N/A	FRP
D	4	———	GUSSET PLATE w/ BOTTOM PLATE (SEE GUSSET DETAIL D)	N/A	N/A	FRP
E	1	———	1/2" THK. x 3' SQ. WIDE PLATE	N/A	N/A	FRP
F	1	10-099	NAME PLATE w/ BRACKET	N/A	N/A	ALUM.
G	2	10-072-#2	#2 LIFT LUG	N/A	N/A	CS

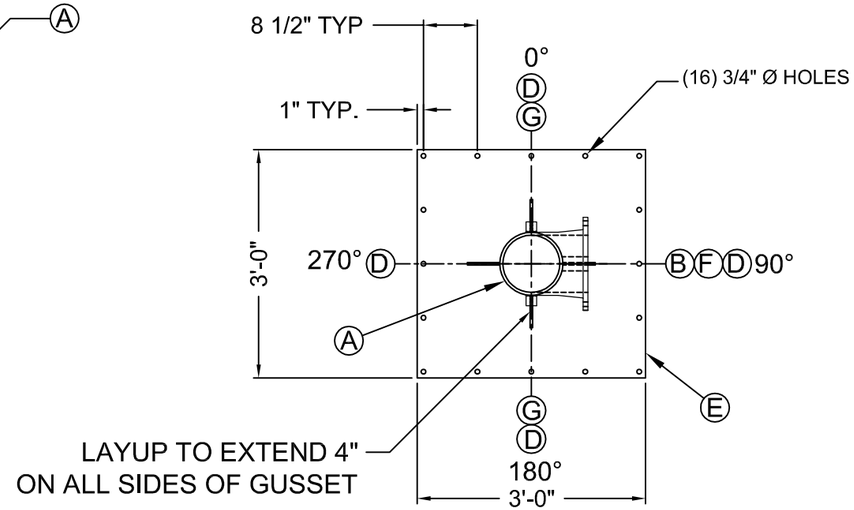


ELEVATION VIEW
FOR TRUE ORIENTATION SEE PLAN VIEW

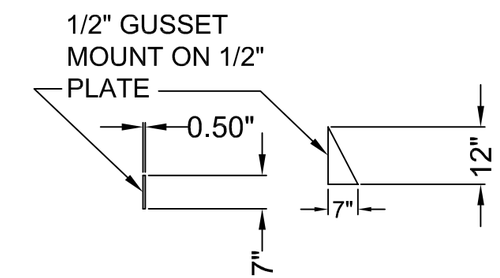


ELEVATION VIEW
FOR TRUE ORIENTATION SEE PLAN VIEW

NOTE:
ALL DIMENSIONS TO BE FROM BOTTOM OF PLATE



PLAN VIEW



GUSSET DETAIL (D)

MATERIALS OF CONSTRUCTION			
	RESIN SYSTEM		CURE SYSTEM
LINER	100 MIL. DERAKANE 470-300		CHP
STRUCTURAL	DERAKANE 470-300		CHP
EXTERIOR COAT	–		
REINFORCEMENTS	THK./LAYER	SYMBOL	REMARKS
"C"-GLASS SURFACING VEIL	0.010"	V	–
NEXUS SURFACING VEIL	0.010"	N	SINGLE C-VEIL
1 1/2 oz. CHOP STRAND MAT	0.043"	M	1 1/2 oz./SQ. FT.
3/4 oz. CHOP STRAND MAT	0.022"	Z	3/4 oz./SQ. FT.
24 oz. WOVEN ROVING	0.033"	R	24 oz./SQ. YD.
WEFT UNIDIRECTIONAL FABRIC	0.025"	U	1.67 oz./SQ. FT.
CHOP STRAND GLASS	0.030"	CP	1 oz./SQ. FT.
HELICAL FILAMENT WIND	0.046"	FW	1.84 oz./SQ. FT.
STRAIGHT FILAMENT WIND	0.022"	SW	0.92 oz./SQ. FT.
COMPONENT	LAMINATE THK.	LAMINATE TYPE	REMARKS
TOP HEAD	–	TYP. II	N/A
SHELL	0.375	TYP. X	FW@77°
BOTTOM	0.50	TYP. II	CHOP

DESIGN CONDITIONS		
DESIGN PRESS.	ATM.	°F
DESIGN TEMP.	AMBIENT	VAC.
OPERATING PRESS.	ATM.	F
OPERATING TEMP.	AMBIENT	VAC.
HYDRO TEST	N	
POST CURE	Y	
SP.GR. CONTENTS	1.2	
WIND LOAD	90 MPH	
SEISMIC ZONE	N/A	
ROOF LOAD	N/A	
VISUAL INSPECTION	ASTM D-3299	
PRODUCT	–	
DESIGN PER.	ASTM D-3299	

REV	REVISION	DATE	INT
4	AS BUILT	11-12-09	KR
3	APPROVED FOR FABRICATION	10-27-09	KR
2	REVISED PER CUSTOMER REQ.	10-21-09-	KR
1	ADDED WIND LOAD TO DESGN COND.	10-16-09	MM
0	NEW DRAWING	10-12-09	KR

CUSTOMER: PARSONS COMMERCIAL TECH.

TITLE: AIR STRIPPER
12" FRP x 27' TALL STACK
EMISSIONS STACK
ASSEMBLY DRAWING

SCALE: NONE
DR: KMR DATE: 10-12-09
CK: - DATE: -

MATERIAL: FRP
SERIAL NO: 0081870
QTY REQ'D: 1
DWG NO: 81870-1
OF: 2
REV: 4

ADVANCEDFIBERGLASSTECHNOLOGIES INC.
An Energy Composites Company

4400 Commerce Drive
Wisconsin Rapids, WI 54494
P(715) 421-2060 F(715) 421-2048

Attachment VI

Permit and Regulation Required Inspection and Maintenance Procedures

Device Name	Common Name	Description	Setpoint
Safety Shower & Eye Wash Station	Safety Shower & Eye Wash Station	Safety shower and eyewash station for groundwater process area	N/A

Task	Function Test
Frequency	Monthly

Procedure	
1	Pull safety shower to activate water valve
2	Note flow volume and allow to run enough time to flush out line with fresh water
3	Close safety shower activation valve. Make sure water flow stops.
4	Activate eye wash unit.
5	Note flow volume and allow to run enough time to flush out line with fresh water
6	Close eye wash activation valve. Make sure water flow stops.

Data Recorded	
Safety shower operates correctly?	
Eye wash works correctly?	
Record date of inspection	

Device Name	Common Name	Description	Setpoint
Flow Meter	Flow Meter	Effluent flow meter (gear drive) for Effluent Tank (T-802)	N/A

Task	Function Test
Frequency	Monthly

Procedure		Data Recorded	
1	When well pump is running, check meter pipe connections for leakage.	Meter connections leaking?	
2	When effluent pumps P-810A/B are running, check meter remote display for flow indication.	Meter flow indication remote display?	
		Record meter reading and date.	

Device Name	Common Name	Description	Setpoint
Temperature/pH Meter	Temperature/pH Meter	Hanna Instruments Model HI991301 pH/EC/TDS/Temperature Portable Meter	N/A

Task	Temperature Calibration Check
Frequency	Monthly prior to measurement of SPDES required effluent grab sample.

Note: Measurement device should be routinely checked against a precision thermometer certified by the National Bureau of Standards ." (p.170.1-1)

	Procedure
1	Pull grab sample from the SPDES Permit approved sample point.
2	Immediately measure the temperature with the Hanna digital meter.
3	Immediately measure the temperature of the effluent sample with the certified thermometer.
4	If a difference exists between the two temperature measurements, use the certified thermometer reading for SPDES reporting. Note: Meter cannot be calibrated for temperature.
5	If a difference exists between the two temperature measurements that are greater than 2.0°F (or 1.0°C), replace the probe.

Data Recorded	
Record date and time sample was taken.	
Record temperature taken with the Hanna digital meter.	
Record the temperature taken with the certified thermomether.	
Record when probes are replaced in logbook.	

Device Name	Common Name	Description	Setpoint
Temperature/pH Meter	Temperature/pH Meter	Hanna Instruments Model HI991301 pH/EC/TDS/Temperature Portable Meter	N/A

Task	pH Calibration
Frequency	Weekly prior to measurement of SPDES required effluent grab sample.

Note: EPA-Methods for Chemical Analysis of Water and Wastes (Method 150.1). Calibration- "7.2 - Each instrument/electrode system must be calibrated at a minimum of two points that bracket the expected pH of the samples and are approximately three pH units or more apart." (p. 150.1-2)

The information in boxes below is kept in the calibration log book in the lab.

Procedure	
1	If probe has been left dry, soak in a storage or pH 7 solution at least one hour to reactivate it.
2	While in pH measurement mode, press and hold the MODE button until TEMP and the current temperature units are displayed on the lower LCD. You want to choose TEMP°F
3	Press the MODE button again to show the current buffer set. Choose "pH 7.01 BUFF" for 4.01/7.01/10.01 buffer set.
4	Press SET/HOLD to change the buffer set if needed. Then press MODE to return to normal pH mode.
5	If a difference exists between the two temperature measurements that are greater than 2.0°F (or 1.0°C), replace the probe.
6	While in pH measurement mode, press and hold the MODE button until CAL is displayed on the lower LCD.
7	Release the button. The LCD will display pH 7.01 USE.
8	For the required two-point calibration, place the probe in pH 7.01 buffer solution in a clean beaker while stiring gently on a stir plate.
9	The meter will recognide the buffer value and then display pH 4.01 USE.
10	Remove probe from 7.01 buffer and rinse the probe with distilled water. Then place the probe in nthe second buffer of pH 4.01 in a clean glass beaker, while gently stirring on a stir plate.
11	When the second buffer is recognised, the LCD will display OK for one second and the meter will return to normal measurement mode. Rinse off the probe with distilled water.
12	Pull grab sample from the SPDES Permit approved sample point. Place in a clean glass beaker and place on a stir plate. Submerge the probe in the sample to be tested while stirring it gently.
13	Wait until the stability indicator on the top left of the LCD disappears. Read the sample pH.
14	Rinse off the probe with distilled water and place probe in storage solution.

Data Recorded	
Record date and time sample was taken.	
Record pH calibration was completed.	
Record the pH taken with the calibrated meter.	
Record when probes are replaced in logbook.	

Device Name	Common Name	Description	Setpoint
Residual Chlorine Meter	Residual Chlorine Meter	Thermal Orion 4-Star Meter	N/A

Task	Meter Calibration and Sample Analysis.
Frequency	Monthly prior to measurement of SPDES required effluent grab sample.

	Procedure
1	Prepare chlorine water by diluting 1 mL of Clorox to 500 mL of distilled water and mix throroughly.
2	Measure slope - place 100 mL of distoilled water into a 150 mL beaker. Add 1 mL of iodide reagent and 1 mL of acid reagent.
3	Add 1 mL of chlorine water to the beaker and stir gently for two minutes to allow complete reaction. Turn on meter and set to mV mode.
4	Rinse electrode with distilled water and dry, then place in to solution in step 3, making sure the reference element is submerged. Do not stir. When a stable mV reading is displayed, record the electrode potential in millivolts.
5	Remove the probe and add 10 mL of chlorine water to the beaker. Stir gently for two minutes to allow complete reaction.
6	Place probe into the solution and wait for a stable reading.
7	The difference between the first and second reading is the slope of the electrode. The slope should be in the range of 26-30 mV/decade. If the slope is not within this range, refer to the trouble shooting section of the Users Guide.
8	Rinse and dry probe.
9	Pipet 1 mL of residual chlorine standard, 1 mL of acid reagent, and 1 mL od iodide reagent into a 150 mL beaker. Add no water. Mix thoroughly and allow to stand for two minutes.
10	Add 99 mL of distilled water and mix thoroughly. Never store this solution more than one day. This is the Standardizing Solution.
11	Rinse and dry the probe, place the probe in a beaker containing the 1 ppm Standardizing Solution mentioned in number 10 above.
12	Set the slope of the meter to the slope value determined earlier.
13	Wait for a stable reading, then calibrate the meter to display the value of the standard (1 ppm) as described in the meter user guide.
14	Remove the probe from solution and dry.
15	Transfer 100 mL of sample water to a 150 mL beaker. Add 1 mL of acid reagent and 1 mL of iodide reagent, mix thoroughly and let stand two minutes.
16	Place electrode in sample solution solution so that the reference element is submerged and wait for a stable reading.

The information in boxes below is kept in the calibration log book in the lab.

Data Recorded	
Millivolt reading of the first (low concentration) solution.	
Millivolt reading of the second (high concentration) solution.	
Calculate slope (second reading minus the first).	
Is slope between 26-30 mV/decade? If yes, procede.	
Set meter to slope calculated and calibrate to 1 mL standard solution.	
Record sample residual chlorine concentration in ppm.	

Device Name	Common Name	Description	Setpoint
Backflow Preventer	Backflow Preventer	City Water Back Flow Preventer	N/A

Task	Function Test
Frequency	Quarterly

Note: Must be certified annually by licensed plumber.

Procedure	
1	Observe if any leakage is coming from backflow preventer.
2	Backflow is free from obstructions in front of unit.
3	Insure there are no taps in water line between meter and backflow preventer.

Data Recorded	
Backflow Preventer leaking?	
Backflow Preventer free of obstructions?	
No taps in water line between meter and backflow preventer?	
Record date of inspection.	

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APPENDIX F

VWCC SYSTEM FUNCTIONAL DESCRIPTION

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Process Instrumentation PLC Integration

2012

Vault Water Collection and Conveyance Design

Sanborn, NY

O & M MANUAL

Table of Contents

Attachment A Functional Description

SECTION 1
OPERATION DESCRIPTION

Parsons Commercial Technology Corp.

Former Carborundum Facility, Sanborn, NY

Main Control Panel Modification and Vault Expansion

System Description and Operation

Prepared by:
ZellerACS.
404 Sonwil Drive
Cheektowaga, NY 14225
(716) 692-5755

April 2012

1.1. System Expansion Overview
1.2. Sump Control Panel
1.3. Main Control Panel Modifications

1.4. Vault Section
    1.4.1. Level Transmitters
    1.4.2. Flow Totalizers
    1.4.3. Pumps 1/2/3
        1.4.3.1. Off / Auto Switches
        1.4.3.2. current switch for run status
    1.4.4. T-001 Sump
    1.4.5. Level Transmitter / Controller
    1.4.6. LSHH Interlock
    1.4.7. Pumps 4/5
        1.4.7.1. Hand off auto switches

1.5. Treatment building section
    1.5.1. Incoming Flow Meter
    1.5.2. T-002 EQ tank
        1.5.2.1. LSHH Interlock
    1.5.3. Level Transmitter
    1.5.4. Pumps 6/7
        1.5.4.1. Hand off auto switches
        1.5.4.2. lead lag configuration
    1.5.5. Bag Filters
        1.5.5.1. PI 212 / PI 218 / DPI 212
        1.5.5.2. MOV 1001 MOV 1002
        1.5.5.3. Active and Standby groups

1.6. Auto Dialer Alarms

System Description and Operation

1.1 System Expansion Overview

The existing system is responsible for pumping water from various extraction wells on the site and processing it in the treatment building. The system was expanded to remove water from three below grade vaults at the Metaullics building adjacent to the treatment plant. An outdoor sump was built, and pumps were installed in the 3 vaults to pump into this new sump. Water is then pumped from the sump to a new equalization tank installed in the treatment building. Then it is filtered by new bag filters before being pumped into the existing equalization tank, where it joins water from the extraction wells.

1.2 Sump Control Panel (SCP)

A new panel was built and installed outside the Metaullics building. It houses the motor starters for 5 of the new pumps, level indicators, flow totalizers, hand/off/auto switches, and other controls equipment for most of the system expansion.

1.3 Main Control Panel Modifications

The PLC in the main control panel had a spare input card removed and replaced with an Analog Input card to make room for all the new analog signals that would be coming from the Sump Control Panel

1.4 Vault Section

1.4.1 Vault Level Transmitters

Each vault has a level transmitter that is used for monitoring of the water level. There is a level indicator for each vault in the SCP. The signal is also transmitted to the PLC in the main treatment building for monitoring

1.4.2 Vault Flow Totalizers

Each vault has a flow meter that is used for monitoring the flow total. There is a flow total indicator for each vault in the SCP. The signal is also transmitted to the PLC in the main treatment building for monitoring.

1.4.3 Vault Pumps P-001 / P-002 / P-003

The pumps in the vault are submersible sump pumps with integrated float switches that control starting and stopping of the pump

1.4.3.1 Off / Auto Switch

There is an Off / Auto switch for each of the 3 vault pumps. The Off / Auto switch is used to control the motor starter in the SCP. In the Off position the starter is de-energized and no power is passed to the pump. In the Auto position the starter is energized and power is passed to the pump. The float switch in

the pump will start and stop the pump. However if the LSHH in the outdoor sump is active, then the starters will be de-energized and the vault pumps will not be able to run.

1.4.3.2 Pump Run Status

There is a current sensing device on each of the 3 vault sumps which are wired to the PLC for status monitoring. Pump runtime is shown on the Vault Details screen, and a trend showing on/off cycles is also on the Vault Details screen.

1.4.4 T-001 Sump

The water from the vaults is pumped into consolidation sump T-001 outside of the Metaullics building. This sump has a level controller, 2 pumps, and a high high level switch to prevent over-filling from the vault sumps

1.4.5 Level Transmitter / Controller

There is a level transmitter in the sump, and a level controller in the SCP. This controller operates the pumps in a Lead / Lag manner. The level is also transmitted to the PLC in the main building for monitoring. When the level rises above SP1 the Lead Pump will start. When the level falls by DB1 amount the Lead Pump will stop. When the level rises above SP2 the Lag pump will start. When the level falls by DB2 amount the Lag Pump will stop.

1.4.6 LSHH Interlock

There is a High High Level Switch in the sump that will prevent the vault sumps from operating when it is active. It is set above the level of the lag start setpoint so it will only become active in the event there is a lead and lag pump failure.

1.4.7 Pumps P-004 / P-005

Pumps P-004 and P-005 are submersible sump pumps installed in the outdoor sump. They are controlled by the level controller in the SCP. They operate in a Lead / Lag manner based on the setpoints entered into the Level Controller.

1.4.7.1. Hand / Off / Auto Switches

Pumps P-004 and P-005 have standard HOA switches to control the motor starters. In the Hand position they run all the time, in the Off position they are off, and in the Auto position the level controller runs the pumps.

1.5. Treatment building section

The water from the outdoor sump is sent to T-002 for equalization before it is sent through the bag filters and onto the existing treatment process.

1.5.1. Incoming Flow Meter

A new flow meter was installed and wired to the PLC to record the incoming flow from the outdoor sump. This value is totaled daily and displayed on the Flow Totals screen.

1.5.2. T-002 EQ tank

T-002 is a newly installed tank where water from the outdoor sump is sent. It holds the water before being filtered and sent to the existing treatment process

1.5.2.1 LSHH Interlock

There is a high high level switch in T-002 that is wired to the PLC. The PLC then activates an output to inhibit pumps P-004 and P-005 if the level is T-002 is too high.

1.5.3. Level Transmitter

There is a level transmitter installed in this tank that is wired to the PLC. The PLC uses this value to control the pumps in a Lead Lag manner.

1.5.4. Pumps P-006 P-007

Pumps P-006 and P-007 pump water from T-002 thru the bag filters then into T-801

1.5.4.1. Hand / Off / Auto switches

Each pump has a Hand/Off/Auto switch on the MCC bucket that can be used to control the pump. If the switch is in the Hand position the pump will turn on. If the switch is in Off position the pump will turn off. If the switch is in the Auto position the PLC will control the pump.

1.5.4.2. Lead Lag configuration

A pump can be assigned Lead or Lag status using pushbuttons on the P-006/7 Details screen. The other pump is automatically assigned the opposite status. If 1 pump is in Automatic and 1 pump is in Manual, the pump in Automatic is always the lead pump. This ensures there will always be a lead pump available to run. Automatic Lead Lag Selection can be turned on from the P-006/7 Details screen. If Automatic Lead Lag Selection is on, and both pumps are in Automatic mode, the PLC will assign Lead status in an alternating fashion. With Automatic Lead Lag selection active, when the water level in T-002 falls below the Pump Stop Setpoint, the Lead pump will turn off, then become the Lag pump, and the Lag pump will become the Lead pump. To turn off Automatic Lead Lag selection the operator needs to press one of the Lead or Lag buttons on the P-006/7 Details screen. This will assign the selected status to the selected pump and turn off Automatic Lead Lag selection. E.G., if Automatic Lead Lag selection is active and P-006 is currently the lead pump, the operator can press the P-006 Lead pushbutton to keep Lead status assigned to P-006 and turn off Automatic Lead Lag selection.

1.5.5. Bag Filters

There are two (2) parallel banks of bag filters, each consisting of a pair of bag filters in a parallel configuration (BF-001/BF-002 and BF-003/BF-004)

1.5.5.1. PI 212 / PI 218 / DPI 212

There are 2 pressure transmitters installed, one before and one after the bag filters. The PLC calculates the Differential pressure. This is displayed on the Bag Filters Details screen.

1.5.5.2. MOV 1001 MOV 1002

There are 2 motorized valves that control which pair of bag filters is active. These valves are dual ended solenoid valves. There is an output from the PLC that controls a relay for each valve. The valve and relay are wired so one solenoid coil is always receiving power.

1.5.5.3. Active and Standby groups

The operator can select which group of bag filters is active, and which group is in standby. If DPI-212 High alarm is triggered, the PLC will swap the currently active and standby filters, and display an alarm on the screen that the operator must reset after changing the full bag filer. Once the alarm is reset, the PLC will re-enable the auto changeover so it can happen next time the High alarm is triggers.

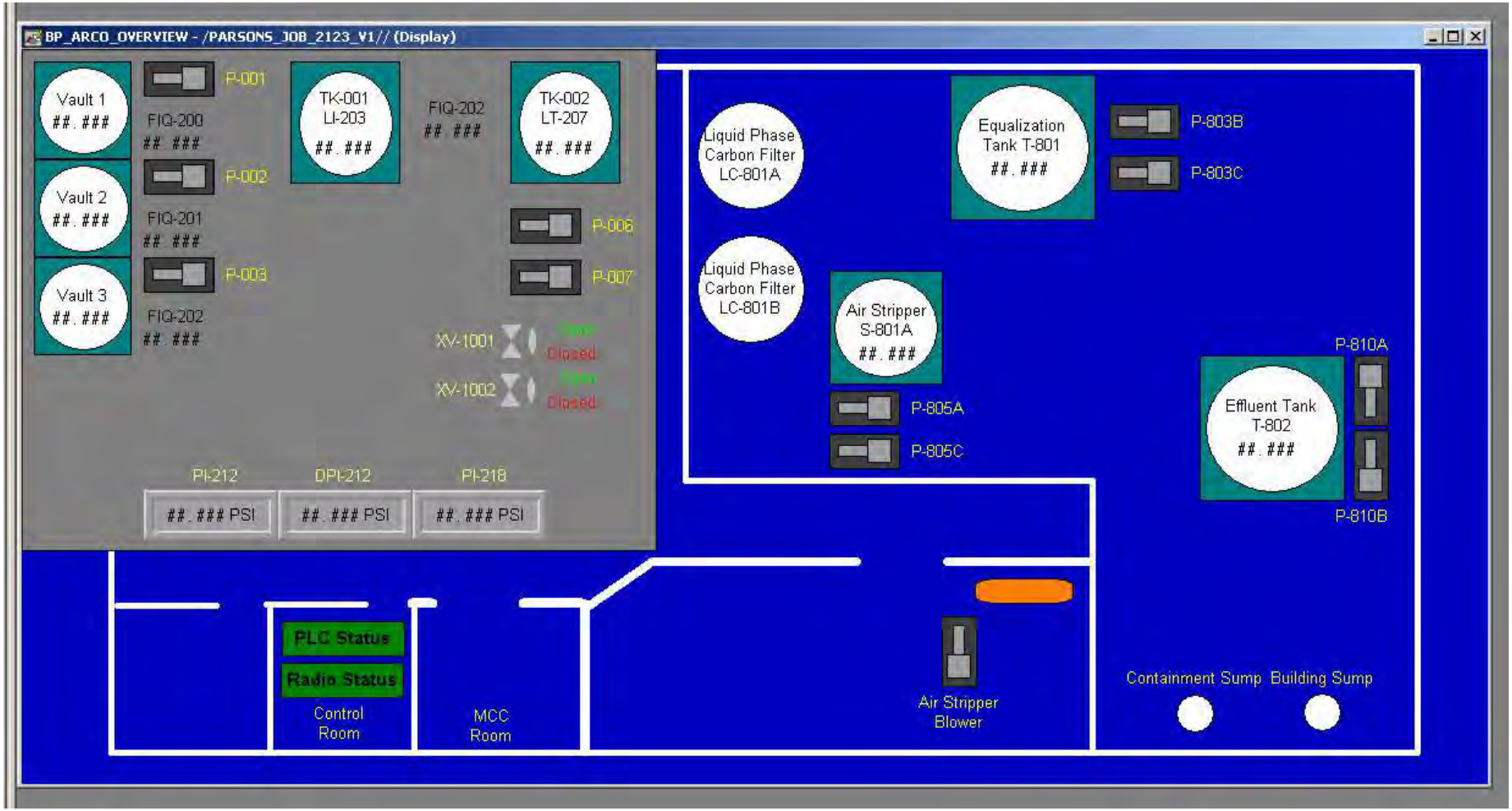
There are also manual open and close override buttons for each valve on the Bag filters Details screen. This will allow the operator to have full control over each valve for maintenance needs.

1.6 Auto Dialer Alarms

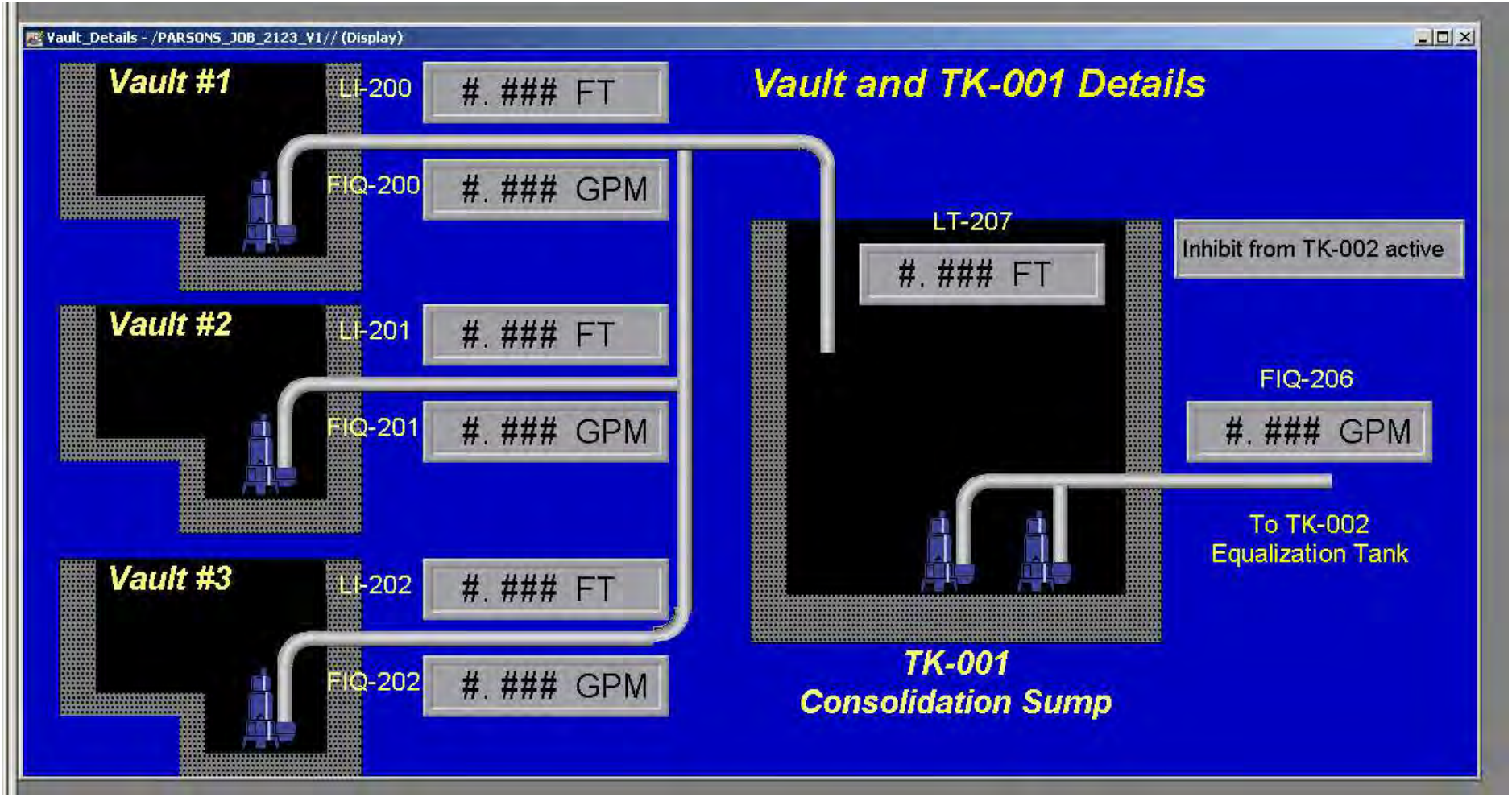
The following alarms have been added to the Auto Dialer Output Ch 6 Treatment Plant Aux System Failure

LAHH-200, LAHH-201, LAHH-202 (Level in Metaullic Vaults)
LAHH-203 (T-001 Level)
LIC-207 High-High Level Alarm (T-002 Level)
DPI-212 High-High Level Alarm (Bag Filter DP)
Heat Trace Fault Alarm

SECTION 2
SCADA SCREENS



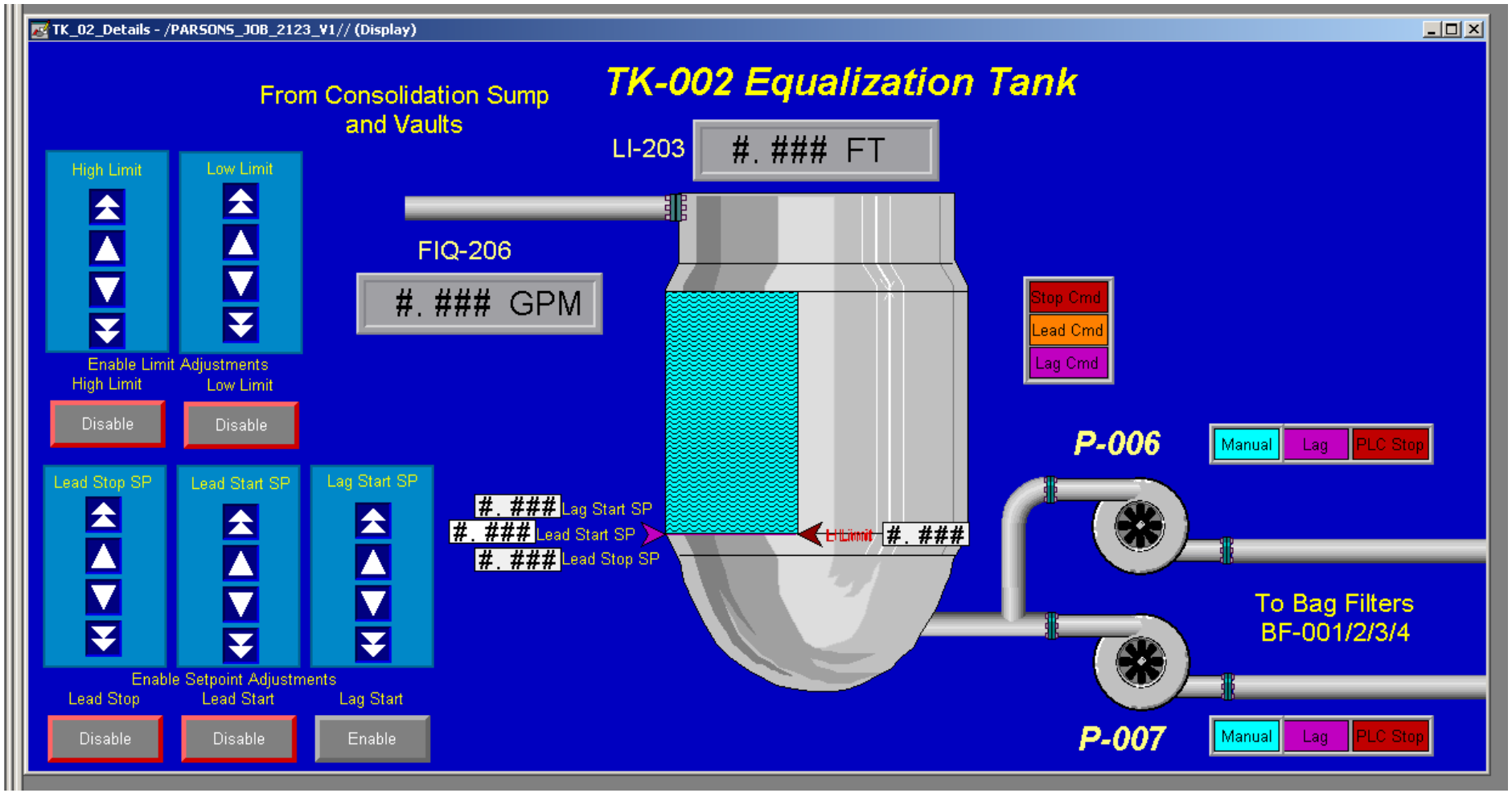
Existing overview with insert in top left corner for new equipment



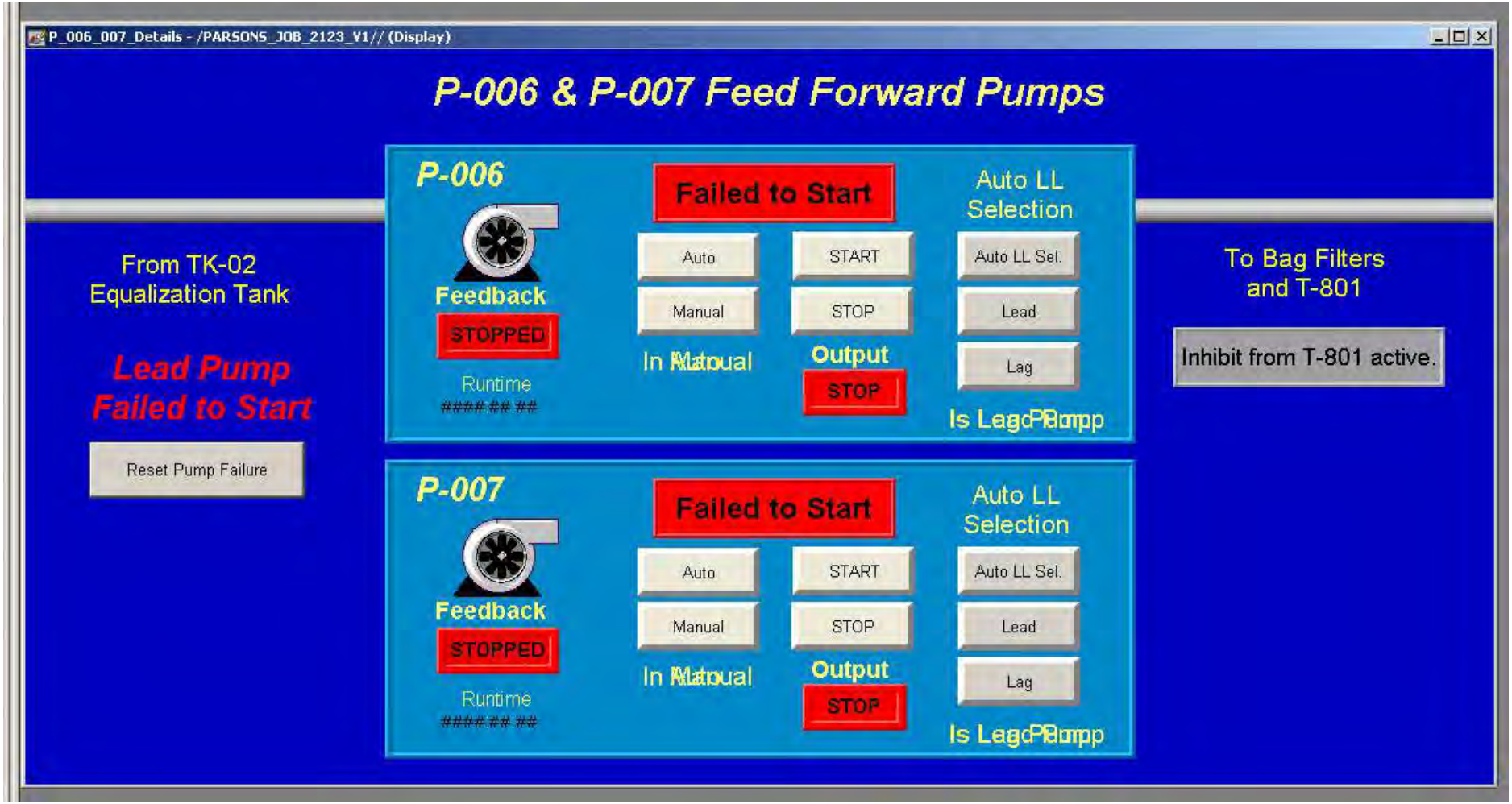
New screen showing the 3 vaults, and TK-01

Pumps 1-3 will animate based on pump status.

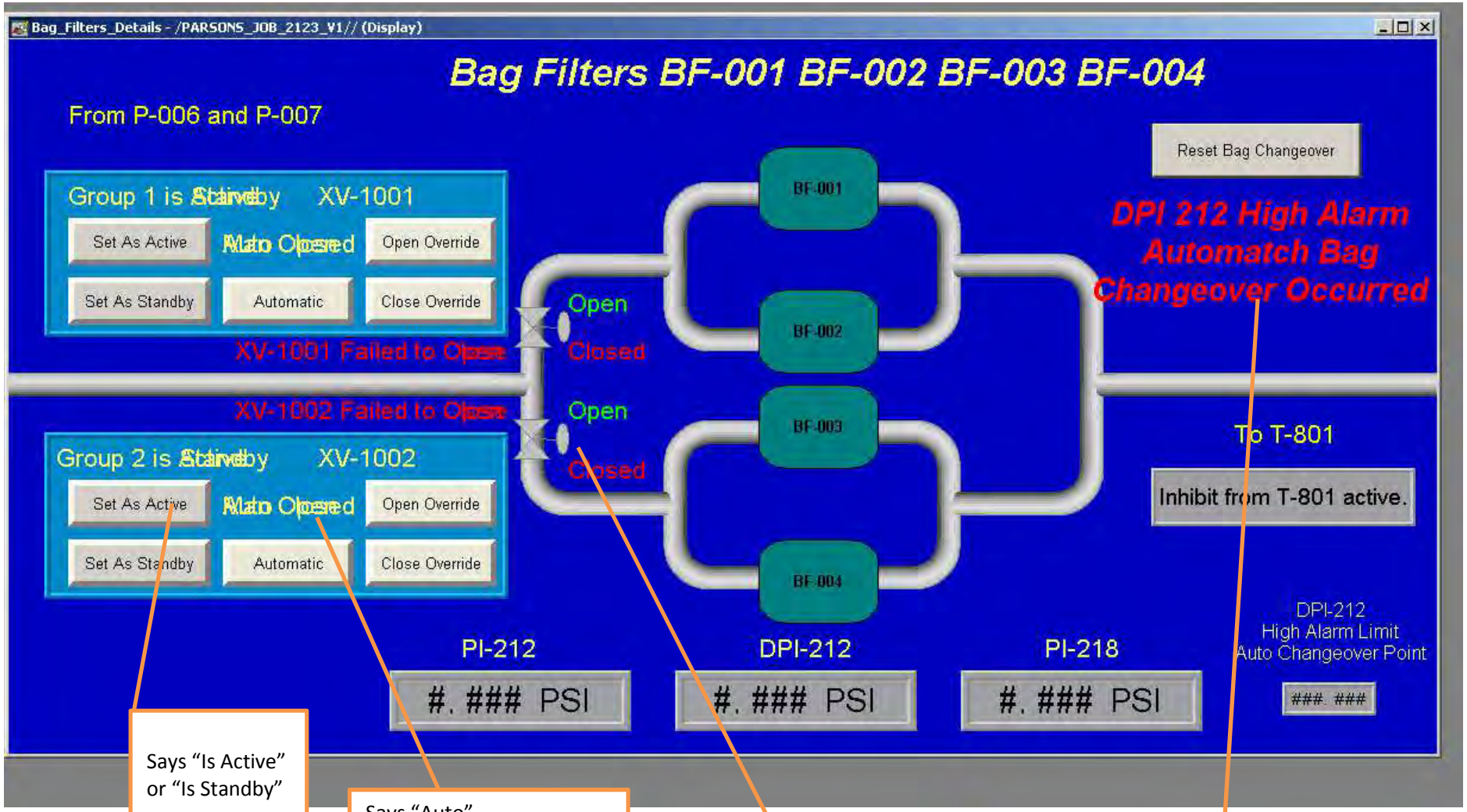
Black area in the vaults and tk01 sump have a water graphic that will animate based on water level reading similar to existing graphics



New screen for TK-02. Based on existing graphics for other tanks.



New screen for pumps 006 and 007. Based on existing pump screens



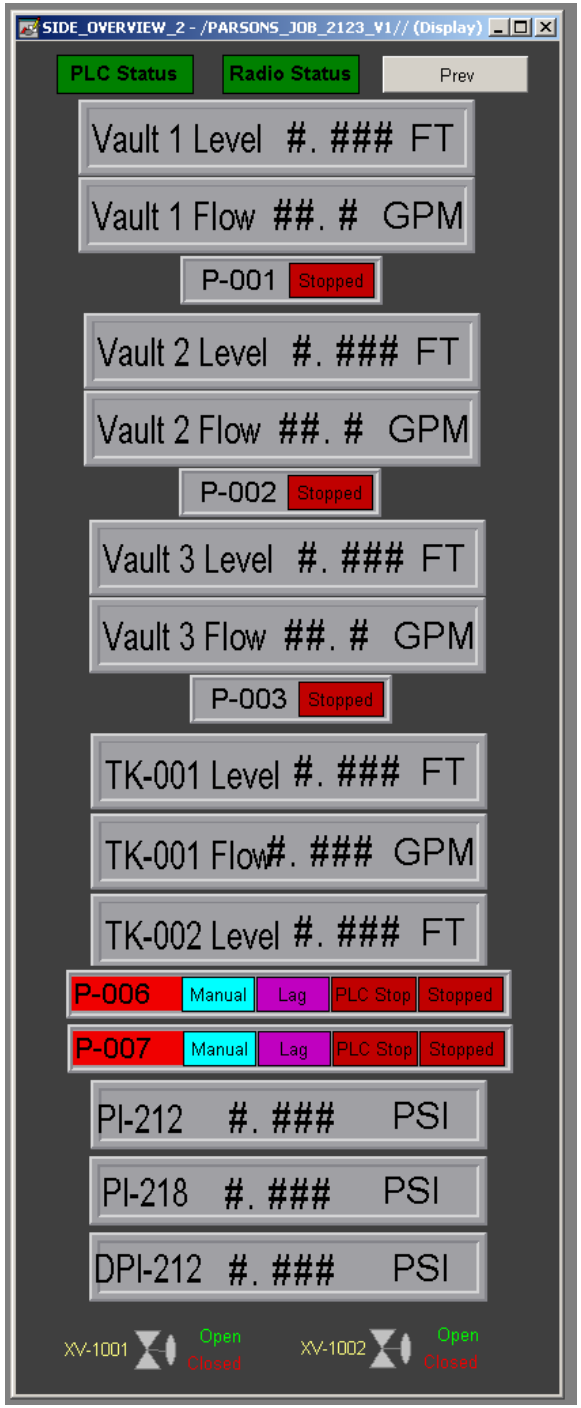
Says “Is Active”
or “Is Standby”

Says “Auto”
Or “Man Open”
Or “Man Closed”
Based on pushbuttons

Open and Closed text appears based on limit switches
Valve color changes based on output status (on=green, off=red)

Warning appears when a high psi alarm occurs.
Operator must press Reset button after changing filters to allow another auto switch to happen

New graphic for bag filters.



New side screen showing all the new equipment.

SECTION 3
PLC PROGRAM

Name	Value	Data Type	Scope
Active_Msg	11	DINT	MainProgram
*Active_Msg - MainProgram/Read_Write_Radio - *29(MOV), *30(MOV), *31(MOV), *32(MOV), *33(MOV), *34(MOV), *35(MOV), *36(MOV), *37(MOV), *38(MOV), *39(MOV), *4(MOV), *40(MOV), *41(MOV), *42(MOV), *43(MOV), *44(MOV), *45(MOV), *46(MOV), *47(MOV), *48(MOV), *49(MOV), *50(MOV), *51(MOV), 10(EQU), 11(EQU), 12(EQU), 13(EQU), 14(EQU), 15(EQU), 16(EQU), 17(EQU), 18(EQU), 19(EQU), 20(EQU), 21(EQU), 22(EQU), 23(EQU), 24(EQU), 25(EQU), 26(EQU), 27(EQU), 29(EQU), 30(EQU), 31(EQU), 32(EQU), 33(EQU), 34(EQU), 35(EQU), 36(EQU), 37(EQU), 38(EQU), 39(EQU), 40(EQU), 41(EQU), 42(EQU), 43(EQU), 44(EQU), 45(EQU), 46(EQU), 47(EQU), 48(EQU), 49(EQU), 5(EQU), 50(EQU), 51(EQU), 6(EQU), 7(EQU), 8(EQU), 9(EQU)*			
AI_Card_Data	8661	INT	MainProgram
*AI_Card_Data - MainProgram/AI_Handler - *0(SBR), 1(MOV), 2(LES), 3(GRT), 5(CPT)*			
*AI_Card_Data - MainProgram/AI_Handler_2 - *0(SBR), 1(MOV)*			
AI_Card_Fault	0	BOOL	MainProgram
*AI_Card_Fault - MainProgram/AI_Handler - *0(SBR), 0(XIC)*			
*AI_Card_Fault - MainProgram/AI_Handler_2 - *0(SBR), 0(XIC)*			
AI_DS		AI_DS	MainProgram
*AI_DS - MainProgram/AI_Handler - *0(SBR), 2(RET), 3(RET), 4(RET), 7(RET)*			
*AI_DS - MainProgram/AI_Handler_2 - *0(SBR), 6(RET)*			
AI_DS.B - MainProgram/AI_Handler_2 - 2(CPT)			
AI_DS.Eng_Max - MainProgram/AI_Handler - 3(MOV), 5(CPT)			
AI_DS.Eng_Max - MainProgram/AI_Handler_2 - 4(GRT), 4(MOV)			
AI_DS.Eng_Min - MainProgram/AI_Handler - 2(MOV), 5(CPT)			
AI_DS.Eng_Min - MainProgram/AI_Handler_2 - 3(LES), 3(MOV)			
*AI_DS.Fault - MainProgram/AI_Handler - *0(OTE)*			
*AI_DS.Fault - MainProgram/AI_Handler_2 - *0(OTE)*			
AI_DS.Limit_Scaling - MainProgram/AI_Handler - 2(XIC), 3(XIC)			
AI_DS.Limit_Scaling - MainProgram/AI_Handler_2 - 3(XIC), 4(XIC)			
AI_DS.M - MainProgram/AI_Handler_2 - 2(CPT)			
*AI_DS.PV - MainProgram/AI_Handler - *2(MOV), *3(MOV), *4(MOV), *5(CPT), *6(CPT), *6(TRN), 6(CPT), 6(TRN)*			
*AI_DS.PV - MainProgram/AI_Handler_2 - *2(CPT), *3(MOV), *4(MOV), *5(CPT), *5(TRN), 3(LES), 4(GRT), 5(CPT), 5(TRN)*			
*AI_DS.Raw_Input - MainProgram/AI_Handler - *1(MOV)*			
*AI_DS.Raw_Input - MainProgram/AI_Handler_2 - *1(MOV), 2(CPT)*			
AI_DS.Raw_Max - MainProgram/AI_Handler - 3(GRT), 4(EQU), 5(CPT)			
AI_DS.Raw_Min - MainProgram/AI_Handler - 2(LES), 4(EQU), 5(CPT)			
Autodialer_CR_2	0	BOOL	Sanborn_GRP
Air Stripper Failure			
AliasFor:	Local:4:O.Data.2		
Base Tag:	Local:4:O.Data.2		
*Autodialer_CR_2 - MainProgram/Alarms_AutoDialer - *6(OTE)*			
Autodialer_CR_4	0	BOOL	Sanborn_GRP
Air Stripper Operator Alarm			
AliasFor:	Local:4:O.Data.3		
Base Tag:	Local:4:O.Data.3		
*Autodialer_CR_4 - MainProgram/Alarms_AutoDialer - *7(OTE)*			
Autodialer_CR_5	0	BOOL	Sanborn_GRP
Ground Water Operator Alarm			
AliasFor:	Local:4:O.Data.4		
Base Tag:	Local:4:O.Data.4		
*Autodialer_CR_5 - MainProgram/Alarms_AutoDialer - *10(OTU), *9(OTL)*			
Autodialer_CR_5_Latch	0	BOOL	Sanborn_GRP
*Autodialer_CR_5_Latch - MainProgram/Alarms_AutoDialer - *8(OTE), 10(XIO), 9(XIC)*			
Autodialer_CR_5_Unlatch_Timer		TIMER	Sanborn_GRP
*Autodialer_CR_5_Unlatch_Timer - MainProgram/Alarms_AutoDialer - *10(TON)*			
Autodialer_CR_5_Unlatch_Timer.DN - MainProgram/Alarms_AutoDialer - 10(XIC)			
Autodialer_CR_6	0	BOOL	Sanborn_GRP
Treatment Plant Aux. System Failure			
AliasFor:	Local:4:O.Data.5		
Base Tag:	Local:4:O.Data.5		
*Autodialer_CR_6 - MainProgram/Alarms_AutoDialer - *13(OTE)*			
Autodialer_CR_8	1	BOOL	Sanborn_GRP
Power Failure			
AliasFor:	Local:4:O.Data.6		

Autodialer_CR_8 (Continued)			
Base Tag:	Local:4:O.Data.6		
*Autodialer_CR_8 - MainProgram/Alarms_AutoDialer - *16(OTE)*			
B_801_Failure_Timer		TIMER	MainProgram
*B_801_Failure_Timer - MainProgram/Air_Stripper - *1(TON)*			
B_801_Failure_Timer.DN - MainProgram/Air_Stripper - 1(XIC)			
B_801_Reset_Failure	0	BOOL	Sanborn_GRP
*B_801_Reset_Failure - MainProgram/Air_Stripper - *3(OTU), 2(XIC), 3(XIC)*			
B_801A_Failure	0	BOOL	Sanborn_GRP
*B_801A_Failure - MainProgram/Air_Stripper - *1(OTL), *2(OTU)*			
B_801A_Failure - MainProgram/Alarms_AutoDialer - 6(XIC)			
B_801A_PLC_Manual_Start	1	BOOL	Sanborn_GRP
B_801A_PLC_Manual_Start - MainProgram/Air_Stripper - 0(XIC)			
B_801A_Start_CR	1	BOOL	Sanborn_GRP
AliasFor:	Local:7:O.Data.0		
Base Tag:	Local:7:O.Data.0		
*B_801A_Start_CR - MainProgram/Air_Stripper - *0(OTE), 1(XIC)*			
B_801A_Status	1	BOOL	Sanborn_GRP
AliasFor:	Local:5:I.Data.0		
Base Tag:	Local:5:I.Data.0		
B_801A_Status - MainProgram/Air_Stripper - 1(XIO)			
B_801A_Status - MainProgram/Alarms_AutoDialer - 1(XIC)			
B_801A_Status - MainProgram/T801_P803 - 27(XIC), 33(XIC)			
BatteryFaultBit	0	DINT	MainProgram
*BatteryFaultBit - MainProgram/MainRoutine - *11(MVM), 11(NEQ)*			
BatteryFaultMask	1024	DINT	MainProgram
BatteryFaultMask - MainProgram/MainRoutine - 11(MVM)			
BF_Group_1_Is_Active	1	BOOL	Sanborn_GRP
*BF_Group_1_Is_Active - MainProgram/Bag_Filters - *5(OTL), *6(OTU), *7(OTU), *8(OTL), 12(XIC), 3(XIC), 4(XIO), 9(XIC)*			
BF_Group_1_Is_Standby	0	BOOL	Sanborn_GRP
*BF_Group_1_Is_Standby - MainProgram/Bag_Filters - *5(OTU), *6(OTL), *7(OTL), *8(OTU)*			
BF_Group_1_Set_As_Active	0	BOOL	Sanborn_GRP
*BF_Group_1_Set_As_Active - MainProgram/Bag_Filters - *4(OTL), *5(OTU), 4(XIO), 5(XIC)*			
BF_Group_1_Set_As_Standby	0	BOOL	Sanborn_GRP
*BF_Group_1_Set_As_Standby - MainProgram/Bag_Filters - *6(OTU), 6(XIC)*			
BF_Group_2_Is_Active	0	BOOL	Sanborn_GRP
*BF_Group_2_Is_Active - MainProgram/Bag_Filters - *5(OTU), *6(OTL), *7(OTL), *8(OTU), 10(XIC), 11(XIC), 4(XIC), 4(XIO)*			
BF_Group_2_Is_Standby	1	BOOL	Sanborn_GRP
*BF_Group_2_Is_Standby - MainProgram/Bag_Filters - *5(OTL), *6(OTU), *7(OTU), *8(OTL)*			
BF_Group_2_Set_As_Active	0	BOOL	Sanborn_GRP
*BF_Group_2_Set_As_Active - MainProgram/Bag_Filters - *3(OTL), *7(OTU), 4(XIO), 7(XIC)*			
BF_Group_2_Set_As_Standby	0	BOOL	Sanborn_GRP
*BF_Group_2_Set_As_Standby - MainProgram/Bag_Filters - *8(OTU), 8(XIC)*			
Containment_Sump_High_Delay		TIMER	Sanborn_GRP
*Containment_Sump_High_Delay - MainProgram/Alarms_AutoDialer - *14(TON)*			
Containment_Sump_High_Delay.DN - MainProgram/Alarms_AutoDialer - 14(XIC)			
Containment_Sump_High_Level	0	BOOL	Sanborn_GRP
*Containment_Sump_High_Level - MainProgram/Alarms_AutoDialer - *14(OTL), *15(OTU), 13(XIC)*			
Containment_Sump_High_Level - MainProgram/S_801A_P805 - 25(XIO), 31(XIO)			
Containment_Sump_High_Level - MainProgram/T801_P803 - 27(XIO), 33(XIO)			

Containment_Sump_High_Level (Continued)
Containment_Sump_High_Level - MainProgram/T802_P810 - 25(XIO), 31(XIO)
Containment_Sump_High_Level - MainProgram/TK002_P06_P07 - 23(XIO), 29(XIO)

DPI_212 AI_DS Sanborn_GRP
*DPI_212.Fault - MainProgram/Buffer_Inputs - *31(OTE)*
*DPI_212.PV - MainProgram/Buffer_Inputs - *30(SUB), 32(ALMA)*

DPI_212_Alarm ALARM_ANALOG Sanborn_GRP
*DPI_212_Alarm - MainProgram/Buffer_Inputs - *32(ALMA)*
DPI_212_Alarm.HHInAlarm - MainProgram/Alarms_AutoDialer - 13(XIC)
DPI_212_Alarm.HInAlarm - MainProgram/Bag_Filters - 0(XIC), 2(XIO)

DPI_212_Auto_Change_Ack 0 BOOL Sanborn_GRP
Set to 1 by HMI once operator has changed bags they press this button to ack the auto switch over
*DPI_212_Auto_Change_Ack - MainProgram/Bag_Filters - *2(OTU), 2(XIC)*

DPI_212_Change_Bag_Auto 0 BOOL Sanborn_GRP
*DPI_212_Change_Bag_Auto - MainProgram/Bag_Filters - *1(OTE), 3(XIC), 4(XIC)*

DPI_212_High_Alarm_Latch 0 BOOL Sanborn_GRP
*DPI_212_High_Alarm_Latch - MainProgram/Bag_Filters - *0(OTL), *2(OTU), 1(XIC)*

DPI_212_into_alarm_ONS 0 BOOL Sanborn_GRP
*DPI_212_into_alarm_ONS - MainProgram/Bag_Filters - *1(ONS)*

End_Of_MSG_Rung_ONS 1 BOOL MainProgram
*End_Of_MSG_Rung_ONS - MainProgram/Read_Write_Radio - *28(ONS)*

FIQ_200 AI_DS Sanborn_GRP
*FIQ_200 - MainProgram/Buffer_Inputs - *24(JSR), 24(JSR)*
FIQ_200.PV - MainProgram/Buffer_Inputs - 25(ALMA)
FIQ_200.PV - Totalizer_Prgm/Totalizers - 2-A1(IREF,FIQ_200.pv), 2-C1(TOT,FIQ_200_Manual_Total.In), 2-C2(TOT,FIQ_200_Daily_Total.In)

FIQ_200_Alarm ALARM_ANALOG Sanborn_GRP
*FIQ_200_Alarm - MainProgram/Buffer_Inputs - *25(ALMA)*

FIQ_200_Daily_Total TOTALIZER Sanborn_GRP
*FIQ_200_Daily_Total - Totalizer_Prgm/Totalizers - *2-A1(IREF,FIQ_200.pv), *2-B3(IREF,0), *2-B3(IREF,0), *2-B3(IREF,1), *2-B3(IREF,1), *2-B3(IREF,FIQ_200_Reset_Daily_Total), *2-C2(TOT,FIQ_200_Daily_Total), *2-D3(OREF,FIQ_200_Daily_Total_Reset_Done)*

FIQ_200_Daily_Total_Last_Reset DINT[7] Sanborn_GRP
*FIQ_200_Daily_Total_Last_Reset - Totalizer_Prgm/Totalizers_LL - *5(COP)*
FIQ_200_Daily_Total_Last_Reset[2] - Totalizer_Prgm/Totalizers_LL - 6(NEQ)

FIQ_200_Daily_Total_Reset_Done 0 BOOL Sanborn_GRP
*FIQ_200_Daily_Total_Reset_Done - Totalizer_Prgm/Totalizers - *2-D3(OREF,FIQ_200_Daily_Total_Reset_Done), 2-C2(TOT,FIQ_200_Daily_Total.ProgResetDone)*
FIQ_200_Daily_Total_Reset_Done - Totalizer_Prgm/Totalizers_LL - 5(XIC)

FIQ_200_Manual_Total TOTALIZER Sanborn_GRP
*FIQ_200_Manual_Total - Totalizer_Prgm/Totalizers - *2-A1(IREF,FIQ_200.pv), *2-B1(IREF,0), *2-B1(IREF,0), *2-B1(IREF,1), *2-B1(IREF,1), *2-B2(IREF,FIQ_200_Reset_Manual_Total), *2-C1(TOT,FIQ_200_Manual_Total), *2-D2(OREF,FIq_200_Manual_Total_Reset_Done)*

FIQ_200_Manual_Total_Last_Reset DINT[7] Sanborn_GRP
*FIQ_200_Manual_Total_Last_Reset - Totalizer_Prgm/Totalizers_LL - *4(COP)*

FIq_200_Manual_Total_Reset_Done 0 BOOL Sanborn_GRP
*FIq_200_Manual_Total_Reset_Done - Totalizer_Prgm/Totalizers - *2-D2(OREF,FIq_200_Manual_Total_Reset_Done), 2-C1(TOT,FIQ_200_Manual_Total.ProgResetDone)*
FIq_200_Manual_Total_Reset_Done - Totalizer_Prgm/Totalizers_LL - 4(XIC)

FIQ_200_Reset_Daily_Total 0 BOOL Sanborn_GRP
FIQ_200_Reset_Daily_Total - Totalizer_Prgm/Totalizers - 2-B3(IREF,FIQ_200_Reset_Daily_Total), 2-C2(TOT,FIQ_200_Daily_Total.ProgResetReq)
*FIQ_200_Reset_Daily_Total - Totalizer_Prgm/Totalizers_LL - *6(OTE)*

FIQ_200_Reset_Manual_Total 0 BOOL Sanborn_GRP
FIQ_200_Reset_Manual_Total - Totalizer_Prgm/Totalizers - 2-B2(IREF,FIQ_200_Reset_Manual_Total), 2-C1(TOT,FIQ_200_Manual_Total.ProgResetReq)
*FIQ_200_Reset_Manual_Total - Totalizer_Prgm/Totalizers_LL - *4(OTU)*

FIQ_200_Total_Daily_Reset_Done_ONS 0 BOOL Sanborn_GRP
*FIQ_200_Total_Daily_Reset_Done_ONS - Totalizer_Prgm/Totalizers_LL - *5(ONS)*

FIQ_201		AI_DS	Sanborn_GRP
*FIQ_201 - MainProgram/Buffer_Inputs - *26(JSR), 26(JSR)*			
FIQ_201.PV - MainProgram/Buffer_Inputs - 27(ALMA)			
FIQ_201.PV - Totalizer_Prgm/Totalizers - 3-A1(IREF,FIQ_201.PV), 3-C1(TOT,FIQ_201_Manual_Total.In), 3-C2(TOT,FIQ_201_Daily_Total.In)			
FIQ_201_Alarm		ALARM_ANALOG	Sanborn_GRP
*FIQ_201_Alarm - MainProgram/Buffer_Inputs - *27(ALMA)*			
FIQ_201_Daily_Total		TOTALIZER	Sanborn_GRP
*FIQ_201_Daily_Total - Totalizer_Prgm/Totalizers - *3-A1(IREF,FIQ_201.PV), *3-B3(IREF,0), *3-B3(IREF,0), *3-B3(IREF,1), *3-B3(IREF,1), *3-B3(IREF,FIQ_201_Reset_Daily_Total), *3-C2(TOT,FIQ_201_Daily_Total), *3-D3(OREF,FIQ_201_Daily_Total_Reset_Done)*			
FIQ_201_Daily_Total_Last_Reset		DINT[7]	Sanborn_GRP
*FIQ_201_Daily_Total_Last_Reset - Totalizer_Prgm/Totalizers_LL - *8(COP)*			
FIQ_201_Daily_Total_Last_Reset[2] - Totalizer_Prgm/Totalizers_LL - 9(NEQ)			
FIQ_201_Daily_Total_Reset_Done	0	BOOL	Sanborn_GRP
*FIQ_201_Daily_Total_Reset_Done - Totalizer_Prgm/Totalizers - *3-D3(OREF,FIQ_201_Daily_Total_Reset_Done), 3-C2(TOT,FIQ_201_Daily_Total.ProgResetDone)*			
FIQ_201_Daily_Total_Reset_Done - Totalizer_Prgm/Totalizers_LL - 8(XIC)			
FIQ_201_Manual_Total		TOTALIZER	Sanborn_GRP
*FIQ_201_Manual_Total - Totalizer_Prgm/Totalizers - *3-A1(IREF,FIQ_201.PV), *3-B1(IREF,0), *3-B1(IREF,0), *3-B1(IREF,1), *3-B1(IREF,1), *3-B2(IREF,FIQ_201_Reset_Manual_Total), *3-C1(TOT,FIQ_201_Manual_Total), *3-D2(OREF,FIQ_201_Manual_Total_Reset_Done)*			
FIQ_201_Manual_Total_Last_Reset		DINT[7]	Sanborn_GRP
*FIQ_201_Manual_Total_Last_Reset - Totalizer_Prgm/Totalizers_LL - *7(COP)*			
FIQ_201_Manual_Total_Reset_Done	0	BOOL	Sanborn_GRP
*FIQ_201_Manual_Total_Reset_Done - Totalizer_Prgm/Totalizers - *3-D2(OREF,FIQ_201_Manual_Total_Reset_Done), 3-C1(TOT,FIQ_201_Manual_Total.ProgResetDone)*			
FIQ_201_Manual_Total_Reset_Done - Totalizer_Prgm/Totalizers_LL - 7(XIC)			
FIQ_201_Reset_Daily_Total	0	BOOL	Sanborn_GRP
FIQ_201_Reset_Daily_Total - Totalizer_Prgm/Totalizers - 3-B3(IREF,FIQ_201_Reset_Daily_Total), 3-C2(TOT,FIQ_201_Daily_Total.ProgResetReq)			
*FIQ_201_Reset_Daily_Total - Totalizer_Prgm/Totalizers_LL - *9(OTE)*			
FIQ_201_Reset_Manual_Total	0	BOOL	Sanborn_GRP
FIQ_201_Reset_Manual_Total - Totalizer_Prgm/Totalizers - 3-B2(IREF,FIQ_201_Reset_Manual_Total), 3-C1(TOT,FIQ_201_Manual_Total.ProgResetReq)			
*FIQ_201_Reset_Manual_Total - Totalizer_Prgm/Totalizers_LL - *7(OTU)*			
FIQ_201_Total_Daily_Reset_Done_ONS	0	BOOL	Sanborn_GRP
*FIQ_201_Total_Daily_Reset_Done_ONS - Totalizer_Prgm/Totalizers_LL - *8(ONS)*			
FIQ_202		AI_DS	Sanborn_GRP
*FIQ_202 - MainProgram/Buffer_Inputs - *28(JSR), 28(JSR)*			
FIQ_202.PV - MainProgram/Buffer_Inputs - 29(ALMA)			
FIQ_202.PV - Totalizer_Prgm/Totalizers - 4-A1(IREF,FIQ_202.PV), 4-C1(TOT,FIQ_202_Manual_Total.In), 4-C2(TOT,FIQ_202_Daily_Total.In)			
FIQ_202_Alarm		ALARM_ANALOG	Sanborn_GRP
*FIQ_202_Alarm - MainProgram/Buffer_Inputs - *29(ALMA)*			
FIQ_202_Daily_Total		TOTALIZER	Sanborn_GRP
*FIQ_202_Daily_Total - Totalizer_Prgm/Totalizers - *4-A1(IREF,FIQ_202.PV), *4-B3(IREF,0), *4-B3(IREF,0), *4-B3(IREF,1), *4-B3(IREF,1), *4-B3(IREF,FIQ_202_Reset_Daily_Total), *4-C2(TOT,FIQ_202_Daily_Total), *4-D3(OREF,FIQ_202_Daily_Total_Reset_Done)*			
FIQ_202_Daily_Total_Last_Reset		DINT[7]	Sanborn_GRP
*FIQ_202_Daily_Total_Last_Reset - Totalizer_Prgm/Totalizers_LL - *11(COP)*			
FIQ_202_Daily_Total_Last_Reset[2] - Totalizer_Prgm/Totalizers_LL - 12(NEQ)			
FIQ_202_Daily_Total_Reset_Done	0	BOOL	Sanborn_GRP
*FIQ_202_Daily_Total_Reset_Done - Totalizer_Prgm/Totalizers - *4-D3(OREF,FIQ_202_Daily_Total_Reset_Done), 4-C2(TOT,FIQ_202_Daily_Total.ProgResetDone)*			
FIQ_202_Daily_Total_Reset_Done - Totalizer_Prgm/Totalizers_LL - 11(XIC)			
FIQ_202_Manual_Total		TOTALIZER	Sanborn_GRP
*FIQ_202_Manual_Total - Totalizer_Prgm/Totalizers - *4-A1(IREF,FIQ_202.PV), *4-B1(IREF,1), *4-B1(IREF,1), *4-B2(IREF,0), *4-B2(IREF,0), *4-B2(IREF,FIQ_202_Reset_Manual_Total), *4-C1(TOT,FIQ_202_Manual_Total), *4-D2(OREF,FIQ_202_Manual_Total_Reset_Done)*			
FIQ_202_Manual_Total_Last_Reset		DINT[7]	Sanborn_GRP
*FIQ_202_Manual_Total_Last_Reset - Totalizer_Prgm/Totalizers_LL - *10(COP)*			
FIQ_202_Manual_Total_Reset_Done	0	BOOL	Sanborn_GRP

FIQ_202_Manual_Total_Reset_Done (Continued)
*FIQ_202_Manual_Total_Reset_Done - Totalizer_Prgm/Totalizers - *4-D2(OREF,FIQ_202_Manual_Total_Reset_Done), 4-C1(TOT,FIQ_202_Manual_Total.ProgResetDone)*
FIQ_202_Manual_Total_Reset_Done - Totalizer_Prgm/Totalizers_LL - 10(XIC)

FIQ_202_Reset_Daily_Total 0 BOOL Sanborn_GRP
FIQ_202_Reset_Daily_Total - Totalizer_Prgm/Totalizers - 4-B3(IREF,FIQ_202_Reset_Daily_Total), 4-C2(TOT,FIQ_202_Daily_Total.ProgResetReq)
*FIQ_202_Reset_Daily_Total - Totalizer_Prgm/Totalizers_LL - *12(OTE)*

FIQ_202_Reset_Manual_Total 0 BOOL Sanborn_GRP
FIQ_202_Reset_Manual_Total - Totalizer_Prgm/Totalizers - 4-B2(IREF,FIQ_202_Reset_Manual_Total), 4-C1(TOT,FIQ_202_Manual_Total.ProgResetReq)
*FIQ_202_Reset_Manual_Total - Totalizer_Prgm/Totalizers_LL - *10(OTU)*

FIQ_202_Total_Daily_Reset_Done_ONS 0 BOOL Sanborn_GRP
*FIQ_202_Total_Daily_Reset_Done_ONS - Totalizer_Prgm/Totalizers_LL - *11(ONS)*

FIQ_206_Daily_Total TOTALIZER Sanborn_GRP
*FIQ_206_Daily_Total - Totalizer_Prgm/Totalizers - *5-B1(IREF,FIT_206.PV), *5-B3(IREF,0), *5-B3(IREF,0), *5-B3(IREF,1), *5-B3(IREF,1), *5-B3(IREF,FIQ_206_Reset_Daily_Total), *5-C2(TOT,FIQ_206_Daily_Total), *5-D3(OREF,FIQ_206_Daily_Total_Reset_Done)*

FIQ_206_Daily_Total_Last_Reset DINT[7] Sanborn_GRP
*FIQ_206_Daily_Total_Last_Reset - Totalizer_Prgm/Totalizers_LL - *14(COP)*
FIQ_206_Daily_Total_Last_Reset[2] - Totalizer_Prgm/Totalizers_LL - 15(NEQ)

FIQ_206_Daily_Total_Reset_Done 0 BOOL Sanborn_GRP
*FIQ_206_Daily_Total_Reset_Done - Totalizer_Prgm/Totalizers - *5-D3(OREF,FIQ_206_Daily_Total_Reset_Done), 5-C2(TOT,FIQ_206_Daily_Total.ProgResetDone)*
FIQ_206_Daily_Total_Reset_Done - Totalizer_Prgm/Totalizers_LL - 14(XIC)

FIQ_206_Manual_Total TOTALIZER Sanborn_GRP
*FIQ_206_Manual_Total - Totalizer_Prgm/Totalizers - *5-B1(IREF,1), *5-B1(IREF,1), *5-B1(IREF,FIT_206.PV), *5-B2(IREF,0), *5-B2(IREF,0), *5-B2(IREF,FIQ_206_Reset_Manual_Total), *5-C1(TOT,FIQ_206_Manual_Total), *5-D2(OREF,FIQ_206_Manual_Total_Reset_Done)*

FIQ_206_Manual_Total_Last_Reset DINT[7] Sanborn_GRP
*FIQ_206_Manual_Total_Last_Reset - Totalizer_Prgm/Totalizers_LL - *13(COP)*

FIQ_206_Manual_Total_Reset_Done 0 BOOL Sanborn_GRP
*FIQ_206_Manual_Total_Reset_Done - Totalizer_Prgm/Totalizers - *5-D2(OREF,FIQ_206_Manual_Total_Reset_Done), 5-C1(TOT,FIQ_206_Manual_Total.ProgResetDone)*
FIQ_206_Manual_Total_Reset_Done - Totalizer_Prgm/Totalizers_LL - 13(XIC)

FIQ_206_Reset_Daily_Total 0 BOOL Sanborn_GRP
FIQ_206_Reset_Daily_Total - Totalizer_Prgm/Totalizers - 5-B3(IREF,FIQ_206_Reset_Daily_Total), 5-C2(TOT,FIQ_206_Daily_Total.ProgResetReq)
*FIQ_206_Reset_Daily_Total - Totalizer_Prgm/Totalizers_LL - *15(OTE)*

FIQ_206_Reset_Manual_Total 0 BOOL Sanborn_GRP
FIQ_206_Reset_Manual_Total - Totalizer_Prgm/Totalizers - 5-B2(IREF,FIQ_206_Reset_Manual_Total), 5-C1(TOT,FIQ_206_Manual_Total.ProgResetReq)
*FIQ_206_Reset_Manual_Total - Totalizer_Prgm/Totalizers_LL - *13(OTU)*

FIQ_206_Total_Daily_Reset_Done_ONS 0 BOOL Sanborn_GRP
*FIQ_206_Total_Daily_Reset_Done_ONS - Totalizer_Prgm/Totalizers_LL - *14(ONS)*

FIT_200_Total_Reset_Done_ONS 0 BOOL Sanborn_GRP
*FIT_200_Total_Reset_Done_ONS - Totalizer_Prgm/Totalizers_LL - *4(ONS)*

FIT_201_Total_Reset_Done_ONS 0 BOOL Sanborn_GRP
*FIT_201_Total_Reset_Done_ONS - Totalizer_Prgm/Totalizers_LL - *7(ONS)*

FIT_202_Total_Reset_Done_ONS 0 BOOL Sanborn_GRP
*FIT_202_Total_Reset_Done_ONS - Totalizer_Prgm/Totalizers_LL - *10(ONS)*

FIT_206 AI_DS Sanborn_GRP
*FIT_206 - MainProgram/Buffer_Inputs - *8(JSR), 8(JSR)*
FIT_206.PV - MainProgram/Buffer_Inputs - 9(ALMA)
FIT_206.PV - Totalizer_Prgm/Totalizers - 5-B1(IREF,FIT_206.PV), 5-C1(TOT,FIQ_206_Manual_Total.In), 5-C2(TOT,FIQ_206_Daily_Total.In)

FIT_206_Alarm ALARM_ANALOG Sanborn_GRP
*FIT_206_Alarm - MainProgram/Buffer_Inputs - *9(ALMA)*

FIT_206_Total_Reset_Done_ONS 0 BOOL Sanborn_GRP
*FIT_206_Total_Reset_Done_ONS - Totalizer_Prgm/Totalizers_LL - *13(ONS)*

FIT_803		AI_DS	Sanborn_GRP
Effluent Pump Flow			
*FIT_803 - MainProgram/Buffer_Inputs - *6(JSR), 6(JSR)*			
FIT_803.PV - MainProgram/Buffer_Inputs - 7(ALMA)			
*FIT_803.PV - MainProgram/Flow_Pulse_Meter - *10(MOV), *9(MOV)*			
FIT_803.PV - Totalizer_Prgm/Totalizers - 1-A1(IREF,FIT_803.PV), 1-B1(TOT,FIT_803_Manual_Total.In), 1-B2(TOT,FIT_803_Daily_Total.In)			
FIT_803_Alarm		ALARM_ANALOG	Sanborn_GRP
*FIT_803_Alarm - MainProgram/Buffer_Inputs - *7(ALMA)*			
FIT_803_Daily_Total		TOTALIZER	Sanborn_GRP
*FIT_803_Daily_Total - Totalizer_Prgm/Totalizers - *1-A1(IREF,FIT_803.PV), *1-B2(TOT,FIT_803_Daily_Total), *1-B3(IREF,0), *1-B3(IREF,0), *1-B3(IREF,1), *1-B3(IREF,1), *1-B3(IREF,FIT_803_Reset_Daily_Total), *1-D3(OREF,FIT_803_Daily_Total_Reset_Done)*			
FIT_803_Daily_Total_Last_Reset		DINT[7]	Sanborn_GRP
*FIT_803_Daily_Total_Last_Reset - Totalizer_Prgm/Totalizers_LL - *2(COP)*			
FIT_803_Daily_Total_Last_Reset[2] - Totalizer_Prgm/Totalizers_LL - 3(NEQ)			
FIT_803_Daily_Total_Last_Reset_2		DINT[7]	Sanborn_GRP
*FIT_803_Daily_Total_Last_Reset_2 - MainProgram/Flow_Pulse_Meter - *3(COP)*			
FIT_803_Daily_Total_Last_Reset_2[2] - MainProgram/Flow_Pulse_Meter - 3(NEQ)			
FIT_803_Daily_Total_Reset_Done	0	BOOL	Sanborn_GRP
Set to 1 when the daily total has finished resetting			
*FIT_803_Daily_Total_Reset_Done - Totalizer_Prgm/Totalizers - *1-D3(OREF,FIT_803_Daily_Total_Reset_Done), 1-B2(TOT,FIT_803_Daily_Total.ProgResetDone)*			
FIT_803_Daily_Total_Reset_Done - Totalizer_Prgm/Totalizers_LL - 2(XIC)			
FIT_803_Manual_Total		TOTALIZER	Sanborn_GRP
*FIT_803_Manual_Total - Totalizer_Prgm/Totalizers - *1-A1(IREF,FIT_803.PV), *1-B1(IREF,0), *1-B1(IREF,0), *1-B1(IREF,1), *1-B1(IREF,1), *1-B1(TOT,FIT_803_Manual_Total), *1-B2(IREF,FIT_803_Reset_Manual_Total), *1-D1(OREF,FIT_803_Manual_Total_Reset_Done)*			
FIT_803_Manual_Total_Last_Reset		DINT[7]	Sanborn_GRP
*FIT_803_Manual_Total_Last_Reset - Totalizer_Prgm/Totalizers_LL - *1(COP)*			
FIT_803_Manual_Total_Last_Reset_2		DINT[7]	Sanborn_GRP
*FIT_803_Manual_Total_Last_Reset_2 - MainProgram/Flow_Pulse_Meter - *2(COP)*			
FIT_803_Manual_Total_Reset_Done	0	BOOL	Sanborn_GRP
Set to 1 when the manual total has finished resetting			
*FIT_803_Manual_Total_Reset_Done - Totalizer_Prgm/Totalizers - *1-D1(OREF,FIT_803_Manual_Total_Reset_Done), 1-B1(TOT,FIT_803_Manual_Total.ProgResetDone)*			
FIT_803_Manual_Total_Reset_Done - Totalizer_Prgm/Totalizers_LL - 1(XIC)			
FIT_803_Pulse	0	BOOL	Sanborn_GRP
this bit is on for 1 scan only when the pulse meter input turns on. Use this bit for counting / totalizing			
*FIT_803_Pulse - MainProgram/Flow_Pulse_Meter - *0(OTE), 1(XIC), 5(XIC), 8(XIC)*			
FIT_803_Pulse_Daily_Old_Total	114000.0	REAL	Sanborn_GRP
*FIT_803_Pulse_Daily_Old_Total - MainProgram/Flow_Pulse_Meter - *3(MOV)*			
FIT_803_Pulse_Daily_Total	57800.0	REAL	Sanborn_GRP
*FIT_803_Pulse_Daily_Total - MainProgram/Flow_Pulse_Meter - *1(ADD), *3(MOV), 1(ADD), 3(MOV)*			
FIT_803_Pulse_Gallons	100	DINT	Sanborn_GRP
FIT_803_Pulse_Gallons - MainProgram/Flow_Pulse_Meter - 1(ADD), 6(CPT), 8(CPT)			
FIT_803_Pulse_Input_4	0	BOOL	Sanborn_GRP
AliasFor:	Local:2:I.Data.0		
Base Tag:	Local:2:I.Data.0		
FIT_803_Pulse_Input_4 - MainProgram/Flow_Pulse_Meter - 0(XIC)			
FIT_803_Pulse_Meter_Flow_Rate_1	99.99334	REAL	Sanborn_GRP
*FIT_803_Pulse_Meter_Flow_Rate_1 - MainProgram/Flow_Pulse_Meter - *6(CPT), 6(FFL)*			
FIT_803_Pulse_Meter_Flow_Rate_1_Average	89.99333	REAL	Sanborn_GRP
this doesn't work too well. we get 1 pulse once a minute, so we alwyas have 100 gpm, but we are really at like 90-95			
*FIT_803_Pulse_Meter_Flow_Rate_1_Average - MainProgram/Flow_Pulse_Meter - *6(AVE)*			
FIT_803_Pulse_Meter_Flow_Rate_2	92.84189	REAL	Sanborn_GRP
*FIT_803_Pulse_Meter_Flow_Rate_2 - MainProgram/Flow_Pulse_Meter - *8(CPT), 10(MOV), 8(FFL)*			

FIT_803_Pulse_Meter_Flow_Rate_2_Average	92.866394	REAL	Sanborn_GRP
*FIT_803_Pulse_Meter_Flow_Rate_2_Average - MainProgram/Flow_Pulse_Meter - *8(AVE)*			
FIT_803_Pulse_Old_Total	1200.0	REAL	Sanborn_GRP
*FIT_803_Pulse_Old_Total - MainProgram/Flow_Pulse_Meter - *2(MOV)*			
fit_803_pulse_on_total_ONS	0	BOOL	Sanborn_GRP
*fit_803_pulse_on_total_ONS - MainProgram/Flow_Pulse_Meter - *0(ONS)*			
FIT_803_Pulse_rate_counter		COUNTER	Sanborn_GRP
*FIT_803_Pulse_rate_counter - MainProgram/Flow_Pulse_Meter - *5(CTU), *6(RES)*			
FIT_803_Pulse_rate_counter.ACC - MainProgram/Flow_Pulse_Meter - 6(CPT)			
FIT_803_pulse_rate_timer		TIMER	Sanborn_GRP
*FIT_803_pulse_rate_timer - MainProgram/Flow_Pulse_Meter - *4(TON), *6(RES)*			
FIT_803_pulse_rate_timer.ACC - MainProgram/Flow_Pulse_Meter - 6(CPT)			
FIT_803_pulse_rate_timer.DN - MainProgram/Flow_Pulse_Meter - 6(XIC)			
FIT_803_Pulse_rate_timer_2		TIMER	Sanborn_GRP
*FIT_803_Pulse_rate_timer_2 - MainProgram/Flow_Pulse_Meter - *7(RTO), *8(RES)*			
FIT_803_Pulse_rate_timer_2.ACC - MainProgram/Flow_Pulse_Meter - 8(CPT)			
FIT_803_Pulse_Total	682300.0	REAL	Sanborn_GRP
*FIT_803_Pulse_Total - MainProgram/Flow_Pulse_Meter - *1(ADD), *2(MOV), 1(ADD), 2(MOV)*			
FIT_803_Reset_Daily_Total	0	BOOL	Sanborn_GRP
Set to 1 by the plc at 00:01 to reset the daily total			
FIT_803_Reset_Daily_Total - Totalizer_Prgm/Totalizers - 1-B2(TOT,FIT_803_Daily_Total.ProgResetReq), 1-B3(IREF,FIT_803_Reset_Daily_Total)			
*FIT_803_Reset_Daily_Total - Totalizer_Prgm/Totalizers_LL - *3(OTE)*			
FIT_803_Reset_Manual_Total	0	BOOL	Sanborn_GRP
Set to 1 by the SCADA to reset the manual total			
FIT_803_Reset_Manual_Total - Totalizer_Prgm/Totalizers - 1-B1(TOT,FIT_803_Manual_Total.ProgResetReq), 1-B2(IREF,FIT_803_Reset_Manual_Total)			
*FIT_803_Reset_Manual_Total - Totalizer_Prgm/Totalizers_LL - *1(OTU)*			
FIT_803_Reset_Manual_Total_2	0	BOOL	Sanborn_GRP
*FIT_803_Reset_Manual_Total_2 - MainProgram/Flow_Pulse_Meter - *2(OTU), 2(XIC)*			
FIT_803_Total_Daily_Reset_Done_ONS	0	BOOL	Totalizer_Prgm
*FIT_803_Total_Daily_Reset_Done_ONS - Totalizer_Prgm/Totalizers_LL - *2(ONS)*			
FIT_803_Total_Reset_Done_ONS	0	BOOL	Totalizer_Prgm
*FIT_803_Total_Reset_Done_ONS - Totalizer_Prgm/Totalizers_LL - *1(ONS)*			
fit_flow_rate_1_ave_control		CONTROL	Sanborn_GRP
*fit_flow_rate_1_ave_control - MainProgram/Flow_Pulse_Meter - *6(AVE)*			
fit_flow_rate_2_ave_control		CONTROL	Sanborn_GRP
*fit_flow_rate_2_ave_control - MainProgram/Flow_Pulse_Meter - *8(AVE)*			
fit803_flow_rate_1_control		CONTROL	Sanborn_GRP
*fit803_flow_rate_1_control - MainProgram/Flow_Pulse_Meter - *6(FFL), *6(FFU)*			
fit803_flow_rate_1_control.DN - MainProgram/Flow_Pulse_Meter - 6(XIC)			
fit803_flow_rate_1_FIFO		REAL[10]	Sanborn_GRP
*fit803_flow_rate_1_FIFO - MainProgram/Flow_Pulse_Meter - *6(FFL), *6(FFU), 6(AVE)*			
fit803_flow_rate_2_control		CONTROL	Sanborn_GRP
*fit803_flow_rate_2_control - MainProgram/Flow_Pulse_Meter - *8(FFL), *8(FFU)*			
fit803_flow_rate_2_control.DN - MainProgram/Flow_Pulse_Meter - 8(XIC)			
fit803_flow_rate_2_FIFO		REAL[10]	Sanborn_GRP
*fit803_flow_rate_2_FIFO - MainProgram/Flow_Pulse_Meter - *8(FFL), *8(FFU), 8(AVE)*			
fit803_junk	92.93825	REAL	Sanborn_GRP
*fit803_junk - MainProgram/Flow_Pulse_Meter - *6(FFU), *8(FFU)*			
Heat_Trace_Fault	0	BOOL	Sanborn_GRP

Heat_Trace_Fault (Continued)			
AliasFor:	Local:2:I.Data.11		
Base Tag:	Local:2:I.Data.11		
Heat_Trace_Fault - MainProgram/Alarms_AutoDialer - 11(XIC)			
Heat_Trace_Fault_2	0	BOOL	Sanborn_GRP
AliasFor:	Local:2:I.Data.15		
Base Tag:	Local:2:I.Data.15		
Heat_Trace_Fault_2 - MainProgram/Alarms_AutoDialer - 11(XIC)			
Heat_Trace_Fault_Latch	0	BOOL	Sanborn_GRP
*Heat_Trace_Fault_Latch - MainProgram/Alarms_AutoDialer - *11(OTL), *12(OTU), 13(XIC)*			
High_Level_Alarm_Timer		TIMER	MainProgram
*High_Level_Alarm_Timer - MainProgram/Alarms_AutoDialer - *2(TON)*			
High_Level_Alarm_Timer.DN - MainProgram/Alarms_AutoDialer - 2(XIC)			
High_Level_Alarms	0	BOOL	MainProgram
*High_Level_Alarms - MainProgram/Alarms_AutoDialer - *2(OTL), *3(OTU), 3(XIC), 6(XIC)*			
High_Pressure_Alarm_Timer		TIMER	MainProgram
*High_Pressure_Alarm_Timer - MainProgram/Alarms_AutoDialer - *0(TON)*			
High_Pressure_Alarm_Timer.DN - MainProgram/Alarms_AutoDialer - 0(XIC)			
High_Pressure_Alarms	0	BOOL	Sanborn_GRP
*High_Pressure_Alarms - MainProgram/Alarms_AutoDialer - *0(OTE), 7(XIC)*			
LI_200		AI_DS	Sanborn_GRP
*LI_200 - MainProgram/Buffer_Inputs - *16(JSR), 16(JSR)*			
LI_200.PV - MainProgram/Buffer_Inputs - 17(ALMA)			
LI_200_Alarm		ALARM_ANALOG	Sanborn_GRP
*LI_200_Alarm - MainProgram/Buffer_Inputs - *17(ALMA)*			
LI_200_Alarm.HHInAlarm - MainProgram/Alarms_AutoDialer - 13(XIC)			
LI_201		AI_DS	Sanborn_GRP
*LI_201 - MainProgram/Buffer_Inputs - *18(JSR), 18(JSR)*			
LI_201.PV - MainProgram/Buffer_Inputs - 19(ALMA)			
LI_201_Alarm		ALARM_ANALOG	Sanborn_GRP
*LI_201_Alarm - MainProgram/Buffer_Inputs - *19(ALMA)*			
LI_201_Alarm.HHInAlarm - MainProgram/Alarms_AutoDialer - 13(XIC)			
LI_202		AI_DS	Sanborn_GRP
*LI_202 - MainProgram/Buffer_Inputs - *20(JSR), 20(JSR)*			
LI_202.PV - MainProgram/Buffer_Inputs - 21(ALMA)			
LI_202_Alarm		ALARM_ANALOG	Sanborn_GRP
*LI_202_Alarm - MainProgram/Buffer_Inputs - *21(ALMA)*			
LI_202_Alarm.HHInAlarm - MainProgram/Alarms_AutoDialer - 13(XIC)			
LI_203		AI_DS	Sanborn_GRP
*LI_203 - MainProgram/Buffer_Inputs - *22(JSR), 22(JSR)*			
LI_203.PV - MainProgram/Buffer_Inputs - 23(ALMA)			
LI_203_Alarm		ALARM_ANALOG	Sanborn_GRP
*LI_203_Alarm - MainProgram/Buffer_Inputs - *23(ALMA)*			
LI_203_Alarm.HHInAlarm - MainProgram/Alarms_AutoDialer - 13(XIC)			
LIT_801A		AI_DS	Sanborn_GRP
S-801A Tank Level			
*LIT_801A - MainProgram/Buffer_Inputs - *2(JSR), 2(JSR)*			
LIT_801A.PV - MainProgram/Buffer_Inputs - 3(ALMA)			
LIT_801A.PV - MainProgram/S_801A_P805 - 0(GEQ), 1(LES), 2(GEQ), 3(LES)			
LIT_801A_Alarm		ALARM_ANALOG	Sanborn_GRP
*LIT_801A_Alarm - MainProgram/Buffer_Inputs - *3(ALMA)*			
LIT_801A_Alarm.HInAlarm - MainProgram/Alarms_AutoDialer - 2(XIC)			

LIT_801A_Alarm (Continued)
LIT_801A_Alarm.HInAlarm - MainProgram/S_801A_P805 - 4(XIC), 5(XIO)
LIT_801A_Alarm.LInAlarm - MainProgram/Alarms_AutoDialer - 4(XIC)
LIT_801A_Alarm.LInAlarm - MainProgram/S_801A_P805 - 25(XIO), 31(XIO)

LIT_803 AI_DS Sanborn_GRP
T-801 Tank Level
*LIT_803 - MainProgram/Buffer_Inputs - *4(JSR), 4(JSR)*
LIT_803.PV - MainProgram/Buffer_Inputs - 5(ALMA)
LIT_803.PV - MainProgram/T801_P803 - 0(GEQ), 1(LES), 2(GEQ), 3(LES)

LIT_803_Alarm ALARM_ANALOG Sanborn_GRP
*LIT_803_Alarm - MainProgram/Buffer_Inputs - *5(ALMA)*
LIT_803_Alarm.HInAlarm - MainProgram/Alarms_AutoDialer - 2(XIC)
LIT_803_Alarm.HInAlarm - MainProgram/T801_P803 - 4(XIC), 5(XIO)
LIT_803_Alarm.LInAlarm - MainProgram/Alarms_AutoDialer - 4(XIC)
LIT_803_Alarm.LInAlarm - MainProgram/T801_P803 - 27(XIO), 33(XIO)

LIT_805 AI_DS Sanborn_GRP
T-802 Tank Level
*LIT_805 - MainProgram/Buffer_Inputs - *0(JSR), 0(JSR)*
LIT_805.PV - MainProgram/Buffer_Inputs - 1(ALMA)
LIT_805.PV - MainProgram/T802_P810 - 0(GEQ), 1(LES), 2(GEQ), 3(LES)

LIT_805_Alarm ALARM_ANALOG Sanborn_GRP
*LIT_805_Alarm - MainProgram/Buffer_Inputs - *1(ALMA)*
LIT_805_Alarm.HInAlarm - MainProgram/Alarms_AutoDialer - 2(XIC)
LIT_805_Alarm.HInAlarm - MainProgram/T802_P810 - 4(XIC), 5(XIO)
LIT_805_Alarm.LInAlarm - MainProgram/Alarms_AutoDialer - 4(XIC)
LIT_805_Alarm.LInAlarm - MainProgram/T802_P810 - 25(XIO), 31(XIO)

Local:1:I AB:1769_IF8:I:0 Sanborn_GRP
Local:1:I.Ch0Data - MainProgram/Buffer_Inputs - 0(JSR)
Local:1:I.Ch0Status - MainProgram/Buffer_Inputs - 0(JSR)
Local:1:I.Ch1Data - MainProgram/Buffer_Inputs - 2(JSR)
Local:1:I.Ch1Status - MainProgram/Buffer_Inputs - 2(JSR)
Local:1:I.Ch2Data - MainProgram/Buffer_Inputs - 4(JSR)
Local:1:I.Ch2Status - MainProgram/Buffer_Inputs - 4(JSR)
Local:1:I.Ch3Data - MainProgram/Buffer_Inputs - 6(JSR)
Local:1:I.Ch3Status - MainProgram/Buffer_Inputs - 6(JSR)
Local:1:I.Ch4Data - MainProgram/Buffer_Inputs - 8(JSR)
Local:1:I.Ch4Status - MainProgram/Buffer_Inputs - 8(JSR)
Local:1:I.Ch5Data - MainProgram/Buffer_Inputs - 10(JSR)
Local:1:I.Ch5Status - MainProgram/Buffer_Inputs - 10(JSR)
Local:1:I.Ch6Data - MainProgram/Buffer_Inputs - 12(JSR)
Local:1:I.Ch6Status - MainProgram/Buffer_Inputs - 12(JSR)
Local:1:I.Ch7Data - MainProgram/Buffer_Inputs - 14(JSR)
Local:1:I.Ch7Status - MainProgram/Buffer_Inputs - 14(JSR)

Local:2:I AB:1769_DI16:I:0 Sanborn_GRP

Local:3:I AB:1769_IF8:I:0 Sanborn_GRP
Local:3:I.Ch0Data - MainProgram/Buffer_Inputs - 16(JSR)
Local:3:I.Ch0Status - MainProgram/Buffer_Inputs - 16(JSR)
Local:3:I.Ch1Data - MainProgram/Buffer_Inputs - 18(JSR)
Local:3:I.Ch1Status - MainProgram/Buffer_Inputs - 18(JSR)
Local:3:I.Ch2Data - MainProgram/Buffer_Inputs - 20(JSR)
Local:3:I.Ch2Status - MainProgram/Buffer_Inputs - 20(JSR)
Local:3:I.Ch3Data - MainProgram/Buffer_Inputs - 22(JSR)
Local:3:I.Ch3Status - MainProgram/Buffer_Inputs - 22(JSR)
Local:3:I.Ch4Data - MainProgram/Buffer_Inputs - 24(JSR)
Local:3:I.Ch4Status - MainProgram/Buffer_Inputs - 24(JSR)
Local:3:I.Ch5Data - MainProgram/Buffer_Inputs - 26(JSR)
Local:3:I.Ch5Status - MainProgram/Buffer_Inputs - 26(JSR)
Local:3:I.Ch6Data - MainProgram/Buffer_Inputs - 28(JSR)
Local:3:I.Ch6Status - MainProgram/Buffer_Inputs - 28(JSR)

Local:4:O AB:1769_DO16:O:0 Sanborn_GRP

Local:4:O (Continued)
CR 2 in Sump Control Panel Inhibit Pumps 4 and 5
*Local:4:O.Data.7 - MainProgram/MainRoutine - *24(OTE)*

Local:5:I — AB:1769_DI16:I:0 — Sanborn_GRP

Local:7:O — AB:1769_DO8:O:0 — Sanborn_GRP

Local:8:O — AB:1769_DO8:O:0 — Sanborn_GRP

Low_Air_Pressure_B801A — 0 — BOOL — MainProgram
*Low_Air_Pressure_B801A - MainProgram/Alarms_AutoDialer - *1(OTE), 6(XIC)*

Low_Air_Pressure_B801A_Timer — TIMER — MainProgram
*Low_Air_Pressure_B801A_Timer - MainProgram/Alarms_AutoDialer - *1(TON)*
Low_Air_Pressure_B801A_Timer.DN - MainProgram/Alarms_AutoDialer - 1(XIC)

Low_Level_Alarm_Timer — TIMER — MainProgram
*Low_Level_Alarm_Timer - MainProgram/Alarms_AutoDialer - *4(TON)*
Low_Level_Alarm_Timer.DN - MainProgram/Alarms_AutoDialer - 4(XIC)

Low_Level_Alarms — 0 — BOOL — MainProgram
*Low_Level_Alarms - MainProgram/Alarms_AutoDialer - *4(OTL), *5(OTU), 5(XIC)*

LSH_804A — 0 — BOOL — Sanborn_GRP
Containment Sump High Level
AliasFor: Local:2:I.Data.2
Base Tag: Local:2:I.Data.2
LSH_804A - MainProgram/Alarms_AutoDialer - 14(XIC), 15(XIO)

LSH_804B — 0 — BOOL — Sanborn_GRP
Building Sump High Level
AliasFor: Local:2:I.Data.3
Base Tag: Local:2:I.Data.3
LSH_804B - MainProgram/Alarms_AutoDialer - 13(XIC)

LSHH_219 — 0 — BOOL — Sanborn_GRP
T801 T-801 High High Level Switch
AliasFor: Local:2:I.Data.14
Base Tag: Local:2:I.Data.14
LSHH_219 - MainProgram/T801_P803 - 6(XIC), 7(XIO)

LSHH_219_Delay — TIMER — Sanborn_GRP
*LSHH_219_Delay - MainProgram/T801_P803 - *6(TON)*
LSHH_219_Delay.DN - MainProgram/Alarms_AutoDialer - 13(XIC)
LSHH_219_Delay.DN - MainProgram/T801_P803 - 6(XIC)

LSHH_222 — 0 — BOOL — Sanborn_GRP
AliasFor: Local:2:I.Data.7
Base Tag: Local:2:I.Data.7
LSHH_222 - MainProgram/MainRoutine - 22(XIC), 23(XIO)

LT_207 — AI_DS — Sanborn_GRP
*LT_207 - MainProgram/Buffer_Inputs - *10(JSR), 10(JSR)*
LT_207.PV - MainProgram/Buffer_Inputs - 11(ALMA)
LT_207.PV - MainProgram/TK002_P06_P07 - 0(GEQ), 1(LES), 2(GEQ), 3(LES)

LT_207_Alarm — ALARM_ANALOG — Sanborn_GRP
*LT_207_Alarm - MainProgram/Buffer_Inputs - *11(ALMA)*
LT_207_Alarm.HHInAlarm - MainProgram/Alarms_AutoDialer - 13(XIC)

MajorFaultWord — 0 — DINT — Sanborn_GRP
*MajorFaultWord - MainProgram/MainRoutine - *12(GSV)*

Master_Alarm_Reset — 0 — BOOL — Sanborn_GRP
Master_Alarm_Reset - MainProgram/Air_Stripper - 2(XIC)
Master_Alarm_Reset - MainProgram/Alarms_AutoDialer - 0(XIO), 1(XIO), 12(XIC), 15(XIC), 3(XIC), 5(XIC)
Master_Alarm_Reset - MainProgram/Bag_Filters - 19(XIC)

Master_Alarm_Reset (Continued)
Master_Alarm_Reset - MainProgram/Extraction_Wells - 12(XIC), 18(XIC), 24(XIC), 30(XIC), 36(XIC), 6(XIC)
*Master_Alarm_Reset - MainProgram/MainRoutine - *15(OTU), 15(XIC)*
Master_Alarm_Reset - MainProgram/S_801A_P805 - 14(XIC), 16(XIC), 18(XIC)
Master_Alarm_Reset - MainProgram/T801_P803 - 16(XIC), 18(XIC), 20(XIC)
Master_Alarm_Reset - MainProgram/T802_P810 - 14(XIC), 16(XIC), 18(XIC)
Master_Alarm_Reset - MainProgram/TK002_P06_P07 - 12(XIC), 14(XIC), 16(XIC)

Master_Radio Radio_DS Sanborn_GRP
*Master_Radio.N7[0] - MainProgram/Read_Write_Radio - *5(MSG), 68(MOV)*
Master_Radio.N7[1] - MainProgram/Read_Write_Radio - 68(MOV)
Master_Radio.N7[2] - MainProgram/Read_Write_Radio - 68(MOV)
*Master_Radio.Signal_Strength - MainProgram/Read_Write_Radio - *68(MOV)*
*Master_Radio.Temperature - MainProgram/Read_Write_Radio - *68(MOV)*
*Master_Radio.Voltage - MainProgram/Read_Write_Radio - *68(MOV)*

Master_Radio_Counter_Reset_ONS 1 BOOL MainProgram
*Master_Radio_Counter_Reset_ONS - MainProgram/Read_Write_Radio - *55(ONS)*

Master_Radio_Error_Counter COUNTER Sanborn_GRP
*Master_Radio_Error_Counter - MainProgram/Read_Write_Radio - *54(CTU), *55(RES)*

Master_Radio_Msg_Error 0 BOOL Sanborn_GRP
*Master_Radio_Msg_Error - MainProgram/Read_Write_Radio - *53(OTE), 54(XIC)*

MinorFaultWord 0 DINT Sanborn_GRP
*MinorFaultWord - MainProgram/MainRoutine - *11(GSV), 11(MVM)*

ModuleFaultWord DINT[10] Sanborn_GRP
*ModuleFaultWord[1] - MainProgram/MainRoutine - *13(GSV)*
*ModuleFaultWord[2] - MainProgram/MainRoutine - *13(GSV)*
*ModuleFaultWord[3] - MainProgram/MainRoutine - *13(GSV)*
*ModuleFaultWord[4] - MainProgram/MainRoutine - *13(GSV)*
*ModuleFaultWord[5] - MainProgram/MainRoutine - *14(GSV)*
*ModuleFaultWord[6] - MainProgram/MainRoutine - *14(GSV)*
*ModuleFaultWord[7] - MainProgram/MainRoutine - *14(GSV)*
*ModuleFaultWord[8] - MainProgram/MainRoutine - *14(GSV)*

MSG_01 MESSAGE Sanborn_GRP
Read Master Radio Status
*MSG_01 - MainProgram/Read_Write_Radio - *5(MSG)*
MSG_01.DN - MainProgram/Read_Write_Radio - 29(XIC), 5(XIC), 55(XIC)
MSG_01.ER - MainProgram/Read_Write_Radio - 29(XIC), 5(XIC), 53(XIC)
*MSG_01.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_01.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_02 MESSAGE Sanborn_GRP
Read Slave #11 Radio Status
*MSG_02 - MainProgram/Read_Write_Radio - *6(MSG)*
MSG_02.DN - MainProgram/Read_Write_Radio - 30(XIC), 6(XIC)
MSG_02.ER - MainProgram/Read_Write_Radio - 30(XIC), 56(XIC), 6(XIC)
*MSG_02.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_02.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_03 MESSAGE Sanborn_GRP
Read Slave #11 AI 1
*MSG_03 - MainProgram/Read_Write_Radio - *7(MSG)*
MSG_03.DN - MainProgram/Read_Write_Radio - 31(XIC), 7(XIC)
MSG_03.ER - MainProgram/Read_Write_Radio - 31(XIC), 56(XIC), 7(XIC)
*MSG_03.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_03.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_04 MESSAGE Sanborn_GRP
Read Slave #11 AI 2
*MSG_04 - MainProgram/Read_Write_Radio - *8(MSG)*
MSG_04.DN - MainProgram/Read_Write_Radio - 32(XIC), 8(XIC)
MSG_04.ER - MainProgram/Read_Write_Radio - 32(XIC), 56(XIC), 8(XIC)
*MSG_04.TO - MainProgram/Read_Write_Radio - *3(OTE)*

MSG_04 (Continued)
*MSG_04.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_05 MESSAGE Sanborn_GRP
Read Slave #11 DI 1
*MSG_05 - MainProgram/Read_Write_Radio - *9(MSG)*
MSG_05.DN - MainProgram/Read_Write_Radio - 33(XIC), 9(XIC)
MSG_05.ER - MainProgram/Read_Write_Radio - 33(XIC), 56(XIC), 9(XIC)
*MSG_05.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_05.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_06 MESSAGE Sanborn_GRP
Read Slave #11 DI 2
*MSG_06 - MainProgram/Read_Write_Radio - *10(MSG)*
MSG_06.DN - MainProgram/Read_Write_Radio - 10(XIC), 34(XIC)
MSG_06.ER - MainProgram/Read_Write_Radio - 10(XIC), 34(XIC), 56(XIC)
*MSG_06.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_06.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_07 MESSAGE Sanborn_GRP
Write Slave #11 DO 1
*MSG_07 - MainProgram/Read_Write_Radio - *11(MSG)*
MSG_07.DN - MainProgram/Read_Write_Radio - 11(XIC), 35(XIC)
MSG_07.ER - MainProgram/Read_Write_Radio - 11(XIC), 35(XIC), 56(XIC)
*MSG_07.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_07.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_08 MESSAGE Sanborn_GRP
Write Slave #11 DO 2
*MSG_08 - MainProgram/Read_Write_Radio - *12(MSG)*
MSG_08.DN - MainProgram/Read_Write_Radio - 12(XIC), 36(XIC), 58(XIC)
MSG_08.ER - MainProgram/Read_Write_Radio - 12(XIC), 36(XIC), 56(XIC)
*MSG_08.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_08.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_09 MESSAGE Sanborn_GRP
Read Slave #12 Radio Status
*MSG_09 - MainProgram/Read_Write_Radio - *13(MSG)*
MSG_09.DN - MainProgram/Read_Write_Radio - 13(XIC), 37(XIC)
MSG_09.ER - MainProgram/Read_Write_Radio - 13(XIC), 37(XIC), 59(XIC)
*MSG_09.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_09.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_10 MESSAGE Sanborn_GRP
Read Slave #12 AI
*MSG_10 - MainProgram/Read_Write_Radio - *14(MSG)*
MSG_10.DN - MainProgram/Read_Write_Radio - 14(XIC), 38(XIC)
MSG_10.ER - MainProgram/Read_Write_Radio - 14(XIC), 38(XIC), 59(XIC)
*MSG_10.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_10.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_11 MESSAGE Sanborn_GRP
Read Slave #12 DI
*MSG_11 - MainProgram/Read_Write_Radio - *15(MSG)*
MSG_11.DN - MainProgram/Read_Write_Radio - 15(XIC), 39(XIC)
MSG_11.ER - MainProgram/Read_Write_Radio - 15(XIC), 39(XIC), 59(XIC)
*MSG_11.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_11.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_12 MESSAGE Sanborn_GRP
Write Slave #12 DO 1
*MSG_12 - MainProgram/Read_Write_Radio - *16(MSG)*
MSG_12.DN - MainProgram/Read_Write_Radio - 16(XIC), 40(XIC), 61(XIC)
MSG_12.ER - MainProgram/Read_Write_Radio - 16(XIC), 40(XIC), 59(XIC)
*MSG_12.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_12.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_13 MESSAGE Sanborn_GRP

MSG_13 (Continued)
Read Slave #13 Radio Status
*MSG_13 - MainProgram/Read_Write_Radio - *17(MSG)*
MSG_13.DN - MainProgram/Read_Write_Radio - 17(XIC), 41(XIC)
MSG_13.ER - MainProgram/Read_Write_Radio - 17(XIC), 41(XIC), 62(XIC)
*MSG_13.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_13.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_14 MESSAGE Sanborn_GRP
Read Slave #13 AI
*MSG_14 - MainProgram/Read_Write_Radio - *18(MSG)*
MSG_14.DN - MainProgram/Read_Write_Radio - 18(XIC), 42(XIC)
MSG_14.ER - MainProgram/Read_Write_Radio - 18(XIC), 42(XIC), 62(XIC)
*MSG_14.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_14.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_15 MESSAGE Sanborn_GRP
Read Slave #13 DI
*MSG_15 - MainProgram/Read_Write_Radio - *19(MSG)*
MSG_15.DN - MainProgram/Read_Write_Radio - 19(XIC), 43(XIC)
MSG_15.ER - MainProgram/Read_Write_Radio - 19(XIC), 43(XIC), 62(XIC)
*MSG_15.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_15.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_16 MESSAGE Sanborn_GRP
Write Slave #13 DO 1
*MSG_16 - MainProgram/Read_Write_Radio - *20(MSG)*
MSG_16.DN - MainProgram/Read_Write_Radio - 20(XIC), 44(XIC), 64(XIC)
MSG_16.ER - MainProgram/Read_Write_Radio - 20(XIC), 44(XIC), 62(XIC)
*MSG_16.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_16.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_17 MESSAGE Sanborn_GRP
Read Slave #14 Radio Status
*MSG_17 - MainProgram/Read_Write_Radio - *21(MSG)*
MSG_17.DN - MainProgram/Read_Write_Radio - 21(XIC), 45(XIC)
MSG_17.ER - MainProgram/Read_Write_Radio - 21(XIC), 45(XIC), 65(XIC)
*MSG_17.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_17.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_18 MESSAGE Sanborn_GRP
Read Slave #14 AI 1
*MSG_18 - MainProgram/Read_Write_Radio - *22(MSG)*
MSG_18.DN - MainProgram/Read_Write_Radio - 22(XIC), 46(XIC)
MSG_18.ER - MainProgram/Read_Write_Radio - 22(XIC), 46(XIC), 65(XIC)
*MSG_18.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_18.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_19 MESSAGE Sanborn_GRP
Read Slave #14 AI 2
*MSG_19 - MainProgram/Read_Write_Radio - *23(MSG)*
MSG_19.DN - MainProgram/Read_Write_Radio - 23(XIC), 47(XIC)
MSG_19.ER - MainProgram/Read_Write_Radio - 23(XIC), 47(XIC), 65(XIC)
*MSG_19.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_19.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_20 MESSAGE Sanborn_GRP
Read Slave #14 DI 1
*MSG_20 - MainProgram/Read_Write_Radio - *24(MSG)*
MSG_20.DN - MainProgram/Read_Write_Radio - 24(XIC), 48(XIC)
MSG_20.ER - MainProgram/Read_Write_Radio - 24(XIC), 48(XIC), 65(XIC)
*MSG_20.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_20.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_21 MESSAGE Sanborn_GRP
Read Slave #14 DI 2
*MSG_21 - MainProgram/Read_Write_Radio - *25(MSG)*
MSG_21.DN - MainProgram/Read_Write_Radio - 25(XIC), 49(XIC)

MSG_21 (Continued)
MSG_21.ER - MainProgram/Read_Write_Radio - 25(XIC), 49(XIC), 65(XIC)
*MSG_21.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_21.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_22 MESSAGE Sanborn_GRP
Write Slave #14 DO 1
*MSG_22 - MainProgram/Read_Write_Radio - *26(MSG)*
MSG_22.DN - MainProgram/Read_Write_Radio - 26(XIC), 50(XIC)
MSG_22.ER - MainProgram/Read_Write_Radio - 26(XIC), 50(XIC), 65(XIC)
*MSG_22.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_22.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

MSG_23 MESSAGE Sanborn_GRP
Write Slave #14 DO 2
*MSG_23 - MainProgram/Read_Write_Radio - *27(MSG)*
MSG_23.DN - MainProgram/Read_Write_Radio - 27(XIC), 28(XIC), 51(XIC), 67(XIC)
MSG_23.ER - MainProgram/Read_Write_Radio - 27(XIC), 28(XIC), 51(XIC), 65(XIC)
*MSG_23.TO - MainProgram/Read_Write_Radio - *3(OTE)*
*MSG_23.UnconnectedTimeout - MainProgram/Read_Write_Radio - *52(MOV)*

Msg_Done_Timers TIMER[40] MainProgram
*Msg_Done_Timers[10] - MainProgram/Read_Write_Radio - *14(TON)*
Msg_Done_Timers[10].DN - MainProgram/Read_Write_Radio - 38(XIC)
*Msg_Done_Timers[11] - MainProgram/Read_Write_Radio - *15(TON)*
Msg_Done_Timers[11].DN - MainProgram/Read_Write_Radio - 39(XIC)
*Msg_Done_Timers[12] - MainProgram/Read_Write_Radio - *16(TON)*
Msg_Done_Timers[12].DN - MainProgram/Read_Write_Radio - 40(XIC)
*Msg_Done_Timers[13] - MainProgram/Read_Write_Radio - *17(TON)*
Msg_Done_Timers[13].DN - MainProgram/Read_Write_Radio - 41(XIC)
*Msg_Done_Timers[14] - MainProgram/Read_Write_Radio - *18(TON)*
Msg_Done_Timers[14].DN - MainProgram/Read_Write_Radio - 42(XIC)
*Msg_Done_Timers[15] - MainProgram/Read_Write_Radio - *19(TON)*
Msg_Done_Timers[15].DN - MainProgram/Read_Write_Radio - 43(XIC)
*Msg_Done_Timers[16] - MainProgram/Read_Write_Radio - *20(TON)*
Msg_Done_Timers[16].DN - MainProgram/Read_Write_Radio - 44(XIC)
*Msg_Done_Timers[17] - MainProgram/Read_Write_Radio - *21(TON)*
Msg_Done_Timers[17].DN - MainProgram/Read_Write_Radio - 45(XIC)
*Msg_Done_Timers[18] - MainProgram/Read_Write_Radio - *22(TON)*
Msg_Done_Timers[18].DN - MainProgram/Read_Write_Radio - 46(XIC)
*Msg_Done_Timers[19] - MainProgram/Read_Write_Radio - *23(TON)*
Msg_Done_Timers[19].DN - MainProgram/Read_Write_Radio - 47(XIC)
*Msg_Done_Timers[1] - MainProgram/Read_Write_Radio - *5(TON)*
Msg_Done_Timers[1].DN - MainProgram/Read_Write_Radio - 29(XIC)
*Msg_Done_Timers[20] - MainProgram/Read_Write_Radio - *24(TON)*
Msg_Done_Timers[20].DN - MainProgram/Read_Write_Radio - 48(XIC)
*Msg_Done_Timers[21] - MainProgram/Read_Write_Radio - *25(TON)*
Msg_Done_Timers[21].DN - MainProgram/Read_Write_Radio - 49(XIC)
*Msg_Done_Timers[22] - MainProgram/Read_Write_Radio - *26(TON)*
Msg_Done_Timers[22].DN - MainProgram/Read_Write_Radio - 50(XIC)
*Msg_Done_Timers[23] - MainProgram/Read_Write_Radio - *27(TON)*
Msg_Done_Timers[23].DN - MainProgram/Read_Write_Radio - 51(XIC)
*Msg_Done_Timers[2] - MainProgram/Read_Write_Radio - *6(TON)*
Msg_Done_Timers[2].DN - MainProgram/Read_Write_Radio - 30(XIC)
*Msg_Done_Timers[3] - MainProgram/Read_Write_Radio - *7(TON)*
Msg_Done_Timers[3].DN - MainProgram/Read_Write_Radio - 31(XIC)
*Msg_Done_Timers[4] - MainProgram/Read_Write_Radio - *8(TON)*
Msg_Done_Timers[4].DN - MainProgram/Read_Write_Radio - 32(XIC)
*Msg_Done_Timers[5] - MainProgram/Read_Write_Radio - *9(TON)*
Msg_Done_Timers[5].DN - MainProgram/Read_Write_Radio - 33(XIC)
*Msg_Done_Timers[6] - MainProgram/Read_Write_Radio - *10(TON)*
Msg_Done_Timers[6].DN - MainProgram/Read_Write_Radio - 34(XIC)
*Msg_Done_Timers[7] - MainProgram/Read_Write_Radio - *11(TON)*
Msg_Done_Timers[7].DN - MainProgram/Read_Write_Radio - 35(XIC)
*Msg_Done_Timers[8] - MainProgram/Read_Write_Radio - *12(TON)*
Msg_Done_Timers[8].DN - MainProgram/Read_Write_Radio - 36(XIC)
*Msg_Done_Timers[9] - MainProgram/Read_Write_Radio - *13(TON)*
Msg_Done_Timers[9].DN - MainProgram/Read_Write_Radio - 37(XIC)

MSG_Err_ONS		BOOL[64]	MainProgram
*MSG_Err_ONS[10] - MainProgram/Read_Write_Radio - *59(ONS)*			
*MSG_Err_ONS[11] - MainProgram/Read_Write_Radio - *59(ONS)*			
*MSG_Err_ONS[12] - MainProgram/Read_Write_Radio - *59(ONS)*			
*MSG_Err_ONS[13] - MainProgram/Read_Write_Radio - *62(ONS)*			
*MSG_Err_ONS[14] - MainProgram/Read_Write_Radio - *62(ONS)*			
*MSG_Err_ONS[15] - MainProgram/Read_Write_Radio - *62(ONS)*			
*MSG_Err_ONS[16] - MainProgram/Read_Write_Radio - *62(ONS)*			
*MSG_Err_ONS[17] - MainProgram/Read_Write_Radio - *65(ONS)*			
*MSG_Err_ONS[18] - MainProgram/Read_Write_Radio - *65(ONS)*			
*MSG_Err_ONS[19] - MainProgram/Read_Write_Radio - *65(ONS)*			
*MSG_Err_ONS[1] - MainProgram/Read_Write_Radio - *53(ONS)*			
*MSG_Err_ONS[20] - MainProgram/Read_Write_Radio - *65(ONS)*			
*MSG_Err_ONS[21] - MainProgram/Read_Write_Radio - *65(ONS)*			
*MSG_Err_ONS[22] - MainProgram/Read_Write_Radio - *65(ONS)*			
*MSG_Err_ONS[23] - MainProgram/Read_Write_Radio - *65(ONS)*			
*MSG_Err_ONS[2] - MainProgram/Read_Write_Radio - *56(ONS)*			
*MSG_Err_ONS[3] - MainProgram/Read_Write_Radio - *56(ONS)*			
*MSG_Err_ONS[4] - MainProgram/Read_Write_Radio - *56(ONS)*			
*MSG_Err_ONS[5] - MainProgram/Read_Write_Radio - *56(ONS)*			
*MSG_Err_ONS[6] - MainProgram/Read_Write_Radio - *56(ONS)*			
*MSG_Err_ONS[7] - MainProgram/Read_Write_Radio - *56(ONS)*			
*MSG_Err_ONS[8] - MainProgram/Read_Write_Radio - *56(ONS)*			
*MSG_Err_ONS[9] - MainProgram/Read_Write_Radio - *59(ONS)*			
Msg_Off_Timers		TIMER[32]	MainProgram
Msg_Off_Timers[23].DN - MainProgram/Read_Write_Radio - 28(XIO)			
MSG_Timeout_Master_Value	15000000	DINT	MainProgram
MSG_Timeout_Master_Value - MainProgram/Read_Write_Radio - 52(MOV)			
NoFaults	0	DINT	MainProgram
NoFaults - MainProgram/MainRoutine - 11(NEQ)			
ONE	1	DINT	Sanborn_GRP
ONE - MainProgram/MainRoutine - 20(SSV)			
P_001_Cycle_Count		COUNTER	Sanborn_GRP
*P_001_Cycle_Count - Runtime_Counters_Prgm/Update_Runtime_Counters - *17(CTU)*			
P_001_Pump_Status	1	BOOL	Sanborn_GRP
AliasFor:	Local:2:I.Data.8		
Base Tag:	Local:2:I.Data.8		
P_001_Pump_Status - Runtime_Counters_Prgm/Update_Runtime_Counters - 12(XIC), 17(XIC)			
P_001_Runtime		Runtime_Couter	Sanborn_GRP
*P_001_Runtime - Runtime_Counters_Prgm/Update_Runtime_Counters - *12(JSR), 12(JSR)*			
P_002_Cycle_Count		COUNTER	Sanborn_GRP
*P_002_Cycle_Count - Runtime_Counters_Prgm/Update_Runtime_Counters - *18(CTU)*			
P_002_Pump_Status	0	BOOL	Sanborn_GRP
AliasFor:	Local:2:I.Data.9		
Base Tag:	Local:2:I.Data.9		
P_002_Pump_Status - Runtime_Counters_Prgm/Update_Runtime_Counters - 13(XIC), 18(XIC)			
P_002_Runtime		Runtime_Couter	Sanborn_GRP
*P_002_Runtime - Runtime_Counters_Prgm/Update_Runtime_Counters - *13(JSR), 13(JSR)*			
P_003_Cycle_Count		COUNTER	Sanborn_GRP
*P_003_Cycle_Count - Runtime_Counters_Prgm/Update_Runtime_Counters - *19(CTU)*			
P_003_Pump_Status	1	BOOL	Sanborn_GRP
AliasFor:	Local:2:I.Data.10		
Base Tag:	Local:2:I.Data.10		
P_003_Pump_Status - Runtime_Counters_Prgm/Update_Runtime_Counters - 14(XIC), 19(XIC)			
P_003_Runtime		Runtime_Couter	Sanborn_GRP

P_003_Runtime (Continued)
*P_003_Runtime - Runtime_Counters_Prgm/Update_Runtime_Counters - *14(JSR), 14(JSR)*

P_006_Auto_Run_Cmd	0	BOOL	Sanborn_GRP
*P_006_Auto_Run_Cmd - MainProgram/TK002_P06_P07 - *19(OTE), 18(XIC), 18(XIO), 23(XIC)*			
P_006_Cycle_Count		COUNTER	Sanborn_GRP
*P_006_Cycle_Count - Runtime_Counters_Prgm/Update_Runtime_Counters - *20(CTU)*			
P_006_Failure	0	BOOL	Sanborn_GRP
*P_006_Failure - MainProgram/TK002_P06_P07 - *11(OTL), *12(OTU), 15(XIC), 19(XIO), 20(XIC), 21(XIO), 22(XIC), 25(XIC)*			
P_006_Failure_Timer		TIMER	Sanborn_GRP
*P_006_Failure_Timer - MainProgram/TK002_P06_P07 - *11(TON)*			
P_006_Failure_Timer.DN - MainProgram/TK002_P06_P07 - 11(XIC)			
P_006_Is_Lag_Pump	0	BOOL	Sanborn_GRP
*P_006_Is_Lag_Pump - MainProgram/TK002_P06_P07 - *33(OTE)*			
P_006_Is_Lead_Pump	1	BOOL	Sanborn_GRP
*P_006_Is_Lead_Pump - MainProgram/TK002_P06_P07 - *10(OTU), *7(OTL), *8(OTU), *9(OTL), 15(XIC), 17(XIC), 17(XIO), 19(XIC), 25(XIC), 32(XIC), 6(XIC), 6(XIO)*			
P_006_Lead_ONS	0	BOOL	Sanborn_GRP
*P_006_Lead_ONS - MainProgram/TK002_P06_P07 - *9(ONS)*			
P_006_Manual_Run_Cmd	0	BOOL	Sanborn_GRP
*P_006_Manual_Run_Cmd - MainProgram/TK002_P06_P07 - *21(OTL), *22(OTU), 23(XIC)*			
P_006_PLC_Auto_Mode	0	BOOL	Sanborn_GRP
*P_006_PLC_Auto_Mode - MainProgram/TK002_P06_P07 - *20(OTU), 10(XIO), 18(XIO), 19(XIC), 21(XIO), 22(XIC), 22(XIO), 6(XIC), 9(XIC)*			
P_006_PLC_Manual_Start	0	BOOL	Sanborn_GRP
*P_006_PLC_Manual_Start - MainProgram/TK002_P06_P07 - *18(OTL), *34(OTU), 21(XIC), 34(XIC)*			
P_006_PLC_Manual_Stop	0	BOOL	Sanborn_GRP
*P_006_PLC_Manual_Stop - MainProgram/TK002_P06_P07 - *18(OTL), *20(OTL), *35(OTU), 22(XIC), 35(XIC)*			
P_006_Pump_Status	0	BOOL	Sanborn_GRP
AliasFor:	Local:5:I.Data.8		
Base Tag:	Local:5:I.Data.8		
P_006_Pump_Status - MainProgram/TK002_P06_P07 - 11(XIO)			
P_006_Pump_Status - Runtime_Counters_Prgm/Update_Runtime_Counters - 15(XIC), 20(XIC)			
P_006_Runtime		Runtime_Couter	Sanborn_GRP
*P_006_Runtime - Runtime_Counters_Prgm/Update_Runtime_Counters - *15(JSR), 15(JSR)*			
P_006_Set_as_Lead	0	BOOL	Sanborn_GRP
*P_006_Set_as_Lead - MainProgram/TK002_P06_P07 - *30(OTU), 30(XIC), 5(XIC), 9(XIC)*			
P_006_Set_as_Lead_Auto	0	BOOL	Sanborn_GRP
*P_006_Set_as_Lead_Auto - MainProgram/TK002_P06_P07 - *17(OTL), *6(OTL), *7(OTU), 7(XIC)*			
P_006_Start_CR	0	BOOL	Sanborn_GRP
AliasFor:	Local:8:O.Data.0		
Base Tag:	Local:8:O.Data.0		
*P_006_Start_CR - MainProgram/TK002_P06_P07 - *23(OTE), 11(XIC)*			
P_006_transition_to_manual_ONS	1	BOOL	Sanborn_GRP
*P_006_transition_to_manual_ONS - MainProgram/TK002_P06_P07 - *18(ONS)*			
P_006Failure_Manual_ONS	0	BOOL	Sanborn_GRP
*P_006Failure_Manual_ONS - MainProgram/TK002_P06_P07 - *20(ONS)*			
P_007_Auto_Run_Cmd	0	BOOL	Sanborn_GRP
*P_007_Auto_Run_Cmd - MainProgram/TK002_P06_P07 - *25(OTE), 24(XIC), 24(XIO), 29(XIC)*			
P_007_Cycle_Count		COUNTER	Sanborn_GRP
*P_007_Cycle_Count - Runtime_Counters_Prgm/Update_Runtime_Counters - *21(CTU)*			

P_007_Failure	0	BOOL	Sanborn_GRP
*P_007_Failure - MainProgram/TK002_P06_P07 - *13(OTL), *14(OTU), 15(XIC), 19(XIC), 25(XIO), 26(XIC), 27(XIO), 28(XIC)*			
P_007_Failure_Timer		TIMER	Sanborn_GRP
*P_007_Failure_Timer - MainProgram/TK002_P06_P07 - *13(TON)*			
P_007_Failure_Timer.DN - MainProgram/TK002_P06_P07 - 13(XIC)			
P_007_Is_Lag_Pump	1	BOOL	Sanborn_GRP
*P_007_Is_Lag_Pump - MainProgram/TK002_P06_P07 - *32(OTE)*			
P_007_Is_Lead_Pump	0	BOOL	Sanborn_GRP
*P_007_Is_Lead_Pump - MainProgram/TK002_P06_P07 - *10(OTL), *7(OTU), *8(OTL), *9(OTU), 15(XIC), 19(XIC), 25(XIC), 33(XIC)*			
P_007_Lead_ONS	0	BOOL	Sanborn_GRP
*P_007_Lead_ONS - MainProgram/TK002_P06_P07 - *10(ONS)*			
P_007_Manual_Run_Cmd	0	BOOL	Sanborn_GRP
*P_007_Manual_Run_Cmd - MainProgram/TK002_P06_P07 - *27(OTL), *28(OTU), 29(XIC)*			
P_007_PLC_Auto_Mode	0	BOOL	Sanborn_GRP
*P_007_PLC_Auto_Mode - MainProgram/TK002_P06_P07 - *26(OTU), 10(XIC), 24(XIO), 25(XIC), 27(XIO), 28(XIC), 28(XIO), 6(XIC), 9(XIO)*			
P_007_PLC_Manual_Start	0	BOOL	Sanborn_GRP
*P_007_PLC_Manual_Start - MainProgram/TK002_P06_P07 - *24(OTL), *36(OTU), 27(XIC), 36(XIC)*			
P_007_PLC_Manual_Stop	0	BOOL	Sanborn_GRP
*P_007_PLC_Manual_Stop - MainProgram/TK002_P06_P07 - *24(OTL), *26(OTL), *37(OTU), 28(XIC), 37(XIC)*			
P_007_Pump_Status	0	BOOL	Sanborn_GRP
AliasFor:	Local:5:I.Data.9		
Base Tag:	Local:5:I.Data.9		
P_007_Pump_Status - MainProgram/TK002_P06_P07 - 13(XIO)			
P_007_Pump_Status - Runtime_Counters_Prgm/Update_Runtime_Counters - 16(XIC), 21(XIC)			
P_007_Runtime		Runtime_Couter	Sanborn_GRP
*P_007_Runtime - Runtime_Counters_Prgm/Update_Runtime_Counters - *16(JSR), 16(JSR)*			
P_007_Set_as_Lead	0	BOOL	Sanborn_GRP
*P_007_Set_as_Lead - MainProgram/TK002_P06_P07 - *31(OTU), 10(XIC), 31(XIC), 5(XIC)*			
P_007_Set_as_Lead_Auto	0	BOOL	Sanborn_GRP
*P_007_Set_as_Lead_Auto - MainProgram/TK002_P06_P07 - *17(OTL), *6(OTL), *8(OTU), 8(XIC)*			
P_007_Start_CR	0	BOOL	Sanborn_GRP
AliasFor:	Local:8:O.Data.1		
Base Tag:	Local:8:O.Data.1		
*P_007_Start_CR - MainProgram/TK002_P06_P07 - *29(OTE), 13(XIC)*			
P_007_transition_to_manual_ONS	1	BOOL	Sanborn_GRP
*P_007_transition_to_manual_ONS - MainProgram/TK002_P06_P07 - *24(ONS)*			
P_007Failure_Manual_ONS	0	BOOL	Sanborn_GRP
*P_007Failure_Manual_ONS - MainProgram/TK002_P06_P07 - *26(ONS)*			
P_0607_Auto_Lead_Lag_Selection	1	BOOL	Sanborn_GRP
*P_0607_Auto_Lead_Lag_Selection - MainProgram/TK002_P06_P07 - *4(OTL), *5(OTU), 6(XIC)*			
P_0607_Auto_Lead_Lag_Selection_Request	0	BOOL	Sanborn_GRP
*P_0607_Auto_Lead_Lag_Selection_Request - MainProgram/TK002_P06_P07 - *4(OTU), 4(XIC)*			
P_0607_Auto_LL_unlatch_ONS	0	BOOL	Sanborn_GRP
*P_0607_Auto_LL_unlatch_ONS - MainProgram/TK002_P06_P07 - *5(ONS)*			
P_2_Auto_Cmd	0	BOOL	MainProgram
*P_2_Auto_Cmd - MainProgram/Extraction_Wells - *19(OTL), *20(OTU), 21(XIC), 21(XIO), 22(XIC)*			
P_2_Failure	0	BOOL	Sanborn_GRP
P_2_Failure - MainProgram/Alarms_AutoDialer - 8(XIC)			

P_2_Failure (Continued)			
*P_2_Failure - MainProgram/Extraction_Wells - *23(OTL), *24(OTU)*			
P_2_Failure_Timer		TIMER	MainProgram
*P_2_Failure_Timer - MainProgram/Extraction_Wells - *23(TON)*			
P_2_Failure_Timer.DN - MainProgram/Extraction_Wells - 23(XIC)			
P_2_LIT		AI_DS	Sanborn_GRP
*P_2_LIT - MainProgram/Buffer_Inputs - *35(JSR), 35(JSR)*			
P_2_LIT.PV - MainProgram/Buffer_Inputs - 36(ALMA)			
P_2_LIT.PV - MainProgram/Extraction_Wells - 19(GEQ), 20(LES)			
P_2_LIT_Alarm		ALARM_ANALOG	Sanborn_GRP
*P_2_LIT_Alarm - MainProgram/Buffer_Inputs - *36(ALMA)*			
P_2_LIT_Alarm.HInAlarm - MainProgram/Alarms_AutoDialer - 8(XIC)			
P_2_PLC_Auto_Mode	1	BOOL	Sanborn_GRP
P_2_PLC_Auto_Mode - MainProgram/Extraction_Wells - 21(XIO), 22(XIC), 22(XIO)			
P_2_PLC_Manual_Start	0	BOOL	Sanborn_GRP
*P_2_PLC_Manual_Start - MainProgram/Extraction_Wells - *21(OTL), *21(OTU), 22(XIC)*			
P_2_Pump_Start_CR	0	BOOL	Sanborn_GRP
AliasFor:	Slave_Radio_11.N8[5].0		
Base Tag:	Slave_Radio_11.N8[5].0		
*P_2_Pump_Start_CR - MainProgram/Extraction_Wells - *22(OTE), 23(XIC), 24(XIC)*			
P_2_Pump_Start_SP	7.5	REAL	Sanborn_GRP
P_2_Pump_Start_SP - MainProgram/Extraction_Wells - 19(GEQ)			
P_2_Pump_Status	0	BOOL	Sanborn_GRP
AliasFor:	Slave_Radio_11.N8[4].0		
Base Tag:	Slave_Radio_11.N8[4].0		
P_2_Pump_Status - MainProgram/Extraction_Wells - 23(XIO), 24(XIC)			
P_2_Pump_Status - Runtime_Counters_Prgm/Update_Runtime_Counters - 3(XIC)			
P_2_Pump_Stop_SP	4.5	REAL	Sanborn_GRP
P_2_Pump_Stop_SP - MainProgram/Extraction_Wells - 20(LES)			
P_2_Reset_Pump_Failure	0	BOOL	Sanborn_GRP
P_2_Reset_Pump_Failure - MainProgram/Extraction_Wells - 24(XIC)			
P_2_Runtime		Runtime_Couter	Sanborn_GRP
*P_2_Runtime - Runtime_Counters_Prgm/Update_Runtime_Counters - *3(JSR), 3(JSR)*			
P_2_transition_to_manual_ONS	0	BOOL	MainProgram
*P_2_transition_to_manual_ONS - MainProgram/Extraction_Wells - *21(ONS)*			
P_3_Auto_Cmd	0	BOOL	MainProgram
*P_3_Auto_Cmd - MainProgram/Extraction_Wells - *25(OTL), *26(OTU), 27(XIC), 27(XIO), 28(XIC)*			
P_3_Failure	0	BOOL	Sanborn_GRP
P_3_Failure - MainProgram/Alarms_AutoDialer - 8(XIC)			
*P_3_Failure - MainProgram/Extraction_Wells - *29(OTL), *30(OTU)*			
P_3_Failure_Timer		TIMER	MainProgram
*P_3_Failure_Timer - MainProgram/Extraction_Wells - *29(TON)*			
P_3_Failure_Timer.DN - MainProgram/Extraction_Wells - 29(XIC)			
P_3_LIT		AI_DS	Sanborn_GRP
*P_3_LIT - MainProgram/Buffer_Inputs - *41(JSR), 41(JSR)*			
P_3_LIT.PV - MainProgram/Buffer_Inputs - 42(ALMA)			
P_3_LIT.PV - MainProgram/Extraction_Wells - 25(GEQ), 26(LES)			
P_3_LIT_Alarm		ALARM_ANALOG	Sanborn_GRP
*P_3_LIT_Alarm - MainProgram/Buffer_Inputs - *42(ALMA)*			
P_3_LIT_Alarm.HInAlarm - MainProgram/Alarms_AutoDialer - 8(XIC)			

P_3_PLC_Auto_Mode	1	BOOL	Sanborn_GRP
P_3_PLC_Auto_Mode - MainProgram/Extraction_Wells - 27(XIO), 28(XIC), 28(XIO)			
P_3_PLC_Manual_Start	0	BOOL	Sanborn_GRP
*P_3_PLC_Manual_Start - MainProgram/Extraction_Wells - *27(OTL), *27(OTU), 28(XIC)*			
P_3_Pump_Start_CR	0	BOOL	Sanborn_GRP
AliasFor:	Slave_Radio_14.N8[3].0		
Base Tag:	Slave_Radio_14.N8[3].0		
*P_3_Pump_Start_CR - MainProgram/Extraction_Wells - *28(OTE), 29(XIC), 30(XIC)*			
P_3_Pump_Start_SP	7.5	REAL	Sanborn_GRP
P_3_Pump_Start_SP - MainProgram/Extraction_Wells - 25(GEQ)			
P_3_Pump_Status	0	BOOL	Sanborn_GRP
AliasFor:	Slave_Radio_14.N8[2].0		
Base Tag:	Slave_Radio_14.N8[2].0		
P_3_Pump_Status - MainProgram/Extraction_Wells - 29(XIO), 30(XIC)			
P_3_Pump_Status - Runtime_Counters_Prgm/Update_Runtime_Counters - 4(XIC)			
P_3_Pump_Stop_SP	3.7	REAL	Sanborn_GRP
P_3_Pump_Stop_SP - MainProgram/Extraction_Wells - 26(LES)			
P_3_Reset_Pump_Failure	0	BOOL	Sanborn_GRP
P_3_Reset_Pump_Failure - MainProgram/Extraction_Wells - 30(XIC)			
P_3_Runtime		Runtime_Couter	Sanborn_GRP
*P_3_Runtime - Runtime_Counters_Prgm/Update_Runtime_Counters - *4(JSR), 4(JSR)*			
P_3_transition_to_manual_ONS	0	BOOL	MainProgram
*P_3_transition_to_manual_ONS - MainProgram/Extraction_Wells - *27(ONS)*			
P_4_Auto_Cmd	0	BOOL	MainProgram
*P_4_Auto_Cmd - MainProgram/Extraction_Wells - *31(OTL), *32(OTU), 33(XIC), 33(XIO), 34(XIC)*			
P_4_Failure	0	BOOL	Sanborn_GRP
P_4_Failure - MainProgram/Alarms_AutoDialer - 8(XIC)			
*P_4_Failure - MainProgram/Extraction_Wells - *35(OTL), *36(OTU)*			
P_4_Failure_Timer		TIMER	MainProgram
*P_4_Failure_Timer - MainProgram/Extraction_Wells - *35(TON)*			
P_4_Failure_Timer.DN - MainProgram/Extraction_Wells - 35(XIC)			
P_4_LIT		AI_DS	Sanborn_GRP
*P_4_LIT - MainProgram/Buffer_Inputs - *43(JSR), 43(JSR)*			
P_4_LIT.PV - MainProgram/Buffer_Inputs - 44(ALMA)			
P_4_LIT.PV - MainProgram/Extraction_Wells - 31(GEQ), 32(LES)			
P_4_LIT_Alarm		ALARM_ANALOG	Sanborn_GRP
*P_4_LIT_Alarm - MainProgram/Buffer_Inputs - *44(ALMA)*			
P_4_LIT_Alarm.HInAlarm - MainProgram/Alarms_AutoDialer - 8(XIC)			
P_4_PLC_Auto_Mode	1	BOOL	Sanborn_GRP
P_4_PLC_Auto_Mode - MainProgram/Extraction_Wells - 33(XIO), 34(XIC), 34(XIO)			
P_4_PLC_Manual_Start	0	BOOL	Sanborn_GRP
*P_4_PLC_Manual_Start - MainProgram/Extraction_Wells - *33(OTL), *33(OTU), 34(XIC)*			
P_4_Pump_Start_CR	0	BOOL	Sanborn_GRP
AliasFor:	Slave_Radio_14.N8[5].0		
Base Tag:	Slave_Radio_14.N8[5].0		
*P_4_Pump_Start_CR - MainProgram/Extraction_Wells - *34(OTE), 35(XIC), 36(XIC)*			
P_4_Pump_Start_SP	7.5	REAL	Sanborn_GRP
P_4_Pump_Start_SP - MainProgram/Extraction_Wells - 31(GEQ)			
P_4_Pump_Status	0	BOOL	Sanborn_GRP
AliasFor:	Slave_Radio_14.N8[4].0		

P_4_Pump_Status (Continued)
Base Tag: Slave_Radio_14.N8[4].0
P_4_Pump_Status - MainProgram/Extraction_Wells - 35(XIO), 36(XIC)
P_4_Pump_Status - Runtime_Counters_Prgm/Update_Runtime_Counters - 5(XIC)

P_4_Pump_Stop_SP 4.0 REAL Sanborn_GRP
P_4_Pump_Stop_SP - MainProgram/Extraction_Wells - 32(LES)

P_4_Reset_Pump_Failure 0 BOOL Sanborn_GRP
P_4_Reset_Pump_Failure - MainProgram/Extraction_Wells - 36(XIC)

P_4_Runtime Runtime_Couter Sanborn_GRP
*P_4_Runtime - Runtime_Counters_Prgm/Update_Runtime_Counters - *5(JSR), 5(JSR)*

P_4_transition_to_manual_ONS 0 BOOL MainProgram
*P_4_transition_to_manual_ONS - MainProgram/Extraction_Wells - *33(ONS)*

P_803_Auto_Lead_Lag_Selection 0 BOOL Sanborn_GRP
*P_803_Auto_Lead_Lag_Selection - MainProgram/T801_P803 - *8(OTL), *9(OTU), 10(XIC)*

P_803_Auto_Lead_Lag_Selection_Request 0 BOOL Sanborn_GRP
Set by SCADA. Set to 1 to request automatic lead/lag pump assignment. PLC will reset this bit after latching it in
*P_803_Auto_Lead_Lag_Selection_Request - MainProgram/T801_P803 - *8(OTU), 8(XIC)*

P_803_Auto_LL_unlatch_ONS 0 BOOL MainProgram
*P_803_Auto_LL_unlatch_ONS - MainProgram/T801_P803 - *9(ONS)*

P_803B_Auto_Run_Cmd 1 BOOL MainProgram
*P_803B_Auto_Run_Cmd - MainProgram/T801_P803 - *23(OTE), 22(XIC), 22(XIO), 27(XIC)*

P_803B_Failure 0 BOOL Sanborn_GRP
P_803B_Failure - MainProgram/Alarms_AutoDialer - 6(XIC)
*P_803B_Failure - MainProgram/T801_P803 - *15(OTL), *16(OTU), 19(XIC), 23(XIO), 24(XIC), 25(XIO), 26(XIC), 29(XIC)*

P_803B_Failure_Timer TIMER MainProgram
*P_803B_Failure_Timer - MainProgram/T801_P803 - *15(TON)*
P_803B_Failure_Timer.DN - MainProgram/T801_P803 - 15(XIC)

P_803B_Is_Lag_Pump 0 BOOL Sanborn_GRP
*P_803B_Is_Lag_Pump - MainProgram/T801_P803 - *37(OTE)*

P_803B_Is_Lead_Pump 1 BOOL Sanborn_GRP
*P_803B_Is_Lead_Pump - MainProgram/T801_P803 - *11(OTL), *12(OTU), *13(OTL), *14(OTU), 10(XIC), 10(XIO), 19(XIC), 21(XIC), 21(XIO), 23(XIC), 29(XIC), 36(XIC)*

P_803B_Lead_ONS 0 BOOL MainProgram
*P_803B_Lead_ONS - MainProgram/T801_P803 - *13(ONS)*

P_803B_Manual_Run_Cmd 0 BOOL MainProgram
*P_803B_Manual_Run_Cmd - MainProgram/T801_P803 - *25(OTL), *26(OTU), 27(XIC)*

P_803B_PLC_Auto_Mode 1 BOOL Sanborn_GRP
Set by SCADA 1=Auto 0=Manual
*P_803B_PLC_Auto_Mode - MainProgram/T801_P803 - *24(OTU), 10(XIC), 13(XIC), 14(XIO), 22(XIO), 23(XIC), 25(XIO), 26(XIC), 26(XIO)*

P_803B_PLC_Manual_Start 0 BOOL Sanborn_GRP
Set to 1 to start pump, PLC will reset
*P_803B_PLC_Manual_Start - MainProgram/T801_P803 - *22(OTL), *38(OTU), 25(XIC), 38(XIC)*

P_803B_PLC_Manual_Stop 0 BOOL Sanborn_GRP
Set to 1 to stop pump, PLC will reset
*P_803B_PLC_Manual_Stop - MainProgram/T801_P803 - *22(OTL), *24(OTL), *39(OTU), 26(XIC), 39(XIC)*

P_803B_Pump_Status 1 BOOL Sanborn_GRP
1=Running, 0=Off
AliasFor: Local:5:I.Data.2
Base Tag: Local:5:I.Data.2
P_803B_Pump_Status - MainProgram/T801_P803 - 15(XIO)
P_803B_Pump_Status - Runtime_Counters_Prgm/Update_Runtime_Counters - 6(XIC)

P_803B_Runtime		Runtime_Couter	Sanborn_GRP
*P_803B_Runtime - Runtime_Counters_Prgm/Update_Runtime_Counters - *6(JSR), 6(JSR)*			
P_803B_Set_as_Lead	0	BOOL	Sanborn_GRP
*P_803B_Set_as_Lead - MainProgram/T801_P803 - *34(OTU), 13(XIC), 34(XIC), 9(XIC)*			
P_803B_Set_as_Lead_Auto	0	BOOL	MainProgram
*P_803B_Set_as_Lead_Auto - MainProgram/T801_P803 - *10(OTL), *11(OTU), *21(OTL), 11(XIC)*			
P_803B_Start_CR	1	BOOL	Sanborn_GRP
AliasFor:	Local:7:O.Data.6		
Base Tag:	Local:7:O.Data.6		
*P_803B_Start_CR - MainProgram/T801_P803 - *27(OTE), 15(XIC)*			
P_803B_transition_to_manual_ONS	0	BOOL	MainProgram
*P_803B_transition_to_manual_ONS - MainProgram/T801_P803 - *22(ONS)*			
P_803BFailure_Manual_ONS	0	BOOL	MainProgram
*P_803BFailure_Manual_ONS - MainProgram/T801_P803 - *24(ONS)*			
P_803C_Auto_Run_Cmd	0	BOOL	MainProgram
*P_803C_Auto_Run_Cmd - MainProgram/T801_P803 - *29(OTE), 28(XIC), 28(XIO), 33(XIC)*			
P_803C_Failure	0	BOOL	Sanborn_GRP
P_803C_Failure - MainProgram/Alarms_AutoDialer - 6(XIC)			
*P_803C_Failure - MainProgram/T801_P803 - *17(OTL), *18(OTU), 19(XIC), 23(XIC), 29(XIO), 30(XIC), 31(XIO), 32(XIC)*			
P_803C_Failure_Timer		TIMER	MainProgram
*P_803C_Failure_Timer - MainProgram/T801_P803 - *17(TON)*			
P_803C_Failure_Timer.DN - MainProgram/T801_P803 - 17(XIC)			
P_803C_Is_Lag_Pump	1	BOOL	Sanborn_GRP
*P_803C_Is_Lag_Pump - MainProgram/T801_P803 - *36(OTE)*			
P_803C_Is_Lead_Pump	0	BOOL	Sanborn_GRP
*P_803C_Is_Lead_Pump - MainProgram/T801_P803 - *11(OTU), *12(OTL), *13(OTU), *14(OTL), 19(XIC), 23(XIC), 29(XIC), 37(XIC)*			
P_803C_Lead_ONS	0	BOOL	MainProgram
*P_803C_Lead_ONS - MainProgram/T801_P803 - *14(ONS)*			
P_803C_Manual_Run_Cmd	0	BOOL	MainProgram
*P_803C_Manual_Run_Cmd - MainProgram/T801_P803 - *31(OTL), *32(OTU), 33(XIC)*			
P_803C_PLC_Auto_Mode	1	BOOL	Sanborn_GRP
Set by SCADA 1=Auto 0= Manual			
*P_803C_PLC_Auto_Mode - MainProgram/T801_P803 - *30(OTU), 10(XIC), 13(XIO), 14(XIC), 28(XIO), 29(XIC), 31(XIO), 32(XIC), 32(XIO)*			
P_803C_PLC_Manual_Start	0	BOOL	Sanborn_GRP
*P_803C_PLC_Manual_Start - MainProgram/T801_P803 - *28(OTL), *40(OTU), 31(XIC), 40(XIC)*			
P_803C_PLC_Manual_Stop	0	BOOL	Sanborn_GRP
*P_803C_PLC_Manual_Stop - MainProgram/T801_P803 - *28(OTL), *30(OTL), *41(OTU), 32(XIC), 41(XIC)*			
P_803C_Pump_Status	0	BOOL	Sanborn_GRP
1=Running, 0=Off			
AliasFor:	Local:5:I.Data.3		
Base Tag:	Local:5:I.Data.3		
P_803C_Pump_Status - MainProgram/T801_P803 - 17(XIO)			
P_803C_Pump_Status - Runtime_Counters_Prgm/Update_Runtime_Counters - 7(XIC)			
P_803C_Runtime		Runtime_Couter	Sanborn_GRP
*P_803C_Runtime - Runtime_Counters_Prgm/Update_Runtime_Counters - *7(JSR), 7(JSR)*			
P_803C_Set_as_Lead	0	BOOL	Sanborn_GRP
*P_803C_Set_as_Lead - MainProgram/T801_P803 - *35(OTU), 14(XIC), 35(XIC), 9(XIC)*			
P_803C_Set_as_Lead_Auto	0	BOOL	MainProgram
*P_803C_Set_as_Lead_Auto - MainProgram/T801_P803 - *10(OTL), *12(OTU), *21(OTL), 12(XIC)*			

P_803C_Start_CR	0	BOOL	Sanborn_GRP
AliasFor:	Local:7:O.Data.7		
Base Tag:	Local:7:O.Data.7		
*P_803C_Start_CR - MainProgram/T801_P803 - *33(OTE), 17(XIC)*			
P_803C_transition_to_manual_ONS	0	BOOL	MainProgram
*P_803C_transition_to_manual_ONS - MainProgram/T801_P803 - *28(ONS)*			
P_803CFailure_Manual_ONS	0	BOOL	MainProgram
*P_803CFailure_Manual_ONS - MainProgram/T801_P803 - *30(ONS)*			
P_805_Auto_Lead_Lag_Selection	0	BOOL	Sanborn_GRP
*P_805_Auto_Lead_Lag_Selection - MainProgram/S_801A_P805 - *6(OTL), *7(OTU), 8(XIC)*			
P_805_Auto_Lead_Lag_Selection_Request	0	BOOL	Sanborn_GRP
*P_805_Auto_Lead_Lag_Selection_Request - MainProgram/S_801A_P805 - *6(OTU), 6(XIC)*			
P_805_Auto_LL_unlatch_ONS	0	BOOL	MainProgram
*P_805_Auto_LL_unlatch_ONS - MainProgram/S_801A_P805 - *7(ONS)*			
P_805A_Auto_Run_Cmd	0	BOOL	MainProgram
*P_805A_Auto_Run_Cmd - MainProgram/S_801A_P805 - *21(OTE), 20(XIC), 20(XIO), 25(XIC)*			
P_805A_Failure	0	BOOL	Sanborn_GRP
P_805A_Failure - MainProgram/Alarms_AutoDialer - 6(XIC)			
*P_805A_Failure - MainProgram/S_801A_P805 - *13(OTL), *14(OTU), 17(XIC), 21(XIO), 22(XIC), 23(XIO), 24(XIC), 27(XIC)*			
P_805A_Failure_Timer		TIMER	MainProgram
*P_805A_Failure_Timer - MainProgram/S_801A_P805 - *13(TON)*			
P_805A_Failure_Timer.DN - MainProgram/S_801A_P805 - 13(XIC)			
P_805A_Is_Lag_Pump	1	BOOL	Sanborn_GRP
*P_805A_Is_Lag_Pump - MainProgram/S_801A_P805 - *35(OTE)*			
P_805A_Is_Lead_Pump	0	BOOL	Sanborn_GRP
*P_805A_Is_Lead_Pump - MainProgram/S_801A_P805 - *10(OTU), *11(OTL), *12(OTU), *9(OTL), 17(XIC), 19(XIC), 19(XIO), 21(XIC), 27(XIC), 34(XIC), 8(XIC), 8(XIO)*			
P_805A_Lead_ONS	0	BOOL	MainProgram
*P_805A_Lead_ONS - MainProgram/S_801A_P805 - *11(ONS)*			
P_805A_Manual_Run_Cmd	0	BOOL	MainProgram
*P_805A_Manual_Run_Cmd - MainProgram/S_801A_P805 - *23(OTL), *24(OTU), 25(XIC)*			
P_805A_PLC_Auto_Mode	1	BOOL	Sanborn_GRP
Set by SCADA 1=Auto 0=Manual			
*P_805A_PLC_Auto_Mode - MainProgram/S_801A_P805 - *22(OTU), 11(XIC), 12(XIO), 20(XIO), 21(XIC), 23(XIO), 24(XIC), 24(XIO), 8(XIC)*			
P_805A_PLC_Manual_Start	0	BOOL	Sanborn_GRP
Set to 1 to start pump, PLC will reset			
*P_805A_PLC_Manual_Start - MainProgram/S_801A_P805 - *20(OTL), *36(OTU), 23(XIC), 36(XIC)*			
P_805A_PLC_Manual_Stop	0	BOOL	Sanborn_GRP
Set to 1 to stop pump, PLC will reset			
*P_805A_PLC_Manual_Stop - MainProgram/S_801A_P805 - *20(OTL), *22(OTL), *37(OTU), 24(XIC), 37(XIC)*			
P_805A_Pump_Status	0	BOOL	Sanborn_GRP
1=Running, 0=Off			
AliasFor:	Local:5:I.Data.4		
Base Tag:	Local:5:I.Data.4		
P_805A_Pump_Status - MainProgram/S_801A_P805 - 13(XIO)			
P_805A_Pump_Status - Runtime_Counters_Prgm/Update_Runtime_Counters - 8(XIC)			
P_805A_Runtime		Runtime_Couter	Sanborn_GRP
*P_805A_Runtime - Runtime_Counters_Prgm/Update_Runtime_Counters - *8(JSR), 8(JSR)*			
P_805A_Set_as_Lead	0	BOOL	Sanborn_GRP
*P_805A_Set_as_Lead - MainProgram/S_801A_P805 - *32(OTU), 11(XIC), 32(XIC), 7(XIC)*			

P_805A_Set_As_Lead_Auto 0 BOOL MainProgram
*P_805A_Set_As_Lead_Auto - MainProgram/S_801A_P805 - *19(OTL), *8(OTU), *9(OTU), 9(XIC)*

P_805A_Start_CR 0 BOOL Sanborn_GRP
1=Turn On
AliasFor: Local:7:O.Data.1
Base Tag: Local:7:O.Data.1
*P_805A_Start_CR - MainProgram/S_801A_P805 - *25(OTE), 13(XIC)*

P_805A_transition_to_manual_ONS 0 BOOL MainProgram
*P_805A_transition_to_manual_ONS - MainProgram/S_801A_P805 - *20(ONS)*

P_805C_Auto_Run_Cmd 1 BOOL MainProgram
*P_805C_Auto_Run_Cmd - MainProgram/S_801A_P805 - *27(OTE), 26(XIC), 26(XIO), 31(XIC)*

P_805C_Failure 0 BOOL Sanborn_GRP
P_805C_Failure - MainProgram/Alarms_AutoDialer - 6(XIC)
*P_805C_Failure - MainProgram/S_801A_P805 - *15(OTL), *16(OTU), 17(XIC), 21(XIC), 27(XIO), 28(XIC), 29(XIO), 30(XIC)*

P_805C_Failure_manual_ONS 0 BOOL MainProgram
*P_805C_Failure_manual_ONS - MainProgram/S_801A_P805 - *28(ONS)*

P_805C_Failure_Timer TIMER MainProgram
*P_805C_Failure_Timer - MainProgram/S_801A_P805 - *15(TON)*
P_805C_Failure_Timer.DN - MainProgram/S_801A_P805 - 15(XIC)

P_805C_Is_Lag_Pump 0 BOOL Sanborn_GRP
*P_805C_Is_Lag_Pump - MainProgram/S_801A_P805 - *34(OTE)*

P_805C_Is_Lead_Pump 1 BOOL Sanborn_GRP
*P_805C_Is_Lead_Pump - MainProgram/S_801A_P805 - *10(OTL), *11(OTU), *12(OTL), *9(OTU), 17(XIC), 21(XIC), 27(XIC), 35(XIC)*

P_805C_Lead_ONS 0 BOOL MainProgram
*P_805C_Lead_ONS - MainProgram/S_801A_P805 - *12(ONS)*

P_805C_Manual_Run_Cmd 0 BOOL MainProgram
*P_805C_Manual_Run_Cmd - MainProgram/S_801A_P805 - *29(OTL), *30(OTU), 31(XIC)*

P_805C_PLC_Auto_Mode 1 BOOL Sanborn_GRP
Set by SCADA 1=PLC Auto mode, 0=PLC Manual mode (start/stop from SCADA)
*P_805C_PLC_Auto_Mode - MainProgram/S_801A_P805 - *28(OTU), 11(XIO), 12(XIC), 26(XIO), 27(XIC), 29(XIO), 30(XIC), 30(XIO), 8(XIC)*

P_805C_PLC_Manual_Start 0 BOOL Sanborn_GRP
Set to 1 to start pump, PLC will reset
*P_805C_PLC_Manual_Start - MainProgram/S_801A_P805 - *26(OTL), *38(OTU), 29(XIC), 38(XIC)*

P_805C_PLC_Manual_Stop 0 BOOL Sanborn_GRP
Set to 1 to stop pump, PLC will reset
*P_805C_PLC_Manual_Stop - MainProgram/S_801A_P805 - *26(OTL), *28(OTL), *39(OTU), 30(XIC), 39(XIC)*

P_805C_Pump_Status 1 BOOL Sanborn_GRP
1=Running, 0=Off
AliasFor: Local:5:I.Data.5
Base Tag: Local:5:I.Data.5
P_805C_Pump_Status - MainProgram/S_801A_P805 - 15(XIO)
P_805C_Pump_Status - Runtime_Counters_Prgm/Update_Runtime_Counters - 9(XIC)

P_805C_Runtime Runtime_Couter Sanborn_GRP
*P_805C_Runtime - Runtime_Counters_Prgm/Update_Runtime_Counters - *9(JSR), 9(JSR)*

P_805C_Set_as_Lead 0 BOOL Sanborn_GRP
*P_805C_Set_as_Lead - MainProgram/S_801A_P805 - *33(OTU), 12(XIC), 33(XIC), 7(XIC)*

P_805C_Set_As_Lead_Auto 0 BOOL MainProgram
*P_805C_Set_As_Lead_Auto - MainProgram/S_801A_P805 - *10(OTU), *19(OTL), *8(OTU), 10(XIC)*

P_805C_Start_CR 1 BOOL Sanborn_GRP
1=Turn On

P_805C_Start_CR (Continued)
AliasFor: Local:7:O.Data.2
Base Tag: Local:7:O.Data.2
*P_805C_Start_CR - MainProgram/S_801A_P805 - *31(OTE), 15(XIC)*

P_805C_transition_to_manual_ONS 0 BOOL MainProgram
*P_805C_transition_to_manual_ONS - MainProgram/S_801A_P805 - *26(ONS)*

P_810_Auto_Lead_Lag_Selection 0 BOOL Sanborn_GRP
*P_810_Auto_Lead_Lag_Selection - MainProgram/T802_P810 - *6(OTL), *7(OTU), 8(XIC)*

P_810_Auto_Lead_Lag_Selection_Request 0 BOOL Sanborn_GRP
*P_810_Auto_Lead_Lag_Selection_Request - MainProgram/T802_P810 - *6(OTU), 6(XIC)*

P_810_Auto_LL_unlatch_ONS 0 BOOL MainProgram
*P_810_Auto_LL_unlatch_ONS - MainProgram/T802_P810 - *7(ONS)*

P_810A_Auto_Run_Cmd 1 BOOL MainProgram
*P_810A_Auto_Run_Cmd - MainProgram/T802_P810 - *21(OTE), 20(XIC), 20(XIO), 25(XIC)*

P_810A_Failure 0 BOOL Sanborn_GRP
P_810A_Failure - MainProgram/Alarms_AutoDialer - 6(XIC)
*P_810A_Failure - MainProgram/T802_P810 - *13(OTL), *14(OTU), 17(XIC), 21(XIO), 22(XIC), 23(XIO), 24(XIC), 27(XIC)*

P_810A_Failure_Timer TIMER MainProgram
*P_810A_Failure_Timer - MainProgram/T802_P810 - *13(TON)*
P_810A_Failure_Timer.DN - MainProgram/T802_P810 - 13(XIC)

P_810A_Is_Lag_Pump 0 BOOL Sanborn_GRP
*P_810A_Is_Lag_Pump - MainProgram/T802_P810 - *35(OTE)*

P_810A_Is_Lead_Pump 1 BOOL Sanborn_GRP
*P_810A_Is_Lead_Pump - MainProgram/T802_P810 - *10(OTU), *11(OTL), *12(OTU), *9(OTL), 17(XIC), 19(XIC), 19(XIO), 21(XIC), 27(XIC), 34(XIC), 8(XIC), 8(XIO)*

P_810A_Lead_ONS 0 BOOL MainProgram
*P_810A_Lead_ONS - MainProgram/T802_P810 - *11(ONS)*

P_810A_Manual_Run_Cmd 0 BOOL MainProgram
*P_810A_Manual_Run_Cmd - MainProgram/T802_P810 - *23(OTL), *24(OTU), 25(XIC)*

P_810A_PLC_Auto_Mode 1 BOOL Sanborn_GRP
Set by SCADA 1=Auto 0=Manual
*P_810A_PLC_Auto_Mode - MainProgram/T802_P810 - *22(OTU), 11(XIC), 12(XIO), 20(XIO), 21(XIC), 23(XIO), 24(XIC), 24(XIO), 8(XIC)*

P_810A_PLC_Manual_Start 0 BOOL Sanborn_GRP
Set to 1 to start pump, PLC will reset
*P_810A_PLC_Manual_Start - MainProgram/T802_P810 - *20(OTL), *36(OTU), 23(XIC), 36(XIC)*

P_810A_PLC_Manual_Stop 0 BOOL Sanborn_GRP
Set to 1 to stop pump, PLC will reset
*P_810A_PLC_Manual_Stop - MainProgram/T802_P810 - *20(OTL), *22(OTL), *37(OTU), 24(XIC), 37(XIC)*

P_810A_Pump_Status 1 BOOL Sanborn_GRP
1=Running, 0=Off
AliasFor: Local:5:I.Data.6
Base Tag: Local:5:I.Data.6
P_810A_Pump_Status - MainProgram/Flow_Pulse_Meter - 10(XIC), 7(XIC)
P_810A_Pump_Status - MainProgram/T802_P810 - 13(XIO)
P_810A_Pump_Status - Runtime_Counters_Prgm/Update_Runtime_Counters - 10(XIC)

P_810A_Runtime Runtime_Couter Sanborn_GRP
*P_810A_Runtime - Runtime_Counters_Prgm/Update_Runtime_Counters - *10(JSR), 10(JSR)*

P_810A_Set_as_Lead 0 BOOL Sanborn_GRP
*P_810A_Set_as_Lead - MainProgram/T802_P810 - *32(OTU), 11(XIC), 32(XIC), 7(XIC)*

P_810A_Set_as_Lead_Auto 0 BOOL MainProgram
*P_810A_Set_as_Lead_Auto - MainProgram/T802_P810 - *19(OTL), *8(OTU), *9(OTU), 9(XIC)*

P_810A_Start_CR	1	BOOL	Sanborn_GRP
1=Turn On			
AliasFor:	Local:7:O.Data.3		
Base Tag:	Local:7:O.Data.3		
*P_810A_Start_CR - MainProgram/T802_P810 - *25(OTE), 13(XIC)*			
P_810A_transition_to_manual_ONS	0	BOOL	MainProgram
*P_810A_transition_to_manual_ONS - MainProgram/T802_P810 - *20(ONS)*			
P_810B_Auto_Run_Cmd	0	BOOL	MainProgram
*P_810B_Auto_Run_Cmd - MainProgram/T802_P810 - *27(OTE), 26(XIC), 26(XIO), 31(XIC)*			
P_810B_Failure	0	BOOL	Sanborn_GRP
P_810B_Failure - MainProgram/Alarms_AutoDialer - 6(XIC)			
*P_810B_Failure - MainProgram/T802_P810 - *15(OTL), *16(OTU), 17(XIC), 21(XIC), 27(XIO), 28(XIC), 29(XIO), 30(XIC)*			
P_810B_Failure_manual_ONS	0	BOOL	MainProgram
*P_810B_Failure_manual_ONS - MainProgram/T802_P810 - *28(ONS)*			
P_810B_Failure_Timer		TIMER	MainProgram
*P_810B_Failure_Timer - MainProgram/T802_P810 - *15(TON)*			
P_810B_Failure_Timer.DN - MainProgram/T802_P810 - 15(XIC)			
P_810B_Is_Lag_Pump	1	BOOL	Sanborn_GRP
*P_810B_Is_Lag_Pump - MainProgram/T802_P810 - *34(OTE)*			
P_810B_Is_Lead_Pump	0	BOOL	Sanborn_GRP
*P_810B_Is_Lead_Pump - MainProgram/T802_P810 - *10(OTL), *11(OTU), *12(OTL), *9(OTU), 17(XIC), 21(XIC), 27(XIC), 35(XIC)*			
P_810B_Lead_ONS	0	BOOL	MainProgram
*P_810B_Lead_ONS - MainProgram/T802_P810 - *12(ONS)*			
P_810B_Manual_Run_Cmd	0	BOOL	MainProgram
*P_810B_Manual_Run_Cmd - MainProgram/T802_P810 - *29(OTL), *30(OTU), 31(XIC)*			
P_810B_PLC_Auto_Mode	1	BOOL	Sanborn_GRP
Set by SCADA 1=Auto 0=Manual			
*P_810B_PLC_Auto_Mode - MainProgram/T802_P810 - *28(OTU), 11(XIO), 12(XIC), 26(XIO), 27(XIC), 29(XIO), 30(XIC), 30(XIO), 8(XIC)*			
P_810B_PLC_Manual_Start	0	BOOL	Sanborn_GRP
Set to 1 to start pump, PLC will reset			
*P_810B_PLC_Manual_Start - MainProgram/T802_P810 - *26(OTL), *38(OTU), 29(XIC), 38(XIC)*			
P_810B_PLC_Manual_Stop	0	BOOL	Sanborn_GRP
Set to 1 to stop pump, PLC will reset			
*P_810B_PLC_Manual_Stop - MainProgram/T802_P810 - *26(OTL), *28(OTL), *39(OTU), 30(XIC), 39(XIC)*			
P_810B_Pump_Status	0	BOOL	Sanborn_GRP
1=Running, 0=Off			
AliasFor:	Local:5:I.Data.7		
Base Tag:	Local:5:I.Data.7		
P_810B_Pump_Status - MainProgram/Flow_Pulse_Meter - 10(XIC), 7(XIC)			
P_810B_Pump_Status - MainProgram/T802_P810 - 15(XIO)			
P_810B_Pump_Status - Runtime_Counters_Prgm/Update_Runtime_Counters - 11(XIC)			
P_810B_Runtime		Runtime_Couter	Sanborn_GRP
*P_810B_Runtime - Runtime_Counters_Prgm/Update_Runtime_Counters - *11(JSR), 11(JSR)*			
P_810B_Set_as_Lead	0	BOOL	Sanborn_GRP
*P_810B_Set_as_Lead - MainProgram/T802_P810 - *33(OTU), 12(XIC), 33(XIC), 7(XIC)*			
P_810B_Set_as_Lead_Auto	0	BOOL	MainProgram
*P_810B_Set_as_Lead_Auto - MainProgram/T802_P810 - *10(OTU), *19(OTL), *8(OTU), 10(XIC)*			
P_810B_Start_CR	0	BOOL	Sanborn_GRP
1=Turn On			
AliasFor:	Local:7:O.Data.4		
Base Tag:	Local:7:O.Data.4		

P_810B_Start_CR (Continued) *P_810B_Start_CR - MainProgram/T802_P810 - *31(OTE), 15(XIC)*			
P_810B_transition_to_manual_ONS *P_810B_transition_to_manual_ONS - MainProgram/T802_P810 - *26(ONS)*	0	BOOL	MainProgram
p001_on_ONS *p001_on_ONS - Runtime_Counters_Prgm/Update_Runtime_Counters - *17(ONS)*	1	BOOL	Sanborn_GRP
p002_on_ONS *p002_on_ONS - Runtime_Counters_Prgm/Update_Runtime_Counters - *18(ONS)*	0	BOOL	Sanborn_GRP
p003_on_ONS *p003_on_ONS - Runtime_Counters_Prgm/Update_Runtime_Counters - *19(ONS)*	1	BOOL	Sanborn_GRP
p006_on_ONS *p006_on_ONS - Runtime_Counters_Prgm/Update_Runtime_Counters - *20(ONS)*	0	BOOL	Sanborn_GRP
p007_on_ONS *p007_on_ONS - Runtime_Counters_Prgm/Update_Runtime_Counters - *21(ONS)*	0	BOOL	Sanborn_GRP
P0607_Auto_LL_request_ONS *P0607_Auto_LL_request_ONS - MainProgram/TK002_P06_P07 - *4(ONS)*	0	BOOL	Sanborn_GRP
P803_Auto_LL_request_ONS *P803_Auto_LL_request_ONS - MainProgram/T801_P803 - *8(ONS)*	0	BOOL	MainProgram
P805_Auto_LL_request_ONS *P805_Auto_LL_request_ONS - MainProgram/S_801A_P805 - *6(ONS)*	0	BOOL	MainProgram
P805A_failure_manual_ONS *P805A_failure_manual_ONS - MainProgram/S_801A_P805 - *22(ONS)*	0	BOOL	MainProgram
P810_Auto_LL_request_ONS *P810_Auto_LL_request_ONS - MainProgram/T802_P810 - *6(ONS)*	0	BOOL	MainProgram
P810A_failure_manual_ONS *P810A_failure_manual_ONS - MainProgram/T802_P810 - *22(ONS)*	0	BOOL	MainProgram
PDS_801 AliasFor: Base Tag: *PDS_801 - MainProgram/Alarms_AutoDialer - 0(XIC)*	0 Local:2:I.Data.4 Local:2:I.Data.4	BOOL	Sanborn_GRP
PDS_802 AliasFor: Base Tag: *PDS_802 - MainProgram/Alarms_AutoDialer - 0(XIC)*	0 Local:2:I.Data.5 Local:2:I.Data.5	BOOL	Sanborn_GRP
PDS_803 AliasFor: Base Tag: *PDS_803 - MainProgram/Alarms_AutoDialer - 0(XIC)*	0 Local:2:I.Data.6 Local:2:I.Data.6	BOOL	Sanborn_GRP
PI_212 *PI_212 - MainProgram/Buffer_Inputs - *12(JSR), 12(JSR)* *PI_212.PV - MainProgram/Buffer_Inputs - 13(ALMA), 30(SUB)* *PI_212.Raw_Input - MainProgram/Buffer_Inputs - 30(GEQ), 31(LES)*		AI_DS	Sanborn_GRP
PI_212_Alarm *PI_212_Alarm - MainProgram/Buffer_Inputs - *13(ALMA)*		ALARM_ANALOG	Sanborn_GRP
PI_218 *PI_218 - MainProgram/Buffer_Inputs - *14(JSR), 14(JSR)* *PI_218.PV - MainProgram/Buffer_Inputs - 15(ALMA), 30(SUB)* *PI_218.Raw_Input - MainProgram/Buffer_Inputs - 30(GEQ), 31(LES)*		AI_DS	Sanborn_GRP
PI_218_Alarm		ALARM_ANALOG	Sanborn_GRP

PI_218_Alarm (Continued)
*PI_218_Alarm - MainProgram/Buffer_Inputs - *15(ALMA)*

PLC_Battery_Fault	0	BOOL	Sanborn_GRP
*PLC_Battery_Fault - MainProgram/MainRoutine - *11(OTE)*			
PLC_DST_Active	1	DINT	Sanborn_GRP
*PLC_DST_Active - MainProgram/MainRoutine - *17(GSV), 20(EQU)*			
PLC_Local_Date_Time		DINT[7]	Sanborn_GRP
Current PLC Local Time			
PLC_Local_Date_Time - MainProgram/Flow_Pulse_Meter - 2(COP), 3(COP)			
PLC_Local_Date_Time - Totalizer_Prgm/Totalizers_LL - 1(COP), 10(COP), 11(COP), 13(COP), 14(COP), 2(COP), 4(COP), 5(COP), 7(COP), 8(COP)			
*PLC_Local_Date_Time[0] - MainProgram/MainRoutine - *16(GSV)*			
PLC_Local_Date_Time[2] - MainProgram/Flow_Pulse_Meter - 3(NEQ)			
PLC_Local_Date_Time[2] - Totalizer_Prgm/Totalizers_LL - 12(NEQ), 15(NEQ), 3(NEQ), 6(NEQ), 9(NEQ)			
PLC_New_Time		DINT[7]	Sanborn_GRP
PLC_New_Time - MainProgram/MainRoutine - 18(SSV)			
PSL_801A	0	BOOL	Sanborn_GRP
AliasFor:	Local:2:I.Data.12		
Base Tag:	Local:2:I.Data.12		
PSL_801A - MainProgram/Alarms_AutoDialer - 1(XIC)			
PW_1_Auto_Cmd	1	BOOL	MainProgram
*PW_1_Auto_Cmd - MainProgram/Extraction_Wells - *0(OTL), *1(OTU), 2(XIC), 2(XIO), 4(XIC)*			
PW_1_Failure	0	BOOL	Sanborn_GRP
PW_1_Failure - MainProgram/Alarms_AutoDialer - 8(XIC)			
*PW_1_Failure - MainProgram/Extraction_Wells - *5(OTL), *6(OTU), 3(XIC)*			
PW_1_Failure_Timer		TIMER	MainProgram
*PW_1_Failure_Timer - MainProgram/Extraction_Wells - *5(TON)*			
PW_1_Failure_Timer.DN - MainProgram/Extraction_Wells - 5(XIC)			
PW_1_LIT		AI_DS	Sanborn_GRP
*PW_1_LIT - MainProgram/Buffer_Inputs - *37(JSR), 37(JSR)*			
PW_1_LIT.PV - MainProgram/Buffer_Inputs - 38(ALMA)			
PW_1_LIT.PV - MainProgram/Extraction_Wells - 0(GEQ), 1(LES)			
PW_1_LIT_Alarm		ALARM_ANALOG	Sanborn_GRP
*PW_1_LIT_Alarm - MainProgram/Buffer_Inputs - *38(ALMA)*			
PW_1_LIT_Alarm.HInAlarm - MainProgram/Alarms_AutoDialer - 8(XIC)			
PW_1_PLC_Auto_Mode	1	BOOL	Sanborn_GRP
*PW_1_PLC_Auto_Mode - MainProgram/Extraction_Wells - *3(OTU), 2(XIO), 4(XIC), 4(XIO)*			
PW_1_PLC_Manual_Start	0	BOOL	Sanborn_GRP
*PW_1_PLC_Manual_Start - MainProgram/Extraction_Wells - *2(OTL), *2(OTU), *3(OTU), 4(XIC)*			
PW_1_Pump_Start_CR	1	BOOL	Sanborn_GRP
AliasFor:	Slave_Radio_12.N8[3].0		
Base Tag:	Slave_Radio_12.N8[3].0		
*PW_1_Pump_Start_CR - MainProgram/Extraction_Wells - *4(OTE), 5(XIC), 6(XIC)*			
PW_1_Pump_Start_SP	8.0	REAL	Sanborn_GRP
PW_1_Pump_Start_SP - MainProgram/Extraction_Wells - 0(GEQ)			
PW_1_Pump_Status	1	BOOL	Sanborn_GRP
AliasFor:	Slave_Radio_12.N8[2].0		
Base Tag:	Slave_Radio_12.N8[2].0		
PW_1_Pump_Status - MainProgram/Extraction_Wells - 5(XIO), 6(XIC)			
PW_1_Pump_Status - Runtime_Counters_Prgm/Update_Runtime_Counters - 0(XIC)			
PW_1_Pump_Stop_SP	5.0	REAL	Sanborn_GRP
PW_1_Pump_Stop_SP - MainProgram/Extraction_Wells - 1(LES)			

PW_1_Reset_Pump_Failure *PW_1_Reset_Pump_Failure - MainProgram/Extraction_Wells - 6(XIC)*	0	BOOL	Sanborn_GRP
PW_1_Runtime *PW_1_Runtime - Runtime_Counters_Prgm/Update_Runtime_Counters - *0(JSR), 0(JSR)*		Runtime_Couter	Sanborn_GRP
PW_1_transition_to_manual_ONS *PW_1_transition_to_manual_ONS - MainProgram/Extraction_Wells - *2(ONS)*	0	BOOL	MainProgram
PW_3_Auto_Cmd *PW_3_Auto_Cmd - MainProgram/Extraction_Wells - *7(OTL), *8(OTU), 10(XIC), 9(XIC), 9(XIO)*	0	BOOL	MainProgram
PW_3_Failure *PW_3_Failure - MainProgram/Alarms_AutoDialer - 8(XIC)* *PW_3_Failure - MainProgram/Extraction_Wells - *11(OTL), *12(OTU)*	0	BOOL	Sanborn_GRP
PW_3_Failure_Timer *PW_3_Failure_Timer - MainProgram/Extraction_Wells - *11(TON)* *PW_3_Failure_Timer.DN - MainProgram/Extraction_Wells - 11(XIC)*		TIMER	MainProgram
PW_3_LIT *PW_3_LIT - MainProgram/Buffer_Inputs - *39(JSR), 39(JSR)* *PW_3_LIT.PV - MainProgram/Buffer_Inputs - 40(ALMA)* *PW_3_LIT.PV - MainProgram/Extraction_Wells - 7(GEQ), 8(LES)*		AI_DS	Sanborn_GRP
PW_3_LIT_Alarm *PW_3_LIT_Alarm - MainProgram/Buffer_Inputs - *40(ALMA)* *PW_3_LIT_Alarm.HInAlarm - MainProgram/Alarms_AutoDialer - 8(XIC)*		ALARM_ANALOG	Sanborn_GRP
PW_3_PLC_Auto_Mode *PW_3_PLC_Auto_Mode - MainProgram/Extraction_Wells - 10(XIC), 10(XIO), 9(XIO)*	1	BOOL	Sanborn_GRP
PW_3_PLC_Manual_Start *PW_3_PLC_Manual_Start - MainProgram/Extraction_Wells - *9(OTL), *9(OTU), 10(XIC)*	0	BOOL	Sanborn_GRP
PW_3_Pump_Start_CR AliasFor: Base Tag: *PW_3_Pump_Start_CR - MainProgram/Extraction_Wells - *10(OTE), 11(XIC), 12(XIC)*	0 Slave_Radio_13.N8[3].0 Slave_Radio_13.N8[3].0	BOOL	Sanborn_GRP
PW_3_Pump_Start_SP *PW_3_Pump_Start_SP - MainProgram/Extraction_Wells - 7(GEQ)*	8.0	REAL	Sanborn_GRP
PW_3_Pump_Status AliasFor: Base Tag: *PW_3_Pump_Status - MainProgram/Extraction_Wells - 11(XIO), 12(XIC)* *PW_3_Pump_Status - Runtime_Counters_Prgm/Update_Runtime_Counters - 1(XIC)*	0 Slave_Radio_13.N8[2].0 Slave_Radio_13.N8[2].0	BOOL	Sanborn_GRP
PW_3_Pump_Stop_SP *PW_3_Pump_Stop_SP - MainProgram/Extraction_Wells - 8(LES)*	4.0	REAL	Sanborn_GRP
PW_3_Reset_Pump_Failure *PW_3_Reset_Pump_Failure - MainProgram/Extraction_Wells - 12(XIC)*	0	BOOL	Sanborn_GRP
PW_3_Runtime *PW_3_Runtime - Runtime_Counters_Prgm/Update_Runtime_Counters - *1(JSR), 1(JSR)*		Runtime_Couter	Sanborn_GRP
PW_3_transition_to_manual_ONS *PW_3_transition_to_manual_ONS - MainProgram/Extraction_Wells - *9(ONS)*	0	BOOL	MainProgram
PW_4_Auto_Cmd *PW_4_Auto_Cmd - MainProgram/Extraction_Wells - *13(OTL), *14(OTU), 15(XIC), 15(XIO), 16(XIC)*	1	BOOL	MainProgram
PW_4_Failure *PW_4_Failure - MainProgram/Alarms_AutoDialer - 8(XIC)* *PW_4_Failure - MainProgram/Extraction_Wells - *17(OTL), *18(OTU)*	0	BOOL	Sanborn_GRP

PW_4_Failure_Timer		TIMER	MainProgram
*PW_4_Failure_Timer - MainProgram/Extraction_Wells - *17(TON)*			
PW_4_Failure_Timer.DN - MainProgram/Extraction_Wells - 17(XIC)			
PW_4_LIT		AI_DS	Sanborn_GRP
*PW_4_LIT - MainProgram/Buffer_Inputs - *33(JSR), 33(JSR)*			
PW_4_LIT.PV - MainProgram/Buffer_Inputs - 34(ALMA)			
PW_4_LIT.PV - MainProgram/Extraction_Wells - 13(GEQ), 14(LES)			
PW_4_LIT_Alarm		ALARM_ANALOG	Sanborn_GRP
*PW_4_LIT_Alarm - MainProgram/Buffer_Inputs - *34(ALMA)*			
PW_4_LIT_Alarm.HInAlarm - MainProgram/Alarms_AutoDialer - 8(XIC)			
PW_4_PLC_Auto_Mode	1	BOOL	Sanborn_GRP
PW_4_PLC_Auto_Mode - MainProgram/Extraction_Wells - 15(XIO), 16(XIC), 16(XIO)			
PW_4_PLC_Manual_Start	0	BOOL	Sanborn_GRP
*PW_4_PLC_Manual_Start - MainProgram/Extraction_Wells - *15(OTL), *15(OTU), 16(XIC)*			
PW_4_Pump_Start_CR	1	BOOL	Sanborn_GRP
AliasFor:	Slave_Radio_11.N8[3].0		
Base Tag:	Slave_Radio_11.N8[3].0		
*PW_4_Pump_Start_CR - MainProgram/Extraction_Wells - *16(OTE), 17(XIC), 18(XIC)*			
PW_4_Pump_Start_SP	10.0	REAL	Sanborn_GRP
PW_4_Pump_Start_SP - MainProgram/Extraction_Wells - 13(GEQ)			
PW_4_Pump_Status	1	BOOL	Sanborn_GRP
AliasFor:	Slave_Radio_11.N8[2].0		
Base Tag:	Slave_Radio_11.N8[2].0		
PW_4_Pump_Status - MainProgram/Extraction_Wells - 17(XIO), 18(XIC)			
PW_4_Pump_Status - Runtime_Counters_Prgm/Update_Runtime_Counters - 2(XIC)			
PW_4_Pump_Stop_SP	7.5	REAL	Sanborn_GRP
PW_4_Pump_Stop_SP - MainProgram/Extraction_Wells - 14(LES)			
PW_4_Reset_Pump_Failure	0	BOOL	Sanborn_GRP
PW_4_Reset_Pump_Failure - MainProgram/Extraction_Wells - 18(XIC)			
PW_4_Runtime		Runtime_Couter	Sanborn_GRP
*PW_4_Runtime - Runtime_Counters_Prgm/Update_Runtime_Counters - *2(JSR), 2(JSR)*			
PW_4_transition_to_manual_ONS	0	BOOL	MainProgram
*PW_4_transition_to_manual_ONS - MainProgram/Extraction_Wells - *15(ONS)*			
Radio_Startup_Delay_Timer		TIMER	Sanborn_GRP
*Radio_Startup_Delay_Timer - MainProgram/Read_Write_Radio - *0(TON)*			
Radio_Startup_Delay_Timer.DN - MainProgram/Read_Write_Radio - 1(XIC)			
Radio_Startup_ONS	1	BOOL	MainProgram
*Radio_Startup_ONS - MainProgram/Read_Write_Radio - *1(ONS)*			
Restart_Msg_Routine	0	BOOL	MainProgram
*Restart_Msg_Routine - MainProgram/Read_Write_Radio - *2(OTL), *4(OTU), 10(XIO), 11(XIO), 12(XIO), 13(XIO), 14(XIO), 15(XIO), 16(XIO), 17(XIO), 18(XIO), 19(XIO), 20(XIO), 21(XIO), 22(XIO), 23(XIO), 24(XIO), 25(XIO), 26(XIO), 27(XIO), 28(XIO), 3(XIC), 4(XIC), 5(XIO), 6(XIO), 7(XIO), 8(XIO), 9(XIO)*			
Restart_Msg_Routine_from_PLC	0	BOOL	MainProgram
*Restart_Msg_Routine_from_PLC - MainProgram/Read_Write_Radio - *1(OTE), 2(XIC)*			
Restart_Msg_Routine_from_SCADA	0	BOOL	Sanborn_GRP
Restart_Msg_Routine_from_SCADA - MainProgram/Read_Write_Radio - 2(XIC)			
Restart_Msg_Routine_Timer		TIMER	MainProgram
*Restart_Msg_Routine_Timer - MainProgram/Read_Write_Radio - *4(TON)*			
Restart_Msg_Routine_Timer.DN - MainProgram/Read_Write_Radio - 4(XIC)			
S_801A_High_Interlock	0	BOOL	Sanborn_GRP
S_801A_High_Interlock - MainProgram/Alarms_AutoDialer - 3(XIO)			

S_801A_High_Interlock (Continued) *S_801A_High_Interlock - MainProgram/S_801A_P805 - *4(OTL), *5(OTU), 5(XIC)* *S_801A_High_Interlock - MainProgram/T801_P803 - 27(XIO), 33(XIO)*			
S_801A_Lag_Pump_Control *S_801A_Lag_Pump_Control - MainProgram/S_801A_P805 - *2(OTL), *3(OTU), 21(XIC), 27(XIC)*	0	BOOL	Sanborn_GRP
S_801A_Lag_Pump_Start_SP Set by SCADA Lag pump will be running if level is >= this value *S_801A_Lag_Pump_Start_SP - MainProgram/S_801A_P805 - 2(GEQ)*	18.0	REAL	Sanborn_GRP
S_801A_Lead_Pump_Control *S_801A_Lead_Pump_Control - MainProgram/S_801A_P805 - *0(OTL), *1(OTU), 17(XIC), 21(XIC), 27(XIC), 5(XIO), 8(XIO)*	1	BOOL	Sanborn_GRP
S_801A_Lead_Pump_Failure *S_801A_Lead_Pump_Failure - MainProgram/S_801A_P805 - *17(OTL), *18(OTU), 19(XIC), 8(XIO)*	0	BOOL	Sanborn_GRP
S_801A_Lead_Pump_Failure_ONS *S_801A_Lead_Pump_Failure_ONS - MainProgram/S_801A_P805 - *19(ONS)*	0	BOOL	MainProgram
S_801A_Lead_Pump_Start_SP Set by SCADA. Lead pump will start when level >= this value *S_801A_Lead_Pump_Start_SP - MainProgram/S_801A_P805 - 0(GEQ), 3(LES)*	14.0	REAL	Sanborn_GRP
S_801A_Pump_Stop_SP Set by SCADA. Lead pump will stop when level < this value *S_801A_Pump_Stop_SP - MainProgram/S_801A_P805 - 1(LES)*	7.25	REAL	Sanborn_GRP
S_801A_Reset_High_Interlock *S_801A_Reset_High_Interlock - MainProgram/S_801A_P805 - 5(XIC)*	0	BOOL	Sanborn_GRP
S_801A_Reset_Pump_Failure *S_801A_Reset_Pump_Failure - MainProgram/S_801A_P805 - *40(OTU), 14(XIC), 16(XIC), 18(XIC), 40(XIC)*	0	BOOL	Sanborn_GRP
S801A_Lead_Control_Off_ONS *S801A_Lead_Control_Off_ONS - MainProgram/S_801A_P805 - *8(ONS)*	0	BOOL	MainProgram
Set_Msg_Timeout_Value *Set_Msg_Timeout_Value - MainProgram/Read_Write_Radio - *52(OTU), 52(XIC)*	0	BOOL	Sanborn_GRP
Set_PLC_DST_Status *Set_PLC_DST_Status - MainProgram/MainRoutine - *21(OTU), 20(XIC), 21(XIC)*	0	BOOL	Sanborn_GRP
Set_PLC_Local_Time *Set_PLC_Local_Time - MainProgram/MainRoutine - *19(OTU), 18(XIC), 19(XIC)*	0	BOOL	Sanborn_GRP
Slave_Radio_11 *Slave_Radio_11.N7[0] - MainProgram/Read_Write_Radio - *6(MSG), 69(MOV)* *Slave_Radio_11.N7[16] - MainProgram/Buffer_Inputs - 33(JSR)* *Slave_Radio_11.N7[16] - MainProgram/Read_Write_Radio - *7(MSG)* *Slave_Radio_11.N7[1] - MainProgram/Read_Write_Radio - 69(MOV)* *Slave_Radio_11.N7[2] - MainProgram/Read_Write_Radio - 69(MOV)* *Slave_Radio_11.N7[32] - MainProgram/Buffer_Inputs - 35(JSR)* *Slave_Radio_11.N7[32] - MainProgram/Read_Write_Radio - *8(MSG)* *Slave_Radio_11.N8[2] - MainProgram/Read_Write_Radio - *9(MSG)* *Slave_Radio_11.N8[3] - MainProgram/Read_Write_Radio - 11(MSG)* *Slave_Radio_11.N8[4] - MainProgram/Read_Write_Radio - *10(MSG)* *Slave_Radio_11.N8[5] - MainProgram/Read_Write_Radio - 12(MSG)* *Slave_Radio_11.Signal_Strength - MainProgram/Read_Write_Radio - *69(MOV), 69(GRT)* *Slave_Radio_11.SS_Fault - MainProgram/Buffer_Inputs - 33(JSR), 35(JSR)* *Slave_Radio_11.SS_Fault - MainProgram/Read_Write_Radio - *69(OTE)* *Slave_Radio_11.Temperature - MainProgram/Read_Write_Radio - *69(MOV)* *Slave_Radio_11.Voltage - MainProgram/Read_Write_Radio - *69(MOV)*		Radio_DS	Sanborn_GRP
Slave_Radio_11_Counter_Reset_ONS *Slave_Radio_11_Counter_Reset_ONS - MainProgram/Read_Write_Radio - *58(ONS)*	1	BOOL	MainProgram
Slave_Radio_11_Error_Counter		COUNTER	Sanborn_GRP

Slave_Radio_11_Error_Counter (Continued)
*Slave_Radio_11_Error_Counter - MainProgram/Read_Write_Radio - *57(CTU), *58(RES)*
Slave_Radio_11_Error_Counter.DN - MainProgram/Alarms_AutoDialer - 8(XIC)

Slave_Radio_11_Msg_Error	0	BOOL	Sanborn_GRP
*Slave_Radio_11_Msg_Error - MainProgram/Read_Write_Radio - *56(OTE), 57(XIC)*			
Slave_Radio_12		Radio_DS	Sanborn_GRP
*Slave_Radio_12.N7[0] - MainProgram/Read_Write_Radio - *13(MSG), 70(MOV)*			
Slave_Radio_12.N7[16] - MainProgram/Buffer_Inputs - 37(JSR)			
*Slave_Radio_12.N7[16] - MainProgram/Read_Write_Radio - *14(MSG)*			
Slave_Radio_12.N7[1] - MainProgram/Read_Write_Radio - 70(MOV)			
Slave_Radio_12.N7[2] - MainProgram/Read_Write_Radio - 70(MOV)			
*Slave_Radio_12.N8[2] - MainProgram/Read_Write_Radio - *15(MSG)*			
Slave_Radio_12.N8[3] - MainProgram/Read_Write_Radio - 16(MSG)			
*Slave_Radio_12.Signal_Strength - MainProgram/Read_Write_Radio - *70(MOV), 70(GRT)*			
Slave_Radio_12.SS_Fault - MainProgram/Buffer_Inputs - 37(JSR)			
*Slave_Radio_12.SS_Fault - MainProgram/Read_Write_Radio - *70(OTE)*			
*Slave_Radio_12.Temperature - MainProgram/Read_Write_Radio - *70(MOV)*			
*Slave_Radio_12.Voltage - MainProgram/Read_Write_Radio - *70(MOV)*			
Slave_Radio_12_Counter_Reset_ONS	1	BOOL	MainProgram
*Slave_Radio_12_Counter_Reset_ONS - MainProgram/Read_Write_Radio - *61(ONS)*			
Slave_Radio_12_Error_Counter		COUNTER	Sanborn_GRP
*Slave_Radio_12_Error_Counter - MainProgram/Read_Write_Radio - *60(CTU), *61(RES)*			
Slave_Radio_12_Error_Counter.DN - MainProgram/Alarms_AutoDialer - 8(XIC)			
Slave_Radio_12_Msg_Error	0	BOOL	Sanborn_GRP
*Slave_Radio_12_Msg_Error - MainProgram/Read_Write_Radio - *59(OTE), 60(XIC)*			
Slave_Radio_13		Radio_DS	Sanborn_GRP
*Slave_Radio_13.N7[0] - MainProgram/Read_Write_Radio - *17(MSG), 71(MOV)*			
Slave_Radio_13.N7[16] - MainProgram/Buffer_Inputs - 39(JSR)			
*Slave_Radio_13.N7[16] - MainProgram/Read_Write_Radio - *18(MSG)*			
Slave_Radio_13.N7[1] - MainProgram/Read_Write_Radio - 71(MOV)			
Slave_Radio_13.N7[2] - MainProgram/Read_Write_Radio - 71(MOV)			
*Slave_Radio_13.N8[2] - MainProgram/Read_Write_Radio - *19(MSG)*			
Slave_Radio_13.N8[3] - MainProgram/Read_Write_Radio - 20(MSG)			
*Slave_Radio_13.Signal_Strength - MainProgram/Read_Write_Radio - *71(MOV), 71(GRT)*			
Slave_Radio_13.SS_Fault - MainProgram/Buffer_Inputs - 39(JSR)			
*Slave_Radio_13.SS_Fault - MainProgram/Read_Write_Radio - *71(OTE)*			
*Slave_Radio_13.Temperature - MainProgram/Read_Write_Radio - *71(MOV)*			
*Slave_Radio_13.Voltage - MainProgram/Read_Write_Radio - *71(MOV)*			
Slave_Radio_13_Counter_Reset_ONS	1	BOOL	MainProgram
*Slave_Radio_13_Counter_Reset_ONS - MainProgram/Read_Write_Radio - *64(ONS)*			
Slave_Radio_13_Error_Counter		COUNTER	Sanborn_GRP
*Slave_Radio_13_Error_Counter - MainProgram/Read_Write_Radio - *63(CTU), *64(RES)*			
Slave_Radio_13_Error_Counter.DN - MainProgram/Alarms_AutoDialer - 8(XIC)			
Slave_Radio_13_Msg_Error	0	BOOL	Sanborn_GRP
*Slave_Radio_13_Msg_Error - MainProgram/Read_Write_Radio - *62(OTE), 63(XIC)*			
Slave_Radio_14		Radio_DS	Sanborn_GRP
*Slave_Radio_14.N7[0] - MainProgram/Read_Write_Radio - *21(MSG), 72(MOV)*			
Slave_Radio_14.N7[16] - MainProgram/Buffer_Inputs - 41(JSR)			
*Slave_Radio_14.N7[16] - MainProgram/Read_Write_Radio - *22(MSG)*			
Slave_Radio_14.N7[1] - MainProgram/Read_Write_Radio - 72(MOV)			
Slave_Radio_14.N7[2] - MainProgram/Read_Write_Radio - 72(MOV)			
Slave_Radio_14.N7[32] - MainProgram/Buffer_Inputs - 43(JSR)			
*Slave_Radio_14.N7[32] - MainProgram/Read_Write_Radio - *23(MSG)*			
*Slave_Radio_14.N8[2] - MainProgram/Read_Write_Radio - *24(MSG)*			
Slave_Radio_14.N8[3] - MainProgram/Read_Write_Radio - 26(MSG)			
*Slave_Radio_14.N8[4] - MainProgram/Read_Write_Radio - *25(MSG)*			
Slave_Radio_14.N8[5] - MainProgram/Read_Write_Radio - 27(MSG)			
*Slave_Radio_14.Signal_Strength - MainProgram/Read_Write_Radio - *72(MOV), 72(GRT)*			

Slave_Radio_14 (Continued)
Slave_Radio_14.SS_Fault - MainProgram/Buffer_Inputs - 41(JSR), 43(JSR)
*Slave_Radio_14.SS_Fault - MainProgram/Read_Write_Radio - *72(OTE)*
*Slave_Radio_14.Temperature - MainProgram/Read_Write_Radio - *72(MOV)*
*Slave_Radio_14.Voltage - MainProgram/Read_Write_Radio - *72(MOV)*

Slave_Radio_14_Counter_Reset_ONS 1 BOOL MainProgram
*Slave_Radio_14_Counter_Reset_ONS - MainProgram/Read_Write_Radio - *67(ONS)*

Slave_Radio_14_Error_Counter COUNTER Sanborn_GRP
*Slave_Radio_14_Error_Counter - MainProgram/Read_Write_Radio - *66(CTU), *67(RES)*
Slave_Radio_14_Error_Counter.DN - MainProgram/Alarms_AutoDialer - 8(XIC)

Slave_Radio_14_Msg_Error 0 BOOL Sanborn_GRP
*Slave_Radio_14_Msg_Error - MainProgram/Read_Write_Radio - *65(OTE), 66(XIC)*

Start_MSG_01_From_Ladder 0 BOOL MainProgram
*Start_MSG_01_From_Ladder - MainProgram/Read_Write_Radio - *28(OTE)*

T_801_High_Interlock 0 BOOL Sanborn_GRP
this high interlock stops the Extraction Wells (outdoor wells)
T_801_High_Interlock - MainProgram/Alarms_AutoDialer - 3(XIO)
T_801_High_Interlock - MainProgram/Extraction_Wells - 10(XIO), 16(XIO), 22(XIO), 28(XIO), 34(XIO), 4(XIO)
*T_801_High_Interlock - MainProgram/T801_P803 - *4(OTL), *5(OTU), 5(XIC)*

T_801_High_Interlock_2 0 BOOL Sanborn_GRP
this high interlock stops P-006 and P-007
*T_801_High_Interlock_2 - MainProgram/T801_P803 - *6(OTL), *7(OTU), 7(XIC)*
T_801_High_Interlock_2 - MainProgram/TK002_P06_P07 - 23(XIO), 29(XIO)

T_801_Lag_Pump_Control 0 BOOL Sanborn_GRP
*T_801_Lag_Pump_Control - MainProgram/T801_P803 - *2(OTL), *3(OTU), 23(XIC), 29(XIC)*

T_801_Lag_Pump_Start_SP 4.0 REAL Sanborn_GRP
Set by SCADA Lag pump will be running if level is >= this value
T_801_Lag_Pump_Start_SP - MainProgram/T801_P803 - 2(GEQ)

T_801_Lead_Pump_Control 1 BOOL Sanborn_GRP
*T_801_Lead_Pump_Control - MainProgram/T801_P803 - *0(OTL), *1(OTU), 10(XIO), 19(XIC), 23(XIC), 29(XIC), 5(XIO), 7(XIO)*

T_801_Lead_Pump_Failure 0 BOOL Sanborn_GRP
*T_801_Lead_Pump_Failure - MainProgram/T801_P803 - *19(OTL), *20(OTU), 10(XIO), 21(XIC)*

T_801_Lead_Pump_Failure_ONS 0 BOOL MainProgram
*T_801_Lead_Pump_Failure_ONS - MainProgram/T801_P803 - *21(ONS)*

T_801_Lead_Pump_Start_SP 2.8 REAL Sanborn_GRP
Set by SCADA. Lead pump will start when level >= this value
T_801_Lead_Pump_Start_SP - MainProgram/T801_P803 - 0(GEQ), 3(LES)

T_801_Pump_Stop_SP 2.0 REAL Sanborn_GRP
Set by SCADA. Lead pump will stop when level < this value
T_801_Pump_Stop_SP - MainProgram/T801_P803 - 1(LES)

T_801_Reset_High_Interlock 0 BOOL Sanborn_GRP
T_801_Reset_High_Interlock - MainProgram/T801_P803 - 5(XIC), 7(XIC)

T_801_Reset_Pump_Failure 0 BOOL Sanborn_GRP
*T_801_Reset_Pump_Failure - MainProgram/T801_P803 - *42(OTU), 16(XIC), 18(XIC), 20(XIC), 42(XIC)*

T_802_High_Interlock 0 BOOL Sanborn_GRP
T_802_High_Interlock - MainProgram/Alarms_AutoDialer - 3(XIO)
T_802_High_Interlock - MainProgram/S_801A_P805 - 25(XIO), 31(XIO)
*T_802_High_Interlock - MainProgram/T802_P810 - *4(OTL), *5(OTU), 5(XIC)*

T_802_Lag_Pump_Control 0 BOOL Sanborn_GRP
*T_802_Lag_Pump_Control - MainProgram/T802_P810 - *2(OTL), *3(OTU), 21(XIC), 27(XIC)*

T_802_Lag_Pump_Start_SP *T_802_Lag_Pump_Start_SP - MainProgram/T802_P810 - 2(GEQ)*	5.5	REAL	Sanborn_GRP
T_802_Lead_Pump_Control *T_802_Lead_Pump_Control - MainProgram/T802_P810 - *0(OTL), *1(OTU), 17(XIC), 21(XIC), 27(XIC), 5(XIO), 8(XIO)*	1	BOOL	Sanborn_GRP
T_802_Lead_Pump_Failure *T_802_Lead_Pump_Failure - MainProgram/T802_P810 - *17(OTL), *18(OTU), 19(XIC), 8(XIO)*	0	BOOL	Sanborn_GRP
T_802_Lead_Pump_Failure_ONS *T_802_Lead_Pump_Failure_ONS - MainProgram/T802_P810 - *19(ONS)*	0	BOOL	MainProgram
T_802_Lead_Pump_Start_SP Set by SCADA. Lead pump will start when level >= this value *T_802_Lead_Pump_Start_SP - MainProgram/T802_P810 - 0(GEQ), 3(LES)*	4.0	REAL	Sanborn_GRP
T_802_Pump_Stop_SP Set by SCADA. Lead pump will stop when level < this value *T_802_Pump_Stop_SP - MainProgram/T802_P810 - 1(LES)*	2.0	REAL	Sanborn_GRP
T_802_Reset_High_Interlock *T_802_Reset_High_Interlock - MainProgram/T802_P810 - 5(XIC)*	0	BOOL	Sanborn_GRP
T_802_Reset_Pump_Failure *T_802_Reset_Pump_Failure - MainProgram/T802_P810 - *40(OTU), 14(XIC), 16(XIC), 18(XIC), 40(XIC)*	0	BOOL	Sanborn_GRP
T801_Lead_Control_Off_ONS *T801_Lead_Control_Off_ONS - MainProgram/T802_P810 - *8(ONS)*	0	BOOL	MainProgram
T801_Lead_Control_On_ONS *T801_Lead_Control_On_ONS - MainProgram/T801_P803 - *10(ONS)*	0	BOOL	MainProgram
TempRC *TempRC - Runtime_Counters_Prgm/Handle_RC - #1, *#22* *TempRC.Hours - Runtime_Counters_Prgm/Handle_RC - #17, *#17, *#6* *TempRC.Minutes - Runtime_Counters_Prgm/Handle_RC - #13, #15, *#13, *#16, *#5* *TempRC.Reset - Runtime_Counters_Prgm/Handle_RC - #3* *TempRC.Seconds - Runtime_Counters_Prgm/Handle_RC - #11, #9, *#12, *#4, *#9*		Runtime_Couter	Runtime_Counters_Prgm
TK_002_Lag_Pump_Control *TK_002_Lag_Pump_Control - MainProgram/TK002_P06_P07 - *2(OTL), *3(OTU), 19(XIC), 25(XIC)*	0	BOOL	Sanborn_GRP
TK_002_Lag_Pump_Start_SP *TK_002_Lag_Pump_Start_SP - MainProgram/TK002_P06_P07 - 2(GEQ)*	3.5	REAL	Sanborn_GRP
TK_002_Lead_Pump_Control *TK_002_Lead_Pump_Control - MainProgram/TK002_P06_P07 - *0(OTL), *1(OTU), 15(XIC), 19(XIC), 25(XIC), 6(XIO)*	0	BOOL	Sanborn_GRP
TK_002_Lead_Pump_Failure *TK_002_Lead_Pump_Failure - MainProgram/TK002_P06_P07 - *15(OTL), *16(OTU), 17(XIC), 6(XIO)*	0	BOOL	Sanborn_GRP
TK_002_Lead_Pump_Failure_ONS *TK_002_Lead_Pump_Failure_ONS - MainProgram/TK002_P06_P07 - *17(ONS)*	0	BOOL	Sanborn_GRP
TK_002_Lead_Pump_Start_SP *TK_002_Lead_Pump_Start_SP - MainProgram/TK002_P06_P07 - 0(GEQ)*	3.0	REAL	Sanborn_GRP
TK_002_Pump_Stop_SP *TK_002_Pump_Stop_SP - MainProgram/TK002_P06_P07 - 1(LES), 3(LES)*	0.75	REAL	Sanborn_GRP
TK_002_Reset_Pump_Failure *TK_002_Reset_Pump_Failure - MainProgram/TK002_P06_P07 - *38(OTU), 12(XIC), 14(XIC), 16(XIC), 38(XIC)*	0	BOOL	Sanborn_GRP
TK_02_High_Interlock *TK_02_High_Interlock - MainProgram/MainRoutine - *22(OTL), *23(OTU), 24(XIC)*	0	BOOL	Sanborn_GRP
TK_02_high_Interlock_Timer *TK_02_high_Interlock_Timer - MainProgram/MainRoutine - *23(TON)*		TIMER	Sanborn_GRP

TK_02_high_Interlock_Timer (Continued)
TK_02_high_Interlock_Timer.DN - MainProgram/MainRoutine - 23(XIC)

TK002_Lead_Control_On_ONS 1 BOOL Sanborn_GRP
*TK002_Lead_Control_On_ONS - MainProgram/TK002_P06_P07 - *6(ONS)*

XV_1001_Close_LS 0 BOOL Sanborn_GRP
AliasFor: Local:5:I.Data.11
Base Tag: Local:5:I.Data.11
XV_1001_Close_LS - MainProgram/Bag_Filters - 16(XIO)

XV_1001_Close_Override 0 BOOL Sanborn_GRP
XV_1001_Close_Override - MainProgram/Bag_Filters - 10(XIC), 9(XIO)

XV_1001_Cmd 1 BOOL Sanborn_GRP
On=Open Off=Close
AliasFor: Local:8:O.Data.2
Base Tag: Local:8:O.Data.2
*XV_1001_Cmd - MainProgram/Bag_Filters - *10(OTU), *9(OTL), 13(XIC), 15(XIC), 16(XIO)*

XV_1001_Fail_Close_Timer TIMER Sanborn_GRP
*XV_1001_Fail_Close_Timer - MainProgram/Bag_Filters - *16(TON)*
XV_1001_Fail_Close_Timer.DN - MainProgram/Bag_Filters - 16(XIC)

XV_1001_Fail_Open_Timer TIMER Sanborn_GRP
*XV_1001_Fail_Open_Timer - MainProgram/Bag_Filters - *15(TON)*
XV_1001_Fail_Open_Timer.DN - MainProgram/Bag_Filters - 15(XIC)

XV_1001_Fail_to_Close 0 BOOL Sanborn_GRP
*XV_1001_Fail_to_Close - MainProgram/Bag_Filters - *16(OTL), *19(OTU)*

XV_1001_Fail_to_Open 0 BOOL Sanborn_GRP
*XV_1001_Fail_to_Open - MainProgram/Bag_Filters - *15(OTL), *19(OTU)*

XV_1001_Is_Open 1 BOOL Sanborn_GRP
*XV_1001_Is_Open - MainProgram/Bag_Filters - *13(OTE), 12(XIC)*

XV_1001_Is_Open_Timer TIMER Sanborn_GRP
*XV_1001_Is_Open_Timer - MainProgram/Bag_Filters - *13(TON)*
XV_1001_Is_Open_Timer.DN - MainProgram/Bag_Filters - 13(XIC)

XV_1001_Open_LS 0 BOOL Sanborn_GRP
AliasFor: Local:5:I.Data.10
Base Tag: Local:5:I.Data.10
XV_1001_Open_LS - MainProgram/Bag_Filters - 15(XIO)

XV_1001_Open_Override 0 BOOL Sanborn_GRP
XV_1001_Open_Override - MainProgram/Bag_Filters - 10(XIO), 9(XIC)

XV_1002_Close_LS 0 BOOL Sanborn_GRP
AliasFor: Local:5:I.Data.13
Base Tag: Local:5:I.Data.13
XV_1002_Close_LS - MainProgram/Bag_Filters - 18(XIO)

XV_1002_Close_Override 0 BOOL Sanborn_GRP
XV_1002_Close_Override - MainProgram/Bag_Filters - 11(XIO), 12(XIC)

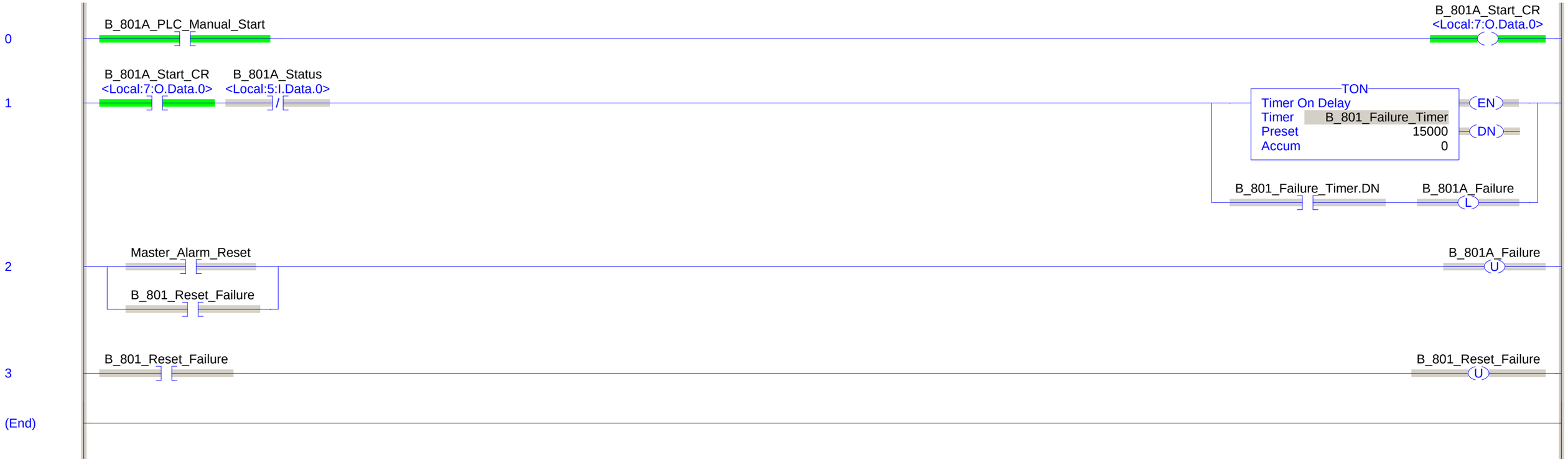
XV_1002_Cmd 0 BOOL Sanborn_GRP
AliasFor: Local:8:O.Data.3
Base Tag: Local:8:O.Data.3
*XV_1002_Cmd - MainProgram/Bag_Filters - *11(OTL), *12(OTU), 14(XIC), 17(XIC), 18(XIO)*

XV_1002_Fail_Close_Timer TIMER Sanborn_GRP
*XV_1002_Fail_Close_Timer - MainProgram/Bag_Filters - *18(TON)*
XV_1002_Fail_Close_Timer.DN - MainProgram/Bag_Filters - 18(XIC)

XV_1002_Fail_Open_Timer TIMER Sanborn_GRP
*XV_1002_Fail_Open_Timer - MainProgram/Bag_Filters - *17(TON)*

XV_1002_Fail_Open_Timer (Continued)
XV_1002_Fail_Open_Timer.DN - MainProgram/Bag_Filters - 17(XIC)

XV_1002_Fail_to_Close	0	BOOL	Sanborn_GRP
*XV_1002_Fail_to_Close - MainProgram/Bag_Filters - *18(OTL), *19(OTU)*			
XV_1002_Fail_to_Open	0	BOOL	Sanborn_GRP
*XV_1002_Fail_to_Open - MainProgram/Bag_Filters - *17(OTL), *19(OTU)*			
XV_1002_Is_Open	0	BOOL	Sanborn_GRP
*XV_1002_Is_Open - MainProgram/Bag_Filters - *14(OTE), 10(XIC)*			
XV_1002_Is_Open_Timer		TIMER	Sanborn_GRP
*XV_1002_Is_Open_Timer - MainProgram/Bag_Filters - *14(TON)*			
XV_1002_Is_Open_Timer.DN - MainProgram/Bag_Filters - 14(XIC)			
XV_1002_Open_LS	0	BOOL	Sanborn_GRP
AliasFor:	Local:5:I.Data.12		
Base Tag:	Local:5:I.Data.12		
XV_1002_Open_LS - MainProgram/Bag_Filters - 17(XIO)			
XV_1002_Open_Override	0	BOOL	Sanborn_GRP
XV_1002_Open_Override - MainProgram/Bag_Filters - 11(XIC), 12(XIO)			
ZERO	0	DINT	Sanborn_GRP
ZERO - MainProgram/MainRoutine - 20(SSV)			


0
B_801A_PLC_Manual_Start
B_801A_Start_CR
<Local:7:O.Data.0>
1
B_801A_Start_CR
<Local:7:O.Data.0>
B_801A_Status
<Local:5:I.Data.0>
/
TON
Timer On Delay
Timer B_801_Failure_Timer
Preset 15000
Accum 0
EN
DN
B_801_Failure_Timer.DN
B_801A_Failure
L
2
Master_Alarm_Reset
B_801_Reset_Failure
B_801A_Failure
U
3
B_801_Reset_Failure
B_801_Reset_Failure
U
(End)

0

SBR
Subroutine
Input Par AI_DS
Input Par AI_Card_Data
Input Par AI_Card_Fault

AI_Card_Fault

AI_DS.Fault

1

MOV
Move
Source AI_Card_Data
8661
Dest AI_DS.Raw_Input
4023

If Limit_Scaling is enabled, check the raw input vs min and max and set to high or low eng value if the input is out of range.
Return from the subroutine this occurs

2

AI_DS.Limit_Scaling

LES
Less Than (A<B)
Source A AI_Card_Data
8661
Source B AI_DS.Raw_Min
4000

MOV
Move
Source AI_DS.Eng_Min
0.0
Dest AI_DS.PV
0.71

RET
Return from Subroutine
Return Par AI_DS

3

AI_DS.Limit_Scaling

GRT
Greater Than (A>B)
Source A AI_Card_Data
8661
Source B AI_DS.Raw_Max
20000

MOV
Move
Source AI_DS.Eng_Max
500.0
Dest AI_DS.PV
0.71

RET
Return from Subroutine
Return Par AI_DS

If Raw min and max are the same, the cpu would try to divide by zero. That is no good, so exit sbr if raw min and max are the same

4

EQU
Equal
Source A AI_DS.Raw_Min
4000
Source B AI_DS.Raw_Max
20000

MOV
Move
Source 0
Dest AI_DS.PV
0.71

RET
Return from Subroutine
Return Par AI_DS

5

CPT
Compute
Dest AI_DS.PV
0.71
Expression (AI_Card_Data - AI_DS.Raw_Min) * (((AI_DS.Eng_Max-AI_DS.Eng_Min)/(AI_DS.Raw_Max-AI_DS.Raw_Min)))+ AI_DS.Eng_Min

6

CPT
Compute
Dest AI_DS.PV
0.71
Expression AI_DS.PV * 100

TRN
Truncate
Source AI_DS.PV
0.71
Dest AI_DS.PV
0.71

CPT
Compute
Dest AI_DS.PV
0.71
Expression AI_DS.PV / 100

7

RET
Return from Subroutine
Return Par AI_DS

(End)

AI handler using y=M*x + B equation

0
SBR
Subroutine
Input Par AI_DS
Input Par AI_Card_Data
Input Par AI_Card_Fault
AI_Card_Fault
AI_DS.Fault

1
MOV
Move
Source AI_Card_Data
8661
Dest AI_DS.Raw_Input
4023

2
CPT
Compute
Dest AI_DS.PV
0.71
Expression AI_DS.M * AI_DS.Raw_Input + AI_DS.B

If Limit_Scaling is enabled, check the raw input vs min and max and set to high or low eng value if the input is out of range.
Return from the subroutine this occurs

3
AI_DS.Limit_Scaling
LES
Less Than (A<B)
Source A AI_DS.PV
0.71
Source B AI_DS.Eng_Min
0.0
MOV
Move
Source AI_DS.Eng_Min
0.0
Dest AI_DS.PV
0.71

4
AI_DS.Limit_Scaling
GRT
Greater Than (A>B)
Source A AI_DS.PV
0.71
Source B AI_DS.Eng_Max
500.0
MOV
Move
Source AI_DS.Eng_Max
500.0
Dest AI_DS.PV
0.71

5
CPT
Compute
Dest AI_DS.PV
0.71
Expression AI_DS.PV * 100
TRN
Truncate
Source AI_DS.PV
0.71
Dest AI_DS.PV
0.71
CPT
Compute
Dest AI_DS.PV
0.71
Expression AI_DS.PV / 100

6
RET
Return from Subroutine
Return Par AI_DS

(End)

0
PDS_801
<Local:2:I.Data.4>
PDS_802
<Local:2:I.Data.5>
PDS_803
<Local:2:I.Data.6>
High_Pressure_Alarm_Timer.DN
Master_Alarm_Reset
/
TON
Timer On Delay
Timer High_Pressure_Alarm_Timer
Preset 60000
Accum 0
EN
DN
High_Pressure_Alarm_Timer.DN
High_Pressure_Alarms

1
B_801A_Status
<Local:5:I.Data.0>
PSL_801A
<Local:2:I.Data.12>
Low_Air_Pressure_B801A_Timer.DN
Master_Alarm_Reset
/
TON
Timer On Delay
Timer Low_Air_Pressure_B801A_Timer
Preset 30000
Accum 0
EN
DN
Low_Air_Pressure_B801A_Timer.DN
Low_Air_Pressure_B801A

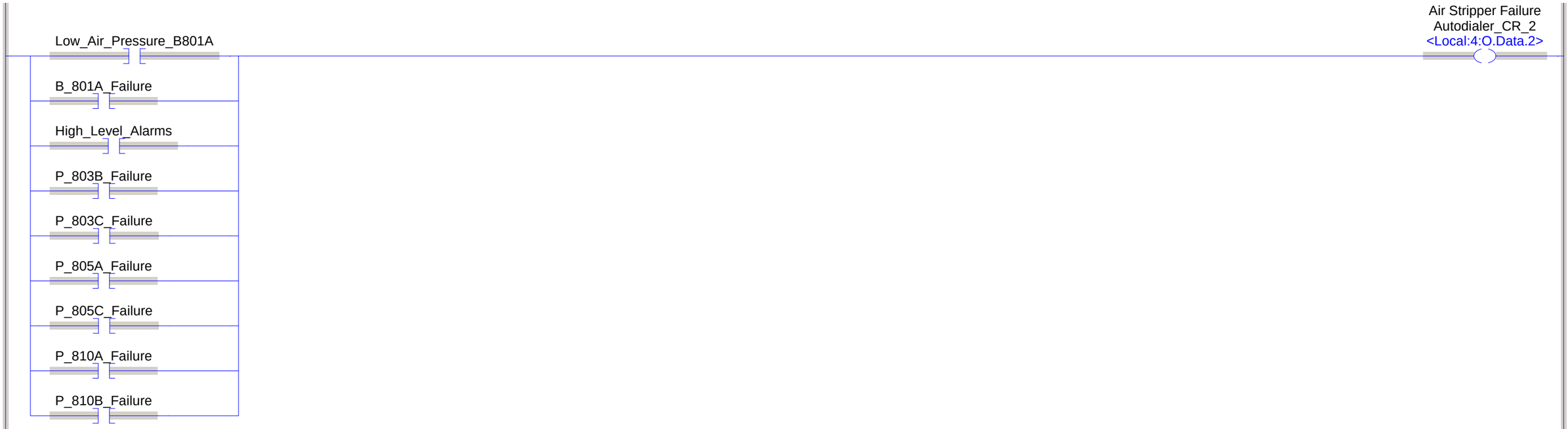
2
LIT_803_Alarm.HInAlarm
LIT_801A_Alarm.HInAlarm
LIT_805_Alarm.HInAlarm
TON
Timer On Delay
Timer High_Level_Alarm_Timer
Preset 120000
Accum 0
EN
DN
High_Level_Alarm_Timer.DN
High_Level_Alarms
L

3
this high interlock stops the Extraction Wells (outdoor wells)
High_Level_Alarms
T_801_High_Interlock
/
T_802_High_Interlock
/
S_801A_High_Interlock
/
Master_Alarm_Reset
High_Level_Alarms
U

4
LIT_803_Alarm.LInAlarm
LIT_801A_Alarm.LInAlarm
LIT_805_Alarm.LInAlarm
TON
Timer On Delay
Timer Low_Level_Alarm_Timer
Preset 10000
Accum 0
EN
DN
Low_Level_Alarm_Timer.DN
Low_Level_Alarms
L

5
Low_Level_Alarms
Master_Alarm_Reset
Low_Level_Alarms
U

6


Low_Air_Pressure_B801A
B_801A_Failure
High_Level_Alarms
P_803B_Failure
P_803C_Failure
P_805A_Failure
P_805C_Failure
P_810A_Failure
P_810B_Failure
Air Stripper Failure
Autodialer_CR_2
<Local:4:O.Data.2>

7


High_Pressure_Alarms
Air Stripper
Operator Alarm
Autodialer_CR_4
<Local:4:O.Data.3>

8

PW_1_Failure
PW_3_Failure
PW_4_Failure
P_2_Failure
P_3_Failure
P_4_Failure
PW_1_LIT_Alarm.HInAlarm
PW_3_LIT_Alarm.HInAlarm
PW_4_LIT_Alarm.HInAlarm
P_2_LIT_Alarm.HInAlarm
P_3_LIT_Alarm.HInAlarm
P_4_LIT_Alarm.HInAlarm
AFI
Slave_Radio_11_Error_Counter.DN
Slave_Radio_12_Error_Counter.DN
Slave_Radio_13_Error_Counter.DN
Slave_Radio_14_Error_Counter.DN

Autodialer_CR_5_Latch

9

Autodialer_CR_5_Latch

Ground Water
Operator Alarm
Autodialer_CR_5
<Local:4:O.Data.4>
L

10

Autodialer_CR_5_Latch
/

TON
Timer On Delay
Timer Autodialer_CR_5_Unlatch_Timer
Preset 300000
Accum 300006
EN
DN

Autodialer_CR_5_Unlatch_Timer.DN

Ground Water
Operator Alarm
Autodialer_CR_5
<Local:4:O.Data.4>
U

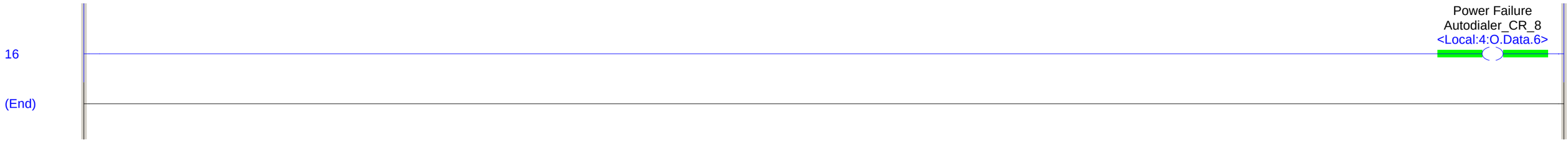
11
Heat_Trace_Fault
<Local:2:I.Data.11>
Heat_Trace_Fault_2
<Local:2:I.Data.15>
Heat_Trace_Fault_Latch
L

12
Master_Alarm_Reset
Heat_Trace_Fault_Latch
U

13
Containment_Sump_High_Level
Building Sump High Level
LSH_804B
<Local:2:I.Data.3>
LI_200_Alarm.HHInAlarm
LI_201_Alarm.HHInAlarm
LI_202_Alarm.HHInAlarm
LI_203_Alarm.HHInAlarm
LT_207_Alarm.HHInAlarm
DPI_212_Alarm.HHInAlarm
Heat_Trace_Fault_Latch
LSHH_219_Delay.DN
Treatment Plant Aux. System Failure Autodialer_CR_6
<Local:4:O.Data.5>

14
Containment Sump High Level
LSH_804A
<Local:2:I.Data.2>
TON
Timer On Delay
Timer Containment_Sump_High_Delay
Preset 5000
Accum 0
EN
DN
Containment_Sump_High_Delay.DN
Containment_Sump_High_Level
L

15
Containment Sump High Level
LSH_804A
<Local:2:I.Data.2>
Master_Alarm_Reset
Containment_Sump_High_Level
U


Power Failure
Autodialer_CR_8
<Local:4:O.Data.6>
16
(End)

When DPI 212 goes into High Alarm, latch in the Alarm Signal (used for Bag Changeover/HMI display)

0
DPI_212_Alarm.HInAlarm
DPI_212_High_Alarm_Latch (L)

The first time DPI 212 goes into high alarm, do the Auto Bag change

1
DPI_212_High_Alarm_Latch
DPI_212_into_alarm_ONS (ONS)
DPI_212_Change_Bag_Auto

Once the operator resets the bag filters and ackowledges the change over, reset the high alarm latch and the auto change signal

2
Set to 1 by HMI once operator has changed bags they press this button to ack the auto switch over
DPI_212_Auto_Change_Ack
DPI_212_Alarm.HInAlarm (/)
DPI_212_High_Alarm_Latch (U)
Set to 1 by HMI once operator has changed bags they press this button to ack the auto switch over
DPI_212_Auto_Change_Ack (U)

If group 1 is currently active, and it is time to change bag filters, set group 2 to become active

3
DPI_212_Change_Bag_Auto
BF_Group_1_Is_Active
BF_Group_2_Set_As_Active (L)

if group 2 is currently active and it is time to change bag filters, set group 1 to become active
OR
if neither group is active, and neither group is set to become active, then set group 1 to become active (will happen at first powerup)

4
DPI_212_Change_Bag_Auto
BF_Group_2_Is_Active
BF_Group_1_Set_As_Active (L)
BF_Group_1_Is_Active (/)
BF_Group_2_Is_Active (/)
BF_Group_1_Set_As_Active (/)
BF_Group_2_Set_As_Active (/)

When setting group 1 to become active
Set Group1 active bit, reset group1 standby bit, set group2 standby bit, reset group2 active bit, and reset set 1 as active bit

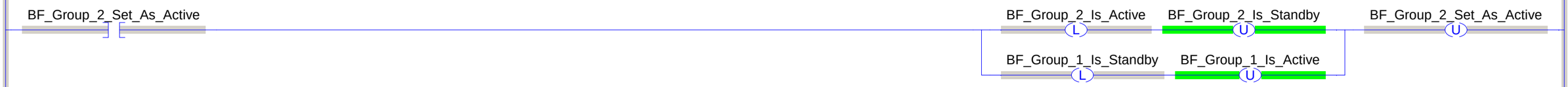
5
BF_Group_1_Set_As_Active
BF_Group_1_Is_Active (L)
BF_Group_1_Is_Standby (U)
BF_Group_1_Set_As_Active (U)
BF_Group_2_Is_Standby (L)
BF_Group_2_Is_Active (U)

When setting group 1 to become standby
reset Group1 active bit, Set group1 standby bit, reset group2 standby bit, Set group2 active bit, and reset set 1 as standby bit

6
BF_Group_1_Set_As_Standby
BF_Group_1_Is_Standby (L)
BF_Group_1_Is_Active (U)
BF_Group_1_Set_As_Standby (U)
BF_Group_2_Is_Active (L)
BF_Group_2_Is_Standby (U)

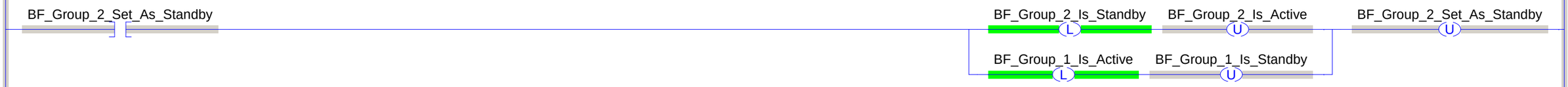
When setting group 2 to become active
Set Group2 active bit, reset group2 standby bit, set group1 standby bit, reset group1 active bit, and reset set 2 as active bit

7



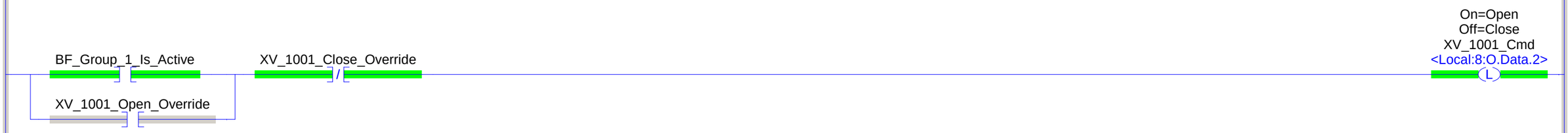
When setting group 2 to become standby
reset Group2 active bit, Set group2 standby bit, reset group1 standby bit, Set group1 active bit, and reset set 2 as standby bit

8



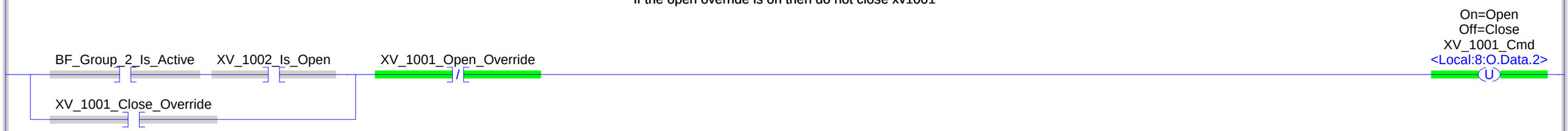
If group1 is active then open xv1001
If the Open overrides is on then open xv1001
if the close override is on then do not open xv1001

9



if group2 is active and xv1002 is open then close xv1001
if the close override is on then close xv1001
if the open override is on then do not close xv1001

10



If group2 is active then open xv1002
If the Open overrides is on then open xv1002
if the close override is on then do not open xv1002

11

if group1 is active and xv1001 is open then close xv1002
if the close override is on then close xv1002
if the open override is on then do not close xv1002

12

BF_Group_1_Is_Active — XV_1001_Is_Open — XV_1002_Open_Override /

XV_1002_Close_Override

XV_1002_Cmd
<Local:8:O.Data.3>
(U)

13

On=Open
Off=Close
XV_1001_Cmd
<Local:8:O.Data.2>

TON
Timer On Delay
Timer XV_1001_Is_Open_Timer
Preset 15000
Accum 15002
EN
DN

XV_1001_Is_Open_Timer.DN — XV_1001_Is_Open

14

XV_1002_Cmd
<Local:8:O.Data.3>

TON
Timer On Delay
Timer XV_1002_Is_Open_Timer
Preset 15000
Accum 0
EN
DN

XV_1002_Is_Open_Timer.DN — XV_1002_Is_Open

if output is on, but feedback does not show open, after a time delay trigger an alarm

15

AFI

On=Open
Off=Close
XV_1001_Cmd
<Local:8:O.Data.2>

XV_1001_Open_LS
<Local:5:I.Data.10> /

TON
Timer On Delay
Timer XV_1001_Fail_Open_Timer
Preset 10000
Accum 0
EN
DN

XV_1001_Fail_Open_Timer.DN — XV_1001_Fail_to_Open
(L)

if output is off, but feedback does not show close, after a time delay trigger an alarm

16

AFI

On=Open
Off=Close
XV_1001_Cmd
<Local:8:O.Data.2> /

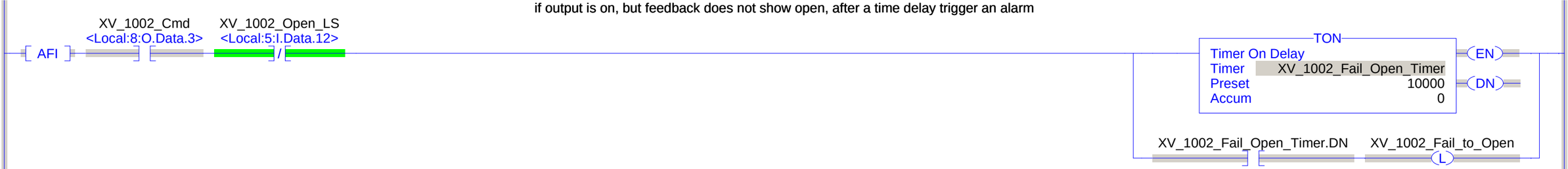
XV_1001_Close_LS
<Local:5:I.Data.11> /

TON
Timer On Delay
Timer XV_1001_Fail_Close_Timer
Preset 10000
Accum 0
EN
DN

XV_1001_Fail_Close_Timer.DN — XV_1001_Fail_to_Close
(L)

if output is on, but feedback does not show open, after a time delay trigger an alarm

17



if output is off, but feedback does not show close, after a time delay trigger an alarm

18

When the alramrs are reset, clear the fail to open/close alarms

19

(End)

0

JSR
Jump To Subroutine
Routine Name AI_Handler
Input Par LIT_805
Input Par Local:1:I.Ch0Data
Input Par Local:1:I.Ch0Status
Return Par LIT_805

1

ALMA
Analog Alarm
ALMA LIT_805_Alarm ...
In LIT_805.PV
2.32
ProgAckAll 0
ProgDisable 0
ProgEnable 1
HHLimit 15.0
HLimit 8.0
LLimit 1.5
LLLimit 0.0
HHInAlarm
HInAlarm
LInAlarm
LLInAlarm
ROCPosInAlarm
ROCNegInAlarm
HHAcked
HAcked
LAcked
LLAcked
ROCPosAcked
ROCNegAcked
Suppressed
Disabled
InstructFault

2

JSR
Jump To Subroutine
Routine Name AI_Handler
Input Par LIT_801A
Input Par Local:1:I.Ch1Data
Input Par Local:1:I.Ch1Status
Return Par LIT_801A

3

ALMA
Analog Alarm
ALMA LIT_801A_Alarm ...
In LIT_801A.PV
8.54
ProgAckAll 0
ProgDisable 0
ProgEnable 1
HHLimit 25.0
HLimit 23.0
LLimit 3.0
LLLimit 0.0
HHInAlarm
HInAlarm
LInAlarm
LLInAlarm
ROCPosInAlarm
ROCNegInAlarm
HHAcked
HAcked
LAcked
LLAcked
ROCPosAcked
ROCNegAcked
Suppressed
Disabled
InstructFault

4

JSR
Jump To Subroutine
Routine Name AI_Handler
Input Par LIT_803
Input Par Local:1:I.Ch2Data
Input Par Local:1:I.Ch2Status
Return Par LIT_803

5

ALMA
Analog Alarm

ALMA	LIT_803_Alarm	...
In	LIT_803.PV	
	3.42	
ProgAckAll	0	
ProgDisable	0	
ProgEnable	1	
HHLimit	12.0	
HLimit	7.5	
LLimit	0.5	
LLLimit	0.0	

HHInAlarm, HInAlarm, LInAlarm, LLInAlarm, ROCPosInAlarm, ROCNegInAlarm, HHAcked, HAcked, LAcked, LLAcked, ROCPosAcked, ROCNegAcked, Suppressed, Disabled, InstructFault

6

AFI

JSR
Jump To Subroutine

Routine Name	AI_Handler
Input Par	FIT_803
Input Par	Local:1:I.Ch3Data
Input Par	Local:1:I.Ch3Status
Return Par	FIT_803

7

ALMA
Analog Alarm

ALMA	FIT_803_Alarm	...
In	FIT_803.PV	
	92.84189	
ProgAckAll	0	
ProgDisable	0	
ProgEnable	1	
HHLimit	600.0	
HLimit	300.0	
LLimit	-1.0	
LLLimit	-2.0	

HHInAlarm, HInAlarm, LInAlarm, LLInAlarm, ROCPosInAlarm, ROCNegInAlarm, HHAcked, HAcked, LAcked, LLAcked, ROCPosAcked, ROCNegAcked, Suppressed, Disabled, InstructFault

8

JSR
Jump To Subroutine

Routine Name	AI_Handler
Input Par	FIT_206
Input Par	Local:1:I.Ch4Data
Input Par	Local:1:I.Ch4Status
Return Par	FIT_206

9

ALMA
Analog Alarm
ALMA FIT_206_Alarm ...
In FIT_206.PV
-0.13
ProgAckAll 0
ProgDisable 0
ProgEnable 1
HHLimit 99.0
HLimit 98.0
LLimit -10.0
LLLimit -15.0
HHInAlarm
HInAlarm
LInAlarm
LLInAlarm
ROCPosInAlarm
ROCNegInAlarm
HHAcked
HAcked
LAcked
LLAcked
ROCPosAcked
ROCNegAcked
Suppressed
Disabled
InstructFault

10

JSR
Jump To Subroutine
Routine Name AI_Handler
Input Par LT_207
Input Par Local:1:I.Ch5Data
Input Par Local:1:I.Ch5Status
Return Par LT_207

11

ALMA
Analog Alarm
ALMA LT_207_Alarm ...
In LT_207.PV
1.64
ProgAckAll 0
ProgDisable 0
ProgEnable 1
HHLimit 7.0
HLimit 4.5
LLimit 0.5
LLLimit -15.0
HHInAlarm
HInAlarm
LInAlarm
LLInAlarm
ROCPosInAlarm
ROCNegInAlarm
HHAcked
HAcked
LAcked
LLAcked
ROCPosAcked
ROCNegAcked
Suppressed
Disabled
InstructFault

12

JSR
Jump To Subroutine
Routine Name AI_Handler
Input Par PI_212
Input Par Local:1:I.Ch6Data
Input Par Local:1:I.Ch6Status
Return Par PI_212

13

ALMA
Analog Alarm

ALMA	PI_212_Alarm	...
In	PI_212.PV	
	0.35	
ProgAckAll	0	
ProgDisable	0	
ProgEnable	1	
HHLimit	25.0	
HLimit	20.0	
LLimit	-10.0	
LLLimit	-15.0	

HHInAlarm, HInAlarm, LInAlarm, LLInAlarm, ROCPosInAlarm, ROCNegInAlarm, HHAcked, HAcked, LAcked, LLAcked, ROCPosAcked, ROCNegAcked, Suppressed, Disabled, InstructFault

14

JSR
Jump To Subroutine

Routine Name	AI_Handler
Input Par	PI_218
Input Par	Local:1:I.Ch7Data
Input Par	Local:1:I.Ch7Status
Return Par	PI_218

15

ALMA
Analog Alarm

ALMA	PI_218_Alarm	...
In	PI_218.PV	
	0.21	
ProgAckAll	0	
ProgDisable	0	
ProgEnable	1	
HHLimit	10.0	
HLimit	5.0	
LLimit	-10.0	
LLLimit	-15.0	

HHInAlarm, HInAlarm, LInAlarm, LLInAlarm, ROCPosInAlarm, ROCNegInAlarm, HHAcked, HAcked, LAcked, LLAcked, ROCPosAcked, ROCNegAcked, Suppressed, Disabled, InstructFault

16

JSR
Jump To Subroutine

Routine Name	AI_Handler
Input Par	LI_200
Input Par	Local:3:I.Ch0Data
Input Par	Local:3:I.Ch0Status
Return Par	LI_200

17

ALMA
Analog Alarm

ALMA	LI_200_Alarm	...
In	LI_200.PV	
	0.69	
ProgAckAll	0	
ProgDisable	0	
ProgEnable	1	
HHLimit	1.5	
HLimit	1.0	
LLimit	-10.0	
LLLimit	-15.0	

HHInAlarm
HInAlarm
LInAlarm
LLInAlarm
ROCPosInAlarm
ROCNegInAlarm
HHAcked
HAcked
LAcked
LLAcked
ROCPosAcked
ROCNegAcked
Suppressed
Disabled
InstructFault

18

JSR
Jump To Subroutine

Routine Name	AI_Handler
Input Par	LI_201
Input Par	Local:3:I.Ch1Data
Input Par	Local:3:I.Ch1Status
Return Par	LI_201

19

ALMA
Analog Alarm

ALMA	LI_201_Alarm	...
In	LI_201.PV	
	1.29	
ProgAckAll	0	
ProgDisable	0	
ProgEnable	1	
HHLimit	5.0	
HLimit	3.0	
LLimit	-10.0	
LLLimit	-15.0	

HHInAlarm
HInAlarm
LInAlarm
LLInAlarm
ROCPosInAlarm
ROCNegInAlarm
HHAcked
HAcked
LAcked
LLAcked
ROCPosAcked
ROCNegAcked
Suppressed
Disabled
InstructFault

20

JSR
Jump To Subroutine

Routine Name	AI_Handler
Input Par	LI_202
Input Par	Local:3:I.Ch2Data
Input Par	Local:3:I.Ch2Status
Return Par	LI_202

21

ALMA
Analog Alarm

ALMA	LI_202_Alarm	...
In	LI_202.PV	
	0.59	
ProgAckAll	0	
ProgDisable	0	
ProgEnable	1	
HHLimit	2.0	
HLimit	1.5	
LLimit	-10.0	
LLLimit	-15.0	

HHInAlarm
HInAlarm
LInAlarm
LLInAlarm
ROCPosInAlarm
ROCNegInAlarm
HHAcked
HAcked
LAcked
LLAcked
ROCPosAcked
ROCNegAcked
Suppressed
Disabled
InstructFault

22

JSR
Jump To Subroutine

Routine Name	AI_Handler
Input Par	LI_203
Input Par	Local:3:I.Ch3Data
Input Par	Local:3:I.Ch3Status
Return Par	LI_203

23

ALMA
Analog Alarm

ALMA	LI_203_Alarm	...
In	LI_203.PV	
	1.1	
ProgAckAll	0	
ProgDisable	0	
ProgEnable	1	
HHLimit	4.0	
HLimit	3.9	
LLimit	0.5	
LLLimit	0.5	

HHInAlarm
HInAlarm
LInAlarm
LLInAlarm
ROCPosInAlarm
ROCNegInAlarm
HHAcked
HAcked
LAcked
LLAcked
ROCPosAcked
ROCNegAcked
Suppressed
Disabled
InstructFault

24

JSR
Jump To Subroutine

Routine Name	AI_Handler
Input Par	FIQ_200
Input Par	Local:3:I.Ch4Data
Input Par	Local:3:I.Ch4Status
Return Par	FIQ_200

25

ALMA
Analog Alarm

ALMA	FIQ_200_Alarm	...
In	FIQ_200.PV	
	0.31	
ProgAckAll	0	
ProgDisable	0	
ProgEnable	1	
HHLimit	1000.0	
HLimit	999.0	
LLimit	-10.0	
LLLimit	-15.0	

HHInAlarm, HInAlarm, LInAlarm, LLInAlarm, ROCPosInAlarm, ROCNegInAlarm, HHAcked, HAcked, LAcked, LLAcked, ROCPosAcked, ROCNegAcked, Suppressed, Disabled, InstructFault

26

JSR
Jump To Subroutine

Routine Name	AI_Handler
Input Par	FIQ_201
Input Par	Local:3:I.Ch5Data
Input Par	Local:3:I.Ch5Status
Return Par	FIQ_201

27

ALMA
Analog Alarm

ALMA	FIQ_201_Alarm	...
In	FIQ_201.PV	
	364.09	
ProgAckAll	0	
ProgDisable	0	
ProgEnable	1	
HHLimit	1000.0	
HLimit	999.0	
LLimit	-10.0	
LLLimit	-15.0	

HHInAlarm, HInAlarm, LInAlarm, LLInAlarm, ROCPosInAlarm, ROCNegInAlarm, HHAcked, HAcked, LAcked, LLAcked, ROCPosAcked, ROCNegAcked, Suppressed, Disabled, InstructFault

28

JSR
Jump To Subroutine

Routine Name	AI_Handler
Input Par	FIQ_202
Input Par	Local:3:I.Ch6Data
Input Par	Local:3:I.Ch6Status
Return Par	FIQ_202

29

ALMA
Analog Alarm
ALMA FIQ_202_Alarm ...
In FIQ_202.PV
0.06
ProgAckAll 0
ProgDisable 0
ProgEnable 1
HHLimit 1000.0
HLimit 999.0
LLimit -10.0
LLLimit -15.0
HHInAlarm
HInAlarm
LInAlarm
LLInAlarm
ROCPosInAlarm
ROCNegInAlarm
HHAcked
HAcked
LAcked
LLAcked
ROCPosAcked
ROCNegAcked
Suppressed
Disabled
InstructFault

30

GEQ
Grtr Than or Eql (A>=B)
Source A PI_212.Raw_Input
4095
Source B 3200

GEQ
Grtr Than or Eql (A>=B)
Source A PI_218.Raw_Input
4056
Source B 3200

SUB
Subtract
Source A PI_212.PV
0.35
Source B PI_218.PV
0.21
Dest DPI_212.PV
0.2

31

LES
Less Than (A<B)
Source A PI_212.Raw_Input
4095
Source B 3200

LES
Less Than (A<B)
Source A PI_218.Raw_Input
4056
Source B 3200

DPI_212.Fault

32

ALMA
Analog Alarm
ALMA DPI_212_Alarm ...
In DPI_212.PV
0.2
ProgAckAll 0
ProgDisable 0
ProgEnable 1
HHLimit 25.0
HLimit 12.0
LLimit -15.0
LLLimit -25.0
HHInAlarm
HInAlarm
LInAlarm
LLInAlarm
ROCPosInAlarm
ROCNegInAlarm
HHAcked
HAcked
LAcked
LLAcked
ROCPosAcked
ROCNegAcked
Suppressed
Disabled
InstructFault

33

AI handler using
y=M*x + B equation

JSR
Jump To Subroutine
Routine Name: AI_Handler_2
Input Par: PW_4_LIT
Input Par: Slave_Radio_11.N7[16]
Input Par: Slave_Radio_11.SS_Fault
Return Par: PW_4_LIT

34

ALMA
Analog Alarm
ALMA: PW_4_LIT_Alarm ...
In: PW_4_LIT.PV
22.65
ProgAckAll: 0
ProgDisable: 0
ProgEnable: 1
HHLimit: 25.0
HLimit: 31.0
LLimit: 6.0
LLLimit: 0.0

HHInAlarm
HInAlarm
LInAlarm
LLInAlarm
ROCPosInAlarm
ROCNegInAlarm
HHAcked
HAcked
LAcked
LLAcked
ROCPosAcked
ROCNegAcked
Suppressed
Disabled
InstructFault

35

AI handler using
y=M*x + B equation

JSR
Jump To Subroutine
Routine Name: AI_Handler_2
Input Par: P_2_LIT
Input Par: Slave_Radio_11.N7[32]
Input Par: Slave_Radio_11.SS_Fault
Return Par: P_2_LIT

36

ALMA
Analog Alarm
ALMA: P_2_LIT_Alarm ...
In: P_2_LIT.PV
5.44
ProgAckAll: 0
ProgDisable: 0
ProgEnable: 1
HHLimit: 25.0
HLimit: 14.0
LLimit: 3.0
LLLimit: 0.0

HHInAlarm
HInAlarm
LInAlarm
LLInAlarm
ROCPosInAlarm
ROCNegInAlarm
HHAcked
HAcked
LAcked
LLAcked
ROCPosAcked
ROCNegAcked
Suppressed
Disabled
InstructFault

37

AI handler using
y=M*x + B equation

JSR
Jump To Subroutine
Routine Name: AI_Handler_2
Input Par: PW_1_LIT
Input Par: Slave_Radio_12.N7[16]
Input Par: Slave_Radio_12.SS_Fault
Return Par: PW_1_LIT

38

ALMA
Analog Alarm
ALMA: PW_1_LIT_Alarm ...
In: PW_1_LIT.PV
14.19
ProgAckAll: 0
ProgDisable: 0
ProgEnable: 1
HHLimit: 20.0
HLimit: 30.0
LLimit: 3.5
LLLimit: 0.0

HHInAlarm
HInAlarm
LInAlarm
LLInAlarm
ROCPosInAlarm
ROCNegInAlarm
HHAcked
HAcked
LAcked
LLAcked
ROCPosAcked
ROCNegAcked
Suppressed
Disabled
InstructFault

39

JSR
Jump To Subroutine
Routine Name: AI_Handler
Input Par: PW_3_LIT
Input Par: Slave_Radio_13.N7[16]
Input Par: Slave_Radio_13.SS_Fault
Return Par: PW_3_LIT

40

ALMA
Analog Alarm
ALMA: PW_3_LIT_Alarm ...
In: PW_3_LIT.PV
6.81
ProgAckAll: 0
ProgDisable: 0
ProgEnable: 1
HHLimit: 18.0
HLimit: 16.0
LLimit: 2.5
LLLimit: 0.0

HHInAlarm
HInAlarm
LInAlarm
LLInAlarm
ROCPosInAlarm
ROCNegInAlarm
HHAcked
HAcked
LAcked
LLAcked
ROCPosAcked
ROCNegAcked
Suppressed
Disabled
InstructFault

41

AI handler using
y=M*x + B equation

JSR
Jump To Subroutine
Routine Name: AI_Handler_2
Input Par: P_3_LIT
Input Par: Slave_Radio_14.N7[16]
Input Par: Slave_Radio_14.SS_Fault
Return Par: P_3_LIT

42

ALMA
Analog Alarm

ALMA	P_3_LIT_Alarm	...
In	P_3_LIT.PV	
	4.8	
ProgAckAll	0	
ProgDisable	0	
ProgEnable	1	
HHLimit	25.0	
HLimit	15.0	
LLimit	1.5	
LLLimit	0.0	

HHInAlarm, HInAlarm, LInAlarm, LLInAlarm, ROCPosInAlarm, ROCNegInAlarm, HHAcked, HAcked, LAcked, LLAcked, ROCPosAcked, ROCNegAcked, Suppressed, Disabled, InstructFault

AI handler using
y=M*x + B equation

43

JSR
Jump To Subroutine

Routine Name	AI_Handler_2
Input Par	P_4_LIT
Input Par	Slave_Radio_14.N7[32]
Input Par	Slave_Radio_14.SS_Fault
Return Par	P_4_LIT

44

ALMA
Analog Alarm

ALMA	P_4_LIT_Alarm	...
In	P_4_LIT.PV	
	3.92	
ProgAckAll	0	
ProgDisable	0	
ProgEnable	1	
HHLimit	25.0	
HLimit	30.0	
LLimit	2.0	
LLLimit	0.0	

HHInAlarm, HInAlarm, LInAlarm, LLInAlarm, ROCPosInAlarm, ROCNegInAlarm, HHAcked, HAcked, LAcked, LLAcked, ROCPosAcked, ROCNegAcked, Suppressed, Disabled, InstructFault

(End)

0
GEQ
Grtr Than or Eql (A>=B)
Source A PW_1_LIT.PV
14.19
Source B PW_1_Pump_Start_SP
8.0
PW_1_Auto_Cmd (L)

1
LES
Less Than (A<B)
Source A PW_1_LIT.PV
14.19
Source B PW_1_Pump_Stop_SP
5.0
PW_1_Auto_Cmd (U)

2
PW_1_PLC_Auto_Mode /
PW_1_transition_to_manual_ONS ONS
PW_1_Auto_Cmd PW_1_PLC_Manual_Start (L)
PW_1_Auto_Cmd / PW_1_PLC_Manual_Start (U)

3
AFI
PW_1_Failure
PW_1_PLC_Manual_Start (U)
PW_1_PLC_Auto_Mode (U)

4
this high interlock stops the Extraction Wells (outdoor wells)
PW_1_PLC_Auto_Mode PW_1_Auto_Cmd T_801_High_Interlock /
PW_1_PLC_Auto_Mode / PW_1_PLC_Manual_Start
PW_1_Pump_Start_CR <Slave_Radio_12.N8[3].0>

5
PW_1_Pump_Start_CR <Slave_Radio_12.N8[3].0>
PW_1_Pump_Status <Slave_Radio_12.N8[2].0> /
TON
Timer On Delay
Timer PW_1_Failure_Timer
Preset 45000
Accum 0
EN
DN
PW_1_Failure_Timer.DN
PW_1_Failure (L)

6
PW_1_Pump_Start_CR <Slave_Radio_12.N8[3].0>
PW_1_Pump_Status <Slave_Radio_12.N8[2].0>
Master_Alarm_Reset
PW_1_Reset_Pump_Failure
PW_1_Failure (U)

7
GEQ
Grtr Than or Eql (A>=B)
Source A PW_3_LIT.PV
6.81
Source B PW_3_Pump_Start_SP
8.0
PW_3_Auto_Cmd (L)

8

LES
Less Than (A<B)
Source A PW_3_LIT.PV 6.81
Source B PW_3_Pump_Stop_SP 4.0

PW_3_Auto_Cmd (U)

9

PW_3_PLC_Auto_Mode (/) PW_3_transition_to_manual_ONS [ONS]

PW_3_Auto_Cmd PW_3_PLC_Manual_Start (L)

PW_3_Auto_Cmd (/) PW_3_PLC_Manual_Start (U)

10

this high interlock stops the Extraction Wells (outdoor wells)

PW_3_PLC_Auto_Mode PW_3_Auto_Cmd T_801_High_Interlock (/)

PW_3_PLC_Auto_Mode (/) PW_3_PLC_Manual_Start

PW_3_Pump_Start_CR <Slave_Radio_13.N8[3].0> ( )

11

PW_3_Pump_Start_CR <Slave_Radio_13.N8[3].0>

PW_3_Pump_Status <Slave_Radio_13.N8[2].0> (/)

TON
Timer On Delay
Timer PW_3_Failure_Timer
Preset 45000
Accum 0
EN
DN

PW_3_Failure_Timer.DN PW_3_Failure (L)

12

PW_3_Pump_Start_CR <Slave_Radio_13.N8[3].0> PW_3_Pump_Status <Slave_Radio_13.N8[2].0>

Master_Alarm_Reset

PW_3_Reset_Pump_Failure

PW_3_Failure (U)

13

GEQ
Grtr Than or Eql (A>=B)
Source A PW_4_LIT.PV 22.65
Source B PW_4_Pump_Start_SP 10.0

PW_4_Auto_Cmd (L)

14

LES
Less Than (A<B)
Source A PW_4_LIT.PV 22.65
Source B PW_4_Pump_Stop_SP 7.5

PW_4_Auto_Cmd (U)

15
PW_4_PLC_Auto_Mode / PW_4_transition_to_manual_ONS ONS
PW_4_Auto_Cmd PW_4_PLC_Manual_Start L
PW_4_Auto_Cmd / PW_4_PLC_Manual_Start U

16
this high interlock stops the Extraction Wells (outdoor wells)
PW_4_PLC_Auto_Mode PW_4_Auto_Cmd T_801_High_Interlock /
PW_4_PLC_Auto_Mode / PW_4_PLC_Manual_Start
PW_4_Pump_Start_CR <Slave_Radio_11.N8[3].0>

17
PW_4_Pump_Start_CR <Slave_Radio_11.N8[3].0> PW_4_Pump_Status <Slave_Radio_11.N8[2].0> /
TON
Timer On Delay
Timer PW_4_Failure_Timer
Preset 30000
Accum 0
EN
DN
PW_4_Failure_Timer.DN PW_4_Failure L

18
PW_4_Pump_Start_CR <Slave_Radio_11.N8[3].0> PW_4_Pump_Status <Slave_Radio_11.N8[2].0>
Master_Alarm_Reset
PW_4_Reset_Pump_Failure
PW_4_Failure U

19
GEQ
Grtr Than or Eql (A>=B)
Source A P_2_LIT.PV 5.44
Source B P_2_Pump_Start_SP 7.5
P_2_Auto_Cmd L

20
LES
Less Than (A<B)
Source A P_2_LIT.PV 5.44
Source B P_2_Pump_Stop_SP 4.5
P_2_Auto_Cmd U

21
P_2_PLC_Auto_Mode / P_2_transition_to_manual_ONS ONS
P_2_Auto_Cmd P_2_PLC_Manual_Start L
P_2_Auto_Cmd / P_2_PLC_Manual_Start U

22
P_2_PLC_Auto_Mode P_2_Auto_Cmd this high interlock stops the Extraction Wells (outdoor wells) T_801_High_Interlock /
P_2_PLC_Auto_Mode / P_2_PLC_Manual_Start
P_2_Pump_Start_CR <Slave_Radio_11.N8[5].0>

23
P_2_Pump_Start_CR <Slave_Radio_11.N8[5].0> P_2_Pump_Status <Slave_Radio_11.N8[4].0> /
TON Timer On Delay, Timer P_2_Failure_Timer, Preset 45000, Accum 0, EN, DN
P_2_Failure_Timer.DN P_2_Failure (L)

24
P_2_Pump_Start_CR <Slave_Radio_11.N8[5].0> P_2_Pump_Status <Slave_Radio_11.N8[4].0>
Master_Alarm_Reset
P_2_Reset_Pump_Failure
P_2_Failure (U)

25
GEQ Grtr Than or Eql (A>=B) Source A P_3_LIT.PV 4.8 Source B P_3_Pump_Start_SP 7.5
P_3_Auto_Cmd (L)

26
LES Less Than (A<B) Source A P_3_LIT.PV 4.8 Source B P_3_Pump_Stop_SP 3.7
P_3_Auto_Cmd (U)

27
P_3_PLC_Auto_Mode / P_3_transition_to_manual_ONS ONS
P_3_Auto_Cmd P_3_PLC_Manual_Start (L)
P_3_Auto_Cmd / P_3_PLC_Manual_Start (U)

28
P_3_PLC_Auto_Mode P_3_Auto_Cmd this high interlock stops the Extraction Wells (outdoor wells) T_801_High_Interlock /
P_3_PLC_Auto_Mode / P_3_PLC_Manual_Start
P_3_Pump_Start_CR <Slave_Radio_14.N8[3].0>

29
P_3_Pump_Start_CR <Slave_Radio_14.N8[3].0>
P_3_Pump_Status <Slave_Radio_14.N8[2].0> /
TON
Timer On Delay
Timer P_3_Failure_Timer
Preset 45000
Accum 0
EN
DN
P_3_Failure_Timer.DN
P_3_Failure (L)

30
P_3_Pump_Start_CR <Slave_Radio_14.N8[3].0>
P_3_Pump_Status <Slave_Radio_14.N8[2].0>
Master_Alarm_Reset
P_3_Reset_Pump_Failure
P_3_Failure (U)

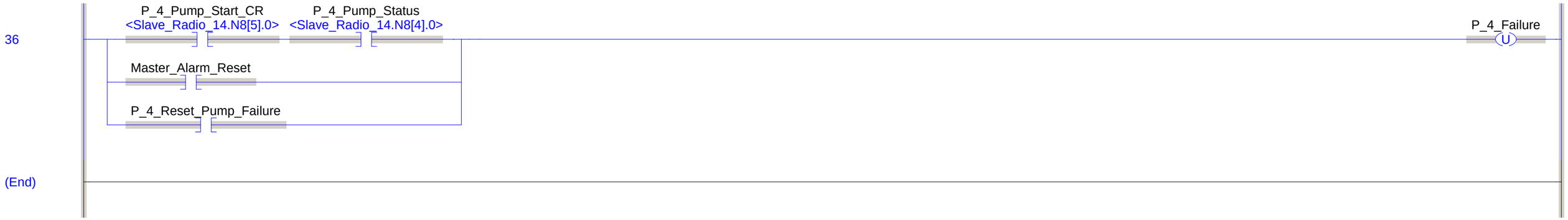
31
GEQ
Grtr Than or Eql (A>=B)
Source A P_4_LIT.PV 3.92
Source B P_4_Pump_Start_SP 7.5
P_4_Auto_Cmd (L)

32
LES
Less Than (A<B)
Source A P_4_LIT.PV 3.92
Source B P_4_Pump_Stop_SP 4.0
P_4_Auto_Cmd (U)

33
P_4_PLC_Auto_Mode /
P_4_transition_to_manual_ONS ONS
P_4_Auto_Cmd
P_4_PLC_Manual_Start (L)
P_4_Auto_Cmd /
P_4_PLC_Manual_Start (U)

34
this high interlock stops the Extraction Wells (outdoor wells)
P_4_PLC_Auto_Mode
P_4_Auto_Cmd
T_801_High_Interlock /
P_4_PLC_Auto_Mode /
P_4_PLC_Manual_Start
P_4_Pump_Start_CR <Slave_Radio_14.N8[5].0>

35
P_4_Pump_Start_CR <Slave_Radio_14.N8[5].0>
P_4_Pump_Status <Slave_Radio_14.N8[4].0> /
TON
Timer On Delay
Timer P_4_Failure_Timer
Preset 45000
Accum 0
EN
DN
P_4_Failure_Timer.DN
P_4_Failure (L)


36
P_4_Pump_Start_CR
<Slave_Radio_14.N8[5].0>
P_4_Pump_Status
<Slave_Radio_14.N8[4].0>
Master_Alarm_Reset
P_4_Reset_Pump_Failure
P_4_Failure
U
(End)

0

FIT_803_Pulse_Input_4
<Local:2:I.Data.0>

fit_803_pulse_on_total_ONS
ONS

this bit is on for 1 scan only when the pulse meter input turns on. Use this bit for counting / totalizing FIT_803_Pulse

Increase the totals when we get a pulse

1

this bit is on for 1 scan only when the pulse meter input turns on. Use this bit for counting / totalizing FIT_803_Pulse

ADD
Add
Source A FIT_803_Pulse_Gallons 100
Source B FIT_803_Pulse_Daily_Total 57800.0
Dest FIT_803_Pulse_Daily_Total 57800.0

ADD
Add
Source A FIT_803_Pulse_Gallons 100
Source B FIT_803_Pulse_Total 682300.0
Dest FIT_803_Pulse_Total 682300.0

When the reset daily total button is pressed,
clear the total and save the timestamp

2

FIT_803_Reset_Manual_Total_2

MOV
Move
Source FIT_803_Pulse_Total 682300.0
Dest FIT_803_Pulse_Old_Total 1200.0

MOV
Move
Source 0
Dest FIT_803_Pulse_Total 682300.0

COP
Copy File
Source PLC_Local_Date_Time[0]
Dest FIT_803_Manual_Total_Last_Reset_2[0]
Length 7

FIT_803_Reset_Manual_Total_2
U

if the current day is not equal to the day the last time the daily total was reset, then reset the total and save the timestamp
save the daily total into Old daily total

3

Day
NEQ
Not Equal
Source A PLC_Local_Date_Time[2] 22
Source B FIT_803_Daily_Total_Last_Reset_2[2] 22

MOV
Move
Source FIT_803_Pulse_Daily_Total 57800.0
Dest FIT_803_Pulse_Daily_Old_Total 114000.0

MOV
Move
Source 0
Dest FIT_803_Pulse_Daily_Total 57800.0

COP
Copy File
Source PLC_Local_Date_Time[0]
Dest FIT_803_Daily_Total_Last_Reset_2[0]
Length 7

calculate the pulse rate once every minute

4

TON
Timer On Delay
Timer FIT_803_pulse_rate_timer
Preset 60000
Accum 46432
EN
DN

count the number of pulses we get

this bit is on for 1 scan only when the pulse meter input turns on. Use this bit for counting / totalizing FIT_803_Pulse

5

CTU
Count Up
Counter FIT_803_Pulse_rate_counter
Preset 999
Accum 1
CU
DN

when the pulse rate time is done, calculate the flow rate based off number of pulses and time we were counting for
add the current sample to a fifo queue (removing 1 sample if the fifo queue is full first)
reset the timer and counter

FIT_803_pulse_rate_timer.DN

6

CPT
Compute
Dest FIT_803_Pulse_Meter_Flow_Rate_1
99.99334
Expression FIT_803_Pulse_Gallons*FIT_803_Pulse_rate_counter.ACC/(FIT_803_pulse_rate_timer.ACC/60000)

fit803_flow_rate_1_control.DN

FFU
FIFO Unload
FIFO fit803_flow_rate_1_FIFO[0]
Dest fit803_junk
Control fit803_flow_rate_1_control
Length 10
Position 10
EU
DN
EM

FFL
FIFO Load
Source FIT_803_Pulse_Meter_Flow_Rate_1
FIFO fit803_flow_rate_1_FIFO[0]
Control fit803_flow_rate_1_control
Length 10
Position 10
EN
DN
EM

FIT_803_pulse_rate_timer
RES

FIT_803_Pulse_rate_counter
RES

AVE
Average File
Array fit803_flow_rate_1_FIFO[0]
Dim. To Vary 0
Dest FIT_803_Pulse_Meter_Flow_Rate_1_Average
89.99333
Control fit_flow_rate_1_ave_control
Length 10
Position 0
EN
DN
ER

run a timer so we can time between pulses

7

1=Running, 0=Off
P_810A_Pump_Status
<Local:5:I.Data.6>

1=Running, 0=Off
P_810B_Pump_Status
<Local:5:I.Data.7>

RTO
Retentive Timer On
Timer FIT_803_Pulse_rate_timer_2
Preset 999999999
Accum 37973
EN
DN

calcualte flow rate based on time between pulses
if fifo is full remove a sample
then insert current value into fifo
then reset the timer

8

this bit is on for 1 scan only when the pulse meter input turns on. Use this bit for counting / totalizing FIT_803_Pulse

CPT
Compute
Dest FIT_803_Pulse_Meter_Flow_Rate_2
92.84189
Expression (FIT_803_Pulse_Gallons)/ (FIT_803_Pulse_rate_timer_2.ACC / 60000)

fit803_flow_rate_2_control.DN

FFU
FIFO Unload
FIFO fit803_flow_rate_2_FIFO
Dest fit803_junk
Control fit803_flow_rate_2_control
Length 10
Position 10
EU
DN
EM

FFL
FIFO Load
Source FIT_803_Pulse_Meter_Flow_Rate_2
FIFO fit803_flow_rate_2_FIFO
Control fit803_flow_rate_2_control
Length 10
Position 10
EN
DN
EM

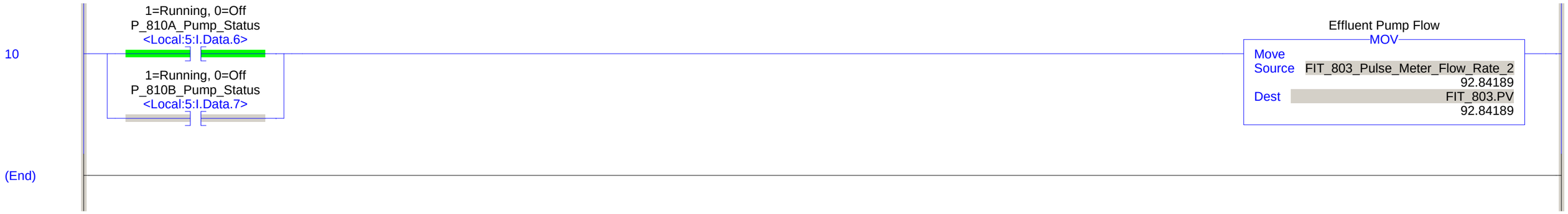
FIT_803_Pulse_rate_timer_2
RES

AVE
Average File
Array fit803_flow_rate_2_FIFO[0]
Dim. To Vary 0
Dest FIT_803_Pulse_Meter_Flow_Rate_2_Average
92.866394
Control fit_flow_rate_2_ave_control
Length 10
Position 0
EN
DN
ER

9

Effluent Pump Flow

MOV
Move
Source 0
Dest FIT_803.PV
92.84189


10
1=Running, 0=Off
P_810A_Pump_Status
<Local:5:I.Data.6>
1=Running, 0=Off
P_810B_Pump_Status
<Local:5:I.Data.7>
Effluent Pump Flow
MOV
Move
Source
FIT_803_Pulse_Meter_Flow_Rate_2
92.84189
Dest
FIT_803.PV
92.84189
(End)

0
JSR
Jump To Subroutine
Routine Name Read_Write_Radio

1
JSR
Jump To Subroutine
Routine Name Buffer_Inputs

2
JSR
Jump To Subroutine
Routine Name Air_Stripper

3
JSR
Jump To Subroutine
Routine Name T802_P810

4
JSR
Jump To Subroutine
Routine Name S_801A_P805

5
JSR
Jump To Subroutine
Routine Name T801_P803

6
JSR
Jump To Subroutine
Routine Name TK002_P06_P07

7
JSR
Jump To Subroutine
Routine Name Bag_Filters

8
JSR
Jump To Subroutine
Routine Name Extraction_Wells

9
JSR
Jump To Subroutine
Routine Name Alarms_AutoDialer

10
JSR
Jump To Subroutine
Routine Name Flow_Pulse_Meter

11
GSV
Get System Value
Class Name FAULTLOG
Instance Name
Attribute Name MinorFaultBits
Dest MinorFaultWord
0

MVM
Masked Move
Source MinorFaultWord
0
Mask BatteryFaultMask
1024
Dest BatteryFaultBit
0

NEQ
Not Equal
Source A BatteryFaultBit
0
Source B NoFaults
0

PLC_Battery_Fault

12

GSV
Get System Value
Class Name FAULTLOG
Instance Name
Attribute Name MajorFaultBits
Dest MajorFaultWord
0

13

GSV
Get System Value
Class Name MODULE
Instance Name AI_Slot_1
Attribute Name FaultCode
Dest ModuleFaultWord[1]
0

GSV
Get System Value
Class Name MODULE
Instance Name DI_24v_DC_Slot_2
Attribute Name FaultCode
Dest ModuleFaultWord[2]
0

GSV
Get System Value
Class Name MODULE
Instance Name AI_Slot_3
Attribute Name FaultCode
Dest ModuleFaultWord[3]
0

GSV
Get System Value
Class Name MODULE
Instance Name DO_Relay_Slot_4
Attribute Name FaultCode
Dest ModuleFaultWord[4]
0

14

GSV
Get System Value
Class Name MODULE
Instance Name DI_120v_AC_Slot_5
Attribute Name FaultCode
Dest ModuleFaultWord[5]
0

GSV
Get System Value
Class Name MODULE
Instance Name DI_120v_AC_Slot_6
Attribute Name FaultCode
Dest ModuleFaultWord[6]
0

GSV
Get System Value
Class Name MODULE
Instance Name DO_Relay_Isolated_Slot_7
Attribute Name FaultCode
Dest ModuleFaultWord[7]
0

GSV
Get System Value
Class Name MODULE
Instance Name DO_Relay_Isolated_Slot_8
Attribute Name FaultCode
Dest ModuleFaultWord[8]
0

15

Master_Alarm_Reset

Master_Alarm_Reset
(U)

16

Year
GSV
Get System Value
Class Name WallClockTime
Instance Name
Attribute Name LocalDateTime
Dest PLC_Local_Date_Time[0]
2012

17

GSV
Get System Value
Class Name WallClockTime
Instance Name
Attribute Name ApplyDST
Dest PLC_DST_Active
1

18

Set_PLC_Local_Time

Year
SSV
Set System Value
Class Name WallClockTime
Instance Name
Attribute Name LocalDateTime
Source PLC_New_Time[0]
2012

19

Set_PLC_Local_Time

Set_PLC_Local_Time
(U)

20

Set_PLC_DST_Status

EQU
Equal
Source A PLC_DST_Active
1
Source B 1

SSV
Set System Value
Class Name WallClockTime
Instance Name
Attribute Name ApplyDST
Source ZERO
0

EQU
Equal
Source A PLC_DST_Active
1
Source B 0

SSV
Set System Value
Class Name WallClockTime
Instance Name
Attribute Name ApplyDST
Source ONE
1

21

Set_PLC_DST_Status

Set_PLC_DST_Status
(U)

22

LSHH_222
<Local:2:I.Data.7>

TK_02_High_Interlock
(L)

23

LSHH_222
<Local:2:I.Data.7>
(/)

TON
Timer On Delay
Timer TK_02_high_Interlock_Timer
Preset 30000
Accum 10000

(EN)
(DN)

TK_02_high_Interlock_Timer.DN

TK_02_High_Interlock
(U)

24

TK_02_High_Interlock

CR 2 in Sump Control Panel
Inhibit Pumps 4 and 5
Local:4:O.Data.7

(End)

0

TON
Timer On Delay
Timer Radio_Startup_Delay_Timer
Preset 5000
Accum 5001
EN
DN

1

Radio_Startup_Delay_Timer.DN
Radio_Startup_ONS
ONS
Restart_Msg_Routine_from_PLC

2

Restart_Msg_Routine_from_PLC
Restart_Msg_Routine_from_SCADA
Restart_Msg_Routine
L

3

Restart_Msg_Routine
Read Master Radio Status MSG_01.TO
Read Slave #11 Radio Status MSG_02.TO
Read Slave #11 AI 1 MSG_03.TO
Read Slave #11 AI 2 MSG_04.TO
Read Slave #11 DI 1 MSG_05.TO
Read Slave #11 DI 2 MSG_06.TO
Write Slave #11 DO 1 MSG_07.TO
Write Slave #11 DO 2 MSG_08.TO
Read Slave #12 Radio Status MSG_09.TO
Read Slave #12 AI MSG_10.TO
Read Slave #12 DI MSG_11.TO
Write Slave #12 DO 1 MSG_12.TO
Read Slave #13 Radio Status MSG_13.TO
Read Slave #13 AI MSG_14.TO
Read Slave #13 DI MSG_15.TO
Write Slave #13 DO 1 MSG_16.TO
Read Slave #14 Radio Status MSG_17.TO
Read Slave #14 AI 1 MSG_18.TO
Read Slave #14 AI 2 MSG_19.TO
Read Slave #14 DI 1 MSG_20.TO
Read Slave #14 DI 2 MSG_21.TO
Write Slave #14 DO 1 MSG_22.TO
Write Slave #14 DO 2 MSG_23.TO

4

Restart_Msg_Routine
TON
Timer On Delay
Timer Restart_Msg_Routine_Timer
Preset 10000
Accum 0
EN
DN
Restart_Msg_Routine_Timer.DN
Restart_Msg_Routine
U
MOV
Move
Source 1
Dest Active_Msg 11

5

EQU
Equal
Source A Active_Msg 11
Source B 1

Restart_Msg_Routine

Read Master Radio Status
MSG
Message
Message Control MSG_01 ...
EN
DN
ER

Read Master Radio Status MSG_01.DN

Read Master Radio Status MSG_01.ER

TON
Timer On Delay
Timer Msg_Done_Timers[1]
Preset 50
Accum 0
EN
DN

6

EQU
Equal
Source A Active_Msg 11
Source B 2

Restart_Msg_Routine

Read Slave #11 Radio Status
MSG
Message
Message Control MSG_02 ...
EN
DN
ER

Read Slave #11 Radio Status MSG_02.DN

Read Slave #11 Radio Status MSG_02.ER

TON
Timer On Delay
Timer Msg_Done_Timers[2]
Preset 50
Accum 0
EN
DN

7

EQU
Equal
Source A Active_Msg 11
Source B 3

Restart_Msg_Routine

Read Slave #11 AI 1
MSG
Message
Message Control MSG_03 ...
EN
DN
ER

Read Slave #11 AI 1 MSG_03.DN

Read Slave #11 AI 1 MSG_03.ER

TON
Timer On Delay
Timer Msg_Done_Timers[3]
Preset 50
Accum 0
EN
DN

8

EQU
Equal
Source A Active_Msg 11
Source B 4

Restart_Msg_Routine

Read Slave #11 AI 2
MSG
Message
Message Control MSG_04 ...
EN
DN
ER

Read Slave #11 AI 2 MSG_04.DN

Read Slave #11 AI 2 MSG_04.ER

TON
Timer On Delay
Timer Msg_Done_Timers[4]
Preset 50
Accum 0
EN
DN

9

EQU
Equal
Source A Active_Msg 11
Source B 5

Restart_Msg_Routine

Read Slave #11 DI 1
MSG
Message
Message Control MSG_05 ...
EN
DN
ER

Read Slave #11 DI 1
MSG_05.DN

Read Slave #11 DI 1
MSG_05.ER

TON
Timer On Delay
Timer Msg_Done_Timers[5]
Preset 50
Accum 0
EN
DN

10

EQU
Equal
Source A Active_Msg 11
Source B 6

Restart_Msg_Routine

Read Slave #11 DI 2
MSG
Message
Message Control MSG_06 ...
EN
DN
ER

Read Slave #11 DI 2
MSG_06.DN

Read Slave #11 DI 2
MSG_06.ER

TON
Timer On Delay
Timer Msg_Done_Timers[6]
Preset 50
Accum 0
EN
DN

11

EQU
Equal
Source A Active_Msg 11
Source B 7

Restart_Msg_Routine

Write Slave #11 DO 1
MSG
Message
Message Control MSG_07 ...
EN
DN
ER

Write Slave #11 DO 1
MSG_07.DN

Write Slave #11 DO 1
MSG_07.ER

TON
Timer On Delay
Timer Msg_Done_Timers[7]
Preset 50
Accum 0
EN
DN

12

EQU
Equal
Source A Active_Msg 11
Source B 8

Restart_Msg_Routine

Write Slave #11 DO 2
MSG
Message
Message Control MSG_08 ...
EN
DN
ER

Write Slave #11 DO 2
MSG_08.DN

Write Slave #11 DO 2
MSG_08.ER

TON
Timer On Delay
Timer Msg_Done_Timers[8]
Preset 50
Accum 0
EN
DN

13

EQU
Equal
Source A Active_Msg 11
Source B 9

Restart_Msg_Routine

Read Slave #12 Radio Status
MSG
Message
Message Control MSG_09 ...
EN
DN
ER

Read Slave #12 Radio Status MSG_09.DN

Read Slave #12 Radio Status MSG_09.ER

TON
Timer On Delay
Timer Msg_Done_Timers[9]
Preset 50
Accum 0
EN
DN

14

EQU
Equal
Source A Active_Msg 11
Source B 10

Restart_Msg_Routine

Read Slave #12 AI
MSG
Message
Message Control MSG_10 ...
EN
DN
ER

Read Slave #12 AI MSG_10.DN

Read Slave #12 AI MSG_10.ER

TON
Timer On Delay
Timer Msg_Done_Timers[10]
Preset 50
Accum 0
EN
DN

15

EQU
Equal
Source A Active_Msg 11
Source B 11

Restart_Msg_Routine

Read Slave #12 DI
MSG
Message
Message Control MSG_11 ...
EN
DN
ER

Read Slave #12 DI MSG_11.DN

Read Slave #12 DI MSG_11.ER

TON
Timer On Delay
Timer Msg_Done_Timers[11]
Preset 50
Accum 0
EN
DN

16

EQU
Equal
Source A Active_Msg 11
Source B 12

Restart_Msg_Routine

Write Slave #12 DO 1
MSG
Message
Message Control MSG_12 ...
EN
DN
ER

Write Slave #12 DO 1 MSG_12.DN

Write Slave #12 DO 1 MSG_12.ER

TON
Timer On Delay
Timer Msg_Done_Timers[12]
Preset 50
Accum 0
EN
DN

17

EQU
Equal
Source A Active_Msg
11
Source B 13

Restart_Msg_Routine

Read Slave #13 Radio Status
MSG
Message
Message Control MSG_13 ...
EN
DN
ER

Read Slave #13 Radio Status
MSG_13.DN

Read Slave #13 Radio Status
MSG_13.ER

TON
Timer On Delay
Timer Msg_Done_Timers[13]
Preset 50
Accum 0
EN
DN

18

EQU
Equal
Source A Active_Msg
11
Source B 14

Restart_Msg_Routine

Read Slave #13 AI
MSG
Message
Message Control MSG_14 ...
EN
DN
ER

Read Slave #13 AI
MSG_14.DN

Read Slave #13 AI
MSG_14.ER

TON
Timer On Delay
Timer Msg_Done_Timers[14]
Preset 50
Accum 0
EN
DN

19

EQU
Equal
Source A Active_Msg
11
Source B 15

Restart_Msg_Routine

Read Slave #13 DI
MSG
Message
Message Control MSG_15 ...
EN
DN
ER

Read Slave #13 DI
MSG_15.DN

Read Slave #13 DI
MSG_15.ER

TON
Timer On Delay
Timer Msg_Done_Timers[15]
Preset 50
Accum 0
EN
DN

20

EQU
Equal
Source A Active_Msg
11
Source B 16

Restart_Msg_Routine

Write Slave #13 DO 1
MSG
Message
Message Control MSG_16 ...
EN
DN
ER

Write Slave #13 DO 1
MSG_16.DN

Write Slave #13 DO 1
MSG_16.ER

TON
Timer On Delay
Timer Msg_Done_Timers[16]
Preset 50
Accum 0
EN
DN

21

EQU
Equal
Source A Active_Msg 11
Source B 17

Restart_Msg_Routine

Read Slave #14 Radio Status
MSG
Message
Message Control MSG_17 ...
EN
DN
ER

Read Slave #14 Radio Status MSG_17.DN

Read Slave #14 Radio Status MSG_17.ER

TON
Timer On Delay
Timer Msg_Done_Timers[17]
Preset 50
Accum 0
EN
DN

22

EQU
Equal
Source A Active_Msg 11
Source B 18

Restart_Msg_Routine

Read Slave #14 AI 1
MSG
Message
Message Control MSG_18 ...
EN
DN
ER

Read Slave #14 AI 1 MSG_18.DN

Read Slave #14 AI 1 MSG_18.ER

TON
Timer On Delay
Timer Msg_Done_Timers[18]
Preset 50
Accum 0
EN
DN

23

EQU
Equal
Source A Active_Msg 11
Source B 19

Restart_Msg_Routine

Read Slave #14 AI 2
MSG
Message
Message Control MSG_19 ...
EN
DN
ER

Read Slave #14 AI 2 MSG_19.DN

Read Slave #14 AI 2 MSG_19.ER

TON
Timer On Delay
Timer Msg_Done_Timers[19]
Preset 50
Accum 0
EN
DN

24

EQU
Equal
Source A Active_Msg 11
Source B 20

Restart_Msg_Routine

Read Slave #14 DI 1
MSG
Message
Message Control MSG_20 ...
EN
DN
ER

Read Slave #14 DI 1 MSG_20.DN

Read Slave #14 DI 1 MSG_20.ER

TON
Timer On Delay
Timer Msg_Done_Timers[20]
Preset 50
Accum 0
EN
DN

25

EQU
Equal
Source A Active_Msg 11
Source B 21

Restart_Msg_Routine

Read Slave #14 DI 2
MSG
Message
Message Control MSG_21 ...
EN
DN
ER

Read Slave #14 DI 2
MSG_21.DN

Read Slave #14 DI 2
MSG_21.ER

TON
Timer On Delay
Timer Msg_Done_Timers[21]
Preset 50
Accum 0
EN
DN

26

EQU
Equal
Source A Active_Msg 11
Source B 22

Restart_Msg_Routine

Write Slave #14 DO 1
MSG
Message
Message Control MSG_22 ...
EN
DN
ER

Write Slave #14 DO 1
MSG_22.DN

Write Slave #14 DO 1
MSG_22.ER

TON
Timer On Delay
Timer Msg_Done_Timers[22]
Preset 50
Accum 0
EN
DN

27

EQU
Equal
Source A Active_Msg 11
Source B 23

Restart_Msg_Routine

Write Slave #14 DO 2
MSG
Message
Message Control MSG_23 ...
EN
DN
ER

Write Slave #14 DO 2
MSG_23.DN

Write Slave #14 DO 2
MSG_23.ER

TON
Timer On Delay
Timer Msg_Done_Timers[23]
Preset 50
Accum 0
EN
DN

28

Msg_Off_Timers[23].DN

Write Slave #14 DO 2
MSG_23.DN

Write Slave #14 DO 2
MSG_23.ER

End_Of_MSG_Rung_ONS
ONS

Restart_Msg_Routine

Start_MSG_01_From_Ladder

29

EQU
Equal
Source A Active_Msg 11
Source B 1

Msg_Done_Timers[1].DN

Read Master Radio Status
MSG_01.DN

Read Master Radio Status
MSG_01.ER

MOV
Move
Source 2
Dest Active_Msg 11

30

EQU
Equal
Source A: Active_Msg 11
Source B: 2

Msg_Done_Timers[2].DN

Read Slave #11 Radio Status
MSG_02.DN

MOV
Move
Source: 3
Dest: Active_Msg 11

Read Slave #11 Radio Status
MSG_02.ER

MOV
Move
Source: 9
Dest: Active_Msg 11

31

EQU
Equal
Source A: Active_Msg 11
Source B: 3

Msg_Done_Timers[3].DN

Read Slave #11 AI 1
MSG_03.DN

MOV
Move
Source: 4
Dest: Active_Msg 11

Read Slave #11 AI 1
MSG_03.ER

MOV
Move
Source: 9
Dest: Active_Msg 11

32

EQU
Equal
Source A: Active_Msg 11
Source B: 4

Msg_Done_Timers[4].DN

Read Slave #11 AI 2
MSG_04.DN

MOV
Move
Source: 7
Dest: Active_Msg 11

Read Slave #11 AI 2
MSG_04.ER

MOV
Move
Source: 9
Dest: Active_Msg 11

33

EQU
Equal
Source A Active_Msg 11
Source B 5

Msg_Done_Timers[5].DN

Read Slave #11 DI 1 MSG_05.DN

MOV
Move
Source 6
Dest Active_Msg 11

Read Slave #11 DI 1 MSG_05.ER

MOV
Move
Source 9
Dest Active_Msg 11

34

EQU
Equal
Source A Active_Msg 11
Source B 6

Msg_Done_Timers[6].DN

Read Slave #11 DI 2 MSG_06.DN

Read Slave #11 DI 2 MSG_06.ER

MOV
Move
Source 9
Dest Active_Msg 11

35

EQU
Equal
Source A Active_Msg 11
Source B 7

Msg_Done_Timers[7].DN

Write Slave #11 DO 1 MSG_07.DN

MOV
Move
Source 8
Dest Active_Msg 11

Write Slave #11 DO 1 MSG_07.ER

MOV
Move
Source 9
Dest Active_Msg 11

36

EQU
Equal
Source A Active_Msg 11
Source B 8

Msg_Done_Timers[8].DN

Write Slave #11 DO 2 MSG_08.DN

MOV
Move
Source 5
Dest Active_Msg 11

Write Slave #11 DO 2 MSG_08.ER

MOV
Move
Source 9
Dest Active_Msg 11

37

EQU
Equal
Source A: Active_Msg 11
Source B: 9

Msg_Done_Timers[9].DN

Read Slave #12 Radio Status
MSG_09.DN

MOV
Move
Source: 10
Dest: Active_Msg 11

Read Slave #12 Radio Status
MSG_09.ER

MOV
Move
Source: 13
Dest: Active_Msg 11

38

EQU
Equal
Source A: Active_Msg 11
Source B: 10

Msg_Done_Timers[10].DN

Read Slave #12 AI
MSG_10.DN

MOV
Move
Source: 12
Dest: Active_Msg 11

Read Slave #12 AI
MSG_10.ER

MOV
Move
Source: 13
Dest: Active_Msg 11

39

EQU
Equal
Source A: Active_Msg 11
Source B: 11

Msg_Done_Timers[11].DN

Read Slave #12 DI
MSG_11.DN

Read Slave #12 DI
MSG_11.ER

MOV
Move
Source: 13
Dest: Active_Msg 11

40

EQU
Equal
Source A: Active_Msg 11
Source B: 12

Msg_Done_Timers[12].DN

Write Slave #12 DO 1
MSG_12.DN

MOV
Move
Source: 11
Dest: Active_Msg 11

Write Slave #12 DO 1
MSG_12.ER

MOV
Move
Source: 13
Dest: Active_Msg 11

41

EQU
Equal
Source A Active_Msg 11
Source B 13

Msg_Done_Timers[13].DN

Read Slave #13 Radio Status
MSG_13.DN

MOV
Move
Source 14
Dest Active_Msg 11

Read Slave #13 Radio Status
MSG_13.ER

MOV
Move
Source 17
Dest Active_Msg 11

42

EQU
Equal
Source A Active_Msg 11
Source B 14

Msg_Done_Timers[14].DN

Read Slave #13 AI
MSG_14.DN

MOV
Move
Source 16
Dest Active_Msg 11

Read Slave #13 AI
MSG_14.ER

MOV
Move
Source 17
Dest Active_Msg 11

43

EQU
Equal
Source A Active_Msg 11
Source B 15

Msg_Done_Timers[15].DN

Read Slave #13 DI
MSG_15.DN

Read Slave #13 DI
MSG_15.ER

MOV
Move
Source 17
Dest Active_Msg 11

44

EQU
Equal
Source A Active_Msg 11
Source B 16

Msg_Done_Timers[16].DN

Write Slave #13 DO 1
MSG_16.DN

MOV
Move
Source 15
Dest Active_Msg 11

Write Slave #13 DO 1
MSG_16.ER

MOV
Move
Source 17
Dest Active_Msg 11

45

EQU
Equal
Source A: Active_Msg 11
Source B: 17

Msg_Done_Timers[17].DN

Read Slave #14 Radio Status
MSG_17.DN

MOV
Move
Source: 18
Dest: Active_Msg 11

Read Slave #14 Radio Status
MSG_17.ER

MOV
Move
Source: 1
Dest: Active_Msg 11

46

EQU
Equal
Source A: Active_Msg 11
Source B: 18

Msg_Done_Timers[18].DN

Read Slave #14 AI 1
MSG_18.DN

MOV
Move
Source: 19
Dest: Active_Msg 11

Read Slave #14 AI 1
MSG_18.ER

MOV
Move
Source: 1
Dest: Active_Msg 11

47

EQU
Equal
Source A: Active_Msg 11
Source B: 19

Msg_Done_Timers[19].DN

Read Slave #14 AI 2
MSG_19.DN

MOV
Move
Source: 22
Dest: Active_Msg 11

Read Slave #14 AI 2
MSG_19.ER

MOV
Move
Source: 1
Dest: Active_Msg 11

48

EQU
Equal
Source A Active_Msg 11
Source B 20

Msg_Done_Timers[20].DN

Read Slave #14 DI 1 MSG_20.DN

MOV
Move
Source 21
Dest Active_Msg 11

Read Slave #14 DI 1 MSG_20.ER

MOV
Move
Source 1
Dest Active_Msg 11

49

EQU
Equal
Source A Active_Msg 11
Source B 21

Msg_Done_Timers[21].DN

Read Slave #14 DI 2 MSG_21.DN

Read Slave #14 DI 2 MSG_21.ER

MOV
Move
Source 1
Dest Active_Msg 11

50

EQU
Equal
Source A Active_Msg 11
Source B 22

Msg_Done_Timers[22].DN

Write Slave #14 DO 1 MSG_22.DN

MOV
Move
Source 23
Dest Active_Msg 11

Write Slave #14 DO 1 MSG_22.ER

MOV
Move
Source 1
Dest Active_Msg 11

51

EQU
Equal
Source A Active_Msg 11
Source B 23

Msg_Done_Timers[23].DN

Write Slave #14 DO 2 MSG_23.DN

MOV
Move
Source 20
Dest Active_Msg 11

Write Slave #14 DO 2 MSG_23.ER

MOV
Move
Source 1
Dest Active_Msg 11

52

Set_Msg_Timeout_Value

Read Master Radio Status
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_01.UnconnectedTimeout 15000000

Read Slave #11 Radio Status
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_02.UnconnectedTimeout 15000000

Read Slave #11 AI 1
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_03.UnconnectedTimeout 15000000

Read Slave #11 AI 2
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_04.UnconnectedTimeout 15000000

Read Slave #11 DI 1
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_05.UnconnectedTimeout 15000000

Read Slave #11 DI 2
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_06.UnconnectedTimeout 15000000

Write Slave #11 DO 1
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_07.UnconnectedTimeout 15000000

Write Slave #11 DO 2
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_08.UnconnectedTimeout 15000000

Read Slave #12 Radio Status
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_09.UnconnectedTimeout 15000000

Read Slave #12 AI
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_10.UnconnectedTimeout 15000000

Read Slave #12 DI
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_11.UnconnectedTimeout 15000000

Write Slave #12 DO 1
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_12.UnconnectedTimeout 15000000

Read Slave #13 Radio Status
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_13.UnconnectedTimeout 15000000

Read Slave #13 AI
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_14.UnconnectedTimeout 15000000

Read Slave #13 DI
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_15.UnconnectedTimeout 15000000

Write Slave #13 DO 1
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_16.UnconnectedTimeout 15000000

Read Slave #14 Radio Status
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_17.UnconnectedTimeout 15000000

Read Slave #14 AI 1
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_18.UnconnectedTimeout 15000000

Read Slave #14 AI 2
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_19.UnconnectedTimeout 15000000

Read Slave #14 DI 1
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_20.UnconnectedTimeout 15000000

Read Slave #14 DI 2
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_21.UnconnectedTimeout 15000000

Write Slave #14 DO 1
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_22.UnconnectedTimeout 15000000

Write Slave #14 DO 2
MOV
Move
Source MSG_Timeout_Master_Value 15000000
Dest MSG_23.UnconnectedTimeout 15000000

Set_Msg_Timeout_Value

U

53
Read Master Radio Status MSG_01.ER
MSG_Err_ONS[1] ONS
Master_Radio_Msg_Error

54
Master_Radio_Msg_Error
CTU
Count Up
Counter Master_Radio_Error_Counter
Preset 3
Accum 0
CU
DN

55
Read Master Radio Status MSG_01.DN
Master_Radio_Counter_Reset_ONS ONS
Master_Radio_Error_Counter RES

56
Read Slave #11 Radio Status MSG_02.ER
MSG_Err_ONS[2] ONS
Slave_Radio_11_Msg_Error
Read Slave #11 AI 1 MSG_03.ER
MSG_Err_ONS[3] ONS
Read Slave #11 AI 2 MSG_04.ER
MSG_Err_ONS[4] ONS
Read Slave #11 DI 1 MSG_05.ER
MSG_Err_ONS[5] ONS
Read Slave #11 DI 2 MSG_06.ER
MSG_Err_ONS[6] ONS
Write Slave #11 DO 1 MSG_07.ER
MSG_Err_ONS[7] ONS
Write Slave #11 DO 2 MSG_08.ER
MSG_Err_ONS[8] ONS

57
Slave_Radio_11_Msg_Error
CTU
Count Up
Counter Slave_Radio_11_Error_Counter
Preset 3
Accum 0
CU
DN

58
Write Slave #11 DO 2 MSG_08.DN
Slave_Radio_11_Counter_Reset_ONS ONS
Slave_Radio_11_Error_Counter RES

59
Read Slave #12 Radio Status
MSG_09.ER
MSG_Err_ONS[9] ONS
Slave_Radio_12_Msg_Error
Read Slave #12 AI
MSG_10.ER
MSG_Err_ONS[10] ONS
Read Slave #12 DI
MSG_11.ER
MSG_Err_ONS[11] ONS
Write Slave #12 DO 1
MSG_12.ER
MSG_Err_ONS[12] ONS

60
Slave_Radio_12_Msg_Error
CTU
Count Up
Counter Slave_Radio_12_Error_Counter
Preset 3
Accum 0
CU
DN

61
Write Slave #12 DO 1
MSG_12.DN
Slave_Radio_12_Counter_Reset_ONS ONS
Slave_Radio_12_Error_Counter RES

62
Read Slave #13 Radio Status
MSG_13.ER
MSG_Err_ONS[13] ONS
Slave_Radio_13_Msg_Error
Read Slave #13 AI
MSG_14.ER
MSG_Err_ONS[14] ONS
Read Slave #13 DI
MSG_15.ER
MSG_Err_ONS[15] ONS
Write Slave #13 DO 1
MSG_16.ER
MSG_Err_ONS[16] ONS

63
Slave_Radio_13_Msg_Error
CTU
Count Up
Counter Slave_Radio_13_Error_Counter
Preset 3
Accum 0
CU
DN

64
Write Slave #13 DO 1
MSG_16.DN
Slave_Radio_13_Counter_Reset_ONS ONS
Slave_Radio_13_Error_Counter RES

65
Read Slave #14 Radio Status
MSG_17.ER
MSG_Err_ONS[17] ONS
Slave_Radio_14_Msg_Error
Read Slave #14 AI 1
MSG_18.ER
MSG_Err_ONS[18] ONS
Read Slave #14 AI 2
MSG_19.ER
MSG_Err_ONS[19] ONS
Read Slave #14 DI 1
MSG_20.ER
MSG_Err_ONS[20] ONS
Read Slave #14 DI 2
MSG_21.ER
MSG_Err_ONS[21] ONS
Write Slave #14 DO 1
MSG_22.ER
MSG_Err_ONS[22] ONS
Write Slave #14 DO 2
MSG_23.ER
MSG_Err_ONS[23] ONS

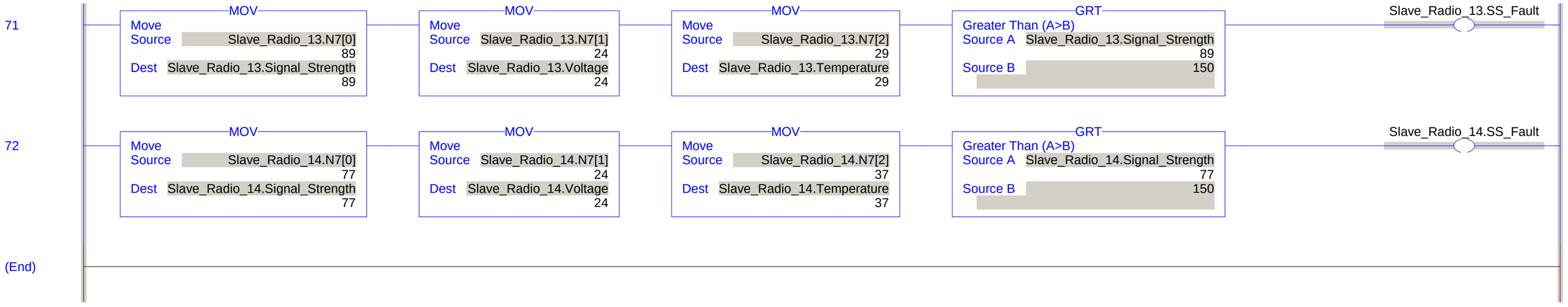
66
Slave_Radio_14_Msg_Error
CTU
Count Up
Counter Slave_Radio_14_Error_Counter
Preset 3
Accum 0
CU
DN

67
Write Slave #14 DO 2
MSG_23.DN
Slave_Radio_14_Counter_Reset_ONS ONS
Slave_Radio_14_Error_Counter RES

68
MOV
Move
Source Master_Radio.N7[0] 81
Dest Master_Radio.Signal_Strength 81
MOV
Move
Source Master_Radio.N7[1] 24
Dest Master_Radio.Voltage 24
MOV
Move
Source Master_Radio.N7[2] 38
Dest Master_Radio.Temperature 38

69
MOV
Move
Source Slave_Radio_11.N7[0] 69
Dest Slave_Radio_11.Signal_Strength 69
MOV
Move
Source Slave_Radio_11.N7[1] 23
Dest Slave_Radio_11.Voltage 23
MOV
Move
Source Slave_Radio_11.N7[2] 36
Dest Slave_Radio_11.Temperature 36
GRT
Greater Than (A>B)
Source A Slave_Radio_11.Signal_Strength 69
Source B 150
Slave_Radio_11.SS_Fault

70
MOV
Move
Source Slave_Radio_12.N7[0] 80
Dest Slave_Radio_12.Signal_Strength 80
MOV
Move
Source Slave_Radio_12.N7[1] 24
Dest Slave_Radio_12.Voltage 24
MOV
Move
Source Slave_Radio_12.N7[2] 32
Dest Slave_Radio_12.Temperature 32
GRT
Greater Than (A>B)
Source A Slave_Radio_12.Signal_Strength 80
Source B 150
Slave_Radio_12.SS_Fault


71
MOV
Move
Source Slave_Radio_13.N7[0]
89
Dest Slave_Radio_13.Signal_Strength
89
MOV
Move
Source Slave_Radio_13.N7[1]
24
Dest Slave_Radio_13.Voltage
24
MOV
Move
Source Slave_Radio_13.N7[2]
29
Dest Slave_Radio_13.Temperature
29
GRT
Greater Than (A>B)
Source A Slave_Radio_13.Signal_Strength
89
Source B 150
Slave_Radio_13.SS_Fault
72
MOV
Move
Source Slave_Radio_14.N7[0]
77
Dest Slave_Radio_14.Signal_Strength
77
MOV
Move
Source Slave_Radio_14.N7[1]
24
Dest Slave_Radio_14.Voltage
24
MOV
Move
Source Slave_Radio_14.N7[2]
37
Dest Slave_Radio_14.Temperature
37
GRT
Greater Than (A>B)
Source A Slave_Radio_14.Signal_Strength
77
Source B 150
Slave_Radio_14.SS_Fault
(End)

0
S-801A Tank Level
GEQ
Grtr Than or Eql (A>=B)
Source A LIT_801A.PV
8.54
Source B S_801A_Lead_Pump_Start_SP
14.0
S_801A_Lead_Pump_Control
L

1
S-801A Tank Level
LES
Less Than (A<B)
Source A LIT_801A.PV
8.54
Source B S_801A_Pump_Stop_SP
7.25
S_801A_Lead_Pump_Control
U

2
S-801A Tank Level
GEQ
Grtr Than or Eql (A>=B)
Source A LIT_801A.PV
8.54
Source B S_801A_Lag_Pump_Start_SP
18.0
S_801A_Lag_Pump_Control
L

3
S-801A Tank Level
LES
Less Than (A<B)
Source A LIT_801A.PV
8.54
Source B S_801A_Lead_Pump_Start_SP
14.0
S_801A_Lag_Pump_Control
U

4
LIT_801A_Alarm.HInAlarm
S_801A_High_Interlock
L

5
S_801A_High_Interlock
S_801A_Lead_Pump_Control
/
S_801A_Reset_High_Interlock
LIT_801A_Alarm.HInAlarm
/
S_801A_High_Interlock
U

6
P_805_Auto_Lead_Lag_Selection_Request
P805_Auto_LL_request_ONS
ONS
P_805_Auto_Lead_Lag_Selection
L
P_805_Auto_Lead_Lag_Selection_Request
U

7
P_805A_Set_as_Lead
P_805_Auto_LL_unlatch_ONS
ONS
P_805C_Set_as_Lead
P_805_Auto_Lead_Lag_Selection
U

8
S_801A_Lead_Pump_Control
S801A_Lead_Control_Off_ONS (ONS)
P_805_Auto_Lead_Lag_Selection
S_801A_Lead_Pump_Failure
Set by SCADA 1=Auto 0=Manual
P_805A_PLC_Auto_Mode
Set by SCADA 1=PLC Auto mode, 0=PLC Manual mode (start/stop from SCADA)
P_805C_PLC_Auto_Mode
P_805A_Is_Lead_Pump — P_805C_Set_As_Lead_Auto (U)
P_805A_Is_Lead_Pump — P_805A_Set_As_Lead_Auto (U)

9
P_805A_Set_As_Lead_Auto
P_805A_Is_Lead_Pump (L) P_805C_Is_Lead_Pump (U) P_805A_Set_As_Lead_Auto (U)

10
P_805C_Set_As_Lead_Auto
P_805C_Is_Lead_Pump (L) P_805A_Is_Lead_Pump (U) P_805C_Set_As_Lead_Auto (U)

11
P_805A_Set_as_Lead
P_805A_Lead_ONS (ONS)
Set by SCADA 1=Auto 0=Manual
P_805A_PLC_Auto_Mode
Set by SCADA 1=PLC Auto mode, 0=PLC Manual mode (start/stop from SCADA)
P_805C_PLC_Auto_Mode
P_805A_Is_Lead_Pump (L) P_805C_Is_Lead_Pump (U)

12
P_805C_Set_as_Lead
P_805C_Lead_ONS (ONS)
Set by SCADA 1=PLC Auto mode, 0=PLC Manual mode (start/stop from SCADA)
P_805C_PLC_Auto_Mode
Set by SCADA 1=Auto 0=Manual
P_805A_PLC_Auto_Mode
P_805C_Is_Lead_Pump (L) P_805A_Is_Lead_Pump (U)

13
1=Turn On
P_805A_Start_CR
<Local:7:O.Data.1>
1=Running, 0=Off
P_805A_Pump_Status
<Local:5:I.Data.4>
TON
Timer On Delay
Timer P_805A_Failure_Timer
Preset 5000
Accum 0
EN
DN
P_805A_Failure_Timer.DN
P_805A_Failure (L)

14
Master_Alarm_Reset
S_801A_Reset_Pump_Failure
P_805A_Failure (U)

15
1=Turn On P_805C_Start_CR <Local:7:O.Data.2>
1=Running, 0=Off P_805C_Pump_Status <Local:5:I.Data.5> /
TON Timer On Delay, Timer P_805C_Failure_Timer, Preset 5000, Accum 0, EN, DN
P_805C_Failure_Timer.DN
P_805C_Failure (L)

16
Master_Alarm_Reset
S_801A_Reset_Pump_Failure
P_805C_Failure (U)

17
S_801A_Lead_Pump_Control
P_805A_Is_Lead_Pump
P_805A_Failure
P_805C_Is_Lead_Pump
P_805C_Failure
S_801A_Lead_Pump_Failure (L)

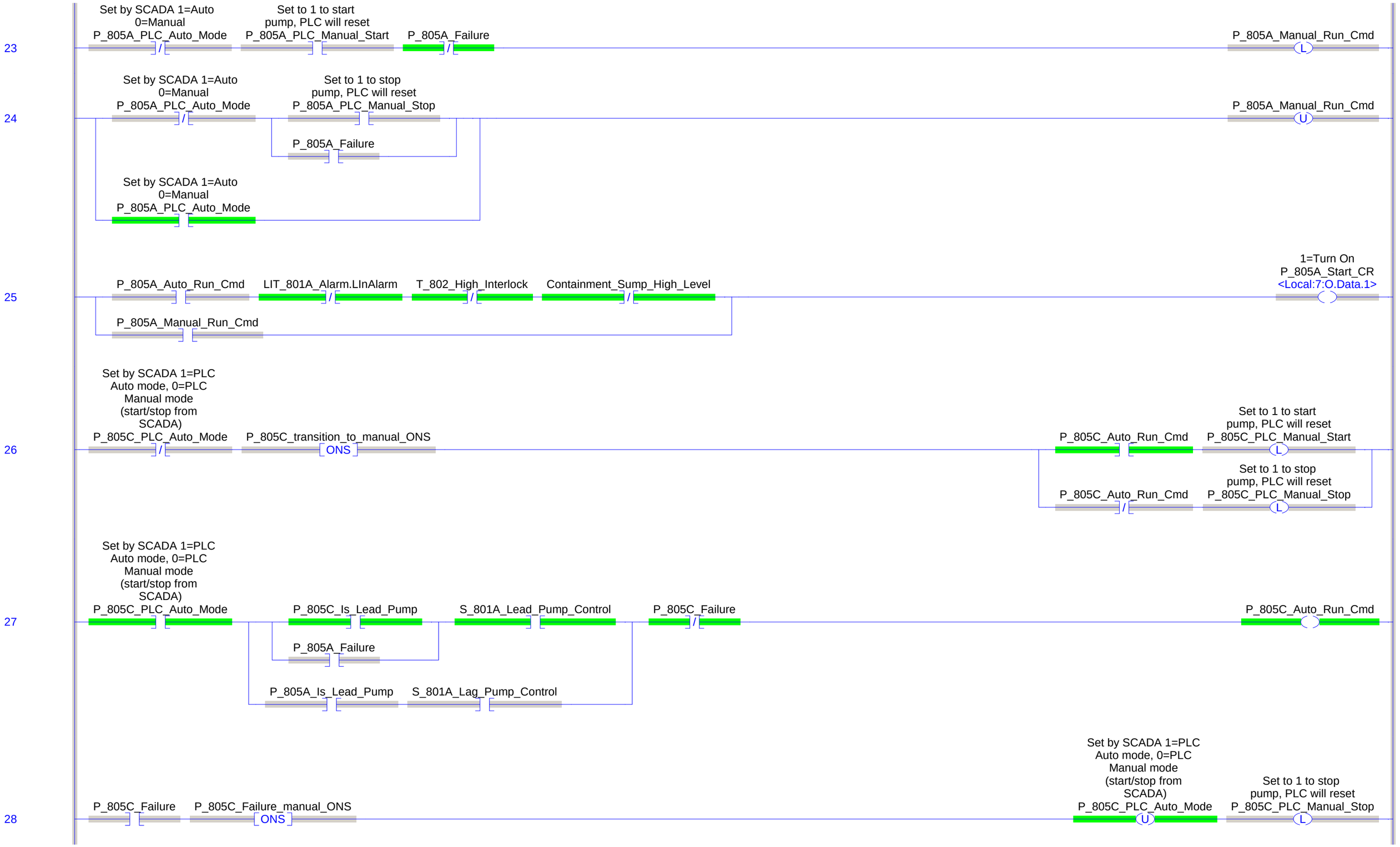
18
Master_Alarm_Reset
S_801A_Reset_Pump_Failure
S_801A_Lead_Pump_Failure (U)

19
S_801A_Lead_Pump_Failure
S_801A_Lead_Pump_Failure_ONS ONS
P_805A_Is_Lead_Pump
P_805C_Set_As_Lead_Auto (L)
P_805A_Is_Lead_Pump /
P_805A_Set_As_Lead_Auto (L)

20
Set by SCADA 1=Auto 0=Manual
P_805A_PLC_Auto_Mode /
P_805A_transition_to_manual_ONS ONS
P_805A_Auto_Run_Cmd
Set to 1 to start pump, PLC will reset
P_805A_PLC_Manual_Start (L)
P_805A_Auto_Run_Cmd /
Set to 1 to stop pump, PLC will reset
P_805A_PLC_Manual_Stop (L)

21
Set by SCADA 1=Auto 0=Manual
P_805A_PLC_Auto_Mode
P_805A_Is_Lead_Pump
S_801A_Lead_Pump_Control
P_805A_Failure /
P_805C_Failure
P_805C_Is_Lead_Pump
S_801A_Lag_Pump_Control
P_805A_Auto_Run_Cmd ( )

22
P_805A_Failure
P805A_failure_manual_ONS ONS
Set by SCADA 1=Auto 0=Manual
P_805A_PLC_Auto_Mode (U)
Set to 1 to stop pump, PLC will reset
P_805A_PLC_Manual_Stop (L)


23
Set by SCADA 1=Auto 0=Manual
P_805A_PLC_Auto_Mode
Set to 1 to start pump, PLC will reset
P_805A_PLC_Manual_Start
P_805A_Failure
P_805A_Manual_Run_Cmd
L
24
Set by SCADA 1=Auto 0=Manual
P_805A_PLC_Auto_Mode
Set to 1 to stop pump, PLC will reset
P_805A_PLC_Manual_Stop
P_805A_Failure
P_805A_Manual_Run_Cmd
U
Set by SCADA 1=Auto 0=Manual
P_805A_PLC_Auto_Mode
25
P_805A_Auto_Run_Cmd
LIT_801A_Alarm.LInAlarm
T_802_High_Interlock
Containment_Sump_High_Level
1=Turn On
P_805A_Start_CR
<Local:7:O.Data.1>
P_805A_Manual_Run_Cmd
26
Set by SCADA 1=PLC Auto mode, 0=PLC Manual mode (start/stop from SCADA)
P_805C_PLC_Auto_Mode
P_805C_transition_to_manual_ONS
ONS
P_805C_Auto_Run_Cmd
Set to 1 to start pump, PLC will reset
P_805C_PLC_Manual_Start
L
P_805C_Auto_Run_Cmd
Set to 1 to stop pump, PLC will reset
P_805C_PLC_Manual_Stop
L
27
Set by SCADA 1=PLC Auto mode, 0=PLC Manual mode (start/stop from SCADA)
P_805C_PLC_Auto_Mode
P_805C_Is_Lead_Pump
S_801A_Lead_Pump_Control
P_805C_Failure
P_805C_Auto_Run_Cmd
P_805A_Failure
P_805A_Is_Lead_Pump
S_801A_Lag_Pump_Control
28
P_805C_Failure
P_805C_Failure_manual_ONS
ONS
Set by SCADA 1=PLC Auto mode, 0=PLC Manual mode (start/stop from SCADA)
P_805C_PLC_Auto_Mode
U
Set to 1 to stop pump, PLC will reset
P_805C_PLC_Manual_Stop
L

29
Set by SCADA 1=PLC Auto mode, 0=PLC Manual mode (start/stop from SCADA) P_805C_PLC_Auto_Mode /
Set to 1 to start pump, PLC will reset P_805C_PLC_Manual_Start
P_805C_Failure /
P_805C_Manual_Run_Cmd (L)

30
Set by SCADA 1=PLC Auto mode, 0=PLC Manual mode (start/stop from SCADA) P_805C_PLC_Auto_Mode /
Set to 1 to stop pump, PLC will reset P_805C_PLC_Manual_Stop
P_805C_Failure
P_805C_Manual_Run_Cmd (U)
Set by SCADA 1=PLC Auto mode, 0=PLC Manual mode (start/stop from SCADA) P_805C_PLC_Auto_Mode

31
P_805C_Auto_Run_Cmd
LIT_801A_Alarm.LInAlarm /
T_802_High_Interlock /
Containment_Sump_High_Level /
P_805C_Manual_Run_Cmd
1=Turn On P_805C_Start_CR <Local:7:O.Data.2>

32
P_805A_Set_as_Lead
P_805A_Set_as_Lead (U)

33
P_805C_Set_as_Lead
P_805C_Set_as_Lead (U)

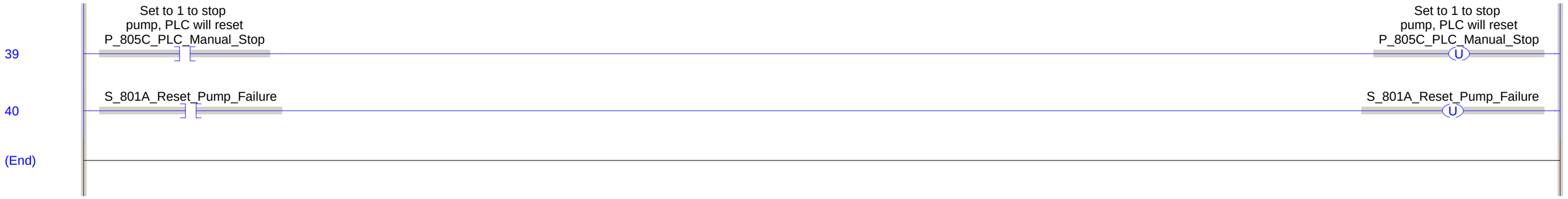
34
P_805A_Is_Lead_Pump
P_805C_Is_Lag_Pump

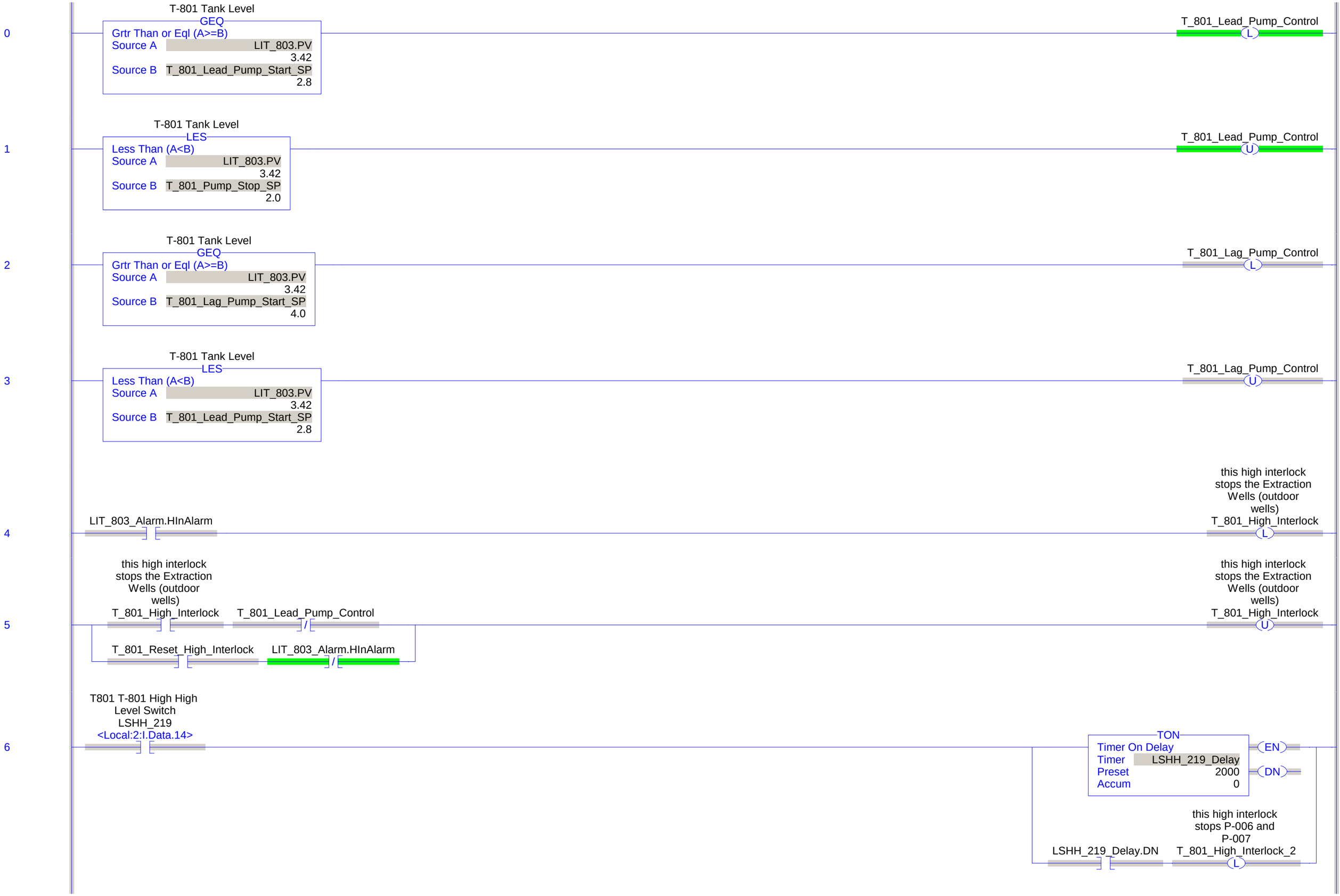
35
P_805C_Is_Lead_Pump
P_805A_Is_Lag_Pump

36
Set to 1 to start pump, PLC will reset P_805A_PLC_Manual_Start
Set to 1 to start pump, PLC will reset P_805A_PLC_Manual_Start (U)

37
Set to 1 to stop pump, PLC will reset P_805A_PLC_Manual_Stop
Set to 1 to stop pump, PLC will reset P_805A_PLC_Manual_Stop (U)

38
Set to 1 to start pump, PLC will reset P_805C_PLC_Manual_Start
Set to 1 to start pump, PLC will reset P_805C_PLC_Manual_Start (U)


39
Set to 1 to stop
pump, PLC will reset
P_805C_PLC_Manual_Stop
Set to 1 to stop
pump, PLC will reset
P_805C_PLC_Manual_Stop
U
40
S_801A_Reset_Pump_Failure
S_801A_Reset_Pump_Failure
U
(End)


0
T-801 Tank Level
GEQ
Grtr Than or Eql (A>=B)
Source A LIT_803.PV
3.42
Source B T_801_Lead_Pump_Start_SP
2.8
T_801_Lead_Pump_Control
L
1
T-801 Tank Level
LES
Less Than (A<B)
Source A LIT_803.PV
3.42
Source B T_801_Pump_Stop_SP
2.0
T_801_Lead_Pump_Control
U
2
T-801 Tank Level
GEQ
Grtr Than or Eql (A>=B)
Source A LIT_803.PV
3.42
Source B T_801_Lag_Pump_Start_SP
4.0
T_801_Lag_Pump_Control
L
3
T-801 Tank Level
LES
Less Than (A<B)
Source A LIT_803.PV
3.42
Source B T_801_Lead_Pump_Start_SP
2.8
T_801_Lag_Pump_Control
U
4
LIT_803_Alarm.HInAlarm
this high interlock stops the Extraction Wells (outdoor wells)
T_801_High_Interlock
L
5
this high interlock stops the Extraction Wells (outdoor wells)
T_801_High_Interlock
T_801_High_Interlock
T_801_Lead_Pump_Control
/
T_801_Reset_High_Interlock
LIT_803_Alarm.HInAlarm
/
U
6
T801 T-801 High High Level Switch
LSHH_219
<Local:2:I.Data.14>
TON
Timer On Delay
Timer LSHH_219_Delay
Preset 2000
Accum 0
EN
DN
LSHH_219_Delay.DN
this high interlock stops P-006 and P-007
T_801_High_Interlock_2
L

7
this high interlock stops P-006 and P-007 T_801_High_Interlock_2
T_801_Lead_Pump_Control /
T801 T-801 High High Level Switch LSHH_219 <Local:2:I.Data.14> /
T_801_Reset_High_Interlock
this high interlock stops P-006 and P-007 T_801_High_Interlock_2 (U)

8
Set by SCADA. Set to 1 to request automatic lead/lag pump assignment. PLC will reset this bit after latching it in P_803_Auto_Lead_Lag_Selection_Request
P803_Auto_LL_request_ONS ONS
P_803_Auto_Lead_Lag_Selection (L)
Set by SCADA. Set to 1 to request automatic lead/lag pump assignment. PLC will reset this bit after latching it in P_803_Auto_Lead_Lag_Selection_Request (U)

9
P_803B_Set_as_Lead
P_803C_Set_as_Lead
P_803_Auto_LL_unlatch_ONS ONS
P_803_Auto_Lead_Lag_Selection (U)

10
T_801_Lead_Pump_Control /
T801_Lead_Control_On_ONS ONS
P_803_Auto_Lead_Lag_Selection
T_801_Lead_Pump_Failure /
Set by SCADA 1=Auto 0=Manual P_803B_PLC_Auto_Mode
Set by SCADA 1=Auto 0= Manual P_803C_PLC_Auto_Mode
P_803B_Is_Lead_Pump P_803C_Set_as_Lead_Auto (L)
P_803B_Is_Lead_Pump / P_803B_Set_as_Lead_Auto (L)

11
P_803B_Set_as_Lead_Auto
P_803B_Is_Lead_Pump (L) P_803C_Is_Lead_Pump (U) P_803B_Set_as_Lead_Auto (U)

12
P_803C_Set_as_Lead_Auto
P_803C_Is_Lead_Pump (L) P_803B_Is_Lead_Pump (U) P_803C_Set_as_Lead_Auto (U)

13
P_803B_Set_as_Lead
P_803B_Lead_ONS ONS
Set by SCADA 1=Auto 0=Manual P_803B_PLC_Auto_Mode
Set by SCADA 1=Auto 0= Manual P_803C_PLC_Auto_Mode /
P_803B_Is_Lead_Pump (L) P_803C_Is_Lead_Pump (U)

14
P_803C_Set_as_Lead
P_803C_Lead_ONS ONS
Set by SCADA 1=Auto 0= Manual P_803C_PLC_Auto_Mode
Set by SCADA 1=Auto 0=Manual P_803B_PLC_Auto_Mode /
P_803C_Is_Lead_Pump (L) P_803B_Is_Lead_Pump (U)

15
P_803B_Start_CR <Local:7:O.Data.6>
1=Running, 0=Off P_803B_Pump_Status <Local:5:I.Data.2> /
TON Timer On Delay Timer P_803B_Failure_Timer Preset 5000 Accum 0 EN DN
P_803B_Failure_Timer.DN
P_803B_Failure (L)

16
Master_Alarm_Reset
T_801_Reset_Pump_Failure
P_803B_Failure (U)

17
P_803C_Start_CR <Local:7:O.Data.7>
1=Running, 0=Off P_803C_Pump_Status <Local:5:I.Data.3> /
TON Timer On Delay Timer P_803C_Failure_Timer Preset 5000 Accum 0 EN DN
P_803C_Failure_Timer.DN
P_803C_Failure (L)

18
Master_Alarm_Reset
T_801_Reset_Pump_Failure
P_803C_Failure (U)

19
T_801_Lead_Pump_Control
P_803B_Is_Lead_Pump P_803B_Failure
P_803C_Is_Lead_Pump P_803C_Failure
T_801_Lead_Pump_Failure (L)

20
Master_Alarm_Reset
T_801_Reset_Pump_Failure
T_801_Lead_Pump_Failure (U)

21
T_801_Lead_Pump_Failure
T_801_Lead_Pump_Failure_ONS ONS
P_803B_Is_Lead_Pump P_803C_Set_as_Lead_Auto (L)
P_803B_Is_Lead_Pump / P_803B_Set_as_Lead_Auto (L)

22
Set by SCADA 1=Auto 0=Manual P_803B_PLC_Auto_Mode
P_803B_transition_to_manual_ONS ONS
P_803B_Auto_Run_Cmd
Set to 1 to start pump, PLC will reset P_803B_PLC_Manual_Start L
P_803B_Auto_Run_Cmd
Set to 1 to stop pump, PLC will reset P_803B_PLC_Manual_Stop L

23
Set by SCADA 1=Auto 0=Manual P_803B_PLC_Auto_Mode
P_803B_Is_Lead_Pump
T_801_Lead_Pump_Control
P_803B_Failure
P_803B_Auto_Run_Cmd
P_803C_Failure
P_803C_Is_Lead_Pump
T_801_Lag_Pump_Control

24
P_803B_Failure
P_803BFailure_Manual_ONS ONS
Set by SCADA 1=Auto 0=Manual P_803B_PLC_Auto_Mode U
Set to 1 to stop pump, PLC will reset P_803B_PLC_Manual_Stop L

25
Set by SCADA 1=Auto 0=Manual P_803B_PLC_Auto_Mode
Set to 1 to start pump, PLC will reset P_803B_PLC_Manual_Start
P_803B_Failure
P_803B_Manual_Run_Cmd L

26
Set by SCADA 1=Auto 0=Manual P_803B_PLC_Auto_Mode
Set to 1 to stop pump, PLC will reset P_803B_PLC_Manual_Stop
P_803B_Failure
P_803B_Manual_Run_Cmd U
Set by SCADA 1=Auto 0=Manual P_803B_PLC_Auto_Mode

27
P_803B_Auto_Run_Cmd
LIT_803_Alarm.LInAlarm
S_801A_High_Interlock
Containment_Sump_High_Level
B_801A_Status <Local:5:I.Data.0>
P_803B_Start_CR <Local:7:O.Data.6>
P_803B_Manual_Run_Cmd

28
Set by SCADA 1=Auto 0= Manual P_803C_PLC_Auto_Mode
P_803C_transition_to_manual_ONS ONS
P_803C_Auto_Run_Cmd
P_803C_PLC_Manual_Start L
P_803C_Auto_Run_Cmd
P_803C_PLC_Manual_Stop L

29
Set by SCADA 1=Auto 0= Manual P_803C_PLC_Auto_Mode
P_803C_Is_Lead_Pump
T_801_Lead_Pump_Control
P_803C_Failure /
P_803C_Auto_Run_Cmd
P_803B_Failure
P_803B_Is_Lead_Pump
T_801_Lag_Pump_Control

30
P_803C_Failure
P_803CFailure_Manual_ONS ONS
Set by SCADA 1=Auto 0= Manual P_803C_PLC_Auto_Mode U
P_803C_PLC_Manual_Stop L

31
Set by SCADA 1=Auto 0= Manual P_803C_PLC_Auto_Mode /
P_803C_PLC_Manual_Start
P_803C_Failure /
P_803C_Manual_Run_Cmd L

32
Set by SCADA 1=Auto 0= Manual P_803C_PLC_Auto_Mode /
P_803C_PLC_Manual_Stop
P_803C_Failure
P_803C_Manual_Run_Cmd U
Set by SCADA 1=Auto 0= Manual P_803C_PLC_Auto_Mode

33
P_803C_Auto_Run_Cmd
LIT_803_Alarm.LInAlarm /
S_801A_High_Interlock /
Containment_Sump_High_Level /
B_801A_Status <Local:5:I.Data.0>
P_803C_Start_CR <Local:7:O.Data.7>
P_803C_Manual_Run_Cmd

Reset any bits that were set by the SCADA system.
This is because I dont trust momentary buttons in the SCADA

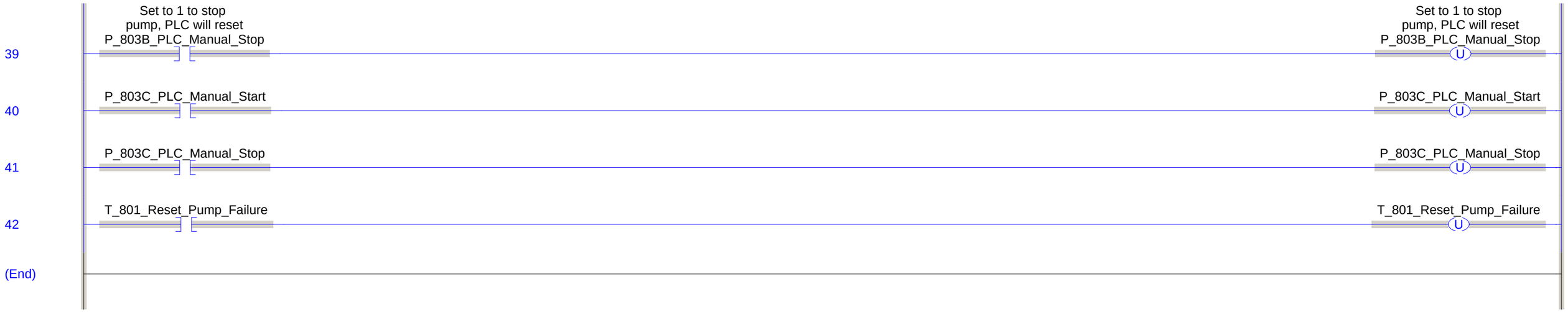
34
P_803B_Set_as_Lead
P_803B_Set_as_Lead U

35
P_803C_Set_as_Lead
P_803C_Set_as_Lead U

36
P_803B_Is_Lead_Pump
P_803C_Is_Lag_Pump

37
P_803C_Is_Lead_Pump
P_803B_Is_Lag_Pump

38
Set to 1 to start pump, PLC will reset P_803B_PLC_Manual_Start
Set to 1 to start pump, PLC will reset P_803B_PLC_Manual_Start U


39
Set to 1 to stop pump, PLC will reset
P_803B_PLC_Manual_Stop
Set to 1 to stop pump, PLC will reset
P_803B_PLC_Manual_Stop
U
40
P_803C_PLC_Manual_Start
P_803C_PLC_Manual_Start
U
41
P_803C_PLC_Manual_Stop
P_803C_PLC_Manual_Stop
U
42
T_801_Reset_Pump_Failure
T_801_Reset_Pump_Failure
U
(End)


0
T-802 Tank Level
GEQ
Grtr Than or Eql (A>=B)
Source A LIT_805.PV
2.32
Source B T_802_Lead_Pump_Start_SP
4.0
T_802_Lead_Pump_Control
L
1
T-802 Tank Level
LES
Less Than (A<B)
Source A LIT_805.PV
2.32
Source B T_802_Pump_Stop_SP
2.0
T_802_Lead_Pump_Control
U
2
T-802 Tank Level
GEQ
Grtr Than or Eql (A>=B)
Source A LIT_805.PV
2.32
Source B T_802_Lag_Pump_Start_SP
5.5
T_802_Lag_Pump_Control
L
3
T-802 Tank Level
LES
Less Than (A<B)
Source A LIT_805.PV
2.32
Source B T_802_Lead_Pump_Start_SP
4.0
T_802_Lag_Pump_Control
U
4
LIT_805_Alarm.HInAlarm
T_802_High_Interlock
L
5
T_802_High_Interlock
T_802_Lead_Pump_Control
/
T_802_Reset_High_Interlock
LIT_805_Alarm.HInAlarm
/
T_802_High_Interlock
U
6
P_810_Auto_Lead_Lag_Selection_Request
P810_Auto_LL_request_ONS
ONS
P_810_Auto_Lead_Lag_Selection
L
P_810_Auto_Lead_Lag_Selection_Request
U
7
P_810A_Set_as_Lead
P_810B_Set_as_Lead
P_810_Auto_LL_unlatch_ONS
ONS
P_810_Auto_Lead_Lag_Selection
U

8
T_802_Lead_Pump_Control /
T801_Lead_Control_Off_ONS ONS
P_810_Auto_Lead_Lag_Selection
T_802_Lead_Pump_Failure /
Set by SCADA 1=Auto 0=Manual P_810A_PLC_Auto_Mode
Set by SCADA 1=Auto 0=Manual P_810B_PLC_Auto_Mode
P_810A_Is_Lead_Pump P_810B_Set_as_Lead_Auto U
P_810A_Is_Lead_Pump / P_810A_Set_as_Lead_Auto U

9
P_810A_Set_as_Lead_Auto
P_810A_Is_Lead_Pump L
P_810B_Is_Lead_Pump U
P_810A_Set_as_Lead_Auto U

10
P_810B_Set_as_Lead_Auto
P_810B_Is_Lead_Pump L
P_810A_Is_Lead_Pump U
P_810B_Set_as_Lead_Auto U

11
P_810A_Set_as_Lead
P_810A_Lead_ONS ONS
Set by SCADA 1=Auto 0=Manual P_810A_PLC_Auto_Mode
Set by SCADA 1=Auto 0=Manual P_810B_PLC_Auto_Mode /
P_810A_Is_Lead_Pump L
P_810B_Is_Lead_Pump U

12
P_810B_Set_as_Lead
P_810B_Lead_ONS ONS
Set by SCADA 1=Auto 0=Manual P_810B_PLC_Auto_Mode
Set by SCADA 1=Auto 0=Manual P_810A_PLC_Auto_Mode /
P_810B_Is_Lead_Pump L
P_810A_Is_Lead_Pump U

13
1=Turn On P_810A_Start_CR <Local:7:O.Data.3>
1=Running, 0=Off P_810A_Pump_Status <Local:5:I.Data.6> /
TON Timer On Delay
Timer P_810A_Failure_Timer
Preset 5000
Accum 0
EN
DN
P_810A_Failure_Timer.DN
P_810A_Failure L

14
Master_Alarm_Reset
T_802_Reset_Pump_Failure
P_810A_Failure U

15
1=Turn On P_810B_Start_CR <Local:7:O.Data.4>
1=Running, 0=Off P_810B_Pump_Status <Local:5:I.Data.7>
TON Timer On Delay, Timer P_810B_Failure_Timer, Preset 5000, Accum 0, EN, DN
P_810B_Failure_Timer.DN
P_810B_Failure (L)

16
Master_Alarm_Reset
T_802_Reset_Pump_Failure
P_810B_Failure (U)

17
T_802_Lead_Pump_Control
P_810A_Is_Lead_Pump
P_810A_Failure
P_810B_Is_Lead_Pump
P_810B_Failure
T_802_Lead_Pump_Failure (L)

18
Master_Alarm_Reset
T_802_Reset_Pump_Failure
T_802_Lead_Pump_Failure (U)

19
T_802_Lead_Pump_Failure
T_802_Lead_Pump_Failure_ONS
P_810A_Is_Lead_Pump
P_810B_Set_as_Lead_Auto (L)
P_810A_Is_Lead_Pump /
P_810A_Set_as_Lead_Auto (L)

20
Set by SCADA 1=Auto 0=Manual P_810A_PLC_Auto_Mode /
P_810A_transition_to_manual_ONS
P_810A_Auto_Run_Cmd
Set to 1 to start pump, PLC will reset P_810A_PLC_Manual_Start (L)
P_810A_Auto_Run_Cmd /
Set to 1 to stop pump, PLC will reset P_810A_PLC_Manual_Stop (L)

21
Set by SCADA 1=Auto 0=Manual P_810A_PLC_Auto_Mode
P_810A_Is_Lead_Pump
T_802_Lead_Pump_Control
P_810A_Failure /
P_810B_Failure
P_810B_Is_Lead_Pump
T_802_Lag_Pump_Control
P_810A_Auto_Run_Cmd

22
P_810A_Failure
P810A_failure_manual_ONS
Set by SCADA 1=Auto 0=Manual P_810A_PLC_Auto_Mode (U)
Set to 1 to stop pump, PLC will reset P_810A_PLC_Manual_Stop (L)

23
Set by SCADA 1=Auto 0=Manual P_810A_PLC_Auto_Mode
Set to 1 to start pump, PLC will reset P_810A_PLC_Manual_Start
P_810A_Failure
P_810A_Manual_Run_Cmd (L)

24
Set by SCADA 1=Auto 0=Manual P_810A_PLC_Auto_Mode
Set to 1 to stop pump, PLC will reset P_810A_PLC_Manual_Stop
P_810A_Failure
Set by SCADA 1=Auto 0=Manual P_810A_PLC_Auto_Mode
P_810A_Manual_Run_Cmd (U)

25
P_810A_Auto_Run_Cmd
LIT_805_Alarm.LInAlarm
Containment_Sump_High_Level
P_810A_Manual_Run_Cmd
1=Turn On P_810A_Start_CR
<Local:7:O.Data.3>

26
Set by SCADA 1=Auto 0=Manual P_810B_PLC_Auto_Mode
P_810B_transition_to_manual_ONS
P_810B_Auto_Run_Cmd
Set to 1 to start pump, PLC will reset P_810B_PLC_Manual_Start (L)
P_810B_Auto_Run_Cmd
Set to 1 to stop pump, PLC will reset P_810B_PLC_Manual_Stop (L)

27
Set by SCADA 1=Auto 0=Manual P_810B_PLC_Auto_Mode
P_810B_Is_Lead_Pump
T_802_Lead_Pump_Control
P_810B_Failure
P_810A_Failure
P_810A_Is_Lead_Pump
T_802_Lag_Pump_Control
P_810B_Auto_Run_Cmd

28
P_810B_Failure
P_810B_Failure_manual_ONS
Set by SCADA 1=Auto 0=Manual P_810B_PLC_Auto_Mode (U)
Set to 1 to stop pump, PLC will reset P_810B_PLC_Manual_Stop (L)

29
Set by SCADA 1=Auto 0=Manual P_810B_PLC_Auto_Mode
Set to 1 to start pump, PLC will reset P_810B_PLC_Manual_Start
P_810B_Failure
P_810B_Manual_Run_Cmd (L)

30
Set by SCADA 1=Auto 0=Manual P_810B_PLC_Auto_Mode
Set to 1 to stop pump, PLC will reset P_810B_PLC_Manual_Stop
P_810B_Failure
Set by SCADA 1=Auto 0=Manual P_810B_PLC_Auto_Mode
P_810B_Manual_Run_Cmd (U)

31
P_810B_Auto_Run_Cmd
LIT_805_Alarm.LInAlarm
Containment_Sump_High_Level
P_810B_Manual_Run_Cmd
1=Turn On P_810B_Start_CR <Local:7:O.Data.4>

32
P_810A_Set_as_Lead
P_810A_Set_as_Lead (U)

33
P_810B_Set_as_Lead
P_810B_Set_as_Lead (U)

34
P_810A_Is_Lead_Pump
P_810B_Is_Lag_Pump

35
P_810B_Is_Lead_Pump
P_810A_Is_Lag_Pump

36
Set to 1 to start pump, PLC will reset P_810A_PLC_Manual_Start
Set to 1 to start pump, PLC will reset P_810A_PLC_Manual_Start (U)

37
Set to 1 to stop pump, PLC will reset P_810A_PLC_Manual_Stop
Set to 1 to stop pump, PLC will reset P_810A_PLC_Manual_Stop (U)

38
Set to 1 to start pump, PLC will reset P_810B_PLC_Manual_Start
Set to 1 to start pump, PLC will reset P_810B_PLC_Manual_Start (U)

39
Set to 1 to stop pump, PLC will reset P_810B_PLC_Manual_Stop
Set to 1 to stop pump, PLC will reset P_810B_PLC_Manual_Stop (U)

40
T_802_Reset_Pump_Failure
T_802_Reset_Pump_Failure (U)

(End)

If the Tank Level is greater then or equal to the Lead Pump Start Setpoint
Then Turn on the Lead Pump Command

0

GEQ
Grtr Than or Eql (A>=B)
Source A LT_207.PV
1.64
Source B TK_002_Lead_Pump_Start_SP
3.0

TK_002_Lead_Pump_Control
(L)

If the Tank Level is less then the Pump Stop Setpoint
Then Turn off the Lead Pump Command

1

LES
Less Than (A<B)
Source A LT_207.PV
1.64
Source B TK_002_Pump_Stop_SP
0.75

TK_002_Lead_Pump_Control
(U)

If the Tank Level is greater then or equal to the Lag Pump Start Setpoint
Then turn on the Lag Pump Command

2

GEQ
Grtr Than or Eql (A>=B)
Source A LT_207.PV
1.64
Source B TK_002_Lag_Pump_Start_SP
3.5

TK_002_Lag_Pump_Control
(L)

If the Tank Level is less then the Lag Pump Start Setpoint
Then turn off the Lag Pump Command

3

LES
Less Than (A<B)
Source A LT_207.PV
1.64
Source B TK_002_Pump_Stop_SP
0.75

TK_002_Lag_Pump_Control
(U)

When the Automatic Lead Lag Selection button is pressed on the HMI, turn on the Auto Lead Lag Selection bit, and reset the Pushbutton bit

4

P_0607_Auto_Lead_Lag_Selection_Request
P0607_Auto_LL_request_ONS
ONS
P_0607_Auto_Lead_Lag_Selection
(L)
P_0607_Auto_Lead_Lag_Selection_Request
(U)

If either Set as Lead pushbutton is pressed on the HMI, then turn off the Auto Lead Lag Selection bit

5

P_006_Set_as_Lead
P_007_Set_as_Lead
P_0607_Auto_LL_unlatch_ONS
ONS
P_0607_Auto_Lead_Lag_Selection
(U)

When the Lead Pump Command Turns off, if Auto Lead Lag Selection is Active, and both Pumps are in PLC Auto mode, and there was no lead pump failure, then set the correct P_X_Set_As_Lead_Auto signal

6

TK_002_Lead_Pump_Control /
TK002_Lead_Control_On_ONS ONS
P_0607_Auto_Lead_Lag_Selection
TK_002_Lead_Pump_Failure /
P_006_PLC_Auto_Mode
P_007_PLC_Auto_Mode

P_006_Is_Lead_Pump
P_007_Set_as_Lead_Auto (L)

P_006_Is_Lead_Pump /
P_006_Set_as_Lead_Auto (L)

If P_6_Set_As_Lead_Auto signal is on, then set the P 6 is lead pump bit, and reset the P 7 is lead pump bit, and reset the p6 set as lead auto command bit

7

P_006_Set_as_Lead_Auto
P_006_Is_Lead_Pump (L)
P_007_Is_Lead_Pump (U)
P_006_Set_as_Lead_Auto (U)

If P_7_Set_As_Lead_Auto signal is on, then set the P 7 is lead pump bit, and reset the P 6 is lead pump bit, and reset the p7 set as lead auto command bit

8

P_007_Set_as_Lead_Auto
P_007_Is_Lead_Pump (L)
P_006_Is_Lead_Pump (U)
P_007_Set_as_Lead_Auto (U)

If the P 6 set as lead pump Pushbutton is pressed on the HMI, or if P6 is auto and P 7 is not auto, then set p6 as lead, and reset p7 is lead bit

9

P_006_Set_as_Lead
P_006_Lead_ONS ONS
P_006_Is_Lead_Pump (L)
P_007_Is_Lead_Pump (U)

P_006_PLC_Auto_Mode
P_007_PLC_Auto_Mode /

If the P 7 set as lead pump pushbutton is pressed on the HMI, or if P7 is auto and P6 is not auto, then set p7 as lead and reset p6 is lead bit

10

P_007_Set_as_Lead
P_007_Lead_ONS ONS
P_007_Is_Lead_Pump (L)
P_006_Is_Lead_Pump (U)

P_007_PLC_Auto_Mode
P_006_PLC_Auto_Mode /

If P6 output is on with no status feedback. then after a time delay, signal the Fail to Start alarm

11

P_006_Start_CR
<Local:8:O.Data.0>
P_006_Pump_Status
<Local:5:I.Data.8> /

TON
Timer On Delay
Timer P_006_Failure_Timer
Preset 5000
Accum 0
EN
DN

P_006_Failure_Timer.DN
P_006_Failure (L)

If a reset pushbutton is pressed on the HMI unlatch the Alarm

12

Master_Alarm_Reset
P_006_Failure (U)

TK_002_Reset_Pump_Failure

If P7 output is on with no status feedback. then after a time delay, signal the Fail to Start alarm

13

P_007_Start_CR <Local:8:O.Data.1>
P_007_Pump_Status <Local:5:I.Data.9> /
TON Timer On Delay, Timer P_007_Failure_Timer, Preset 5000, Accum 0, EN, DN
P_007_Failure_Timer.DN
P_007_Failure (L)

If a reset pushbutton is pressed on the HMI unlatch the Alarm

14

Master_Alarm_Reset
TK_002_Reset_Pump_Failure
P_007_Failure (U)

If the Lead Pump command is active, and the lead pump fails, set the Lead Pump Failure bit
this will prevent automatic alternation of the lead pumps, until the fault is reset (from the HMI)

15

TK_002_Lead_Pump_Control
P_006_Is_Lead_Pump
P_006_Failure
P_007_Is_Lead_Pump
P_007_Failure
TK_002_Lead_Pump_Failure (L)

16

Master_Alarm_Reset
TK_002_Reset_Pump_Failure
TK_002_Lead_Pump_Failure (U)

If the lead pump fails, set the non failed pump to become lead pump

17

TK_002_Lead_Pump_Failure
TK_002_Lead_Pump_Failure_ONS ONS
P_006_Is_Lead_Pump
P_007_Set_as_Lead_Auto (L)
P_006_Is_Lead_Pump /
P_006_Set_as_Lead_Auto (L)

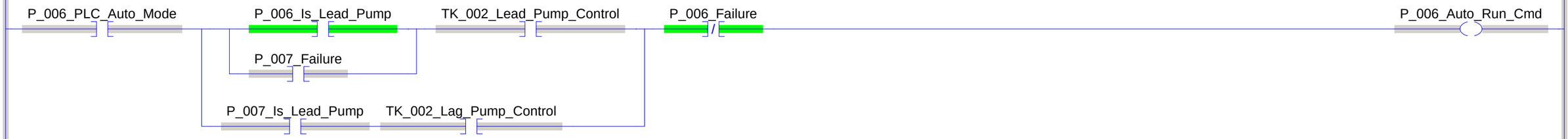
If the pump is put into PLC manual mode, then copy the status of the current auto command to the manual command, so the pump stays on or off

18

P_006_PLC_Auto_Mode /
P_006_transition_to_manual_ONS ONS
P_006_Auto_Run_Cmd
P_006_PLC_Manual_Start (L)
P_006_Auto_Run_Cmd /
P_006_PLC_Manual_Stop (L)

Run the pump if it is in PLC Auto mode And
It is lead pump and lead pump command is on OR
other pump failed and lead pump command is on OR
It is lag pump and lag pump command is on AND
Pump fail to start alarm is OFF

19



If the pump fails to start, put it into manual mode, and set the manual stop command
this will de-engergize the output

20

If the pump is in PLC manual mode, and the start buttons is pressed from the HMI, then set the manual run command

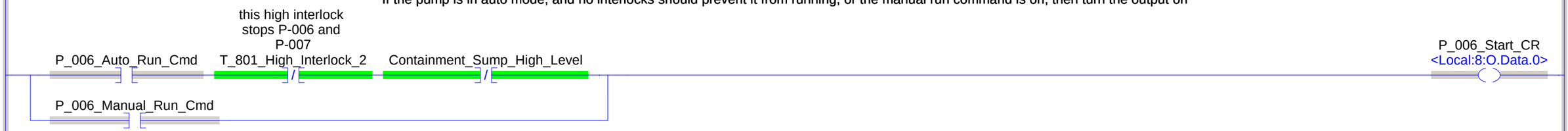
21

If the pump is in PLC Manula mode, and the stop button is pressed from the HMI, then reset the manual run comnmand
or if the pump is in PLC auto mode, reset the manual run commnad

22

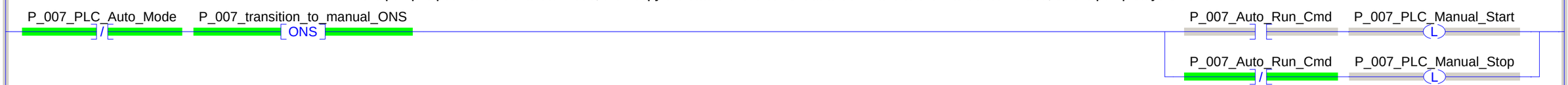
If the pump is in auto mode, and no interlocks should prevent it from running, or the manual run command is on, then turn the output on

23



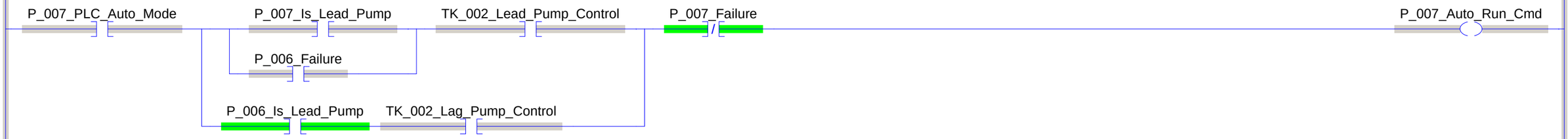
If the pump is put into PLC manual mode, then copy the status of the current auto command to the manual command, so the pump stays on or off

24



Run the pump if it is in PLC Auto mode And
It is lead pump and lead pump command is on OR
other pump failed and lead pump command is on OR
It is lag pump and lag pump command is on AND
Pump fail to start alarm is OFF

25



If the pump fails to start, put it into manual mode, and set the manual stop command
this will de-engergize the output

26

If the pump is in PLC manual mode, and the start buttons is pressed from the HMI, then set the manual run command

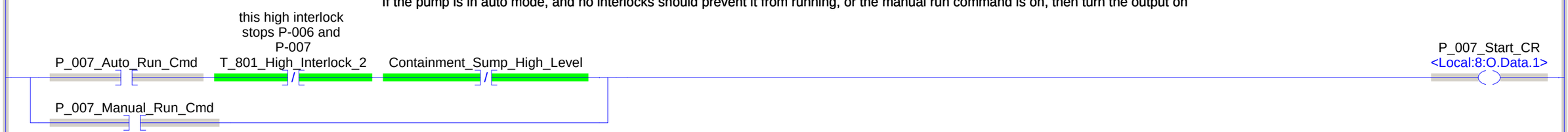
27

If the pump is in PLC Manula mode, and the stop button is pressed from the HMI, then reset the manual run comnmand
or if the pump is in PLC auto mode, reset the manual run commnad

28

If the pump is in auto mode, and no interlocks should prevent it from running, or the manual run command is on, then turn the output on

29



The following rungs reset bits which are set by the HMI

30

31

32


33
P_007_Is_Lead_Pump
P_006_Is_Lag_Pump
34
P_006_PLC_Manual_Start
P_006_PLC_Manual_Start
U
35
P_006_PLC_Manual_Stop
P_006_PLC_Manual_Stop
U
36
P_007_PLC_Manual_Start
P_007_PLC_Manual_Start
U
37
P_007_PLC_Manual_Stop
P_007_PLC_Manual_Stop
U
38
TK_002_Reset_Pump_Failure
TK_002_Reset_Pump_Failure
U
(End)

```
1  SBR(TempRC);
2
3  If TempRC.Reset Then
4      TempRC.Seconds := 0;
5      TempRC.Minutes := 0;
6      TempRC.Hours := 0;
7  End_If;
8
9  TempRC.Seconds := TempRC.Seconds + 1;
10
11 If( TempRC.Seconds > 59) Then
12     TempRC.Seconds := 0;
13     TempRC.Minutes := TempRC.Minutes + 1;
14
15     If( TempRC.Minutes > 59) Then
16         TempRC.Minutes := 0;
17         TempRC.Hours := TempRC.Hours + 1;
18     End_If;
19
20 End_If;
21
22 Ret(TempRC);
```

0
PW_1_Pump_Status
<Slave_Radio_12.N8[2].0>

JSR
Jump To Subroutine
Routine Name Handle_RC
Input Par PW_1_Runtime
Return Par PW_1_Runtime

1
PW_3_Pump_Status
<Slave_Radio_13.N8[2].0>

JSR
Jump To Subroutine
Routine Name Handle_RC
Input Par PW_3_Runtime
Return Par PW_3_Runtime

2
PW_4_Pump_Status
<Slave_Radio_11.N8[2].0>

JSR
Jump To Subroutine
Routine Name Handle_RC
Input Par PW_4_Runtime
Return Par PW_4_Runtime

3
P_2_Pump_Status
<Slave_Radio_11.N8[4].0>

JSR
Jump To Subroutine
Routine Name Handle_RC
Input Par P_2_Runtime
Return Par P_2_Runtime

4
P_3_Pump_Status
<Slave_Radio_14.N8[2].0>

JSR
Jump To Subroutine
Routine Name Handle_RC
Input Par P_3_Runtime
Return Par P_3_Runtime

5
P_4_Pump_Status
<Slave_Radio_14.N8[4].0>

JSR
Jump To Subroutine
Routine Name Handle_RC
Input Par P_4_Runtime
Return Par P_4_Runtime

6
1=Running, 0=Off
P_803B_Pump_Status
<Local:5:I.Data.2>

JSR
Jump To Subroutine
Routine Name Handle_RC
Input Par P_803B_Runtime
Return Par P_803B_Runtime

7
1=Running, 0=Off
P_803C_Pump_Status
<Local:5:I.Data.3>

JSR
Jump To Subroutine
Routine Name Handle_RC
Input Par P_803C_Runtime
Return Par P_803C_Runtime

8
1=Running, 0=Off
P_805A_Pump_Status
<Local:5:I.Data.4>

JSR
Jump To Subroutine
Routine Name Handle_RC
Input Par P_805A_Runtime
Return Par P_805A_Runtime

9
1=Running, 0=Off
P_805C_Pump_Status
<Local:5:I.Data.5>

JSR
Jump To Subroutine
Routine Name Handle_RC
Input Par P_805C_Runtime
Return Par P_805C_Runtime

10
1=Running, 0=Off
P_810A_Pump_Status
<Local:5:I.Data.6>

JSR
Jump To Subroutine
Routine Name Handle_RC
Input Par P_810A_Runtime
Return Par P_810A_Runtime

11
1=Running, 0=Off
P_810B_Pump_Status
<Local:5:I.Data.7>

JSR
Jump To Subroutine
Routine Name Handle_RC
Input Par P_810B_Runtime
Return Par P_810B_Runtime

12
P_001_Pump_Status
<Local:2:I.Data.8>

JSR
Jump To Subroutine
Routine Name Handle_RC
Input Par P_001_Runtime
Return Par P_001_Runtime

13
P_002_Pump_Status
<Local:2:I.Data.9>

JSR
Jump To Subroutine
Routine Name Handle_RC
Input Par P_002_Runtime
Return Par P_002_Runtime

14
P_003_Pump_Status
<Local:2:I.Data.10>

JSR
Jump To Subroutine
Routine Name Handle_RC
Input Par P_003_Runtime
Return Par P_003_Runtime

15
P_006_Pump_Status
<Local:5:I.Data.8>

JSR
Jump To Subroutine
Routine Name Handle_RC
Input Par P_006_Runtime
Return Par P_006_Runtime

16
P_007_Pump_Status
<Local:5:I.Data.9>
JSR
Jump To Subroutine
Routine Name Handle_RC
Input Par P_007_Runtime
Return Par P_007_Runtime

17
P_001_Pump_Status
<Local:2:I.Data.8>
p001_on_ONS
ONS
CTU
Count Up
Counter P_001_Cycle_Count
Preset 100
Accum 642
CU
DN

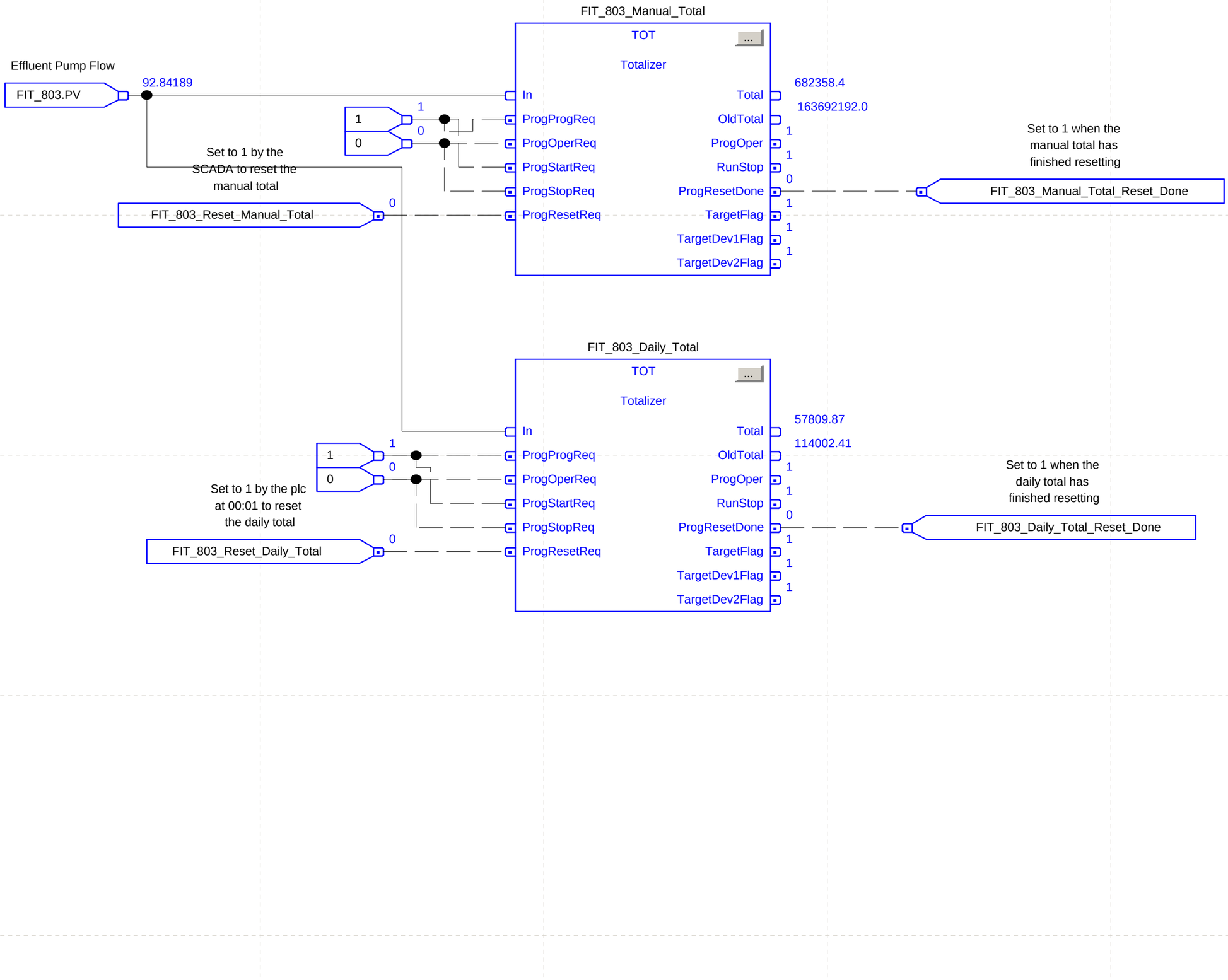
18
P_002_Pump_Status
<Local:2:I.Data.9>
p002_on_ONS
ONS
CTU
Count Up
Counter P_002_Cycle_Count
Preset 100
Accum 139
CU
DN

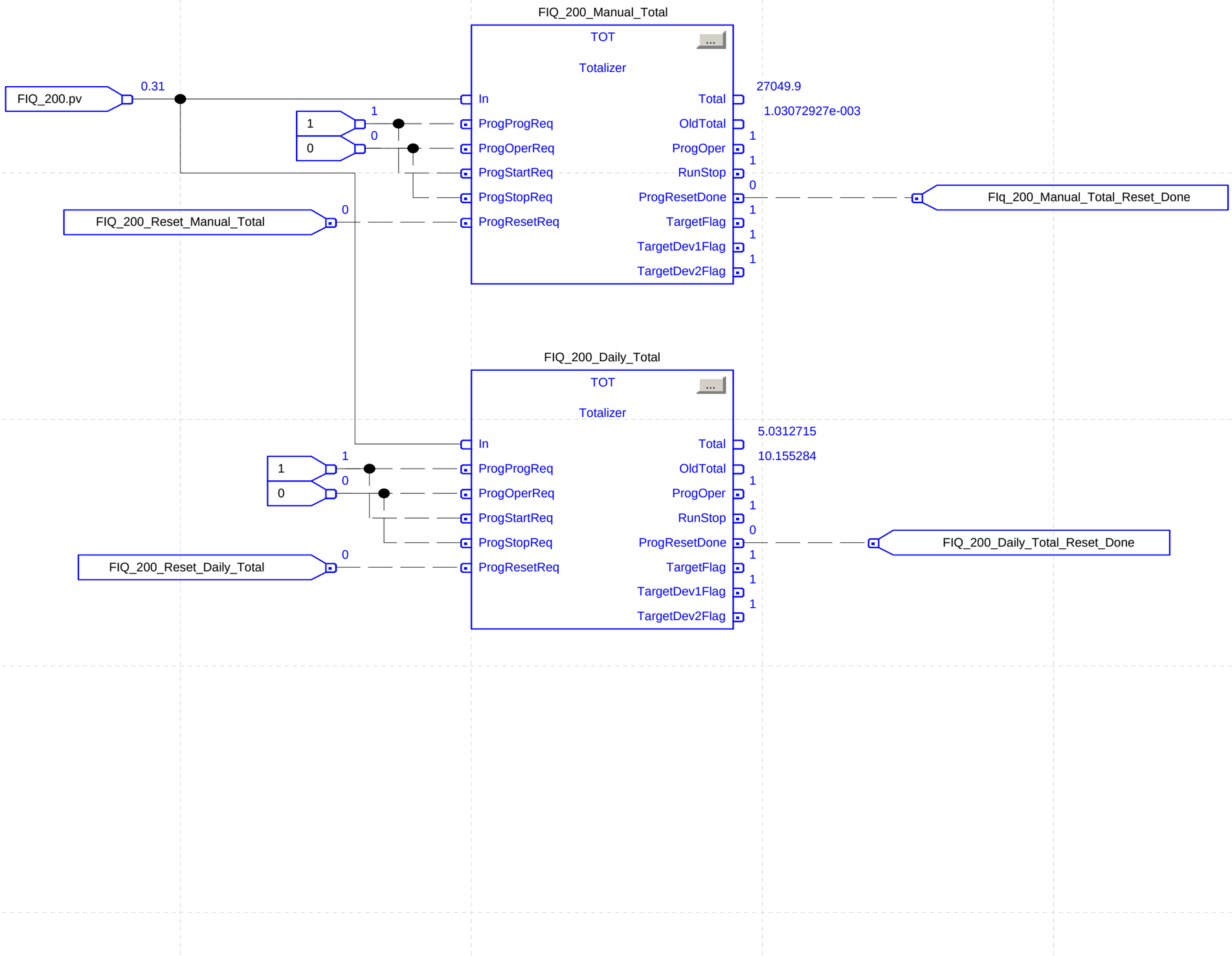
19
P_003_Pump_Status
<Local:2:I.Data.10>
p003_on_ONS
ONS
CTU
Count Up
Counter P_003_Cycle_Count
Preset 100
Accum 10
CU
DN

20
P_006_Pump_Status
<Local:5:I.Data.8>
p006_on_ONS
ONS
CTU
Count Up
Counter P_006_Cycle_Count
Preset 100
Accum 19
CU
DN

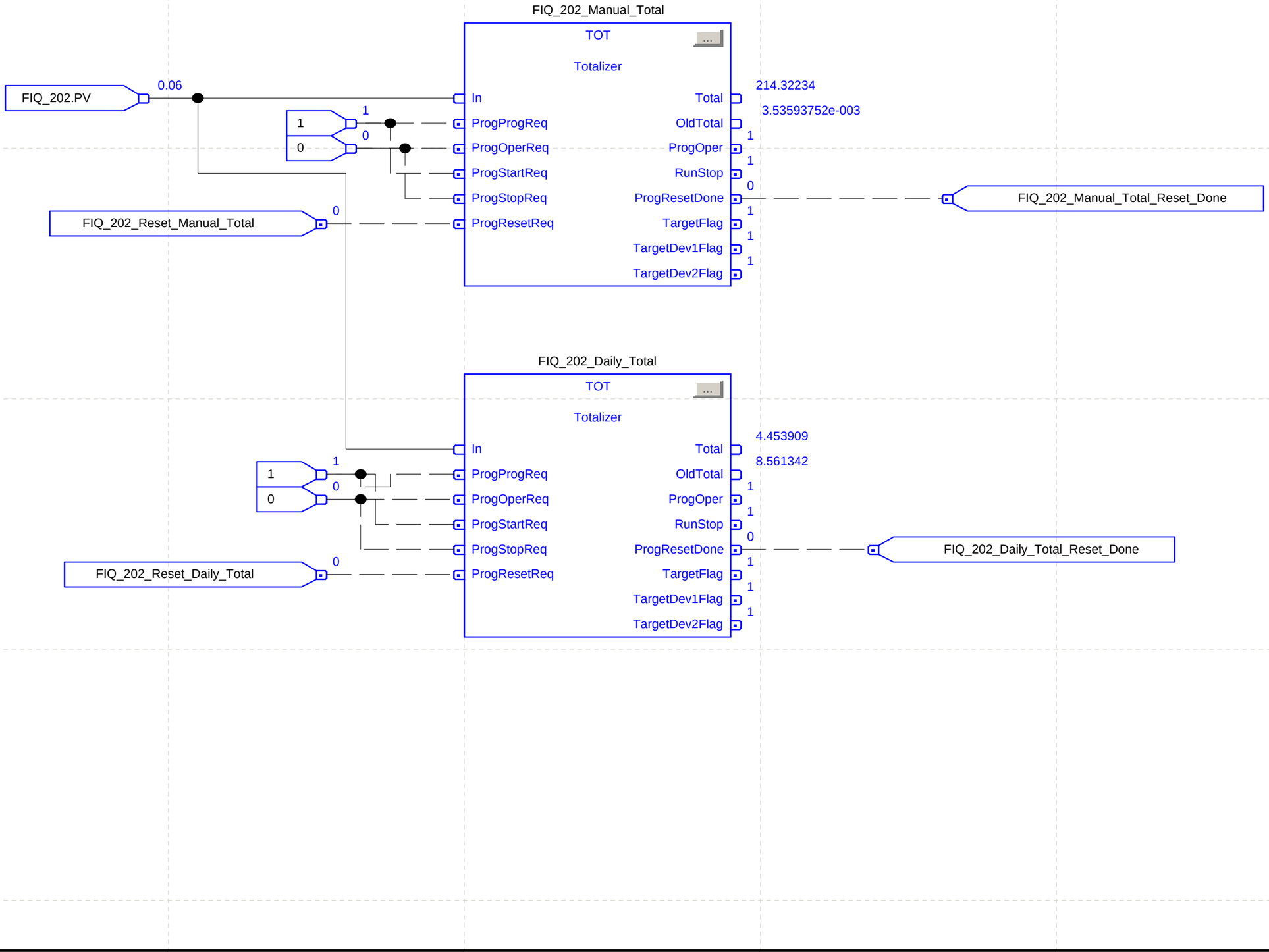
21
P_007_Pump_Status
<Local:5:I.Data.9>
p007_on_ONS
ONS
CTU
Count Up
Counter P_007_Cycle_Count
Preset 100
Accum 20
CU
DN

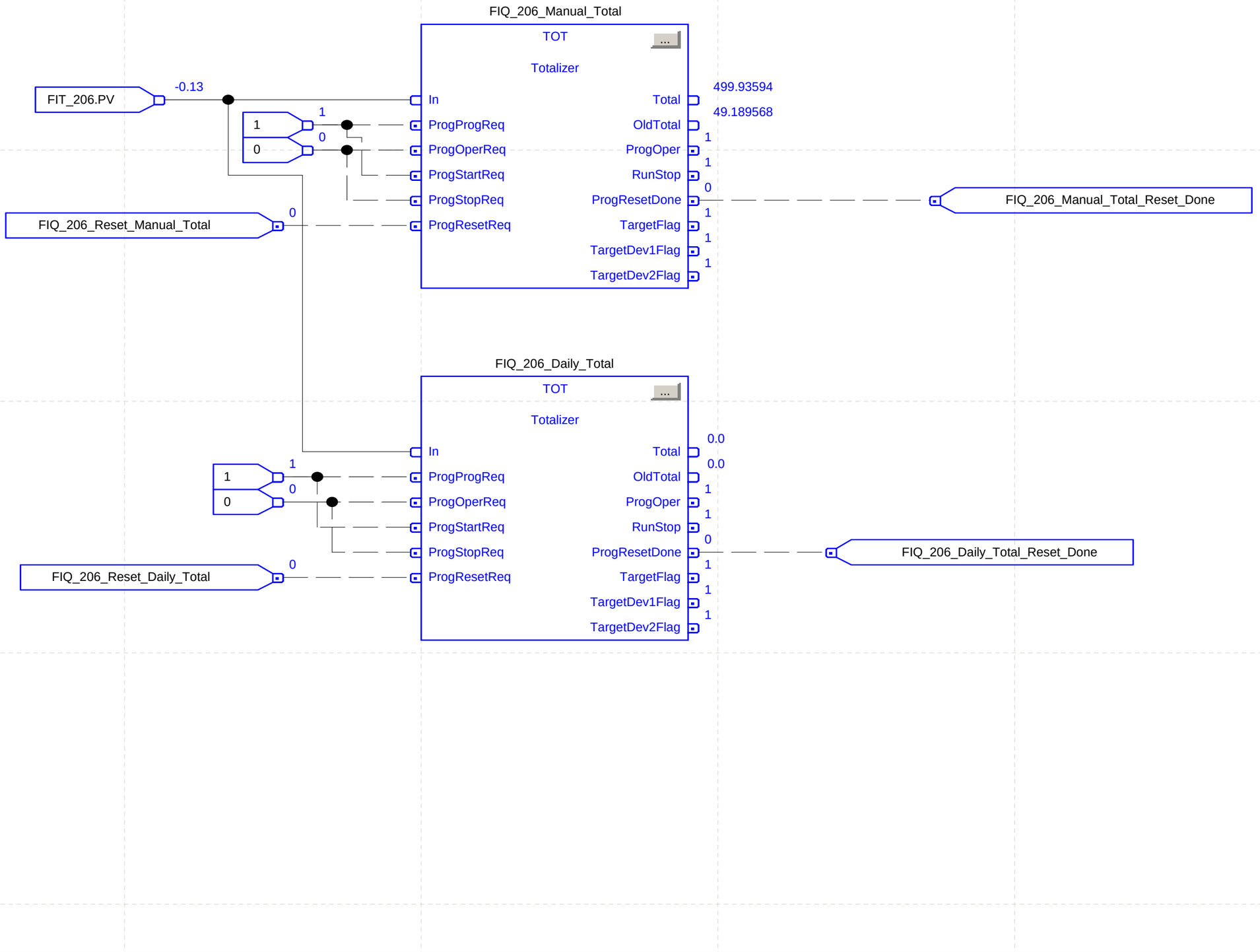
(End)


FIT_803_Manual_Total
TOT
Totalizer
Effluent Pump Flow
FIT_803.PV
92.84189
In
ProgProgReq
ProgOperReq
ProgStartReq
ProgStopReq
ProgResetReq
1
0
Set to 1 by the SCADA to reset the manual total
FIT_803_Reset_Manual_Total
Total
OldTotal
ProgOper
RunStop
ProgResetDone
TargetFlag
TargetDev1Flag
TargetDev2Flag
682358.4
163692192.0
Set to 1 when the manual total has finished resetting
FIT_803_Manual_Total_Reset_Done
FIT_803_Daily_Total
Set to 1 by the plc at 00:01 to reset the daily total
FIT_803_Reset_Daily_Total
57809.87
114002.41
Set to 1 when the daily total has finished resetting
FIT_803_Daily_Total_Reset_Done


FIQ_200_Manual_Total
TOT
Totalizer
...
FIQ_200.pv
0.31
1
0
In
ProgProgReq
ProgOperReq
ProgStartReq
ProgStopReq
ProgResetReq
FIQ_200_Reset_Manual_Total
0
Total
OldTotal
ProgOper
RunStop
ProgResetDone
TargetFlag
TargetDev1Flag
TargetDev2Flag
27049.9
1.03072927e-003
1
1
0
1
1
1
Flq_200_Manual_Total_Reset_Done
FIQ_200_Daily_Total
TOT
Totalizer
...
1
0
In
ProgProgReq
ProgOperReq
ProgStartReq
ProgStopReq
ProgResetReq
FIQ_200_Reset_Daily_Total
0
Total
OldTotal
ProgOper
RunStop
ProgResetDone
TargetFlag
TargetDev1Flag
TargetDev2Flag
5.0312715
10.155284
1
1
0
1
1
1
FIQ_200_Daily_Total_Reset_Done

FIQ_201_Manual_Total
TOT
Totalizer
FIQ_201.PV
364.09
1
0
FIQ_201_Reset_Manual_Total
0
In
ProgProgReq
ProgOperReq
ProgStartReq
ProgStopReq
ProgResetReq
Total
OldTotal
ProgOper
RunStop
ProgResetDone
TargetFlag
TargetDev1Flag
TargetDev2Flag
1533973.6
0.010096876
1
1
0
1
1
1
FIQ_201_Manual_Total_Reset_Done
FIQ_201_Daily_Total
TOT
Totalizer
1
0
FIQ_201_Reset_Daily_Total
0
In
ProgProgReq
ProgOperReq
ProgStartReq
ProgStopReq
ProgResetReq
Total
OldTotal
ProgOper
RunStop
ProgResetDone
TargetFlag
TargetDev1Flag
TargetDev2Flag
256875.77
446795.3
1
1
0
1
1
1
FIQ_201_Daily_Total_Reset_Done


FIQ_202_Manual_Total
TOT
Totalizer
FIQ_202.PV
0.06
In
1
1
0
ProgProgReq
0
ProgOperReq
ProgStartReq
ProgStopReq
FIQ_202_Reset_Manual_Total
0
ProgResetReq
214.32234
Total
3.53593752e-003
OldTotal
1
ProgOper
1
RunStop
0
ProgResetDone
FIQ_202_Manual_Total_Reset_Done
1
TargetFlag
1
TargetDev1Flag
1
TargetDev2Flag
FIQ_202_Daily_Total
TOT
Totalizer
In
1
1
0
ProgProgReq
0
ProgOperReq
ProgStartReq
ProgStopReq
FIQ_202_Reset_Daily_Total
0
ProgResetReq
4.453909
Total
8.561342
OldTotal
1
ProgOper
1
RunStop
0
ProgResetDone
FIQ_202_Daily_Total_Reset_Done
1
TargetFlag
1
TargetDev1Flag
1
TargetDev2Flag


FIQ_206_Manual_Total
TOT
Totalizer
FIT_206.PV
-0.13
In
1
1
0
ProgProgReq
0
ProgOperReq
ProgStartReq
ProgStopReq
FIQ_206_Reset_Manual_Total
0
ProgResetReq
Total
499.93594
OldTotal
49.189568
ProgOper
1
RunStop
1
ProgResetDone
0
TargetFlag
1
TargetDev1Flag
1
TargetDev2Flag
1
FIQ_206_Manual_Total_Reset_Done
FIQ_206_Daily_Total
TOT
Totalizer
In
1
1
0
ProgProgReq
0
ProgOperReq
ProgStartReq
ProgStopReq
FIQ_206_Reset_Daily_Total
0
ProgResetReq
Total
0.0
OldTotal
0.0
ProgOper
1
RunStop
1
ProgResetDone
0
TargetFlag
1
TargetDev1Flag
1
TargetDev2Flag
1
FIQ_206_Daily_Total_Reset_Done

0

JSR
Jump To Subroutine
Routine Name Totalizers

1

Set to 1 when the manual total has finished resetting
FIT_803_Manual_Total_Reset_Done

FIT_803_Total_Reset_Done_ONS
ONS

Year
COP
Copy File
Source PLC_Local_Date_Time[0]
Dest FIT_803_Manual_Total_Last_Reset[0]
Length 7

Set to 1 by the SCADA to reset the manual total
FIT_803_Reset_Manual_Total
U

2

Set to 1 when the daily total has finished resetting
FIT_803_Daily_Total_Reset_Done

FIT_803_Total_Daily_Reset_Done_ONS
ONS

Year
COP
Copy File
Source PLC_Local_Date_Time[0]
Dest FIT_803_Daily_Total_Last_Reset[0]
Length 7

3

Day
NEQ
Not Equal
Source A PLC_Local_Date_Time[2] 22
Source B FIT_803_Daily_Total_Last_Reset[2] 22

Set to 1 by the plc at 00:01 to reset the daily total
FIT_803_Reset_Daily_Total

4

FIq_200_Manual_Total_Reset_Done

FIT_200_Total_Reset_Done_ONS
ONS

COP
Copy File
Source PLC_Local_Date_Time[0]
Dest FIQ_200_Manual_Total_Last_Reset[0]
Length 7

FIQ_200_Reset_Manual_Total
U

5

FIQ_200_Daily_Total_Reset_Done

FIQ_200_Total_Daily_Reset_Done_ONS
ONS

COP
Copy File
Source PLC_Local_Date_Time[0]
Dest FIQ_200_Daily_Total_Last_Reset[0]
Length 7

6

Day
NEQ
Not Equal
Source A PLC_Local_Date_Time[2] 22
Source B FIQ_200_Daily_Total_Last_Reset[2] 22

FIQ_200_Reset_Daily_Total

7

FIQ_201_Manual_Total_Reset_Done

FIT_201_Total_Reset_Done_ONS
ONS

COP
Copy File
Source PLC_Local_Date_Time[0]
Dest FIQ_201_Manual_Total_Last_Reset[0]
Length 7

FIQ_201_Reset_Manual_Total
U

8
FIQ_201_Daily_Total_Reset_Done FIQ_201_Total_Daily_Reset_Done_ONS
ONS
COP
Copy File
Source PLC_Local_Date_Time[0]
Dest FIQ_201_Daily_Total_Last_Reset[0]
Length 7

9
Day
NEQ
Not Equal
Source A PLC_Local_Date_Time[2]
22
Source B FIQ_201_Daily_Total_Last_Reset[2]
22
FIQ_201_Reset_Daily_Total

10
FIQ_202_Manual_Total_Reset_Done FIT_202_Total_Reset_Done_ONS
ONS
COP
Copy File
Source PLC_Local_Date_Time[0]
Dest FIQ_202_Manual_Total_Last_Reset[0]
Length 7
FIQ_202_Reset_Manual_Total
U

11
FIQ_202_Daily_Total_Reset_Done FIQ_202_Total_Daily_Reset_Done_ONS
ONS
COP
Copy File
Source PLC_Local_Date_Time[0]
Dest FIQ_202_Daily_Total_Last_Reset[0]
Length 7

12
Day
NEQ
Not Equal
Source A PLC_Local_Date_Time[2]
22
Source B FIQ_202_Daily_Total_Last_Reset[2]
22
FIQ_202_Reset_Daily_Total

13
FIQ_206_Manual_Total_Reset_Done FIT_206_Total_Reset_Done_ONS
ONS
COP
Copy File
Source PLC_Local_Date_Time[0]
Dest FIQ_206_Manual_Total_Last_Reset[0]
Length 7
FIQ_206_Reset_Manual_Total
U

14
FIQ_206_Daily_Total_Reset_Done FIQ_206_Total_Daily_Reset_Done_ONS
ONS
COP
Copy File
Source PLC_Local_Date_Time[0]
Dest FIQ_206_Daily_Total_Last_Reset[0]
Length 7

15
Day
NEQ
Not Equal
Source A PLC_Local_Date_Time[2]
22
Source B FIQ_206_Daily_Total_Last_Reset[2]
22
FIQ_206_Reset_Daily_Total

(End)

Data type Name: AI_DS

Description:

Size 120 byte(s)

Name	Data Type	Style	Description
PV	REAL	Float	
Fault	BOOL	Decimal	
Eng_Min	REAL	Float	
Eng_Max	REAL	Float	
⊞ EGU	STRING		
Raw_Min	INT	Decimal	
Raw_Max	INT	Decimal	
Limit_Scaling	BOOL	Decimal	
Raw_Input	INT	Decimal	
M	REAL	Float	
B	REAL	Float	

Data type Name: Radio_DS

Description:

Size 340 byte(s)

Name	Data Type	Style	Description
Signal_Strength	INT	Decimal	
Temperature	INT	Decimal	
Voltage	INT	Decimal	
N7	INT[145]	Decimal	
N8	INT[18]	Decimal	
SS_Fault	BOOL	Decimal	

Data type Name: Runtime_Couter

Description:

Size 16 byte(s)

Name	Data Type	Style	Description
Hours	DINT	Decimal	
Minutes	DINT	Decimal	
Seconds	DINT	Decimal	
Reset	BOOL	Decimal	

Data type Name: STRING

Description:

Size 88 byte(s)

Name	Data Type	Style	Description
LEN	DINT	Decimal	
DATA	SINT[82]	ASCII	

SECTION 4
PLC DRAWINGS (See Appendix A)

SECTION 5
NEWPORT INFCP APPLICABLE TO LI-200, LI-201 & LI-203

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THE NEW STANDARD FOR QUALITY

CE

INFCP and INFCP-xxxB

INFINITY® C Process Panel Meter

Operator's Manual

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http://www.newportUS.com	info@newportUS.com

PREFACE

Manual Objectives

This manual shows you how to set up and use the Programmable Digital Meter.

Standard Procedures:

* Checking voltage jumpers, or changing voltage power
* Mounting the panel
* Selecting the input type
* Selecting a decimal point position
* Scaling with known loads (on-line calibration)
* Scaling without known loads
* Enabling/disabling the front-panel tare
* Displaying the filtered/unfiltered input signal
* Selecting a display color
* Setting the setpoint's active band
* Selecting a latched or unlatched operation
* Setting setpoint deadbands
* Enabling/disabling setpoint changes
* Enabling/disabling the RESET button in the Run Mode

Optional Procedures:

* Setting input resolution
* Enabling/disabling analog output
* Selecting analog output as current or voltage
* Selecting analog output or proportional control
* Selecting proportional band
* Using manual reset (offsetting setpoint errors)
* Scaling analog output

For first-time users: Refer to the QuickStart Manual for basic operation and set-up instructions.

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Table A-1. Sections of the Manual

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List of Tables

NOTES, WARNINGS and CAUTIONS

Information that is especially important to note is identified by three labels:

- **NOTE**
- **WARNING**
- **CAUTION**
- **IMPORTANT**

NOTE: provides you with information that is important to successfully setup and use the Programmable Digital Meter.

CAUTION or WARNING: tells you about the risk of electric shock.

CAUTION, WARNING or IMPORTANT: tells you of circumstances or practices that can effect the meter's functionality and must refer to accompanying documents.

TIP: Provides you helpful hints.

SECTION 1. INTRODUCTION

1.1 UNPACKING

Remove the Packing List and verify that all equipment has been received. If there are any questions about the shipment, use the phone numbers listed on the back cover to contact the Customer Service Department nearest you.

Upon receipt of shipment, inspect the container and equipment for any signs of damage. Take particular note of any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

Verify that you receive the following items in the shipping box:

QTY	DESCRIPTION
1	Programmable Digital Meter indicator/controller with all applicable connectors attached.
1	Owner's Manual
1	Set Mounting brackets

If you ordered any of the available options (except the "BL" Blank Lens option), they will be shipped in a separate container to avoid any damage to your indicator/controller.

1.2 SAFETY CONSIDERATIONS

This device is marked with the **international caution symbol**. It is **important to read** this manual before installing or commissioning this device as it contains important information relating to **Safety and EMC** (Electromagnetic Compatibility).

This instrument is a **panel mount** device protected in accordance with EN 61010-1:2001, electrical safety requirements for electrical equipment for measurement, control and laboratory. Installation of this instrument should be done by qualified personnel. In order to ensure safe operation, the following instructions should be followed.

This instrument has **no power-on switch**. An external **switch or circuit-breaker** shall be included in the building installation as a disconnecting device. It shall be marked to indicate this function, and it shall be in close proximity to the equipment within easy reach of the operator. The switch or circuit-breaker shall not interrupt the Protective Conductor (Earth wire), and it shall meet the relevant requirements of IEC 947–1 and IEC 947-3 (International Electrotechnical Commission). The switch shall not be incorporated in the main supply cord.

Furthermore, to provide protection against **excessive energy** being drawn from the main supply in case of a fault in the equipment, an **overcurrent** protection device shall be installed.

- Do not exceed voltage rating on the label located on the top of the instrument housing.
- Always disconnect power before changing signal and power connections.
- Do not use this instrument on a work bench without its case for safety reasons.
- Do not operate this instrument in flammable or explosive atmospheres.
- Do not expose this instrument to rain or moisture.
- Unit mounting should allow for adequate ventilation to ensure instrument does not exceed operating temperature rating.
- Use electrical wires with adequate size to handle mechanical strain and power requirements. Install without exposing bare wire outside the connector to minimize electrical shock hazards.

EMC Considerations

- Whenever EMC is an issue, always use shielded cables.
- Never run signal and power wires in the same conduit.
- Use signal wire connections with twisted-pair cables.
- Install Ferrite Bead(s) on signal wires close to the instrument if EMC problems persist.

Failure to follow all instructions and warnings may result in injury!

SECTION 2. ABOUT THE METER

2.1 DESCRIPTION

The Digital Programmable Process meter is a value packed indicator/controller. Four full digits and broad scaling capability allow for display in virtually all engineering units. A wide variety of DC current and voltage input ranges cover typical process applications. Standard features include sensor excitation and front panel or remote tare. Your meter may be a basic indicator or it may include analog output or dual relay output. Analog or dual relay output must be ordered at time of purchase. Analog output is fully scalable and may be configured as a proportional controller, or to follow your display. Dual 5 amp, form C relays control critical processes. A mechanical lockout has been included to guard against unauthorized changes.

2.2 FEATURES

The following is a list of standard features:

* 4-digit three color Programmable “Big” LED display or 4-digit, Standard LED Display
* NEMA 4 / Type 4 Front Bezel
* ±0.03 % accuracy
* 8 DC input ranges: 0-100 mV, ±50 mV, 0-5 V, 1-5 V, 0-10 V, ±5 V, 0-20 mA, and 4-20 mA
* 5, 10, 12, or 24 Vdc sensor excitation
* Peak detection
* Front panel and remote tare function
* Nonvolatile memory-no battery backup
* 115 or 230 Vac 50/60 Hz power supply or 10-32 Vdc or 26-56 Vdc

The following is a list of optional features:

* Dual 5 amp, form C relay outputs
* Scalable analog output
* Proportional control
* Easy setup for proportional control

Note Features with NEW are for the “B” version which has three-color programmable “Big” LED display - All segment characters shown are for the “B” version.

2.3 AVAILABLE ACCESSORIES

Table 2-1. Accessories and Add-Ons

Add-On Options

FS	Special Calibration/Configuration
SPC4	NEMA-4 Splash Proof Cover
SPC18	NEMA-4 Splash Proof Cover, NEW

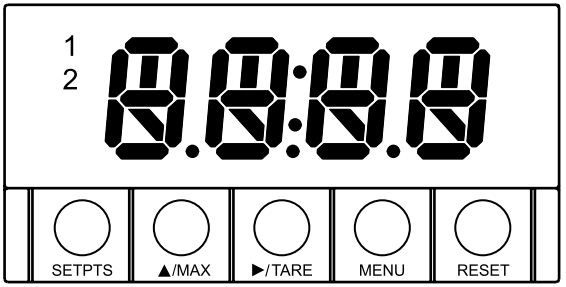
Accessories

TP1A	Trimplate panel adaptor. Adapts DIN1A/DIN2A cases to larger panel cutouts
RP18	19-In. Rack Panel for one (1) 1/8 DIN instrument
RP28	19-In. Rack Panel for two (2) 1/8 DIN instruments
RP38	19-In. Rack Panel for three (3) 1/8 DIN instruments

2.4 FRONT OF THE METER

NEW

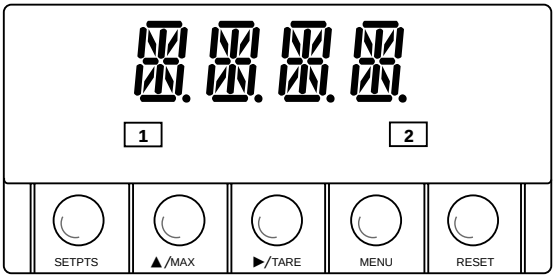
Figure 2-1 shows each part of the front of the three-color programmable "Big" LED display meter (Version B).



Digital LED Display:
-1.9.9.9 or 9.9.9.9 4-digit three color programmable, 21 mm (0.83") high LED display with programmable decimal point.

Figure 2-1. Front-Panel with Big Display

Figure 2-2 shows each part of the front of the standard LED display meter.



Digital LED Display:
-1.9.9.9. or 9.9.9.9.
14 segment, 13.8 mm (0.54") high LED display with programmable decimal point.

Figure 2-2. Front-Panel wtih Standard Display

These meter display windows (both versions) light when appropriate:

1 - Setpoint 1 status
2 - Setpoint 2 status

5 Pushbuttons for programming the meter.

2.4 FRONT OF THE METER(Continued)

METER BUTTONS

SETPTS Button

In the Run Mode, this button will sequentially recall the previous setpoint settings. As necessary, use the ▲**/MAX** and ▶**/TARE** buttons to alter these settings, then press the **SETPTS** button to store new values.

Unless you press the **SETPTS**, ▶**/TARE**, or ▲**/MAX** button within 20 seconds, the meter will scroll to setpoint 2 and then to the Run Mode.

Note ☞ *If the dual relay option is not installed or if the* L.3=1 *on the* LK.CF *menu, pressing the* ***SETPTS*** *button will display the meter's firmware version.*

▲**/MAX** Button

In the Run Mode, this button will recall the **PEAK** reading since the last press of the **RESET** button.

In the Configuration Mode, press this button to change the value of the flashing digit shown on the display and/or toggle between menu choices, such as R.1=t or R.1=N on Rd.CF menu. When configuring your setpoint values, press the ▲**/MAX** button to advance the flashing digit's value from 0 to 9 by 1.

▶**/TARE** Button

In the Run Mode press the ▶**/TARE** button to tare your reading (zeroing) if you configure the Reading Configuration bit R.1=t of the Rd.CF menu. If you configure R.1=N, the ▶**/TARE** button has no function.

In the Configuration Mode, press the this button to scroll to the next digit.

2.4 FRONT OF THE METER(Continued)

MENU Button

In the Run Mode, press the **MENU** button to terminate the current measuring process and enter you into the Configuration Mode.

Note ☞ *Only if you have not installed the lockout jumpers on the main board.*

In the Configuration Mode, press the **MENU** button to store changes in the nonvolatile memory and then advance you to the next menu item.

RESET Button

If you hard reset (press the **MENU** button followed by the **RESET** button) or power off/on the meter, it shows RSt, followed by PROC.

In the Run Mode, press the **RESET** button to reset tare, if any. The meter shows t.RSt and returns to the Run Mode.

In the Configuration Mode, press the **RESET** button once to review the previous menu. Press the **RESET** button twice to perform a hard reset and return to the Run Mode.

In the Peak Mode, press the **RESET** button to reset peak values. The meter shows PK.RS and returns to the Run Mode.

In the Setpoint Mode, press the **RESET** button to reset the latched setpoint. The meter shows SP.RS and enters the Run Mode.

Note ☞ *When in setpoint or Configuration Mode, if the meter shows 9999 or -1999 with all flashing digits, the value has overflowed. Press the* ▲**/MAX** *button to start a new value.*

2.5 BACK OF THE METER

Figure 2-2 shows the label describing the connectors on the back of the meter. Table 2-2 on the following page gives a brief description of each connector at the back of the meter.

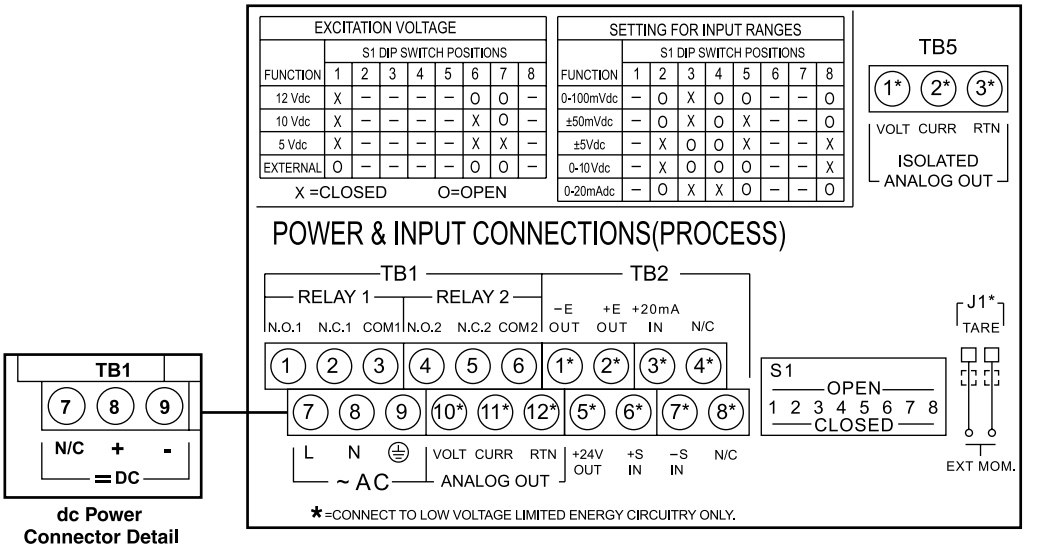


Figure 2-3. Connector Label (AC-Powered and DC-Powered Detail)

2.5 BACK OF THE METER (Continued)

Table 2-2. Connector Description

Connector	Description
TB1-1	Setpoint 1: Normally open (N.O.1) connection
TB1-2	Setpoint 1: Normally closed (N.C.1) connection
TB1-3	Setpoint 1: Common (COM1) connection
TB1-4	Setpoint 2: Normally open (N.O.2) connection
TB1-5	Setpoint 2: Normally closed (N.C.2) connection
TB1-6	Setpoint 2: Common (COM2) connection
TB1-7	AC line connection (no connections on DC-powered units)
TB1-8	AC neutral connection (+ Input on DC-powered units)
TB1-9	AC earth ground (DC-power return on DC-powered units)
TB1-10	Analog voltage output
TB1-11	Analog current output
TB1-12	Analog return
TB2-1	-E: Negative excitation connection from meter (5, 10, 12 V)
TB2-2	+E: Positive excitation connection from meter (5, 10, 12 V)
TB2-3	+20 mA connection for analog input
TB2-4	Not used.
TB2-5	+24 V output connection
TB2-6	+S: Positive signal input
TB2-7	-S: Negative signal input and return for +20 mA or +24 V
TB2-8	Not used
TB5-1	Isolated Analog Voltage Output
TB5-2	Isolated Analog Current Output
TB5-3	Isolated Analog Output Return
J1 (1-2)	Remote tare connection with a momentary switch

The DIP switches are located at the S1 position (refer to Figure 3-2). Use a small instrument, such as a paper clip, to change the switches from open to closed. Table 2-3 lists DIP switch settings at the S1 position required to complete the setup of your meter.

Table 2-3. DIP Switch Positions/Input Range & Excitation

Function	S1 DIP Switch Positions							
C= Closed O= Open	1	2	3	4	5	6	7	8
Settings for Excitation Voltage								
Internal 5/10/12 excitation	C	-	-	-	-	-	-	-
External 5/10/12 excitation	O	-	-	-	-	O	O	-
Internal 12 Vdc excitation	C	-	-	-	-	O	O	-
Internal 10 Vdc excitation	C	-	-	-	-	C	O	-
Internal 5 Vdc excitation	C	-	-	-	-	C	C	-
Settings for Input Ranges								
0-100 mV DC	-	O	C	O	O	-	-	O
±50 mV DC	-	O	C	O	C	-	-	O
±5 Vdc	-	C	O	O	C	-	-	C
0-10 Vdc	-	C	O	O	O	-	-	C
0-20 mA DC	-	O	C	C	O	-	-	O

Note The display must also be configured to the selected input type after setting the DIP switches (see Section 4.1, Selecting the Input Type)

2.6 DISASSEMBLY

You may need to open up the meter for one of the following reasons:

- To check or change the 115 or 230 Vac power jumpers.
- To install or remove jumpers on the main board.

Note Disconnect the power supply before proceeding.

To remove and access the main board, follow these steps:

- Disconnect the main power from the meter.
- Remove the back case cover.
- Lift the back of the main board upwards and let it slide out of the case.

SECTION 3. GETTING STARTED

Caution: The meter has no power-on switch, so it will be in operation as soon you apply power.

If you power off/on the meter, or perform a hard reset (press the **RESET** button twice), the meter shows RSt, followed by PROC.

3.1 RATING/PRODUCT LABEL

This label is located on top of the meter housing (refer to Figure 3-4).

3.2 MAIN BOARD POWER JUMPERS (refer to Figure 3-1)

Note

Important: If you want to change the Factory preset jumpers, do the following steps; otherwise go to section 3.3.

Warning: Disconnect the power from the unit before proceeding. This device must only be reconfigured by a specially trained electrician with corresponding qualifications. Failure to follow all instructions and warnings may result in injury!

1. Remove the main board from the case. Refer to Section 2.6.
2. Locate the solder jumpers W1, W2, and W3 (located near the edge of the main board alongside the transformer).
3. If your power requirement is **115 Vac, solder jumpers W1 and W3 should be wired, but jumper W2 should not.** If your power requirement is **230 Vac, solder jumper W2 should be wired, but jumpers W1 and W3 should not.**

   Note: W4 jumper is not used.

Figure 3-1 shows the location of solder jumpers W1 through W3.

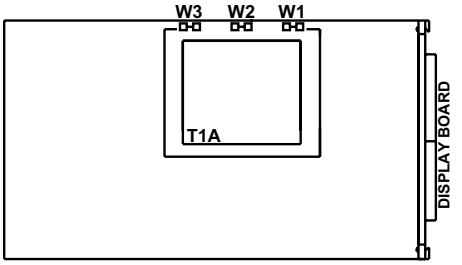


Figure 3.1 Main Board Power Jumpers

3.2 MAIN BOARD POWER JUMPERS (Continued)

Figure 3-2 shows the location jumper positions on the main board.

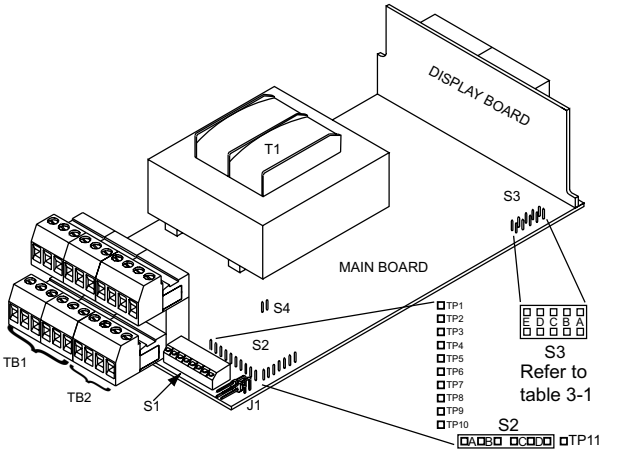


Figure 3-2. Main Board Jumper Positions

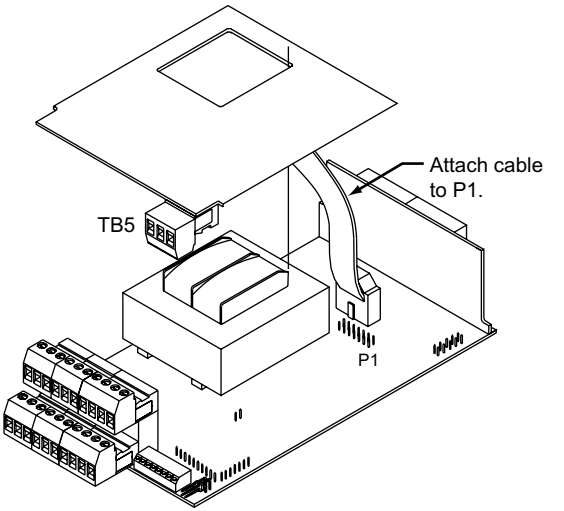


Figure 3-3. Upper Isolated Analog Output Option Board Installation

3.2 MAIN BOARD POWER JUMPERS (Continued)

S2 jumpers are used for testing purposes. Do not use as reading errors may result.
S3 jumpers are used for the following (refer to Figure 3-2):

* To enable or disable the front panel push-buttons
* To allow for an extremely low resistance load for analog output
* To disable the **MENU** button
* To perform calibration procedure

Test pins TP1 - TP11 are for testing purposes. Do not use as reading errors may result.
S4-A Factory default jumper installed.

Table 3-1. S3 Jumper Functions

Jumper	Description
S3-A	Install to enable front panel push-buttons. Remove to disable all front panel push-buttons.
S3-B	Removed. Install for factory calibration only.
S3-C	Removed. Not used.
S3-D	Removed. Not used.
S3-E	If installed without S3-B, the **MENU** button locks out. If you press the **MENU** button, the meter shows LOCK.

3.3 PANEL MOUNTING

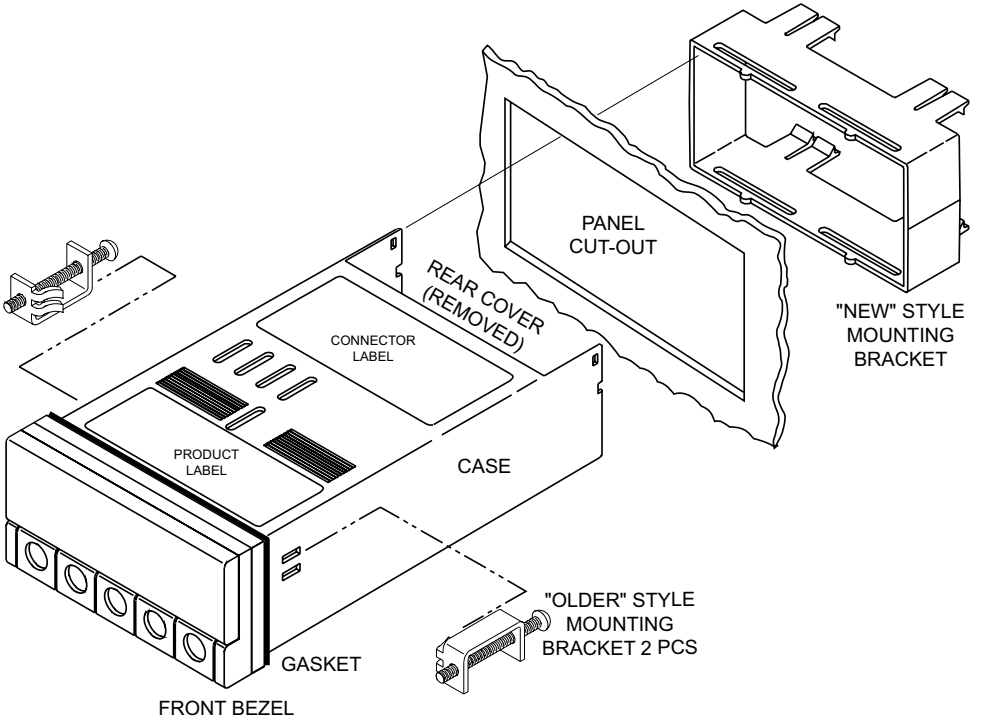
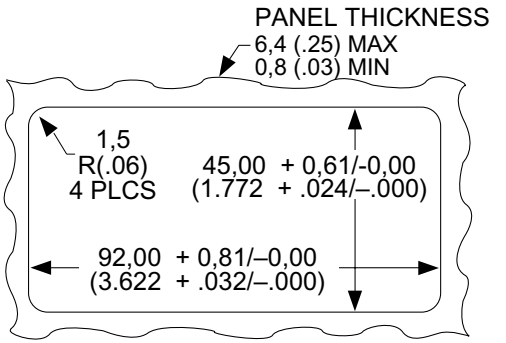


Figure 3-4. Meter - Exploded View

1. Cut a hole in your panel, as shown in **Figure 3-4**. For specific dimensions refer to **Figure 3-5**.
2. Insert the meter into the hole. Be sure the front bezel gasket is flush to the panel.
3. Slide on mounting bracket to secure.
4. Proceed to **Section 3.4** to connect your sensor input and main power.



NOTE: Dimensions in Millimeters (Inches)

Figure 3-5. Panel Cut-Out

3.4 CONNECTING SENSOR INPUTS

Figures 3-6 through 3-12 describe how to connect your sensors.

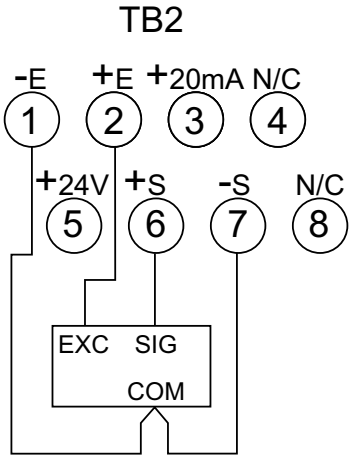


Figure 3-6. 3-Wire DC Input Connections with Internal Excitation

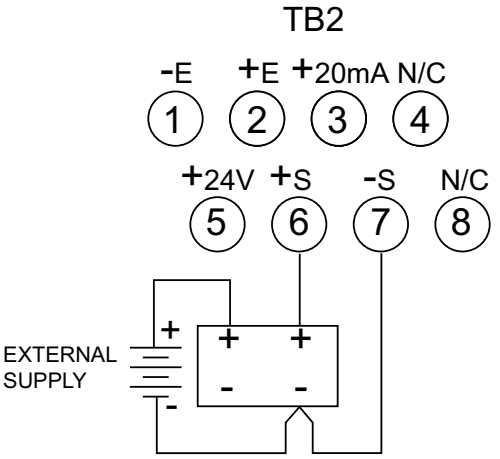


Figure 3-7. 3-Wire DC Input Connections with External Excitation

3.4 CONNECTING SENSOR INPUTS (Continued)

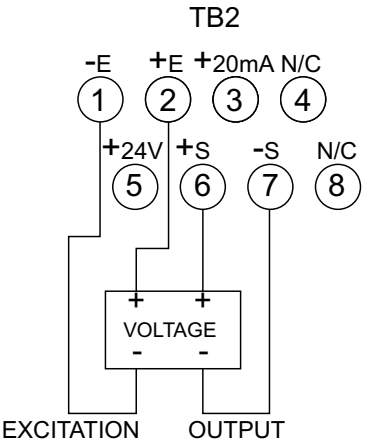


Figure 3-8. 4-Wire DC Input Connections with Internal Excitation

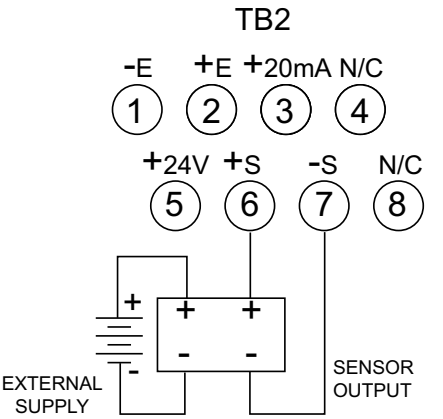


Figure 3-9. Wire DC Input Connections with External Excitation

3.4 CONNECTING SENSOR INPUTS (Continued)

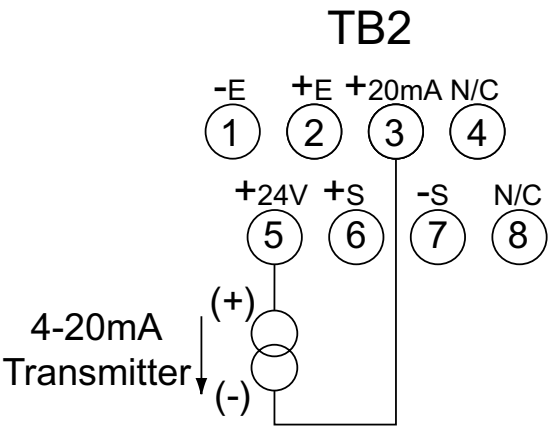


Figure 3-10. DC Current Input Connections with Internal Excitation

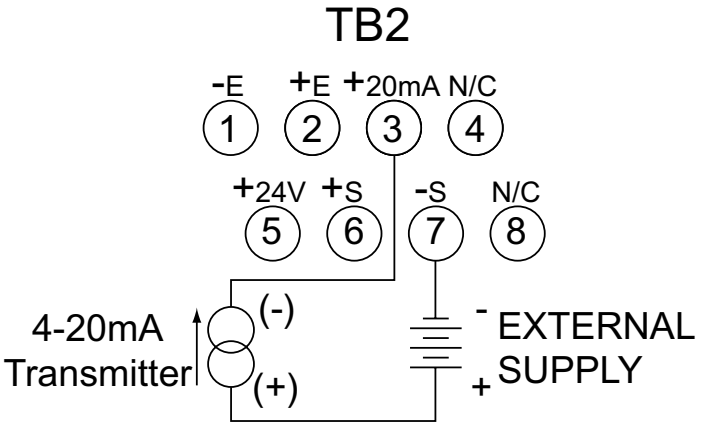


Figure 3-11. DC Current Input Connections with External Excitation

3.4 CONNECTING SENSOR INPUTS (Continued)

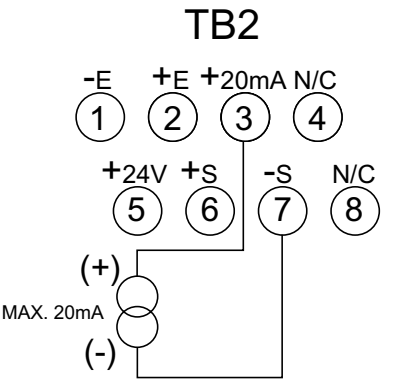


Figure 3-12. DC Current Input Connections with Current Source

3.5 CONNECTING MAIN POWER

Connect the AC main power connections as shown in Figure 3-13.

WARNING: Do not connect AC power to your device until you have completed all input and output connections. This device must only be installed by a specially trained electrician with corresponding qualifications. Failure to follow all instructions and warnings may result in injury!

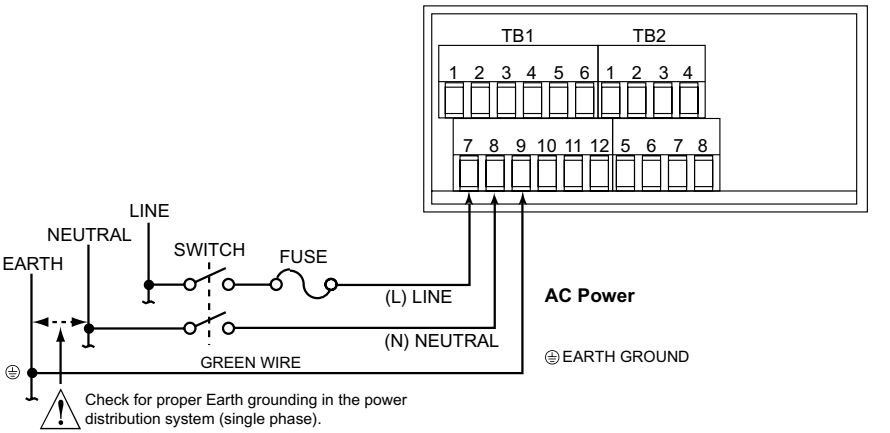


Figure 3-13. Main Power Connections - AC Powered Unit

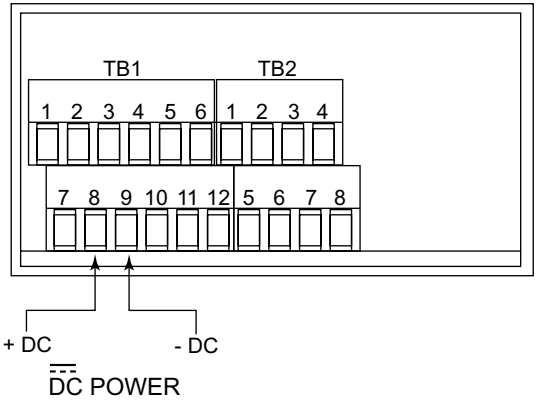
3.5 CONNECTING MAIN POWER (Continued)

Table 3-2 shows the wire color and respective terminal connections for both USA and Europe.

Table 3-2. Main Power Connection - AC Powered Unit

		WIRE COLORS	
TB1	**AC POWER**	**EUROPE**	**USA**
7	∿ AC Line	Brown	Black
8	∿ AC Neutral	Blue	White
9	∿ AC Earth	Green/Yellow	Green

Connect the DC main power connections as shown in Figure 3-14.



When using DC power, refer to the Table 8-1 Color Chart in the Specifications Section for Display Color, Intensity, Excitation Voltage and Current, and Analog Output Isolated Option. Failure to use proper ratings may result in damaging the unit.

Figure 3-14. Main Power Connections - DC Powered Unit

3.6 CONNECTING EXTERNAL TARE SWITCH

Connect external tare connections as shown in Figure 3-15.

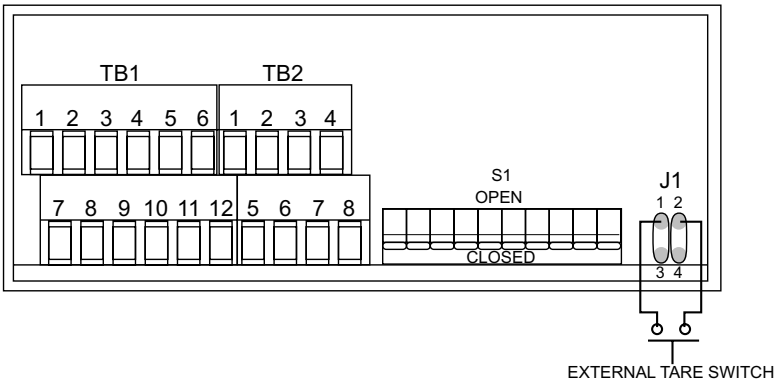


Figure 3-15. External Tare Connections

3.7 CONNECTING ANALOG AND RELAY OUTPUTS

If you have purchased a meter with analog or dual relay or isolated analog output, refer to the following drawings for output connections.

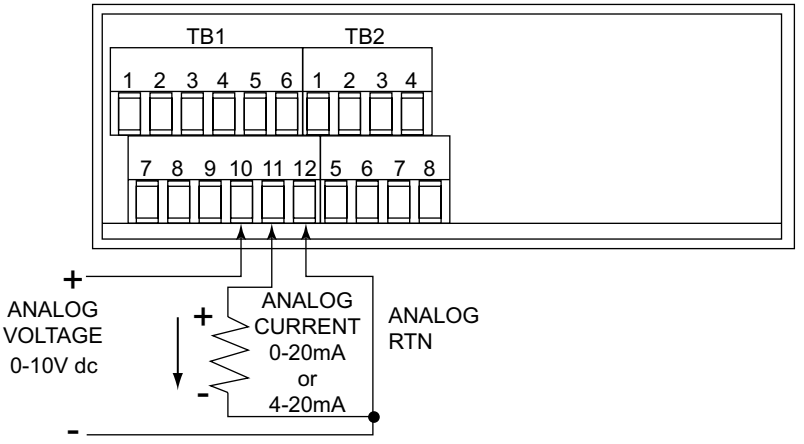


Figure 3-16. Analog Output Connections

3.7 CONNECTING ANALOG AND RELAY OUTPUTS (Continued)

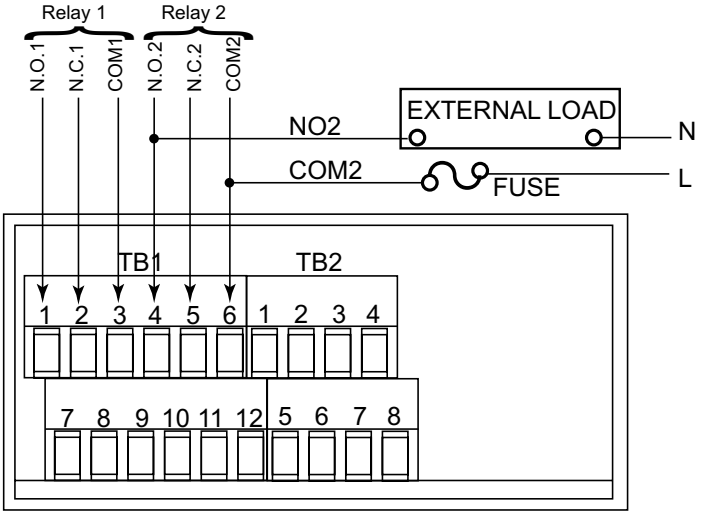


Figure 3-17. Relay Output Connections.

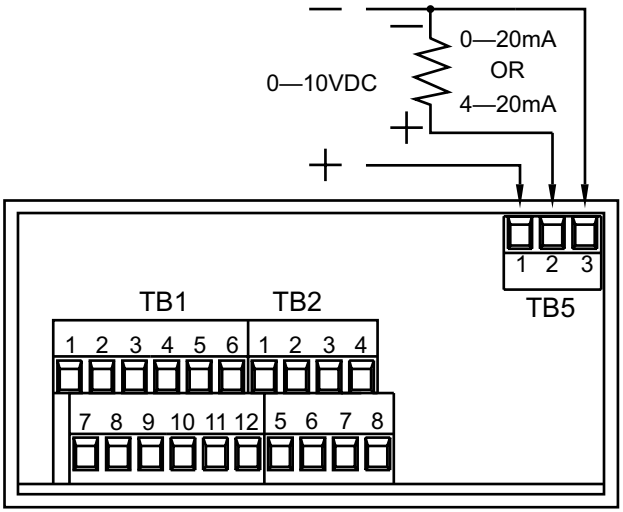


Figure 3-18. Isolated Analog Output Connections.

SECTION 4. CONFIGURING THE METER

Note ☞ Refer to Table 6-1 for a summary list of menu configuration.

4.1 SELECTING THE INPUT TYPE INPt

To select your appropriate input type signal, follow these steps:

Note ☞ Before proceeding, set the input DIP switch settings at the back of your meter. (Refer to Table 2-3).

1. Press the **MENU** button. The meter shows INPt.

2. Press the ►/**TARE** button. The meter flashes one of the following:

   - 0-20 ***(for 4-20 mA dc)*** (Default)
   - 100M (for 0-100 mV dc)
   - ±50M (for ±50 mV dc)
   - 10V (for 0-10 Vdc)
   - ±5V (for ±5 Vdc)

3. Press the ▲/**MAX** button to scroll through available choices.

4. Press the **MENU** button to store your choice. The meter momentarily shows StRd, followed by dEC.P (Decimal Point).

4.2 SELECTING A DECIMAL POINT POSITION dEC.P

Note Refer to Table 6-1 for a summary list of menu configuration.

To select a decimal point display position, follow these steps:

1. Press the **MENU** button until the meter shows dEC.P.
2. Press the ▶/**TARE** button. The meter shows one of the following:
   - FFF.F
   - FF.FF
   - F.FFF
   - FFFF (Default)
3. Press the ▲/**MAX** button to scroll between available choices.
4. Press the **MENU** button to store your choice. The meter momentarily shows StRd, followed by the next menu Rd.S.O (Reading Scale and Offset). Or you can press the **RESET** button to abort and go back to the dEC.P menu.

4.3 SELECTING READING SCALE AND OFFSET Rd.S.O

Note Refer to Table 6-1 for a summary list of menu configuration.

To scale the meter to show readings in engineering units. There are two methods. One method is to scale with known inputs. Another method is to scale without known inputs: you calculate input values based on the transducer specifications and manually enter them through the keyboard.

4.3.1 Scaling with Known Loads (On-Line Calibration)

Note

For maximum resolution, find the maximum signal that will be applied to the meter input.

- For regular voltage input, refer to the main body of Table 4-1.
- For millivolt or milliamp input, refer to the main body of Table 4-2.

Set the DIP switch positions as indicated at the top of either Table 4-1 or 4-2. The numbers 1 through 8 in the top row of either table represent dip switches 1 through 8, and the O, C or X directly below the number indicates the correct position of each switch.

- 'O' Switch should be open or up.
- 'C' Switch should be closed or down.
- 'X' Switch is used to control excitation (refer to Table 2-3 to determine correct position of these switches).

Once Dip switches have been positioned correctly, apply power. Proceed to the rd.CF (Reading Configuration) and set R2 equal to the value in the right hand column of the chart.

Table 4-1. Range Selection Dip Switch Positions For Regular Voltage Input

12345678 XCOOOXXC	12345678 XCOOCXXC	RD.CF* R2=
0 - 10 V	±5 V	4
0 - 5 V	±5 V	3
0 - 3 V	±3 V	2
0 - 2 V	±2 V	1
0 - 1 V	±1 V	0

Table 4-2. Range Selection Dip Switch Positions For Millivolt/ Milliamp Input

12345678 XOCOOXX0	12345678 XOCOCXX0	12345678 XOCCOXX0	RD.CF* R2=
0 - 100 mV	±50 mV	0 - 20 mA	4
0 - 50 mV	±50 mV	0 - 10 mA	3
0 - 30 mV	±30 mV	0 - 6 mA	2
0 - 20 mV	±20 mV	0 - 4 mA	1
0 - 10 mV	±10 mV	0 - 2 mA	0

* Reading Configuration

4.3.1 Scaling with Known Loads (On-Line Calibration) (Continued)

To scale with known inputs: apply known loads to a transducer connected to a meter, or simulate the transducer output with a voltage or current simulator. To scale with known inputs, follow these steps:

1. Apply a known load equal to approximately 0% of the transducer range.

2. Press the **MENU** button until the meter shows Rd.S.0.

3. Press the ►/**TARE** button. The meter shows IN 1 (Input 1).

   Note ☞ IN 1 (Input 1) is the unscaled display reading at minimum input.

4. Press the ►/**TARE** button again. The meter shows last stored value for Input 1.

5. Press the ►/**TARE** button once more. The meter shows the actual signal being received.

6. Press the **MENU** button to store this value as IN 1 (Input 1). The meter shows Rd 1 (Read 1).

   Note ☞ Rd 1 (Read 1) is the desired display reading at Input 1.

7. Press the ►/**TARE** button. The meter shows the last stored value for Read 1.

8. Press the ▲/**MAX** button to change the value of your digits.

9. Press the ►/**TARE** button to scroll horizontally to the next digit.

10. Press the **MENU** button to store value as Rd 1. The meter shows IN 2 (Input 2).

    Note ☞ IN 2 (Input 2) is the unscaled display reading at maximum input.

4.3.1 Scaling with Known Loads (On-Line Calibration) (Continued)

11. Apply a known load equal to approximately 100% of the transducer range.

12. Press the ►/**TARE** button again. The meter shows the last stored value for Input 2.

13. Press the ►/**TARE** button once more. The meter shows the actual signal being received.

14. Press the **MENU** button to store Input 2 value. The meter shows Rd 2 (Read 2).

    Note Rd 2 (Read 2) is the desired display reading at input 2.

15. Press the ►/**TARE** button. The meter shows the last stored value for Read 2.

16. Press the ▲/**MAX** button to change the value of your digits.

17. Press the ►/**TARE** button to scroll horizontally to the next digit.

18. Press the **MENU** button to store value as Rd 2 (Read 2). The meter momentarily shows StRd, followed by Rd.CF. Meter scaling is now complete.

4.3.2 Scaling Without Known Loads

To scale without known inputs, calculate input values based on the transducer specifications and manually enter them on the front-panel pushbuttons. The following example assumes a pressure transducer with these specifications:

Pressure Range: 0 to 2000 PSI

Output Span: 1 to 5 Vdc

1. Determine the correct values for IN 1 and IN 2 based on the transducer specifications. In most cases, Rd 1 & Rd 2 are equal to the minimum and maximum of the transducer output span. The example assumes Rd 1 & Rd 2 are equal to the pressure range of the transducer (Rd 1 = 0000 and Rd 2 = 2000). Calculate IN 1 and IN 2 using the transducer output span and the following equation:

   IN = (Sensor Output) x (Natural Gain) x (Multiplier).

Table 4-3. Natural Gain

Input Range	Span Units	Natural Gain
0 to 100 mV	Millivolts	100 cts/mV
±50 mV	Millivolts	40 cts/mV
0 to 10 V	Volts	1000 cts/V
± 5 V	Volts	400 cts/V
0 to 20 mA	Milliamps	500 cts/mA

2. Determine the multiplier by the Input Resolution setting (R.2 in the rd.CF menu) and the input range selected. Typically R.2=4 is suitable for most applications.

Table 4-4. Input Resolution Multiplier

Input Range	R.2=4	R.2=3	R.2=2	R.2=1	R.2=0
0 to 100 mV	1.000	2.000	3.333	5.000	10.00
0 to 10 V	1.000	2.000	3.333	5.000	10.00
0 to 20 mA	1.000	2.000	3.333	5.000	10.00
± 50 mV	1.000	1.000	1.667	2.500	5.000
± 5 V	1.000	1.000	1.667	2.500	5.000

4.3.2 Scaling Without Known Loads (Continued)

3. Determine IN 1 & IN 2 input range and resolution. The example selects the 0 to 10 V range and 10 uV resolution (R.2=4).

   Example: IN 1 = (1 Volt) x (1000 cts/v) x (1.000) = 1000
   IN 2 = (5 Volt) x (1000 cts/v) x (1.000) = 5000
   Rd 1 = 0000
   Rd 2 = 2000

4. Press **MENU** button until the meter shows Rd.S.0.

5. Press the ►/**TARE** button. The meter shows IN 1.

6. Press the ►/**TARE** button again, the meter shows the last Input 1 value, with the fourth digit flashing.

7. Press the ▲/**MAX** button to change the value of your digits.

8. Press the ►/**TARE** button to scroll horizontally to the next digit.

9. Press the **MENU** button to store this value. The meter shows Rd 1.

10. Press the ►/**TARE** button. The meter shows the last value for read 1.

Repeat steps 7, 8 and 9 until Rd 1, IN 2 and Rd 2 have been displayed, verified, changed (if necessary) and stored.

4.4 USING READING CONFIGURATION Rd.CF

Note Refer to Table 6-1 for a summary list of menu configuration.

You may use Reading Configuration Rd.CF to configure your meter for the following:

- To enable or disable the front panel tare
- To set the input resolution of your meter
- To display the filtered/unfiltered signal input value

4.4.1 Enabling or Disabling the Front-Panel Tare

To enable or disable the front-panel tare, follow these steps:

1. Press the **MENU** button until Rd.CF displays.

2. Press the ▶/**TARE** button. The meter shows one of the following:

   - R.1=E ***(Tare enabled)*** (Default)
   - R.1=N (Tare disabled)

3. Press the ▲/**MAX** button to view last stored selection. Press the ▲/**MAX** button to toggle between selections.

4. Press the ▶/**TARE** button to select input resolution or press the **MENU** button to store your selections. StRd momentarily displays, followed by COLR menu.

4.4.2 Setting Input Resolution

To set the input resolution of your meter, follow these steps:

1. Press the MENU button until Rd.CF displays, then press the ▶/**TARE** button twice.
   or
   Press the ▶/**TARE** button from R.1.

   One of the following displays (default is R.2=4):

   R.2=4 **=** ***10 µV for Unipolar inputs. 25 µV for Bipolar inputs***
   R.2=0 = 1 µV for Unipolar inputs. 5 µV for Bipolar inputs.
   R.2=1 = 2 µV for Unipolar inputs. 10 µV for Bipolar inputs
   R.2=2 = 3 µV for Unipolar inputs. 15 µV for Bipolar inputs.
   R.2=3 = 5 µV for Unipolar inputs. 25 µV for Bipolar inputs

Example: 3 µV resolution means that if you input 0-30 mV, at 30 mV the display shows 9999.

2. Press the ▲/**MAX** button to scroll through available selections.

3. Press the ▶/**TARE** button to display the filtered/unfiltered signal input or press the **MENU** button to store your selections. StRd momentarily displays, followed by COLR menu.

4.4.3 Displaying the Filtered/Unfiltered Input Signal

To display the filtered/unfiltered signal input, follow these steps:

1. Press the **MENU** button until Rd.CF displays, then press the ►/**TARE** button three times.
   or
   Press the ►/**TARE** button from R.2.

   One of the following displays:

   - R.3=F ***(Filtered value)*** (Default)
   - R.3=U (Unfiltered value)

2. Press the ▲/**MAX** button to toggle between available choices.
3. Press the **MENU** button to store your selections. StRd momentarily displays, followed by COLR menu.

4.5 Selecting a Display Color COLR NEW

Note Refer to Table 6-1 for a summary list of menu configuration.

Selecting “Display Color” is not active unless your meter is a Version “B”.

To select a display color, follow these steps:

1. Press the **MENU** button until the meter shows COLR.
2. Press the ►/**TARE** button. The meter shows one of the following:

   - GRN
   - REd
   - AMbR

3. Press the ▲/**MAX** button to scroll between available choices.
4. Press the **MENU** button to store your choice. The meter momentarily shows StRd, followed by the next menu S1.CF (Setpoint 1 Configuration). Or you can press the **RESET** button to abort and go back to the Rd.CF menu.

4.6 USING SETPOINT 1 CONFIGURATION S 1.CF

Note Refer to Table 6-1 for a summary list of menu configuration.

Setpoint 1 Configuration S 1.CF is not active unless your meter has dual relay output capabilities. The LED's will display whether the S 1.CF is active or not. You may use Setpoint 1 Configuration S 1.CF for the following:

- To set the setpoint's active band above or below your chosen value
- To select whether the setpoint operation is latched or unlatched

4.6.1 Setting Setpoint 1's Active Band

1. Press the **MENU** button until the meter shows S 1.CF.
2. Press the ▶/**TARE** button. The meter shows one of the following:
   - S.1=A ***(Active above the setpoint)*** (Default)
   - S.1=b (Active below the setpoint)
3. Press the ▲/**MAX** button to toggle between available choices.
4. Press the ▶/**TARE** button to select if Setpoint 1 is latched or unlatched or press the **MENU** button to store your selection.

4.6.2 Selecting if Setpoint 1 is Latched or Unlatched

1. Press the **MENU** button until S 1.CF displays, then press the ▶/**TARE** button twice.
   or
   Press the ▶/**TARE** button from S.1.

   The meter shows one of the following:
   - S.2=U ***Setpoint 1 to be unlatched*** (Default)
   - S.2=L Setpoint 1 to be latched
2. Press the ▲/**MAX** button to toggle between available choices.
3. Press the **MENU** button to store your selection(s). The meter momentarily shows StRd, followed by S2.CF (Setpoint 2 Configuration).

4.7 USING SETPOINT 2 CONFIGURATION S2.CF

Note Refer to Table 6-1 for a summary list of menu configuration.

Setpoint 2 Configuration S2.CF is not active unless your meter has dual relay output capabilities. The LED's will display whether the S2.CF is active or not. You may use Setpoint 2 Configuration S2.CF for the following:

- To set the setpoint's active band above or below your chosen value
- To select whether the setpoint operation is latched or unlatched

4.7.1 Setting Setpoint 2's Active Band

1. Press the **MENU** button until the meter shows S2.CF.
2. Press the ►/**TARE** button. The meter shows one of the following:
   - S.1=A ***(Active above the setpoint)*** (Default)
   - S.1=b (Active below the setpoint)
3. Press the ▲/**MAX** button to toggle between available choices.
4. Press the ►/**TARE** button to select if Setpoint 2 is latched **or** unlatched or press the **MENU** button to store your selection and enter S1.db (Setpoint 1 Deadband)

4.7.2 Selecting if Setpoint 2 is Latched or Unlatched

1. Press the **MENU** button until S2.CF displays, then press the ►/**TARE** button twice.
   or
   Press the ►/**TARE** button from S.1.

   The meter shows one of the following:
   - S.2=U ***Setpoint 2 to be unlatched*** (Default)
   - S.2=L Setpoint 2 to be latched
2. Press the ▲/**MAX** button to toggle between available choices.
3. Press the **MENU** button to store your selection(s). The meter momentarily shows StRd, followed by S1.db (Setpoint 1 Deadband).

4.8 SETTING THE SETPOINT 1 DEADBAND S1.db

Note Refer to Table 6-1 for a summary list of menu configuration.

Setpoint 1 Deadband S1.db is not active unless your meter has dual relay output capabilities. The LED's will display whether the S1.db is active or not. The Setpoint 1 Default deadband is 0003. To change the deadband (hysteresis) of Setpoint 1, follow these steps:

1. Press the **MENU** button until the meter shows S1.db.
2. Press the ▶/**TARE** button. The meter shows the last previously stored 4-digit number (0000 through 9999) with flashing 4th digit.
3. Press the ▲/**MAX** button to change the value of the flashing digit. If you continue to press the ▲/**MAX** button, the flashing digit's value continues to change.
4. Press the ▶/**TARE** button to scroll to the next digit.
5. Press the **MENU** button to store your selection. The meter momentarily shows StRd, followed by S2.db (Setpoint 2 Deadband).

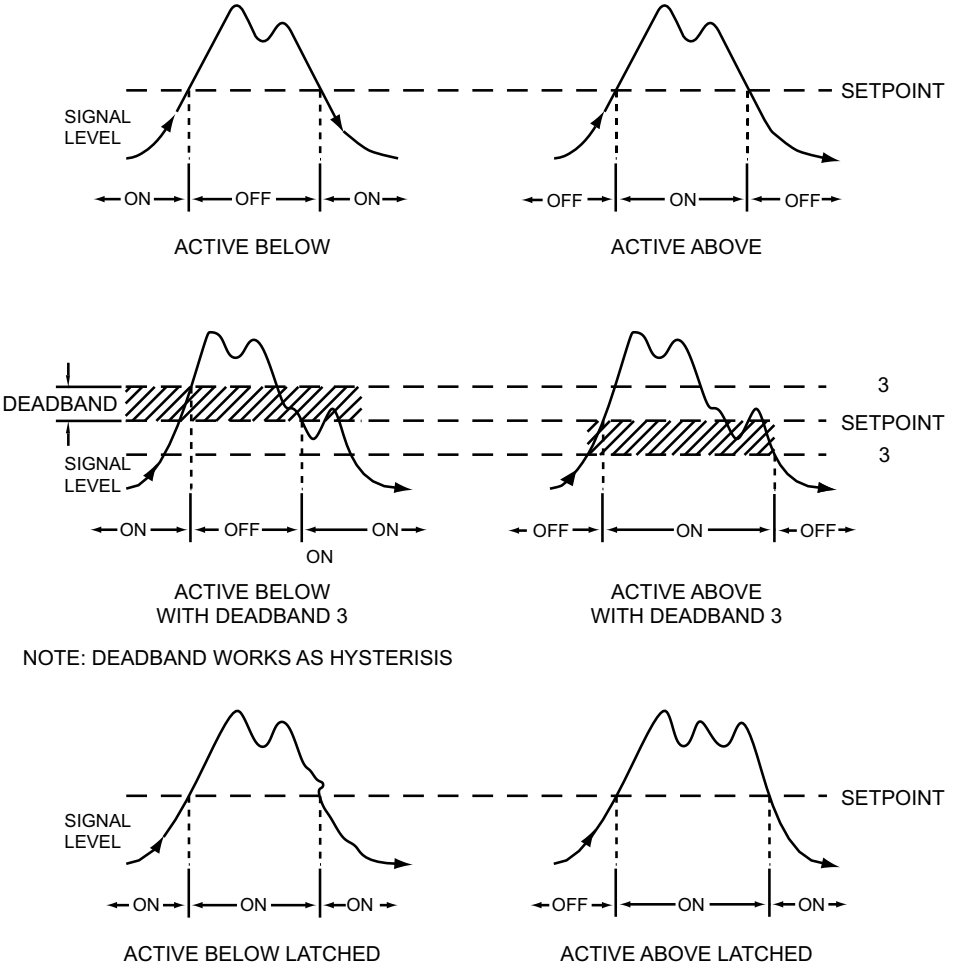
4.9 SETTING THE SETPOINT 2 DEADBAND S2.db

Note Refer to Table 6-1 for a summary list of menu configuration.

Setpoint 2 Deadband S2.db is not active unless your meter has dual relay output capabilities. The LED's will display whether the S2.db is active or not. The Setpoint 2 default deadband is 0003. To change the deadband (hysteresis) of Setpoint 2, follow these steps:

1. Press the **MENU** button until the meter shows S2.db.
2. Press the ▶/**TARE** button. The meter shows the last previously stored 4-digit number (0000 through 9999) with flashing 4th digit.
3. Press the ▲/**MAX** button to change the value of the flashing digit. If you continue to press the ▲/**MAX** button, the flashing digit's value continues to change.
4. Press the ▶/**TARE** button to scroll to the next digit.
5. Press the **MENU** button to store your selection. The meter momentarily shows StRd, followed by Ot.CF (Output Configuration) if you have analog output capabilities.

Figure 4-1. Alarm Example



Note To reset latched alarms you must:

1. Input a signal OUT of the alarm zone
2. Then press **SETPTS** and then, **RESET** button

4.10 USING OUTPUT CONFIGURATION 0t.CF

Note Refer to Table 6-1 for a summary list of menu configuration.

Output Configuration 0t.CF is not active unless your meter has analog output capabilities. The menu will display whether analog output is present or not. Analog output must be ordered at the time of purchase.

Use Output Configuration 0t.CF to select the following:

- To enable or disable the analog output
- To select if the analog output is current or voltage
- To select if the analog output is regular or proportional

4.10.1 Enabling or Disabling the Analog Output

To enable or disable the analog output, follow these steps:

1. Press the **MENU** button until the meter shows 0t.CF.

2. Press the ▶/**TARE** button. The meter shows one of the following:

   - 0.I=E ***(Analog output enabled)*** (Default)
   - 0.I=d (Analog output disabled)

3. Press the ▲/**MAX** button to toggle between available choices.

4. Press the ▶/**TARE** button to select analog output as current or voltage or press the **MENU** button to store your selection and enter 0t.S.0 (Output Scale and Offset).

4.10.2 Selecting Analog Output as Current or Voltage

1. Press the **MENU** button until it shows **0t.CA**, then press the ▶/**TARE** button twice.
   or
   Press the ▶/**TARE** button from **0.1**.
   The meter shows one of the following:

   - **0.2=C** ***(Analog output = current)*** (Default)
   - **0.2=V** (Analog output = voltage)

2. Press the ▲/**MAX** button to toggle between available choices.

3. Press the ▶/**TARE** button to select analog output or proportional control or press the **MENU** button to store your selection and enter **0t.S.0** (Output Scale and Offset).

4.10.3 Selecting Analog Output or Proportional Control

Note ☞ Use this section to select if the meter will transmit an analog signal proportional to the display readings, or proportional to the error signal between the display reading and Setpoint 1.

Proportional Control Analog Option is not available for models without Relay Option.

1. Press the **MENU** button until it shows **0t.CA**, then press the ▶/**TARE** button twice.
   or
   Press the ▶/**TARE** button from **0.2**.
   The meter shows one of the following:

   - **0.3=A** ***(Analog output is regular)*** (Default)
   - **0.3=P** (Analog output is proportional)

2. Press the ▲/**MAX** button to toggle between available choices.

4.10.3 Selecting Analog Output or Proportional Control (Continued)

3a. If you select 0.3=A, press the **MENU** button to store your selection. The meter momentarily shows StRd, followed by 0t.S.0 (Output Scale and Offset).

3b. If you select 0.3=P, press the ►/**TARE** button. The meter shows one of the following:

- 0.4=d (Proportional analog output is **DIRECT ACTING)**
- 0.4=R (Proportional analog output is **REVERSE ACTING**).

4. Press the ▲/**MAX** button to toggle between available choices.

5. Press the **MENU** button to store your selections. The meter momentarily shows StRd, followed by P.bNd (Proportional Band).

   Additionally, if you select 0.2=V (Analog output to be voltage), press the ►/**TARE** button. One of the following displays:

- 0.5=F (Proportional 0-10 V analog output)
- 0.5=H (Proportional 0-5 V analog output).

6. Press the ▲/**MAX** button to toggle between available choices.

7. Press the **MENU** button to store your selections. The meter momentarily shows StRd, followed by P.bNd (Proportional Band).

4.11 SELECTING PROPORTIONAL BAND P.bnd

Proportional Band P.bnd is not active unless your meter has analog output and relay capabilities. The menu will display whether analog output is present or not.

- A proportional controller's output is linearly proportional to the change of the error signal, whenever the signal is within 2 prescribed values (Proportional Band).
- There are three (3) points of interest on the proportional controller transfer curve.
- The first is the magnitude of the error signal that drives the controller to "full on" (e.g. 20 mA out for 4-20 mA).

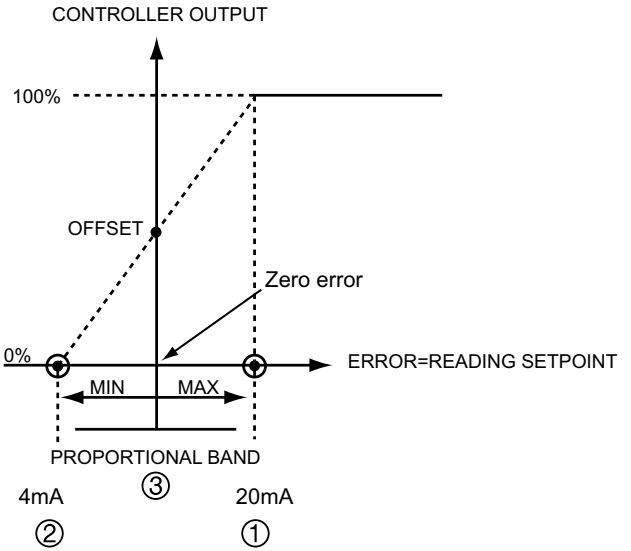


Figure 4-2. Controller Output

- The second point of interest is the magnitude of the error signal that drives the controller output to "full off" (e.g. 4 mA out on 4-20 mA). These two (2) points need not be equally spaced on either side of the zero error point.
- The third is the factor "Offset" and it is the output value of the controller which causes zero error.

Note

The above example illustrates the parameters for the 4-20 mA analog out, likewise, analog voltage output will have these (3) points of interest.

4.11 SELECTING PROPORTIONAL BAND P.bNd (Continued)

If A is the controller gain then,

$$\textbf{Proportional Band} = \frac{\text{Max. out - Min. out}}{A}$$

$$\textbf{CONTROLLER OUT} = A \bullet \text{ERROR} + \text{OFFSET}$$

To select the proportional band for your proportional controller, follow these steps:

1. Press the **MENU** button until the meter shows P.bNd.

If P.bNd menu doesn't show, set 0.3=P on Menu 0t.CF.

Note

Remember to press ►/**TARE** when 0t.CF is displayed until 0.3=A, then press ▲/**MAX,** unit will show 0.3=P. Pressing the **MENU** button will store the selection.

2. Press the ►/**TARE** button. The meter shows last previously stored 4-digit number (0000 through 9999) with flashing 4th digit.

3. Press the ▲/**MAX** button to change the value of the flashing digit. If you continue to press the ▲/**MAX** button, the flashing digit's value continues to change.

4. Press the ►/**TARE** button to scroll to the next digit.

5. Press the **MENU** button to store your selection. The meter shows StRd, followed by M.RSt (Manual Reset).

4.12 USING MANUAL RESET M.RSt

Note ☞ Refer to Table 6-1 for a summary list of menu configuration.

Manual Reset M.RSt is not active unless your meter has analog output and relay capabilities. The menu will display whether analog output is present or not. This feature allows you to offset the error that may occur with your setpoint. In order to determine the amount of error, you must compare your display value to the Setpoint 1 value. The difference between these two values (display - Setpoint 1) is the amount of error that you may want to enter into Manual Reset M.RSt. The value of M.RSt must be less than P.bNd**/2**. Larger values will not be accepted and the meter will display ER4 (flashing).

1. Press the **MENU** button until M.RSt displays.

Note ☞ This menu M.RSt and P.bNd will show up if **0.3=P** on **OT.CF**.

2. Press the ►/**TARE** button. The meter shows the last previously stored 4-digit number (-1999 through 9999) with flashing 4th digit.

3. Press the ▲/**MAX** button to change the value of the flashing digit. If you continue to press the ▲/**MAX** button, the flashing digit's value continues to change.

4. Press the ►/**TARE** button to scroll to the next digit.

5. Press the **MENU** button to store your selection. StRd momentarily displays, followed by RSt (Reset).

4.13 USING OUTPUT SCALE AND OFFSET 0t.S.0

Note ☞ Refer to Table 6-1 for a summary list of menu configuration.

Output Scale and Offset 0t.S.0 is not active unless your meter has analog output capabilities. The menu will display whether analog output is present or not. Output Scale and Offset 0t.S.0 scales your analog output to be equal to the meter's display and/or any engineering units you require. You may scale the output for direct (4-20 mA, 0-10 V, etc) or reverse acting (20-4 mA, 10-0 V, etc).

1. Press the **MENU** button until 0t.S.0 displays.

2. Press the ►/**TARE** button. Rd 1 (Read 1) displays.

   Note ☞ This is your first point of display reading.

3. Press the ►/**TARE** button again. The meter shows the last previously stored 4-digit number (-1999 through 9999) with flashing 4th digit.

4. Press the ▲/**MAX** button to change the digits.

5. Press the ►/**TARE** button to scroll to the next digit.

6. Press the **MENU** button to store your selection. Out.1 (Output 1) displays.

   Note ☞ This starting analog signal corresponds to your Read 1 display.

7. Press the ►/**TARE** button. Selected output displays.

   Note ☞ If you select 0.2.4 for voltage, the maximum signal you may select is 10.00 for an 0-10 Vdc signal output. If you select 0.2.C for current, the maximum signal you may select is 20.00.

8. Press the ▲/**MAX** button to enter the Output 1 signal selection. If you continue to press the ▲/**MAX** button, the flashing digit's value continues to change.

9. Press the ►/**TARE** button to scroll to the next digit.

10. Press the **MENU** button to store your selection. Rd 2 (Read 2) displays.

    Note ☞ This is your second point of display reading.

4.13 USING OUTPUT SCALE AND OFFSET OE.S.O (Continued)

11. Press the ►/**TARE** button. The meter shows last previously stored 4-digit number (-1999 through 9999) displays with flashing 4th digit.

12. Press the ▲/**MAX** button to change the value of the flashing digit. If you continue to press the ▲/**MAX** button, the flashing digit's value continues to change.

13. Press the ►/**TARE** button to scroll to the next digit.

14. Press the **MENU** button to store your selection. The meter shows OUt.2 (Output 2).

Note ☞ This analog signal should correspond to your Read 2 display.

15. Press the ►/**TARE** button. The meter shows selected output.

Note ☞ If you select 0.2-V for voltage, the maximum signal you may select is 10.00 for an 0-10 Vdc signal output. If you select 0.2-C for current, the maximum signal you may select is 20.00 for a 0-20 or 4-20 mA DC signal output.

16. Press the ▲/**MAX** button to change the value of the flashing digit. If you continue to press the ▲/**MAX** button, the flashing digit's value continues to change.

17. Press the ►/**TARE** button to scroll to the next digit.

18. Press the **MENU** button to store your selection. The meter momentarily shows StRd, followed by LK.CF (Lockout Configuration).

WARNING: If the meter displays all flashing values on any item, the value has overflowed. Press the ▲/**MAX** button to start new values.

4.14 USING LOCK OUT CONFIGURATION LK.CF

Note Refer to Table 6-1 for a summary list of menu configuration.

Use Lock Out Configuration LK.CF for the following:

- To enable or disable setpoint changes
- To enable or disable the **RESET** button in the Run Mode
- To enable or disable displaying the meter's firmware version.

4.14.1 Enabling or Disabling the RESET button in the Run Mode

1. Press the **MENU** button until the meter shows LK.CF (after 0t.S.0).
2. Press the ▶/**TARE** button. The meter shows one of the following:
   - RS.=E ***To enable the RESET button in the Run Mode*** (Default)
   - RS.=d To disable the **RESET** button in the Run Mode
3. Press the ▲/**MAX** button to toggle between available choices.
4. Press the **MENU** button to store the changes. The meter shows StRd if the new value is different otherwise the meter shows bR ,t and returns to the Run Mode.

4.14.2 Enabling or Disabling SETPOINT Changes

1. Press the **MENU** button until the meter shows LK.CF (after 0t.S.0).
2. Press the ▶/**TARE** button twice. The meter shows one of the following:
   - SP.=E ***To enable setpoint changes*** (Default)
   - SP.=d To disable setpoint changes
3. Press the ▲/**MAX** button to toggle between available choices.
4. Press the **MENU** button to store the changes. The meter shows StRd if the new value is different otherwise the meter shows bR ,t and returns to the Run Mode.

4.14.3 SETPOINT Display Function: Firmware version or Setpoint value

1. Press the **MENU** button until the meter shows LK.CF (after Ot.S.0).
2. Press the ►/**TARE** button three times. The meter shows one of the following:
   - L.3=0 **SETPTS** button will display setpoint values.
   - L.3=1 **SETPTS** button will display the meter's firmware version.
3. Press the ▲/**MAX** button to toggle between the choices above.
4. Press the **MENU** button to store the changes. The meter shows StRd if the new value is different otherwise the meter shows bR.tE and returns to the Run Mode.

Note ☞ If your meter does not have the relay option, setpoint menu items above will not be available and **SETPTS** button will always display the meter's firmware version. These units will have FOL (overload) or FOPN memory indicated by Alarm 1 & 2 LED displays. LEDs can be reset by pressing **MENU** then **RESET** button or by Power **OFF** then **ON**.

4.15 USING DISPLAY BRIGHTNESS CONFIGURATION NEW

Changing “Display Brightness” is not active unless your meter is a Version “B”.

1. Press the **MENU** button until the meter shows bR.tE (after LKCF).
2. Press the ►/**TARE** button from bR.tE. The meter shows one of the following:
   - M.brt Medium Brightness
   - L.brt Low Brightness
   - H.brt ***High Brightness*** (Default)
3. Press the ▲/**MAX** button to toggle between available choices.
4. Press the **MENU** button to store your selection. The meter momentarily shows StRd followed by StRd, RSt, PROC, then measured value.

SECTION 5. DISPLAY MESSAGES

Table 5-1. Display Messages

MESSAGE	DESCRIPTION
PROC	Process Meter
RSt	Hard (Power On) Reset
INPt	Input Type
dEC.P	Decimal Point
Rd.S.O	Reading Scale and Offset
Rd.CF	Reading Configuration
COLR	Display Color NEW
S1.CF	Setpoint 1 Configuration
S2.CF	Setpoint 2 Configuration
S1.db	Setpoint 1 Deadband
S2.db	Setpoint 2 Deadband
P.bNd	Proportional Band
M.RSt	Manual Reset
ER4	Manual Reset Error
Ot.CF	Output Configuration
Ot.S.O	Output Scale and Offset
LK.CF	Lock Out Configuration
bR it	Display Brightness NEW
+OL	+ Overload Signal
-OL	- Overload Signal
RS.OF	Resolution Overflow
+999	Value Overflow in Setpoint/Menu & Peak Routines
-1999	Value Overflow in Setpoint/Menu & Peak Routines
ER1	2 Coordinate Format Programming Error
PEAK	Peak Value
PK.RS	Peak Reset
t.RS	Tare Reset
SP.RS	Reset Latched Alarms
SP1	Setpoint 1 Value
SP2	Setpoint 2 Value
R.OV.S	Resolution Over Scale
V.-8.8	Firmware Version (where 8 is 0 ~ 9)
RUN	Operating Mode

SECTION 6. MENU CONFIGURATION DISPLAYS

Not all menu items display on standard meters.

Table 6-1. Menu Configuration Displays

(Defaults in Bold and Italics)

MENU	►/TARE	▲/MAX
INPt	Show input choices:	100M ±50M 10V ±5V 0-20 (***Default***)
dEC.P	Show current decimal point position	FFFF (***Default***) F.FFF FF.FF FFF.F
Reading Scale & Offset Rd.S.0	Shows IN 1 **1** Shows prior value entered and flashing digit. Scrolls to the next digit. • If ►/**TARE** is pressed, actual input is shown and can not be changed with ▲/**MAX**. • If ▲/**MAX** is pressed, unit can scroll through digits with ►/**TARE**.	Changes the value of the flashing digit
2 Enter new value and show Rd 1	**3** Shows prior value entered and flashing digit. Scrolls to the next digit.	Changes the value of the flashing digit
4 Enter new value and show IN2	**5** Shows prior value entered and flashing digit. Scrolls to the next digit. • If ►/**TARE** is pressed, actual input is shown and can not be changed with ▲/**MAX**. • If ▲/**MAX** is pressed, unit can scroll through digits with ►/**TARE**.	Changes the value of the flashing digit
6 Enter new value and show Rd2	**7** Shows prior value entered and flashing digit. Scrolls to the next digit.	Changes the value of the flashing digit

SECTION 6. MENU CONFIGURATION DISPLAYS (Continued)

Table 6-1. Menu Configuration Displays (Continued)

(Defaults in Bold and Italics)

MENU	►/TARE	▲/MAX
Reading Configuration rd.CF	**R.1=**	R.1=t ***(Tare enabled)*** R.1=N (Tare disabled)
	R.2=	R.2=0 (1 µV resolution for unipolar & 5 µV resolution for bipolar)
		R.2=1 (2 µV resolution for unipolar & 10 µV resolution for bipolar)
		R.2=2 (3 µV resolution for unipolar & 15 µV resolution for bipolar)
		R.2=3 (5 µV resolution for unipolar & 25 µV resolution for bipolar)
		R.2=4 ***(10 µV resolution for unipolar & 25 µV resolution for bipolar)***
		Note: *3 µV resolution means if your input is 0-30 mV, at 30 mV the display shows 9999.*
	R.3=	R.3=F ***(Filtered value)*** R.3=U (Unfiltered value)
NEW Display Color Selection COLR	Show input choices:	GRN (Green) RED (Red) AMbR (Amber)
Setpoint 1 Configuration S1.CF	**S.1=**	S.1=A ***(Active above)*** S.1=b (Active below)
	S.2=	S.2=U ***(Unlatched)*** S.2=L (Latched)
Setpoint 2 Configuration S2.CF	**S.1=**	S.1=A ***(Active above)*** S.1=b (Active below)
	S.2=	S.2=U ***(Unlatched)*** S.2=L (Latched)

SECTION 6. MENU CONFIGURATION DISPLAYS (Continued)

Table 6-1. Menu Configuration Displays (Continued)

(Defaults in Bold and Italics)

MENU	▶/TARE	▲/MAX
Setpoint 1 Deadband S1.db	Press to scroll to the next digit to the right	Press to change the value of the flashing digit
Setpoint 2 Deadband S2.db	Press to scroll to the next digit to the right	Press to change the value of the flashing digit
Output Configuration Ot.CF	0.1 =	0.1=E ***(Analog output is enabled)*** 0.1=d (Analog output is disabled)
	0.2 =	0.2=C ***(Analog output is current)*** 0.2=V (Analog output is voltage)
	0.3 =	0.3=R ***(Regular analog output)*** 0.3=P (Proportional analog output)*
	0.4 = shown if menu 0.3=P	0.4=d (Proportional analog is direct acting) 0.4=R (Proportional analog is reverse acting)
	0.5 = shown if menu 0.2=V	0.5=F (Analog output is 0-10 Vdc) 0.5=H (Analog output is 0-5 Vdc)
	Note * If you select 0.2V and 0.3=P, you may select your analog output to be 0-10 V or 0-5 V by accessing submenu 0.5=F or 0.5=H. * If 0.3=P, you may select your proportional output analog to be: • Direct Acting 0.4=d: 4-20 mA, 0-5 V, 0-10 V • Reverse Acting 0.4=R: 20-4 mA, 5 V-0 V, 10 V-0 V	

SECTION 6. MENU CONFIGURATION DISPLAYS (Continued)

Table 6-1. Menu Configuration Displays (Continued)

(Defaults in Bold and Italics)

MENU	►/TARE	▲/MAX
P.bNd Proportional Band **shown menu if** 0.3=P	Shows prior value entered. Scrolls to the next digit to the right.	Changes the value of the flashing digit
M.RSt Manual Reset **shown menu if** 0.3=P	Shows prior value entered. Scrolls to the next digit to the right.	Changes the value of the flashing digit
Output Scale & Offset 0t.S.0 (Shown if 0.3=A in Output Configuration Menu 0t.CF)	**1** Shows Rd1 Shows prior value entered and flashing digit. Scrolls to the next digit.	Changes the value of the flashing digit
2 Enter new value and show Out1	**3** Shows prior value entered and flashing digit. Scrolls to the next digit.	Changes the value of the flashing digit
4 Enter new value and show Rd2	**5** Shows prior value entered and flashing digit. Scrolls to the next digit.	Changes the value of the flashing digit
6 Enter new value and show Out2	**7** Shows prior value entered and flashing digit. Scrolls to the next digit.	Changes the value of the flashing digit

SECTION 6. MENU CONFIGURATION DISPLAYS (Continued)

Table 6-1. Menu Configuration Displays (Continued)

(Defaults in Bold and Italics)

MENU	▶/TARE	▲/MAX
Lock Out Configuration LK.CF	**RS=**	RS:E ***(Enable RESET button in the Run Mode)*** RS:d (Disable **RESET** button in the Run Mode)
	SP=	SP:E ***(Enable setpoint changes)*** SP:d (Disable setpoint changes)
	L3=	L3:0 ***(SETPTS button display setpoint values)*** L3:1 (**SETPTS** button display firmware version 4.-8.8 where 8 is 0~9)
NEW Brightness Configuration bRIt		M.brt (Medium Brightness) L.brt (Low Brightness) H.brt ***(High Brightness)***

Table 6-2. Run Mode Displays

Display	▶/TARE	▲/MAX	RESET	Description
PEAK		Displays the peak reading and must be pressed again to return to the normal operating mode without resetting.	Reset the peak reading when in this mode.	**Peak Reading** Displays the highest reading since last reset.
t.RSt	Press to activate.		Will reset your tare when viewing this function.	**Tare Reset**
SP.RS				**Reset Latched Alarms** Pressing the **RESET** button resets your latched alarms.

SECTION 7. SETPOINT CONFIGURATION DISPLAYS

Table 7-1. Setpoint Configuration Displays

MENU	▶/TARE	▲/MAX	Description
	Press to scroll to the next digit to the right	Press to change the value of the flashing digit	SETPOINT 1 Select from -1999 through 9999
	Press to scroll to the next digit to the right	Press to change the value of the flashing digit	SETPOINT 2 Select from -1999 through 9999

SECTION 8. SPECIFICATIONS

SIGNAL INPUT

Input Ranges:	0-100 mV, ± 50 mV, 0-10 V, ± 5 V, 0-20 mA, 4-20 mA
Isolation:	Dielectric strength to 2500V transient per 3mm spacing based on EN 61010 for 260Vrms or DC working voltage
Noise Rejection:	Normal Mode Rejection (NMR) = 60 dB Common Mode Rejection (CMR) = 120 dB
Resistance:	100 Meg ohms for 100 mV or ±50 mV input range 1 Meg ohm for 10 V or +5 V input range 5 ohms for 20 mA current input range
NEW "Big" Display:	4-digit, three color programmable 9-segment, LED 21 mm (0.83")
Symbol:	8.8.8.8 (-1.9.9.9 ~ 9.9.9.9)
Standard Display:	4-digit, 14-segment LED, 13.8 mm (0.54")
Symbol:	8.8.8.8 (-1.9.9.9. ~ 9.9.9.9.)

ANALOG TO DIGITAL

Technique:	Dual slope
Internal resolution:	15 bits
Read Rate:	3/sec Polarity Automatic

ACCURACY AT 25°C

Max Error Strain/Process:	±0.03% of reading, ±1 count
Span Tempco:	50 ppm/°C
Step Response:	1 sec
Warm Up to Rated Accuracy:	30 min
Excitation Voltage:	AC power units: 24 V @ 25 mA, 12 V @ 50 mA, 10 V @ 120 mA, 5 V @ 60 mA DC power units: **Refer to Table 8-1** Color chart for DC Output Excitation
Load Regulation:	1.1%
Line Regulation:	0.02% per Vac

SECTION 8. SPECIFICATIONS (Continued)

ALARM OUTPUTS (if applicable)

2 Form "C" on/off relays. Configurable for latched and unlatched by software.

Max current: 5 AMPS, resistive load
Max voltage: 250 Vac or 30 Vdc

ANALOG OUTPUT (if applicable)

Signal Type:	Current or voltage
Signal Level:	Current: 10 V max compliance at 20 mA output Voltage: 20 mA max for 0-10 V output
Function:	May be assigned to a display range or proportional control output with Setpoint #1 when used as a control output.
Linearity:	0.2%
Step Response Time:	2 - 3 seconds to 99% of the final value

ISOLATED ANALOG OUTPUT (TB5, if applicable)

Same as non-isolated analog output except isolated.

Signal Type:	Current or voltage
Signal Level:	Current: 10 V max compliance at 20 mA output Voltage: 20 mA max for 0-10 V output
Function:	May be assigned to a display range or proportional control output with Setpoint #1 when used as a control output.
Linearity:	0.2%
Step Response Time:	2 - 3 seconds to 99% of the final value
Isolation	130 Vrms working voltage, 1000 V/60sec Dielectric test

Note ☞

- Only one analog output is available on each unit and it must be factory installed.

SECTION 8. SPECIFICATIONS (Continued)

INPUT POWER INFORMATION

∿ AC units	115/230 V~(AC) ± 10%, 50/60 Hz 9.5 W max, power consumption (Non-Isolated Analog Out) 11.0 W max, power consumption (Isolated Analog Out)
⎓ DC units	10-32 Vdc or 26-56 Vdc, 8W (Refer to Table 8-1 below)

External Fuse Required:

IEC 127-2/III	
Power	Fuse
115 V	125 mA @ 250 (T)
230 V	63 mA @ 250 (T)
UL 248-14 (Listed Fuse)	
Power	Fuse
115 V	175 mA @ 250 V Slow-Blow
230 V	80 mA @ 250 V Slow-Blow

ENVIRONMENT

Operating temperature:	0° to 50°C (32° to 122°F)
Storage temperature:	-40° to 85°C (-40° to 185° F)
Relative humidity:	90% at 40°C (non-condensing)

MECHANICAL

Panel cutout:	1/8 DIN 3.62 x 1.78" (45 x 92mm)
Weight:	1.27 lb (575 g)
Case material:	Polycarbonate, 94 V-O UL rated
Protection:	NEMA-4/Type 4 Front Bezel

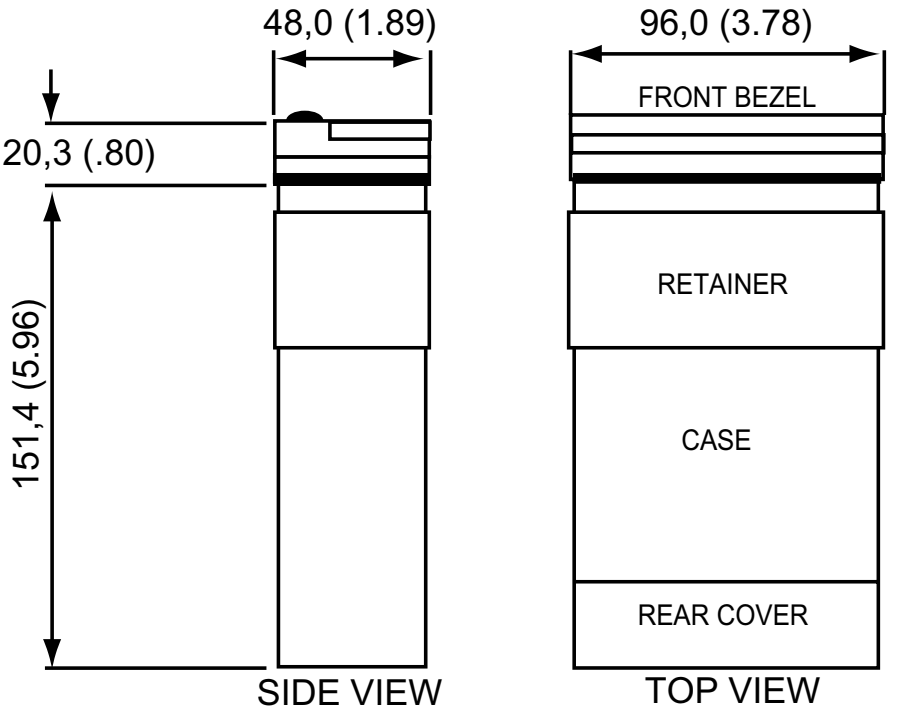
SECTION 8. SPECIFICATIONS (Continued)

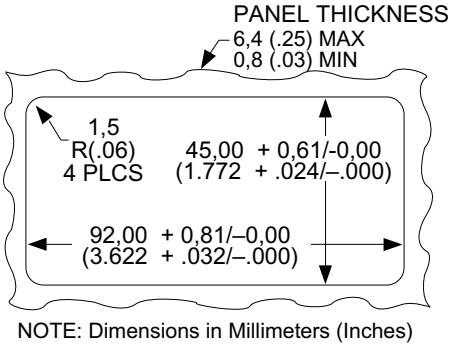
Table 8-1. COLOR CHART FOR DC POWER

COLOR	HIGH BRIGHTNESS	MEDIUM & LOW BRIGHTNESS
RED	Sensor Excitation: 24 V @ 25 mA, 12 V, 10 V, 5 V @ 35 mA Max Analog Output: Non-Isolated option only	Any combination of Sensor Excitation and Analog Output 24 V @ 25 mA, 12 V @ 35 mA Max 10 V @ 35 mA Max 5 V @ 35 mA Max Analog Output: Non-Isolated options or Isolated Analog option
GREEN	**Warning:** • Do not use Internal Excitation. Use External Excitation. • Do not use Isolated Analog Output. Use Non-Isolated Analog Ouput.	
AMBER		

Note ☞ HIGH/LOW Brightness and AMBER are only available on Version “B” meters. Standard display meters are MEDIUM Brightness.

SECTION 8. SPECIFICATIONS (Continued)





NOTE: Dimensions in Millimeters (Inches)

Figure 8-1 Meter Dimensions/ Panel Cutout

SECTION 9. FACTORY PRESET VALUES

Table 9-1. Factory Preset Values

MENU ITEM	FACTORY PRESET VALUES
INPt	Input Type: 0-20 (0-20 mA dc input)
dEC.P	Decimal Point Position: FFFF
Rd.S.O	Reading Scale and Offset: 4-20 mA dc = 0-1000
Rd.CF	Reading Configuration: R.1=t (Tare enabled) R.2=4 (10 µV resolution for unipolar & 25 µV resolution for bipolar) R.3=F (Filtered value)
NEW COLR	Normal Color Display: REd or GRN (Note: depending how unit was ordered)
S1.CF	Setpoint 1 Configuration: S.1=A (Setpoint is active above) S.2=U (Setpoint is unlatched)
S2.CF	Setpoint 2 Configuration: S.1=A (Setpoint is active above) S.2=U (Setpoint is unlatched)
S1.db	Setpoint 1 Deadband: 0003
S2.db	Setpoint 2 Deadband: 0003
Ot.CF	Output Configuration: O.1=E (Analog output is enabled) O.2=C (Analog output is current) O.3=A (Analog output follows the display value)
Ot.S.O	Output Scale and Offset: 0-1000 = 4-20 mA dc
LK.CF	Lock Out Configuration RS=E (Enable the **RESET** button in the Run Mode) SP=E (Enable setpoint changes) L3=O (Display setpoint values)
NEW bRIt	H.brt (Brightness Level)
SP1	Setpoint 1 Value: 0000
SP2	Setpoint 2 Value: 0000
Sensor Excitation Output: 12 Vdc	

CE APPROVALS INFORMATION

CE This product conforms to the EMC directive 89/336/EEC amended by 93/68/EEC, and with the European Low Voltage Directive 72/23/EEC.

Electrical Safety EN61010-1:2001

Safety requirements for electrical equipment for measurement, control and laboratory.

Double Insulation

Pollution Degree 2

Dielectric withstand Test per 1 min

- Power to Input/Output: 2300 Vac (3250 Vdc)
- Power to Input/Output: 500 Vac (720 Vdc)
  (Low Voltage dc Power Option*)
- Power to Relays Output: 2300 Vac (3250 Vdc)
- Relay 1 to Relay 2: 2300 Vac (3250 Vdc)
- Isolated Analog to Inputs: 1000 Vac (1420 Vdc)
- Analog to Inputs: No Isolation

Measurement Category I

Category I are measurements performed on circuits not directly connected to the Mains Supply (power). Maximum Line-to-Neutral working voltage is 50 Vac/dc. This unit should not be used in Measurement Categories II, III, IV.

Transients Overvoltage Surge (1.2 / 50uS pulse)

- Input Power: 2500 V
- Input Power: 500 V
  (Low Voltage dc Power Option*)
- Isolated Analog: 500 V
- Input/Output Signals: 500 V

Note: **Units configured for external low power dc voltage, 10-32 Vdc (Basic Insulation)*

EMC EN61326:1997 + and A1:1998 + A2:2001

Immunity and Emissions requirements for electrical equipment for measurement, control and laboratory.

- EMC Emissions Table 4, Class B of EN61326
- EMC Immunity** Table 1 of EN61326

Note: ***I/O signal and control lines require shielded cables and these cables must be located on conductive cable trays or in conduits. Furthermore, the length of these cables should not exceed 30 meters*

⚠ Refer to the EMC and Safety installation considerations (Guidelines) of this manual for additional information.

NOTES

NOTES

Warranty/Disclaimer

NEWPORT Electronics, Inc. warrants this unit to be free of defects in materials and workmanship for a period of **one (1) year** from the date of purchase. In addition to NEWPORT's standard warranty period, NEWPORT Electronics will extend the warranty period for **four (4) additional years** if the warranty card enclosed with each instrument is returned to NEWPORT.

If the unit should malfunction, it must be returned to the factory for evaluation. NEWPORT's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by NEWPORT, if the unit is found to be defective it will be repaired or replaced at no charge. NEWPORT's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of NEWPORT's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

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Return Requests/Inquiries

Direct all warranty and repair requests/inquiries to the NEWPORT Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO NEWPORT, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM NEWPORT'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting NEWPORT:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult NEWPORT for current repair charges. Have the following information available BEFORE contacting NEWPORT:

1. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

NEWPORT's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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NEWPORT Electronics, Inc.

M3597/N/1006

SECTION 6
ACUAMP ACS200 CURRENT SWITCH APPLICABLE TO IR-1, IR-2 & IR-3

Specifications	
Power Required	None - self powered
Output Switch	Isolated solid-state switch
AC Switch Rating	N.O./N.C.: AC: 1.0 A @ 240 VAC,
Off State Leakage	<10 µA
DC Switch Rating	N.O./N.C.: 0.15A @ 30 VDC
Off State Leakage	<10 µA
Response Time	40 to120 ms
Hysteresis Approx.	5% of setpoint
Input Ranges	Fixed core: 1-6, 6-40 & 40-175 A
	Split core: 1.75-6, 6-40 & 40-200 A
Setpoint Adjust	4 Turn potentiometer
Isolation Voltage	UL Listed to 1,270 VAC, Tested to 5,000 VAC
Frequency Range	6 to 100 Hz
Sensing Aperture	-F 0.55" (14mm) dia.
	-S 0.85" (21.7 mm) sq.
Case	UL 94V-0 Flammability rated
Environmental	-58 to149°F (-50 to 65°C) operating temperature
	0-95% RH, Non-condensing humidity
Listings	UL 508 and cUL Listed, UL File E222847 CE Certified

Part Number Key

ACS 200 - A D - F

- F - Fixed Core
- S - Split-Core

CASE STYLE

VOLTAGE
- A - AC
- D - DC ✓

OUTPUT (Solid State Switch)
- A - Normally Open, 1.0 A, 240 VAC
- 0.15 A, 30 VDC
- C - Normally Closed, 1.0A, 240 VAC
- 0.15 A, 30 VDC

RANGE
Up to 200 A ✓

SENSOR TYPE:
S - Switch with 3 jumper-selectable ranges and adjustable setpoint

✓ AC current operated

Ranges & Maximum Amps				
RANGE JUMPER	RANGE FIXED CORE	RANGE SPLIT CORE	MAXIMUM 6 Seconds	MAXIMUM 1 Second
NONE	1 - 6 A	1.75 - 6 A	400 A	600 A
MID	6 - 40 A	6 - 40 A	500 A	800 A
HIGH	40 - 175 A	40 - 200 A	800 A	1200 A

Switching Delay			
	LOW Range	MID Range	HIGH Range
ON Delay	0.23 sec. max	0.05 sec. max	0.03 sec. max
OFF Delay	0.02 sec. max	0.02 sec. max	0.01 sec. max

Hysteresis		
LOW Range	MID Range	HIGH Range
6%	4%	3%

IR-1 IR-2 IR-3

P-001 , P-002 & P-003 STATUS

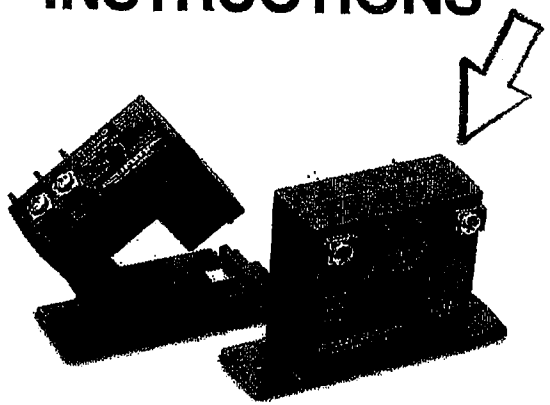
AUTOMATIONDIRECT.com

AutomationDirect.com (ADC)
3505 Hutchinson Road, Cumming, GA 30040
Phone: (800) 633-0405 or (770) 889-2858
Fax: (770) 889-7876

ACS200 - Inst - Rev 2 0508 P-N 391000212

ACUAMP™

ACS200 SERIES INSTALLATION INSTRUCTIONS



Quick Start Guide

1. **Run the wire to be monitored through aperture.**
2. **Mount the sensor.**
3. **Connect output wiring.**
   - **A. Use up to 14 AWG copper wires.**
   - **B. Ensure load matches the output shown on the sensor label.**
4. **Use the potentiometer to adjust setpoint.**

Description

ACS200 Series are solid-state current operated switches. They operate (switch) when the current level through the sensing aperture exceeds the adjustable setpoint. Internal circuits are totally powered by induction from the line being monitored. See the Specifications table for output ratings.

Installation

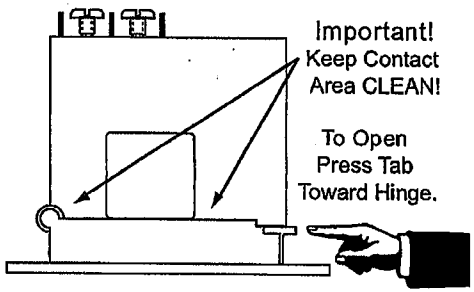
For All Versions

Run wire to be monitored through the opening in the sensor. ACS200 switches work in the same environment as motors, contactors, heaters, pull-boxes, and other electrical enclosures.

They can be mounted in any position. Leave at least one inch distance between sensor and other magnetic devices.

Split-Core Versions (-S Suffix)

Press the tab in the direction as shown to open the sensor. After placing wire in aperture, press the hinged portion firmly downward until a click is heard and the tab pops out fully.



KEEP SPLIT-CORE SENSORS CLEAN.

Silicone grease is factory applied on the mating surfaces to prevent rust and improve performance. Be careful not to allow grit or dirt onto the grease in the contact area. Operation can be impaired if the mating surfaces do not have good contact. Check visually before closing.

Output Wiring

Connect control or monitoring wires to the sensor. Use up to 14 AWG copper wire and tighten terminals to 7 inch-pounds torque. Be sure the output load does not exceed the switch rating. DC output models are polarity sensitive.

CAUTION: INCANDESCENT LAMPS CAN HAVE "COLD FILAMENT INRUSH" CURRENT OF UP TO 10 TIMES THEIR RATED AMPERAGE. USE CAUTION WHEN SWITCHING LAMPS ON AND OFF.

Setpoint Adjustment

ACS200 switches have two setpoint adjustment mechanisms, as follows:

1. Select the setpoint RANGE with the Range Jumper.
2. Fine tune the SETPOINT with the 4 turn potentiometer (pot). See the product label for the amp ranges and jumper positions.

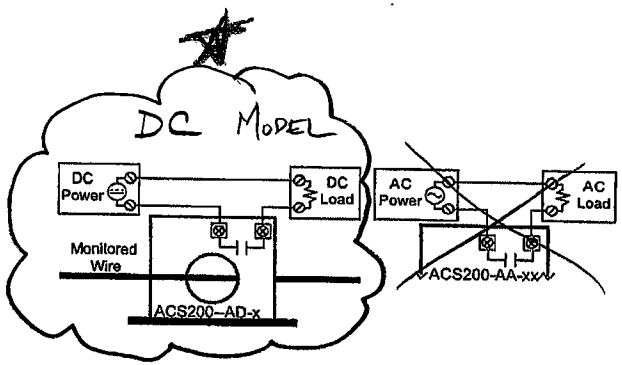
The 4-turn pot is shipped from the factory set fully clockwise (CW) to the lowest setpoint. Turning the pot counterclockwise (CCW) will increase the setpoint. The pot has a slip-clutch to prevent damage at either end of its rotation. To determine where the adjustment is, turn the pot at least 4 times CW. This will return it to the minimum setpoint.

Adjustment Notes:

1. Output contacts are solid-state. Check output status by applying voltage to the contacts and reading the voltage drop across the contacts. An ohmmeter set on "Continuity" will give misleading results.
2. We recommended adjusting the setpoint to allow for usual utility company voltage variations of 10-15%.

Typical Adjustment

1. Move the jumper to the desired range. Turn the pot to minimum setpoint (4 turns CW).
2. Have normal operating current running through sensor. The output should be tripped since the pot is at its minimum setpoint. For units with LED, it should be flashing fast (2 to 3 times per second).
3. Turn the pot CCW until the unit output changes state. This is indicated by the slow flashing of the LED (once every 2 to 3 seconds), or by the changing of the output switch status.
4. Now turn the pot CW slowly until the unit trips again. It is now set at the current level being monitored.
   A. To Set UNDERLOAD - Turn the pot about 1/8 turn further CW.
   B. To Set OVERLOAD - Turn the pot about 1/8 turn further CCW.



Troubleshooting

1. Sensor is always tripped
   A. The jumper may be set in a range that is too low for current being monitored.
   Move jumper to the correct range.
   B. The setpoint may be too low.
   Turn pot CCW to increase setpoint.
   C. Mismatched Polarity (DC Output Only).
   Check polarity on output wiring; correct as needed.
   D. Switch has been overloaded and contacts are burned out.
   Check the output load, remembering to include inrush on inductive loads (coils, motors, ballasts).
2. Sensor will not trip
   A. The jumper may be set in a range that is too high for current being monitored.
   Move jumper to the correct range.
   B. The setpoint may be too high.
   Turn pot CW to decrease setpoint.
   C. Monitored current is below minimum required.
   Loop the monitored wire several times through the aperture until the "sensed" current rises above minimum.
   Sensed Amps = (Actual Amps) x (Number of Loops).
   Count loops on the inside of the aperture.
   Split Core models: The core contact area may be dirty.
   Open the sensor and clean the contact area.
   D. Switch has been overloaded and contacts are burned out.
   Check the output load, remembering to include inrush on inductive loads (coils, motors, ballasts).

Monitored Amps	Output N.O.	Smart-LED (if present)
None or less than minimum	OPEN	OFF
Below Trip level	OPEN	SLOW (2 sec.)
Above Trip level	CLOSED	FAST (0.5 sec.)

SECTION 7
KARI FLOAT SWITCH APPLICABLE TO LSHH-203 & LSHH-219

PARSONS

18325

DATA SHEET - LEVEL SWITCH (FLOATING TYPE)

Parsons Commercial Technology Group, Syracuse, NY		Revision:	Date:	Released For:	Engr:	Chkd:	Appr:
CLIENT	BP SANBORN	A	9/12/2011	Issued for Bid	GRM	WGS	JDF
PROJECT	VAULT WATER COLLECTION AND CONVEYANCE						
PROJECT NO.	446476						
LOCATION	SANBORN, NEW YORK						

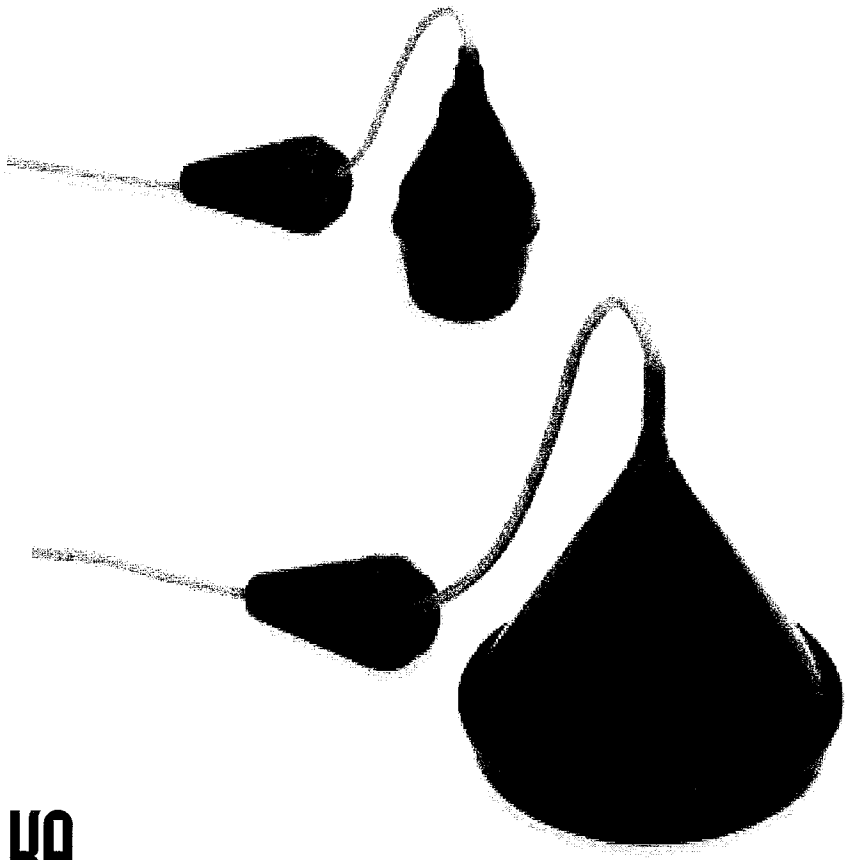
General	1. Tag Number	LSHH-219		
	2. Quantity	One		
	3. Service Description	Ex. Equalization Tank T-801 High-High Level		
	4. P&ID Drawing	446476-D-102		
	5. Line No. / Vessel No.	T-801		
	6. Line Size | Schedule | Pipe Spec.	N/A	N/A	N/A
	7. Area Classification	General Purpose (Non-Classified)		
Process Data	8. Fluid Description	Groundwater		
	9. Pressure Max. | Nom. | Min.		Atm	
	10. Temp. Max. | Nom. | Min.	100° F	60° F	32° F
	11. Oper. Sp. Gr. | M.W. | Visc.	1.0	N/A	1 cP
	12. Percent Solids & Type	N/A (Filtered Groundwater)		
Probe	13. Probe Type	Mini Cable Suspended Float Level Sensor		
	14. Probe Material	Polypropylene		
	15. Minimum Specific Gravity Required	0.95		
	16. Probe Housing Classification	NEMA 6 (IP67)		
	17. Number of Probes	1		
	18. Mounting	Cable Suspended Float		
	19. Cable Connection Type	Strain Relief Connector (See Note 3)		
	20. Conduit Connection	N/A		
	21. Adjustable Range	N/A		
	22. Dead Band	N/A		
	23. Setpoint	Suspension Height TBD During Installation		
	24. Cable Length	50 Ft (15 M) 3 Conductor Cable		
	25. Cable Material	PVC		
	26. Power Supply	N/A		
	27.			
	28. Process Connection (Existing Tank)	Field Retrofit Ex. Flange Conn. (Note 3)		
	29.			
	30.			
Switch	31. Number of Switches	1 Hermetically Sealed		
	32. Switching Element	Micro-Switch		
	33. Type Of Contact	Form "C"		
	34. Contact Rating	6A Resistive; 3A Inductive; 250 VAC/VDC		
	35. Action	NC (Opens on Rising Liquid)		
	36. Terminal Enclosure Classification	NEMA 4X (By I&C Contractor-See Note 4))		
	37. Power Supply	N/A		
Options	38. Strain Relief Connector	Part No. SRCG (See Note 3)		
	39.			
	40.			
Model	41. Manufacturer	APG(KARI) / Automation Products Group, Inc.		
	42. Model Number	KA-M1C-15		
	43. Approvals	N/A		

NOTES

1. Vendor to verify / confirm Model Numbers.
2. Each device shall be supplied with a SS nameplate attached with SS wire stamped with Tag Number.
3. Vendor to provide liquid tight Strain Relief Connector Part no. SRCG for field installation to existing tank.
   Installation I&C Contractor to provide drilling and tapping of blind flange as required for installation of connector.
4. Installation I&C Contractor to provide watertight enclosure with terminal blocks for terminating wiring & extending to panel.
   Appleton type NTJC watertight round junction box & cover with 5 terminals or equal.

SPEC NO.: 18325 / LSHH-219 / A

Rev. 8.03



liquid level sensing

KA

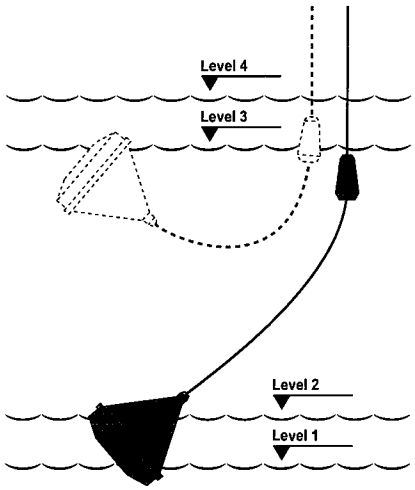
Cable Suspended Float Level Sensors

- Usable in most liquids
- No mercury; no lead
- Installation does not require penetration of tank wall
- Adjustable switch point levels
- Choice of 16 standard models
- Highly chemical resistant
- Proven reliability in operation
- No maintenance required
- Cost effective

File No. 156365 (LR90200-26)

■ *Operational Description*

The KARI float switches are unique cable suspended liquid level sensors offering convenience and reliability for a wide range of pump control and alarm applications. Their most



important feature is the ability to sense multiple levels using only one float. This results in a simple device that can be used in many different level sensing situations. The dependability of KARI float switches has been proven in many thousands of installations, worldwide, for over a quarter of a century.

These sensors come in sixteen different configurations to suit various applications. Details of the various models are given in the specification section.

KARI sensors consist of a free floating switch enclosure with an attached, jacketed, multiconductor cable. Inside the float, up to three heavy duty miniature

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switches are cast at different angles. A control weight is fixed at a point along the cable. As the liquid level rises and falls, the weight on the cable causes the inclination of the float to change.

This tilting action causes the miniature switches to open and/or close at different levels. The switch operating levels are easily adjusted by moving the weight along the cable and/or altering the length of the cable.

The hermetically sealed switch enclosure is conical in shape, filled with plastic foam and weighted on one side. The rugged float and the weight are made of chemical resistant polypropylene. The standard cable is PVC covered.

There are two versions of the KARI sensor. The standard S series units are larger and have greater capabilities than the smaller M (miniature) series units.

■ *Applications*

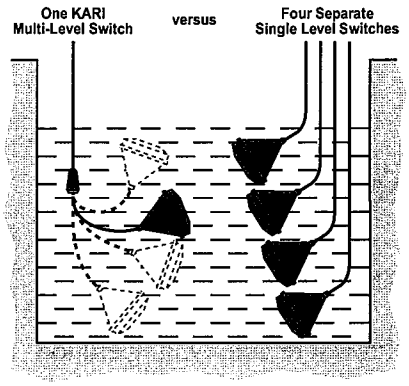
There are many possible uses for these sensors since they can operate in practically any liquid. They are unaffected by floating material or by fluid characteristics (density, color, suspensions, mixtures, coating properties, etc.). They work well in viscous media. By having a separation between the switching levels, problems caused by turbulence are overcome.

Sixteen different configurations allow control circuitry to be simplified. Normally a "make" (closure) is used to activate an alarm or start an action and a "break" (opening) is used to stop the action. Installation is extremely simple because KARI level sensors are designed to hang freely in the tank from a single fixing point. Operating levels are easily adjusted.

■ *Single Versus Dual Point Control*

The simplest single point KARI level sensors (Models 1L or 1H) switch ON and OFF at one level. Such sensors work well as alarm point indicators but are unsuitable for maintenance of liquid levels in a container.

Tank levels are usually maintained by pumps or electrically controlled solenoid valves in the supply or drain



lines. Holding the level exactly at one point is difficult if there is flow in and out of the container, because it would involve the control switch going on and off constantly. This leads to excessive pump wear. Thus, the normal practice is to have two control levels involved (hysteresis or dead band). At one level the pump or valve is turned on, and at the other level it is turned off.

These situations take advantage of the unique capabilities of the KARI float level sensors. Rather than using two separate single level float switches, one float switch (models 2L or 2H) can provide a latching circuit between the ON and OFF levels. This differential can be easily adjusted from 10 inches to 50 inches. Other KARI level sensors provide additional facilities for high and low alarms as well as control of duplex pump systems.

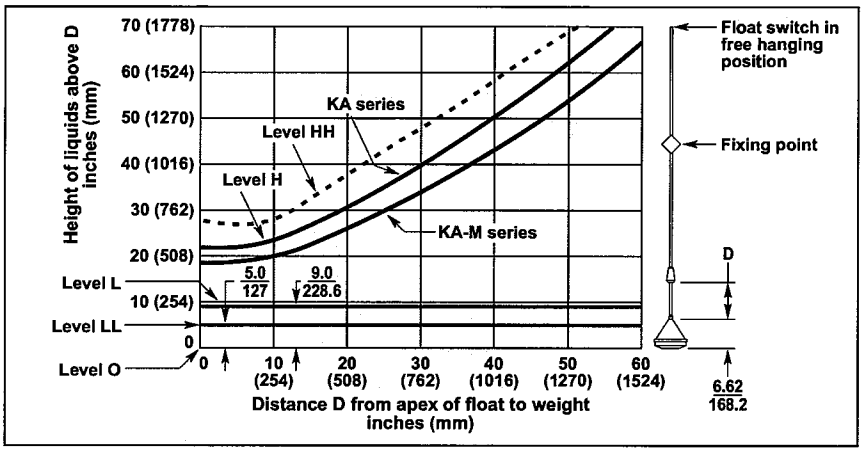
■ *Chemical Compatibility — Corrosion Resistance of Materials*

With a standard KARI level sensor, the only materials in contact with the liquid are the polypropylene float and weight, the polyethylene wedge, and the heavy duty PVC covered cable. Consequently, these switches are unaffected by a wide range of liquids. However, some liquids are not compatible with these materials. For such applications, optional cable materials, (PTFE and polyurethane) are available. In assessing corrosion, key factors are the liquid temperature and concentration, and the amount of time the float is immersed (see Chemical Compatibility appendix for details). Even if periodic replacement of KARI float switches is necessary, they still may be the most economical choice. ATON® rubber cables are preferred for applications where freezing conditions can occur. TPU cables are recommended for petroleum based media. PVC covered cables tend to stiffen in low temperatures and also to absorb petroleum based media.

■ Operating Levels

The diagram below illustrates the relationship between the switching levels, the spacing of the weight along the cable, and the height of the fixing point. For multi level switches, there are some restrictions on the different elevations that can be selected.

There is a minimum standard switching level difference of 10 in. for the basic two level switch. This differential can be increased by moving the weight farther away from the float. The level of these switching points



can be altered by changing the height at which the float hangs in the empty tank. The other two levels of a three function switch bear a fixed relationship to the above adjustments. If these need to be adjustable or the normal elevation ranges are unsuitable, a combination of switches can be used or a special switch can be ordered. For example, a 3HE can be replaced by a 2H working together with a 1H.

■ Cable Weights

Single level switches (high or low alarm) are not supplied with weights. All multiple level switches are supplied with standard weights. Heavier weights may be needed if there is a danger of caking, thick crusts developing and/or if the liquid is very dense and viscous. Contact STI for details.

Alternative weights available are:

Type A	Black	0.75 lb.. (400 g)
Type B	Red	1.5 lb. (800 g)
Type C	Grey	2.25 lb. (1 kg)

■ Cable Length

The standard cable length is 16 ft. (5 m). An optional length of 50 ft. (15 m) is also available from stock.

Standard units have heavy duty cables with PVC covering. Typical diameters and weights of the cables are:

	Dim	Wt/5M
2 Wires	0.25 in.	275 or 350 g
3 Wires	0.27 in.	338 g
4 Wires	0.31 in.	426 g
5 Wires	0.34 in.	515 g

Longer cables can be provided by special order. Once the cable is outside the liquid it can be easily extended through a waterproof junction box or liquid tight connector.

■ Specifications

Series	KA Series	KA-M Series
Contact Ratings		
Maximum Voltage:	250 VAC or DC	250 VAC or DC
Maximum AC Current (Resistive):	6 A	6 A
Maximum AC Current (Inductive):	3 A	3 A
Maximum DC Power:	75 VA (0.3 A @ 250 V)	75 VA (0.3 A @ 250 V)
Maximum Liquid Temperature[1]:	140°F (60°C)	140°F (60°C)
Maximum Pressure (at 20°C):	28 psi (2 bar)	28 psi (2 bar)
Minimum Fluid Specific Gravity: (Water 1.0)	0.7	0.95
Standard Cable Length[1]:	16 ft. (5 m)	16 ft. (5 m)
Switching Differential[1]		
Minimum:	10 in.	10 in.
Maximum:	50 in.	40 in.
Ratings:	IP67 (NEMA 6)	IP67 (NEMA 6)
Maximum Number of Switching Levels:	4	2
Maximum Number of Wires in Cable:	5	2
Standard Weight Type[2]:	A (black-0.75 lb.)	A (black-0.75 lb.)

[1] See options available. [2] On floats with more than one switch point.
Specifications are subject to change without notice.

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■ Importance Of Control Relays

The contacts used in KARI float switches are high performance miniature switches, although they are capable of carrying moderate currents at up to 250 VAC. Because they are immersed in a liquid, it is not a good practice to switch pump motor currents directly through these contacts. Therefore, it is usually just low currents for relay coil operation that are applied to the float switch contacts. The contact rating of the KARI switches should never be exceeded.

Relays with heavy duty contacts are known as contactors. Pump motor manufacturers often provide suitable contactors with the control circuits on their motors. These allow the KARI float switches to be connected directly. If contactors are not provided, the contact ratings needed to start and stop a pump should be thoroughly understood. When pump motors start and stop, they can produce momentary surge currents several times greater than the steady running current. Suppliers of relays and contactors usually provide maximum ratings for their contacts in terms of allowable pump motor horsepower figures.

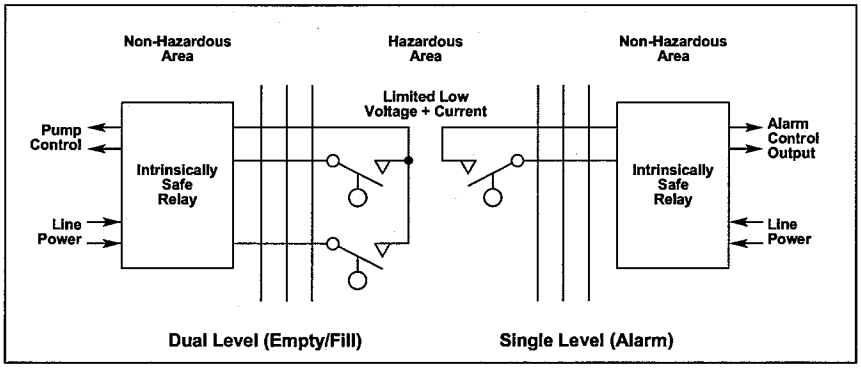
■ Hazardous Locations; Intrinsic Safety

KA series switches do not carry hazardous area ratings. Since they are simple switches with no active electronic components, they can be used in hazardous locations provided they are operated in conjunction with ***appropriately rated and installed intrinsically safe barriers.***

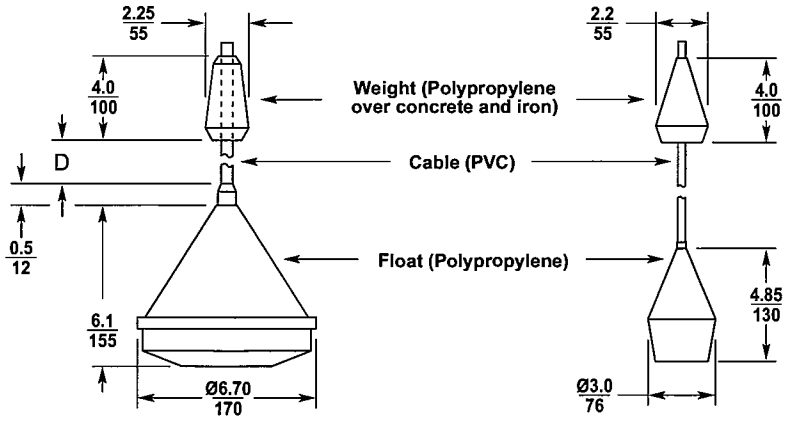
The technique of intrinsic safety is an alternative approach to explosion proofing. The traditional method of preventing explosions in hazardous environments is based on placing all electrical circuits and components in heavy boxes and conduit so that if an explosion is sparked by the electrical circuit, it will be contained and not escape into the hazardous area. With intrinsic safety, special circuits and barriers are built into the external equipment so that any wiring running into the hazardous location do not have sufficient voltage and current (hence power) to cause an explosion. Typical intrinsically safe configurations for KA series switches are illustrated below.

Customers requiring additional information on electrical requirements for hazardous locations should contact their local electrical fire and building authorities.

Also see STI Intrinsic Safety information on the website at: stiapg.com/0825 and stiapg.com/7150.



■ Dimensions — in./mm



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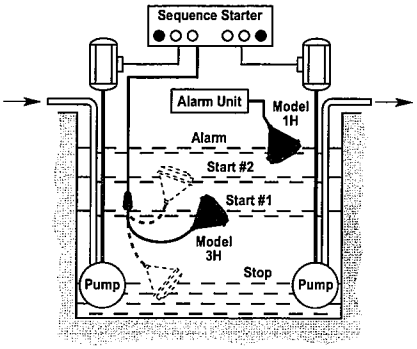
■ Typical KA Series Applications

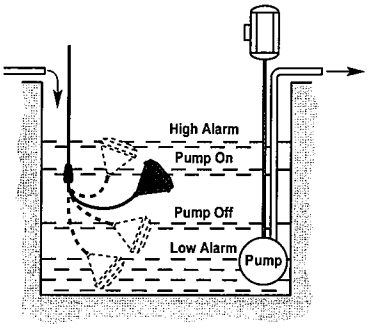
Model 1H and 3H

Control of alternating emptying pumps with high level alarm.



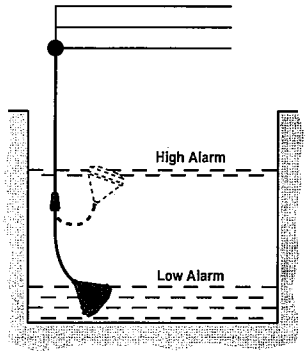
Model 4H

Control of emptying pumps with high and low level alarms.



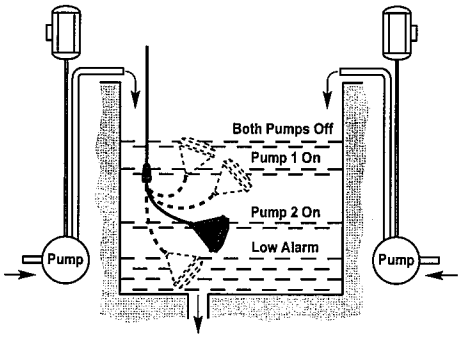
Model 2HL or M2AY

Control of both high and low level alarms.



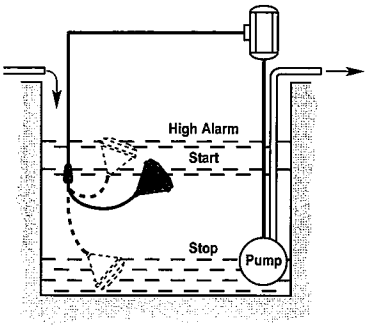
Model 4L5E

Control of alternating filling pumps with low level alarm.



Model 3HE

Emptying pump control with high level alarm.



Options

- Higher working temperature to 175°F (80°C)
- Custom cables to specified lengths
- Greater switching differentials to 75 in. (S Series) or 60 in. (M Series)
- Smaller switching differentials to 2 1/2 in.
- Alternative logic at switching points (NO or NC).
- Alternative cables in ATON® (rubber) and polyurethane
- Alternative cable in TPU
- Alternative cable in PTFE (max. 4 conductors for 3 or less switch points)
- Lead weight in place of polypropylene covered weight.

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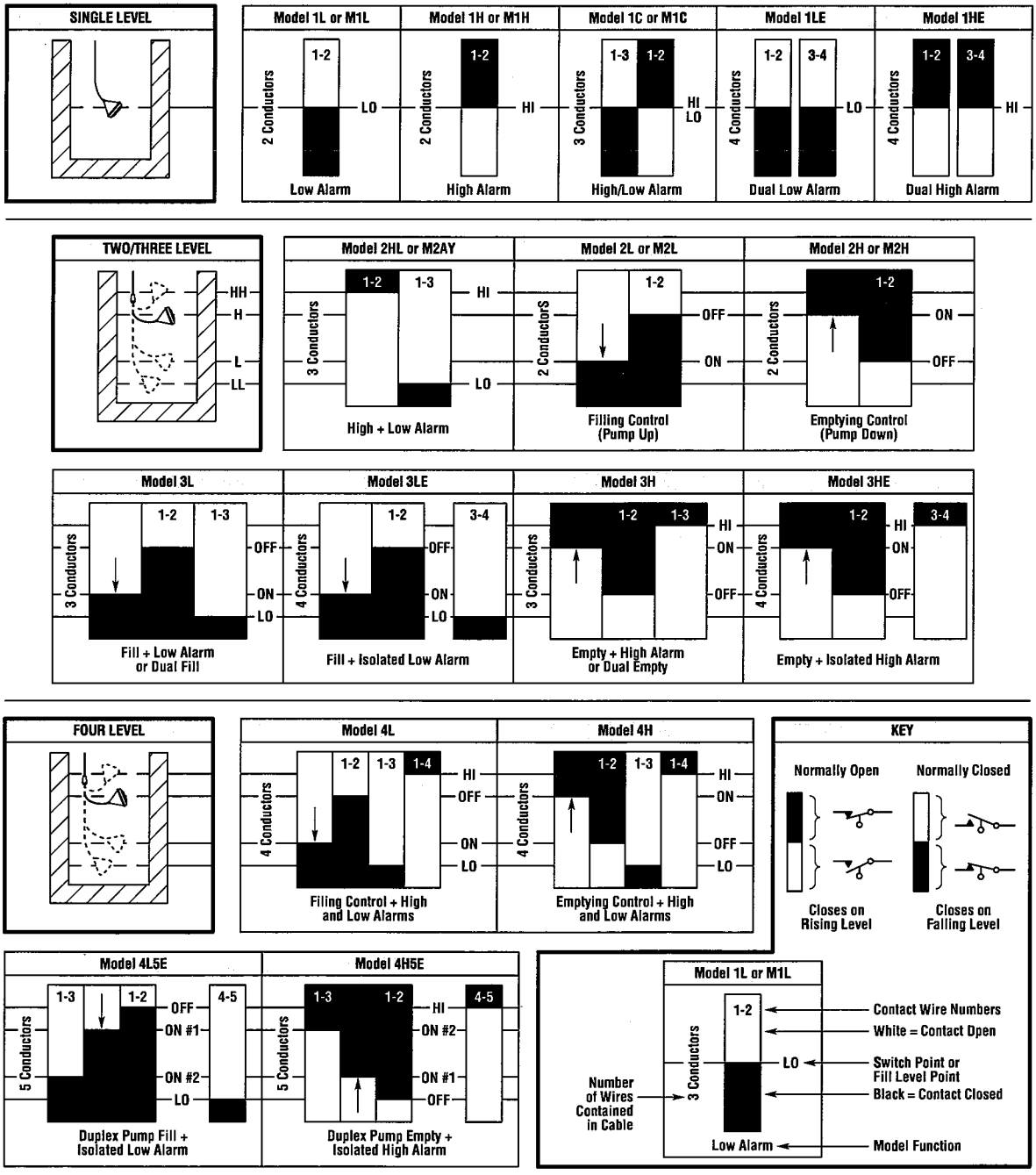
■ *Model Selection Table*

KARI float switches provide up to four separate switching levels in one conically shaped float. A weight on the cable is used to adjust the difference between switching points. Full details of the different standard configurations are given in the table below. For installation and additional application details, ask for the KA series owner manual.



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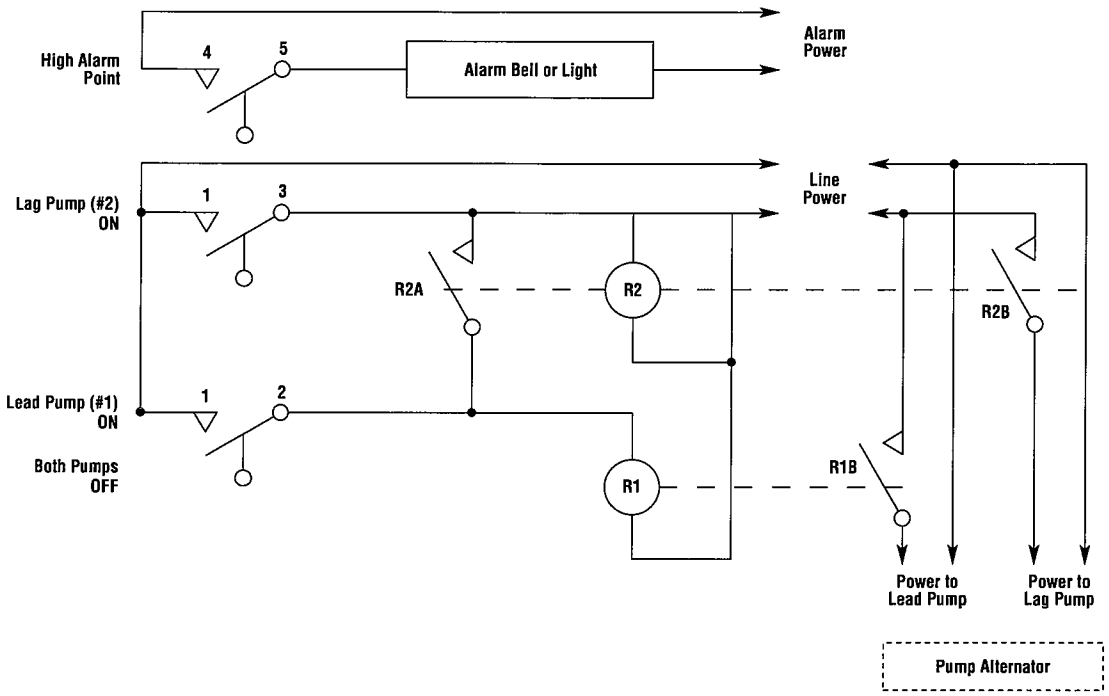
■ *Typical Wiring Diagram for Dual Pumps Emptying with High Alarm Using KA-4H5E*



■ *Selecting the Right KA Series Switch*

KA series float switches provide up to four separate switching levels in one conically shaped float. A weight on the cable is used to adjust the difference between switching points. Full details of the different standard configurations are given on the preceding page.

Sometimes combinations of switches may be needed to meet critical switching point elevations or multiple pump situations. Our Application Engineers will be pleased to assist users in selecting the best models/versions for their particular needs.

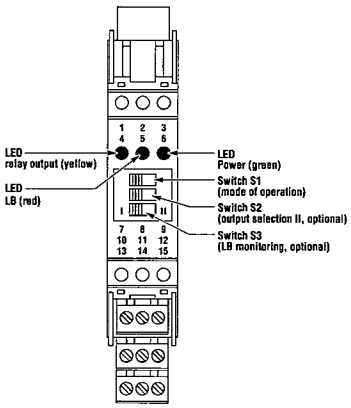
1. Determine number of level control points needed; for example, one point for alarm and two points for empty/fill operations.

2. Select required model.

3. If no suspended solids are present, the specific gravity of the liquid is greater than 0.95 and no more than two separate switch points are needed, the smaller M series switches may be used.

4. If a special situation exists (material compatibility, special operating levels, etc.), a number of options are available.

5. For more detailed applications information and installation advice on KA series float switches request a copy of the Owner Manual.



STI Intrinsic Safety Barrier

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■ Ordering Information

KA - [M] - [1] - [C] [1] [5]

Model
- 1
- 2
- 3
- 4
- M1
- M2

Function
- **H** High alarm or pump down (NO)
- **L** Low alarm or pump up (NC)
- **C** High or low alarm (single level only)
- **HL** High and low alarm
- **E** Isolated switch
- **L5E** Duplex pumping filling
- **H5E** Duplex pumping empty

High Temperature Option
- (null) standard 140°F (60°C)
- **K** High temperature 180°F (80°C)

Cable Options
- (null) PVC
- **R** Polyurethane
- **A** ATON® rubber
- **T** Teflon® (PTFE)
- **N** TPU

Special Cable Length
- (null) 16 ft. (5 m) cable, standard
- L15 (Specify meters) * 15 METERS *

SF [ ] 5 - SR2 - [ ]

Intrinsic Safety Barriers

Voltage
- **A** 115/230 VA
- **D** 24 VDC

Channels
- **1** 1 channel
- **2** 2 channels

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SECTION 8
KPSI LEVEL TRANSDUCER APPLICABLE TO LT-200, LT-201, LT-202 & LT-203

PARSONS

18355

DATA SHEET - LEVEL TRANSMITTER (HYDROSTATIC)

Parsons Commercial Technology Group, Syracuse, NY		Revision:	Date:	Released For:	Engr:	Chkd:	Appr:
CLIENT	BP SANBORN	A	9/12/2011	Issued for Bid	GRM	WGS	JDF
PROJECT	VAULT WATER COLLECTION AND CONVEYANCE						
PROJECT NO.	446476						
LOCATION	SANBORN, NEW YORK						

General	1. Tag Number	**LT-200**		
	2. Service Description	Vault 1 Sump Level		
	3. P&ID Drawing	446476-D-101		
	4. Line No. / Vessel No.	Vault 1		
	5. Line Size | Schedule | Pipe Spec.	N/A	N/A	N/A
	6. Area Classification	General Purpose (Non-Classified)		
	7. Vault Height	6 Feet		
Process Data	8. Fluid Description	Groundwater		
	9. Pressure Max. | Nom. | Min.		Atm	
	10. Temp. Max. | Nom. | Min.	100° F	60° F	32° F
	11. Oper. Sp. Gr. | M.W. | Visc.	1.0	N/A	1 cP
	12. Percent Solids & Type	1% in Suspension		
Element	13. Probe Type	Suspended/Submersible Hydrostatic Sensor		
	14. Probe Housing Wetted Material	316 SS		
	15. Probe Diaphragm Wetted Material	Teflon / Viton		
	16. Probe Connection	1/2" MNPT w/Molded Cable Seal		
	17. Conduit Connection	1/2"		
	18. Mounting	Cable Hanger or 1/2" Conduit by Inst. Contr.		
	19. Measuring Range	0.000 to 002.600 psi (6 ft WC/2.3073 = psi)		
	20. Reference Format	Vented Gage		
	21. Enclosure Classification	NEMA 6P		
	22. Probe Length	4.53"		
	23.			
Transmitter	24. Output signal	4-20 mA DC		
	25. Calibrated Range	0.0 to 2.6 psi = 0 to 6 ft WC		
	26. Accuracy	±0.25% of FSO		
	27. Mounting	Integral to Probe		
	28. Enclosure Classification	NEMA 6P		
	29. Power Supply	24 VDC Loop Powered		
	30. Conduit Connection	N/A		
	31. Accessories			
	32.			
Cable	33. Integral Signal Cable Length	20 Feet (See Note 3)		
	34. Jacket Material	ETFE		
	35. Cable Seal	Viton		
Options	36. Vent Filter	Yes-Vent Filter 810 to be Provided w/Cable		
	37. Terminal Box	Yes-Terminal Box P/N 840		
	38. Cable Hanger	Yes-P/N 12-90-0931		
	39.			
	40.			
Model	41. Manufacturer	KPSI		
	42. Model Number	705-S-1-4CBA-000.000-002.600-B2-0020-B		
	43. Approvals	N/A		

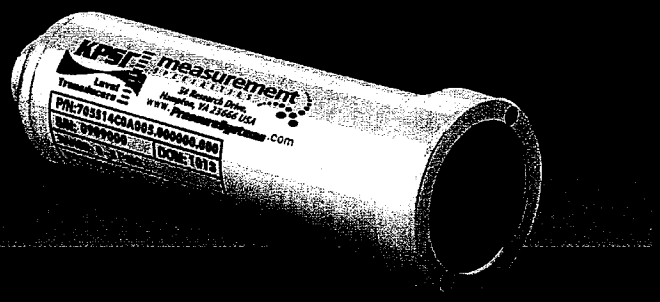
NOTES

1. Vendor to verify / confirm Model Numbers.
2. Each device shall be supplied with a SS nameplate attached with SS wire stamped with Tag Number.
3. Installation I&C Contractor to install supplied terminal box and wire.
4. Vendor to provide calibration certificate traceable to NIST.

SPEC NO.: 18355 / LT-200 / A

Based on ISA Form

KPSI submersible level transducer



KPSI™ Level Transducers

- TEFLON COATED ELASTOMERIC DIAPHRAGM
- CUSTOM LEVEL RANGES FROM 6-115FT (2-35M) H2O
- CUSTOM POLYURETHANE OR ETFE CABLE LENGTHS
- ±0.25% FSO STATIC ACCURACY
- MULTIPLE ANALOG OUTPUTS
- WELDED 316SS OR TITANIUM
- OPTIONAL LIFETIME LIGHTNING PROTECTION
- CUSTOM-BUILT IN TWO DAYS
- TWO YEAR WARRANTY
- SHIPPED WITH LONG LIFE VENT FILTER

- LIFT STATIONS
- WASTEWATER
- SLURRY TANKS
- PUMP CONTROL

KPSI 700 specifications information

FULL SCALE LEVEL RANGES

Intermediate Level Ranges Are Available

Vented gage reference.....6-155 ft 2-35 m H2O
Proof Pressure.....1.5 X FS
Burst Pressure.....2.0 X FS

STATIC PERFORMANCE

Combined Effects Of Non-Linearity, Hysteresis And Repeatability, Best Fit Straight Line Method

Static Accuracy.....±0.25%FSO
Resolution.....±0.0001%FS

ENVIRONMENTAL

Wetted Materials.....316 SS or Titanium, Teflon®, Viton®, polyurethane Teflon® and Viton® are registered trademarks of DuPont.
Compensated Temp Range.....0 to 50ºC
Maximum Allowable Deviation From The Best Fit Straight Line Due To A Change In Temperature
Thermal Error..... ±0.10%FSO/ºC worst case for level ranges >23" (7m) H2O, prorated for level ranges <= 23' (7m) H2O
Operoting Temperature Range.....-20 to 60º C when attached to polyurethane cable
Protection Rating.....IP 68, NEMA 6P

ELECTRICAL

Excitation.....9-28V - VDC output (0-5V, 0-2.5V, 0-4V)
• 9-28V - mA output (4-20) • 15-28V - VDC output (0-10V)
• 10-28V - VDC output (1.5-7.5V)
Input Current.....20 mA max, for mA output; 3.5 mA max, for VDC output
Output..... 4-20 mA, 0-5 VDC, 0-2.5VDC, 0-4VDC, 0-10VDC, 1.5-7.5VDC
Zero Offset.... ±0.25 mA for mA output, < 0.25 VDC for VDC output
Output Impedance.....See Loop Resistance diagram for mA output 20 ohm for VDC output
Insulation Resistance.....100 mega ohm at 50 VDC
Circuit Protection.....Polarity, surge/shorted output

CERTIFICATIONS

UL, CUL and FM – Intrinsically safety approved
CE compliant to EN 61326-1:2001 and EN 61326-2-3:2006

PHYSICAL

Approximate Weight.....0.5 lbs (227 g) transducer, 0.05 lbs/ft (79 g/m) cable
Cable Jacket Material.....Polyurethane (standard), Tefzel®, Teflon® and Kevlar® are registered trademarks of DuPont. ETFE (optional), ETFE is a fluoropolymer (Teflon® derivative) material, Tefzel® or equivalent
Cable Pull Strength.....200 lbs (90kg)
Cable Number of Conductors.....4
Cable Conductor Size.....22 AWG
Cable Seal.....Molded Polyurethane for polyurethane cable Viton® Gland for ETFE cable

TEMPERATURE OUTPUT OPTION (not intrinsically safety approved)

Temperature Range.....-20 to 60ºC, available for 4-20mA output versions only
Output Signal.....4-20 mA
Temperature Measurement Accuracy.....±4ºC

LIGHTNING PROTECTION (OPTIONAL)

Power Supply Needs To Be Limited To 150 Ma To Avoid Lock Up Of The Gas Tube After A Suppression Event

Life Expectancy.....> 1,000 operations
Peak Clamping Voltage.....36 volts
Response Time.....<10 nsecs

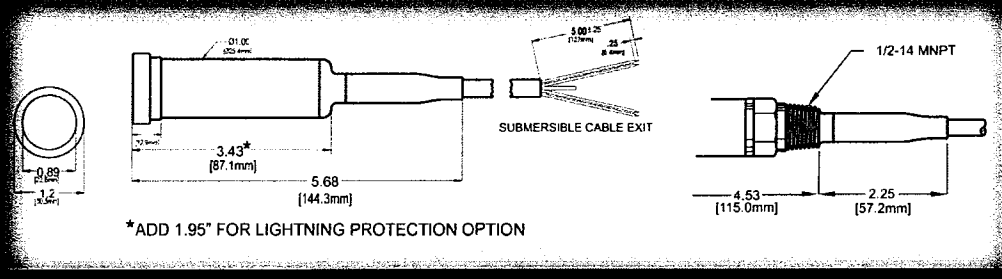
measurement SPECIALTIES
34 Research Drive, Hampton, VA 23666 USA, 757-865-1243, Toll Free 800-328-3665, Fax 757-865-8744
E-mail sales@PressureSystems.com • www.PressureSystems.com • online orders www.LevelandPressure.com • iso-9001:2008

KPSI technical data

ELECTRICAL TERMINATION

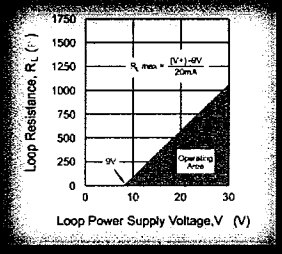
22AWG CONDUCTORS IN A SHIELDED CABLE WITH VENT TUBE		
4-20 mA	RED	+ EXCITATION
	BLACK	- EXCITATION
0-5 VDC	RED	+ EXCITATION
	BLACK	- EXCITATION
	WHITE	+ SIGNAL
ALL	DRAIN WIRE	SHIELD

MOLDED CABLE SEAL CONFIGURATION FOR POLYURETHANE CABLE

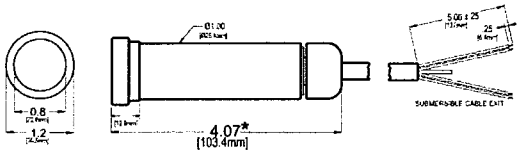


*ADD 1.95" FOR LIGHTNING PROTECTION OPTION

LOOP RESISTANCE VS. POWER SUPPLY



GLAND CABLE SEAL CONFIGURATION FOR ETFE CABLE



*ADD 1.95" FOR LIGHTNING PROTECTION OPTION

KPSI 705 order information

RECYCLED PAPER

LT-200

MODEL **705**, ±0.25% FSO Static Accuracy
MATERIAL **S**, Stainless Steel, **T**, Titanium
REFERENCE FORMAT **1**, Vented gage
OUTPUT **3**, 0-5.0V **F**, 0-2.5V **G**, 0-4V **H**, 0-10V **J**, 1.5-7.5V **4**, 4-20 mA **6**, 4-20 mA temp. measurement option
PRESSURE CONNECTION **C**, Teflon-coated elastomeric diaphragm
ELECTRICAL CONNECTION **0**, Molded cable seal **4**, ½"-14 NPT male conduit fitting with molded cable seal **A**, Gland cable seal **B**, ½"-14 NPT male conduit fitting with gland cable seal
LIGHTNING PROTECTION **A**, None **B**, Full Lightning Protection
LEVEL RANGE (at MAX output)1
• # # # LEVEL RANGE (at MIN output)1
• # # # MOISTURE PROTECTION **B**, Vent Filter **C**, Aneroid Bellows
CABLE TYPE **1**, Polyurethane **2**, ETFE
CABLE LENGTH (in feet)
LABEL **A**, psi **B**, ft H2O **C**, m H2O

7	0	5		5		1		4		C		B		A		0	0	0	·	0	0	0		0	0	2	·	6	0	0		B		2		0	0	2	0		B
XAMPLE	7	0	5	S		1		F		C		0		B		0	0	4	•	3	3	4		0	0	0	•	0	0	0		B		1		0	0	5	5		A

1. The part number requires two level range limits, corresponding to maximum and minimum outputs, to be specified in **pounds per square inch** (psi) to three decimal places. The lower level range is typically 000.000 unless otherwise required. For reverse output requirements, enter the lower range for the maximum output and the upper range for the minimum output. Use the following conversioan factors:

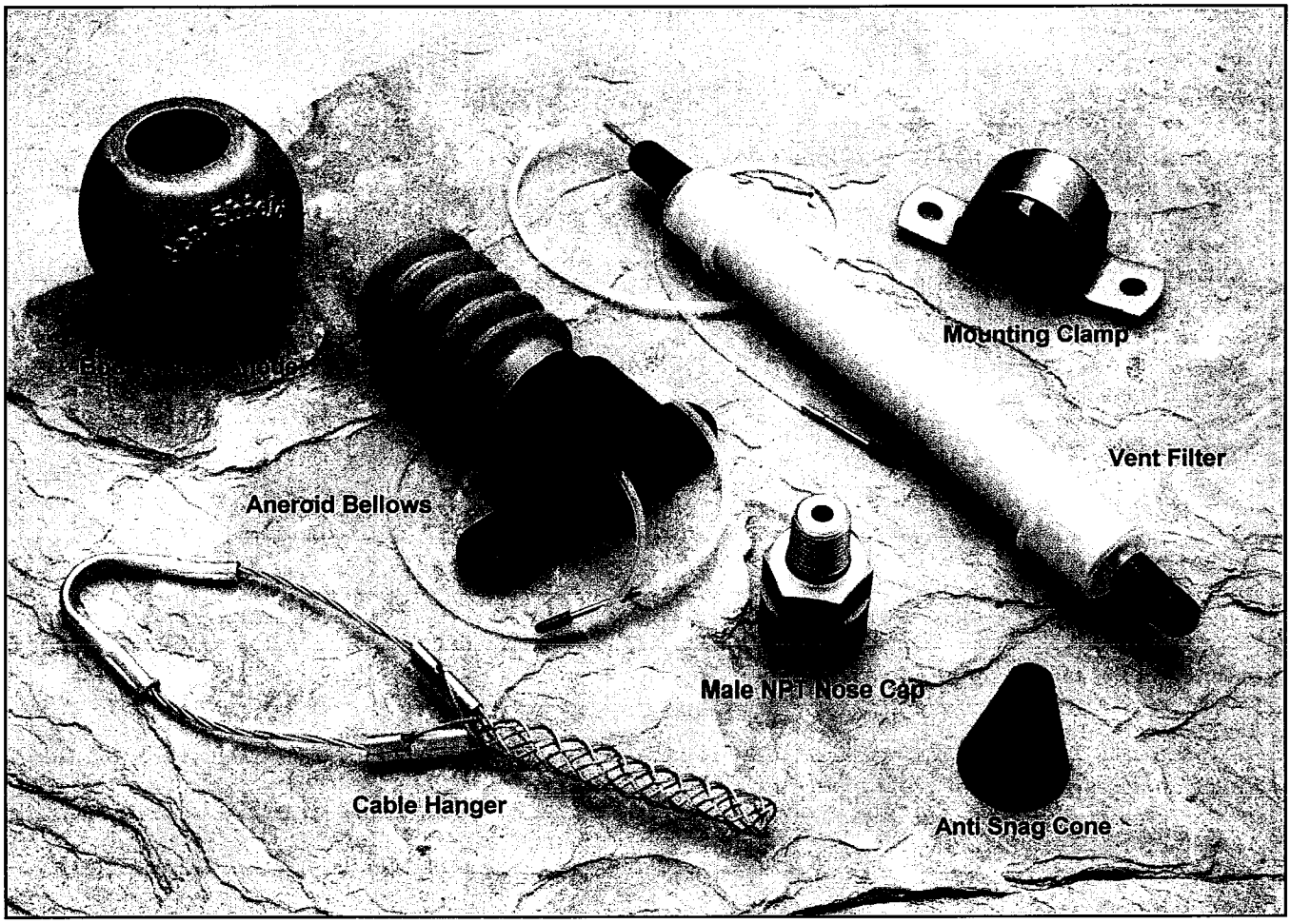
ft H2O / 2.3073 = psi	Examples: 10 ft H2O / 2.3073 = 4.334 psi	(enter 004.334 in the part number)
m H2O / 0.703265 = psi	10m H2O / 0.703265 = 14.219 psi	(enter 014.219 in the part number)

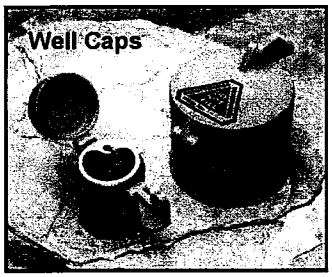
2. Contact PSI if private labeling is required.

Accessories and Options

measurement SPECIALTIES

KPSI™ Transducers





Pressure Systems, Inc. offers an extensive line of accessories and options to augment the functionality of our KPSI™ Level and Pressure Transducers. These enhancements can be specified with the instrument's order or, in many cases, can be retrofitted in the field. Our Accessories and Options include 1-4 day expedited shipping service, lifetime lightning protection, and a variety of pressure connections to suit almost any installation. Industry-leading performance and reliability, combined with short lead times, responsive, knowledgeable Customer Service personnel, and our ability to customize KPSI transducers to meet virtually any requirement give us our competitive advantage. For trouble-free, cost-effective level and pressure monitoring instrumentation, contact our Sales or Customer Service Team today.

Sensing the Environment™

www.PressureSystems.com

ISO-9001:2000 Certified

Order on-line!
www.LevelandPressure.com

34 Research Drive
Hampton, VA 23666
USA

Phone: 757-865-1243
Toll Free: 800-328-3665
Fax: 757-865-8744
E-mail: sales@PressureSystems.com

Table of Contents

INSTALLATION HARDWARE

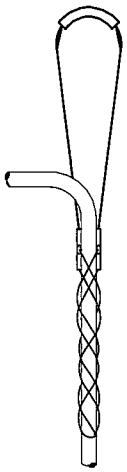
Pressure Systems offers an extensive array of hardware to facilitate the installation of KPSI Transducers into almost any application. Contact our Technical Support staff for assistance in selecting the hardware that may best suit your application or if you have unique requirements that may require a custom solution.

Anti-Snag Cone

Anti-Snag Cones are designed to fit over the cable end of either 1.0" or 0.75" diameter transducers to prevent the transducers from getting hung on obstacles when pulling the cable. The cones are constructed of PVC and come in separate sizes for the two diameters.

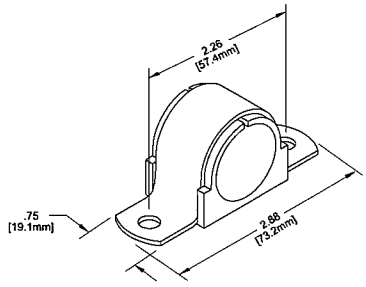
Cable Hanger

The *Cable Hanger* is used to suspend the transducers in the liquid media. The hanger slides onto the cable from the unterminated end and is easily positioned while pushing the ends of the hanger together. As the hanger expands from the weight of the transducer, it grips the cable by the sheath. The cable hanger is 6.0 in (15.3 cm) long and is constructed of 304 stainless steel. ***The cable hanger is not recommended for cable lengths in excess of 500 ft (150 m) as it does not take advantage of the Kevlar® strength members in the cable.***



Mounting Clamp

The *Mounting Clamp* is used to secure 1.0" diameter transducers to a bulkhead. The clamp is consists of a 304 stainless steel bracket with a thermoplastic insert that holds the transducer housing.

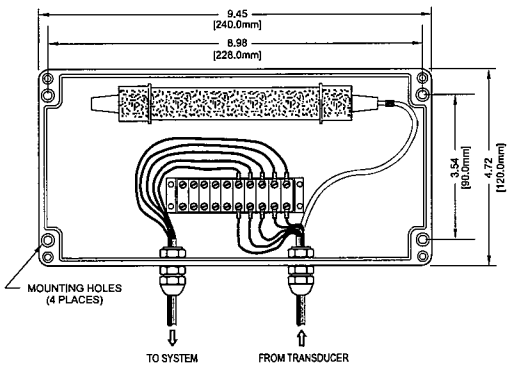


Well Caps

Locking *Well Caps* enable transducers to be suspended within the well while providing security. The vented orange PVC caps are 2" or 4" ID and come with a 304 stainless steel dock (ring and threaded quick-link) to support a cable hanger. The dual-hinge locking lid uses a Buna-N/Nitril o-ring for a watertight seal. The black triangle warning label on the lid can be marked for well identification.

Junction Box

The *Junction Box* provides a water-resistant enclosure for electrically connecting the transducer cable to the users system via a terminal strip. The enclosure also provides convenient location for terminating the vent tube on vented gage transducers. The enclosure can be ordered with either a vent filter or an aneroid bellows. The enclosure is constructed of polycarbonate with a clear top incorporating a neoprene seal. The junction box is rated IP66 and measures 9.45" L x 6.30" W x 4.72" H. Mounting screws are provided.



Identification Tags

Identification Tags are available to attach to the transducer cable to provide easy identification in the field. User-specified information is laser engraved onto the 1.0" square tag, which is constructed of 304 stainless steel.

Cable Splice Kit

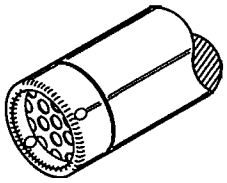
The *Cable Splice Kit* provides a waterproof connection to extend or repair Pressure Systems submersible cables. In many cases, the cable splice kit is a more economical alternative for repairing damaged cable. The kit includes all necessary items to electrically connect and insulate the conductors, couple the vent tubes, and seal the 316 stainless steel housing to either polyurethane and ETFE cable. Assembly instructions are also included.

Replaceable and Interchangeable Nose Caps

Submersible transducers having 1.0" diameter housings are shipped with replaceable nose caps of the requested variety at no additional cost when ordered. The nose caps screw on to the front of the transducer housing via a 7/8"-20 UNEF thread with an o-ring seal. Spare or alternative nose caps may be ordered separately.

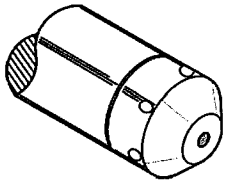
Open-face Nose Cap

The *Open-face Nose Cap* offers the best resistance to clogging. This single-piece nose cap provides maximum exposure of the sensing diaphragm to the liquid media through a protective perforated screen on the front. The open-face nose cap is constructed from molded Delrin®.



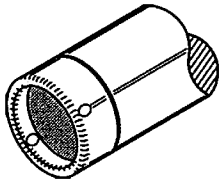
Ported Nose Cap

The *Ported Nose Cap* offers the best protection against damage to the sensing diaphragm. This single-piece nose cap allows the liquid media to enter through 6ea 1/8" holes around the outside and includes a #8-32 UNC-2B threaded hole on the front. The closed-face nose cap is constructed of molded Delrin®.



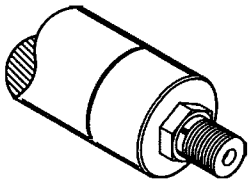
Piezometer Nose Cap

The *Piezometer Nose Cap* offers the best alternative for burying the transducer in the ground without risk to the sensing diaphragm. This two-piece nose cap allows the liquid media to enter through a permeable 40 micron centered stainless steel mesh filter at the front of the cap. The piezometer nose cap is constructed of Delrin®.



Male NPT Nose Cap

The *Male NPT Pressure Nose Cap* offers the best alternative for installing the transducer on a pipe. This single-piece nose cap incorporates a 1/4"-18 or a 1/2"-14 MNPT fitting on the front for connection. The male NPT nose cap is constructed of stainless steel or titanium, as required.

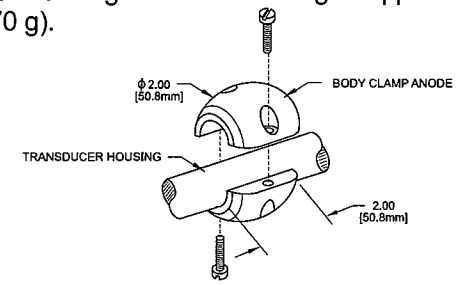


Corrosion Protection

KPSI Transducers are available with optional wetted materials to maintain compatibility with a variety of caustic liquid media. Stainless steel or titanium construction, Viton® seals, and polyurethane or ETFE cable permit the transducers to operate in most liquid environments. In the event galvanic corrosion is anticipated, PSI offers two self-sloughing sacrificial anodes that attach to 1.0" diameter transducers.

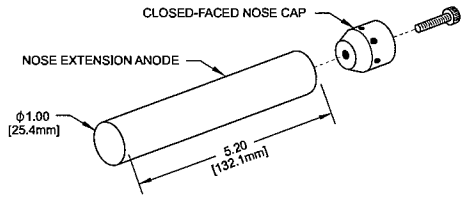
Body Clamp Anode

The *Body Clamp Anode* is a 2.2 in (5.6 cm) diameter zinc sphere of which the two halves bolt on to the transducer housing. The anode weighs approximately 13 oz (370 g).



Nose Extension Anode

The *Nose Extension Anode* is a 5.25 in (13.34 cm) long by 1.0" diameter zinc cylinder that attaches to a closed-face nose cap via an 8-32 threaded hole in the front of the nose cap. The anode weighs approximately 15 oz (417 g) and is shipped with an attached stainless steel closed-face nose cap.

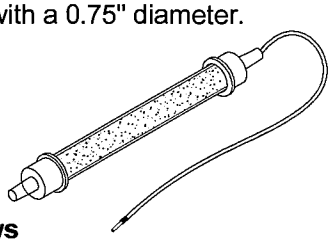


MOISTURE PROTECTION

Two solutions are offered to provide protection against moisture incursion on transducers with vented gage reference pressure format. The choice of which solution to utilize depends on the ability to provide periodic maintenance and the accuracy required for level measurement.

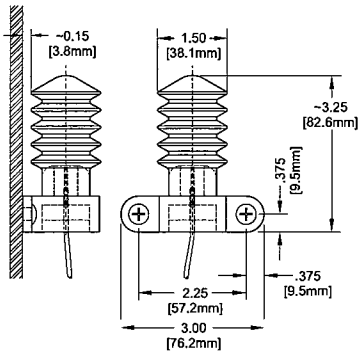
Vent Filter

Vent Filters provide the highest accuracy capability and utilize indicating desiccant to prevent moisture from entering the vent tube and damaging transducers with vented gage reference pressure format. The desiccant will turn from blue to pink when exposed to moisture indicating the need for maintenance. All vented gage transducers are shipped with our SuperDry™ Vent Filter. This latest vent filter design prevents moisture from entering the vent tube **for at least one year without maintenance**, at no additional cost. Spare filters may be ordered. The vent filters are 6.0 in (15.3 cm) long with a 0.75" diameter.



Aneroid Bellows

The *Aneroid Bellows* is a maintenance-free alternative to desiccant filters for moisture protection on vented gage transducers. Made of flexible neoprene material attached to a polycarbonate mounting bracket, the bellows fluctuates with changes in atmospheric pressure maintaining a constant barometric reference. Note that the use of the bellows results in a closed reference pressure system subject to zero shift errors induced by changing temperatures of up to 0.003 psi/°C. The bellows is not recommended for use with accuracy requirements of ±0.25% FS or better, nor for ranges < 2 psi..



DIGITAL DISPLAYS

Pressure Systems offers two types of Display Meters to provide a visual readout of a single KPSI transducer having mA or VDC output. Both varieties utilize a red 0.54" LED display with 4 active characters to indicate a numeric range of -1999 to 9999. The units operate from VAC power and provide a 24 VDC supply for power to the transducer.

The Model 3019 Digital Readouts provide a sophisticated display of the transducer output with six 14-segment LED's for display of true alphanumeric characters; the last two used for process descriptors. These readouts offer programmable input configuration, isolated transducer power supply, selectable 2-point scaling or up to 17-point linearization, optional 4-20 mA retransmission, and two or four optional 10-amp SPDT alarm contacts for control. The 3019 has a NEMA 4X front panel with a polycarbonate bezel and a 1/8 DIN aluminum housing measuring 1.9375" H x 3.75 "W x 6.5" D.

The Model 3620 Pump Controllers provide a more rugged package specifically designed to operate external pumps via two 10-amp SPDT alarm contacts. The 3620 provides front panel scaling, operates from -20 to 70°C, and uses 120 or 240 VAC. The NEMA 4X rated enclosure can be surface or panel mounted and measures 3.2" H x 5.5" W x 2.7" D.

Model 3019 Digital Readout	Model 3620 Pump Controller
6 digit 14 segment 0.54"red LED	4 digit7 segment 0.54" red LED
NEMA 4X front panel	NEMA 4X enclosure
Polycarbonate bezel, 1/8 DIN aluminum housing	Surface or panel mountable polycarbonate housing
Programmable mA or VDC input configuration	Fixed mA or VDC input configuration
Isolated 24 VDC@100 A power supply	Regulated 24 VDC@25A power supply
0 to 70°C operation	-20 to 70°C operation
20 bit A/D resolution	16 bit A/D resolution
90 to 140 VAC, 50/60 Hz power	Selectable 120/240 VAC, 50/60 Hz power
Plug-in terminal block electrical connections	Screw clamp terminal electrical connections
Selectable flashing display and/or horn alarm notification	Flashing display alarm notification
Optional 2ea or 4ea 10 amp, 250 VAC SPDT contacts	Standard 2 or optional 3ea 10 amp, 250 VAC SPDT contacts
Optional 4-20 mA retransmission	N/A

Expedite Shipment Service

Standard lead times for many of Pressure Systems' line of KPSI Level and Pressure Transducers are 5 working days. At a premium, PSI offers an *Expedite Shipment Service* in order to ship transducers within 1-4 working days. This service includes requirements for custom pressure ranges within the limits of the relevant transducer models as well as custom cable lengths. Expedite shipment service is available on most models. Consult our Customer Service staff for availability.

Reference Pressure Format

KPSI Transducers are available in three different *Reference Pressure Formats* to meet varying requirements. The format indicates whether the sensor is referenced to atmospheric pressure (vented gage), a hard vacuum (absolute), or a simulated atmospheric pressure (sealed gage).

Vented gage reference is usually used in lower full-scale range transducers where the sensor must track changes in atmosphere to maintain stated accuracy. Care must be taken to employ appropriate moisture protection to prevent humidity from entering the transducer via the vent tube.

Sealed gage and absolute reference is typically used when the full-scale range is above 700 ft (210 m) H_2O. Changes in atmospheric pressure have negligible impact on the accuracy of transducers at that range and moisture protection is not a concern since no vent tube is required. Sealed gage units are absolute units that are electrically adjusted to simulate reference to the atmospheric pressure at site of the installation. Base elevation with respect to sea level of the site must therefore be specified when ordering sealed gage transducers. Consult our Technical Support staff if you need assistance in choosing the reference pressure format.

Transducer Output

A variety of electrical *Transducer Output* signals are available to facilitate interfacing to almost any system. The most popular output signal is 4-20 mA, which is transmitted over two wires along with power for the transducer. Transducers with this output are typically referred to as transmitters and interface with almost any data logger or PLC

Amplified voltage output is also commonplace requiring three wires for power and output signal. Most common is 0-5 VDC, but the full-scale voltage output can be factory-adjusted to as much as 2.5 VDC less than the anticipated excitation voltage supply. Specify the voltage range required when ordering VDC output transducers.

Electrical Connection

Two basic *Electrical Connection* options are offered to facilitate submerged use in different environments.

The standard connection is a submersible cable exit using a factory molded polyurethane seal to the transducer housing. This provides the best water ingress protection. As an option, a compressed gland seal is offered to facilitate field attachment but requires considerable care in assembly to insure water-proof integrity.

An optional ½"-14 male NPT conduit fitting can also be specified for a more rugged and protected connection. This configuration also employs the standard molded cable seal or the optional gland cable seal.

Temperature Sense Output

As an option, a precision silicon temperature sensor can be installed within the transducer to provide a separate 4-20 mA temperature measurement output over the range of -20 to 60°C. The accuracy of the temperature measurement is ±4°C.

WETTED MATERIALS

Optional *Wetted Materials* are offered for both the transducer and the cable to enable compatibility with a wide range of liquid media.

Transducer Housing Assemblies

The transducer assemblies are most commonly made from 316 stainless steel, which offers good compatibility for most water and hydrocarbon liquid applications. Alternatively, the transducer assembly can be made from titanium, which offers superior compatibility to salt water and chemical liquid applications.

Cable Seals

The molded cable seal is KPSI's standard offering and provides a very reliable injection molded polyurethane seal. The gland cable seal is primarily used for ETFE cable and incorporates a compressed Viton® gland.

Transducer Cable

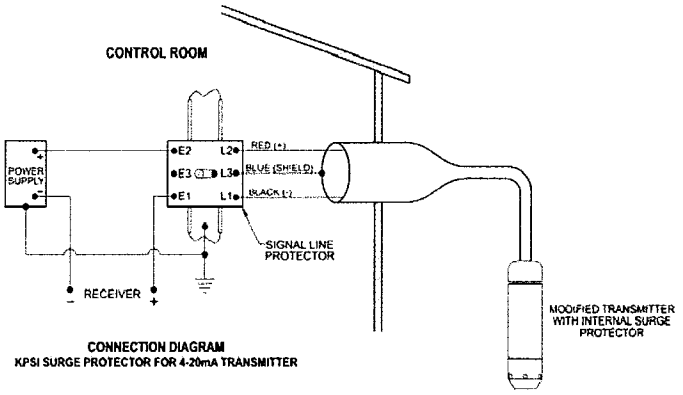
The jacket on our transducer cable is typically constructed from polyurethane, which provides excellent general-purpose use and reliability with good flexibility and economy. For liquid media such as hydrocarbons and other chemicals, ETFE can be specified providing excellent compatibility and maintaining all the features of the polyurethane though somewhat less flexible and more expensive.

Consult our Technical Support staff for the material best suited for the anticipated media.

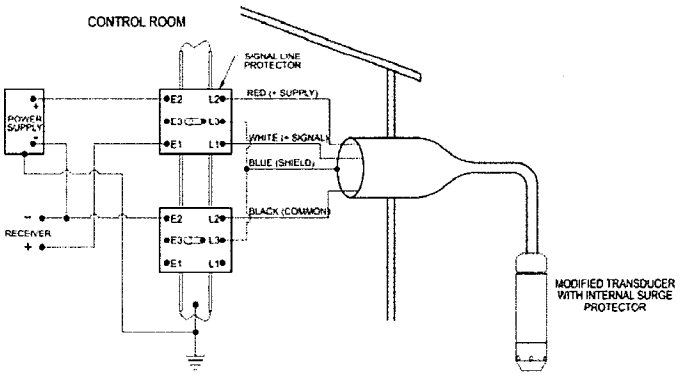
LIGHTNING PROTECTION)

Lightning Protection is designed to protect KPSI Level and Pressure Transducers from damaging surge voltage and current. The protection is offered for 2-wire 4-20 mA output as well as 3-wire VDC and digital output configurations. This circuit is capable of protecting against fast rising voltage transients as well as current surges associated with lightning discharges. The protectors are a multi-stage design, with a solid-state section that intercepts the leading edge of the surge within nanoseconds. The second stage of the design contains a gas discharge tube which crowbars up to 20,000 ampere currents to ground. The tube remains in the crowbar state until the surge has passed, then automatically resets the line to normal operation without the need to reset a circuit breaker. Each circuit consists of two parts. One is housed integral to the transducer via a factory-installed extension to the end of the housing while the other is installed by the user between the transducer wiring and the system. External line protection must be used at all times to ensure lifetime warranty coverage. The protectors are FM/UL/CUL Intrinsic Safety rated for use in hazardous environments when used with an appropriate Intrinsic Safety barrier. The transducer carries a **lifetime warranty for damage due to lightning or voltage spikes** when this 2-part option is properly installed. It is not warranted against continuous over voltage. This option is not available for the Series 300DS.

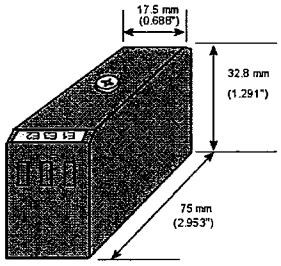
Note: For 4-20 mA output transducers the supply voltage must be at least 15 VDC when Lightning Protection is installed. Lightning Protection is available as an option on all new units.



CONNECTION DIAGRAM
KPSI SURGE PROTECTOR FOR 4-20mA TRANSMITTER



CONNECTION DIAGRAM
KPSI SURGE PROTECTOR FOR 0-5VDC TRANSDUCER



EXTERNAL LINE PROTECTOR

Order Information

Installation Hardware

PN: 42-01-66181	Anti-Snag Cone for 1.0" diameter for use with molded cable seal
PN: 42-01-64134	Anti-Snag Cone for 1.0" diameter for use with gland cable seal
PN: 42-01-64136	Anti-Snag Cone for 0.75" diameter for use with gland cable seal
PN: 12-90-0931	Cable Hanger
PN: 49-06-00PC	Mounting Clamp
PN: 840	Junction Box with Vent Filter
PN: 845	Junction Box with Aneroid Bellows
PN: 36-05-1540T79	Identification Tags
PN: 830	Cable Splice Kit
PN: 861-2A	2" vented locking well cap with dock
PN: 861-2B	2" vented locking well cap
PN: 861-2C	2" well dock
PN: 861-4A	4" vented locking well cap with dock
PN: 861-4B	4" vented locking well cap
PN: 861-4C	4" well dock

Replaceable/Interchangeable Nose Caps

PN: 42-30-6659	Open-face Nose Cap
PN: 42-01-1314A	Closed-face Nose Cap
PN: 42-30-6676S	Piezometer Nose Cap
PN: 42-01-64154	Stainless Steel 1/4"-18 Male NPT Nose Cap
PN: 42-01-64154T	Titanium 1/4"-18 Male NPT Nose Cap
PN: 42-02-64180	Stainless Steel 1/2"- 14 Male NPT Nose Cap
PN: 42-02-64180T	Titanium 1/2"-14 Male NPT Nose Cap

Corrosion Protection

PN: 820	Body Clamp Anode
PN: 825	Nose Extension Anode

Moisture Protection

PN: 810	Vent Filter
PN: 815	Aneroid Bellows

Digital Displays

PN: D3019-2-420	Digital Readout, two SPDT 10A control relays, 4-20 retransmission
PN: D3019-4	Digital Readout, four SPDT 10A control relays
PN: D3019-4-420	Digital Readout, four SPDT 10A control relays, 4-20 retransmission
PN: D3620	Digital Readout, NEMA 4X rated, two SPDT 10A control relays
PN: D3621	Digital Readout, NEMA 4X rated, three SPDT 10A control relays

Lightning Protection

PN: 809	External line protector

SECTION 9
HONEYWELL ST3000 LEVEL TRANSMITTER
APPLICABLE TO LT-207

PARSONS

18345

DATA SHEET - FLANGE MOUNTED DIFF. PRESS. LEVEL TRANSMITTER W/SEAL

Parsons Commercial Technology Group, Syracuse, NY		Revision:	Date:	Released For:	Engr:	Chkd:	Appr:
CLIENT	BP SANBORN	A	9/12/2011	Issued for Bid	GRM	WGS	JDF
PROJECT	VAULT WATER COLLECTION AND CONVEYANCE						
PROJECT NO.	446476						
LOCATION	SANBORN, NEW YORK						

General	1. Tag Number	LT-207		
	2. Service Description	Equalization Tank TK-002 Level		
	3. P&ID Drawing	446476-D-101		
	4. Line No. / Vessel No.	TK-002		
	5. Line Size | Schedule | Pipe Spec.	N/A	N/A	N/A
	6. Area Classification	General Purpose (Non-Classified)		
	7.			
Process Data	8. Fluid Description	Groundwater		
	9. Pressure Max. | Nom. | Min.		Atm	
	10. Temp. Max. | Nom. | Min.	100°F	70°F	32°F
	11. Oper. Sp. Gr. | M.W. | Visc.	1.00	N/A	1cP
	12.			
Element	13. Application	Differential Pressure Level (inches WC)		
	14. Element Type	Diaphragm		
	15. Element Material (Diaphragm)	316L SST		
	16. Body Material	316 SST		
	17. Range Limits	0 to 400 inches WC		
	18. Overrange | Proof Press Ratings	275 psig		
	19. High Side Process Connection	3"-150# RFF (See Note 4,5)		
	20. Low Side Process Connection	1/4" NPT (Vented to Atmosphere)		
	21. Fill Fluid	Silicone		
Transmitter	22. Output Signal	4-20 mA DC Hart		
	23. Calibrated Range	0 to 49" WC (0-100% Level) = 4 to 20 mA		
	24. Accuracy | Stability	±0.0375% of Cal. Span	±0.1%	
	25. Power Supply	24 vDC Loop Powered		
	26. Enclosure Classification	NEMA 4X		
	27. Mounting	Integral (w/Diaphragm Seal)		
	28. Options			
Diaphragm Seal	29. Diaphram Seal	Yes-Integral Flanged Mtd. Diapragm Seal		
	30. Diaphram Seal Type/Style	Flanged, Direct Connect, Flush Diaphragm		
	31. Process Conn. | Instrument Conn.	3"-150# RFF (See Note 4,5)	N/A	
	32. Flange Material	304 SST		
	33. Diaphragm Material	316L SST		
	34. Upper Housing Material	304 SST		
	35. Flushing Connection	None		
	36. Capillary Length | Material	N/A	N/A	
	37. Fill Liquid | Seal Pot	N/A	N/A	
Options	38. Equalizing Manifold|# of Vlv's	N/A	N/A	
	39. Local Indicator	No		
	40. Adapter Flange	N/A		
	41. Mounting Bracket	No		
	42.			
Model	43. Manufacturer	Honeywell		
	44. Transmitter Model Number	ST 3000/STF128-E1A-A1F-		
	45. Seal Manufacturer/Model Number	Included in Transmitter Model No.		
	46. Approvals	N/A		

1. Vendor to verify / confirm Model Numbers.
2. Each device shall be supplied with a SS nameplate attached with SS wire stamped with Tag Number.
3. Vendor to provide calibration certificate for each device.
4. A PTFE "Filler Flange" must be utilized to connect the raised face flange on the pressure transmitter to the flat faced plastic flange on the isolation valve. Micromold Products p/n FFT-0.75-TH or equal.
5. Installation Contractor to verify tank TK-002 nozzle size.

SPEC NO.: 18345 / LT-207 / A

Honeywell

ST 3000 Smart Transmitter Series 100 Flange Mounted Liquid Level Models Specifications

34-ST-03-63 July 2010

Introduction

In 1983, Honeywell introduced the first Smart Pressure Transmitter— the ST 3000®. In 1989, Honeywell launched the first all digital, bi-directional protocol for smart field devices. Today, its ST 3000 Series 100 Flange-mount Transmitters continue to bring proven "smart" technology to a wide spectrum of measurement applications. Honeywell flange-mount transmitters may be installed directly onto a tank flange and are offered with a variety of tank connections to include ANSI flange connections. Typical applications are high accuracy level measurement in pressurized and un-pressurized vessels in the chemical and hydrocarbon industries. Honeywell flange mount transmitters demonstrate proven reliability in hundreds on installations in a wide variety of industries and applications. All ST 3000 transmitters can provide a 4-20 mA output, Honeywell Digitally Enhanced (DE) output, HART® output, or Foundation™ Fieldbus output. When digitally integrated with Honeywell's Process Knowledge System™, EXPERION PKS™, ST 3000 instruments provide a more accurate process variable as well as advanced diagnostics.

Models		
STF128	0 to 400 inH_2O	0 to 1,000 mbar
STF132	0 to 100 psi	0 to 7bar
STF12F	0 to 400 inH_2O	0 to 1,000 mbar
STF13F	0 to 100 psi	0 to 7 bar
STF14F	0 to 600 inH_2O	0 to 1,500 mbar

The devices provide comprehensive self-diagnostics to help users maintain high uptime, meet regulatory requirements, and attain high quality standards. S100 transmitters are ideal for critical applications, such as custody transfer of natural gas and energy and material balances, where accuracy and stability are of the utmost importance.

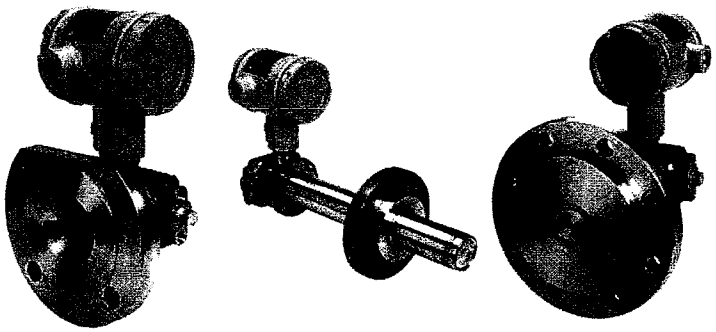


Figure 1 - On the left is Model STF12F, STF13F and STF14F. In the middle is Model STF128 and STF132 (extended diaphragm). On the right is Model STF128 and STF132.
All these Series 100 Flange Mounted Liquid Level Pressure Transmitters feature proven piezoresistive sensor technology

Honeywell's high-performance ST 3000 S100 transmitters lead the industry in:

- Accuracy
- Stability
- Reliability
- Rangeability
- Warranty

Includes Lifetime™ Transmitters:

ST 3000 Lifetime™ Transmitter Benefits
Total Accuracy = ±0.0375%
Stability = ±0.01% per year
Reliability = 470 years MTBF
Rangeability = 400 to 1
Lifetime Warranty = 15 years

LT-207

Description

The ST 3000 transmitter can replace any 4 to 20 mA output transmitter in use today and operates over a standard two-wire system.

The measuring means is a piezoresistive sensor, which actually contains three sensors in one. It contains a differential pressure sensor, a temperature sensor, and a static pressure sensor.

Microprocessor-based electronics provide higher span-turndown ratio, improved temperature and pressure compensation, and improved accuracy.

The transmitter's meter body and electronics housing resist shock, vibration, corrosion, and moisture. The electronics housing contains a compartment for the single-board electronics, which is isolated from an integral junction box. The single-board electronics is replaceable and interchangeable with any other ST 3000 Series 100 or Series 900 model transmitters.

Like other Honeywell transmitters, the ST 3000 features two-way communication and configuration capability between the operator and the transmitter through several Honeywell field-rated portable configuration devices, including the Smart Field Communicator (SFC) and the Multiple Communication Configurator (MC ToolKit). While both are made for in-field use, the MC Toolkit also can be ordered for use in intrinsically safe environments.

The SCT 3000 Smartline® Configuration Toolkit provides an easy way to configure instruments using a personal computer. The toolkit enables configuration of devices before shipping or installation. The SCT 3000 can operate in the offline mode to configure an unlimited number of devices. The database can then be loaded down-line during commissioning.

Features

- Choice of linear or square root output conformity is a simple configuration selection.
- Direct digital integration with Experion PKS and other control systems provides local measurement accuracy to the system level without adding typical A/D and D/A converter inaccuracies.
- Unique piezoresistive sensor automatically compensates input for temperature and static pressure. Added "smart" features include configuring lower and upper range values, simulating accurate analog output, and selecting preprogrammed engineering units for display.
- Smart transmitter capabilities with local or remote interfacing means significant manpower efficiency improvements in commissioning, start-up, and ongoing maintenance functions.

Advanced Diagnostics

ST 3000 is now available for both HART® 6 and Foundation™ Fieldbus with advanced diagnostics that minimize unplanned plant outages, minimize maintenance costs and by providing the industry's most reliable transmitter.

- Provide advanced warning of possible failure events and avoid costly shutdowns.
- Three levels of failure reporting
- Comprehensive list of on-board diagnostics (Ref. ST 3000 User manual with HART® 6, 34-ST-25-17 Rev: June 09 and Foundation™ Fieldbus option manual 34-ST-25-15 Rev: June 09)

Operating Conditions – All Models

Parameter	Reference Condition		Rated Condition		Operative Limits		Transportation and Storage	
	°C	°F	°C	°F	°C	°F	°C	°F
Ambient Temperature								
All models except STF14F	25±1	77±2	-40 to 85	-40 to 185	-40 to 93	-40 to 200	-55 to 125	-67 to 257
STF14F	25±1	77±2	-40 to 85	-40 to 185	-40 to 85	-40 to 185	-55 to 125	-67 to 257
Meter Body Temperature								
All models except STF14F	25±1	77±2	-40 to 110*	-40 to 230*	-40 to 125	-40 to 257	-55 to 125	-67 to 257
STF14F	25±1	77±2	-40 to 85	-40 to 185	-40 to 85	-40 to 185	-55 to 125	-67 to 257
Process Interface Temp. STF128, STF132 only	25±1	77±2	-40 to 110*	-40 to 230*	-40 to 175**	-40 to 350**	-55 to 125	-67 to 257
Humidity %RH	10 to 55		0 to 100		0 to 100		0 to 100	
Minimum Pressure								
mmHg absolute	atmospheric		25		2 (short term ***)			
inH$_2$O absolute	atmospheric		13		1 (short term ***)			
Supply Voltage, Current, and Load Resistance	**Voltage Range:** 10.8 to 42.4 Vdc at terminals **Current Range:** 3.0 to 21.8 mA **Load Resistance:** 0 to 1,440 ohms (as shown in Figure 2)							

* For CTFE fill fluid, the rating is –15 to 110 °C (5 to 230°F)

** For CTFE fill fluid, the maximum temperature rating is 150°C (300°F)

*** Short term equals 2 hours at 70°C (158 °F)

Maximum Allowable Working Pressure (MAWP)[3,4]

(ST 3000 products are rated to Maximum Allowable Working Pressure. MAWP depends on Approval Agency and transmitter materials of construction.)

STF 128, STF 132	Flange Material	Ambient Temperature -29 to 38°C [-20 to 100°F]	Maximum Meterbody Temperature 125°C [257°F]	Process Interface Temperature 175°C [350°F]
ANSI Class 150	Carbon Steel	285 [19.6]	245 [16.9]	215 [14.8]
psi [bar]	304 S.S.	275 [19.0]	218 [15.0]	198 [13.7]
	316 S.S.	275 [19.0]	225 [15.5]	205 [14.1]
ANSI Class 300	Carbon Steel	740 [51.0]	668 [46.0]	645 [44.5]
psi [bar]	304 S.S.	720 [49.6]	570 [39.3]	518 [35.7]
	316 S.S.	720 [49.6]	590 [40.7]	538 [37.1]
DN PN40	Carbon Steel	580 [40.0] [1]	574 [39.6]	559 [38.5]
psi [bar]	304 S.S.	534 [36.8] [1]	419 [28.9]	385 [26.5]
	316 S.S.	534 [36.8] [1]	434 [29.9]	399 [27.5]
STF12F, STF13F, STF14F ANSI Class 150 **psi [bar]**	316L Stainless Steel	230 [15.9]	185 [12.8]	No rating at this temp

[1] Ambient Temperature for DN PN40 is –10 to 50°C [14 to 122 F]

[3] MAWP applies for temperature range -40 to 125°C. However, Static Pressure Limit is de-rated to 3,000 psi from -26°C to -40°C. Use of graphite o-rings de-rates transmitter to 3,625 psi. Use of adaptor with graphite o-rings de-rates transmitter to 3,000 psi.

[4] Consult factory for MAWP of ST 3000 transmitters with CSA approval.

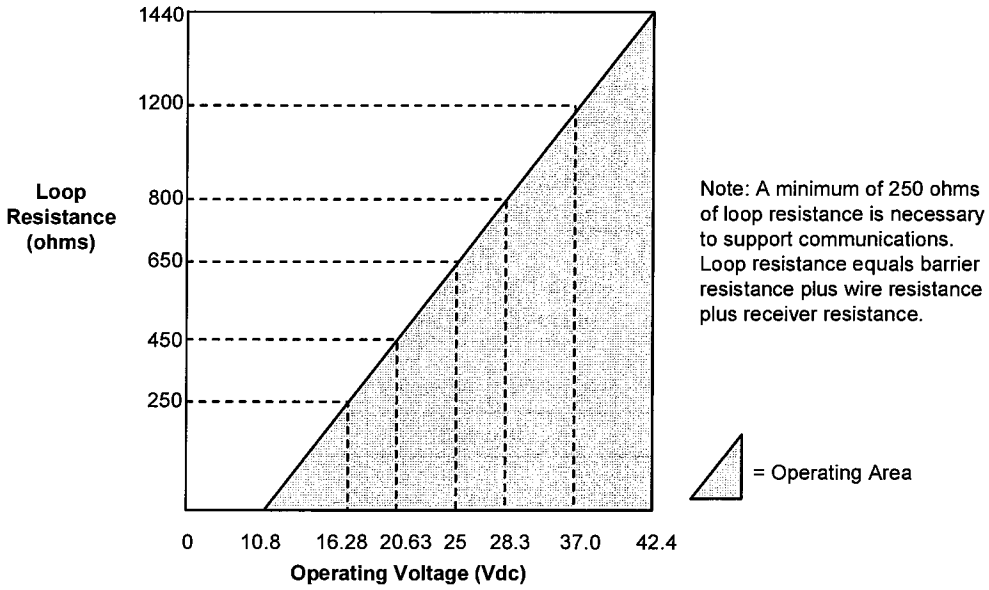


Figure 2 - Supply voltage and loop resistance chart

Performance Under Rated Conditions* - Model STF128 (0 to 400 inH_2O)

Parameter	Description
Upper Range Limit **inH_2O**	400 (39.2°F/4°C is standard reference temperature for inH_2O range.)
mbar	1,000
Minimum Span **inH_2O**	4 Note: Recommended minimum span in square root mode is 20 inH_2O (50 mbar).
mbar	10
Turndown Ratio	100 to 1
Zero Elevation and Suppression	No limit except min. span within ±100% URL. Specifications valid from -5 to +100% URL.
Accuracy (Reference – Includes combined effects of linearity, hysteresis, and repeatability) • *Accuracy includes residual error after averaging successive readings.* • *For FOUNDATION™ Fieldbus use Digital Mode specifications.* • *For HART® use Analog Mode specifications.*	**In Analog Mode:** ±0.0525% of calibrated span or upper range value (URV), whichever is greater, terminal based. For URV below reference point (25 inH_2O), accuracy equals: $\pm\left[0.025+0.0275\left(\frac{25\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.025+0.0275\left(\frac{62.5\ mbar}{span\ mbar}\right)\right]$ in % of span **In Digital Mode:** ±0.0375% of calibrated span or upper range value (URV), whichever is greater, terminal based. For URV below reference point (25 inH_2O), accuracy equals: $\pm\left[0.0125+0.025\left(\frac{25\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.0125+0.025\left(\frac{62.5\ mbar}{span\ mbar}\right)\right]$ in % of span * For **High Accuracy (HA)** option: ±0.025% of calibrated span or upper range value (URV), whichever is greater, terminal based.
Zero Temperature Effect per 28°C (50°F)	**In Analog Mode:** ±0.2125% of span. For URV below reference point (50 inH_2O), effect equals: $\pm\left[0.0125+0.05\left(\frac{50\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.0125+0.05\left(\frac{125\ mbar}{span\ mbar}\right)\right]$ in % of span **In Digital Mode:** ±0.20% of span. For URV below reference point (50 inH_2O), effect equals: $\pm 0.20\left(\frac{50\ inH_2O}{span\ inH_2O}\right)$ or $\pm 0.20\left(\frac{125\ mbar}{span\ mbar}\right)$ in % of span
Combined Zero and Span Temperature Effect per 28°C (50°F)	**In Analog Mode:** ±0.40% of span. For URV below reference point (50 inH_2O), effect equals: $\pm\left[0.20+0.20\left(\frac{50\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.20+0.20\left(\frac{125\ mbar}{span\ mbar}\right)\right]$ in % of span **In Digital Mode:** ±0.375% of span. For URV below reference point (50 inH_2O), effect equals: $\pm\left[0.175+0.20\left(\frac{50\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.175+0.20\left(\frac{125\ mbar}{span\ mbar}\right)\right]$ in % of span
Zero Static Pressure Effect per 300 psi (20 bar)	±0.1625% of span. For URV below reference point (50 inH_2O), effect equals: $\pm\left[0.0125+0.15\left(\frac{50\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.0125+0.15\left(\frac{125\ mbar}{span\ mbar}\right)\right]$ in % of span
Combined Zero and Span Static Pressure Effect per 300 psi (20 bar)	±0.30% of span. For URV below reference point (50 inH_2O), effect equals: $\pm\left[0.15+0.15\left(\frac{50\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.15+0.15\left(\frac{125\ mbar}{span\ mbar}\right)\right]$ in % of span
Stability	±0.03% of URL per year

* Performance specifications are based on reference conditions of 25°C (77°F), zero (0) static pressure, 10 to 55% RH, and 316 Stainless Steel barrier diaphragm.

Performance Under Rated Conditions* - Model STF132 (0 to 100 psi)

Parameter		Description
Upper Range Limit	**psi** **bar**	100 7
Minimum Span	**psi** **bar**	1 0.07
Turndown Ratio		100 to 1
Zero Elevation and Suppression		No limit except minimum span within –18 and +100% URL. Specifications valid from –5 to +100% URL.
Accuracy (Reference – Includes combined effects of linearity, hysteresis, and repeatability) • *Accuracy includes residual error after averaging successive readings.* • *For FOUNDATION™ Fieldbus use Digital Mode specifications.* • *For HART® use Analog Mode specifications.*		**In Analog Mode:** ±0.10% of calibrated span or upper range value (URV), whichever is greater, terminal based. For URV calibrated below reference point (20 psi), accuracy equals: $\pm\left[0.05+0.05\left(\frac{20\text{ psi}}{\text{span psi}}\right)\right]$ or $\pm\left[0.05+0.05\left(\frac{1.4\text{ bar}}{\text{span bar}}\right)\right]$ in % of span **In Digital Mode:** ±0.075% of calibrated span or upper range value (URV), whichever is greater, terminal based. For URV calibrated below reference point (20 psi), accuracy equals: $\pm\left[0.025+0.05\left(\frac{20\text{ psi}}{\text{span psi}}\right)\right]$ or $\pm\left[0.025+0.05\left(\frac{1.4\text{ bar}}{\text{span bar}}\right)\right]$ in % of span
Zero Temperature Effect per 28°C (50°F)		**In Analog Mode:** ±0.2125% of span. For URV below reference point (30 psi), effect equals: $\pm\left[0.0125+0.20\left(\frac{30\text{ psi}}{\text{span psi}}\right)\right]$ or $\pm\left[0.0125+0.20\left(\frac{2\text{ bar}}{\text{span bar}}\right)\right]$ in % of span **In Digital Mode:** ±0.20% of span. For URV below reference point (30 psi), effect equals: $\pm 0.20\left(\frac{30\text{ psi}}{\text{span psi}}\right)$ or $\pm 0.20\left(\frac{2\text{ bar}}{\text{span bar}}\right)$ in % of span
Combined Zero and Span Temperature Effect per 28°C (50°F)		**In Analog Mode:** ±0.40% of span. For URV below reference point (30 psi), effect equals: $\pm\left[0.20+0.20\left(\frac{30\text{ psi}}{\text{span psi}}\right)\right]$ or $\pm\left[0.20+0.20\left(\frac{2\text{ bar}}{\text{span bar}}\right)\right]$ in % of span **In Digital Mode:** ±0.375% of span. For URV below reference point (30 psi), effect equals: $\pm\left[0.175+0.20\left(\frac{30\text{ psi}}{\text{span psi}}\right)\right]$ or $\pm\left[0.175+0.20\left(\frac{2\text{ bar}}{\text{span bar}}\right)\right]$ in % of span
Zero Static Pressure Effect per 300 psi (20 bar)		±0.1625% of span. For URV below reference point (30 psi), effect equals: $\pm\left[0.0125+0.15\left(\frac{30\text{ psi}}{\text{span psi}}\right)\right]$ or $\pm\left[0.0125+0.15\left(\frac{2\text{ bar}}{\text{span bar}}\right)\right]$ in % of span
Combined Zero and Span Static Pressure Effect per 300 psi (20 bar)		±0.30% of span. For URV below reference point (30 psi), effect equals: $\pm\left[0.15+0.15\left(\frac{30\text{ psi}}{\text{span psi}}\right)\right]$ or $\pm\left[0.15+0.15\left(\frac{2\text{ bar}}{\text{span bar}}\right)\right]$ in % of span
Stability		±0.04% of URL per year.

* Performance specifications are based on reference conditions of 25°C (77°F), zero (0) static pressure, 10 to 55% RH, and 316 Stainless Steel barrier diaphragm.

Performance Under Rated Conditions* - Model STF12F (0 to 400 inH_2O)

Parameter	Description
Upper Range Limit **inH_2O** **mbar**	400 (39.2°F/4°C is standard reference temperature for inH_2O range.) 1,000
Minimum Span **inH_2O** **mbar**	1 Note: Recommended minimum span in square root mode is 20 inH_2O (50 mbar). 2.5
Turndown Ratio	400 to 1
Zero Elevation and Suppression	No limit except minimum span within ±100% URL. Specifications valid from –5 to +100% URL.
Accuracy (Reference – Includes combined effects of linearity, hysteresis, and repeatability) • *Accuracy includes residual error after averaging successive readings.* • *For FOUNDATION™ Fieldbus use Digital Mode specifications. For HART® use Analog Mode specifications.*	**In Analog Mode:** ±0.075% of calibrated span or upper range value (URV), whichever is greater, terminal based. For URV below reference point (25 in inH_2O), accuracy equals: $\pm\left[0.025+0.05\left(\frac{25\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.025+0.05\left(\frac{62\ mbar}{span\ mbar}\right)\right]$ in % of span **In Digital Mode:** ±0.0625% of calibrated span or upper range value (URV), whichever is greater, terminal based. For URV below reference point (25 in inH_2O), accuracy equals: $\pm\left[0.0125+0.05\left(\frac{25\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.0125+0.05\left(\frac{62\ mbar}{span\ mbar}\right)\right]$ in % of span
Zero Temperature Effect per 28°C (50°F)	**In Analog Mode:** ±0.0625% of span. For URV below reference point (50 inH_2O), effect equals: $\pm\left[0.0125+0.05\left(\frac{50\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.0125+0.05\left(\frac{125\ mbar}{span\ mbar}\right)\right]$ in % of span **In Digital Mode:** ±0.05% of span. For URV below reference point (50 inH_2O), effect equals: $\pm 0.05\left(\frac{50\ inH_2O}{span\ inH_2O}\right)$ or $\pm 0.05\left(\frac{125\ mbar}{span\ mbar}\right)$ in % of span
Combined Zero and Span Temperature Effect per 28°C (50°F)	**In Analog Mode:** ±0.10% of span. For URV below reference point (50 inH_2O), effect equals: $\pm\left[0.05+0.05\left(\frac{50\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.05+0.05\left(\frac{125\ mbar}{span\ mbar}\right)\right]$ in % of span **In Digital Mode:** ±0.075% of span. For URV below reference point (50 inH_2O), effect equals: $\pm\left[0.025+0.05\left(\frac{50\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.025+0.05\left(\frac{125\ mbar}{span\ mbar}\right)\right]$ in % of span
Zero Static Pressure Effect per 1000 psi (70 bar)	±0.075% of span. For URV below reference point (50 inH_2O), effect equals: $\pm\left[0.0125+0.0625\left(\frac{50\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.0125+0.0625\left(\frac{125\ mbar}{span\ mbar}\right)\right]$ in % of span
Combined Zero and Span Static Pressure Effect per 1000 psi (70 bar)•	±0.15% of span. For URV below reference point (50 inH_2O), effect equals: $\pm\left[0.0875+0.0625\left(\frac{50\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.0875+0.0625\left(\frac{125\ mbar}{span\ mbar}\right)\right]$ in % of span
Stability	±0.015% of URL per year.

* Performance specifications are based on reference conditions of 25°C (77°F), zero (0) static pressure, 10 to 55% RH, and 316 Stainless Steel barrier diaphragm.

Performance Under Rated Conditions* - Model STF13F (0 to 100 psi)

Parameter		Description
Upper Range Limit	**psi** **bar**	100 7
Minimum Span	**psi** **bar**	1 0.07
Turndown Ratio		100 to 1
Zero Elevation and Suppression		No limit except minimum span within –18 and +100% URL. Specifications valid from –5 to +100% URL.
Accuracy (Reference – Includes combined effects of linearity, hysteresis, and repeatability) • *Accuracy includes residual error after averaging successive readings.* • *For FOUNDATION™ Fieldbus use Digital Mode specifications. For HART® use Analog Mode specifications.*		**In Analog Mode:** ±0.075% of calibrated span or upper range value (URV), whichever is greater, terminal based. For URV below reference point (15 psi), accuracy equals: $\pm\left[0.025+0.05\left(\frac{15\text{ psi}}{\text{span psi}}\right)\right]$ or $\pm\left[0.025+0.05\left(\frac{1\text{ bar}}{\text{span bar}}\right)\right]$ in % of span **In Digital Mode:** ±0.0625% of calibrated span or upper range value (URV), whichever is greater, terminal based. For URV below reference point (15 psi), accuracy equals: $\pm\left[0.0125+0.05\left(\frac{15\text{ psi}}{\text{span psi}}\right)\right]$ or $\pm\left[0.0125+0.05\left(\frac{1\text{ bar}}{\text{span bar}}\right)\right]$ in % of span
Zero Temperature Effect per 28°C (50°F)		**In Analog Mode:** ±0.0625% of span. For URV below reference point (30 psi), effect equals: $\pm\left[0.0125+0.05\left(\frac{30\text{ psi}}{\text{span psi}}\right)\right]$ or $\pm\left[0.0125+0.05\left(\frac{2\text{ bar}}{\text{span bar}}\right)\right]$ in % of spa **In Digital Mode:** ±0.05% of span. For URV below reference point (30 psi), effect equals: $\pm 0.05\left(\frac{30\text{ psi}}{\text{span psi}}\right)$ or $\pm 0.05\left(\frac{2\text{ bar}}{\text{span bar}}\right)$ in % of span
Combined Zero and Span Temperature Effect per 28°C (50°F)		**In Analog Mode:** ±0.10% of span. For URV below reference point (30 psi), effect equals: $\pm\left[0.05+0.05\left(\frac{30\text{ psi}}{\text{span psi}}\right)\right]$ or $\pm\left[0.05+0.05\left(\frac{2\text{ bar}}{\text{span bar}}\right)\right]$ in % of span **In Digital Mode:** ±0.075% of span. For URV below reference point (30 psi), effect equals: $\pm\left[0.025+0.05\left(\frac{30\text{ psi}}{\text{span psi}}\right)\right]$ or $\pm\left[0.025+0.05\left(\frac{2\text{ bar}}{\text{span bar}}\right)\right]$ in % of span
Zero Static Pressure Effect per 1000 psi (70 bar)		±0.075% of span. For URV below reference point (30 psi), effect equals: $\pm\left[0.0125+0.0625\left(\frac{30\text{ psi}}{\text{span psi}}\right)\right]$ or $\pm\left[0.0125+0.0625\left(\frac{2\text{ bar}}{\text{span bar}}\right)\right]$ in % of span
Combined Zero and Span Static Pressure Effect per 1000 psi (70 bar)		±0.15% of span. For URV below reference point (30 psi), effect equals: $\pm\left[0.0875+0.0625\left(\frac{30\text{ psi}}{\text{span psi}}\right)\right]$ or $\pm\left[0.0875+0.0625\left(\frac{2\text{ bar}}{\text{span bar}}\right)\right]$ in % of span
Stability		±0.04% of URL per year.

* Performance specifications are based on reference conditions of 25°C (77°F), zero (0) static pressure, 10 to 55% RH, and 316 Stainless Steel barrier diaphragm.

Performance Under Rated Conditions* - Model STF14F (0 to 600 inH_2O)

Parameter	Description
Upper Range Limit **inH_2O** **mbar**	600 (39.2°F/4°C is standard reference temperature for inH_2O range.) 1,500
Minimum Span **inH_2O** **mbar**	6 15
Turndown Ratio	100 to 1
Zero Elevation and Suppression	No limit except minimum span within 0 to 100% URL.
Accuracy (Reference – Includes combined effects of linearity, hysteresis, and repeatability) • *Accuracy includes residual error after averaging successive readings.* • *For FOUNDATION™ Fieldbus use Digital Mode specifications. For HART® use Analog Mode specifications.*	**In Analog Mode:** ±0.075% of calibrated span or upper range value (URV), whichever is greater, terminal based. For URV below reference point (25 inH_2O), accuracy equals: $\pm\left[0.0375+0.0375\left(\frac{25\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.0375+0.0375\left(\frac{62\ mbar}{span\ mbar}\right)\right]$ in % of span **In Digital Mode:** ±0.05% of calibrated span or upper range value (URV), whichever is greater, terminal based. For URV below reference point (25 inH_2O), accuracy equals: $\pm\left[0.0125+0.0375\left(\frac{25\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.0125+0.0375\left(\frac{62\ mbar}{span\ mbar}\right)\right]$ in % of span
Zero Temperature Effect per 28°C (50°F)	**In Analog Mode:** ±0.0625% of span. For URV below reference point (50 inH_2O), effect equals: $\pm\left[0.0125+0.05\left(\frac{50\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.0125+0.05\left(\frac{125\ mbar}{span\ mbar}\right)\right]$ in % of span **In Digital Mode:** ±0.05% of span. For URV below reference point (50 inH_2O), effect equals: $\pm 0.05\left(\frac{50\ inH_2O}{span\ inH_2O}\right)$ or $\pm 0.05\left(\frac{125\ mbar}{span\ mbar}\right)$ in % of span
Combined Zero and Span Temperature Effect per 28°C (50°F)	**In Analog Mode:** ±0.10% of span. For URV below reference point (50 inH_2O), effect equals: $\pm\left[0.05+0.05\left(\frac{50\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.05+0.05\left(\frac{125\ mbar}{span\ mbar}\right)\right]$ in % of span **In Digital Mode:** ±0.075% of span. For URV below reference point (50 inH_2O), effect equals: $\pm\left[0.025+0.05\left(\frac{50\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.025+0.05\left(\frac{125\ mbar}{span\ mbar}\right)\right]$ in % of span
Zero Static Pressure Effect per 1000 psi (70 bar)	±0.075% of span. For URV below reference point (50 inH_2O), effect equals: $\pm\left[0.0125+0.0625\left(\frac{50\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.0125+0.0625\left(\frac{125\ mbar}{span\ mbar}\right)\right]$ in % of span
Combined Zero and Span Static Pressure Effect per 1000 psi (70 bar)	±0.20% of span. For URV below reference point (50 inH_2O), effect equals: $\pm\left[0.1375+0.0625\left(\frac{50\ inH_2O}{span\ inH_2O}\right)\right]$ or $\pm\left[0.1375+0.0625\left(\frac{125\ mbar}{span\ mbar}\right)\right]$ in % of span
Stability	±0.04% URL per year

* Performance specifications are based on reference conditions of 25°C (77°F), zero (0) static pressure, 10 to 55% RH, and 316 Stainless Steel barrier diaphragm.

Performance Under Rated Conditions - General for all Models

Parameter	Description
Output (two-wire)	Analog 4 to 20 mA or digital communications DE mode. Options available for FOUNDATION™ Fieldbus and HART® protocol.
Supply Voltage Effect	0.005% of span per volt.
Damping Time Constant	Adjustable from 0 to 32 seconds digital damping.
NAMUR NE 43 Compliance Option	Transmitter failure information is generated when the measuring information is invalid or no longer present. Failure information is transmitted as a current signal but outside the normal 4-20 mA measurement signal level. Transmitter failure values are: ≤ 3.6 mA and ≥ 21.0 mA. The normal signal range is ≥ 3.8 mA and ≤ 20.5 mA.
SIL 2/3 Compliance	SIL certified to IEC 61508 for non-redundant use in SIL 2 related Safety Systems (single use) and for redundant (multiple) use in SIL 3 Safety Systems through TÜV Nord Sys Tec GmbH & Co. KG under the following standards: IEC61508-1: 1998; IEC 61508-2: 2000; IEC61508-3: 1998.
Lightning Protection Option (Code "LP")	Leakage Current: 10 microamps max. @ 42.4 VDC, 93°C Impulse Rating: 10/20 µ sec. 5,000 Amps (50 strikes) 10,000 Amps (20 strikes) (rise/decay) 10/1,000 µ sec. 250 Amps (1,000 strikes) 500 Amps (400 strikes)

Physical and Approval Bodies

Parameter	Description
Barrier Diaphragms Material (Wetted)	316L SS, Hastelloy® C-276*[2], Monel®400**[3]
Gasket Ring Material (Wetted)	316/316L SS, Hastelloy® C-276*[2], Monel®400**[3]
Extension Tube Material	316 SS[4]
Process Head and Adapter Flange Material	316 SS[4], Carbon Steel (Zinc-plated)[5], Monel®400**[7], Hastelloy® C-276*[6]
Process Head Gaskets	Teflon® is standard. Viton® is optional
Meter Body Bolting	Carbon Steel (Zinc-plated)[5] or 316 SS[4] (NACE) bolts.
Mounting Flange STF128, STF132 STF12F, STF13F, STF14F	**Flush or Extended Diaphragm**: Zinc Chromate plated Carbon Steel[5], 304 SS, or 316 SS[4]. 316L SS ***(NOTE: Mounting Flange is process wetted.)***
Fill Fluid	DC® 200 Silicone oil or CTFE (Chlorotrifluoroethylene)
Electronic Housing	Epoxy-Polyester hybrid paint. Low Copper-Aluminum. Meets NEMA 4X (watertight) and NEMA 7 (explosion proof). Stainless Steel optional.
Process Connections All Models STF128, STF132 STF12F, STF13F, STF14F	 **Process Head:** 1/4-inch NPT; 1/2-inch NPT with adapter and DIN, standard options. **Flange:** 2, 3 or 4-inch Class 150 or 300 ANSI; DN50-PN40, DN80-PN40 or DN100-PN40 DIN flange. **Extended Diaphragm:** 2, 4, or 6 inches (50, 101, 152 mm) long. 2 or 3-inch, Class 150 ANSI flange.
Wiring	Accepts up to 16 AWG (1.5 mm diameter).
Mounting	See Figure 3 for typical flange mounting arrangement.
Dimensions	See Figures 4, 5, and 6
Net Weight STF128, STF132 STF12F, STF13F, STF14F	 **Flush or Extended Model:** 15.5 to 35.0 pounds (7 to 16 Kg) depending on flange size 14.2 to 18.4 pounds (6.5 to 9 Kg) depending on flange size

[2] Hastelloy® C-276 or UNS N10276
[3] Monel® 400 or UNS N04400
[4] Supplied as 316 SS or as Grade CF8M, the casting equivalent of 316 SS.
[5] Carbon Steel heads are zinc-plated and not recommended for water service due to hydrogen migration. For that service, use 316 stainless steel wetted Process Heads.
[6] Hastelloy® C-276 or UNS N10276. Supplied as indicated or as Grade CW12MW, the casting equivalent of Hastelloy® C-276
[7] Monel® 400 or UNS N04400. Supplied as indicated or as Grade M30C, the casting equivalent of Monel® 400

* Flush design only.

**Flush or pseudo flange design.

NOTE: Pressure transmitters that are part of safety equipment for the protection of piping (systems) or vessel(s) from exceeding allowable pressure limits, (equipment with safety functions in accordance with Pressure Equipment Directive 97/23/EC article 1, 2.1.3), require separate examination.

Certifications

	Type of Protection	Comm. Option	Field Parameters	Temp. Codes
FM Approvals[SM]	**Explosionproof:** Class I, Division 1, Groups A, B, C, D locations **Dust Ignition Proof:** Class II, III, Division 1, Groups E, F, G locations, Enclosure Type 4X	All	All	T5 Ta = 93°C
	Intrinsically Safe: Class I, II, III, Division 1, Groups A, B, C, D, E, F, G locations, Encl	4-20 mA / DE	Vmax = 42.4V Imax = 225mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = 93°C
		4-20 mA	Vmax = 30V Imax = 225mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = 93°C
	Intrinsically Safe: Class I, II, III, Division 1, Groups A, B, C, D, E, F, G locations; Class 1, Zone 0, AEx ia Group IIC, Enclosure Type 4X / IP 66/67	Fieldbus – Entity (Not FISCO)	Vmax = 32V Imax = 120mA Ci = 4.2nF Li = 0 Pi =0.84W	T4 Ta = 40°C T3 Ta = 93°C
		Fieldbus – Entity (Not FISCO)	Vmax = 24V Imax = 250mA Ci = 4.2nF Li = 0 Pi =1.2W	T4 Ta = 40°C T3 Ta = 93°C
		FISCO	Vmax = 17.5V Imax = 380mA Ci = 4.2nF Li = 0 Pi =5.32W	T4 Ta = 40°C T3 Ta = 93°C
	Nonincendive: Class I, Division 2, Groups A, B, C, D locations, Enclosure Type 4X	4-20 mA / DE	Vmax = 42.4V Imax = 225mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = 93°C
		4-20 mA / HART	Vmax = 30V Imax = 225mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = 93°C
	Nonincendive: Class I, Division 2, Groups A, B, C, D; Suitable for: Class II, Division 2, Groups F&G; Class III, Division 2; Class I, Zone 2, Group IIC, Enclosure Type 4X / IP 66/67	Fieldbus – Entity (Not FNICO)	Vmax = 32V Imax = 120mA Ci = 4.2nF Li = 0 Pi =0.84W	T4 Ta = 40°C T3 Ta = 93°C
		Fieldbus – Entity (Not FNICO)	Vmax = 24V Imax = 250mA Ci = 4.2nF Li = 0 Pi =1.2W	T4 Ta = 40°C T3 Ta = 93°C
		FNICO	Vmax = 32V Ci = 4.2nF Li = 0	T4 Ta = 40°C T3 Ta = 93°C

*Li = 0 except Li = 150µH when Option ME, Analog Meter, is selected.

FM Approvals[SM] is a service mark of FM Global

	Type of Protection	Comm. Option	Field Parameters	Temp. Codes
Canadian Standards Association (CSA)	**Explosion Proof:** Class I, Division 1, Groups B, C, D locations **Dust Ignition Proof:** Class II, III, Division 1, Groups E, F, G locations, Enclosure Type 4X	All	All	T4 Ta = 93°C
	Intrinsically Safe: Class I, II, III, Division 1, Groups A, B, C, D, E, F, G locations, Enclosure Type 4X	4-20 mA / DE	Vmax = 42V Imax = 225mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = 93°C
		4-20 mA / HART	Vmax = 42V Imax = 225mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = 93°C
		Fieldbus – Entity (Not FISCO)	Vmax = 24V Imax = 250mA Ci = 4.2nF Li = 0 Pi =1.2W	T4 Ta = 40°C T3 Ta = 93°C
	Nonincendive: Class I, Division 2, Groups A, B, C, D locations, Enclosure Type 4X	4-20 mA / DE	Vmax = 42.4V Imax = 225mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = 93°C
		4-20 mA / HART	Vmax = 30V Imax = 225mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = 93°C
		Fieldbus – Entity (Not FNICO)	Vmax = 24V Imax = 250mA Ci = 4.2nF Li = 0 Pi =1.2W	T4 Ta = 40°C T3 Ta = 93°C
	Canadian Registration Number (CRN):	All ST 3000 models except STG19L, STG99L, STG170 and STG180 have been registered in all provinces and territories in Canada and are marked CRN: 0F8914.5C.		

	Type of Protection	Comm. Option	Field Parameters	Temp. Codes
IECEx International Electrotechnical Commission (LCIE)	**Flameproof, Zone 1:** Ex d IIC, Enclosure IP 66/67	All	All	T5 Ta = –50 to 93°C T6 Ta = –50 to 78°C
	Intrinsically Safe, Zone 0/1: Ex ia IIC, Enclosure IP 66/67	4-20 mA / DE	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = –50 to 93°C T5 Ta = –50 to 85°C T6 Ta = –50 to 70°C
		4-20 mA / HART	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = –50 to 93°C T5 Ta = –50 to 63°C T6 Ta = –50 to 48°C
		Fieldbus (Not FISCO)	Ui = 24V Ii = 250mA Ci = 4.2nF Li = 0 Pi =1.2W	T3 Ta = –50 to 93°C T4 Ta = –50 to 40°C

* Li = 0 except Li = 150µH when Option ME, Analog Meter, is selected.

	Type of Protection	Comm. Option	Field Parameters	Temp. Codes
SAEx (South Africa)	**Flameproof, Zone 1:** Ex d IIC, Enclosure IP 66/67	All	All	T5 Ta = –50 to 93°C T6 Ta = –50 to 78°C
	Intrinsically Safe, Zone 0/1: Ex ia IIC, Enclosure IP 66/67	4-20 mA / DE	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = –50 to 93°C T5 Ta = –50 to 85°C T6 Ta = –50 to 70°C
		4-20 mA / HART	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = –50 to 93°C T5 Ta = –50 to 63°C T6 Ta = –50 to 48°C
		Fieldbus (Not FISCO)	Ui = 24V Ii = 250mA Ci = 4.2nF Li = 0 Pi =1.2W	T3 Ta = –50 to 93°C T4 Ta = –50 to 40°C
	Multiple Marking: **Flameproof, Zone 1:** Ex d IIC, Enclosure IP 66/67 **Intrinsically Safe, Zone 0/1:** Ex ia IIC, Enclosure IP 66/67 **NOTE:** The user must determine the type of protection required for installation of the equipment. The user shall then check the box [√] adjacent to the type of protection used on the equipment certification nameplate. Once a type of protection has been checked on the nameplate, subsequently the equipment shall not be reinstalled using any of the other certification types.	4-20 mA / DE	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = –50 to 93°C T5 Ta = –50 to 85°C T6 Ta = –50 to 70°C
		4-20 mA / HART	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = –50 to 93°C T5 Ta = –50 to 63°C T6 Ta = –50 to 48°C
		Fieldbus (Not FISCO)	Ui = 24V Ii = 250mA Ci = 4.2nF Li = 0 Pi =1.2W	T3 Ta = –50 to 93°C T4 Ta = –50 to 40°C

* Li = 0 except Li = 150µH when Option ME, Analog Meter, is selected.

	Type of Protection	Comm. Option	Field Parameters	Temp. Codes
ATEX (LCIE)	**Flameproof, Zone 0:** Ⓔx II 1 D, Ex tD Enclosure IP 66/67	All	All	A20 IP6X T95°C Ta = 93°C or T80°C Ta = 78°C
	Flameproof, Zone 1: Ⓔx II 2 GD, Ex d IIC, Ex tD Enclosure IP 66/67	All	All	T5 Ta = –50 to +93°C T6 Ta = –50 to +78°C, A21 IP6X T95°C Ta = 93°C or T80°C Ta = 78°C
	Intrinsically Safe, Zone 0/1: Ⓔx II 1 G, Ex ia IIC, Enclosure IP 66/67	4-20 mA / DE	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = –50 to 93°C T5 Ta = –50 to 85°C T6 Ta = –50 to 70°C
		4-20 mA / HART	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = –50 to 93°C T5 Ta = –50 to 63°C T6 Ta = –50 to 48°C
		Fieldbus (Not FISCO)	Ui = 24V Ii = 250mA Ci = 4.2nF Li = 0 Pi =1.2W	T3 Ta = –50 to 93°C T4 Ta = –50 to 40°C
	Non-Sparking, Zone 2: Ⓔx II 3 G, Ex nA IIC (Honeywell), Enclosure IP 66/67	4-20 mA / DE	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = –50 to 93°C T5 Ta = –50 to 85°C T6 Ta = –50 to 70°C
		4-20 mA / HART	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = –50 to 93°C T5 Ta = –50 to 63°C T6 Ta = –50 to 48°C
		Fieldbus (Not FNICO)	Ui = 24V Ii = 250mA Ci = 4.2nF Li = 0 Pi =1.2W	T3 Ta = –50 to 93°C T4 Ta = –50 to 40°C
	Multiple Marking: **Flameproof, Zone 1:** Ⓔx II 2 G, Ex d IIC **Intrinsically Safe, Zone 0/1:** Ⓔx II 1 G, Ex ia IIC **Non-Sparking, Zone 2:** Ⓔx II 3 G, Ex nA IIC **NOTE:** The user must determine the type of protection required for installation of the equipment. The user shall then check the box [√] adjacent to the type of protection used on the equipment certification nameplate. Once a type of protection has been checked on the nameplate, subsequently the equipment shall not be reinstalled using any of the other certification types.	4-20 mA / DE	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = –50 to 93°C T5 Ta = –50 to 85°C T6 Ta = –50 to 70°C
		4-20 mA / HART	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = –50 to 93°C T5 Ta = –50 to 63°C T6 Ta = –50 to 48°C
		Fieldbus (Not FISCO/FNICO)	Ui = 24V Ii = 250mA Ci = 4.2nF Li = 0 Pi =1.2W	T3 Ta = –50 to 93°C T4 Ta = –50 to 40°C

* Li = 0 except Li = 150µH when Option ME, Analog Meter, is selected.

	Type of Protection	Comm. Option	Field Parameters	Temp. Codes
INMETRO (CERTUSP) Brazil	**Flameproof, Zone 1:** BR-Ex d IIC Enclosure IP 66/67	All	All	T5 Ta = –50 to 93°C T6 Ta = –50 to 78°C
	Intrinsically Safe, Zone 0/1: BR-Ex ia IIC Enclosure IP 66/67	4-20 mA / DE	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = –50 to 93°C T5 Ta = –50 to 85°C T6 Ta = –50 to 70°C
		4-20 mA / HART	Ui = 30V Ii = 100mA Ci = 4.2nF Li = * Pi =1.2W	T4 Ta = –50 to 93°C T5 Ta = –50 to 63°C T6 Ta = –50 to 48°C
		Fieldbus (Not FISCO)	Ui = 24V Ii = 250mA Ci = 4.2nF Li = 0 Pi =1.2W	T3 Ta = –50 to 93°C T4 Ta = –50 to 40°C

*Li = 0 except Li = 150µH when Option ME, Analog Meter, is selected.

ST 3000 Pressure Transmitter Marine Certificate (MT Option)	This certificate defines the certifications covered for the ST 3000 Pressure Transmitter family of products, including the SMV 3000 Smart Multivariable Transmitter. It represents the compilation of the five certificates Honeywell currently has covering the certification of these products into marine applications. For ST 3000 Smart Pressure Transmitter and SMV 3000 Smart Multivarible Transmitter
	American Bureau of Shipping (ABS) - 2009 Steel Vessel Rules 1-1-4/3.7, 4-6-2/5.15, 4-8-3/13 & 13.5, 4-8-4/27.5.1, 4-9-7/13. Certificate number: 04-HS417416-PDA
	Bureau Veritas (BV) - Product Code: 389:1H. Certificate number: 12660/B0 BV
	Det Norske Veritas (DNV) - Location Classes: Temperature D, Humidity B, Vibration A, EMC B, Enclosure C. For salt spray exposure; enclosure of 316 SST or 2-part epoxy protection with 316 SST bolts to be applied. Certificate number: A-11476
	Korean Register of Shipping (KR) - Certificate number: LOX17743-AE001
	Lloyd's Register (LR) - Certificate number: 02/60001(E1) & (E2)

European Pressure Equipment Directive (PED) (97/23/EC)	The ST 3000 Smart Pressure Transmitters are in conformity with the essential requirements of the Pressure Equipment Directive. Honeywell ST 3000 Smart Pressure Transmitters are designed and manufactured in accordance with the applicable portions of Annex I, Essential Safety Requirements, and sound engineering practices. These transmitters have no pressurized internal volume, or have a pressurized internal volume rated less than 200 bar (2,900 psig), and/or have a maximum volume of less than 0.1 liter (Article 3, 1.1.(a) first indent, Group 1 fluids). Therefore, these transmitters are not subject to the essential requirements of the directive 97/23/EC (PED, Annex I) and shall not have the CE mark applied. For transmitters rated > 200 bar (2,900 psig) < 1,000 bar (14,500 psig) Honeywell maintains a technical file in accordance with Annex III, Module A, (internal production control) when the CE mark is required. Transmitter Attachments: Diaphragm Seals, Process Flanges and Manifolds comply with Sound Engineering Practice.
	NOTE: Pressure transmitters that are part of safety equipment for the protection of piping (systems) or vessel(s) from exceeding allowable pressure limits, (equipment with safety functions in accordance with Pressure Equipment Directive 97/23/EC article 1, 2.1.3), require separate examination. A formal statement from TÜV Industry Service Group of TÜV America, Inc., a division of TÜV Süddeutschland, a Notified Body regarding the Pressure Equipment Directive, can be found at www.honeywell.com. A hard copy may be obtained by contacting a Honeywell representative.
CE Mark	***Electro Magnetic Compatibility (EMC) (2004/108/EC)*** All Models: EN 50081-1: 1992; EN 50082-2:1995; EN 61326-1:1997 + A1, A2, and A3 – Industrial Locations
Recommended Frequency of Calibration	Honeywell recommends verifying the calibration of these devices once every four years.
Approved Manufacturing Locations	Honeywell Process Solutions - York, PA USA Honeywell (Tianjin) Limited – Tianjin, P.R. China Honeywell Automation India Ltd. – Pune 411013 India

Mounting

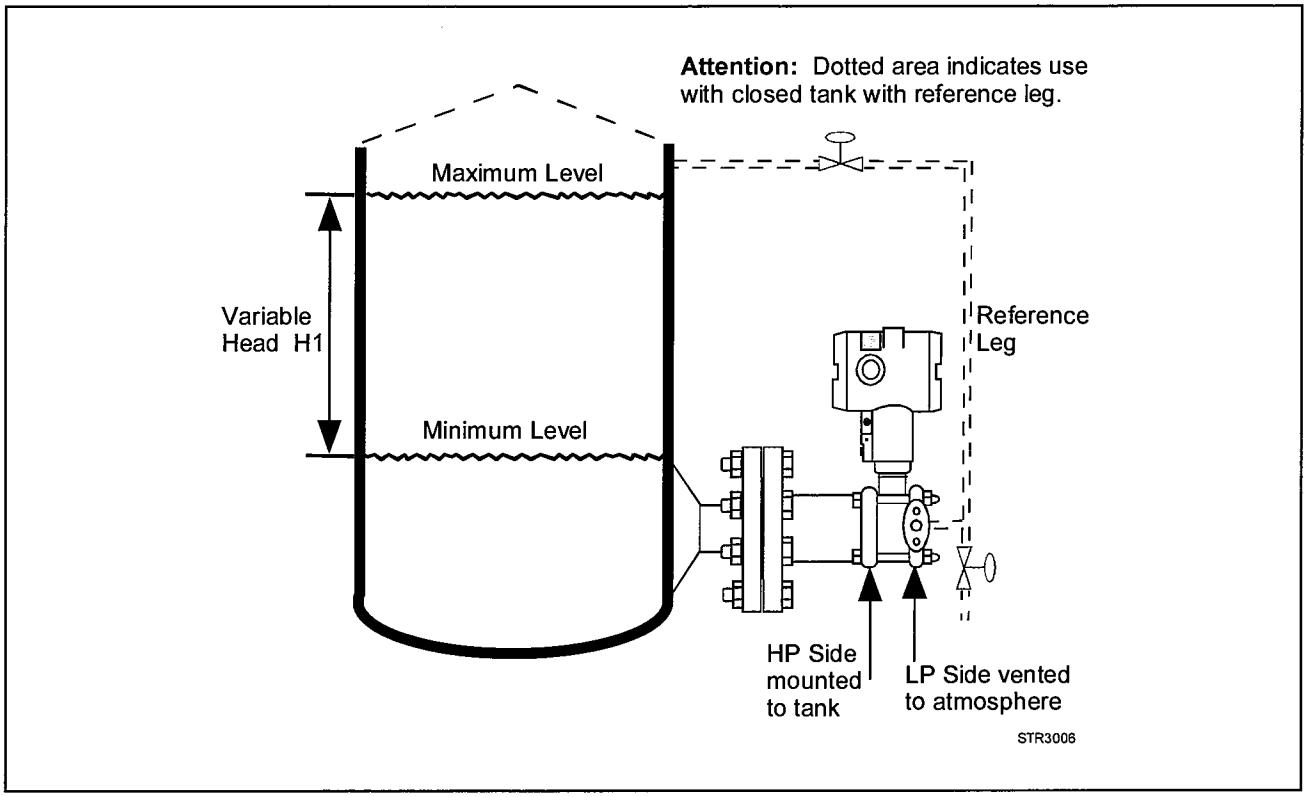
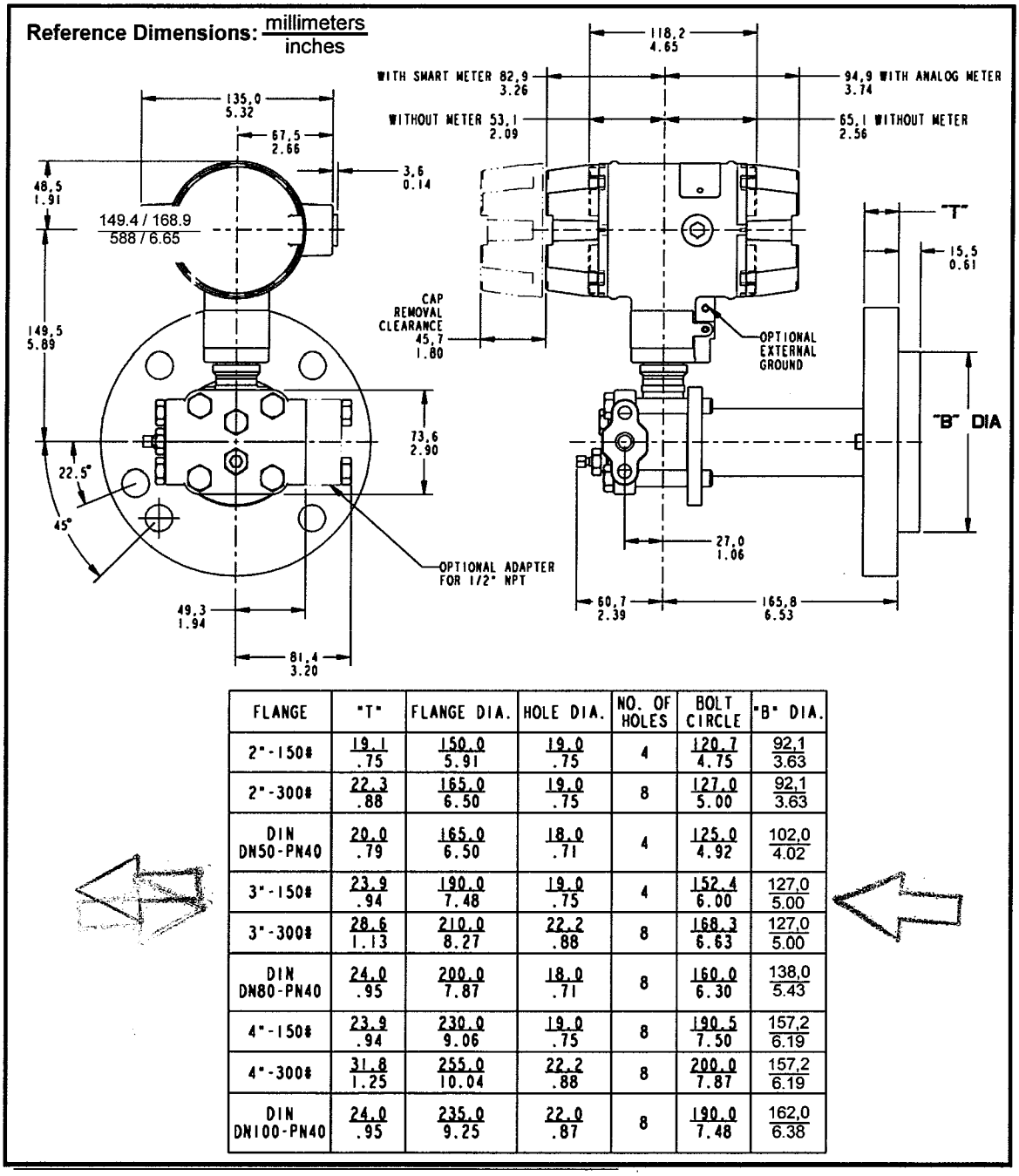


Figure 3 - Typical mounting arrangement for flange mounted liquid level transmitter.

Reference Dimensions

millimeters
inches

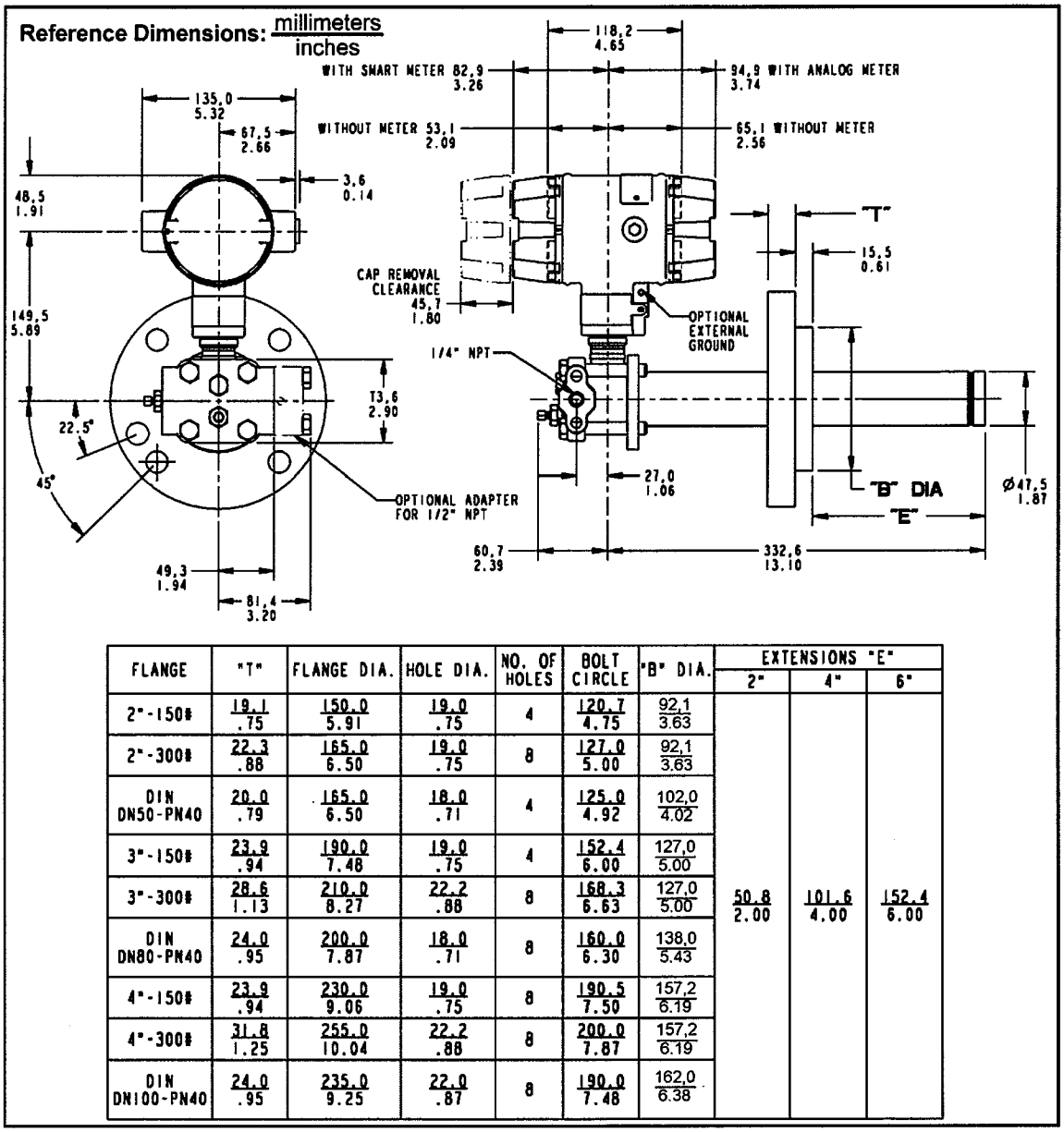


FLANGE	"T"	FLANGE DIA.	HOLE DIA.	NO. OF HOLES	BOLT CIRCLE	"B" DIA.
2"-150#	19,1 / .75	150,0 / 5.91	19,0 / .75	4	120,7 / 4.75	92,1 / 3.63
2"-300#	22,3 / .88	165,0 / 6.50	19,0 / .75	8	127,0 / 5.00	92,1 / 3.63
DIN DN50-PN40	20,0 / .79	165,0 / 6.50	18,0 / .71	4	125,0 / 4.92	102,0 / 4.02
3"-150#	23,9 / .94	190,0 / 7.48	19,0 / .75	4	152,4 / 6.00	127,0 / 5.00
3"-300#	28,6 / 1.13	210,0 / 8.27	22,2 / .88	8	168,3 / 6.63	127,0 / 5.00
DIN DN80-PN40	24,0 / .95	200,0 / 7.87	18,0 / .71	8	160,0 / 6.30	138,0 / 5.43
4"-150#	23,9 / .94	230,0 / 9.06	19,0 / .75	8	190,5 / 7.50	157,2 / 6.19
4"-300#	31,8 / 1.25	255,0 / 10.04	22,2 / .88	8	200,0 / 7.87	157,2 / 6.19
DIN DN100-PN40	24,0 / .95	235,0 / 9.25	22,0 / .87	8	190,0 / 7.48	162,0 / 6.38

Figure 4 - Approximate mounting dimensions for flush diaphragm type models STF128 and STF132.

Reference Dimensions

millimeters
inches

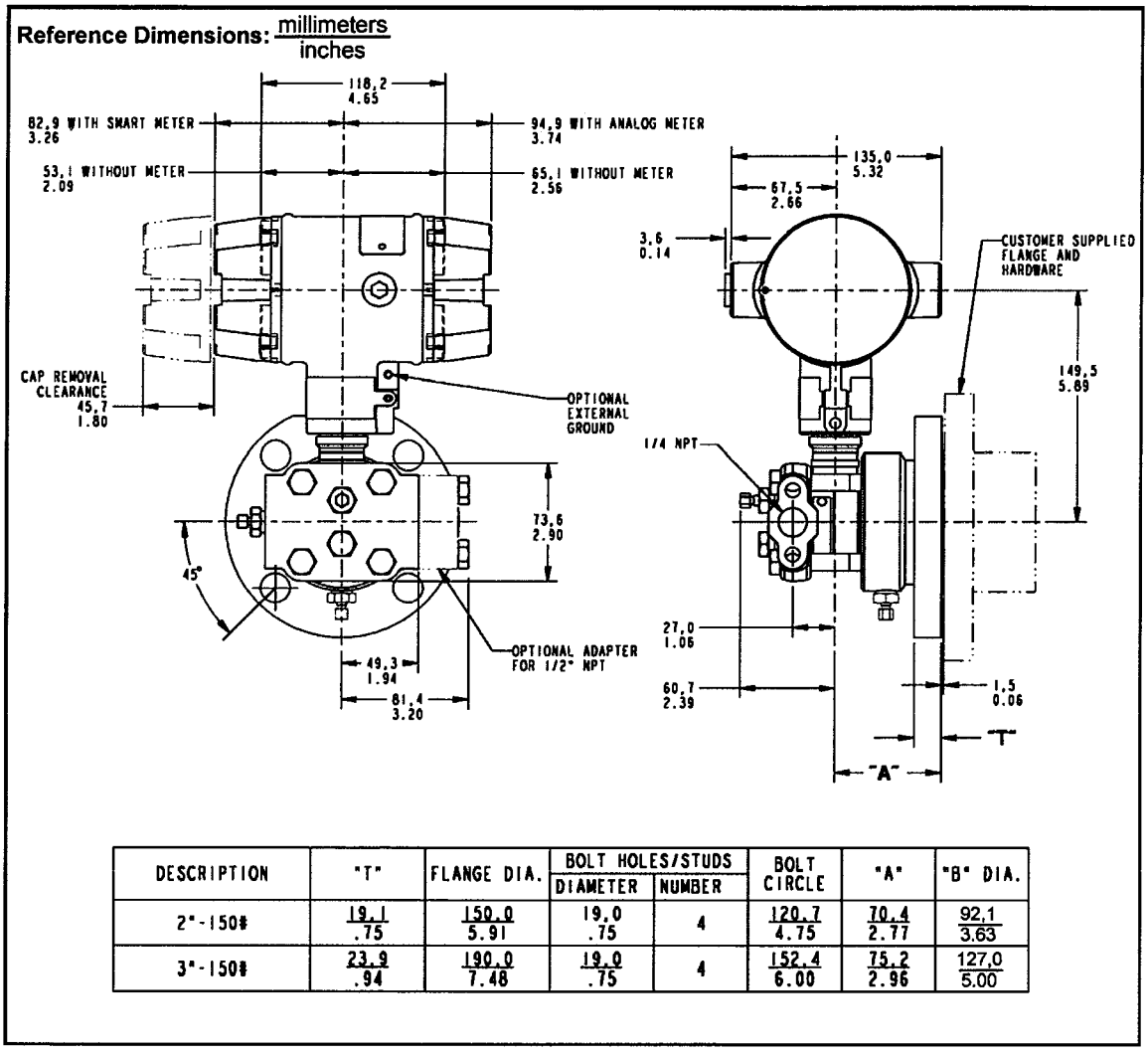


FLANGE	"T"	FLANGE DIA.	HOLE DIA.	NO. OF HOLES	BOLT CIRCLE	"B" DIA.	EXTENSIONS "E"		
							2"	4"	6"
2"-150#	19,1 .75	150,0 5.91	19,0 .75	4	120,7 4.75	92,1 3.63	50,8 2.00	101,6 4.00	152,4 6.00
2"-300#	22,3 .88	165,0 6.50	19,0 .75	8	127,0 5.00	92,1 3.63			
DIN DN50-PN40	20,0 .79	165,0 6.50	18,0 .71	4	125,0 4.92	102,0 4.02			
3"-150#	23,9 .94	190,0 7.48	19,0 .75	4	152,4 6.00	127,0 5.00			
3"-300#	28,6 1.13	210,0 8.27	22,2 .88	8	168,3 6.63	127,0 5.00			
DIN DN80-PN40	24,0 .95	200,0 7.87	18,0 .71	8	160,0 6.30	138,0 5.43			
4"-150#	23,9 .94	230,0 9.06	19,0 .75	8	190,5 7.50	157,2 6.19			
4"-300#	31,8 1.25	255,0 10.04	22,2 .88	8	200,0 7.87	157,2 6.19			
DIN DN100-PN40	24,0 .95	235,0 9.25	22,0 .87	8	190,0 7.48	162,0 6.38			

Figure 5 - Approximate mounting dimensions for extended diaphragm type models STF128 and STF132.

Reference Dimensions

millimeters
inches



DESCRIPTION	"T"	FLANGE DIA.	BOLT HOLES/STUDS		BOLT CIRCLE	"A"	"B" DIA.
			DIAMETER	NUMBER			
2"-150#	19,1 / .75	150,0 / 5.91	19,0 / .75	4	120,7 / 4.75	70,4 / 2.77	92,1 / 3.63
3"-150#	23,9 / .94	190,0 / 7.48	19,0 / .75	4	152,4 / 6.00	75,2 / 2.96	127,0 / 5.00

Figure 6 - Approximate mounting dimensions for pseudo flange type models STF12F, STF13F, and STF14F.

Options

- **Indicating Meter (Options ME and SM)**

  Two integral meter options are available. An analog meter (option ME) is available with a 0 to 100% linear scale. The Smart Meter (option SM) provides an LCD display for both analog and digital output and can be configured to display pressure in pre-selected engineering units.

- **Lightning Protection (Option LP)**

  A terminal block is available with circuitry that protects the transmitter from transient surges induced by nearby lightning strikes.

- **HART® Protocol Compatibility (Options HC and H6)**

  Optional electronics modules for the ST 3000 provides HART Protocol compatibility in either HART 5.x or 6.x formats. Transmitters with a HART Option are compatible with any HART enabled system that provides 5.x or 6.x format support.

- **Foundation Fieldbus (Option FF)**
  Equips transmitter with FF protocol for use in 31.25 kbit/s FF networks. See document 34-ST-03-72 for additional information on ST 3000 Fieldbus transmitters

- **SIL2/SIL3 Certification (Option SL)**

  This ST 3000 product is available for use with safety systems. With the SL option, we are fully certified to SIL 2 capability for single transmitters and SIL 3 capability for multiple transmitter use through TÜV Nord Sys Tec GmbH & Co. KG. We are in compliance with the following SIL standards:

  - IEC 61508-1: 1998;
  - IEC 61508-2: 2000
  - IEC 61508-3: 1998

- **NAMUR NE43 Compliance (Option NE)**

  This option provides software the meets the NAMUR NE43 requirements for failsafe software. Transmitter failure information is generated when the measuring information is no longer valid. Transmitter failure values are:
  ≤ 3.6 mA and ≥ 21.0 mA. The normal ST 3000 ranges are ≤ 3.8 mA and ≥ 20.5 mA.

- **Tagging (Option TG)**
  Up to 30 characters can be added on the stainless steel nameplate mounted on the transmitter's electronics housing at no extra cost. Note that a separate nameplate on the meter body contains the serial number and body-related data. A stainless steel wired on tag with additional data of up to 4 lines of 28 characters is also available. The number of characters for tagging includes spaces.

- **Lifetime Warranty (Option WL)**

  Extends limited 1-year warranty policy to 15 years for ST 3000 S100 pressure transmitters. See Honeywell Terms and Conditions.

- **Indicator Configuration (Option CI)**

  Provides custom configuration of Smart Meters

- **Transmitter Configuration (Option TC)**

  The factory can configure the transmitter linear/square root extraction, damping time, LRV, URV and mode (analog/digital) and enter an ID tag of up to eight characters and scratchpad information as specified.

- **Custom Calibration and ID in Memory (Option C)**
  The factory can calibrate any range within the scope of the transmitter's range and enter an ID tag of up to eight characters in the transmitter's memory.

Ordering information

For application assistance, current specifications, pricing, or name of the nearest Authorized Distributor, contact one of the offices below. Or, visit Honeywell on the World Wide Web at: http://www.honeywell.com.

ASIA PACIFIC

Control Products
Asia Pacific Headquarters
Phone: +(65) 6355-2828
Fax: +(65) 6445-3033

Asia Pacific Global Technical Support

Field Instruments
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Fax: +65 6445-3033
Process Instruments
Phone: (603) 76950 4777
Fax: (603) 7958 8922

Australia
Honeywell Limited
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Toll Free 1300-36-39-36
Toll Free Fax:
1300-36-04-70

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Honeywell China Inc.
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Fax: (86-21) 6237-2826

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Honeywell China Inc.
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Honeywell China Ltd - Xi'an.
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Fax: +(81) 3 6730 7228

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Sdn Bhd
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Fax: +(60-3) 7958-8922

New Zealand
Honeywell Limited
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Fax: +(64-9) 623-5060
Toll Free (0800) 202-088

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Phone: +(63-2) 633-2830-31/
636 1661-62
Fax: +(63-2) 638-4013

Singapore
Honeywell Pte Ltd.
Phone: +(65) 6580 3278
Fax: +(65) 6445-3033

South Korea
Honeywell Korea Co Ltd
Phone: +(822) 799 6315
Fax: +(822) 792 9015

Thailand
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(Thailand) Ltd.
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FAX: +(662) 693-3089

Taiwan R.O.C.
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for:
Pakistan
Cambodia
Guam
Laos
Myanmar
Vietnam
East Timor

SE Asia Countries

see Honeywell Automation
India Ltd for:
Bangladesh
Nepal
Sri Lanka

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FAX: +43 (316)40017

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FAX: +32 (0) 2 728 22 45

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FAX: +(359) 2 40 20 990

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FAX: +40 (0) 21 2316439

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ZAO "Honeywell"
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Fax: +380-44-201-44-75

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Honeywell SpA
Phone: +39 (02) 250 10 604
FAX: +39 (02) 250 10 659

South Africa (Republic of) and sub saharan
Honeywell Southern Africa
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FAX: +(58-2) 238-3391

Specifications are subject to change without notice.

Model Selection Guides are subject to change and are inserted into the specifications as guidance only.
Prior to specifying or ordering a model check for the latest revision Model Selection Guides which are published at:
http://hpsweb.honeywell.com/Cultures/en-US/Products/Instrumentation/ProductModelSelectionGuides/default.htm

Model Selection Guide (34-ST-16-21)

Honeywell

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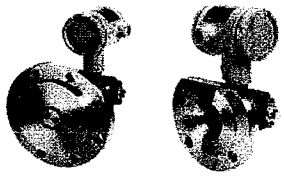
Issue 52
Page 1 of 5

ST 3000 Smart Transmitter Flange Mounted Liquid Level Series 100

Model Selection Guide



Instructions

- Select the desired Key Number. The arrow to the right marks the selection available.
- Make one selection from each Table I and II using the column below the proper arrow.
- Select as many Table III options as desired (if no options or approvals are desired, specify 9X).
- A (•) denotes unrestricted availability. A letter denotes restricted availability.
- Restrictions follow Table IV.

Key Number		I		II		III (Optional)		IV
STF128	-	E1A	-	0A1F0	-	HC,CC	+	XXXX

Important Note: **Base STF models no longer include a default communications option. All units now require the selection of a communication option from Table III (AN, DE, HC, H6 or FF).**

KEY NUMBER

Span	Selection	Availability		
0-10" to 0-400" H_2O/0-25 to 0-1,000 mbar - Compound Characterized	STF128	↓		
0-5 to 0-100 psi/0-0.34 to 7 bar - Compound Characterized	STF132	↓		
0-1" to 0-400" H_2O/0-2.5 to 0-1,000 mbar	STF12F		↓	
0-5 to 0-100 psi/0-0.34 to 0-7 bar	STF13F		↓	
0-25" to 0-600" H_2O/0-62.2 to 0-1,500 mbar	STF14F			↓

TABLE I - METER BODY

	Design	Ref. Head	Vent/Drain Valve on Ref. Head [2]	Barrier Diaphrm. (wetted)	Diaphrm. Plate (wetted)	Extension (wetted)	Sel.			
Materials of Construction	Flush	Carbon [1] Steel	316 SS	316L SS	316L SS	N/A	A__	•	•	
				Hast C [3]	316L SS		W__	•		
				Hast C [3]	Hast C [3]		B__	•		
				Monel 400 [4]	Monel 400 [4]		C__	19		
		316 SS [5]		316L SS	316L SS		E__	•		
				Hast C [3]	316L SS		X__	•		
				Hast C [3]	Hast C [3]		F__	•		
				Monel 400 [4]	Monel 400 [4]		G__	19		
		Hast C [3,6]	Hast C [3]	Hast C [3]	Hast C [3]		J__	•		
		Monel 400 [4,7]	Monel 400 [10]	Monel 400 [4]	Monel 400 [4]		L__	19		
	Extended	Carbon [1] Steel	316 SS	316L SS	316L SS	316L SS	M__	•		
				Hast C [3]			N__	•		
		316 SS [5]		316L SS			R__	•		
				Hast C [3]			S__	•		
	Pseudo Flange	Carbon [1] Steel	316 SS	316L SS	N/A	N/A	A__		•	•
				Hast C [3]			B__		•	
				Monel 400 [4]			C__		19	
		316 SS [5]		316L SS			E1A		•	•
				Hast C [3]			F__		•	
				Monel 400 [4]			G__		19	
Fill Fluid (Meter Body & Flange)	DC® 200 Silicone						_1_	•	•	•
	CTFE						_2_	•	•	
	Reference Head			Flange			Sel.			
Process Connection	1/4" NPT			High Pressure Side			__A	•	•	•
	1/4" NPT			Low Pressure Side			__C		•	•
	1/2" NPT (with Adapter)			High Pressure Side			__H	t	t	t
	1/2" NPT (with Adapter)			Low Pressure Side			__K		t	t

[1] Carbon Steel heads are zinc-plated and not recommended for water service due to hydrogen migration. For that service, use the 316 stainless steel Wetted Reference Head.
[2] Vent/Drains are Teflon or PTFE coated for lubricity.
[3] Hastelloy® C-276 or UNS N10276
[4] Monel 400® or UNS N04400
[5] Supplied as indicated or as Grade CW12MW, the casting equivalent of Hastelloy® C-276
[7] Supplied as indicated or as Grade M30C, the casting equivalent of Monel 400®
[10] Monel 400® or UNS N04400 or UNS N04405

LT-207 PART # STF128-E1A-0A1F0-HC,CC,TG,F1,9X+XXXX
0-49 IWC

TABLE II - FLANGE ASSEMBLY

		Flange Material	Threaded Nut Ring Material	Selection	Availability STF1xx 28 32	2F 3F	4F
No Selection		None	None	0 _ _ _	•	•	•
Flange (ANSI Flanges have 125-500 AARH Surface Finish)	3" ANSI Class 150	Carbon Steel (non-wetted)	Carbon Steel (non-wetted)	_1 _ _ _	•		
	3" ANSI Class 300			_2 _ _ _	•		
	DN80-PN40 DIN			_3 _ _ _	•		
	4" ANSI Class 150			_4 _ _ _	•		
	4" ANSI Class 300			_5 _ _ _	•		
	DN100-PN40 DIN			_6 _ _ _	•		
	2" ANSI Class 150			_7 _ _ _	•		
	2" ANSI Class 300			_8 _ _ _	•		
	DN50-PN40 DIN			_9 _ _ _	•		
	3" ANSI Class 150	304 SS (non-wetted)	304 SS (non-wetted)	_A _ _ _	•		
	3" ANSI Class 300			_B _ _ _	•		
	DN80-PN40 DIN			_C _ _ _	•		
	4" ANSI Class 150			_D _ _ _	•		
	4" ANSI Class 300			_E _ _ _	•		
	DN100-PN40 DIN			_F _ _ _	•		
	2" ANSI Class 150			_Q _ _ _	•		
	2" ANSI Class 300			_U _ _ _	•		
	DN50-PN40 DIN			_V _ _ _	•		
	3" ANSI Class 150	316 SS (non-wetted)	304 SS (non-wetted)	_H _ _ _	•		
	3" ANSI Class 300			_J _ _ _	•		
	DN80-PN40 DIN			_K _ _ _	•		
	4" ANSI Class 150			_L _ _ _	•		
	4" ANSI Class 300			_M _ _ _	•		
	DN100-PN40 DIN			_N _ _ _	•		
	2" ANSI Class 150			_W _ _ _	•		
	2" ANSI Class 300			_X _ _ _	•		
	DN50-PN40 DIN			_Y _ _ _	•		
	Pseudo Flange on Standard DP						
	2" ANSI Class 150 w/Vent/Drain	316L SS (wetted)	304 SS (wetted)	_T _ _ _		•	•
	3" ANSI Class 150 w/Vent/Drain			_R _ _ _		•	•
	3" ANSI Class 150 w/o Vent/Drain			_P _ _ _		•	
	No Selection			_ _ 0 _ _		•	•
Gasket Ring (wetted)	Flush Design		316L SS	_ _ 1 _ _	g		
			Hastelloy® C [3]	_ _ 2 _ _	g		
			Monel 400® [4]	_ _ 3 _ _	q		
	Extended Design		316L SS	_ _ 5 _ _	v		
Extension (wetted)	No Selection			_ _ _ 0 _		•	•
	Flush			_ _ _ F _	h		
	Diameter		**Length**				
	1.87 Inches (for 2", 3" or 4 " spud)[13]		2 inches	_ _ _ C _	v		
			4 inches	_ _ _ D _	v		
			6 inches	_ _ _ E _	v		
No Selection	No Selection			_ _ _ _ 0	•	•	•

[3] Hastelloy® C-276 or UNS N10276
[4] Monel 400® or UNS N04400
[13] For part numbers and pricing information on Tank Spuds refer to page ST-91 (Supplementary Accessories & Kits).

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TABLE III - OPTIONS	Selection	STF1xx 28 32	2F 3F	4F	
Communication Options					
Analog only (can be configured using appropriate Honeywell DE tool)	AN	•	•	•	
DE Protocol communications	DE	•	•	•	
HART® 5.x Protocol Compatible Electronics	HC	•	•	•	b
HART® 6.x Protocol Compatible Electronics	H6	•	•	•	
FOUNDATION™ Fieldbus Communications	FF	r	r	r	
Indicating Meter Options					
Analog Meter (0-100 Even 0-10 Square Root)	ME	•	•	•	
Smart Meter	SM	•	•	•	b
Custom Configuration of Smart Meter	CI	e	e	e	
Local Zero & Span	ZS	m	m	m	
Local Zero	LZ	x	x	x	b
Transmitter Housing & Electronics Options					
NAMUR Failsafe Software	NE	15	15	15	
SIL 2 - TÜV Certified transmitter (requires HC or H6 and WP options)	SL	p	p	p	
Lightning Protection	LP	•	•	•	
Custom Calibration and I.D. in Memory	CC	•	•	•	
Transmitter Configuration - (non-Fieldbus)	TC	15	15	15	
Transmitter Configuration - (Fieldbus)	FC	21	21	21	b
Write Protection (Delivered in the "enabled" position)	WP	•	•	•	
Write Protection (Delivered in the "disabled" position)	WX	•	•	•	b
316 SS[5] Electronics Housing - *with M20 Conduit Connections*	SH	n	n	n	
1/2" NPT to M20 316 SS Conduit Adapter (BASEEFA EEx d IIC)	A1	n	n	n	b
1/2" NPT to 3/4" NPT 316 SS Conduit Adapter	A2	•	•	•	
316 SS [5] Housing with M20 to 1/2" NPT 316 SS Conduit Adapter *(use for FM and CSA Approvals)*	A3	i	i	i	
Stainless Steel Customer Wired-On Tag (4 lines, 28 characters per line, customer supplied information)	TG	•	•	•	
Stainless Steel Customer Wired-On Tag (blank)	TB	•	•	•	
End Cap Live Circuit Warning Label in Spanish (only with ATEX 3D)	SP	a	a	a	
End Cap Live Circuit Warning Label in Portuguese (only with ATEX 3D)	PG	a	a	a	b
End Cap Live Circuit Warning Label in Italian (only with ATEX 3D)	TL	a	a	a	
End Cap Live Circuit Warning Label in German (only with ATEX 3D)	GE	a	a	a	
Meter Body Options (Carbon Steel standard)					
NACE A286 SS Bolts	CR	•	•	•	
316 SS Bolts	SS	•	•	•	b
B7M Bolts	B7	•	•	•	
316 SS[5] Adapter Flange - 1/2" NPT with CS Bolts	S2	c	c	c	
316 SS[5] Adapter Flange - 1/2" NPT with 316 SS Bolts	S3	c	c	c	
316 SS[5] Adapter Flange - 1/2" NPT with NACE A286 SS Bolts	S4	c	c	c	
316 SS[5] Adapter Flange - 1/2" NPT with B7M Bolts	S5	c	c	c	
Hastelloy® C-276 [3, 6] Adapter Flange - 1/2" NPT with CS Bolts	T2	c	c	c	b
Hastelloy® C-276 [3, 6] Adapter Flange - 1/2" NPT with 316 SS Bolts	T3	c	c	c	
Monel 400® [4, 7] Adapter Flange - 1/2" NPT with CS Bolts	V2	c	c	c	
Monel 400® [4, 7] Adapter Flange - 1/2" NPT with 316 SS Bolts	V3	c	c	c	
316 SS[5] Blind Adapter Flange with CS Bolts	B3	•	•	•	
316 SS[5] Blind Adapter Flange with 316 SS Bolts	B4	•	•	•	
316 SS[5] Blind Adapter Flange with NACE A286 SS Bolts	B5	•	•	•	b
316 SS[5] Blind Adapter Flange with B7M Bolts	B6	•	•	•	
316 SS Center Vent Drain and Bushing	CV	•	•	•	
Viton® [8] Process Head Gaskets (adapter gaskets ordered separately)	VT	•	•	•	
Viton® [8] Adapter Flange Gaskets	VF	17	17	17	
Services/Certificates/Marine Type Approval Options					
User's Manual Paper Copy (Standard, HC/H6, or FF ships accordingly)	UM	•	•	•	
Clean Transmitter for Oxygen or Chlorine Service with Certificate	0X	j	j		
Over-Pressure Leak Test with F3392 Certificate	TP	•	•	•	
Calibration Test Report and Certificate of Conformance (F3399)	F1	•	•	•	b
Certificate of Conformance (F3391)	F3	•	•	•	
Certificate of Origin (F0195)	F5	•	•	•	
FMEDA Certificate (SIL 1) (FC33321)	F6	•	•	•	b
SIL Certificate (SIL 2/3) (FC33337)	FE	22	22	22	
NACE Certificate (Process-Wetted & Non-Process Wetted) (FC33339)	F7	o	o	o	b
NACE Certificate (Process-Wetted Only) (FC333xx)	FG	•	•	•	
Material Traceability Certification per EN 10204 3.1 (FC33341)	FX	•	•	•	
Marine Type Approvals (DNV, ABS, BV, KR & LR) (FC33340)	MT	•	•	•	

Table III continued next page

[3] Hastelloy® C-276 or UNS N10276
[4] Monel 400® or UNS N04400
[5] Supplied as 316 SS or as Grade CF8M, the casting equivalent of 316 SS.
[6] Supplied as indicated or as Grade CW12MW, the casting equivalent of Hastelloy® C-276
[7] Supplied as indicated or as Grade M30C, the casting equivalent of Monel 400®
[8] Viton® or Fluorocarbon Elastomer

TABLE III - OPTIONS (continued)

Warranty Options	Selection	STF1xx Availability 28 32	2F 3F	4F
Additional Warranty - 1 year	W1	•	•	•
Additional Warranty - 2 years	W2	•	•	•
Additional Warranty - 3 years	W3	•	•	•
Additional Warranty - 4 years	W4	•	•	•
Lifetime Warranty - 15 years	WL	•	•	•

b

Approval Body	Approval Type	Location or Classification	Selection	28 32	2F 3F	4F
No hazardous location approvals			9X	•	•	•
FM Approvals[SM]	Explosion Proof	Class I, Div. 1, Groups A,B,C,D	1C	•	•	•
	Dust Ignition Proof	Class II, III Div. 1, Groups E,F,G				
	Non-Incendive	Class I, Div. 2, Groups A,B,C,D				
	Intrinsically Safe	Class I, II, III, Div. 1, Groups A,B,C,D,E,F,G				
ATEX[10] (LCIE)	Intrinsically Safe, Zone 0	⟨Ex⟩ II 1 G	3S	23	23	23
	Intrinsically Safe, Zone 1	⟨Ex⟩ II 2 G		•	•	•
	Dust-Ignitionproof, Zone 0	⟨Ex⟩ II 1 D				
	Flameproof, Zone 1	⟨Ex⟩ II 2 GD	33	•	•	•
	Non-Sparking, Zone 2	⟨Ex⟩ II 3 G	3N	•	•	•
	Multiple Marking[11] Int. Safe, Zone 0/1, or Flameproof, Zone 1, or Non-Sparking, Zone 2	⟨Ex⟩ II 1 GD	3C	•	•	•
		⟨Ex⟩ II 2 GD				
		⟨Ex⟩ II 3 GD				

Ex ia IIC
T4 (Ta = –50°C to +93°C);
T5 (Ta = –50°C to +85°C);
T6 (Ta = –50°C to +70°C)
Enclosure IP 66/67

Ex ia IIC
T4 (Ta = –50°C to +93°C);
T5 (Ta = –50°C to +85°C);
T6 (Ta = –50°C to +70°C)
Enclosure IP 66/67

Ex tD A20 IP6X
T95°C (at Ta = 93°C) or
T80°C (at Ta = 78°C)
Enclosure IP 66/67

Ex d IIC
T5 (Ta = –40°C to +93°C),
T6 (Ta = –40°C to +78°C)
Supply 11- 42Vdc
Ex tD A21 IP6X
T95°C (at Ta = 93°C) or
T80°C (at Ta = 78°C)
Enclosure IP 66/67

Ex nA, IIC
T5 (Ta = –40°C to +93°C),
T6 (Ta = –40°C to +78°C);
Zone 2 Supply < 42Vdc, 23mA
(Honeywell). Enclosure IP 66/67

Ex ia IIC
T4 (Ta = –50°C to +93°C);
T5 (Ta = –50°C to +85°C);
T6 (Ta = –50°C to +70°C);
Ui = 30V; Ii = 100mA
Ex tD A20 IP6X
T95°C (at Ta = 93°C) or
T80°C (at Ta = 78°C)

Ex d IIC
T5 (Ta = –40°C to +93°C),
T6 (Ta = –40°C to +78°C)
Supply 11- 42Vdc
Ex tD A21 IP6X
T95°C (at Ta = 93°C) or
T80°C (at Ta = 78°C)

Ex nA, IIC
T5 (Ta = –40°C to +93°C),
T6 (Ta = –40°C to +78°C);
Zone 2 Supply < 42Vdc, 23mA
Ex tD A22 IP6X
T95°C (at Ta = 93°C) or
T80°C (at Ta = 78°C)
(Honeywell)
Enclosure IP 66/67

b

Table III Approvals continued next page

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TABLE III - OPTIONS (continued)

Approval Body	Approval Type	Location or Classification	Selection	28 32	2F 3F	4F
Canadian Standards Association (CSA)	Explosion Proof	Class I, Div. 1, Groups B,C,D	2J	•	•	•
	Dust Ignition Proof	Class II, III, Div. 1, Groups E,F,G				
	Intrinsically Safe	Class I, II, III, Div. 1, Groups A,B,C,D,E,F,G				
IECEx	Flameproof, Zone 1	**Ex d IIC** T5 (Ta = -40 to +93°C), T6 (Ta = -40 to +78°C)	CA	•	•	•
	Intrinsically Safe, Zone 0/1	**Ex ia IIC**; T3, T4, T5 , T6 See Spec for detailed temperature codes by Communications option				
SAEx (South Africa)	Intrinsically Safe, Zone 0/1	**Ex ia IIC** T4, T5, T6	Z2	•	•	•
	Flameproof, Zone 1	**EX d IIC** T5, T6 Enclosure IP 66/67	ZD	•	•	•
	Multiple Marking [11] Int. Safe, Zone 0/1, or Flameproof, Zone 1	**Ex ia IIC** T4, T5, T6 **Ex d IIC** T5, T6 Enclosure IP 66/67	ZA	•	•	•
CERTUSP INMETRO (Brazil)	Flameproof, Zone 1	**BR- Ex d IIC** T5, T6	6D	•	•	•
	Intrinsically Safe, Zone 0/1	**BR- Ex ia IIC**; T4, T5, T6 (See CERTUSP certificate for detailed temperature codes by Communications option)	6S	•	•	•

b

[10] See ATEX installation requirements in the ST 3000 User's Manual
[11] The user must determine the type of protection required for installation of the equipment. The user shall then check the box [√] adjacent to the type of protection used on the equipment certification nameplate. Once a type of protection has been checked on the nameplate, subsequently the equipment shall not be reinstalled using any of the other certification types.

TABLE IV

Factory Identification	XXXX	•	•	•

RESTRICTIONS

Restriction Letter	Available Only With		Not Available With	
	Table	Selection	Table	Selection
a	III	33 or 3C		
b	Select only one option from this group			
c	I	_ _H, _ _K		
e	III	SM		
g	I	A _ _, B _ _, E _ _, F _ _, J _ _, W _ _, X _ _		
h			I II	M _ _, N _ _, R _ _, S _ _ _ _5 _ _
i	III	1C or 2J		
j	I	_2_		
m			III	ME, FF
n			III	1C, 2J
o	III	CR	III	S2, S3, S5, T2, T3, B3, B4, B6, V2, V3
p	III	HC or H6 and WP	III	FF, 00
q	I	C _ _, G _ _, L _ _		
r			III	TC, ME, CA, 3S
t	III	Select S2,S3,S4,S5,T2,T3,V2,V3		
v	I	M _ _, N _ _, R _ _, S _ _		
x	III	FF, SM		
15			III	FF
17	III	VT		
19			III	F7, FG
21	III	FF		
22	III	SL		
23	III	SH or A3		

Ordering Example: STF128-A1A-01000-HC,2J+XXXX

Hastelloy® is a registered trademark of Haynes International
Monel 400® is a registered trademark of Special Metals Corporation.
HART® is a registered trademark of HART Communication Foundation.
FOUNDATION™ Fieldbus is a trademark of Fieldbus Foundation.
Viton® is a registered trademark of DuPont Performance Elastomers.
Teflon® is a registered trademark of DuPont.
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For More Information

Learn more about how Honeywell's ST 3000 Smart Pressure Transmitters can increase performance, reduce downtime and decrease configuration costs, visit our website www.honeywell.com/ps or contact your Honeywell account manager.

Honeywell

Honeywell Process Solutions
1860 West Rose Garden Lane
Phoenix, Arizona 85027
Tel: 1-800-423-9883 or 1-800-343-0228
www.honeywell.com/ps

34-ST-03-63
July 2010

M&G™
MANSFIELD & GREEN

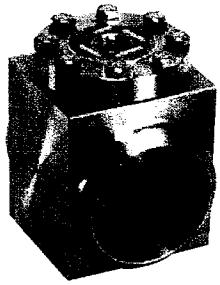
Diaphragm Seals

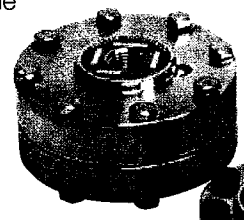
Type S Series
General Purpose Diaphragm Seal Elements

DESCRIPTION

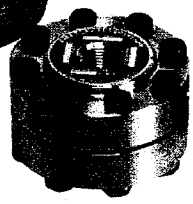
Mansfield & Green S Series diaphragm seals feature a diaphragm which is permanently welded onto the seal element's upper flange. This design eliminates the need for a diaphragm retaining ring and minimizes the risk of fluid leakage during normal operation or seal element maintenance.

Type SM





Type SG

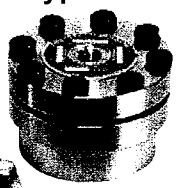


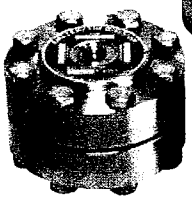
Type SB

Type S Series seal elements feature an upper housing which is contoured. This design permit free movement of the diaphragm with accurate response to pressure changes. It also protects the seal element from distortion due to improper handling during maintenance routines.

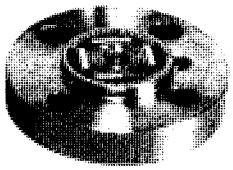
Type S Series diaphragm seals have a volumetric displacement of .07 cubic inches. Filling screws are standard on all models except the high pressure Type SX Series.

Type SJ





Type SW



Type SF

FEATURES

- Diaphragm directly welded to upper flange
  - Eliminates retaining ring
  - Minimizes risk of leaks
- Ideal for general purpose application
- Materials available for corrosive applications
- Optional seal ratings to 10,000 psig (690 bar)
- Compatible with most 4-1/2" and smaller gauges

SEAL CONFIGURATIONS

Threaded Seal Elements

There are four basic versions of S Series diaphragm seals with threaded attachments. The SB seal element is used for pressure applications only and has a standard pressure rating of 2500 psig at 100°F (172 bar at 38°C) with an optional rating for up to 5000 psig (345 bar). The SG seal element is similar to the SB seal, except that it has a 1/4 NPT flushing connection. The SX seal element has a standard pressure rating of 10,000 psig at 100°F (690 bar at 38°C). This high pressure model can be supplied with 1/8, 1/4, 3/8, 1/2, 3/4, and 1 NPT process connections.

Flanged Seal Elements

There are two basic versions of flanged S Series seal elements. The flange is a standard raised type. The SC seal element can be supplied in 1/2" and 3/4". Both sizes can be supplied for standard ANSI Class ratings of 150, 300, 600, 1500, and 2500. Type SC seals are available in ring joint, flat face and DIN sizes. The SR series features an all tantalum wetted surface. 1/2" and 3/4" sizes are available for ANSI Class 150 and 300. 1" thru 3" sizes have standard ANSI Class 150, 300, 600, and 1500 ratings.

In-line Flow Thru Seal Elements

In-line flow thru S Series diaphragm seals include the SJ versions for 3" and larger pipe connections. The SK versions are available with 1/4, 3/8, or 1/2 NPT process connections with a standard pressure rating of 1500 psig with an optional pressure rating of 3000 psig. The SM version is for pipe sizes from 3/4" to 3" schedule 40 pipe (other schedules available) where the diaphragm seal element is to be directly welded to the process pipe. The SN version is for pipe sizes from 3/4" to 3" requiring ANSI ratings of 150 or 300. These can be supplied with an optional TEFLON® liner. The SP versions are for pipe sizes from 4" to 10" and with ANSI ratings of 150 or 300.

Options are available for all-welded construction

AMETEK®
www.ametekusg.com

ALL ORDERS CAN BE SENT TO:
On-line fax: 215-323-9450 or e-mail to usg.sales@ametek.com

Sales/Technical Support: 215-257-6531
900 Clymer Avenue
Sellersville, PA 18960 U.S.A.

Customer Service: 727-536-7831
8600 Somerset Drive
Largo, FL 33773 U.S.A.

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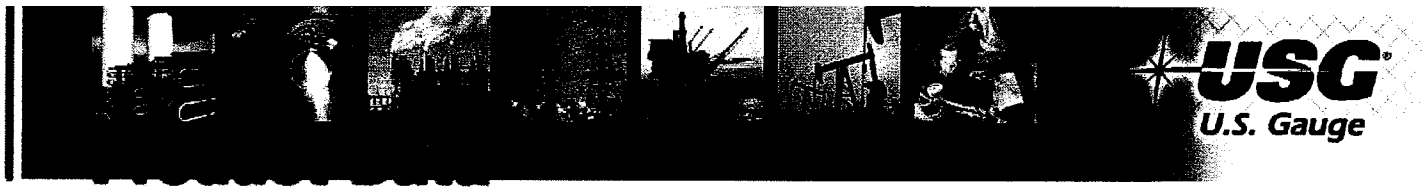


M&G™
MANSFIELD & GREEN

Diaphragm Seals

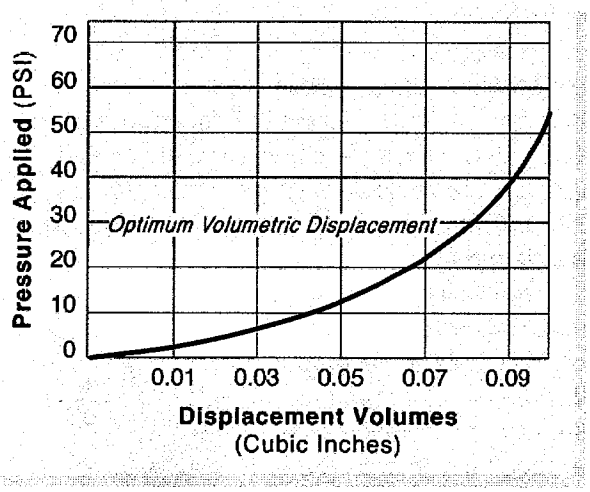
Type S Series
General Purpose Diaphragm Seal Elements

MODEL S SERIES SELECTION GUIDE

SEAL TYPE	SEAL MOUNTING	OPERATING TEMPERATURE	OPERATING PRESSURE	PROCESS APPLICATION	FLUSHING CONNECTION
SB	Thread	100°F (38°C)	2500 psig (172 bar)[1]	General Purpose	No Flush
SG	Thread	100°F (38°C)	2500 psig (172 bar)[1]	General Purpose	With Flushing Connection
SX	Thread[3]	100°F (38°C)	10000 psig (690 bar)	High Pressure	No Flush
SW	Thread[4]	100°F (38°C)	2500 psig (172 bar)	EPA Clean Air Act	No Flush
SC	Flange	–	Flange Dependent	General Purpose	No Flush
SD	Flange	–	Flange Dependent	General Purpose	With Flushing Connection
SR	Flange	–	Flange Dependent	Tantalum Clad Bottom	No Flush
SJ	In-Line Flow Thru[A]	100°F (38°C)	1500 psig (103 bar)[2]	Saddle Mounted	No Flush
SK	In-Line Flow Thru[B]	100°F (38°C)	1500 psig (103 bar)[2]	Thread Attached	No Flush
SM	In-Line Flow Thru[C]	100°F (38°C)	1500 psig (103 bar)[2]	Butt Welded	No Flush
SN	In-Line Flow Thru[D]	–	Flange & Sched. Dependent	Small Pipe	No Flush
SP	In-Line Flow Thru[E]	–	Flange & Sched. Dependent	Larger Pipe	No Flush

NOTE:
[1] Optional 5000 psig available at 100°F (345 bar at 38°C)
[2] Optional 3000 psig available at 100°F (207 bar at 38°C)
[3] No bleed screw
[4] Top, bottom, and diaphragm must be the same

[A] In-line flow thru welded by user
[B] In-line flow thru thread-attached connection
[C] In-line flow thru welded by user, pipe supplied, schedule dependent
[D] In-line flow thru for 3/4" to 3" pipe diameters
[E] In-line flow thru for 4" to 10" pipe diameters



Application Note

Avoid sizing the diaphragm too small or with a diaphragm that may be too rigid and inflexible since thermal expansion of the fill fluid may lead to inaccurate pressure readings and zero shifts.

Special Requests

The diaphragm seal combinations in this catalog represent AMETEK's more commonly ordered products. If you don't find a seal combination in this specification sheet, or if you are in need of a special application or material, call us. AMETEK can supply you with the safe and reliable solution for most applications.

Pressure vs. Volumetric Displacement

Displacement curves are provided to assist in selecting a diaphragm seal with minimal full span displacement bias effects. This graph is for reference only and may not accurately represent the maximum displacement that may be used. Contact AMETEK for exact specifications.

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8600 Somerset Drive
Largo, FL 33773 U.S.A.

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Specifications are subject to change without notice. Visit our Web site for the most up-to-date information.

SECTION 10
GEMS SENSOR MODEL LS-800 APPLICABLE TO LSHH-222

PARSONS

18325

DATA SHEET - LEVEL SWITCH (FLOAT TYPE)

Parsons Commercial Technology Group, Syracuse, NY		Revision:	Date:	Released For:	Engr:	Chkd:	Appr:
CLIENT	BP SANBORN	A	9/12/2011	Issued for Bid	GRM	WGS	JDF
PROJECT	VAULT WATER COLLECTION AND CONVEYANCE						
PROJECT NO.	446476						
LOCATION	SANBORN, NEW YORK						

General	1. Tag Number	**LSHH-222**		
	2. Quantity	One		
	3. Service Description	Equalization Tank TK-002 High-High Level		
	4. P&ID Drawing	446476-D-101		
	5. Line No. / Vessel No.	TK-002		
	6. Line Size | Schedule | Pipe Spec.	N/A	N/A	N/A
	7. Area Classification	General Purpose (Non-Classified)		
Process Data	8. Fluid Description	Groundwater		
	9. Pressure Max. | Nom. | Min.		Atm	
	10. Temp. Max. | Nom. | Min.	100° F	60° F	32° F
	11. Oper. Sp. Gr. | M.W. | Visc.	1.0	N/A	1 cP
	12. Percent Solids & Type	1% in Suspension		
Probe	13. Probe Type	Adjustable Stem Mounted Float Level Sensor		
	14. Probe Material	316 SS		
	15. Minimum Specific Gravity Required	0.75		
	16. Probe Housing Classification	NEMA 4		
	17. Conduit Connection	1/2" NPT		
	18. Number of Floats	1		
	19. Float Mounting / Material	Stem Mounting / 316 SS		
	20. Cable Connection Type	24" Lead Wire (Connected to Housing TB)		
	21. Stem Length	12"		
	22. Adjustable Range	Cinch-nut Adjustable over Stem Length		
	23. Dead Band	N/A		
	24. Setpoint	Height TBD During Installation		
	25. Cable Length	N/A (Integral Housing Provided)		
	26. Cable Material	N/A		
	27. Power Supply	N/A		
	28. Float Part No.	14569		
	29. Process Connection (HDPE Tank)	2" NPT		
	30.			
Switch	31. Number of Switches	1 Hermetically Sealed		
	32. Switching Element	Reed-Switch		
	33. Type Of Contact	Form "C" (SPDT)		
	34. Contact Rating	20 VA		
	35. Action	NC (Opens on Rising Liquid)		
	36.			
	37. Power Supply	N/A		
Options	38.			
	39.			
	40.			
Model	41. Manufacturer	Gems Sensors & Controls		
	42. Model Number	LS-800-A		
	43. Approvals	UL		

NOTES

1. Vendor to verify / confirm Model Numbers.
2. Each device shall be supplied with a SS nameplate attached with SS wire stamped with Tag Number.

SPEC NO.: 18325 / LSHH-222 / A

Model LS-800 HLI
High Level Indicator

Instruction Bulletin No. 155896

Environmental Products

These Sensors may not be compatible with indicating and alarm equipment supplied by other manufacturers

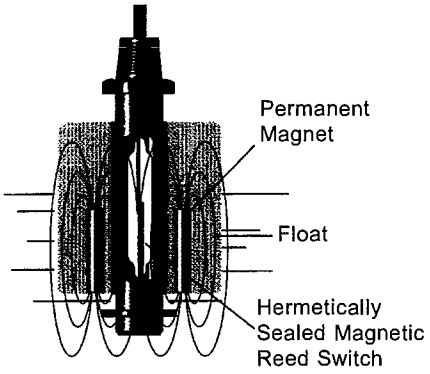
Note: LS-800 HLI sensors are non-voltage producing devices and do not contain energy storing components. However, since primary use is in hazardous locations, an appropriate intrinsically safe interface device is required.

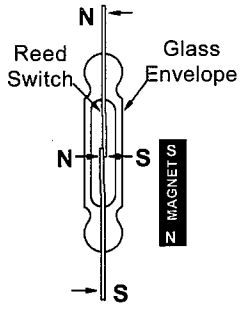
Gems LS-800 HLI High Level Indicator has a 2" NPT mounting, making it ideal for use in underground and aboveground storage tanks. When mounted vertically at the tank top, it reliably indicates high liquid level. This indicator is exceptionally versatile. The unit adapts to just about any environment due to rugged construction and the multiple design options available. The LS-800 HLI is available in brass or stainless steel, making it suitable for use with a wide range of liquids.

Adjustable versions of the LS-800 HLI are available for varying tank sizes. A special cinch nut on the mounting allows the stem to travel up or down, to fine-tune actuation points. The extent of the adjustment depends on the unit length and distance from the mounting to the highest float stop.

Sensor Operating Principle

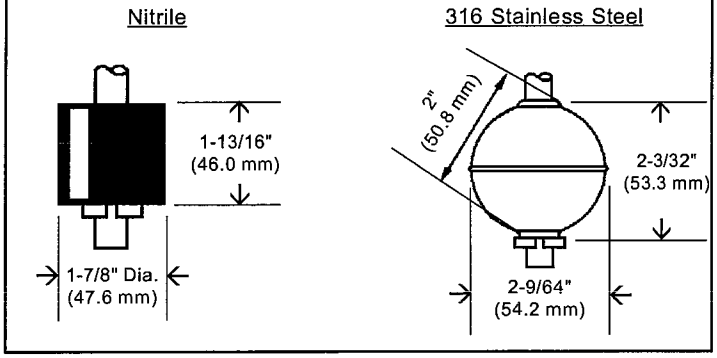
Gems LS-800 HLI liquid level sensor operates on a direct, simple principle. A float is equipped with powerful, permanent magnets. As the float rises or lowers with liquid level, it actuates a magnetic reed switch mounted within the stem. This condition either opens or closes the electrical circuit to operate an external alarm or control circuit. When mounted vertically, this basic design provides a consistent accuracy of ±1/8th inch.



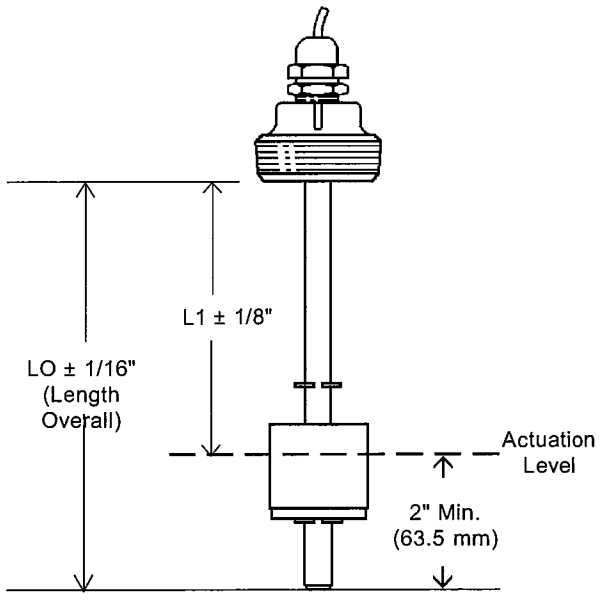


Note: Please refer to specific Gems outline drawings for operational specifications.

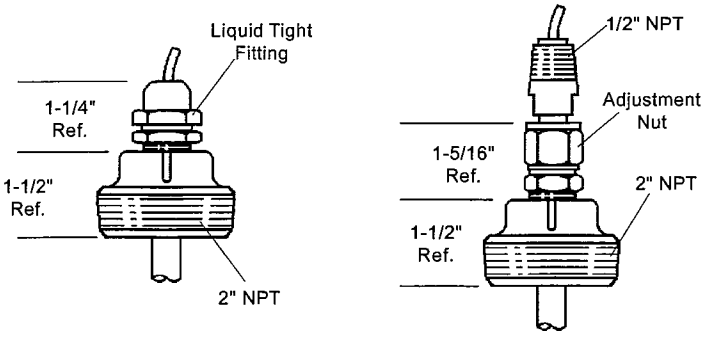
Float Types



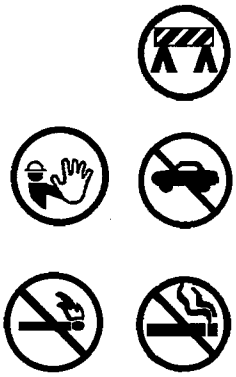
Actuation Level



Mounting Types



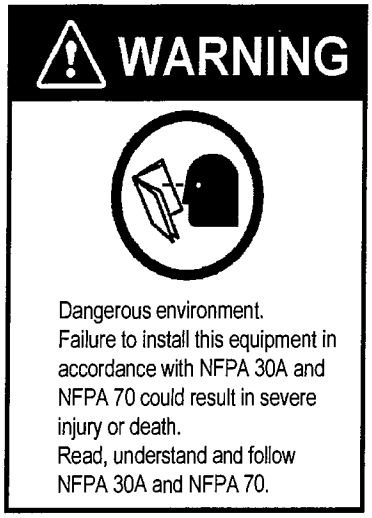
Read all instructions before beginning - Follow all safety precautions



Barricade the area

Do not allow vehicles or unauthorized people in the work area

Do not smoke or allow open flames in the work area



WARNINGS

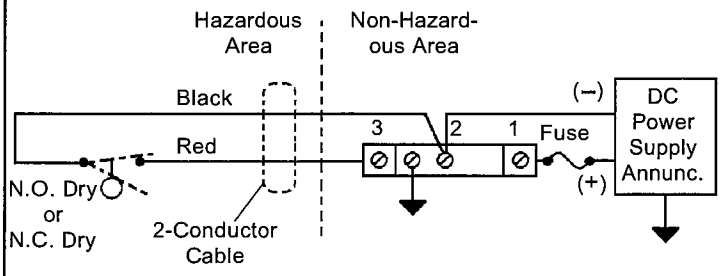
Read the instructions and warnings carefully before installing the sensor. This unit must be installed in accordance with National Electrical Code ANSI/NPFA-70, 1990; as well as Federal, State and local codes and any other applicable safety codes.

1. To avoid electrical shock, which could kill you, be sure AC power to monitor is off during installation.
2. The nature of the sensor is that it is a non-voltage producing device, containing limited energy-storing components. However, since its primary use is in a hazardous location, an appropriate intrinsically safe interface device must be used.

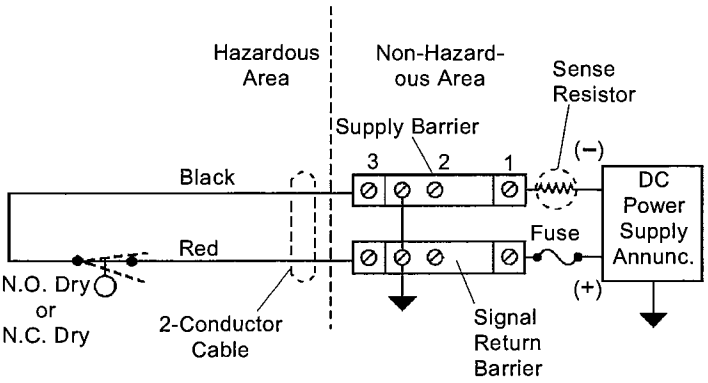
Note: Failure to observe these warnings could result in serious injury and death, as well as undetected potential environmental and health hazards.

Typical Wiring Diagrams

Non-Isolated System – Single Zener Barrier



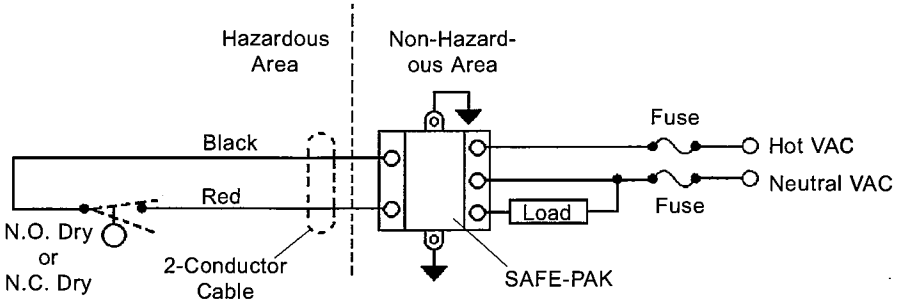
Isolated System – Dual Zener Barrier



If two signal lines must be maintained at above ground potential, an individual zener barrier is required per single line.

Single Safe-Pak® Relay

Safe-Pak® is an intrinsically safe, solid-state relay.



- IMPORTANT -

This manual assumes all preliminary site preparation is completed and that field wiring from the monitor to the sensor junction box is in place.

Installation Instructions

A. Pre-Installation Sensor Testing

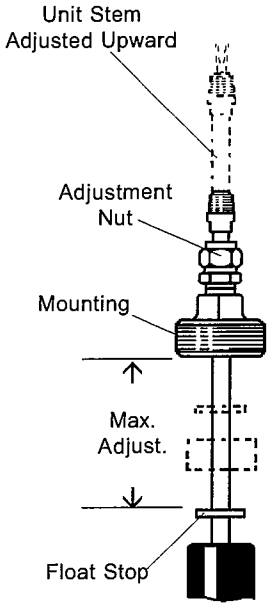
1. Temporarily connect the two-wire sensor cable to the field wires in the sensor junction box.
2. Turn power on.
3. Turn the LS-800 HLI upside down. Audible and visual indicators should alarm.
4. To remove alarm condition, turn the sensor right side up.

B. Sensor Installation Instructions

1. Turn off power to the control.
2. Apply thread tape or pipe sealant to male threads on the 2" NPT of LS-800 HLI.
3. Install LS-800 HLI hand-tight, plus 1-1/2 to 2-1/2 turns.
4. Tighten using wrench: 1 to 1-1/2 turns past hand-tight.
5. Feed sensor cable through the cord grip on the junction box.
6. Tighten cord grip nut to ensure a watertight seal at the cable entry.
7. Using the wire nuts, connect the 2-wire cable to the field wires in the sensor junction box.

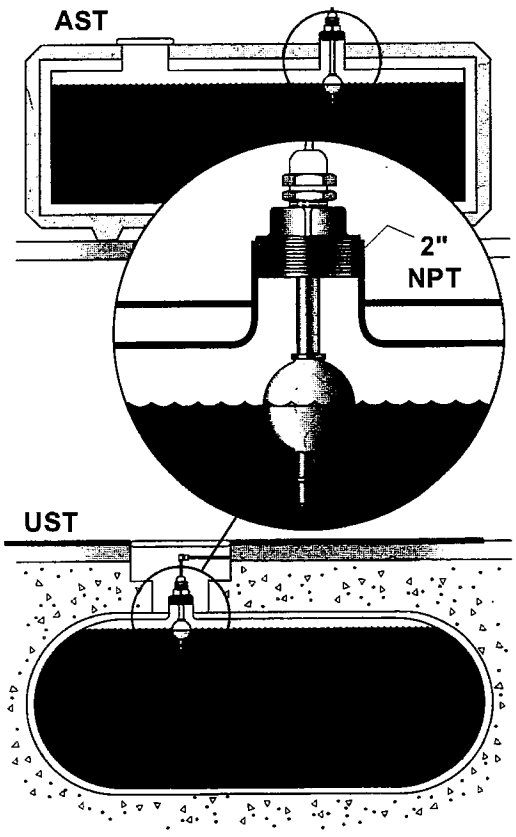
For Adjustable Mounting:
A special cinch-nut on this mounting allows stem to travel up or down for fine-tuning the actuation points. The extent of adjustment depends on unit length and distance from mounting to highest float stop.

To adjust unit, loosen adjustment nut, slide center stem to desired location and tighten nut.



Typical Installation

- Underground Storage Tanks
- Aboveground Storage Tanks



Maintenance

Note: Please consult your state E.P.A. office or appropriate regulatory agency regarding periodic inspection of the sensor. There are no user serviceable parts.

WARNING

Product must be maintained and installed in strict accordance with the National Electrical Code and the applicable GEMS technical bulletin and instruction bulletin. Failure to observe this warning could result in serious injuries or damages.

Warranty

Gems' standard warranty applies

MEMBER PEI PETROLEUM EQUIPMENT INSTITUTE

Gems Sensors

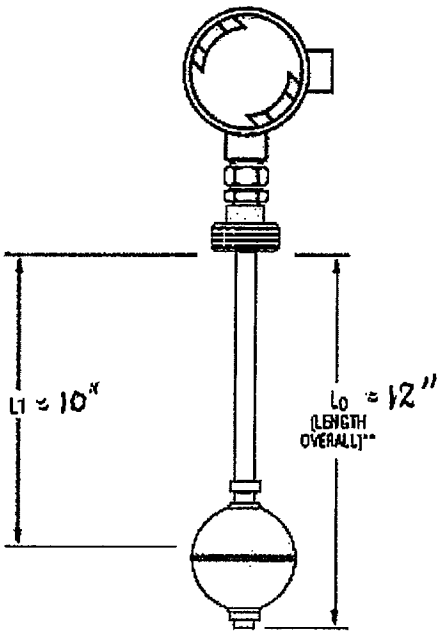
Gems Sensors Inc.
One Cowles Road
Plainville, CT
06062.1198

tel 860.747.3000
fax 860.747.4244

P/N 155896
Rev. A

Part No. W19859

Lead Time(Days) 15



Technical Specifications

Series:	Standard LS-800
Specific Gravity:	1.0
Max. Pressure:	15
Stem Length:	1.5" - 36"
Stem Construction:	Tubing (for units < 72")
Operating Temp.:	100
Stem Material:	316 Stainless Steel
Mounting Type:	2" NPT Adjustable
Switch Type:	SPDT, 20VA
Wiring Group:	Group 4 - Independent Return
Number of Levels:	1
Electrical Connection:	Nema 4 Junction Box
Float Material:	316 Stainless Steel
Float Type:	316 SS (14569)
Media Type:	Water
Float Stops:	Grip Rings
Stainless Tag:	LSHH-222

Ordering Information

Part Number: W19859

Lead Time:	15 Days
Min. Order Quantity:	1
Shipping Weight:	7.83 lbs.
Model Description:	LS-800-3A-SS-SS-SPDT-020-GR

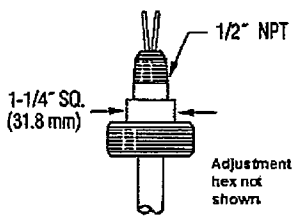
Add to Cart | Edit Configuration

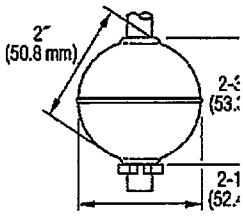
Dimensional Specifications

L1: 10" NC

L0: 12.000"

Hover over images to enlarge





SECTION 11
US GAUGE XR SERIES PROCESS PRESSURE GAUGE APPLICABLE TO PI-204, PI-205, PI-210, PT-211 & PI-212

PARSONS 18415 **DATA SHEET - PRESSURE INDICATOR w / SEAL**

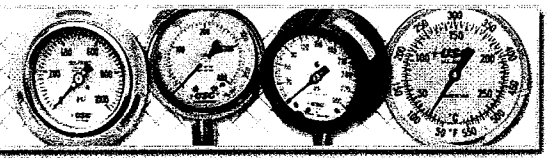
Parsons Commercial Technology Group, Syracuse, NY		Revision:	Date:	Released For:	Engr:	Chkd:	Appr:
CLIENT	BP SANBORN	A	9/12/2011	Issued for Bid	GRM	WGS	JDF
PROJECT	VAULT WATER COLLECTION AND CONVEYANCE						
PROJECT NO.	446476						
LOCATION	SANBORN, NEW YORK						

General	1. Tag Number	**PI-204**		
	2. Service Description	Submersible Sump Pump P-004 Discharge Pressure		
	3. P&ID Drawing	446476-D-101		
	4. Line No. / Vessel No.	2"-GW-HDPE-006		
	5. Line Size | Schedule | Pipe Spec.	2"		HDPE
	6.			
	7.			
Process Data	8. Fluid Description	Groundwater		
	9. Pressure Max. | Nom. | Min.	psig	psig	psig
	10. Temp. Max. | Nom. | Min.	100°F	70°F	32°F
	11. Oper. Sp. Gr. | M.W. | Visc.	1.0	N/A	1cP
	12.			
Case	13. Mounting	Vertical		
	14. Dial: Size | Color	4.5 Inch	White Painted Aluminum	
	15. Material	Phenolic		
	16. Ring	Stainless Steel		
	17. Blow-Out Protection	Yes / Back		
	18. Lens	Laminated Safety Glass		
	19.			
Element	20. Type	Bourdon Tube		
	21. Material	316L Stainless Steel		
	22. Socket Material	316L Stainless Steel		
	23. Movement Material	Stainless Steel		
	24. Connection: Size | Location	1/2" Welded	Bottom	
	25. Construction	316L Stainless Steel		
	26. Measuring Range	0 to 100 Psig		
Diaphragm Seal	27. Top Housing Material	316L Stainless Steel		
	28. Bottom Housing Material	316L Stainless Steel		
	29. Instrument Connection	N/A (Welded Design)		
	30. Fluid Fill	Silicone		
	31. Process Connection	1/2" MNPT		
	32. Diaphragm	316L Stainless Steel		
	33. Manufacturer	M&G		
	34. Model	XR		
Options	35. Syphon (Yes/No) | Material	N/A		
	36. Snubber (Yes/No) | Material	N/A		
	37. Pressure Limit Value			
	38. Movement Damping	Mechanical Plus Performance Movement		
	39. Pointer	Adjustable		
	40. Filled (Yes/No) | Fill Fluid	No	N/A	
	41.			
	42.			
Model	43. Manufacturer	AMETEK (US Gauge)		
	44. Model Number	XR-81 / 170025SSL		
	45. Approvals	N/A		

NOTES

1. Vendor to verify / confirm Model Numbers.
2. Each device shall be supplied with a SS nameplate attached with SS wire stamped with Tag Number.
3. Vendor to provide calibration certificate for each device.

SPEC NO.: 18415 / PI-204 / A



Process Gauges

XR-Series All-welded Process Gauge and Diaphragm Seal

316L Stainless Steel SPEC NUMBER SELECTION CHART

	XR-81 Liquid Fillable* with All Welded Seal
Model	**XR-81 LX (Fill Ready)**
Pressure Gauge Size	**4-1/2"**
Pressure Gauge Internals	**316L Stainless Steel**
Diaphragm Seal Material	**316L Stainless Steel**
Process Connection	**1/2" NPT male**
Range	**Spec No.**
30" Hg	170016SSL
30"-0-15 psi	170017SSL
30"-0-30 psi	170018SSL
0-15 psi	170022SSL
0-30 psi	170023SSL
0-60 psi	170024SSL
0-100 psi	170025SSL
0-160 psi	170026SSL
0-200 psi	170027SSL
0-300 psi	170028SSL
0-400 psi	170029SSL
0-600 psi	170030SSL
0-800 psi	170031SSL
0-1000 psi	170032SSL
0-1500 psi	170033SSL

Diaphragm seal filled with silicon standard. Other fill fluids, such as Halocarbon also available. Please contact Customer Service for more information.

* This gauge is shipped dry, in a fill-ready case. Gauges can be ordered already filled at the factory with glycerine, silicone DC-200 or mineral oil. Please contact Customer Service at 727-536-7831 for more information.

Monel® SPEC NUMBER SELECTION CHART

	XR-86 Liquid Fillable* with All Welded Seal
Model	**XR-86 LX (Fill Ready)**
Pressure Gauge Size	**4-1/2"**
Pressure Gauge Internals	**Monel®**
Diaphragm Seal Material	**Monel®**
Process Connection	**1/2" NPT male**
Range	**Spec No.**
0-30" Hg VAC	170060KSL
30"-0-15 psi	170061KSL
30"-0-30 psi	170062KSL
0-15 psi	170066KSL
0-30 psi	170067KSL
0-60 psi	170068KSL
0-100 psi	170069KSL
0-160 psi	170070KSL
0-200 psi	170071KSL
0-300 psi	170072KSL
0-400 psi	170073KSL
0-600 psi	170074KSL
0-1000 psi	170075KSL
0-1500 psi	170540KSL

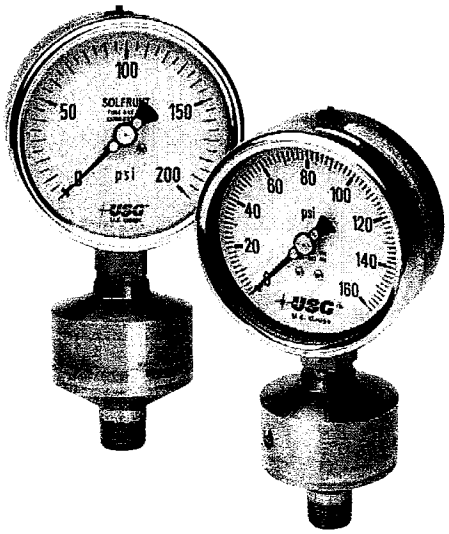
Monel® is a registered trademark of Inco Alloys International, Inc.

* This gauge is shipped dry, in a fill-ready case. Gauges can be ordered already filled at the factory with glycerine, silicone DC-200 or mineral oil. Please contact Customer Service at 727-536-7831 for more information.

Other XR-Series Products Include:

XR-656 Open Front 4" All SST Process Gauge and XR Diaphragm Seal, and XR-659 Solid Front 4" All SST Process Gauge and XR Diaphragm Seal.

Additional options include a flanged XR-Seal, restrictor on gauge socket, and capillaries.



AMETEK®

U.S. GAUGE
820 Pennsylvania Blvd., Feasterville, PA 19053 U.S.A.
Tel: (215) 355-6900 • Fax: (215) 354-1802
www.ametekusg.com
Customer Service Tel: (727) 536-7831 • Customer Service Fax: (727) 539-6882

ISO 9001:2000 CERTIFIED

Process Gauges

XR-Series All-welded Process Gauge and Diaphragm Seal

DESCRIPTION

AMETEK's XR-Series All-welded Gauge and Seal offers customers a lower cost alternative to an individual gauge and diaphragm seal with the added benefit of a reduction in potential leaks. Our high quality, rugged SOLFRUNT® 1981 (SST internals) or SOLFRUNT® 1986 (Monel® internals) gauge is mounted and welded onto our M&G XR Diaphragm Seal. These units are in inventory and available for quick delivery. Please contact Customer Service for more information at 727-536-7831.

The standard diaphragm seal is available with either 316L SST or Monel wetted parts, and has an 1/2 NPT male bottom for the process connection. Other connections and materials are available, such as Hastelloy® C body and diaphragm or Tantalum diaphragm.

FEATURES

- All-welded seal-to-gauge design and **seamless** Bourdon tube provides fewer leak paths than competitive models
- Reduced installation cost
- Tamper resistance design
- Compact size to fit into applications with space restrictions

APPLICATIONS

- Chemical and petrochemical processing plants
- Petrochemical refineries
- General processing such as food and pharmaceutical

SPECIFICATIONS

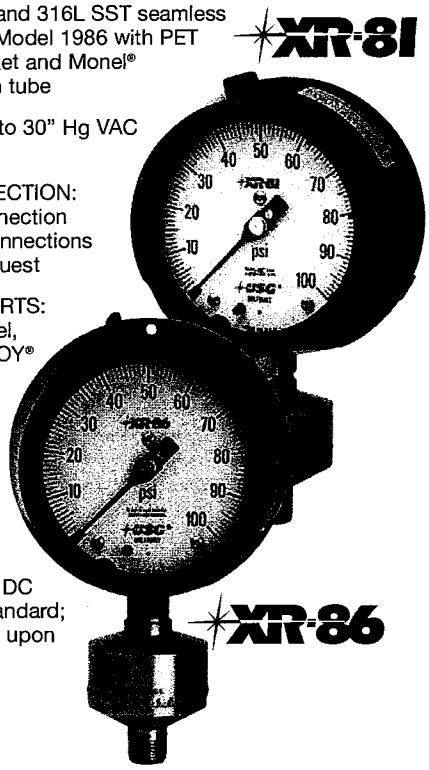
GAUGE: Model 1981 with PET case, 316L SST socket and 316L SST seamless Bourdon tube, or Model 1986 with PET case, Monel® socket and Monel® seamless Bourdon tube

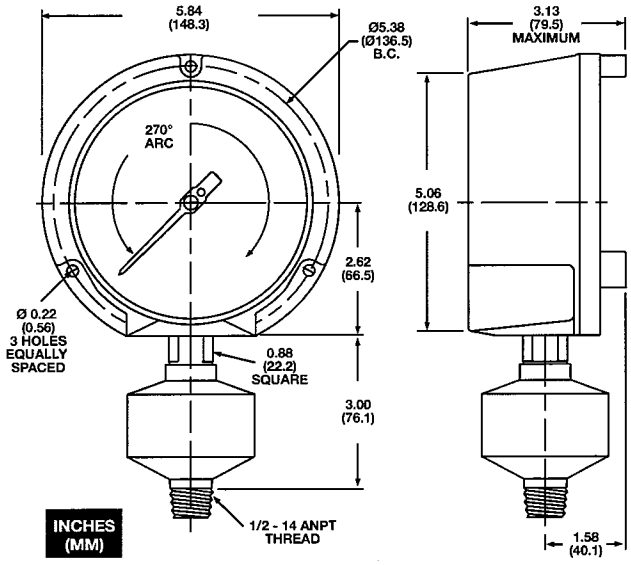
RANGES: From 0 to 30" Hg VAC to 0 to 5000 psi

PROCESS CONNECTION: 1/2 NPT male connection standard, other connections available upon request

SEAL WETTED PARTS: 316L stainless steel, Monel®, HASTELLOY® C bodies; 316L stainless steel, Monel®, HASTELLOY® C and Tantalum diaphragms; other materials available upon request

SEAL FILL FLUID: DC Silicone 200 cs standard; other fills available upon request





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U.S. GAUGE
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Tel: (215) 355-6900 • Fax: (215) 354-1802
www.ametekusg.com
Customer Service Tel: (727) 536-7831 • Customer Service Fax: (727) 539-6882

ISO 9001:2000 CERTIFIED

SECTION 12
HONEYWELL ST3000 SMART PRESSURE TRANSMITTER
APPLICABLE TO PIT-212 & PIT-218

PARSONS

18415

DATA SHEET - PRESSURE INDICATOR w / SEAL

Parsons Commercial Technology Group, Syracuse, NY		Revision:	Date:	Released For:	Engr:	Chkd:	Appr:
CLIENT	BP SANBORN	A	9/12/2011	Issued for Bid	GRM	WGS	JDF
PROJECT	VAULT WATER COLLECTION AND CONVEYANCE						
PROJECT NO.	446476						
LOCATION	SANBORN, NEW YORK						

General	1. Tag Number	**PI-212**			
	2. Service Description	Bag Filter BF-001 thru BF-004 Inlet Pressure			
	3. P&ID Drawing	446476-D-102			
	4. Line No. / Vessel No.	2"-GW-PVC-017		None	
	5. Line Size | Schedule | Pipe Spec.	2"	Sched. 80	PVC	
	6.				
	7.				
Process Data	8. Fluid Description	Groundwater			
	9. Pressure Max. | Nom. | Min.	psig	psig	psig	
	10. Temp. Max. | Nom. | Min.	100°F	70°F	32°F	
	11. Oper. Sp. Gr. | M.W. | Visc.	1.0	N/A	1cP	
	12.				
Case	13. Mounting	Vertical			
	14. Dial: Size | Color	4.5 Inch	White Painted Aluminum		
	15. Material	Phenolic			
	16. Ring	Stainless Steel			
	17. Blow-Out Protection	Yes / Back			
	18. Lens	Laminated Safety Glass			
	19.				
Element	20. Type	Bourdon Tube			
	21. Material	316L Stainless Steel			
	22. Socket Material	316L Stainless Steel			
	23. Movement Material	Stainless Steel			
	24. Connection: Size | Location	1/2" Welded	Bottom		
	25. Construction	316L Stainless Steel			
	26. Measuring Range	0 to 100 Psig			
Diaphragm Seal	27. Top Housing Material	316L Stainless Steel			
	28. Bottom Housing Material	316L Stainless Steel			
	29. Instrument Connection	N/A (Welded Design)			
	30. Fluid Fill	Silicone			
	31. Process Connection	1/2" MNPT			
	32. Diaphragm	316L Stainless Steel			
	33. Manufacturer	M&G			
	34. Model	XR			
Options	35. Syphon (Yes/No) | Material	N/A			
	36. Snubber (Yes/No) | Material	N/A			
	37. Pressure Limit Value				
	38. Movement Damping	Mechanical Plus Performance Movement			
	39. Pointer	Adjustable			
	40. Filled (Yes/No) | Fill Fluid	No	N/A		
	41.				
	42.				
Model	43. Manufacturer	AMETEK (US Gauge)			
	44. Model Number	XR-81 / 170025SSL			
	45. Approvals	N/A			

NOTES

1. Vendor to verify / confirm Model Numbers.
2. Each device shall be supplied with a SS nameplate attached with SS wire stamped with Tag Number.
3. Vendor to provide calibration certificate for each device.

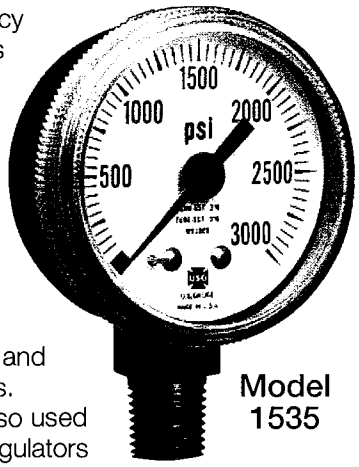
SPEC NO.: 18415 / PI-212 / A

Special Application Gauges

Series 1500 Corrosion Resistant Pressure Gauges

DESCRIPTION

The Model 1535 features ±1% of span accuracy and utilize 300 series stainless steel case. These heavy duty 2" and 2-1/2" pressure gauges are specifically designed to withstand the corrosive atmospheres, such as salt air, sour gas, and other industrial gases. These gauges are also used in specialty gauge regulators and gas cabinets, as well as many other applications. The Model 1535 features all internal wetted surfaces of 316L, making these gauges ideally suited for use with corrosive process media.



Model 1535

The Model P1535 is available in pressure ranges from 30" Hg VAC-0 psi to 0-3000 psi. This precision gauge incorporates rugged case construction with rear pressure relief, and a seamless Bourdon tube with welded joints for heavy duty service.

This gauge is also available in a version for the semiconductor industry. Please reference our web site at www.ametekusg.com.

SPECIFICATIONS

SIZE: 2" and 2-1/2"

CASE: Drawn stainless steel polished with pressure relief in back of case

RING AND WINDOW: One piece, threaded polycarbonate

POINTER: Aluminum, adjustable, black finish

DIAL: Aluminum, white background with black markings; dual scale dials available in some pressure ranges

BOURDON TUBE
P-1535: 316L seamless stainless steel

CONNECTION
P-1535: 1/4-18 ANPT 316L stainless steel

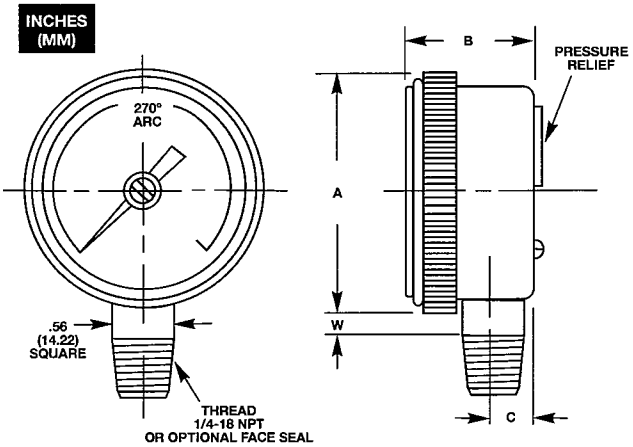
RANGE: VAC-0-30 psi to 3000 psi

ACCURACY (Grade 1A):
±1% of span for range to but not including 3000 psi
±2% of span for ranges 3000 psi and above

SCALES: psi, bar, kg/cm², kPa (single or dual scale)

MODEL NUMBER	DIAL SIZE	UNIT	A	B	C	W
1535	2"	inches	2.28	1.18	.41	.24
	50	mm	57.9	30	10.4	6.1
1535	2-1/2"	inches	2.83	1.22	.41	.23
	63	mm	71.9	31	10.4	5.8

INCHES (MM)



AMETEK®
www.ametekusg.com

Printed in the U.S.A. 908PDF (160166)

ALL ORDERS CAN BE SENT TO:
On-line fax: 215-323-9450 or e-mail to usg.sales@ametek.com

Sales/Technical Support: 215-257-6531
900 Clymer Avenue
Sellersville, PA 18960 U.S.A.

Customer Service: 727-536-7831
8600 Somerset Drive
Largo, FL 33773 U.S.A.

ISO 9001:2000 CERTIFIED

Specifications are subject to change without notice. Visit our Web site for the most up-to-date information.

Special Application Gauges

Series 1500 Corrosion Resistant Pressure Gauges

SPEC NUMBER SELECTION CHART

Series 1500

	Model 1535 1/4-18 ANPT Low Mount	Model 1535 1/4-18 ANPT Low Mount
Bourdon Tube	**316L Stainless Steel**	**316L Stainless Steel**
Connection	**316L Stainless Steel**	**316L Stainless Steel**
Size	**2"**	**2-1/2"**
Range	**Spec No.**	**Spec No.**
30"-0-30 psi	148953	–
30"-0-60 psi	149641	–
30"-0-150 psi	149642	–
0-15 psi	148954*	110792*
30 psi	148955	110793
60 psi	148956	110794
100 psi	148957	110690
160 psi	148958	110795
200 psi	148959	110796
300 psi	148960	110797
400 psi	148961	110798
600 psi	148962	110799
1000 psi	148963	110800
1500 psi	148964	110801
2000 psi	148965	110802
3000 psi	148966	148182

* Dial graduated on 180° arc

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www.ametekusg.com

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Largo, FL 33773 U.S.A.

ISO 9001:2000 CERTIFIED

Specifications are subject to change without notice. Visit our Web site for the most up-to-date information.

SECTION 13
FIKE BI-DIRECTIONAL RUPTURE DISK

704 SW 10th St, Blue Springs, MO 64015
PO Box 610, Blue Springs, MO 64013 USA
Tel 816-229-3405 Fax 816-228-9277
WWW.FIKE.COM

FIKE CORPORATION

Certificate of Conformance
Rupture Discs

CUSTOMER INFORMATION

Customer:	ZELLER CORPORATION	Sales Order#:	462831 1D 5.000
Customer P.O.#:	PO0048488		
Tag Number(s):	PSE-228		

PRODUCT SPECIFICATIONS

Product Type:	LO-V BT		
Nominal Size:	4 IN	Flange Rating:	150 ANSI
Material:	316 FEP		
		Spec. B Temperature:	72.00° F
Spec. A Temperature:	72.00° F	Spec. B Burst Pressure:	9.000 INWC
Spec. A Burst Pressure:	N/A		

TESTING/MARKING INFORMATION

MFG. Lot#: **1226548** Lot Size: **3**

Burst Tolerance: Burst A N/A

***** SEE SPECIAL NOTES FOR B BURST TESTING/MARKING INFORMATION *****
***Ambient temperature is defined as 59°- 86°f (15°- 30°c). Rupture discs are manufactured at ambient temperature to manufacturing range values derived from Fike Temperature Compensation data unless actual temperature tests are performed**

MATERIALS OF CONSTRUCTION

Component	Material	Cert. Nr.
Top Material	316 SST	7606-0211
Seal Material	FEP Fluoropolymer Seal	613813
Slot Cover	FEP Slot Cover Top	613813
Support Buckle Material	316 SST	7612-0112

Mill Test Certification attached. Refer to Material Lot Numbers listed above.

SPECIAL NOTES

B Burst Tolerance: Min: 9.000 Max: 15.000 INWC @ 72.00° F.
B Burst Test Results: 12.65 12.87

We certify that these components meet applicable specifications, drawings, and requirements of your purchase order. Evidence of compliance is maintained on file in our records and is available for review upon request.

GERALDINE JOHNS
Authorized Quality Representative
As Approved by the Sr. V.P. of Quality Assurance

06/05/12
Date: ()

Zapp Precision Strip, Inc. 12633 Clark Street, Santa Fe Springs, CA 90670

FIKE CORPORATION
708 SOUTH 10th STREET
BLUE SPRINGS MO 64015

Zapp Precision Strip, Inc.
12633 Clark Street
Santa Fe Springs, California
90670
Phone+1 562-944-5484
Fax+1 562-944-1874
Tollfree 888-236-0004
www.zapp.com

Member of the Zapp Group

August 16, 2011

Inspection certificate Type 3.1 per EN 10204:2004

Certificate No. 2210028819000010 01

Your purchase Order 142056 dated 08/10/2011
Sales Order 2302017287 Delivery Note 2210028819
Production Lot 2685128 Inspection Lot 020000239194
BLANKET RELEASE
FIKE LOT # 7606-0211
HEAT# 7410184

Item 10	STAINLESS STEEL
Grade / Alloy	SS316/316L ✓
✓/ Dimensions	0.0080 " X 36.0000 "
Thickness tolerance	-0.00040 " / 0.00040 "
Width tolerance	0.00000 " / 0.37500 "
Conditions	Annealed
Surface	Bright Annealed Finish
Edge	slit edges
Techn. Specification	ASTM A240/A240M-10B ✓
Techn. Specification	SA-240/SA-240M
Specifications	ASTM A 240 ASME SA240
Material	8700164
Customer part no	95-7606
Quantity / Weight	**105.000 LB**

ACCEPTED
LOT# 7606-0211
PO# 142056
Insp BT Date 8-19-11
Page 1 of 2

Chemical composition **Heat 7410184**

C (%)	Si (%)	Mn (%)	S (%)	P (%)	Cr (%)
0.019	0.500	1.35	0.0010	0.0280	16.28
Ni (%)	**Mo (%)**	**Cu (%)**	**N (%)**	**Co (%)**	
10.10	2.04	0.250	0.030	0.150	

Melt Source AK Steel - US

MATCHES
316 Exact Match

Element	%	+\-
Fe	69.42	1.26
Cr	16.91	0.56
Ni	9.94	0.65
Mo	2.19	0.08
Mn	1.54	0.31

Reading #7 19-Aug-2011
LOT #: 7606-0211

Quality inspection results

Tensile Strength	98.3 KSI
.2% Yield Strength	46.1 KSI
Elongation 2"	61.60 %
Grain Size	9.5
Hardness	86.0 HRB

Zapp Precision Strip, Inc. 12633 Clark Street, Santa Fe Springs, CA 90670

FIKE CORPORATION
708 SOUTH 10th STREET
BLUE SPRINGS MO 64015

August 16, 2011

Batch D014258008

This material is melted and produced in the United States and meets the requirements of DFARS 252.225-7008.

Sizes and Quality identification test examined and in order.
Surface visual inspection at finish: without objection
In compliance with the conditions mentioned in the acknowledgement of order.
This certificate signifies that the material meets the appropriate requirements defined in the current revision of the following specifications: ISO 9445-1; ISO 9445-2;ASTM A480/A480M;DIN EN 1014. This document may not be reproduced except in its entirety.
This certificate has been issued by computer and is valid without signature.

ZPS / GENE SHELDON (MANAGER TECHNICAL SERVICES) +1 508-998-6300

ZAPP Precision Strip does not use mercury in the testing or production of material.
ZAPP Precision Strip is certified to ISO 9001, AS 9100 and is approved as a manufacturer according to AD2000-MERKBLATT W0 and the Pressure Equipment Directive PED 97/23/EC. To view certificates go to customer information www.zapp.com

FIKE
ACCEPTED
LOT# 7606-0211
PO# 142056
Insp BT Date 8-19-11
Page 2 of 2

Saint-Gobain Performance Plastics Corporation

150 Dey Road, Wayne, New Jersey 07470
973-696-4700 (Phone) 973-628-5300(Fax)

Inspection Certificate EN10204-3.1

Customer:	**Fike Corporation**	**Product Description**	**Norton FEP Film – FG Grade**
Customer Product	**95-7776**	**SGPPL P/N**	**D9410202**
Customer Order	**138741-OP**	**SGPPL SO No.**	**S3196376**
Ship date:	**02-14-2012**	**Thickness**	**0.002**
Quantity, UOM	**100.0 lbs**	**Width**	**48"**
		Color	**Clear**

The test results stated below were determined on actual lot samples:

Properties	Unit	Lot #	Method
Lot		A182AXX-6	
Roll number(s)		01	
Thickness, point Avg.	mil	1.95	micrometer
Tensile Strength, MD	K#/in^2	45.56	(1)
Tensile Strength, TD	K#/in^2	39.36	(1)
Elongation, MD	%	371	(1)
Elongation, TD	%	387	(1)
Dimensional Stability, MD @200°C	%	-0.09	(2)
Dimensional Stability, TD @200°C	%	-1.05	(2)

(1) SGPPL TP-FE01 (equivalent to ASTM-D-638/ASTM D-882 and DIN EN ISO 527-1/ DIN EN ISO 527-3)
(2) SGPPL TP-016 (equivalent to ASTM-D1204)

SPECIFICATION(S): Made from FEP resin which meets ASTM-D2116
We certify that the product lot(s) as listed above shipped on this order and evaluated/tested according to the applicable requirement(s) of the above specification(s), was found to conform to the specification(s).

CERTIFIED BY: *Elizabeth Wargacki* Date: *02/14/12*
Elizabeth Wargacki
Quality Supervisor

FIKE
ACCEPTED
613813
138741
BT Date 2-23-12

Page 1 of 1

Form equivalent to DIN EN 10204, Inspection Certificate EN102043.1

Zapp Precision Strip, Inc. 12633 Clark Street, Santa Fe Springs, CA 90670

FIKE CORPORATION
704 SOUTH 10th STREET
BLUE SPRINGS/ Kansas MO 64015

Zapp Precision Strip, Inc.
12633 Clark Street
Santa Fe Springs, California
90670
Phone+1 562-944-5484
Fax+1 562-944-1874
Tollfree 888-236-0004
www.zapp.com

Member of the Zapp Group

April 04, 2012

Inspection certificate Type 3.1 per EN 10204:2004

Certificate No. 2210032595000010 01

Your purchase Order 150805 OP dated 03/23/2012
Sales Order 2302019399 Delivery Note 2210032595
Production Lot 2836087 Inspection Lot 020000252095

BLANKET RELEASE

Item 10 STAINLESS STEEL
Grade / Alloy SS316/316L
Dimensions 0.0100 " X 36.0000 "
Thickness tolerance -0.00050 " / 0.00050 "
Width tolerance 0.00000 " / 0.06250 "
Conditions ANN
Surface BA
Edge slit edges
Techn. Specification ASTM A240/A240M-11A
Techn. Specification SA-240/SA-240M
Specifications ASTM A 240 ASME SA240
Material 8800201
Customer part no 95-7612
Quantity / Weight **159.000 LB**

Chemical composition **Heat 7310678**

C (%)	Si (%)	Mn (%)	S (%)	P (%)	Cr (%)
0.020	0.490	1.32	0.0020	0.0260	16.41
Ni (%)	**Mo (%)**	**Cu (%)**	**N (%)**		
10.13	2.06	0.350	0.020		

Melt Source AK Steel - US

FIKE
ACCEPTED
LOT# 7612-0112
PO# 150805
Insp BT Date 41012
Page 1 of 2

Quality inspection results

Tensile Strength trans. 93.20 KSI
.2% Yield Strength trans. 43.40 KSI
Elongation 2" trans. 56.20 %
Tensile Strength trans. 642 MPa
Grain Size 9.5
.2%Yield Strength trans. 299 MPa
Hardness 83.0 HRB

Zapp Precision Strip, Inc. 12633 Clark Street, Santa Fe Springs, CA 90670

FIKE CORPORATION
704 SOUTH 10th STREET
BLUE SPRINGS/ Kansas MO 64015

April 04, 2012

Batch D015786011

This material is melted and produced in the United States and meets the requirements of DFARS 252.225-7008.

Sizes and Quality identification test examined and in order.
Surface visual inspection at finish: without objection
In compliance with the conditions mentioned in the acknowledgement of order.
This certificate signifies that the material meets the appropriate requirements defined in the current revision of the following specifications:
Strip-Products: ISO 9445-1; ISO 9445-2; ASTM A480/480M and DIN EN 10140.
Wire/Bar-Products: ASTM A370; ASTM A555/A555M; ASTM A580/A580M.

This certificate has been issued by computer and is valid without signature.

ZPS / GENE SHELDON (MANAGER TECHNICAL SERVICES) +1 508-998-6300

ZAPP Precision Strip does not use mercury in the testing or production of material.
ZAPP Precision Strip is certified to ISO 9001, AS 9100 and is approved as a manufacturer according to AD2000-MERKBLATT W0 and the Pressure Equipment Directive PED 97/23/EC. To view certificates go to customer information www.zapp.com

MATCHES
316 Exact Match

Element	%	+\-
Fe	69.54	0.89
Cr	16.59	0.39
Ni	10.46	0.47
Mo	2.17	0.05
Mn	1.24	0.20

Reading #3 10-Apr-2012
LOT #: 7612-0112

FIKE
ACCEPTED
LOT# 7612-0112
PO# 150805
Insp BT Date 41012
Page 2 of 2

704 SW 10th St, Blue Springs, MO 64015
PO Box 610, Blue Springs, MO 64013 USA
Tel 816-229-3405 Fax 816-228-9277
WWW.FIKE.COM

FIKE CORPORATION

Certificate of Conformance
Rupture Discs

CUSTOMER INFORMATION

Customer:	ZELLER CORPORATION	Sales Order#:	462831 1D 4.000
Customer P.O.#:	PO0048488		
Tag Number(s):	PSE-228		

PRODUCT SPECIFICATIONS

Product Type:	LO-V BT		
Nominal Size:	4 IN	Flange Rating:	150 ANSI
Material:	316 FEP		
		Spec. B Temperature:	72.00° F
Spec. A Temperature:	72.00° F	Spec. B Burst Pressure:	5.000 INWC
Spec. A Burst Pressure:	N/A		

TESTING/MARKING INFORMATION

MFG. Lot#: **1226545** Lot Size: **3**

Burst Tolerance: Burst A N/A

***** SEE SPECIAL NOTES FOR B BURST TESTING/MARKING INFORMATION *****
***Ambient temperature is defined as 59°- 86°f (15°- 30°c). Rupture discs are manufactured at ambient temperature to manufacturing range values derived from Fike Temperature Compensation data unless actual temperature tests are performed**

MATERIALS OF CONSTRUCTION

Component	Material	Cert. Nr.
Top Material	316 SST	7606-0211
Seal Material	FEP Fluoropolymer Seal	613813
Slot Cover	FEP Slot Cover Top	613813
Support Buckle Material	316 SST	7612-0112

Mill Test Certification attached. Refer to Material Lot Numbers listed above.

SPECIAL NOTES

B Burst Tolerance: Min: 5.000 Max: 11.000 INWC @ 72.00° F.
B Burst Test Results: 8.23 8.31

We certify that these components meet applicable specifications, drawings, and requirements of your purchase order. Evidence of compliance is maintained on file in our records and is available for review upon request.

GERALDINE JOHNS
Authorized Quality Representative
As Approved by the Sr. V.P. of Quality Assurance

Jeri Johns

06/05/12
Date: ()

Zapp Precision Strip, Inc. 12633 Clark Street, Santa Fe Springs, CA 90670

FIKE CORPORATION
704 SOUTH 10th STREET
BLUE SPRINGS/ Kansas MO 64015

Zapp Precision Strip, Inc.
12633 Clark Street
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Phone+1 562-944-5484
Fax+1 562-944-1874
Tollfree 888-236-0004
www.zapp.com

Member of the Zapp Group

April 04, 2012

Inspection certificate Type 3.1 per EN 10204:2004

Certificate No. 2210032595000010 01

Your purchase Order 150805 OP dated 03/23/2012
Sales Order 2302019399 Delivery Note 2210032595
Production Lot 2836087 Inspection Lot 020000252095

BLANKET RELEASE

Item 10 STAINLESS STEEL
Grade / Alloy SS316/316L
Dimensions 0.0100 " X 36.0000 "
Thickness tolerance -0.00050 " / 0.00050 "
Width tolerance 0.00000 " / 0.06250 "
Conditions ANN
Surface BA
Edge slit edges
Techn. Specification ASTM A240/A240M-11A
Techn. Specification SA-240/SA-240M
Specifications ASTM A 240 ASME SA240
Material 8800201
Customer part no 95-7612
Quantity / Weight **159.000 LB**

Chemical composition **Heat 7310678**

C (%)	Si (%)	Mn (%)	S (%)	P (%)	Cr (%)
0.020	0.490	1.32	0.0020	0.0260	16.41
Ni (%)	**Mo (%)**	**Cu (%)**	**N (%)**		
10.13	2.06	0.350	0.020		

Melt Source AK Steel - US

FIKE
ACCEPTED
LOT# 7612-0112
PO# 150805
Insp BT Date 41012
Page 1 of 2

Quality inspection results

Tensile Strength trans. 93.20 KSI
.2% Yield Strength trans. 43.40 KSI
Elongation 2" trans. 56.20 %
Tensile Strength trans. 642 MPa
Grain Size 9.5
.2%Yield Strength trans. 299 MPa
Hardness 83.0 HRB

Zapp Precision Strip, Inc. 12633 Clark Street, Santa Fe Springs, CA 90670

FIKE CORPORATION
704 SOUTH 10th STREET
BLUE SPRINGS/ Kansas MO 64015

April 04, 2012

Batch D015786011

This material is melted and produced in the United States and meets the requirements of DFARS 252.225-7008.

Sizes and Quality identification test examined and in order.
Surface visual inspection at finish: without objection
In compliance with the conditions mentioned in the acknowledgement of order.
This certificate signifies that the material meets the appropriate requirements defined in the current revision of the following specifications:
Strip-Products: ISO 9445-1; ISO 9445-2; ASTM A480/480M and DIN EN 10140.
Wire/Bar-Products: ASTM A370; ASTM A555/A555M; ASTM A580/A580M.

This certificate has been issued by computer and is valid without signature.

ZPS / GENE SHELDON (MANAGER TECHNICAL SERVICES) +1 508-998-6300

ZAPP Precision Strip does not use mercury in the testing or production of material.
ZAPP Precision Strip is certified to ISO 9001, AS 9100 and is approved as a manufacturer according to AD2000-MERKBLATT W0 and the Pressure Equipment Directive PED 97/23/EC. To view certificates go to customer information www.zapp.com

MATCHES
316 Exact Match

Element	%	+\-
Fe	69.54	0.89
Cr	16.59	0.39
Ni	10.46	0.47
Mo	2.17	0.05
Mn	1.24	0.20

Reading #3 10-Apr-2012
LOT #: 7612-0112

FIKE
ACCEPTED
LOT# 7612-0112
PO# 150805
Insp BT Date 41012
Page 2 of 2

Saint-Gobain Performance Plastics Corporation

150 Dey Road, Wayne, New Jersey 07470
973-696-4700 (Phone) 973-628-5300(Fax)

Inspection Certificate EN10204-3.1

Customer:	**Fike Corporation**	**Product Description**	**Norton FEP Film – FG Grade**
Customer Product	**95-7776**	**SGPPL P/N**	**D9410202**
Customer Order	**138741-OP**	**SGPPL SO No.**	**S3196376**
Ship date:	**02-14-2012**	**Thickness**	**0.002**
Quantity, UOM	**100.0 lbs**	**Width**	**48"**
		Color	**Clear**

The test results stated below were determined on actual lot samples:

Properties	Unit	Lot #	Method
Lot		A182AXX-6	
Roll number(s)		01	
Thickness, point Avg.	mil	1.95	micrometer
Tensile Strength, MD	K#/in^2	45.56	(1)
Tensile Strength, TD	K#/in^2	39.36	(1)
Elongation, MD	%	371	(1)
Elongation, TD	%	387	(1)
Dimensional Stability, MD @200°C	%	-0.09	(2)
Dimensional Stability, TD @200°C	%	-1.05	(2)

(1) SGPPL TP-FE01 (equivalent to ASTM-D-638/ASTM D-882 and DIN EN ISO 527-1/ DIN EN ISO 527-3)
(2) SGPPL TP-016 (equivalent to ASTM-D1204)

SPECIFICATION(S): Made from FEP resin which meets ASTM-D2116

We certify that the product lot(s) as listed above shipped on this order and evaluated/tested according to the applicable requirement(s) of the above specification(s), was found to conform to the specification(s).

CERTIFIED BY: *Elizabeth Wargacki* Date: *02/14/12*

Elizabeth Wargacki
Quality Supervisor

FIKE
ACCEPTED
613813
138741
BT Date 2-23-12

Page 1 of 1

Form equivalent to DIN EN 10204, Inspection Certificate EN102043.1

Zapp Precision Strip, Inc. 12633 Clark Street, Santa Fe Springs, CA 90670

FIKE CORPORATION
704 SOUTH 10th STREET
BLUE SPRINGS/ Kansas MO 64015

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Fax+1 562-944-1874
Tollfree 888-236-0004
www.zapp.com

Member of the Zapp Group

April 04, 2012

Inspection certificate Type 3.1 per EN 10204:2004

Certificate No. 2210032595000010 01

Your purchase Order 150805 OP dated 03/23/2012
Sales Order 2302019399 Delivery Note 2210032595
Production Lot 2836087 Inspection Lot 020000252095

BLANKET RELEASE

Item 10 STAINLESS STEEL
Grade / Alloy SS316/316L
Dimensions 0.0100 " X 36.0000 "
Thickness tolerance -0.00050 " / 0.00050 "
Width tolerance 0.00000 " / 0.06250 "
Conditions ANN
Surface BA
Edge slit edges
Techn. Specification ASTM A240/A240M-11A
Techn. Specification SA-240/SA-240M
Specifications ASTM A 240 ASME SA240
Material 8800201
Customer part no 95-7612
Quantity / Weight **159.000 LB**

Chemical composition **Heat 7310678**

C (%)	Si (%)	Mn (%)	S (%)	P (%)	Cr (%)
0.020	0.490	1.32	0.0020	0.0260	16.41
Ni (%)	**Mo (%)**	**Cu (%)**	**N (%)**		
10.13	2.06	0.350	0.020		

Melt Source AK Steel - US

FIKE
ACCEPTED
LOT# 7612-0112
PO# 150805
Insp BT Date 41012
Page 1 of 2

Quality inspection results

Tensile Strength trans. 93.20 KSI
.2% Yield Strength trans. 43.40 KSI
Elongation 2" trans. 56.20 %
Tensile Strength trans. 642 MPa
Grain Size 9.5
.2%Yield Strength trans. 299 MPa
Hardness 83.0 HRB

Zapp Precision Strip, Inc. 12633 Clark Street, Santa Fe Springs, CA 90670

FIKE CORPORATION
704 SOUTH 10th STREET
BLUE SPRINGS/ Kansas MO 64015

April 04, 2012

Batch D015786011

This material is melted and produced in the United States and meets the requirements of DFARS 252.225-7008.

Sizes and Quality identification test examined and in order.
Surface visual inspection at finish: without objection
In compliance with the conditions mentioned in the acknowledgement of order.
This certificate signifies that the material meets the appropriate requirements defined in the current revision of the following specifications:
Strip-Products: ISO 9445-1; ISO 9445-2; ASTM A480/480M and DIN EN 10140.
Wire/Bar-Products: ASTM A370; ASTM A555/A555M; ASTM A580/A580M.

This certificate has been issued by computer and is valid without signature.

ZPS / GENE SHELDON (MANAGER TECHNICAL SERVICES) +1 508-998-6300

ZAPP Precision Strip does not use mercury in the testing or production of material.
ZAPP Precision Strip is certified to ISO 9001, AS 9100 and is approved as a manufacturer according to AD2000-MERKBLATT W0 and the Pressure Equipment Directive PED 97/23/EC. To view certificates go to customer information www.zapp.com

MATCHES
316 Exact Match

Element	%	+\-
Fe	69.54	0.89
Cr	16.59	0.39
Ni	10.46	0.47
Mo	2.17	0.05
Mn	1.24	0.20

Reading #3 10-Apr-2012
LOT #: 7612-0112

FIKE
ACCEPTED
LOT# 7612-0112
PO# 150805
Insp BT Date 4-10-12
Page 2 of 2

INSTALLATION AND MAINTENANCE INSTRUCTIONS

Bi-Directional Rupture Disc Assembly
Lo-V (Bolt Type and Sanitary Holders)

06-348-1

3-A SYMBOL NOTICE: This rupture disc is 3-A certified. 3-A is only valid when installed in compliance with applicable 3-A Standards and 3-A Accepted Practices, including 3-A Accepted Practice code number 606-04, E5.8 requiring the installation to be self draining.

WARNING

- Read these instructions carefully and completely before attempting to unpack, install or service the rupture disc.
- Do not vent a rupture disc assembly to an area where it would endanger personnel.
- Install the rupture disc assembly in such a way that equipment in the area will not prevent rupture disc from opening or be damaged by system discharge.
- The Lo-V rupture discs are not designed for clean in place applications. The Lo-V sanitary rupture discs are designed for disassembly for manual cleaning. Be sure that no brush, jet stream or any other cleaning mechanism makes contact with the disc. The Lo-V bolt type rupture disc removal and reinstallation is not recommended.
- "A" and "B" direction arrows on rupture disc tag must align with corresponding "A" and "B" direction arrows on rupture disc holder.
- "A" and "B" pressures on rupture disc tag must correspond with desired protection in accordance with process design.
- Note the "A" arrow will point in the direction of "higher" pressure process flow. The "B" flow arrow will point in the direction of "lower" pressure process flow.
- A baffle plate on the outlet end of vent piping does NOT necessarily prevent potentially dangerous discharge.
- Install the enclosed DANGER sign in a conspicuous location near the zone of potential danger.
- SANITARY ONLY: Install the enclosed "loose" rupture disc tag in a conspicuous location as needed for visibility to maintenance personnel.
- The holder contains a sharp knife blade. Use extreme caution when working around the knife blade.
- Handle the burst indicator (BI) circuit with care to avoid tearing, cutting or breaking the circuit material.

The Fike Lo-V rupture discs are designed for use in standard sanitary ferrules and clamps or in ANSI Bolt-Type Flanges.

- The Bolt-Type rupture discs have the 3-D rupture disc tag attached to the top-section component of the rupture disc assembly.
- The Sanitary rupture discs have rupture disc tag info etched on the flat portion of the top section component of the rupture disc assembly, and a loose, flat rupture disc tag. Note that there are a variety of sanitary ferrule standards used in industry including but not limited to Tri-Clover, DIN 32676, ISO 2852, etc. It is important to specify the type of ferrule when specifying the rupture disc.

INSPECTION/PREPARATION

Except where noted, rupture disc applies to both the metal and FEP components assembled.

A. NEW RUPTURE DISCS

WARNING: Always handle the rupture disc with extreme caution. Nicks, dents, scratches or foreign material may result in leakage or affect the burst pressure. Read the rupture disc tag completely before installing to confirm that the size and type are correct for your system.

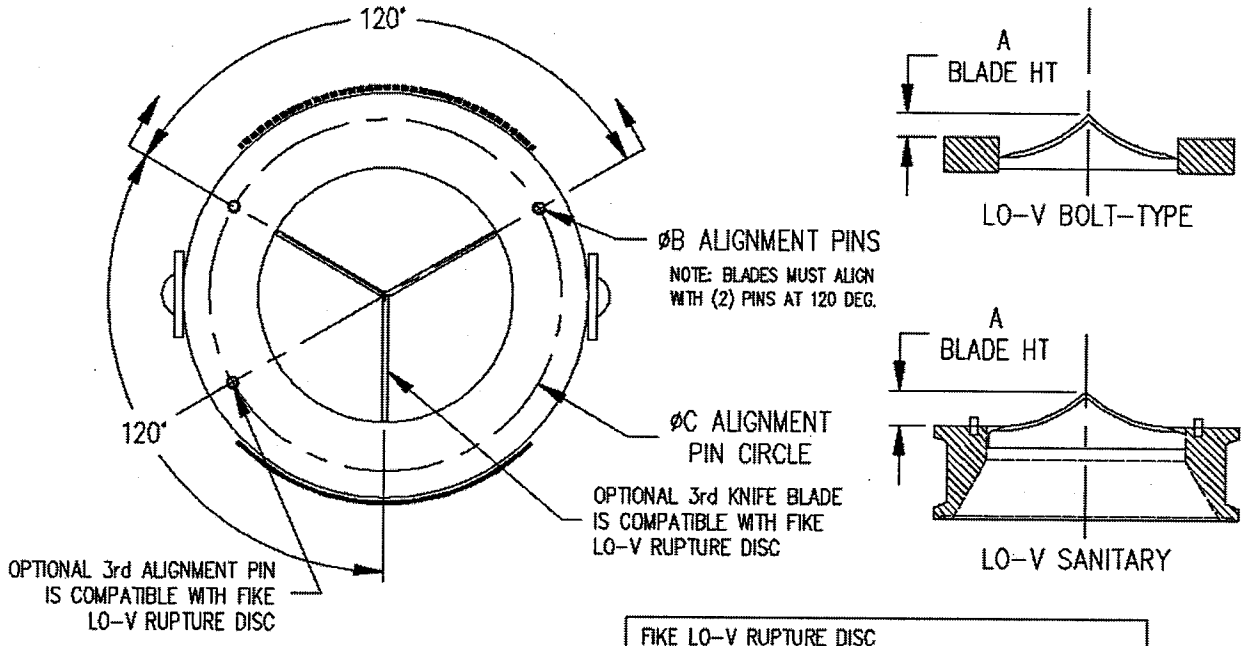
- Carefully remove the rupture disc from its packing container.
- Carefully remove the holder base and top from its packing container.
- Do not use the knife blade to lift the holder. Carefully remove the pre-assembly screws and side clips and discard the plastic shipping protector.
- Inspect the rupture disc assembly for damage. Look for nicks or cuts in the seal or dents in the dome of the rupture disc. (Note the slot cover is designed with a pattern of slits.)
- Unless otherwise specified, the rupture disc has been cleaned with a water soluble detergent and is ready for installation. However, if your process requires additional cleaning or foreign material is present, disassemble and carefully clean the rupture disc with a solvent that is compatible with your process.
- If installing a Fike Lo-V rupture disc in a non-Fike holder, verify the holder complies with following specifications for the Lo-V rupture disc. (See Figure 1 on next page).
- **NOTE:** Fike Lo-V rupture discs have 3 alignment pins, and the Fike Lo-V rupture discs are typically compatible with comparable 2-pin rupture discs.

B. MAINTAINING EXISTING RUPTURE DISCS AND MANUAL CLEANING (SANITARY ONLY)

If the sanitary rupture disc has not ruptured, it can be removed, inspected & reinstalled provided the following conditions are met. (The Lo-V bolt type rupture disc removal and reinstallation is not recommended.)

- The rupture disc must be free of foreign material.
- Corrosion is not evident.
- The slot cover and seal are intact and the seal is not punctured, nicked or scratched. (Note: the slot cover is designed with a pattern of slits.)
- The dome of the rupture disc is not damaged in any way.

1. Note the disc dome is taller than the holder assembly. Therefore, carefully spread the companion flanges to avoid damage to the disc dome when removing the disc & holder assembly.
2. Place the disc & holder assembly on a work surface with disc dome facing up.
3. Do not use the knife blades to lift the holder.
4. Carefully remove the pre-assembly screws or side clips.
5. Separate the base and holddown. Remove the rupture disc from the holder.
6. The holder may be hand polished with ScotchBrite™, fine emery cloth or #0000 steel wool. DO NOT MACHINE THE RUPTURE DISC HOLDER! If scratches, nicks, corrosion or deposits from the media cannot be removed by hand polishing, contact the factory.



FIKE LO-V RUPTURE DISC			
SIZE	A (NOTE 1)	B (LESS THAN)	C
3"	7/16"	3/16"	4 5/64 TO 4 9/16"
4"	7/16"	3/16"	5 5/8"
6"	11/16"	3/16"	7 5/8"
8"	11/16"	3/16"	9 9/16"

NOTE 1: IF THE BLADE HEIGHT "A" IS GREATER THAN LISTED VALUE, CONSULT FIKE.

Figure 1 -- Holder Fit-Up specifications for Non-Fike Holders and Lo-V Rupture Discs

7. KNIFE BLADE INSPECTION
New knife blades have been factory sharpened and inspected prior to shipment, and should not require sharpening. Knife blades that have been in process media, or may have been damaged during an upset condition. The knife blades should be inspected prior to installing the rupture disc in the holder. In a well-lit work area, with the knife blade edge facing up, carefully clean any dirt from the knife blades. The knife blade leading edge should have no nicks, gouges or burrs, and the leading tip should be sharp. The welds and base materials should not have any cracks. Sharpen the knife blades or return the holder to Fike Corporation for sharpening or holder replacement.
8. KNIFE BLADE SHARPENING -Standard knife blade material is 316 SST. Follow the original knife blade angles. Improper knife sharpening can affect the disc opening characteristics. Re-inspect the knife blades after sharpening.
9. ASSEMBLY - Before attempting to assemble the rupture disc and holder, confirm that the seat area of the rupture disc is designed to fit the rupture disc holder (See Figure 1).

C. SANITARY FERRULE HOLDER INSTALLATION

(See Figure 2)

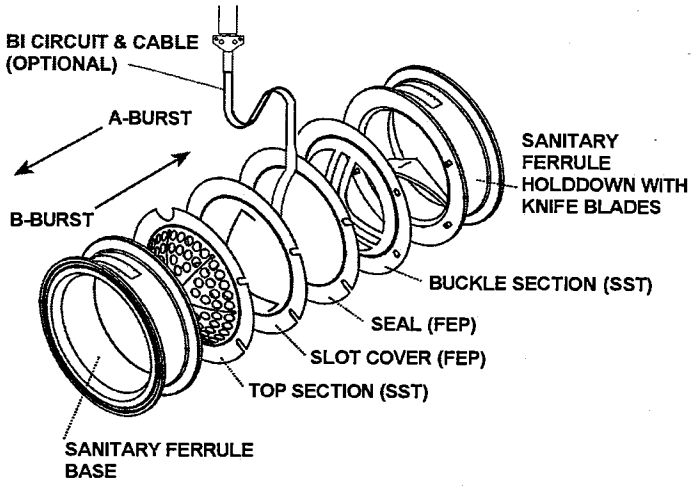


Figure 2 -- Rupture Disc Assembly (Sanitary Holder Type Shown)

WARNING: Before attempting to install the rupture disc, confirm that the rupture disc is matched to the proper corresponding size (see Table 1).

Table 1 -- Rupture Disc/Holder Size

Rupture Disc Size		Corresponding Sanitary Holder Ferrule Size	
Inches	DN	Inches	DN
3	80	4	100
4	100	6	150
6	150	8	200
8	200	10	250*
DN sizes correspond with DIN 32676 & ISO 2852 *ISO 2852 does not offer DN250 size.			

1. Verify the process flow directions.
2. Place the rupture disc assembly into the ferrules with the flow arrows on the holder tags pointing in the same direction as the desired flows, and with the dome of the disc oriented to correspond with the flow directions (locating pins on the holder prevent the disc from being installed upside down).
3. Install the clamp around the ferrules so that the wing nut is on the same side as the holder tags.
4. Hand-tighten the wing nut until the clamp is fully engaged with the ferrules and the rupture disc is securely in position, approximately 25 in-lbs.

WARNING: Double check the orientation of the rupture disc. Verify flow arrows on the disc tags are pointed in the same direction as the process flow.

Under normal operation conditions, the rupture disc should be replaced annually. Severe operating conditions may require that the rupture disc be replaced more often.

D. BOLT-TYPE HOLDER INSTALLATION -
(See Figure 3)

WARNING: Before attempting to install the rupture disc and holder, confirm that the rupture disc size matches the bolt-type flange size.

1. Verify the process flow directions.
2. Before attempting to assemble the rupture disc and holder, confirm that the seat area of the rupture disc is designed to fit the rupture disc holder. Place the base on a work surface with seating surface facing up.

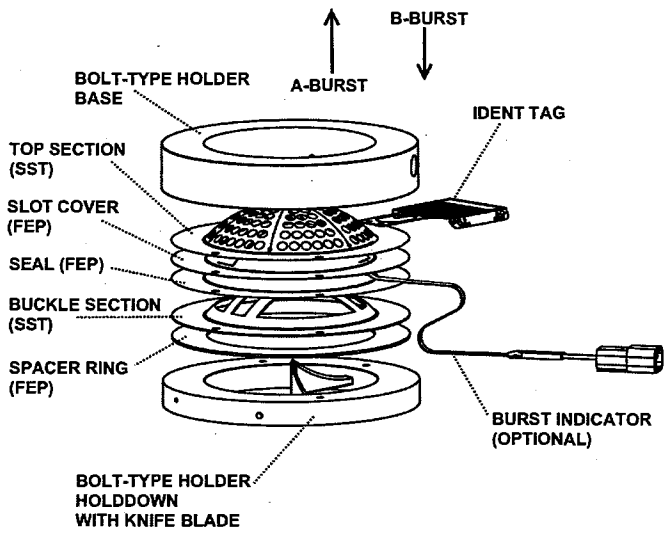


Figure 3 -- Rupture Disc Assembly (Bolt-Type Shown)

3. Place the rupture disc into the base with the tag flow arrows in the same direction as base flow arrows. Carefully place holddown onto rupture disc with flow arrows in the same direction as disc and base flow arrows. Rotate holddown to align pre-assembly pins and side clip holes. (Pre-assembly pins on the holder prevent the disc from being installed upside down.)
4. Install and tighten pre-assembly screws and side clips.
5. Place gaskets on top and bottom of assembly. Gaskets subject to relaxation or cold flow are not recommended.
6. Carefully spread the flanges apart to clear the dome of the rupture disc, and install the holder & rupture disc assembly in the flanges. Verify flow arrows are pointed in the same direction as the process flow. Locate the rupture disc holder assembly to the center of the flanges.
7. If necessary, clean the threads on studs and nuts. Wire brushing is usually sufficient. Fike recommends SAE 20 oil as a fastener lubricant. Commercial thread lubricants are recommended whenever conditions warrant. These conditions may include corrosive, marine and outdoor environments, service temperatures greater than 212°F (100°C), or stainless steel on stainless steel threads.

8. The commercial thread lubricants recommended by Fike are mineral oil-based paste containing solid lubricants, powdered metals and corrosion inhibitors. Advantages include, corrosion protection, a wide service temperature range, protection against scaling, galling and seizing, and aids assembly and release. Some common thread lubricants are Molykote 1000, Anti-Seize lubricant, manufactured by Dow Corning, and Thread Gard Anti-Seize Compound Copper, manufactured by Federal Process Company. The use of these products will require the recommended torque to be decreased by approximately 15% to achieve the same load. Fike does not recommend the use of thread lubricants with powders, liquids or pastes containing a high percentage (>60%) of molybdenum disulfide (MoS2). These products are designed with a low coefficient of friction to reduce wear for load bearing, moving parts. Use of these products as thread lubricants can increase the load by as much as 100% causing damage to the companion flanges, rupture disc holder, rupture disc, and fasteners.
9. Do not use studs & nuts that show evidence of galling. Finger tighten flange bolt nuts. Install and tighten the studs and nuts of the flange to the torque values provided, Table 2. Using a crisscross pattern, apply torque in four steps of 25% increments. After the recommended torque has been achieved, perform a final tightening in a clockwise bolt-to-bolt fashion to ensure all studs have equal loading.
10. Experience has shown that in some installation conditions, it may be necessary to re-torque the flange bolting after the system has operated through normal pressure and temperature cycles.

WARNING: Double check the orientation of the rupture disc. Verify flow arrows on the disc tags are pointed in the same direction as the process flow. Under normal operation conditions, the rupture disc should be replaced annually. Severe operating conditions may require that the rupture disc be replaced more often.

Table 2 -- Lo-V Bolt Type ANSI 150 Flange Torque

ANSI 150		
Disc Size	Torque	
(inch)	(ft-lbs)	(Nm)
3	37	50
4	23	31
6	40	54
8	53	72
PN 6		
Disc Size	Torque	
DN	(ft-lbs)	(Nm)
80	37	50
100	47	64
150	34	46
200	44	60
PN 10		
Disc Size	Torque	
DN	(ft-lbs)	(Nm)
80	18	24
100	23	31
150	42	57
200	56	76

E. INTEGRATED BURST INDICATOR

WARNING: Read these instructions carefully and completely before attempting to unpack, install or service the indicator. Specific attention must be paid to the circuit. Special care must be taken to avoid applying any force to the circuit or Teflon seal.

INTEGRATED BURST INDICATOR WIRING

The indicator should be wired per the wiring diagram illustrated in Figure 4. Install in accordance with all applicable local and national codes (in Canada, Canadian Electric Code, Part 1).

NOTE: For hazardous locations, barriers must be CSA certified and must be installed in accordance with barrier manufacturer's instructions. Barrier parameters are as follows: 28 V (max.), 300 ohm (min.).

NOTE: Rupture disc specifications can be found on the rupture disc tag. When equipped with an integrated burst indicator, a tie strap is recommended to hold the wiring secure to the piping, as shown in Figure 5.

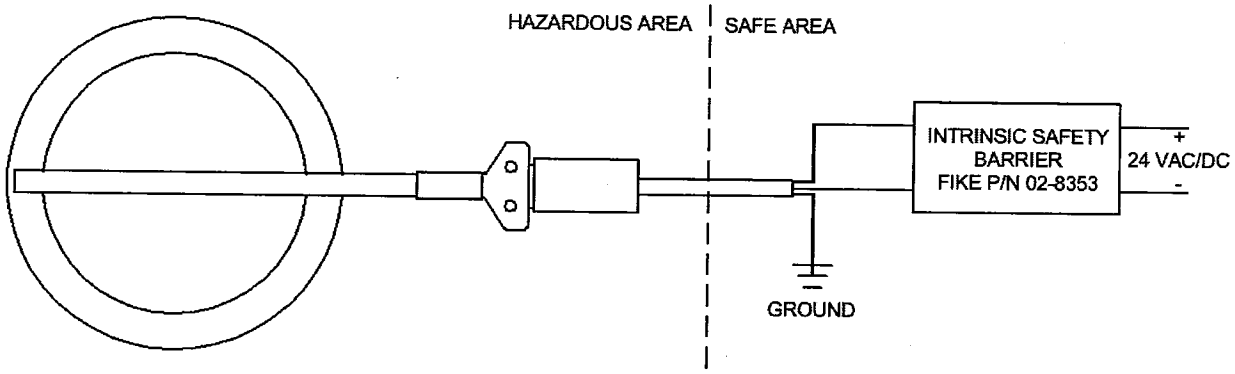


Figure 4 -- Integrated burst indicator wiring diagram

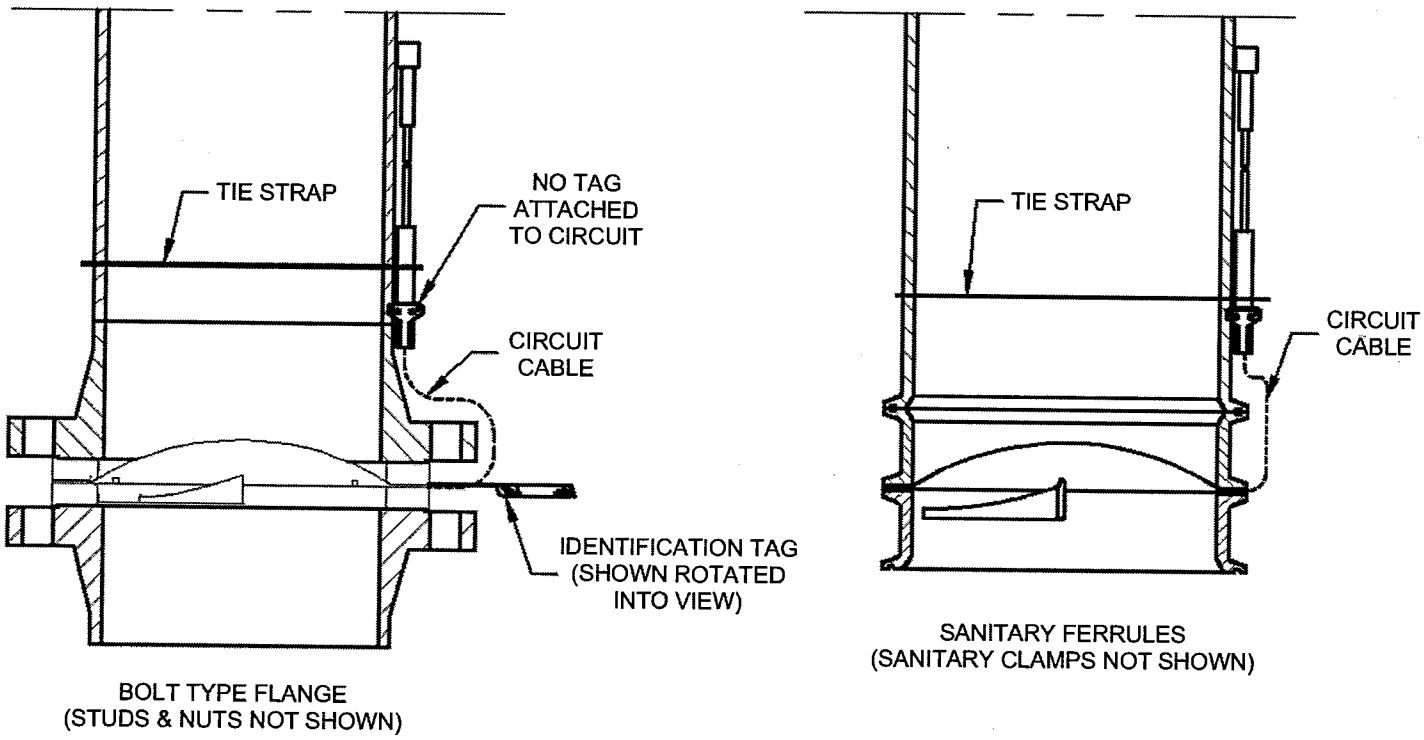


Figure 5 -- Rupture Disc Burst Indicator Circuit Cable Routing and Secure to Piping

SECTION 14
HOFFMAN WATERSHED ENCLOSURE

Hoffman®
A Pentair Company

Hoffman Watershed® ENCLOSURES

Free-Standing Enclosure
Freistehendes Gehäuse
Clôture Indépendante
Recinto Aislado

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2100 Hoffman Way
Anoka, MN 55303-1745
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www.hoffmanonline.com

Pentair Electronic Packaging
170 Commerce Drive
Warwick, RI 02886
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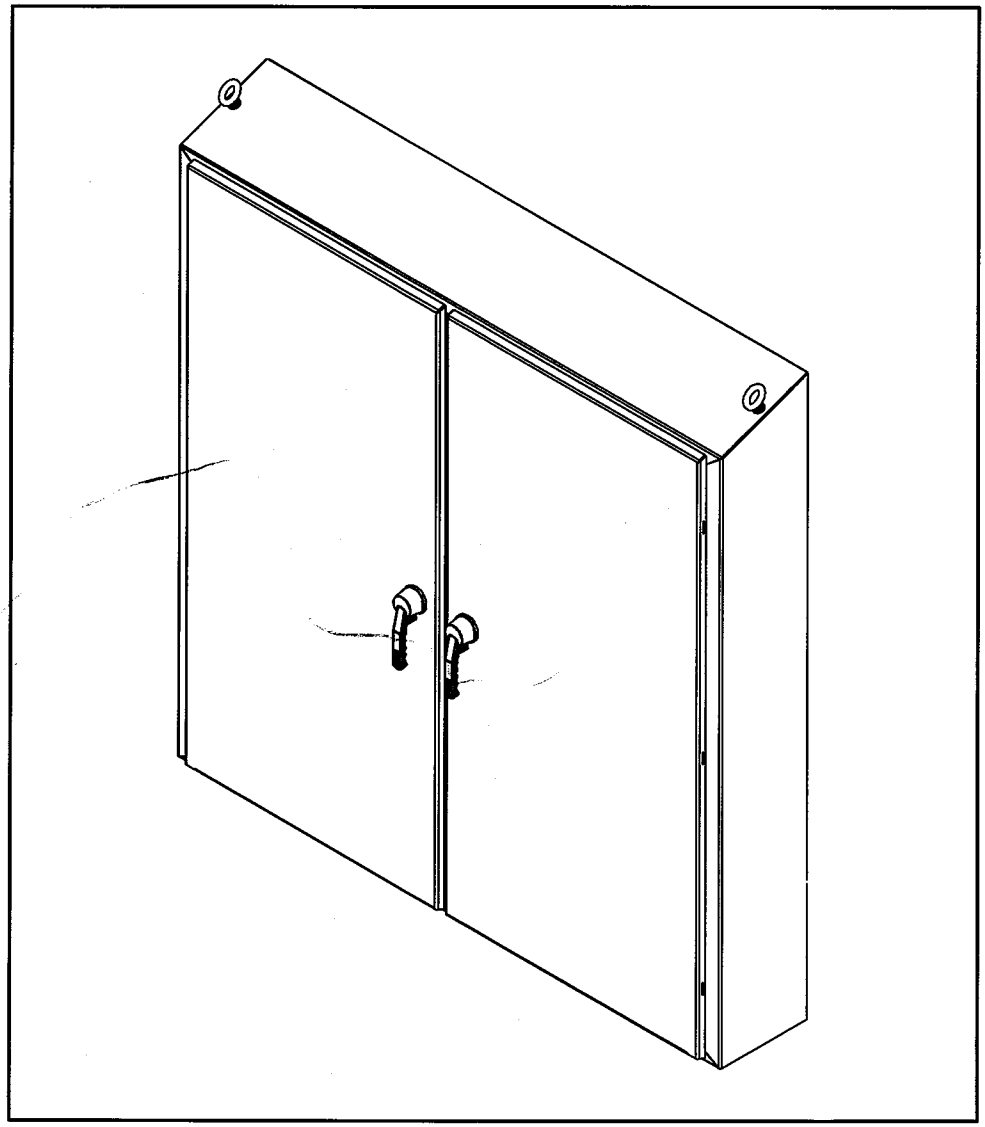
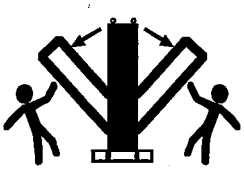
358 09 222 68 00

Norway
Schroff Scandinavia AB
Bjoernerudveien 24
1266 Oslo
47 022 76 33 60



⚠ WARNING ⚠ WARNUNG ⚠ AVERTISSEMENT ⚠ PRECAUCION



Enclosure is TOP-HEAVY

- Stabilize enclosure before opening doors.
- Follow guidelines in "Large Enclosure Handling Manual".

Einschließung ist OBERES SCHWERES

- Stabilisieren Sie Einschließung vor Öffnung Türen.
- Folgen Sie Richtlinien in der "Large Einschließung, die Handbuch "anfaßt.

La clôture est LOURDE SUPÉRIEUR

- Stabilisez la clôture avant des portes d'ouverture.
- Suivez les directives dans la clôture de "Large manipulant le manuel ".

El recinto es PESADO SUPERIOR

- Estabilice el recinto antes de puertas de la abertura.
- Siga las pautas en el recinto del "Large que maneja el manual ".

- To get additional copies of the "Large Enclosure Handling Manual", call 1-800-355-3560.
- Zusätzliche Kopien der "Large Einschließung erhalten, die Handbuch ", Anruf 1-800-355-3560 anfaßt.
- Pour obtenir les copies additionnelles de la clôture de "Large manipulant le manuel ", appel 1-800-355-3560.
- Para conseguir las copias adicionales del recinto del "Large que maneja el manual ", llamada 1-800-355-3560.

⚠ WARNING ⚠ WARNUNG ⚠ AVERTISSEMENT ⚠ PRECAUCION

To avoid electric shock, do not energize any circuits before all internal and external electrical and mechanical clearances are checked to assure that all assembled equipment functions safely and properly.

Um elektrische Schocks zu vermeiden, setzen Sie die Stromkreise erst dann Spannung aus, wenn alle internen und externen mechanischen Sicherheitsabstände überprüft worden sind, um sicherzustellen, daß alle zusammengebauten Geräte sicher und ordnungsgemäß funktionieren.

Pour éviter les décharges électriques, n'activer aucun circuit avant de vérifier tous les circuits internes et externes et tous les dégagements mécaniques afin de s'assurer que les fonctions de tous les équipements assemblés fonctionnent correctement et en toute sécurité.

Para evitar una descarga eléctrica no energice ningun circuito antes de que todos los espacios mecánicos y eléctricos (internos y externos) se revisen para asegurar que todo el equipo ensamblado funcione bien y de manera segura.

Maintenance / Cleaning
Wartung / Reinigung
Entretien / Nettoyage
Mantenimiento / Limpieza

Notice:
- Use of enclosure shall comply with manufacture's specification.
- Cleaning instructions shall comply with equipment manufacture's specification.
- Maintenance procedures and schedule shall follow equipment manufacture's specification.

Hardware Kits
- Included with your Hoffman enclosure is a complete package of hardware for back panel installation. Also provided is all the necessary hardware for grounding the back panel and doors to the enclosure body.
- The proper installation procedures for grounding the doors, covers, and optional panels is included with the ground kits.
- Ground wires are available from Hoffman Enclosures. Consult the latest Hoffman Specifiers Guide.

Nachricht:
- Gebrauch von Einschließung stimmt mit Spezifikation der Herstellung überein.
- Reinigung Anweisungen stimmen mit Spezifikation der Ausrüstung Herstellung überein.
- Wartung Verfahren und Zeitplan folgen Spezifikation der Ausrüstung Herstellung.

Hardware-Pakete
- Für die Installation der Rückwand ist ein komplettes Hardware-Paket im Lieferumfang des Hoffman Gehäuses enthalten. Ferner werden alle Hardware-Bauteile mitgeliefert, die für die Erdung der Rückwand und Türen am Gehäuse erforderlich sind.
- Die korrekten Installationsverfahren für die Erdung der Türen, der Abdeckungen und der wahlweise freigestellten Verkleidungen wird mit den Grundinstallationssätzen umfaßt.
- Erdungsdrähte sind bei Hoffman Engineering erhältlich. Konsultieren Sie den Hoffman Specifiers Guide.

Notification:
- L'utilisation de la clôture sera conforme aux spécifications de la fabrication.
- Les instructions de nettoyage seront conformes aux spécifications de la fabrication d'équipement.
- Les procédures et le programme d'entretien suivront les spécifications de la fabrication d'équipement.

Kits D'Accessoires
- Un paquet complet d'accessoires pour l'installation du panneau arrière est fourni avec le meuble Hoffman. Est également fourni tout le matériel nécessaire de mise à la terre du panneau et des portes du corps du meuble.
- Les procédures d'installation appropriées pour fondre les portes, les couvertures, et les panneaux facultatifs est incluses avec les kits moulus.
- Les fils de mise à la terre sont disponibles à Hoffman Engineering. Consulter le guide des identificateurs Hoffman.

Aviso:
- El uso del recinto se conformará con la especificación de la fabricación.
- Las instrucciones de la limpieza se conformarán con la especificación de la fabricación del equipo.
- Los procedimientos y el horario de mantenimiento seguirán la especificación de la fabricación del equipo.

Accesorios
- Estos se incluyen en el enclaustro Hoffman y comprende en paquete con el equipo para la instalación del panel trasero. También se proporciona todo el equipo necesario para hacer tierra de las puertas del panel inferior al cuerpo del enclaustro.
- Los procedimientos de instalación apropiados para poner a tierra las puertas, las cubiertas, y los paneles opcionales se incluyen con los kits de tierra.
- Los cables de tierra están disponibles en Hoffman Engineering. Consulte la guia de Hoffman quelo especifica.

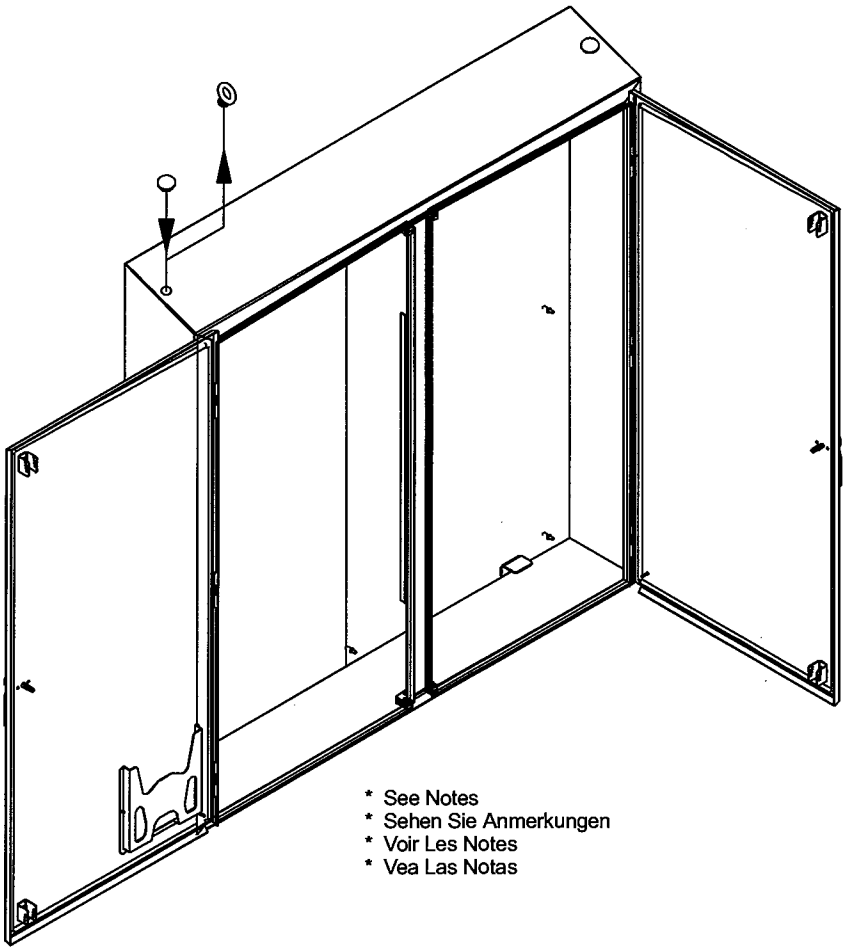
NSF Certification
NSF Bescheinigung
Certification de NSF
Certificación del NSF

* To maintain NSF certification, there must be a minimum of six inches of clearance under the enclosure and the perimeter between enclosure back and mounting surface must be sealed with silicon rubber sealant. Also, replace lifting eyes with hole seals (order separately).

* Zwischen NSF Bescheinigung beibehalten, muß es ein Minimum von sechs Zoll Abstand unter der Einschließung geben und der Umkreis Einschließung Rückseite und Befestigungsfläche muß mit Silikongummidichtungsmittel versiegelt werden. Auch ersetzen Sie anhebende Augen durch Bohrung Dichtungen (Auftrag separat).

* Pour maintenir la certification de NSF, il doit y a six pouces au minimum de dégagement sous la clôture et le périmètre entre le dos de clôture et la surface de montage doit être scellé avec le mastic en caoutchouc de silicium. En outre, remplacez les yeux de levage par des joints de trou (ordre séparément).

* Para mantener la certificación del NSF, debe haber un mínimo de seis pulgadas de separación bajo recinto y el perímetro entre la parte posteriora del recinto y la superficie de montaje se debe sellar con el sellante del caucho del silicio. También, substituya los ojos de elevación por los sellos del agujero (orden por separado).



* See Notes
* Sehen Sie Anmerkungen
* Voir Les Notes
* Vea Las Notas

English
Enclosure Alterations

Hoffman cannot assure the safety or effectiveness of any alterations or additions not made by Hoffman Enclosures Inc. However, the following information may be helpful. These instructions do not eliminate the need to consult with equipment manufacturers and to observe all regulatory agency procedures and safe practices to assure the proper electrical and mechanical function of Hoffman products in each particular application.

1. Mounting Instructions

a. Wall-mounted enclosures have either an internal mounting means or external mounting feet. Proper fasteners must be used in all mounting holes to secure the enclosure to the wall.
b. Floor-mounted enclosures have floor-stands (legs) which include mounting plates. Proper fasteners must be used in all mounting holes to securely anchor the enclosure to the floor.

2. Door Closing Adjustments

a. Two door (floor mounted)
The overlapping doors are factory-fitted to meet evenly at the top and bottom. If the floor under the enclosure is not level, the doors will not close evenly. In this case, place metal shims under the corners of the enclosure. The enclosure should be bolted in place with the doors closed to prevent tipping when installing shims. Shims under the right front corner will raise the right door. Shims under the left front corner will raise the left door. It is important that the doors meet evenly to insure a proper seal against liquids and dust. Be sure all mounting bolts are tightened securely.

3. PANEL INSTALLATION

When the interior panel is being installed, it may be necessary to bend one or more mounting studs slightly to permit the panel to fit in place. Simply position the panel on the studs that line up properly and pry the other studs into position with a suitable screwdriver inserted through the panel holes.

4. PRINT POCKET

The print pocket on the door can be inverted or removed entirely.

5. REMOVING HINGE PINS FROM CONTINUOUS HINGES

This is a difficult operation requiring at least two people. This procedure is best accomplished by using a small diameter punch to drive the hinge pin toward the bottom of the enclosure. When the hinge pin protrudes about two inches below the bottom hinge barrel, bend the end of the pin 180° so it is shaped like the letter "J". Use an electric or air powered vibrating hammer fitted with a tool which has a hole in the end to fit over the hinge pin, and drive the hinge pin out while opening and closing the door. To install the hinge pin, straighten the pin and drive it in with the vibrating hammer while opening and closing the door. Most hinge pins have one end chamfered, so be sure to start the chamfered end first when installing the pin.

ACCESSORIES AND HARDWARE

Hoffman cannot assure the safety or effectiveness of any alterations or additions not made in its plant.

Lock kits and latch kits are available for field or factory installation on many types of Hoffman enclosures. Lock kits provide key-locking capabilities. Latch kits permit rapid access to enclosure interiors while retaining the oil tight and dust tight features.

Louver plate kits provide ventilation in enclosures where internal heat is a problem.

Floor-stand kits for converting wall mounting enclosures to floor mounting are available for field or factory installation on single door NEMA 12 and NEMA 4 enclosures.

Drip shield kits are available for field or factory installation on single door and double door NEMA 12 enclosures.

Electrical interlocks provide a positive internal safety lockout on electrical enclosures while the enclosure contents are energized.

Swing-out panel kits provide a means of mounting gauges, switches, pilot lights and other components near the front of the enclosure.

Safety Lockouts protect personnel and equipment by enabling multiple padlocks to be installed on a de-energized switch.

Window kits are available for many types of Hoffman enclosures.

Corrosion inhibitors protect interior components of enclosures, wireway, consoles, etc. from corrosion. There are no coatings, oils, or greases to apply.

Hole seals are used to seal extra conduit openings, pushbutton holes, cutouts, etc. against dust, dirt, oil, and water.

Terminal kit assemblies provide an easy method to mount terminal blocks in many types of Hoffman enclosures.

Folding Shelves can be used to support instruments and test equipment.

Pedestals are used to provide floor mounting at a working height for small to medium size enclosures.

Standoffs are used for cleaning access on back side of enclosure.

Mounting foot kit is used for external wall-mounting.

Temperature Control options are available to provide an optimal environment for your controls. Options include louvers, filter fans, heat exchangers, air conditioners, and electric heaters.

Data Pocket Kits offer a convenient place for documentation.

Deutsch
Einschließung Änderungen

Hoffman kann nicht der Sicherheit oder der Wirksamkeit von irgendwelchen Änderungen oder von Hinzufügung versichern, die nicht von Hoffman Enclosures Inc. gebildet werden. Jedoch können die folgenden Informationen nützlich sein. Diese Anweisungen beseitigen nicht die Notwendigkeit, mit Geräteherstellern zu beraten und alle Verfahren und sichere Praxis der Aufsichtsbehörde zu beobachten, der korrekten elektrischen und mechanischen Funktion von den Hoffman Produkten in jeder bestimmten Anwendung zu versichern.

1. Montageanleitung

a. Wall angebrachte Einschließungen haben irgendein Mittel einer interne Montage oder externe Montagefüße. Korrekte Befestiger müssen in allen Entlüftungslöchern benutzt werden, um die Einschließung an die Wand zu befestigen.
b. Breiten Sie angebrachte Einschließungen haben Fußbodenstandplätze aus (Beine) die Montageplatten miteinschließen. Korrekte Befestiger müssen in allen Entlüftungslöchern benutzt werden, um die Einschließung am Fußboden sicher zu befestigen.

2. Tür-Schließende Justagen

a. Tür zwei (Fußboden angebracht)
Die deckentüren werden Fabrik-gepaßt, um an der Oberseite und an der Unterseite gleichmäßig zu treffen. Wenn der Fußboden unter der Einschließung nicht waagerecht ausgerichtet ist, schließen die Türen nicht gleichmäßig. In diesem Fall Platzmetallmeßplättchen unter den Ecken der Einschließung. Die Einschließung sollte in Platz mit den Türen verriegelt werden, die geschlossen werden, um Neigen zu verhindern, wenn man Meßplättchen anbringt. Meßplättchen unter der rechten vorderen Ecke heben die rechte Tür an. Meßplättchen unter der linken vorderen Ecke heben die linke Tür an. Es ist wichtig, daß die Türen gleichmäßig treffen, um eine korrekte Dichtung gegen Flüssigkeiten und Staub zu versichern. Seien Sie sicher, daß alle Befestigungsbolzen sicher festgezogen werden.

3. Installation Der Rückwand

Wenn die Innenverkleidung angebracht wird, kann es notwendig sein, einen oder mehr Montagebolzen etwas zu verbiegen, um die Verkleidung zu ermöglichen, in Platz zu passen. Bringen Sie einfach die Verkleidung auf die Bolzen in Position, die richtig ausrichten und die anderen Bolzen in Stellung mit einem verwendbaren Schraubenzieher sich einmischen, der durch die Verkleidung Bohrungen eingesetzt wird.

4. DruckTasche

Die Drucktasche auf der Tür kann völlig umgekehrt werden oder entfernt werden.

5. ENTFERNEN DER SCHARNIERSTIFTE VON DEN UNUNTERBROCHENEN SCHARNIEREN

Dieses ist ein schwieriger Betrieb, der mindestens zwei Leute erfordert. Dieses Verfahren wird gut vollendet, indem man einen kleinen Durchmesserdurchschlag verwendet, um den Scharnierstift in Richtung zur Unterseite der Einschließung zu fahren. Wenn der Scharnierstift ungefähr zwei Zoll unter dem unteren Scharnierfaß hervorsteht, verbiegen Sie das Ende des Stiftes 1805, also wird er wie das Buchstabe "J "geformt. Verwenden Sie ein elektrisches oder lüften Sie den angetriebenen vibrierenden Hammer, der mit einem Werkzeug gepaßt wird, das eine Bohrung im über hat dem Scharnierstift zu passen Ende, und fahren Sie den Scharnierstift heraus beim Öffnen und Schließen der Tür. Um den Scharnierstift anzubringen, richten Sie den Stift gerade und fahren Sie ihn innen mit dem vibrierenden Hammer beim Öffnen und Schließen der Tür. Die meisten Scharnierstifte haben ein Ende, das abgeschrägt wird, also sind sicher, das abgeschrägte Ende zuerst zu beginnen, wenn sie den Stift anbringen.

ZUSATZGERÄTE UND KLEINTEILE

Verriegelung Installationssätze und Verriegelung Installationssätze sind für Feld- oder Fabrikinstallation auf vielen Arten Hoffman Einschließungen vorhanden. Verriegelung Installationssätze liefern die Schlüssel-Blockierung von von Fähigkeiten. Verriegelung Installationssätze ermöglichen schnellen Zugang zu den Einschließung Inneren, beim des Öls fest behalten und wischen feste Eigenschaften ab.

Luftschlitzplatte Installationssätze liefern Ventilation in den Einschließungen, in denen interne Hitze ein Problem ist.

Fußbodenstandplatzinstallationssätze für umwandelnde Wandmontageeinschließungen zur Fußbodenmontage sind für Feld- oder Fabrikinstallation auf einzelnen Tür NEMA 12 und NEMA 4 Einschließungen vorhanden.

Tropfenfängerschildinstallationssätze sind für Feld- oder Fabrikinstallation auf einzelner Tür und doppelten Tür NEMA 12 Einschließungen vorhanden.

Elektrische Sicherheitskreise stellen eine positive interne Sicherheit Aussperrung auf elektrischen Einschließungen zur Verfügung, während der Einschließung Inhalt angezogen wird.

Ausschwenkbare Verkleidung Installationssätze liefern Mittel der Montagelehren, der Schalter-, Dauerflammen und anderer Bestandteile nahe der Frontseite der Einschließung.

Sicherheit Aussperrungen schützen Personal und Ausrüstung, indem sie mehrfachen padlocks ermöglichen, auf einen abgefallenen Schalter angebracht zu werden.

Fensterinstallationssätze sind für viele Arten Hoffman Einschließungen vorhanden.

Korrosion Hemmnisse schützen Innenbestandteile von Einschließungen, wireway, von Konsolen, von etc. vor Korrosion. Es gibt keine Schichten, Öle oder Fette zum zuzutreffen.

Bohrung Dichtungen werden benutzt, um Extrarohröffnungen, pushbutton Bohrungen, Ausschnitte, etc. gegen Staub, Schmutz, Öl und Wasser zu versiegeln.

Terminalinstallationssätze liefern eine einfache Methode, um Klemmenblöcke in viele Arten Hoffman Einschließungen anzubringen.

Faltende Regale können benutzt werden, um Instrumente und Testgerät zu stützen.

Untersätze werden benutzt, um Fußbodenmontage auf einer Arbeitshöhe für kleines zu den mittlere Größe Einschließungen zur Verfügung zu stellen.

Distanzhülsen werden für Reinigung Zugang auf Rückseite der Einschließung benutzt.

Montagefußinstallationssatz wird für externe Wand-Montage benutzt.

Temperaturreglerwahlen sind vorhanden, ein optimales Klima für Ihre Kontrollen zur Verfügung zu stellen. Wahlen schließen Luftschlitze, Filterventilatoren, Wärmeaustauscher, Klimaanlagen und elektrische Heizungen mit ein.

Daten-Pocket Installationssätze bieten einen bequemen Platz für Unterlagen an.

Français
Changements de Clôture

Hoffman ne peut pas assurer la sûreté ou efficacité of aucun changement ou additions non faites par Hoffman Enclosures inc.. Cependant, l'information suivante peut être utile. Ces instructions n'éliminent pas la nécessité de consulter avec des fabricants d'équipement et d'observer procédures d'organisme de normalisation et pratiques tout le sûres d'assurer la fonction électrique et mécanique appropriée des produits de Hoffman dans chaque application particulière.

1. Instructions de montage

a. Murez les clôtures montées ont l'un ou l'autre des moyens internes d'un support ou des pieds externes de support. Des attaches appropriées doivent être employées en tous les trous de support pour fixer la clôture au mur.
b. Les clôtures fixées au sol ont des stands de plancher (jambes) qui incluent des plats de support. Des attaches appropriées doivent être employées en tous les trous de support pour ancrer solidement la clôture au plancher.

2. Ajustements Se fermants De Porte

a. Porte deux (fixée au sol)
Les portes de recouvrement usine–sont adaptées pour se réunir même au dessus et au bas. Si le plancher sous la clôture n'est pas de niveau, les portes ne se fermeront pas également. Dans ce cas–ci, cales en métal d'endroit sous les coins de la clôture. La clôture devrait être boulonnée en place avec les portes fermées pour empêcher incliner en installant des cales. Les cales sous le bon coin avant soulèveront la porte droite. Les cales sous le coin avant gauche soulèveront la porte gauche. Il est important que les portes se réunissent également pour assurer un joint approprié contre les liquides et la poussière. Soyez sûr que tous les boulons de fixation sont serrés solidement.

3. Installation du Panneau

Quand le panneau intérieur est installé, il peut être nécessaire de plier un ou plusieurs goujons de fixation légèrement pour permettre au panneau d'aller en place. Placez simplement le panneau sur les goujons qui alignent correctement et soulèvent les autres goujons en l'place avec un tournevis approprié passé dans les trous de panneau.

4. Poche D'Impression

La poche d'impression sur la porte peut être inversée ou enlevée entièrement.

5. ENLÈVEMENT DES GOUPILLES DE CHARNIÈRE DES CHARNIÈRES CONTINUES

C'est une opération difficile exigeant au moins deux personnes. Ce procédé mieux est accompli en employant un petit poinçon de diamètre pour conduire la goupille de charnière vers le fond de la clôture. Quand la goupille de charnière dépasse environ deux pouces au–dessous du baril inférieur de charnière, pliez l'extrémité de la borne 1805 ainsi elle est formée comme le "J de lettre ". Employez un électrique ou aérez le marteau vibrant actionné équipé d'un outil qui a un trou à la fin à adapter au–dessus de la goupille de charnière, et conduisez la goupille de charnière dehors tout en ouvrant et en fermant la porte. Pour installer la goupille de charnière, redressez la goupille et conduisez–la dedans avec le marteau vibrant tout en ouvrant et en fermant la porte. La plupart des goupilles de charnière ont une extrémité chanfreinée, ainsi soient sûres de commencer l'extrémité chanfreinée d'abord en installant la goupille.

ACCESSOIRES ET MATÉRIEL

Les kits de serrure et les kits de verrou sont disponibles pour l'installation de champ ou d'usine sur beaucoup de types de clôtures de Hoffman. Les kits de serrure fournissent clef–fermer des possibilités à clef. Les kits de verrou permettent l'accès rapide aux intérieurs de clôture tout en maintenant l'huile fortement et époussettent les dispositifs serrés.

Les kits de plat d'auvent fournissent la ventilation dans les clôtures où la chaleur interne est un problème.

Les kits de stand de plancher pour des clôtures convertissantes de support de mur au support de plancher sont disponibles pour l'installation de champ ou d'usine sur des clôtures simples de la NEMA 12 et de la NEMA 4 de porte.

Les kits de bouclier d'égouttement sont disponibles pour l'installation de champ ou d'usine sur simples la porte et les doubles clôtures de la NEMA 12 de porte.

Les couplages électriques fournissent un verrouillage interne positif de sûreté sur des clôtures électriques tandis que le contenu de clôture active.

Les kits swing–out de panneau fournissent des moyens des mesures de support, des lampes témoin de commutateur et et d'autres composants près de l'avant de la clôture.

Les verrouillages de sûreté protègent le personnel et l'équipement en permettant aux padlocks multiples d'être installés sur un commutateur déactivé.

Les kits de fenêtre sont disponibles pour beaucoup de types de clôtures de Hoffman.

Les inhibiteurs de corrosion protègent les composants intérieurs des clôtures, wireway, des consoles, etc. contre la corrosion. Il n'y a aucun enduit, pétrole, ou graisse à appliquer.

Des joints de trou sont utilisés pour sceller des ouvertures supplémentaires de conduit, des trous à bouton–poussoir, des coupes–circuit, etc. contre la poussière, la saleté, le pétrole, et l'eau.

Les kits terminaux fournissent une méthode facile pour monter les TB dans beaucoup de types de clôtures de Hoffman.

Des étagères se pliantes peuvent être employées pour soutenir les instruments et l'équipement d'essai.

Des piédestaux sont employés pour fournir le support de plancher à une hauteur de de travail pour des clôtures petites à moyennes de taille.

Des entretoises sont utilisées pour l'accès de nettoyage de l'arrière de la clôture.

Le kit de pied de support est employé pour le mur–support externe.

Les options de commande de température sont disponibles pour fournir un environnement optimal pour vos commandes. Les options incluent des auvents, des ventilateurs de filtre, des échangeurs de chaleur, des climatiseurs, et des réchauffeurs électriques.

Les kits de poche de données offrent un endroit commode pour la documentation.

Español
Alteraciones del Recinto

Hoffman no puede asegurar la seguridad de o eficacia ninguna alteraciones o las adiciones no hechas por Hoffman Enclosures inc.. Sin embargo, la información siguiente puede ser provechosa. Estas instrucciones no eliminan la necesidad de consultar con los fabricantes de equipo y de observar todos los procedimientos de la agencia reguladora y las prácticas seguras de asegurar la función eléctrica y mecánica apropiada de los productos de Hoffman en cada uso particular.

1. Instrucciones de Montaje

a. Emparede los recintos montados tienen cualquiera los medios internos de un montaje o los pies externos del montaje. Los sujetadores apropiados se deben utilizar en todos los agujeros de montaje para asegurar el recinto a la pared.
b. Suele los recintos montados tienen soportes del piso (piernas) que incluyan las placas de montaje. Los sujetadores apropiados se deben utilizar en todos los agujeros de montaje para anclar con seguridad el recinto al piso.

2. Ajustes De Cierre De la Puerta

a. Puerta dos (piso montado)
Las puertas traslapadas fa'brica-se caben para satisfacer uniformemente en la tapa y el fondo. Si el piso bajo recinto no es llano, las puertas no se cerrarán uniformemente. En este caso, coloque las calzas del metal bajo esquinas del recinto. El recinto se debe empernar en lugar con las puertas cerradas para evitar el inclinar al instalar las calzas. Las calzas bajo esquina delantera derecha levantarán la puerta a la derecha. Las calzas bajo esquina izquierda delantera levantarán la puerta izquierda. Es importante que las puertas satisfacen uniformemente para asegurar un sello apropiado contra líquidos y polvo. Sea seguro que todos los pernos de montaje están apretados con seguridad.

3. instalacion del panel

Cuando el panel interior está siendo instalado, puede ser necesario doblar unos o más pernos prisioneros de montaje levemente para permitir que el panel quepa en lugar. Coloque simplemente el panel en los pernos prisioneros que se alinean correctamente y alzapriman los otros pernos prisioneros en la posición con un destornillador conveniente insertado a través de los agujeros del panel.

4. Bolsillo De la Impresión

El bolsillo de la impresión en la puerta se puede invertir o quitar enteramente.

5. QUITAR LOS PERNOS DE BISAGRA DE LAS BISAGRAS CONTINUAS

Esto es una operación difícil que requiere por lo menos a dos personas. Este procedimiento es logrado lo más mejor posible usando un sacador pequeño del diámetro para conducir el perno de bisagra hacia el fondo del recinto. Cuando el perno de bisagra resalta cerca de dos pulgadas debajo del barril inferior de la bisagra, doble el extremo del perno 1805 así que se forma como el "J de la letra ". Utilice un eléctrico o ventile el martillo que vibra accionado cabido con una herramienta que tenga un agujero en el extremo a caber sobre el perno de bisagra, y conduzca el perno de bisagra hacia fuera mientras que abre y cierra la puerta. Para instalar el perno de bisagra, enderece el perno y condúzcalo adentro con el martillo que vibra mientras que abre y cierra la puerta. La mayoría de los pernos de bisagra tienen un extremo chaflanado, así que sean seguros comenzar el extremo chaflanado primero al instalar el perno.

ACCESORIOS Y HARDWARE

Los kits de la cerradura y los kits del cierre están disponibles para la instalación del campo o de la fábrica en muchos tipos de recintos de Hoffman. Los kits de la cerradura proporcionan la llave-fijacio'n de capacidades. Los kits del cierre permiten el acceso rápido a los interiores del recinto mientras que conservan el aceite firmemente y sacan el polvo de características apretadas.

Los kits de la placa de la lumbrera proporcionan la ventilación en recintos donde está un problema el calor interno.

Los kits del soporte del piso para los recintos del montaje de la pared que convierten al montaje del piso están disponibles para la instalación del campo o de la fábrica en solos recintos de la nema 12 y de la nema **4** de la puerta.

Los kits del protector del goteo están disponibles para la instalación del campo o de la fábrica en sola puerta y recintos dobles de la nema 12 de la puerta.

Los dispositivos de seguridad eléctricos proporcionan un cierre interno positivo de seguridad en recintos eléctricos mientras que se energiza el contenido del recinto.

Los kits swing-out del panel proporcionan medios de las galgas del montaje, de los pilotos del interruptor, y de otros componentes cerca del frente del recinto.

Los cierres de seguridad protegen personal y el equipo permitiendo a padlocks múltiples ser instalado en un interruptor desenergizado.

Los kits de la ventana están disponibles para muchos tipos de recintos de Hoffman.

Los inhibidores de la corrosión protegen componentes interiores de recintos, wireway, de las consolas, del etc. contra la corrosión. No hay capas, aceites, o grasas a aplicarse.

Los sellos del agujero se utilizan para sellar aberturas adicionales del conducto, los agujeros de botón, los recortes, el etc. contra el polvo, la suciedad, el aceite, y el agua.

Los montajes terminales del kit proporcionan un método fácil para montar bloques de terminales en muchos tipos de recintos de Hoffman.

Los estantes que doblan se pueden utilizar para apoyar los instrumentos y el equipo de prueba.

Los pedestales se utilizan para proporcionar el montaje del piso en una altura de funcionamiento para los recintos pequeños-medios del tamaño.

Los pilares se utilizan para el acceso de la limpieza en el lado trasero del recinto.

El kit del pie del montaje se utiliza para el pared-montaje externo.

Las opciones del control de la temperatura están disponibles para proporcionar un ambiente óptimo para sus controles. Las opciones incluyen lumbreras, los ventiladores del filtro, los cambiadores de calor, los acondicionadores de aire, y los calentadores eléctricos.

Los kits de bolsillo de los datos ofrecen un lugar conveniente para la documentación.

SECTION 15
SQUARE D DISCONNECT SWITCH (BOM ITEM 3)

Product Data Sheet

9422ATEN102

Switch A2 Handle+Mech No Fuse 100A 600Va

Availability **Non-Stock Item: This item is not normally stocked in our distribution facility.**

Technical Characteristics

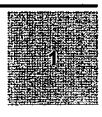
Ampere Rating	100A
Style	Rod Operated - Variable Depth/Flange Mounted
Approvals	UL Recognized - CSA Certified
Fuse Clip Amperes	Non Fusible
Fuse Type	Non Fusible
Handle Type	6" Handle Included (9422A2)
Horsepower Rating	25HP@200Vac - 30HP@230Vac - 60HP@460Vac - 75HP@575Vac - 20HP@250Vdc(max)
Mounting Type	Flange

Shipping and Ordering

Category	21732 - Disconnect Switches, Flange Mounted
Discount Schedule	CP1
GTIN	00785901353225
Package Quantity	1
Weight	10 lbs.
Availability Code	Non-Stock Item: This item is not normally stocked in our distribution facility.
Returnability	N
Country of Origin	MX

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

Schneider Electric

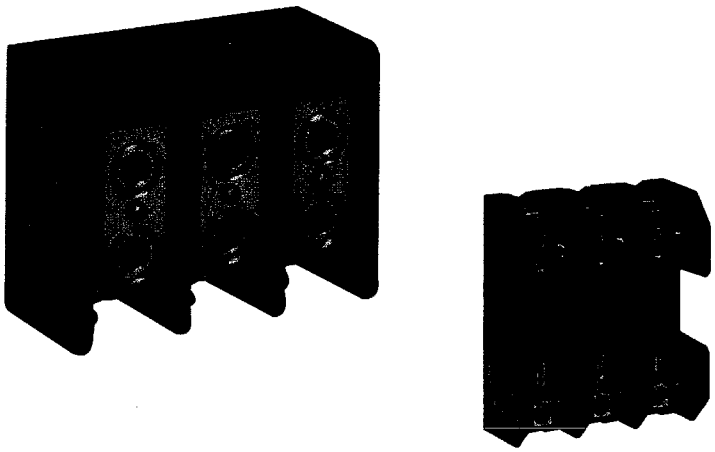


SECTION 16
SQUARE POWER DISTRIBUTION BLOCK (BOM ITEM 4)

Terminal Blocks

Fuseholders and Power Distribution Blocks

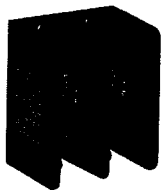
Catalog
9080CT9603R07/10
2010
Class 9080



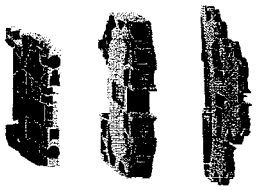
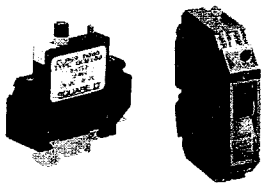
CONTENTS

SQUARE D
by Schneider Electric

Terminal Blocks

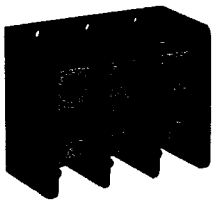
Family	Description
 Class 9080 Type LB	**Power Distribution Blocks** Available in a wide varity of sizes, these power distribution and splicer blocks are available in one, two, and three pole versions, with either aluminum or copper lugs. Whatever your application, the class 9080 type LB blocks should have a component to meet your needs. A wide selection of covers completes this family. The power distribution blocks are UL component recognized and CSA approved; many blocks have been tested to achieve a higher SCCR according to the 2005 NEC and UL508A.
 Class 9080 Type FB	**Fuse Holders** This family of fuse holders will accept Types H, R, CC, M and J fuses up to 200 amperes. Both 250 V and 600 V versions are available. All Class H, R and J fuses are supplied as standard. All fuse holders are UL Listed and CSA approved.

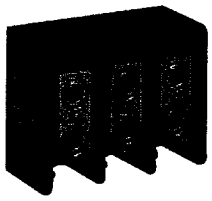
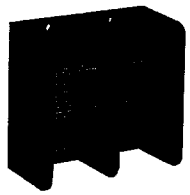
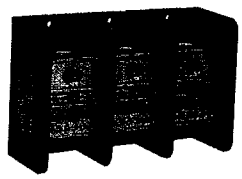
NOTE: The product lines listed below are not shown in this catalog.
Please refer to the referenced catalog included with each family.

Family	Description
	**IEC Terminal Blocks** Depending on the application, there are several types of IEC terminal blocks: • Spring terminal • Screw terminal • Insulation displacement connection Refer to catalog 9080CT9901R7/07
 Class 9080 Type G	**NEMA Type Terminal Blocks** This family of blocks and accessories offers a wide variety of features like DIN 3 track mounting, colored blocks, terminal screws shipped backed out, captive screws and higher density to save you both money and time. This line also includes a direct mount block that can be panel or track mounted. Standard track comes in common lengths and breakoff styles. All blocks are UL component recognized and CSA approved. Refer to Catalog 9080CT9601.
	**Circuit Protectors** There are two families of circuit protectors. One will be right for your application. The Class 9080 Type GCB thermal magnetic product is available from 0.1 A through 15 A and offers high density. The Telemecanique GB2 thermal magnetic product is available from 0.5 A through 12 A and is available world wide. Refer to Catalog 9080CT9601 or Catalog 9080CT9602.

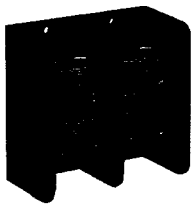
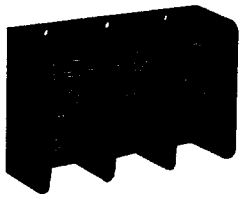
Class 9080	Miniature		Standard	
				
Maximum Voltage Rating	600	600	600	600
Service Class	C	C	C	C
Current Rating - CU Wire	115 A	115 A	175 A	175 A
Current Rating - AL Wire	90 A	90 A	135 A	135 A
SCCR with Circuit Breakers	See page 20	See page 20	N/A	See page 21
SCCR with Fuses	See page 22	See page 22	See page 22	See page 22
Wire Range **Lugs suitable for use with** **75° C Conductors**	**Main** (1) #14-2 AWG **Branch** (1) #14-2 AWG	**Main** (1) #14-2 AWG **Branch** (4) #18-10 AWG	**Main** (1) #14-2/0 AWG **Branch** (1) #14-2/0 AWG	**Main** (1) #14-2/0 AWG **Branch** (4) #14-4 AWG
Tightening Torque	**Main** #3-#2 / 50 lb-in / (5.6 N-m) #6-#4 / 45 lb-in / (5.1 N-m) #8 / 40 lb-in / (4.5 N-m) #14-#10 / 35 lb-in / (4.0 N-m) **Branch** #3-#2 / 50 lb-in / (5.6 N-m) #6-#4 / 45 lb-in / (5.1 N-m) #8 / 40 lb-in / (4.5 N-m) #14-#10 / 35 lb-in / (4.0 N-m)	**Main** #3-#2 / 50 lb-in / (5.6 N-m) #6-#4 / 45 lb-in / (5.1 N-m) #8 / 40 lb-in / (4.5 N-m) #14-#10 / 35 lb-in / (4.0 N-m) **Branch** #18-#10 / 7 lb-in / (0.8 N-m)	**Main** #6-2/0 / 120 lb-in / (13.5 N-m) #8 / 40 lb-in / (4.5 N-m) #14-#10 / 35 lb-in / (4.0 N-m) **Branch** #6-2/0 / 120 lb-in / (13.5 N-m) #8 / 40 lb-in / (4.5 N-m) #14-#10 / 35 lb-in / (4.0 N-m)	**Main** #6-2/0 / 120 lb-in / (13.5 N-m) #8 / 40 lb-in / (4.5 N-m) #14-#10 / 35 lb-in / (4.0 N-m) **Branch** #14-#4 / 35 lb-in / (4.0 N-m)
Lug Material	Tin Plated High Conductive AL	Tin Plated High Conductive AL	Tin Plated High Conductive AL	Tin Plated High Conductive AL
Base Material	High Impact Thermoplastic	High Impact Thermoplastic	General Purpose Phenolic	General Purpose Phenolic
Temperature Rating	-40 to 257° F -40 to 125° C	-40 to 257° F -40 to 125° C	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C
Certifications	File E60616 Guide XCFR2	File 070361 / Class 6228-01	RoHS Compliant	Marked
Flammability Rating	UL94V-0	UL94V-0	UL94V-0	UL94V-0
		One Pole Blocks		
Block Catalog Number	9080LBA161101	9080LBA161104	9080LBA162101	9080LBA162104
Clear Plastic Covers	N/A	N/A	9080LB21	9080LB21
Block Dimensions **(D) x (H) x (W)**	1.53 x 2.29 x 0.76 in. 38.8 x 58.2 x 19.3 mm	1.53 x 2.29 x 0.83 in. 38.8 x 58.2 x 21.08 mm (including dovetail)	1.78 x 2.88 x 1.13 in. 45.2 x 73.2 x 28.7 mm	1.78 x 2.88 x 1.13 in. 45.2 x 73.2 x 28.7 mm
		Two Pole Blocks		
Block Catalog Number	N/A	9080LBA261104	9080LBA262101	9080LBA262104
Clear Plastic Covers	N/A	N/A	9080LB22	9080LB22
Block Dimensions **(D) x (H) x (W)**	N/A	1.53 x 2.29 x 1.46 in. 38.8 x 58.2 x 37.08 mm (including dovetail)	1.78 x 2.88 x 1.94 in. 45.2 x 73.2 x 49.3 mm	1.78 x 2.88 x 1.94 in. 45.2 x 73.2 x 49.3 mm
		Three Pole Blocks		
Block Catalog Number	9080LBA361101	9080LBA361104	9080LBA362101	9080LBA362104
Clear Plastic Covers	N/A	N/A	9080LB23	9080LB23
Block Dimensions **(D) x (H) x (W)**	1.53 x 2.29 x 2.03 in. 38.8 x 58.2 x 51.6 mm	1.53 x 2.29 x 2.1 in. 38.8 x 58.2 x 53.34 mm (including dovetail)	1.78 x 2.88 x 2.75 in. 45.2 x 73.2 x 69.9 mm	1.78 x 2.88 x 2.75 in. 45.2 x 73.2 x 69.9 mm

Terminal Blocks
9080LBA Power Distribution Blocks Copper or Aluminum Wire

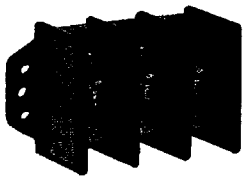
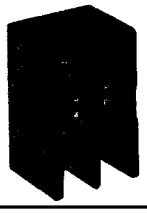
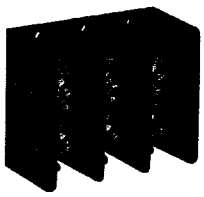
Class 9080	Standard			
				
Maximum Voltage Rating	600	600	600	600
Service Class	C	C	C	C
Current Rating-CU Wire	310 A	335 A	335 A	350 A
Current Rating-AL Wire	250 A	270 A	270 A	270 A
SCCR w/Circuit Breakers	N/A	See page 20	See page 21	See page 21
SCCR with Fuses	N/A	See page 22	See page 22	See page 22
Wire Range **Lugs suitable for use with** **75° C Conductors**	**Main** (1) #6 - 350 MCM **Branch** (1) #6 - 350 MCM	**Main** (1) #6 - 400 MCM **Branch** (4) #14 - #2 AWG	**Main** (1) #6 - 500 MCM **Branch** (6) #14 - #2 AWG	**Main** (2) #14 - 2/0 AWG **Branch** (6) #14 - #4AWG
Tightening Torque	**Main** #6-350 MCM / 275 lb-in / (31.0 N-m) **Branch** #6-350 MCM / 275 lb-in / (31.0 N-m)	**Main** #6-400 MCM / 275 lb-in / (31.0 N-m) **Branch** #3-#2 / 50 lb-in / (5.6 N-m) #6-#4 / 45 lb-in / (5.1 N-m) #8 / 40 lb-in / (4.5 N-m) #14-#10 / 35 lb-in / (4.0 N-m)	**Main** #6-400 MCM / 275 lb-in / (31.0 N-m) **Branch** #3-#2 / 50 lb-in / (5.6 N-m) #6-#4 / 45 lb-in / (5.1 N-m) #8 / 40 lb-in / (4.5 N-m) #14-#10 / 35 lb-in / (4.0 N-m)	**Main** #6-2/0 / 120 lb-in / (13.5 N-m) #8 / 40 lb-in / (4.5 N-m) #14-#10 / 35 lb-in / (4.0 N-m) **Branch** #14-#4 / 35 lb-in / (4.0 N-m)
Lug Material	Tin Plated High Conductive AL	Tin Plated High Conductive AL	Tin Plated High Conductive AL	Tin Plated High Conductive AL
Base Material	General Purpose Phenolic	General Purpose Phenolic	General Purpose Phenolic	General Purpose Phenolic
Temperature Rating	-40 to 302°F -40 to 150°C	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C
Certifications	File E60616 Guide XCFR2	File 070361 / Class 6228-01	RoHS Compliant	Marked
Flammability Rating	UL94V-0	UL94V-0	UL94V-0	UL94V-0
One Pole Blocks				
Block Catalog Number	9080LBA163101	9080LBA163104	9080LBA163106	9080LBA163206
Clear Plastic Covers	9080LB31	9080LB31	9080LB31	9080LB31
Block Dimensions **(D) x (H) x (W)**	2.61 x 4.00 x 1.94 in. 66.3 x 101.6 x 49.3 mm	2.61 x 4.00 x 1.94 in. 66.3 x 101.6 x 49.3 mm	2.61 x 4.00 x 1.94 in. 66.3 x 101.6 x 49.3 mm	2.61 x 4.00 x 1.94 in. 66.3 x 101.6 x 49.3 mm
Two Pole Blocks				
Block Catalog Number	9080LBA263101	9080LBA263104	9080LBA263106	9080LBA263206
Clear Plastic Covers	9080LB32	9080LB32	9080LB32	9080LB32
Block Dimensions **(D) x (H) x (W)**	2.61 x 4.00 x 3.47 in. 66.3 x 101.6 x 88.1 mm	2.61 x 4.00 x 3.47 in. 66.3 x 101.6 x 88.1 mm	2.61 x 4.00 x 3.47 in. 66.3 x 101.6 x 88.1 mm	2.61 x 4.00 x 3.47 in. 66.3 x 101.6 x 88.1 mm
Three Pole Blocks				
Block Catalog Number	9080LBA363101	9080LBA363104	9080LBA363106	9080LBA363206
Clear Plastic Covers	9080LB33	9080LB33	9080LB33	9080LB33
Block Dimensions **(D) x (H) x (W)**	2.61 x 4.00 x 5.00 in. 66.3 x 101.6 x 27.0 mm	2.61 x 4.00 x 5.00 in. 66.3 x 101.6 x 127.0 mm	2.61 x 4.00 x 5.00 in. 66.3 x 101.6 x 127.0 mm	2.61 x 4.00 x 5.00 in. 66.3 x 101.6 x 127.0 mm

Class 9080	Standard			
				
Maximum Voltage Rating	600	600	600	600
Service Class	C	C	C	C
Current Rating-CU Wire	420 A	335 A	380 A	380 A
Current Rating-AL Wire	340 A	270 A	310 A	310 A
SCCR w/Circuit Breakers	N/A	See page 20	See page 20	See page 20
SCCR with Fuses	See page 22	See page 22	See page 22	See page 22
Wire Range **Lugs suitable for use with 75° C Conductors**	**Main** (1) #4-600 MCM **Branch** (1) #4-600 MCM	**Main** (1) #6-400 MCM **Branch** (8) #14-2 AWG	**Main** (1) #4-500 MCM **Branch** (6) #14-2/0 AWG	**Main** (1) #4-500 MCM **Branch** (12) #14-2 AWG
Tightening Torque	**Main** #4-600 MCM 500 lb-in (56.5 N-m) **Branch** #4-600 MCM 500 lb-in (56.5 N-m)	**Main** #6-400 MCM 275 lb-in (31.0 N-m) **Branch** #3-#2 50 lb-in (5.6 N-m) #6-#4 45 lb-in (5.1 N-m) #8 40 lb-in (4.5 N-m) #14-#10 35 lb-in (4.0 N-m)	**Main** #4-500 MCM 375 lb-in (42.3 N-m) **Branch** #6-2/0 120 lb-in (13.5 N-m) #8 40 lb-in (4.5 N-m) #14-#10 35 lb-in (4.0 N-m)	**Main** #4-500 MCM 375 lb-in (42.3 N-m) **Branch** #3-#2 50 lb-in (5.6 N-m) #6-#4 45 lb-in (5.1 N-m) #8 40 lb-in (4.5 N-m) #14-#10 35 lb-in (4.0 N-m)
Lug Material	Tin Plated High Conductive AL	Tin Plated High Conductive AL	Tin Plated High Conductive AL	Tin Plated High Conductive AL
Base Material	General Purpose Phenolic	General Purpose Phenolic	General Purpose Phenolic	General Purpose Phenolic
Temperature Rating	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C
Certifications	File E60616 Guide XCFR2	File 070361 / Class 6228-01	RoHS Compliant	Marked
Flammability Rating	UL94V-0	UL94V-0	UL94V-0	UL94V-0
	One Pole Blocks			
Block Catalog Number	9080LBA164101	9080LBA164108	9080LBA165106	9080LBA165112
Clear Plastic Covers	9080LB41	9080LB41	9080LB51	9080LB51
Block Dimensions **(D) x (H) x (W)**	2.90 x 4.75 x 2.29 in. 80.3 x 120.7 x 57.2 mm	2.90 x 4.75 x 2.29 in. 80.3 x 120.7 x 57.2 mm	3.12 x 5.50 x 3.17 in. 79.2 x 139.7 x 80.5 mm	3.12 x 5.50 x 3.17 in. 79.2 x 139.7 x 80.5 mm
	Two Pole Blocks			
Block Catalog Number	N/A	9080LBA264108	9080LBA265106	9080LBA265112
Clear Plastic Covers	N/A	9080LB42	9080LB52	9080LB52
Block Dimensions **(D) x (H) x (W)**	N/A	2.90 x 4.75 x 4.17 in. 80.3 x 120.7 x 104.6 mm	3.12 x 5.50 x 5.85 in. 79.2 x 139.7 x 149.4 mm	3.12 x 5.50 x 5.85 in. 79.2 x 139.7 x 149.4 mm
	Three Pole Blocks			
Block Catalog Number	9080LBA364101	9080LBA364108	9080LBA365106	9080LBA365112
Clear Plastic Covers	9080LB43	9080LB43	9080LB53	9080LB53
Block Dimensions **(D) x (H) x (W)**	2.90 x 4.75 x 6.05 in. 80.3 x 120.7 x 152.4 mm	2.90 x 4.75 x 6.05 in. 80.3 x 120.7 x 152.4 mm	3.12 x 5.50 x 8.54 in. 79.2 x 139.7 x 216.9 mm	3.12 x 5.50 x 8.54 in. 79.2 x 139.7 x 216.9 mm

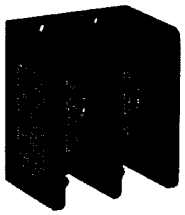
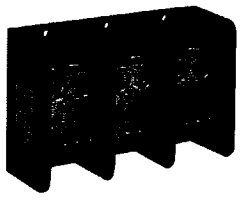
Terminal Blocks
9080LBA Power Distribution Blocks Copper or Aluminum Wire

Class 9080	Standard			
				
Maximum Voltage Rating	600	600	600	600
Service Class	C	C	C	C
Current Rating-CU Wire	620 A	760 A	760 A	760 A
Current Rating-AL Wire	500 A	620 A	620 A	620 A
SCCR w/Circuit Breakers	N/A	N/A	N/A	N/A
SCCR with Fuses	See page 22	See page 22	See page 22	See page 23
Wire Range **Lugs suitable for use with** **75° C Conductors**	**Main** (2) #4 - 350 MCM **Branch** (2) #4 - 350 MCM	**Main** (2) #4 - 500 MCM **Branch** (2) #4 - 500 MCM	**Main** (2) #4 - 500 MCM **Branch** (8) #14 - 2/0 AWG	**Main** (2) #4 - 500 MCM **Branch** (12) #14-4 AWG
Tightening Torque	**Main** #6-350 MCM / 275 lb-in / (31.0 N-m) **Branch** #6-350 MCM / 275 lb-in / (31.0 N-m)	**Main** #4-500 MCM / 375 lb-in / (42.3 N-m) **Branch** #4-500 MCM / 375 lb-in / (42.3 N-m)	**Main** #4-500 MCM / 375 lb-in / (42.3 N-m) **Branch** #6-2/0 / 120 lb-in / (13.5 N-m) #8 / 40 lb-in / (4.5 N-m) #14-#10 / 35 lb-in / (4.0 N-m)	**Main** #4-500 MCM / 375 lb-in / (42.3 N-m) **Branch** #14-#4 / 35 lb-in / (4.0 N-m)
Lug Material	Tin Plated High Conductive AL	Tin Plated High Conductive AL	Tin Plated High Conductive AL	Tin Plated High Conductive AL
Base Material	General Purpose Phenolic	General Purpose Phenolic	General Purpose Phenolic	General Purpose Phenolic
Temperature Rating	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C
Certifications	File E60616 Guide XCFR2	File 070361 / Class 6228-01	RoHS Compliant	Marked
Flammability Rating	UL94V-0	UL94V-0	UL94V-0	UL94V-0
One Pole Blocks				
Block Catalog Number	9080LBA165202	9080LBA1652021	9080LBA165208	9080LBA165212
Clear Plastic Covers	9080LB51	9080LB51	9080LB51	9080LB51
Block Dimensions **(D) x (H) x (W)**	3.12 x 5.50 x 3.17 in. 79.2 x 139.7 x 80.5 mm	3.12 x 5.50 x 3.17 in. 79.2 x 139.7 x 80.5 mm	3.12 x 5.50 x 3.17 in. 79.2 x 139.7 x 80.5 mm	3 .12 x 5.50 x 3.17 in. 79.2 x 139.7 x 80.5 mm
Two Pole Blocks				
Block Catalog Number	9080LBA265202	9080LBA2652021	9080LBA265208	9080LBA265212
Clear Plastic Covers	9080LB52	9080LB52	9080LB52	9080LB52
Block Dimensions **(D) x (H) x (W)**	3.12 x 5.50 x 5.85 in. 79.2 x 139.7 x 149.4 mm	3.12 x 5.50 x 5.85 in. 79.2 x 139.7 x 149.4 mm	3.12 x 5.50 x 5.85 in. 79.2 x 139.7 x 149.4 mm	3.12 x 5.50 x 5.85 in. 79.2 x 139.7 x 149.4 mm
Three Pole Blocks				
Block Catalog Number	9080LBA365202	9080LBA3652021	9080LBA365208	9080LBA365212
Clear Plastic Covers	9080LB53	9080LB53	9080LB53	9080LB53
Block Dimensions **(D) x (H) x (W)**	3.12 x 5.50 x 8.54 in. 79.2 x 139.7 x 216.9 mm	3.12 x 5.50 x 8.54 in. 79.2 x 139.7 x 216.9 mm	3.12 x 5.50 x 8.54 in. 79.2 x 139.7 x 216.9 mm	3.12 x 5.50 x 8.54 in. 79.2 x 139.7 x 216.9 mm

9080LBA and 9080LBC Power Distribution Blocks Copper Wire Only or Aluminum/Copper Wire

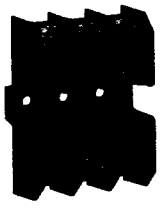
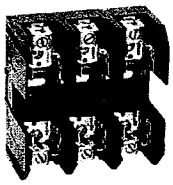
Class 9080	Standard			
				
Maximum Voltage Rating	600	600	600	600
Service Class	C	C	C	C
Current Rating-CU Wire	175 A	150 A	175 A	255 A
Current Rating-AL Wire	135 A	N/A	N/A	N/A
SCCR w/Circuit Breakers	See page 20	See page 21	See page 21	N/A
SCCR with Fuses	See page 22	N/A	See page 23	N/A
Wire Range Lugs suitable for use with 75° C Conductors	**Main** - (1) #14-2/0 AWG **Branch** - (6) #14-#4 AWG	**Main** - (1) #18-1/0 AWG **Branch** - (1) #18-1/0 AWG	**Main** - (1) #14-2/0 AWG **Branch** - (4) #14-#4 AWG	**Main** - (1) #6-250 MCM **Branch** - (1) #6-250 MCM
Tightening Torque	**Main:** #6-2/0 / 120 lb-in / (13.5 N-m) #8 / 40 lb-in (4.5 N-m) #14-#10 / 35 lb-in (4.0 N-m) **Branch** #14-#4 / 35 lb-in / (4.0 N-m)	**Main** #3-1/0 / 50 lb-in /(5.6 N-m) #6-#4 / 45 lb-in / (5.1 N-m) #8 / 40 lb-in / (4.5 N-m) #18-#10 / 35 lb-in / (4.0 N-m) **Branch** #3-1/0 / 50 lb-in / (5.6 N-m) #6-#4 / 45 lb-in / (5.1 N-m) #8 / 40 lb-in / (4.5 N-m) #18-#10 / 35 lb-in / (4.0 N-m)	**Main** #6-2/0 120 lb-in (13.5 N-m) #8 40 lb-in (4.5 N-m) #14-#10 35 lb-in (4.0 N-m) **Branch** #14-#4 35 lb-in (4.0 N-m)	**Main** #6-250 MCM / 375 lb-in (42.3 N-m) **Branch** #6-250 MCM / 375 lb-in (42.3 N-m)
Lug Material	Tin Plated High Conductive AL	Tin Plated High Conductive CU	Tin Plated High Conductive CU	Tin Plated High Conductive CU
Base Material	General Purpose Phenolic	General Purpose Phenolic	General Purpose Phenolic	General Purpose Phenolic
Temperature Rating	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C
Certifications	File E60616 Guide XCFR2	File 070361 / Class 6228-01	RoHS Compliant	Marked
Flammability Rating	UL94V-0	UL94V-0	UL94V-0	UL94V-0
	One Pole Blocks			
Block Catalog Number	N/A	9080LBC162101	9080LBC162104	9080LBC163101
Clear Plastic Covers	N/A	9080LB21	9080LB21	9080LB31
Block Dimensions (D) x (H) x (W)	N/A	1.78 x 2.88 x 1.13 in. 45.2 x 73.2 x 28.7 mm	1.78 x 2.88 x 1.13 in. 45.2 x 73.2 x 28.7 mm	2.61 x 4.00 x 1.94 in. 66.3 x 101.6 x 49.3 mm
	Two Pole Blocks			
Block Catalog Number	N/A	N/A	9080LBC262104	N/A
Clear Plastic Covers	N/A	N/A	9080LB22	N/A
Block Dimensions (D) x (H) x (W)	N/A	N/A	1.78 x 2.88 x 1.94 in. 45.2 x 73.2 x 49.3 mm	N/A
	Three Pole Blocks			
Block Catalog Number	9080LBA362106	9080LBC362101	9080LBC362104	9080LBC363101
Clear Plastic Covers	9080LB23	9080LB23	9080LB23	9080LB33
Block Dimensions (D) x (H) x (W)	2.10 x 2.90 x 5.38 in. 53.3 x 73.7 x 136.7 mm	1.78 x 2.88 x 2.75 in. 45.2 x 73.2 x 69.9 mm	1.78 x 2.88 x 2.75 in. 45.2 x 73.2 x 69.9 mm	2.61 x 4.00 x 5.00 in. 66.3 x 101.6 x 127.0 mm
 **DIN 3 (35 mm) Track Adapter**	9080FBDIN3	N/A	N/A	N/A

Terminal Blocks
9080LBC Power Distribution Blocks Copper Wire Only

Class 9080	Standard			
				
Maximum Voltage Rating	600	600	600	600
Service Class	C	C	C	C
Current Rating-CU Wire	380 A	350 A	760 A	760 A
Current Rating-AL Wire	N/A	N/A	N/A	N/A
SCCR w/Circuit Breakers	N/A	See page 21	N/A	N/A
SCCR with Fuses	See page 23	See page 23	See page 23	See page 23
Wire Range **Lugs suitable for use with** **75° C Conductors**	**Main** (1) #4 - 500 MCM **Branch** (6) #14-2 AWG	**Main** (2) #14 - 2/0 AWG **Branch** (6) #14 - #4 AWG	**Main** (2) #4 - 500 MCM **Branch** (8) #14 - 2/0 AWG	**Main** (2) #4 - 500 MCM **Branch** (12) #14-2 AWG
Tightening Torque	**Main** #4-500 MCM - 375 lb-in (42.3 N-m) **Branch** #3-#2 50 lb-in (5.6 N-m) #6-#4 45 lb-in (5.1 N-m) #8 40 lb-in (4.5 N-m) #14-#10 35 lb-in (4.0 N-m)	**Main** #6-2/0 120 lb-in (13.5 N-m) #8 40 lb-in (4.5 N-m) #14-#10 35 lb-in (4.0 N-m) **Branch** #14-#4 35 lb-in (4.0 N-m)	**Main** #4-500 MCM - 375 lb-in (42.3 N-m) **Branch** #6-2/0 120 lb-in (13.5 N-m) #8 40 lb-in (4.5 N-m) #14-#10 35 lb-in (4.0 N-m)	**Main** #4-500 MCM - 375 lb-in (42.3 N-m) **Branch** #3-#2 50 lb-in (5.6 N-m) #6-#4 45 lb-in (5.1 N-m) #8 40 lb-in (4.5 N-m) #14-#10 35 lb-in (4.0 N-m)
Lug Material	Tin Plated High Conductive CU	Tin Plated High Conductive CU	Tin Plated High Conductive CU	Tin Plated High Conductive CU
Base Material	General Purpose Phenolic	General Purpose Phenolic	General Purpose Phenolic	General Purpose Phenolic
Temperature Rating	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C
Certifications	File E60616 Guide XCFR2	File 070361 / Class 6228-01	RoHS Compliant	Marked
Flammability Rating	UL94V-0	UL94V-0	UL94V-0	UL94V-0
	One Pole Blocks			
Block Catalog Number	9080LBC163106	9080LBC163206	9080LBC165208	9080LBC165212
Clear Plastic Covers	9080LB31	9080LB31	9080LB51	9080LB51
Block Dimensions **(D) x (H) x (W)**	2.61 x 4.00 x 1.94 in. 66.3 x 101.6 x 49.3 mm	2.61 x 4.00 x 1.94 in. 66.3 x 101.6 x 49.3 mm	3.12 x 5.50 x 3.17 in. 79.2 x 139.7 x 80.5 mm	3.12 x 5.50 x 3.17 in. 79.2 x 139.7 x 80.5 mm
	Two Pole Blocks			
Block Catalog Number	9080LBC263106	9080LBC263206	N/A	N/A
Clear Plastic Covers	9080LB32	9080LB32	N/A	N/A
Block Dimensions **(D) x (H) x (W)**	2.61 x 4.00 x 3.47 in. 66.3 x 101.6 x 88.1 mm	2.61 x 4.00 x 3.47 in. 66.3 x 101.6 x 88.1 mm	N/A	N/A
	Three Pole Blocks			
Block Catalog Number	9080LBC363106	9080LBC363206	9080LBC365208	9080LBC365212
Clear Plastic Covers	N/A	9080LB33	9080LB53	9080LB53
Block Dimensions **(D) x (H) x (W)**	2.61 x 4.00 x 5.00 in. 66.3 x 101.6 x 127.0 mm	2.61 x 4.00 x 5.00 in. 66.3 x 101.6 x 127.0 mm	3.12 x 5.50 x 8.54 in. 79.2 x 139.7 x 216.9 mm	3.12 x 5.50 x 8.54 in. 79.2 x 139.7 x 216.9 mm

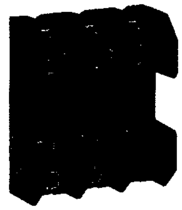
Class 9080	Class H Fuses		Class R Fuses	
				
Maximum Voltage Rating	250	600	250	600
Wire Range (based on 75° C wire)	#14 to #10 AWG	#14 to #10 AWG	#14 to #10 AWG	#14 to #10 AWG
Wire Type	Solid or Stranded Copper Wire	Solid or Stranded Copper Wire	Solid or Stranded Copper Wire	Solid or Stranded Copper Wire
Lug Termination	Pressure Wire Connector	Pressure Wire Connector	Pressure Wire Connector	Pressure Wire Connector
Clip Material	Copper Alloy Tin Plated	Copper Alloy Tin Plated	Copper Alloy Tin Plated	Copper Alloy Tin Plated
Clip Type	Reinforced	Reinforced	Reinforced	Reinforced
Base Material	High Impact Thermoplastic	General Purpose Phenolic	High Impact Thermoplastic	General Purpose Phenolic
Recommended Tightening Torque	25 lb-in (2.8 N-m)	25 lb-in (2.8 N-m)	25 lb-in (2.8 N-m)	25 lb-in (2.8 N-m)
Temperature Rating	-40 to 257° F -40 to 125° C	-40 to 302° F -40 to 150° C	-40 to 257° F -40 to 125° C	-40 to 302° F -40 to 150° C
Fuse Size (Via. x Length)	9/16" x 2"	13/16" x 5"	9/16" x 2"	13/16" x 5"
AIC Rating in accordance with UL512	10,000	10,000	200,000	200,000
Certifications	File E40747 Guide IZLT	File 70360/ Class 6225-01	RoHS Compliant	Marked
Flammability Rating	UL94V-0	UL94V-0	UL94V-0	UL94V-0
One Pole Blocks				
Catalog Number	9080FB1211	9080FB1611	9080FB1211R	9080FB1611R
Dimensions (D) x (H) x (W)	1.38 x 3.00 x 1.12 in. 35.1 x 76.2 x 28.4 mm	1.69 x 6.25 x 1.63 in. 42.9 x 159.0 x 41.4 mm	1.38 x 3.00 x 1.12 in. 35.1 x 76.2 x 28.4 mm	1.69 x 6.25 x 1.63 in. 42.9 x 159.0 x 41.4 mm
Two Pole Blocks				
Catalog Number	9080FB2211	9080FB2611	9080FB2211R	9080FB2611R
Dimensions (D) x (H) x (W)	1.38 x 3.00 x 1.91 in. 35.1 x 76.2 x 48.5 mm	1.69 x 6.25 x 2.94 in. 42.9 x 159.0 x 74.7 mm	1.38 x 3.00 x 1.91 in. 35.1 x 76.2 x 48.5 mm	1.69 x 6.25 x 2.94 in. 42.9 x 159.0 x 74.7 mm
Three Pole Blocks				
Catalog Number	9080FB3211	9080FB3611	9080FB3211R	9080FB3611R
Dimensions (D) x (H) x (W)	1.38 x 3.00 x 2.95 in. 35.1 x 76.2 x 74.9 mm	1.69 x 6.25 x 4.25 in. 42.9 x 159.0 x 108 mm	1.38 x 3.00 x 2.95 in. 35.1 x 76.2 x 74.9 mm	1.69 x 6.25 x 4.25 in. 42.9 x 159.0 x 108 mm
 **DIN 3 (35 mm) Track Adapter**	9080FBDIN3	N/A	9080FBDIN3	N/A

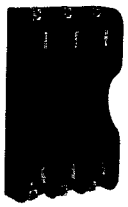
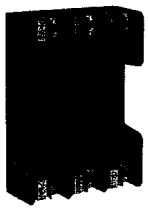
Terminal Blocks
Fuseholders 30 A Rated

Class 9080	Class M Fuses	Class CC Fuses	Class J Fuses
			
Maximum Voltage Rating	600	600	600
Wire Range (based on 75° C wire)	#14 to #10 AWG	#14 to #10 AWG	#14 to #2 AWG
Wire Type	Solid or Stranded Copper Wire	Solid or Stranded Copper Wire	Solid or Stranded Copper Wire
Lug Termination	Pressure Wire Connector	Pressure Wire Connector	Box Lug Connector
Clip Material	Copper Alloy Tin Plated	Copper Alloy Tin Plated	Copper Alloy Tin Plated
Clip Type	Standard	Standard	Reinforced
Base Material	High Impact Thermoplastic	High Impact Thermoplastic	High Impact Thermoplastic
Recommended Tightening Torque	25 lb-in (2.8 N-m)	25 lb-in (2.8 N-m)	25 lb-in (2.8 N-m)
Temperature Rating	-40 to 257° F -40 to 125° C	-40 to 257° F -40 to 125° C	-40 to 257° F -40 to 125° C
Fuse Size (Dia. x Length)	13/32" x 1 1/2"	13/32" x 1 1/2"	13/16"x2 1/4"
AIC Rating in accordance with UL512	100,000	200,000	200,000
Certifications	File E40747 / Guide IZLT2 File 070360 Class 6225-01 RoHS Compliant CE Marked	File E40747 / Guide IZLT File 70360 Class 6225-01 RoHS Compliant CE Marked	
Flammability Rating	UL94V-0	UL94V-0	UL94V-0
One Pole Blocks			
Catalog Number	9080FB1611M	9080FB1611CC	9080FB1611J
Dimensions (D) x (H) x (W)	1.29 x 3.13 x 0.85 in. 32.8 x 79.5 x 21.6 mm	1.29 x 3.13 x 0.85 in. 32.8 x 79.5 x 21.6 mm	1.95 x 3.38 x 1.16 in. 49.5 x 85.7 x 29.4 mm
Two Pole Blocks			
Catalog Number	9080FB2611M	9080FB2611CC	9080FB2611J
Dimensions (D) x (H) x (W)	1.29 x 3.13 x 1.60 in. 32.8 x 79.5 x 40.6 mm	1.29 x 3.13 x 1.60 in. 32.8 x 79.5 x 40.6 mm	1.95 x 3.38 x 2.20 in. 49.5 x 85.7 x 56.0 mm
Three Pole Blocks			
Catalog Number	9080FB3611M	9080FB3611CC	9080FB3611J
Dimensions (D) x (H) x (W)	1.29 x 3.13 x 2.35 in. 32.8 x 79.5 x 59.7 mm	1.29 x 3.13 x 2.35 in. 32.8 x 79.5 x 59.7 mm	1.95 x 3.38 x 3.25 in. 49.5 x 85.7 x 82.5 mm
 **DIN 3 (35 mm) Track Adapter**	9080FBDIN3	9080FBDIN3	DIN 3 Track Mounting is standard.

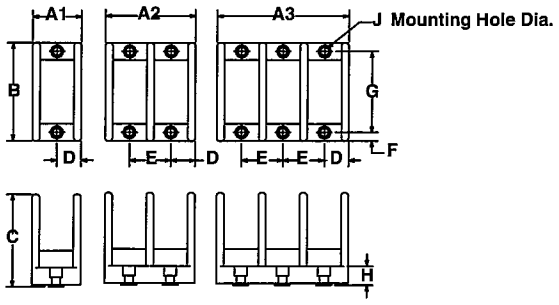
Class 9080	Class H Fuses		
			
Maximum Voltage Rating	250	600	600
Wire Range (based on 75° C wire)	#14 to #2 AWG	#14 to #2 AWG	#14 to #2 AWG
Wire Type	Solid or Stranded Copper or Aluminum Wire	Solid or Stranded Copper or Aluminum Wire	Solid or Stranded Copper Wire
Lug Termination	Box Lug Connector	Box Lug Connector	Box Lug Connector
Clip Material	Copper Alloy Tin Plated	Copper Alloy Tin Plated	Copper Alloy Tin Plated
Clip Type	Reinforced	Reinforced	Reinforced
Base Material	High Impact Thermoplastic	General Purpose Phenolic	General Purpose Phenolic
Recommended Tightening Torques	#2 to #3 AWG 50 lb-in (5.6 N-m) #4 to #6 AWG 45 lb-in (5.1 N-m) #8 AWG 40 lb-in (4.5 N-m) #10 to #14 AWG 35 lb-in (4.0 N-m)	#2 to #3 AWG 50 lb-in (5.6 N-m) #4 to #6 AWG 45 lb-in (5.1 N-m) #8 AWG 40 lb-in (4.5 N-m) #10 to #14 AWG 35 lb-in (4.0 N-m))	#2 to #3 AWG 50 lb-in (5.6 N-m) #4 to #6 AWG 45 lb-in (5.1 N-m) #8 AWG 40 lb-in (4.5 N-m) #10 to #14 AWG 35 lb-in (4.0 N-m)
Temperature Rating	-40 to 257° F -40 to 125° C	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C
Fuse Size (Dia. x Length)	13/16" x 3"	1 1/16" x 5 1/2"	1 1/16" x 5 1/2"
AIC Rating in accordance with UL512	10,000	10,000	10,000
Certifications	File E40747 Guide IZLT	File 70360/ Class 6225-01	RoHS Compliant CE Marked
Flammability Rating	L94V-0	UL94V-0	UL94V-0
One Pole Blocks			
Catalog Number	9080FB1221	9080FB1621	N/A
Dimensions (D) x (H) x (W)	2.01 x 4.83 x 1.48 in. 51.1 x 123.0 x 37.7 mm	2.12 x 6.75 x 1.95 in. 53.8 x171.4 x 49.5 mm	N/A
Two Pole Blocks			
Catalog Number	9080FB2221	9080FB2621	9080FB2621C
Dimensions (D) x (H) x (W)	2.01 x 4.83 x 2.86 in. 51.1 x 123.0 x 72.7 mm	2.12 x 6.75 x 3.51 in. 53.8 x171.4 x 89.2 mm	2.12 x 6.75 x 3.51 in. 53.8 x171.4 x 89.2 mm
Three Pole Blocks			
Catalog Number	9080FB3221	9080FB3621	N/A
Dimensions (D) x (H) x (W)	2.01 x 4.83 x 4.23 in. 51.1 x 123.0 x 108.0 mm	2.12 x 6.75 x 5.08 in. 53.8 x171.4 x 129.0 mm	N/A

Terminal Blocks
Fuseholders 60 A Rated

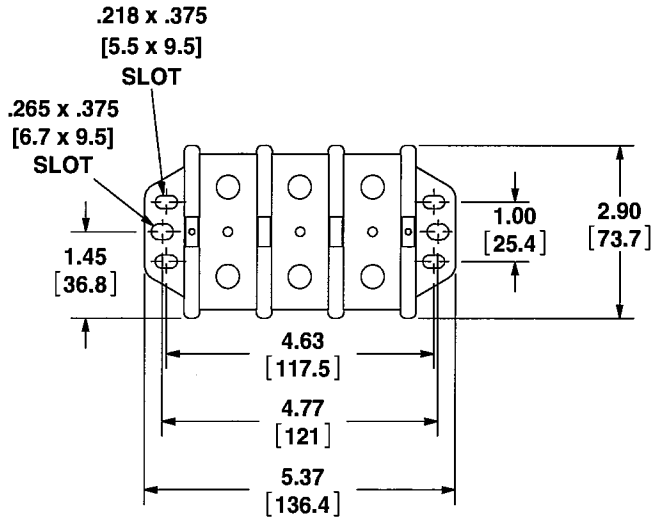
Class 9080	Class R Fuses		Class J Fuses
			
Maximum Voltage Rating	250	600	600
Wire Range (based on 75° C wire)	#14 to #2 AWG	#14 to #2 AWG	#14 to #2 AWG
Wire Type	Solid or Stranded Copper or Aluminum Wire	Solid or Stranded Copper or Aluminum Wire	Solid or Stranded Copper or Aluminum Wire
Lug Termination	Box Lug Connector	Box Lug Connector	Box Lug Connector
Clip Material	Copper Alloy Tin Plated	Copper Alloy Tin Plated	Copper Alloy Tin Plated
Clip Type	Reinforced	Reinforced	Reinforced
Base Material	High Impact Thermoplastic	General Purpose Phenolic	High Impact Thermoplastic
Recommended Tightening Torques	#2 to #3 AWG 50 lb-in (5.6 N-m) #4 to #6 AWG 45 lb-in (5.1 N-m) #8 AWG 40 lb-in (4.5 N-m) #10 to #14 AWG 35 lb-in (4.0 N-m)	#2 to #3 AWG 50 lb-in (5.6 N-m) #4 to #6 AWG 45 lb-in (5.1 N-m) #8 AWG 40 lb-in (4.5 N-m) #10 to #14 AWG 35 lb-in (4.0 N-m)	#2 to #3 AWG 50 lb-in (5.6 N-m) #4 to #6 AWG 45 lb-in (5.1 N-m) #8 AWG 40 lb-in (4.5 N-m) #10 to #14 AWG 35 lb-in (4.0 N-m)
Temperature Rating	-40 to 257° F -40 to 125° C	-40 to 302° F -40 to 150° C	-40 to 257° F -40 to 125° C
Fuse Size (Dia. x Length)	13/16" x 3"	1 1/16" x 5 1/2"	1 1/16" x 2 3/8"
AIC Rating in accordance with UL512	200,000	200,000	200,000
Certifications	UL File E40747 Guide IZLT	CSA File 70360/ Class 6225-01	RoHS Compliant CE Marked
Flammability Rating	UL94V-0	UL94V-0	UL94V-0
		One Pole Blocks	
Catalog Number	9080FB1221R	9080FB1621R	9080FB1621J
Dimensions (D) x (H) x (W)	2.01 x 4.83 x 1.48 in. 51.1 x 123.0 x 37.7 mm	2.12 x 6.75 x 1.95 in. 53.8 x 171.4 x 49.5 mm	2.09 x 4.07 x 1.67 in. 53.0 x 103.0 x 42.4 mm
		Two Pole Blocks	
Catalog Number	9080FB2221R	N/A	9080FB2621J
Dimensions (D) x (H) x (W)	2.01 x 4.83 x 2.86 in. 51.1 x 123.0 x 72.7 mm	N/A	2.09 x 4.07 x 3.20 in. 53.0 x 103.0 x 81.2 mm
		Three Pole Blocks	
Catalog Number	9080FB3221R	9080FB3621R	9080FB3621J
Dimensions (D) x (H) x (W)	2.01 x 4.83 x 4.23 in. 51.1 x 123.0 x 108.0 mm	2.12 x 6.75 x 5.08 in. 53.8 x171.4 x 129.0 mm	2.09 x 4.07 x 4.72 in. 53.0 x 103.0 x 120.0 mm

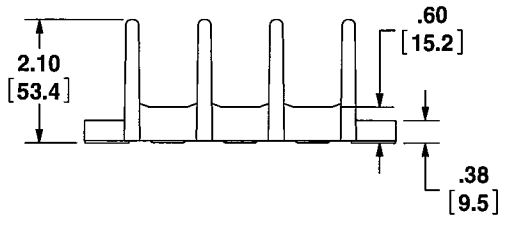
Class 9080	Class H Fuses		Class R Fuses	
				
Maximum Voltage Rating	600	600	250	600
Current Rating	100	100	100	100
Wire Range (based on 75° C wire)	#6 to 2/0 AWG	#6 to 2/0 AWG	#6 to 2/0 AWG	#6 to 2/0 AWG
Wire Type	Solid or Stranded Copper Wire	Solid or Stranded Cu or Al Wire	Solid or Stranded Cu or Al Wire	Solid or Stranded Cu or Al Wire
Lug Termination	Box Lug Connector	Box Lug Connector	Box Lug Connector	Box Lug Connector
Clip Material	Copper Alloy Tin Plated	One piece Aluminum w/ Stainless Steel Spring	One piece Aluminum w/ Copper Spring Tin Plated	One piece Aluminum w/ Copper Spring Tin Plated
Clip Type	Reinforced	Reinforced	Reinforced	Reinforced
Base Material	General Purpose Phenolic	General Purpose Phenolic	General Purpose Phenolic	General Purpose Phenolic
Recommended Tightening Torques	120 lb-in (13.6 N-m)	120 lb-in (13.6 N-m)	120 lb-in (13.6 N-m)	120 lb-in (13.6 N-m)
Temperature Rating	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C	-40 to 302° F -40 to 150° C
Fuse Size (Dia. x Length)	1" x 7 7/8"	1" x 7 7/8"	1" x 5 7/8"	1" x 7 7/8"
AIC Rating in accordance with UL512	10,000	10,000	20,000	20,000
Certifications	File E40747 Guide IZLT	File 70360 / Class 6225-01	RoHS Compliant	Marked
Flammability Rating	UL94V-0	UL94V-0	UL94V-0	UL94V-0
One Pole Blocks				
Catalog Number	N/A	N/A	9080FB1231R	9080FB1631R
Dimensions (D) x (H) x (W)	N/A	N/A	2.44 x 6.12 x 1.93 in. 62.0 x 155.5 x 49.0 mm	2.60 x 8.12 x 2.10 in. 66.0 x 206.2 x 53.3 mm
Two Pole Blocks				
Catalog Number	N/A	N/A	9080FB2231R	N/A
Dimensions (D) x (H) x (W)	N/A	N/A	2.44 x 6.12 x 3.49 in. 62.0 x 155.5 x 88.6 mm	N/A
Three Pole Blocks				
Catalog Number	9080FB3631C	9080FB3631	9080FB3231R	9080FB3631R
Dimensions (D) x (H) x (W)	2.6 x 8.12 x 5.73 in. 66.0 x 206.2 x 145.5 mm	2.60 x 8.12 x 5.73 in. 66.0 x 206.2 x 145.5 mm	2.44 x 6.12 x 5.05 in. 62.0 x 155.5 x 128.3 mm	2.60 x 8.12 x 5.73 in. 66.0 x 206.2 x 145.5 mm

Terminal Blocks
9080LBA and 9080LBC Power Distribution Block Approximate Dimensions



1 Pole	2 Pole	3 Pole	A1	A2	A3	B	C	D	E	F	G	H	J
LBA161101 LBA161104	N/A LBA261104	LBA361101 LBA361104	0.76	1.40	2.03	2.29	1.53	0.38	0.64	0.19	1.93	0.32	0.201
LBA162101 LBA162104 LBC162101 LBC162104	LBA262101 LBA262104 N/A LBC262104	LBA362101 LBA362104 LBC362101 LBC362104	1.13	1.94	2.75	2.88	1.78	0.56	0.81	0.31	2.25	0.24	0.205
LBA163101 LBA163104 LBA163106 LBA163206 LBC163101 LBC163106 LBC163206	LBA263101 LBA263104 LBA263106 LBA263206 N/A LBC263106 LBC263206	LBA363101 LBA363104 LBA363106 LBA363206 LBC363101 LBC363106 LBC363206	1.94	3.47	5.00	4.00	2.61	0.97	1.53	0.31	3.38	0.40	0.203
LBA164101 LBA164108	N/A LBA264108	LBA364101 LBA364108	2.28	4.16	6.04	4.75	2.92	1.14	1.88	0.31	4.13	0.51	0.200
LBA165202 LBA1652021 LBA165106 LBA165112 LBA165212 LBC165208 LBC165212	LBA265202 LBA2652021 LBA265106 LBA265112 LBA265212 N/A N/A	LBA365202 LBA3652021 LBA365106 LBA365112 LBA365212 LBC365208 LBC365212	3.17	5.85	8.54	5.50	3.12	1.58	2.69	0.38	4.75	0.50	0.265





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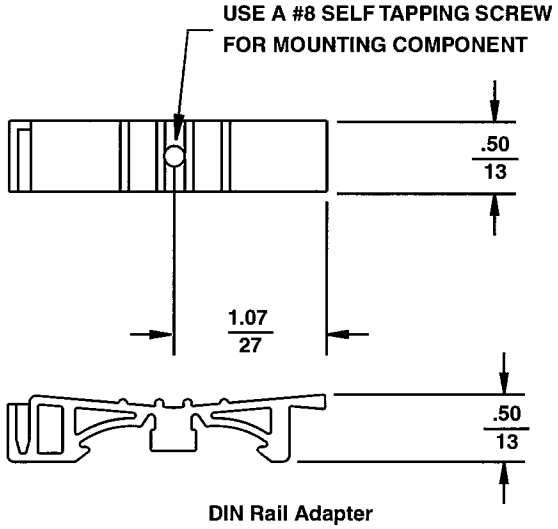
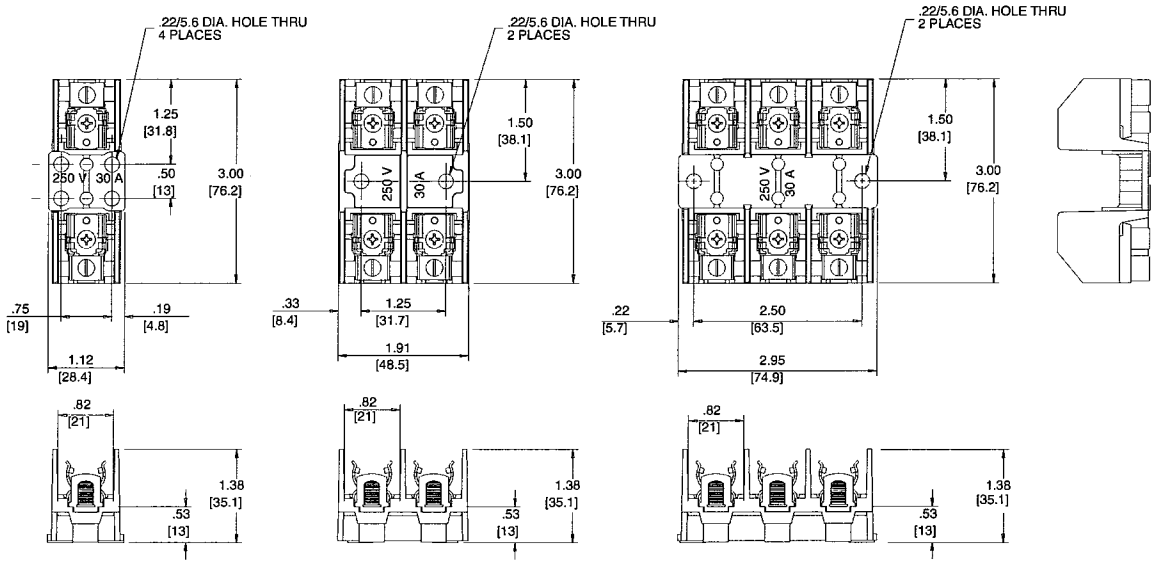


DIN Rail Adapter

Dimensions: in. / [mm]

SQUARE D
by Schneider Electric

Fuseholder Approximate Dimensions 250 V, 30 and 60 A

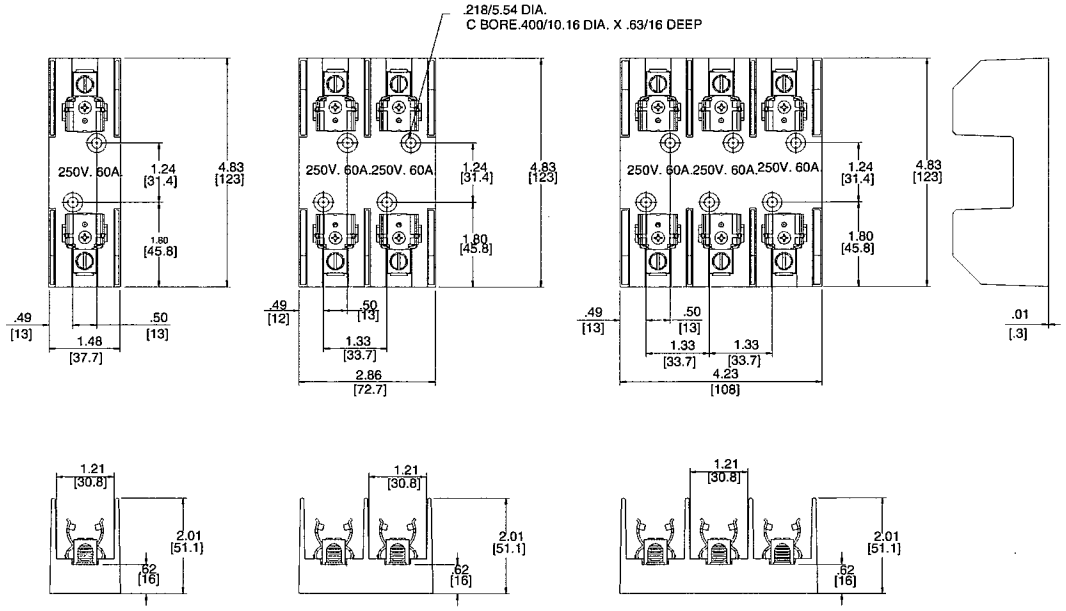


FB1211
FB1211R

FB2211
FB2211R

FB3211
FB3211R

30 A



FB1221
FB1221R

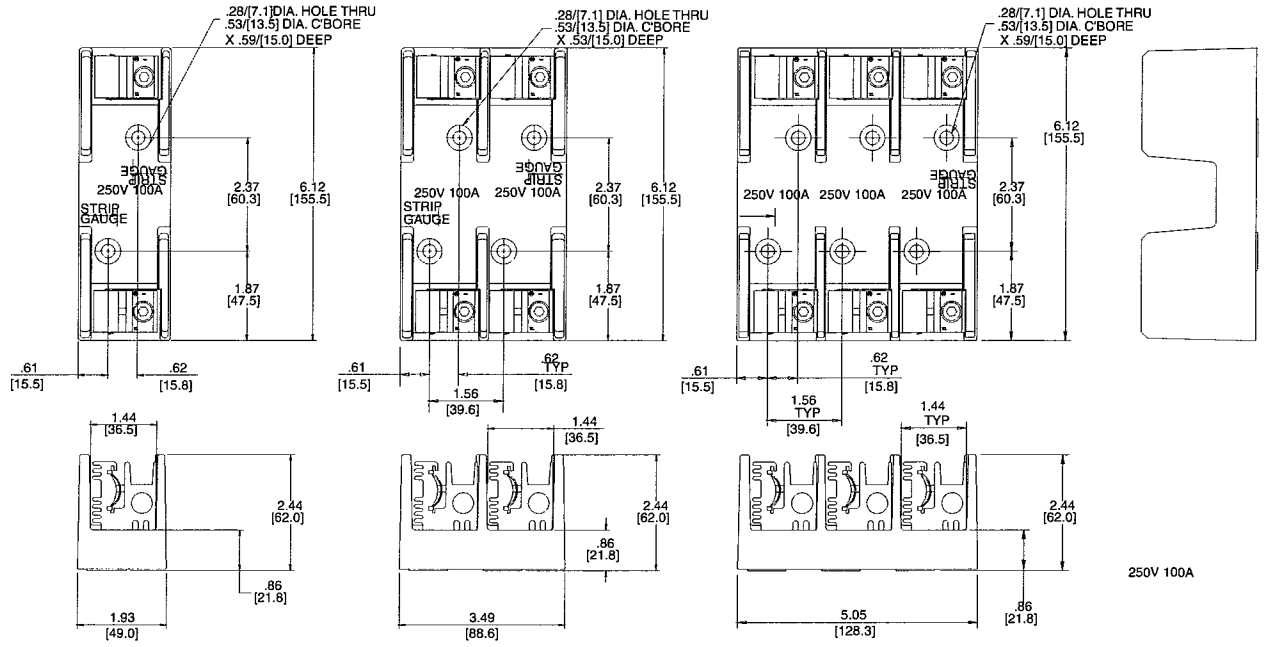
FB2221
FB2221R

FB3221
FB3221R

Dimensions: in. / [mm]

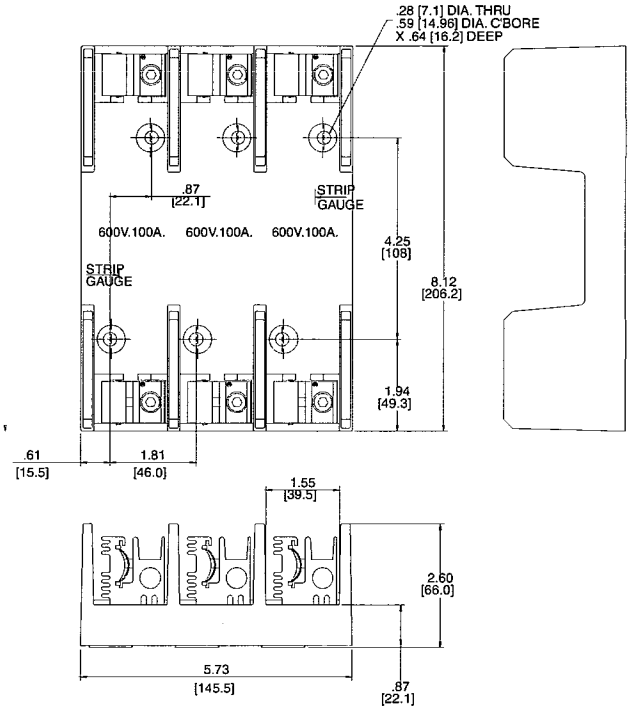
60 A

Fuseholder Approximate Dimensions 250 V, 100 A



FB1231R **FB2231R** **FB3231**

100 A

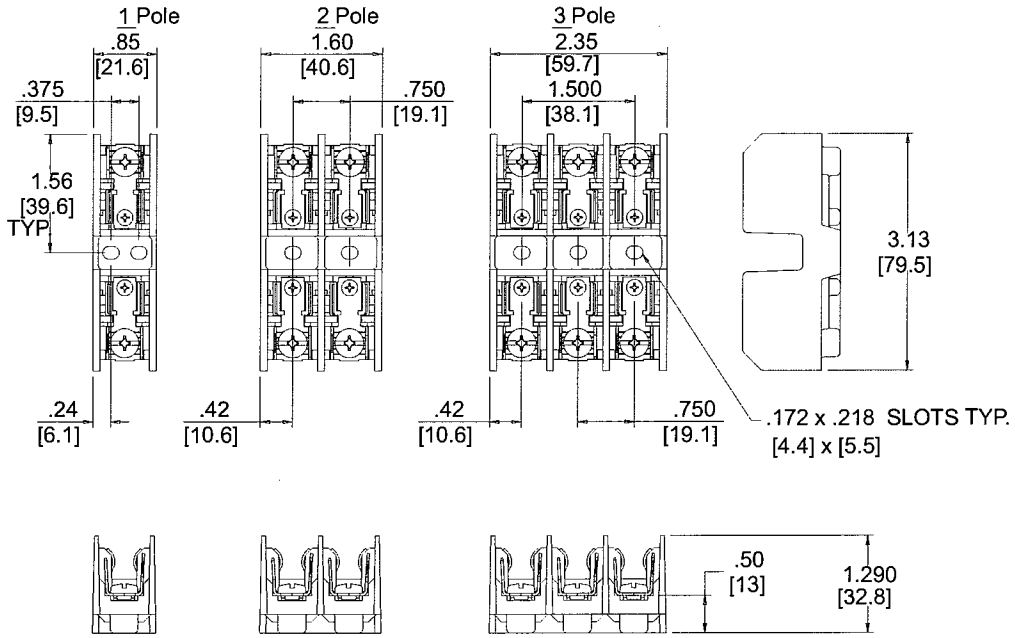


FB3631
FB3631R

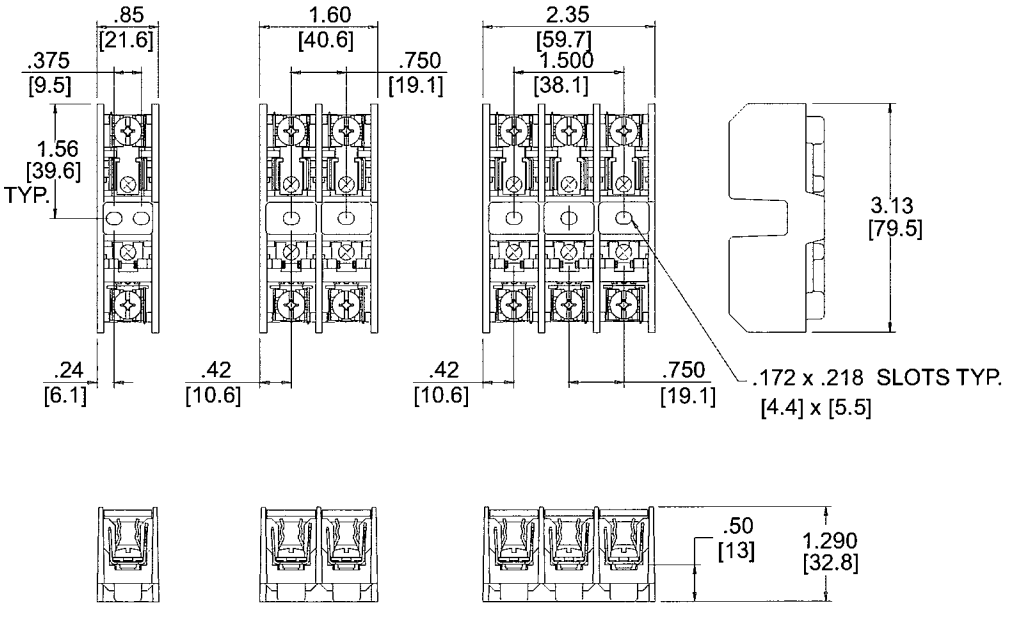
Dimensions: in. / [mm]

100 A

30 A



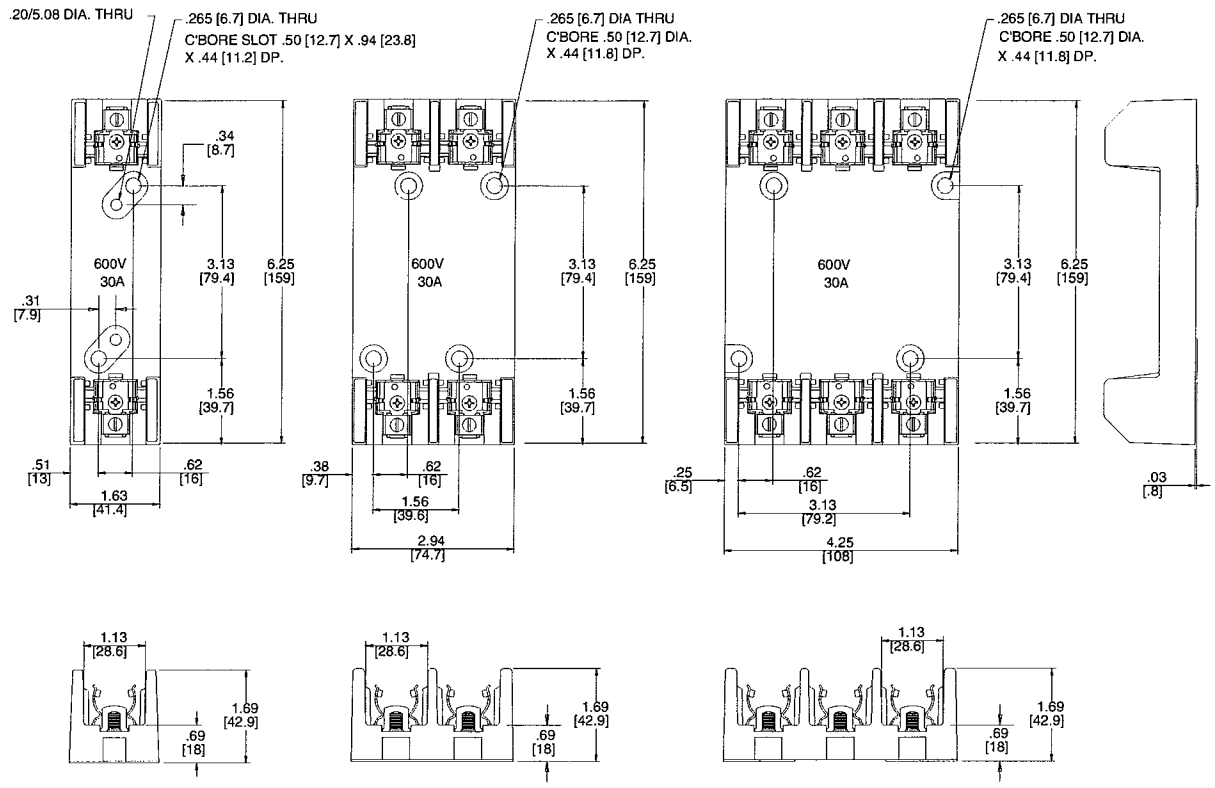
FB1611M **FB2611M** **FB3611M**



FB1611CC **FB2611CC** **FB3611CC**

Dimensions: in. / [mm]

Fuseholders Approximate Dimensions 600 V, 30 A and 60 A



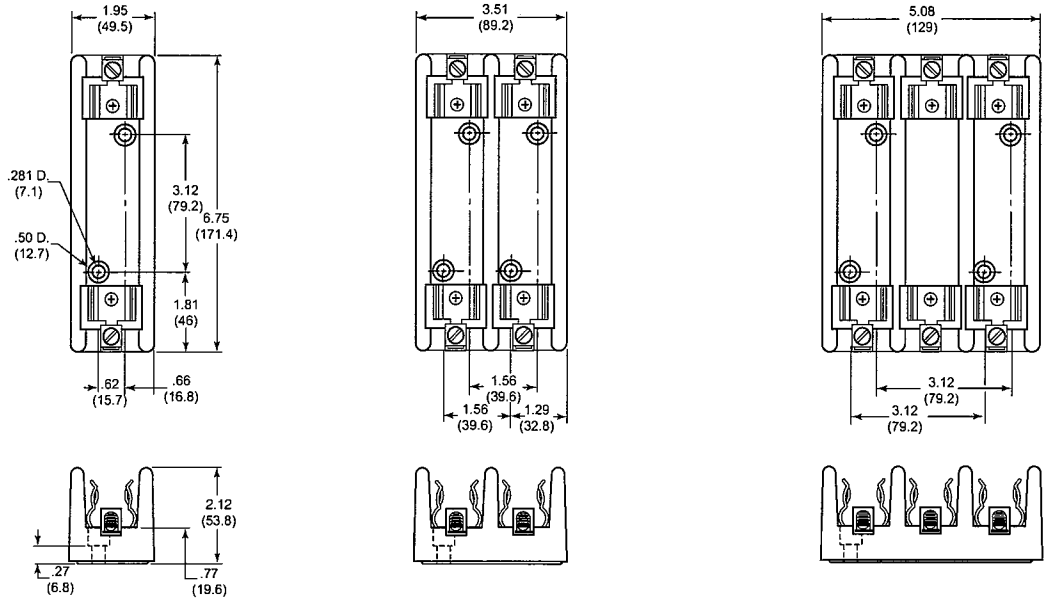
FB1611
FB1611R

FB2611
FB2611R

FB3611
FB3611R

Dimensions: in. / [mm]

60 A



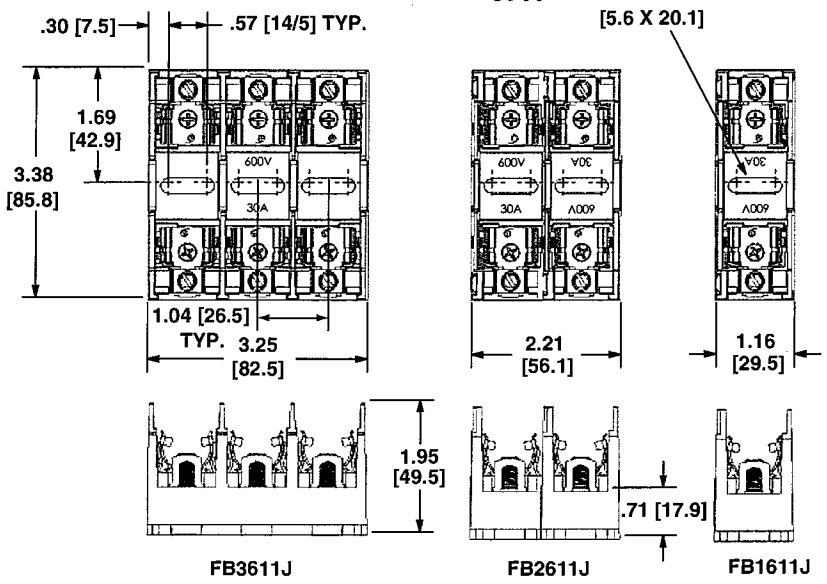
FB1621
FB1621R

FB2621
FB2621C

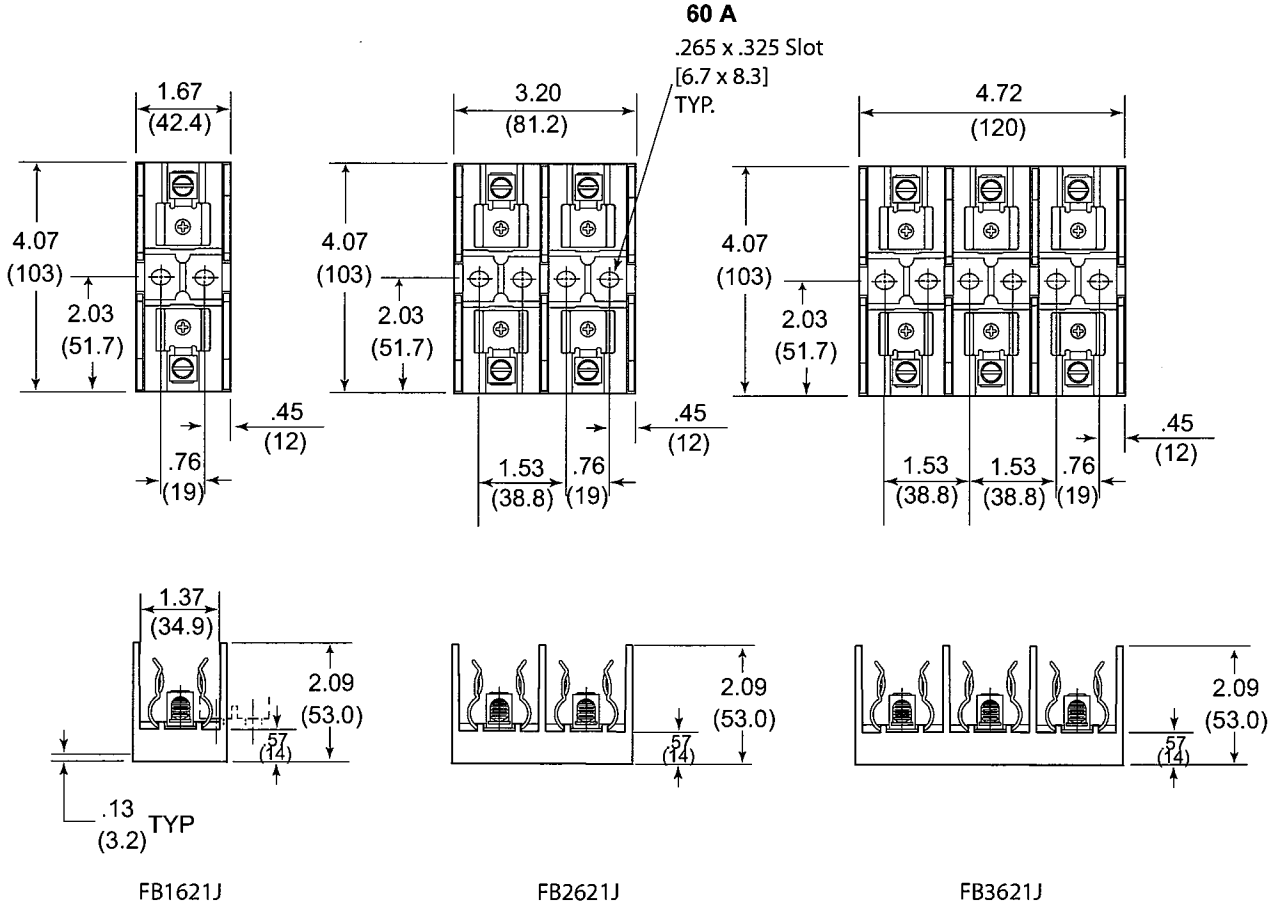
FB3621
FB3621R

30 A

30 A



60 A



Dimensions: in. / [mm]

Table 1: 9080LBA and 9080LBC Power Distribution Blocks Short Circuit Current Ratings with Circuit Breakers

Cat No.	Suitable Conductors MCM / AWG CU		Overcurrent Protection Circuit Breaker Required				
	Line	Load	Mfr.	Type	Max A	SCCR, RMS Sym A	Volts Max
9080LBA161101 9080LBA361101	2-6	2 -6	Square D	JDL36250	250	18 kA	480
				JGL36250	250	35 kA	
				JJL36250	250	65 kA	
				JLL36250	250	65 kA	
	8-10	8-10	Square D	HDL36100	100	18 kA	
				HGL36100	100	35 kA	
				HJL36100	100	65 kA	
				HLL36100	100	65 kA	
9080LBA161104 9080LBA261104 9080LBA361104	8- 10	4) 14	Square D	JDL36250	250	18 kA	480
				JGL36250	250	35 kA	
				JJL36250	250	65 kA	
				JLL36250	250	65 kA	
				HDL36100	100	18 kA	
				HGL36100	100	35 kA	
				HJL36100	100	65 kA	
				HLL36100	100	65 kA	
9080LBA362106	2/0 -6	6) 4- 10	Square D	JDL36250	250	18 kA	480
				JGL36250	250	35 kA	
				JJL36250	250	65 kA	
				JLL36250	250	65 kA	
				JDL36250	250	18 kA	
9080LBA165106 9080LBA265106 9080LBA365106	2/0 -4	6) 8	Square D	JGL36250	250	35 kA	480
				JJL36250	250	65 kA	
				JLL36250	250	65 kA	
				JDL36250	250	18 kA	
9080LBA165112 9080LBA265112 9080LBA365112	2/0 -4	12) 2 -8	Square D	JGL36250	250	35 kA	480
				JJL36250	250	65 kA	
				JLL36250	250	65 kA	
				JDL36250	250	18 kA	
9080LBA164108 9080LBA264108 9080LBA364108	2/0 -6	6) 2 - 10	Square D	JGL36250	250	35 kA	480
				JJL36250	250	65 kA	
				JLL36250	250	65 kA	
				JDL36250	250	18 kA	
9080LBA163104 9080LBA263104 9080LBA363104	2/0 -4	4) 2 -8	Square D	JGL36250	250	35 kA	480
				JJL36250	250	65 kA	
				JLL36250	250	65 kA	
				JDL36250	250	18 kA	

Table 1: 9080LBA and 9080LBC Power Distribution Blocks Short Circuit Current Ratings with Circuit Breakers (continued)

Cat No.	Suitable Conductors MCM / AWG CU		Overcurrent Protection Circuit Breaker Required				
	Line	Load	Mfr.	Type	Max A	SCCR, RMS Sym A	Volts Max
9080LBA163206 9080LBA263206 9080LBA363206	2) 1/0 -8	6) 4- 10	Square D	JGL36250	250	35 kA	480
				JJL36250	250	65 kA	
				JLL36250	250	65 kA	
				JDL36250	250	18 kA	
9080LBC163206 9080LBC263206 9080LBC363206	2) 2/0 -2	6) 4-8	Square D	JGL36250	250	35 kA	480
				JJL36250	250	65 kA	
				JLL36250	250	65 kA	
				JDL36175	175	18 kA	
	2) 4-6	6) 10-12	Square D	JGL36175	175	35 kA	
				JJL36175	175	65 kA	
				JLL36175	175	65 kA	
				JDL36250	250	18 kA	
9080LBC162101 9080LBC362101	1/0 -8	1/0 -8	Square D	JGL36250	250	35 kA	480
				JJL36250	250	65 kA	
				JLL36250	250	65 kA	
				JDL36250	250	18 kA	
9080LBA163106 9080LBA263106 9080LBA363106	2/0 -6	6) 2 - 10	Square D	JGL36250	250	35 kA	480
				JJL36250	250	65 kA	
				JLL36250	250	65 kA	
				JDL36250	250	18 kA	
9080LBA162104 9080LBA262104 9080LBA362104	2/0 - 10	4) 4- 10	Square D	JGL36250	250	35 kA	480
				JJL36250	250	65 kA	
				JLL36250	250	65 kA	
				JDL36250	250	18 kA	
9080LBC162104 9080LBC262104 9080LBC362104	2/0 -8	4) 4-8	Square D	JGL36250	250	35 kA	480
				JJL36250	250	65 kA	
				JLL36250	250	65 kA	
				JDL36250	250	18 kA	

Terminal Blocks
UL Short Circuit Current Ratings

Table 2: 9080LBA and 9080LBC Power Distribution Blocks Short Circuit Current Ratings with Fuses

Catalog Number			Suitable Conductors MCM / AWG CU		Fuse Type / Amperage							
1 Pole	2 Pole	3 Pole	Line	Load	J	T	RK1	RK5	G	CC	SCCR	Volts Max
9080LBA161101	N/A	9080LBA361101	2-6	2-6	200	200	200	100	60	30	100 kA	600
			8-10	8-10	100	100	100	–	60	30	100 kA	600
9080LBA161104	9080LBA261104	9080LBA361104	2-6	10-14	200	200	200	100	60	30	200 kA	600
			8-10	10-14	100	100	100	30	60	30	100 kA	600
9080LBA162101	9080LBA262101	9080LBA362101	2/0-6	2/0-6	300	300	200	100	60	30	65 kA	600
9080LBA162104	9080LBA262104	9080LBA362104	2/0-6	4-14	200	200	200	100	60	30	100 kA	600
N/A	N/A	9080LBA362106	2/0-6	4-14	–	–	–	–	60	–	100 kA	600
					200	200	200	100	–	30	200 kA	600
9080LBA163101	9080LBA263101	9080LBA363101	N/A									
9080LBA163104	9080LBA263104	9080LBA363104	400-3/0	2-8	400	400	400	100	60	30	100 kA	600
			2/0-6	2-14	200	200	200	100	60	30	100 kA	600
9080LBA163106	9080LBA263106	9080LBA363106	400-3/0	2-8	400	400	400	200	–	30	200 kA	600
					600	–	–	–	60	–	100 kA	600
			2/0-6	2-14	200	200	200	100	–	30	200 kA	600
					–	–	–	–	60	–	100 kA	600
9080LBA163206	9080LBA263206	9080LBA363206	(2)2/0-2	4-8	400	400	400	100	60	30	100 kA	600
			(2)4-6	10-14	300	300	200	100	60	30	100 kA	600
9080LBA164101	N/A	9080LBA364101	600-2	600-2	600	600	–	–	–	–	50 kA	600
					400	400	400	200	60	30	100 kA	600
9080LBA164108	9080LBA264108	9080LBA364108	400-3/0	2-8	400	400	400	200	60	30	100 kA	600
			2/0-6	2-14	200	200	200	100	60	30	100 kA	600
9080LBA165202	9080LBA265202	9080LBA365202	(2)350-4	(2)350-4	450	450	400	200	60	30	100 kA	600
					600	600	–	–	–	–	50 kA	600
9080LBA1652021	9080LBA2652021	9080LBA3652021	(2)500-4	(2)500-4	600	600	400	200	60	30	100 kA	600
9080LBA165106	9080LBA265106	9080LBA365106	500-3/0	2/0-6	400	400	400	100	60	30	100 kA	600
			2/0-4	8-14	200	200	200	100	60	30	100 kA	600
9080LBA165112	9080LBA265112	9080LBA365112	500-3/0	2-8	400	400	400	200	60	30	100 kA	600
			2/0-4	2-14	200	200	200	100	60	30	100 kA	600
9080LBA165208	9080LBA265208	9080LBA365208	(2)500-250	2/0-4	600	600	400	200	60	30	100 kA	600
			(2)4/0-4	2/0-10	600	600	–	–	–	–	50 kA	600
					400	400	400	200	60	30	100 kA	600

Table 2: 9080LBA and 9080LBC Power Distribution Blocks Short Circuit Current Ratings with Fuses (continued)

Catalog Number			Suitable Conductors MCM / AWG CU		Fuse Type / Amperage							
1 Pole	2 Pole	3 Pole	Line	Load	J	T	RK1	RK5	G	CC	SCCR	Volts Max
9080LBA165212	9080LBA265212	9080LBA365212	(2)500-250	4-8	600	600	600	N/A	N/A	N/A	50 kA	600
					400	400	400	200	60	30	100 kA	600
			(2)4/0-4	4-14	600	600	N/A	N/A	N/A	N/A	50 kA	600
					400	400	400	200	60	30	100 kA	600
9080LBC162101	N/A	9080LBC362101	N/A									
9080LBC162104	9080LBC262104	9080LBC362104	2/0-6	4-14	200	200	200	100	60	30	100 kA	600
9080LBC163101	N/A	9080LBC363101	N/A									
9080LBC163106	9080LBC263106	9080LBC363106	500-3/0	2-8	400	400	400	200	60	30	100 kA	600
			2/0-4	2-14	200	200	200	100	60	30	100 kA	600
9080LBC163206	9080LBC263206	9080LBC363206	(2)2/0-2	4-8	400	400	400	100	60	30	100 kA	600
			(2)4-6	10-14	200	200	200	100	60	30	100 kA	600
9080LBC165208	N/A	9080LBC365208	(2)500-250	2/0-4	600	600	400	200	60	30	100 kA	600
			(2)4/0-4	2/0-6	600	600	N/A	N/A	N/A	N/A	50 kA	600
					400	400	400	200	60	30	100 kA	600
9080LBC165212	N/A	9080LBC365212	(2)500-250	2-8	600	600	600	–	–	–	50 kA	600
					400	400	400	200	60	30	100 kA	600
			(2)4/0-4	2-14	600	600	–	–	–	–	50 kA	600
					400	400	400	200	60	30	100 kA	600

Index of Catalog Numbers

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Knightdale, N.C. 27545, USA
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www.schneider-electric.us

9080CT9603R09/08 Dated 4/2009
9080CT9603 Dated 2/1997

08/2010

SECTION 17
SQUARE D TRANSFORMER (BOM ITEM 5)

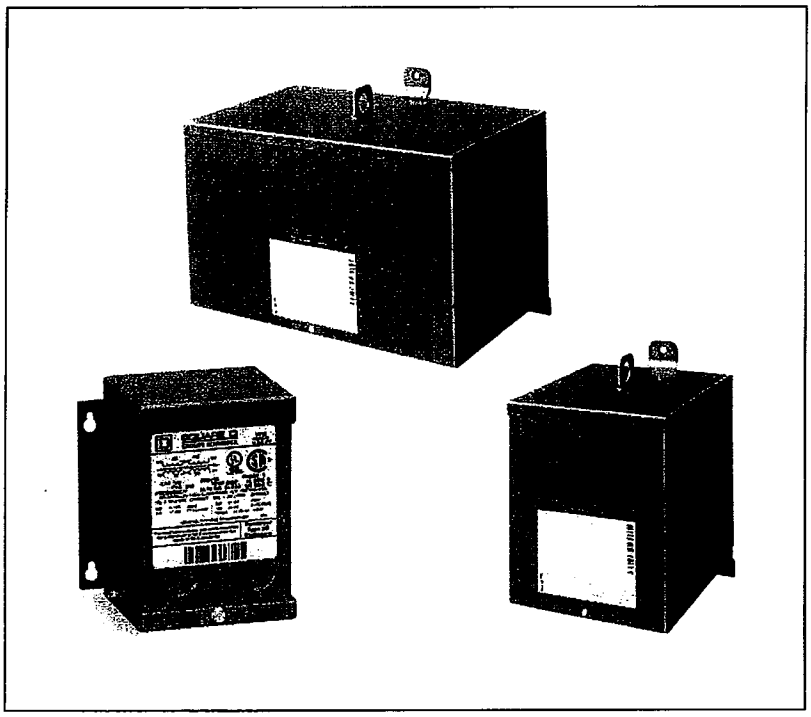
ITEM 5

Low Voltage Transformers
Sealed, General Purpose, Dry Type

Class 7400

Catalog
7400CT9601R4/08
08

PART No: 1ΦS1F PG. 5
WIRING: PG. 17
ENCLOSURE DIA. PG. 15



CONTENTS

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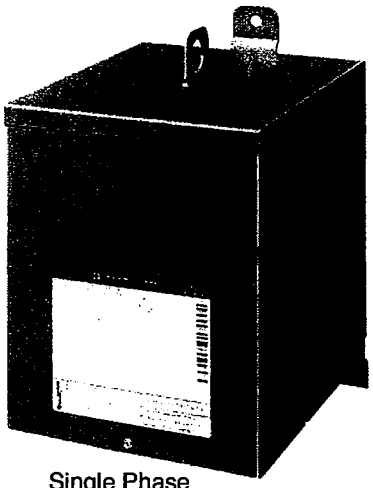
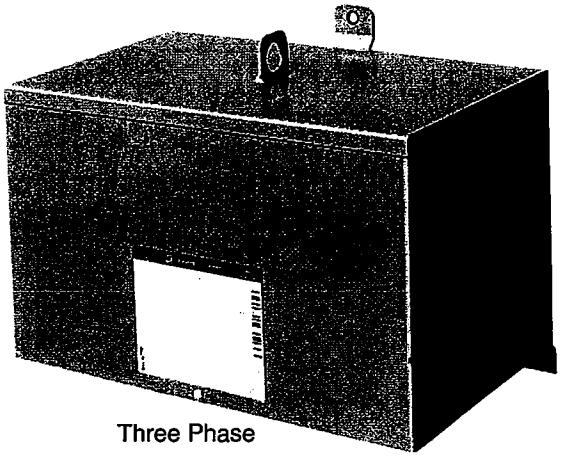
SQUARE D

Introduction

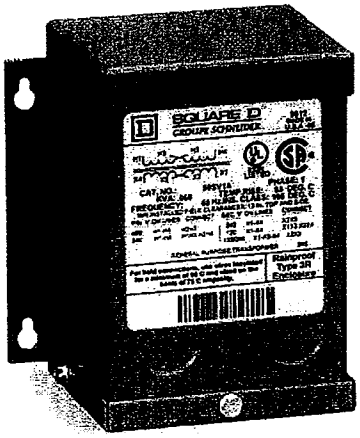
As the industry leading designer, manufacturer, and supplier of low voltage, general purpose transformers, Schneider Electric has the expertise necessary to meet your increased demands by providing reliable products and outstanding support services.



Single Phase



Three Phase



Single Phase

Sealed Transformers

Resin-Filled Transformers

Resin-filled general purpose transformers are epoxy encapsulated. The enclosure has no openings, making resin-filled transformers ideal for use indoor or outdoor where airborne particles or contaminants could be detrimental to operation. The core-and-coil assembly is embedded in an epoxy resin compound and wall mounted for maximum protection. These units can be used outdoors without accessories. Units are UL Listed and CSA Certified.

Public Law 109-58, the 2005 Energy Act, mandates that distribution transformers be energy efficient. However, resin-filled units are not included in this law; they are listed in Section (35)(B)(ii) as "a transformer that is designed to be used in a special purpose application and is unlikely to be used in general purpose application, such as ... sealed and non-ventilating transformer..."

Three-Phase Resin-Filled Transformers

kVA	Part Number	Enclosure (Refer to pages 10–16)	Wiring Diagram	Weight (lbs)	°C Rise	Full Capacity Taps[a]
480 V Delta Primary to 208Y/120 V Secondary 60 Hz						
3	3T2F	12C	4 on page 17	125	115	2–5% FCBN
6	6T2F	12C		150	115	2–5% FCBN
9	9T2F	14C		265	115	2–5% FCBN
15	15T2F	14C		335	115	2–5% FCBN
30	30T2F	16C	8 on page 17	775	115	2–5% FCBN
480 V Delta Primary to 240 V Delta Secondary 60 Hz						
3	3T5F	12C	5 on page 17	125	115	2–5% FCBN
6	6T5F	12C		150	115	2–5% FCBN
9	9T75F	14C	6 on page 17	265	115	4–2.5% FCBN
15	15T75F	14C		335	115	4–2.5% FCBN
600 V Delta Primary to 208Y/120 Volts Secondary 60 Hz						
3	3T7F	12C	4 on page 17	125	115	2–5% FCBN
6	6T7F	12C		150	115	2–5% FCBN
9	9T7F	14C		265	115	2–5% FCBN
15	15T7F	14C		335	115	2–5% FCBN
30	30T7F	16C	8 on page 17	775	115	2–5% FCBN

[a] (FCBN) Full Capacity Taps Below Normal, where noted.

Single-Phase Resin-Filled Transformers

kVA	Part Number	Enclosure (Refer to pages 10–16)	Wiring Diagram	Weight (lbs)	°C Rise	Full Capacity Taps[a]
240 x 480 V Primary to 120/240 V Secondary 60 Hz						
0.050	50SV1A	1A	1 on page 17	4.2	55	—
0.100	100SV1A	2A		4.5	55	—
0.150	150SV1A	3A		6.2	55	—
0.250	250SV1B	4A		10.5	80	—
0.500	500SV1B	5A		13.8	80	—
0.750	750SV1F	6A		15.5	115	—
1	1S1F	7A		21.2	115	—
1.5	1.5S1F	8A		30.1	115	—
2	2S1F	9A		39.1	115	—
3	3S1F	10A		55.2	115	—
5	5S1F	13B		115	115	—
7.5	7S1F	13B		150	115	—
10	10S1F	13B		165	115	—
480 V Primary to 120/240 V Secondary 60 Hz						
3	3S40F	10A	7 on page 17	55.2	115	2–5% FCBN
5	5S40F	13B		115	115	2–5% FCBN
7.5	7S40F	13B		150	115	2–5% FCBN
10	10S40F	13B		165	115	2–5% FCBN
15	15S40F	15B		320	115	2–5% FCBN
25	25S40F	15B		385	115	2–5% FCBN
600 V Primary to 120/240 V Secondary 60 Hz						
0.050	50SV51A	1A	2 on page 17	4.2	55	—
0.100	100SV51A	2A		4.5	55	—
0.150	150SV51A	3A		6.2	55	—
0.250	250SV51B	4A		10.5	80	—
0.500	500SV51B	5A		13.8	80	—
0.750	750SV51F	6A		15.5	115	—
1	1S51F	7A		21.2	115	—
1.5	1.5S51F	8A		30.1	115	—
2	2S51F	9A		39.1	115	—
3	3S4F	10A	7 on page 17	55.2	115	2–5% FCBN
5	5S4F	13B		115	115	2–5% FCBN
7.5	7S4F	13B		150	115	2–5% FCBN
10	10S4F	13B		165	115	2–5% FCBN
120x240 V Primary to 120/240 V Secondary 60 Hz						
1	1S6F	7A	1 on page 17	21.2	115	—
1.5	1.5S6F	8A		30.1	115	—
2	2S6F	9A		39.1	115	—
3	3S6F	10A		55.2	115	—
5	5S6F	13B		115	115	—
7.5	7S6F	13B		150	115	—
10	10S6F	13B		165	115	—

continued on next page

Single-Phase Resin-Filled Transformers *(continued)*

kVA	Part Number	Enclosure (Refer to pages 10–16)	Wiring Diagram	Weight (lbs)	°C Rise	Full Capacity Taps[a]
208 V Primary to 120/240 V Secondary 60 Hz						
1	1S7F	7A	2 on page 17	21.2	115	—
1.5	1.5S7F	8A		30.1	115	—
2	2S7F	9A		39.1	115	—
3	3S7F	10A		55.2	115	—
3	3S60F	10A	7 on page 17	55.2	115	2–5% FCB
5	5S7F	13B	2 on page 17	115	115	—
5	5S60F	13B	7 on page 17	115	115	2–5% FCB
7.5	7S7F	13B	2 on page 17	150	115	—
7.5	7S60F	13B	7 on page 17	150	115	2–5% FCB
10	10S7F	13B	2 on page 17	165	115	—
10	10S60F	13B	7 on page 17	165	115	2–5% FCB
15	15S60F	15B		320	115	2–5% FCB
25	25S60F	15B		385	115	2–5% FCB
240 V Primary to 120/240 Secondary 60 Hz						
3	3S62F	10A	7 on page 17	55.2	115	2–5% FCB
5	5S62F	13B		115	115	2–5% FCB
7.5	7S62F	13B		150	115	2–5% FCB
10	10S62F	13B		165	115	2–5% FCB
15	15S62F	15B		320	115	2–5% FCB
25	25S62F	15B		385	115	2–5% FCB
277 V Primary to 120/240 V Secondary 60 Hz						
1	1S8F	7A	2 on page 17	21.2	115	—
1.5	1.5S8F	8A		30.1	115	—
2	2S8F	9A		39.1	115	—
3	3S8F	10A		55.2	115	—
3	3S61F	10A	7 on page 17	55.2	115	2–5% FCB
5	5S8F	13B	2 on page 17	115	115	—
5	5S61F	13B	7 on page 17	115	115	2–5% FCB
7.5	7S8F	13B	2 on page 17	150	115	—
7.5	7S61F	13B	7 on page 17	150	115	2–5% FCB
10	10S8F	13B	2 on page 17	165	115	—
10	10S61F	13B	7 on page 17	165	115	2–5% FCB
15	15S61F	15B		320	115	2–5% FCB
25	25S61F	15B		385	115	2–5% FCB
480 V Primary to 208 V Secondary 60 Hz						
1	1S72F	7A	3 on page 17	21.2	115	—
1.5	1.5S72F	8A		30.1	115	—
2	2S72F	9A		39.1	115	—
3	3S72F	10A		55.2	115	—
5	5S72F	13B		115	115	—
7.5	7S72F	13B		150	115	—
10	10S72F	13B		165	115	—

continued on next page

Single-Phase Resin-Filled Transformers *(continued)*

kVA	Part Number	Enclosure (Refer to pages 10–16)	Wiring Diagram	Weight (lbs)	°C Rise	Full Capacity Taps[a]
240 V Primary to 208 V Secondary 60 Hz						
1	1S1723F	7A	3 on page 17	21.2	115	—
1.5	1.5S1723F	8A		30.1	115	—
2	2S1723F	9A		39.1	115	—
3	3S1723F	10A		55.2	115	—
5	5S1723F	13B		115	115	—
7.5	7S1723F	13B		150	115	—
10	10S1723F	13B		165	115	—
480 V Primary to 277 V Secondary 60 Hz						
1	1S78F	7A	3 on page 17	21.2	115	—
1.5	1.5S78F	8A		30.1	115	—
2	2S78F	9A		39.1	115	—
3	3S78F	10A		55.2	115	—
5	5S78F	13B		115	115	—
7.5	7S78F	13B		150	115	—
10	10S78F	13B		165	115	—
208 V Primary to 277 V Secondary 60 Hz						
1	1S1292F	7A	3 on page 17	21.2	115	—
1.5	1.5S1292F	8A		30.1	115	—
2	2S1292F	9A		39.1	115	—
3	3S1292F	10A		55.2	115	—
5	5S1292F	13B		115	115	—
7.5	7S1292F	13B		150	115	—
10	10S1292F	13B		165	115	—

[a] (FCBN) Full Capacity Taps Below Normal, where noted.

Export Model Transformers

Export model transformers are designed to accommodate voltage systems world-wide.

In addition to being UL Listed and CSA Certified, export model transformers 10kVA and smaller are certified by TUV (file no. E9571881.01) to meet EN standard EN60-742. Original equipment is eligible for the "CE" mark if transformer components meet the EN60-742 standard.

Single-Phase Export Model Transformers[a]

kVA	Part Number	Enclosure (Refer to pages 10–16)	Wiring Diagram	Weight (lbs)	°C Rise	Full Capacity Taps
190/200/208/220 x 380/400/416/440 V Primary to 110/220 V Secondary 50/60 Hz						
1[b]	1S67F	9A	9 on page 17	21.2	115	—
2	2S67F	11A		39.1	115	—
3	3S67F	11A		55.2	115	—
5	5S67F	13B		135	115	—
7.5	7S67F	13B		165	115	—
10	10S67F	13B		165	115	—
380/400/415 V Primary to 120/240 V Secondary 50/60 Hz						
1[b]	EN1S71F50HZ	7A	7 on page 17	22.8	115	yes
1.5	EN1.5S71F50HZ	8A		32.4	115	yes
2	EN2S71F50HZ	9A		42.0	115	yes
3	EN3S71F50HZ	10A		59.3	115	yes
5	EN5S71F50HZ	13B		123.6	115	yes
7.5	EN7S71F50HZ	13B		161.3	115	yes
10	EN10S71F50HZ	13B		177.4	115	yes

[a] Units are UL Listed and CSA Certified. Eligible for the CE mark; contact the factory for details.

[b] 0.750 kVA EN rating.

Stainless Steel Enclosures

Stainless steel enclosures provide better corrosion resistance than standard painted enclosures. Schneider Electric offers an entire line of resin-filled transformers. They are available with #316 stainless steel enclosures to meet demands for extra protection in environments where harsh chemicals or corrosive materials such as acids, food products, gasoline, organic solvents, or salt water are present.

Square D® brand transformers with #316 stainless steel have a higher nickel content than #304 stainless steel, making them even more resistant to harsh environments.

Units are painted with standard ANSI 49 gray and have a NEMA Type 3R rating. Additional voltages are available. Contact your local Schneider Electric representative for details. NEMA 4X enclosures are also available; contact your local Schneider Electric representative for price and availability.

Three-Phase Stainless Steel Enclosures

kVA	Part Number	Enclosure (Refer to pages 10–16)	Wiring Diagram	Weight (lbs)	°C Rise	Full Capacity Taps[a]
480 V Primary to 208Y/120 V Secondary 60 Hz						
3	3T2FSS	12C	4 on page 17	125	115	2–5% FCBN
6	6T2FSS	12C		150	115	2–5% FCBN
9	9T2FSS	14C		265	115	2–5% FCBN
15	15T2FSS	14C		335	115	2–5% FCBN
30	30T2FSS	16C	8 on page 17	775	115	2–5% FCBN

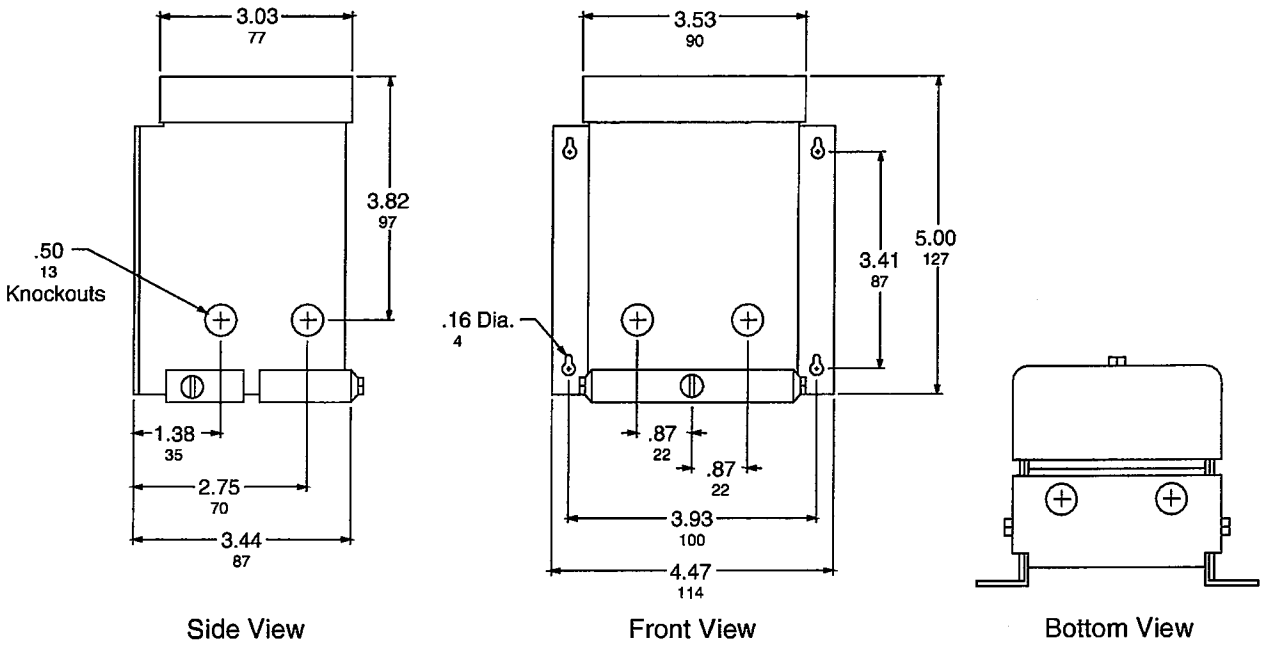
[a] (FCBN) Full Capacity Taps Below Normal, where noted.

Single-Phase Stainless Steel Enclosures

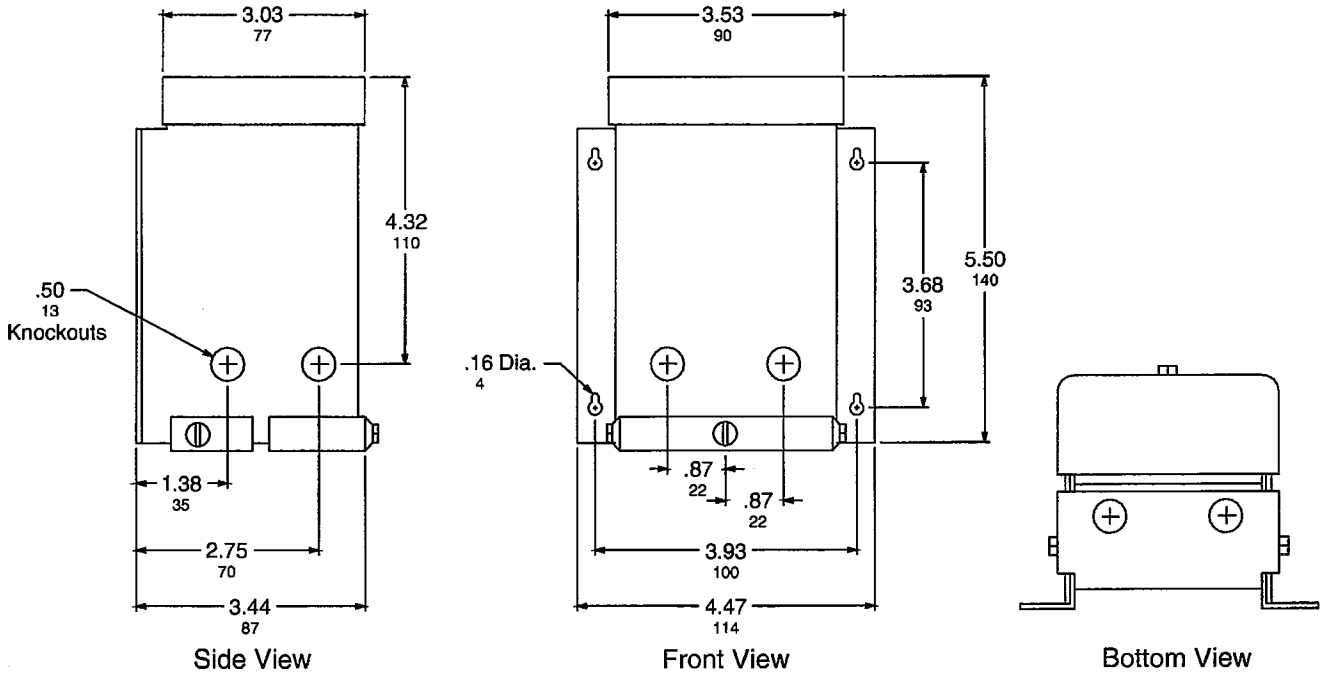
kVA	Part Number	Enclosure (Refer to pages 10–16)	Wiring Diagram	Weight (lbs)	°C Rise	Full Capacity Taps[a]
240 x 480 V Delta Primary to 120/240 V Secondary 60 Hz						
1	1S1FSS	7A	1 on page 17	21	115	—
1.5	1.5S1FSS	8A		30	115	—
2	2S1FSS	9A		39	115	—
3	3S1FSS	10A		55.2	115	—
5	5S1FSS	13B		115	115	—
7.5	7S1FSS	13B		150	115	—
10	10S1FSS	13B		165	115	—
15	15S1FSS	15B		320	115	—
25	25S1FSS	15B		385	115	—
480 V Delta Primary to 120/240 V Secondary 60 Hz						
3	3S40FSS	10A	7 on page 17	55.2	115	2–5% FCBN
5	5S40FSS	13B		115	115	2–5% FCBN
7.5	7S40FSS	13B		150	115	2–5% FCBN
10	10S40FSS	13B		165	115	2–5% FCBN
15	15S40FSS	15B		320	115	2–5% FCBN
25	25S40FSS	15B		385	115	2–5% FCBN

[a] (FCBN) Full Capacity Taps Below Normal, where noted.

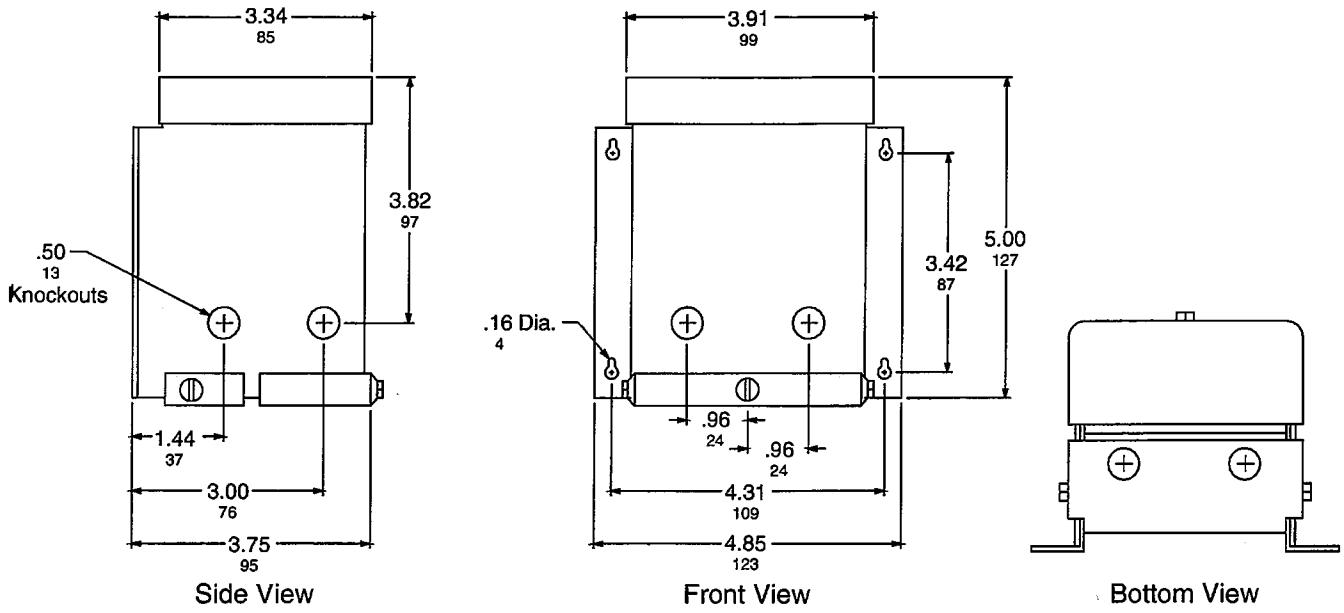
Enclosure Diagrams and Accessories



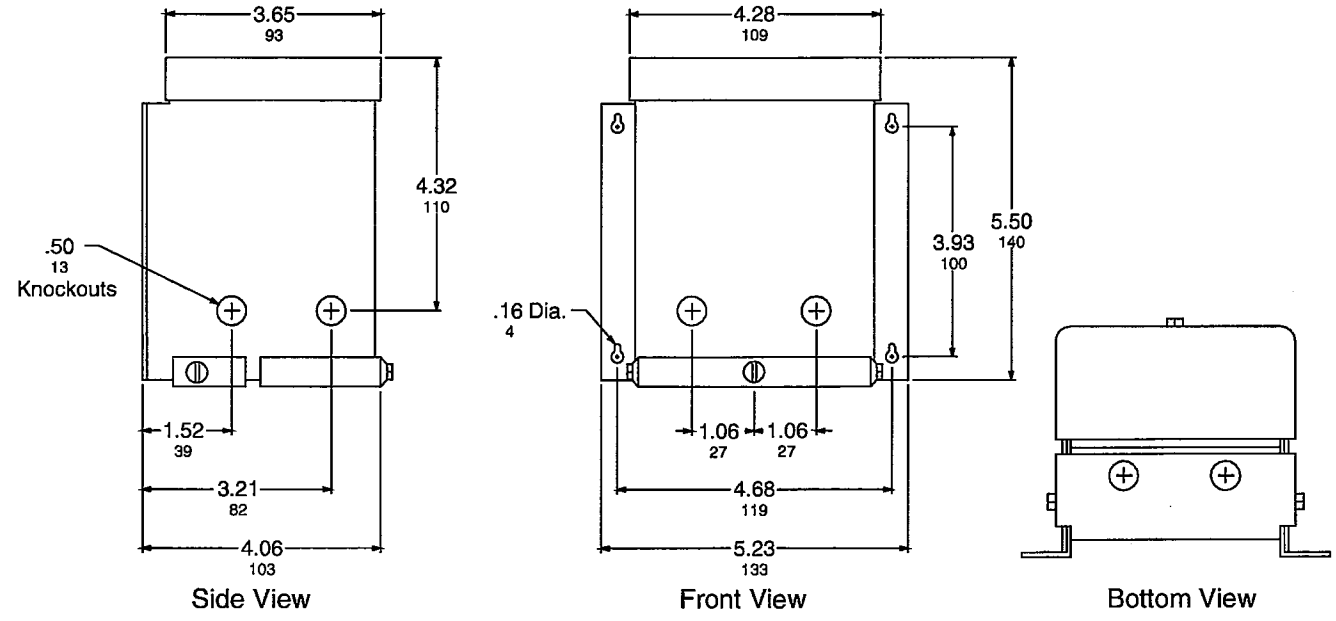
Enclosure 1A—General Purpose Transformer: 0.05 kVA—120/240 V Secondary Current



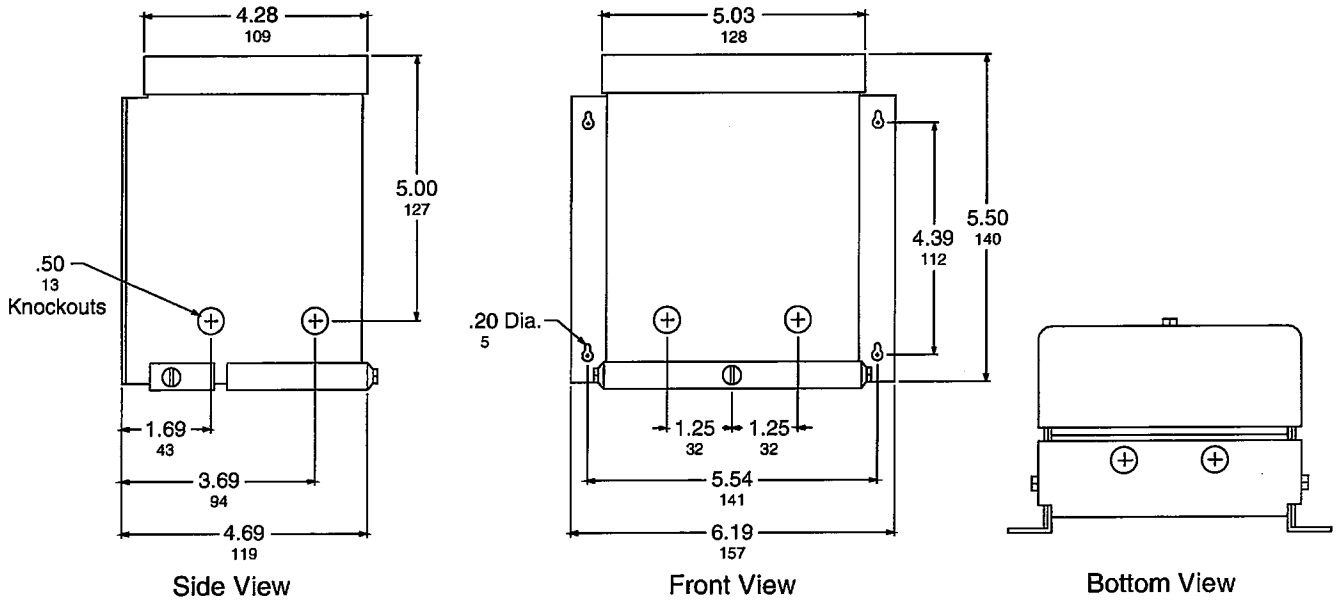
Enclosure 2A—General Purpose Transformer: 0.10 kVA—120/240 V Secondary Current



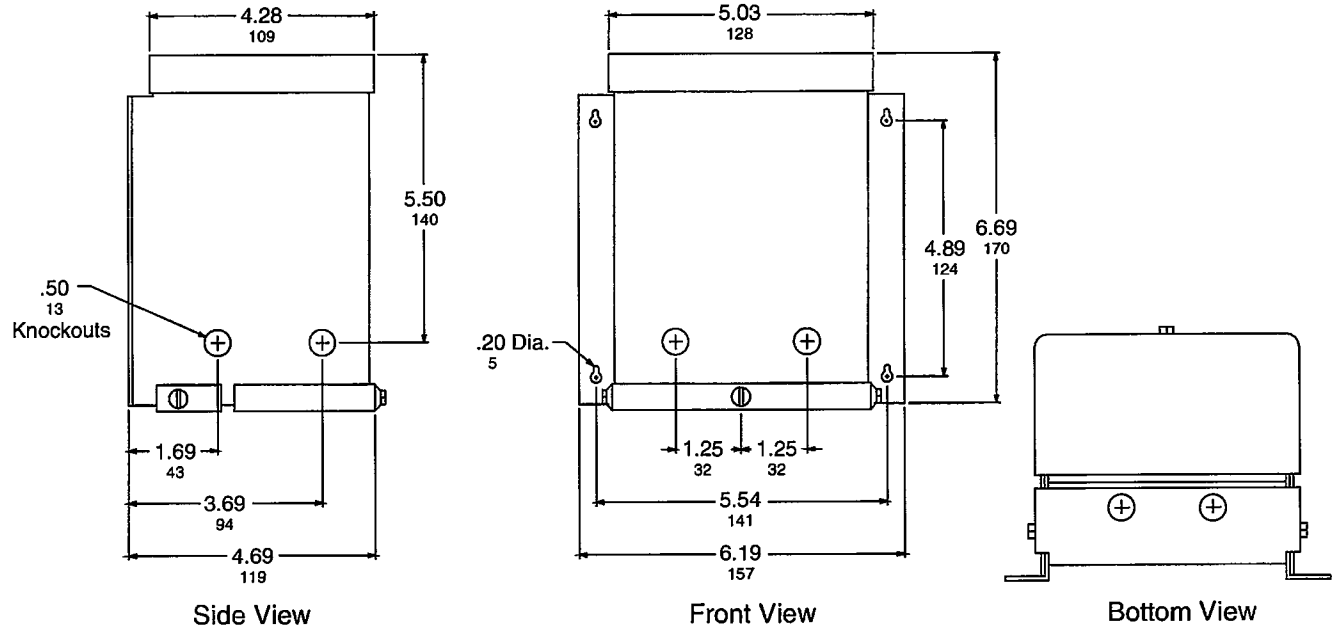
Enclosure 3A—General Purpose Transformer: 0.15 kVA—120/240 V Secondary Current



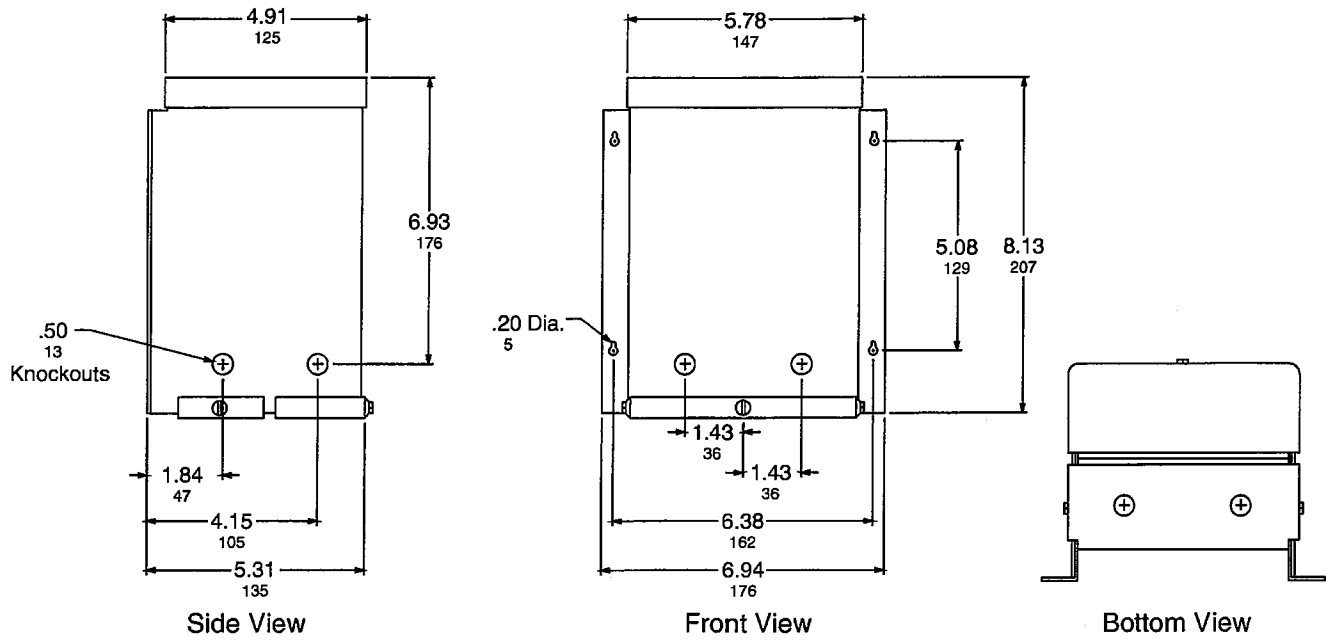
Enclosure 4A—General Purpose Transformer: 0.25 kVA—120/240 V Secondary Current



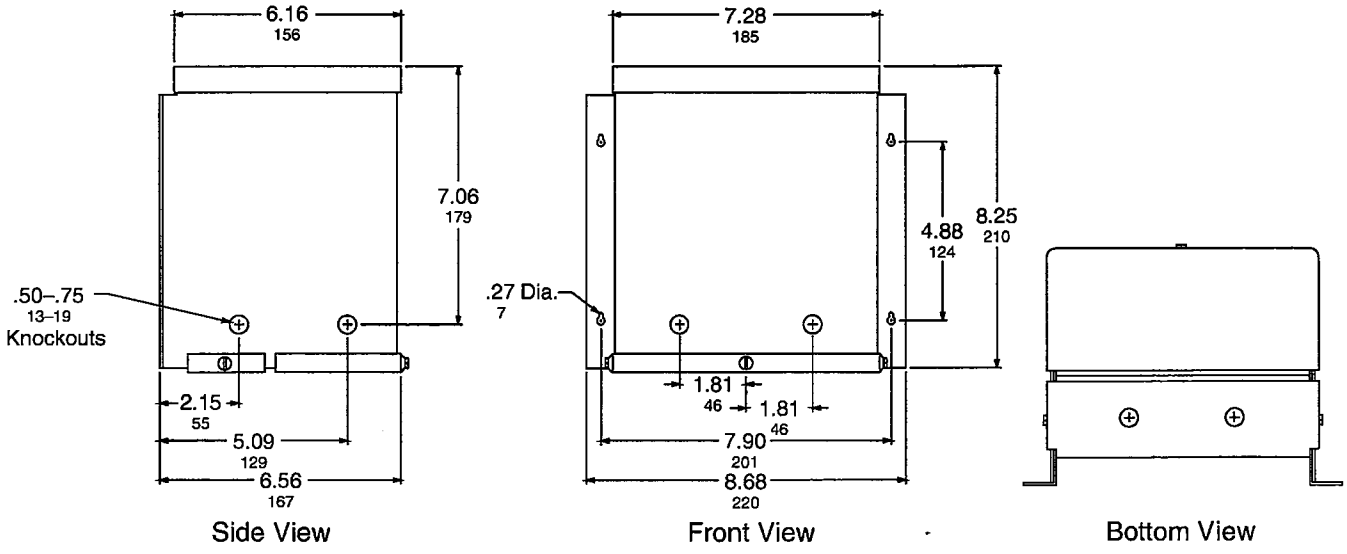
~~Enclosure 5A—General Purpose Transformer: 0.50 kVA—120/240 V Secondary Current~~



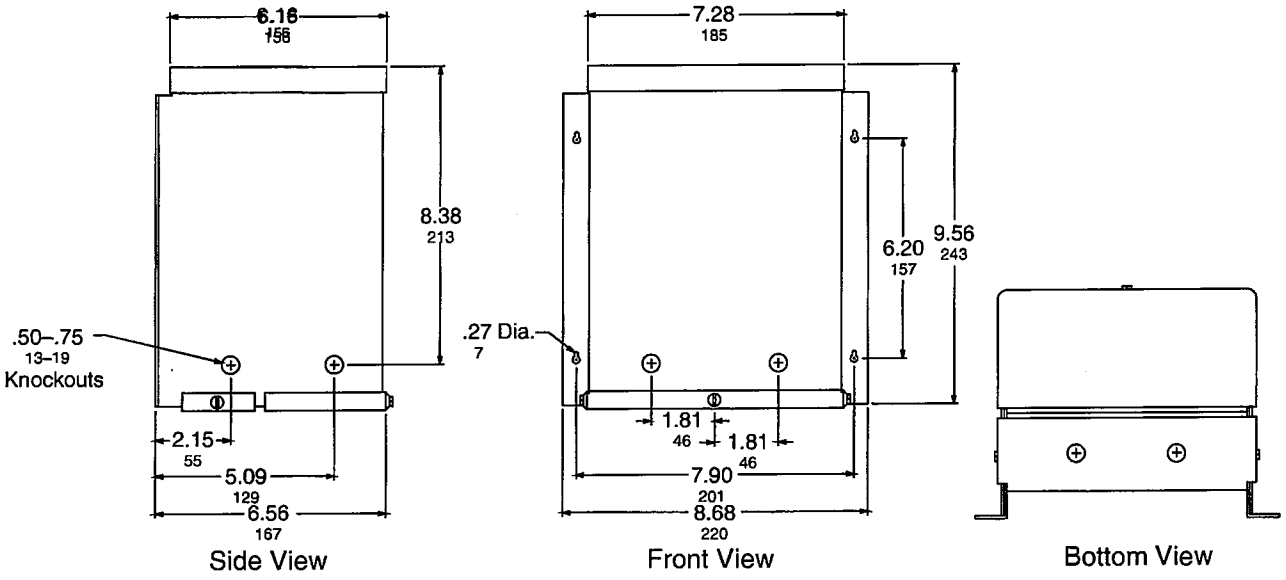
Enclosure 6A—General Purpose Transformer: 0.75 kVA—120/240 V Secondary Current



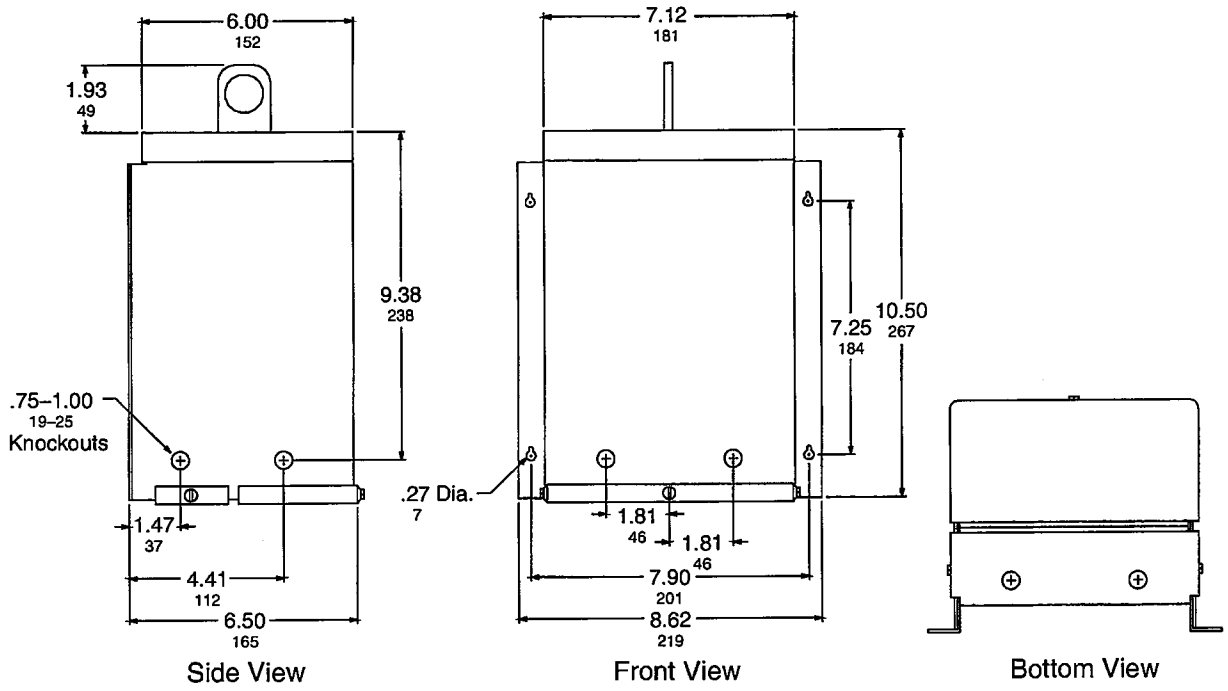
Enclosure 7A—General Purpose Transformer: 1.00 kVA—120/240 V Secondary Current



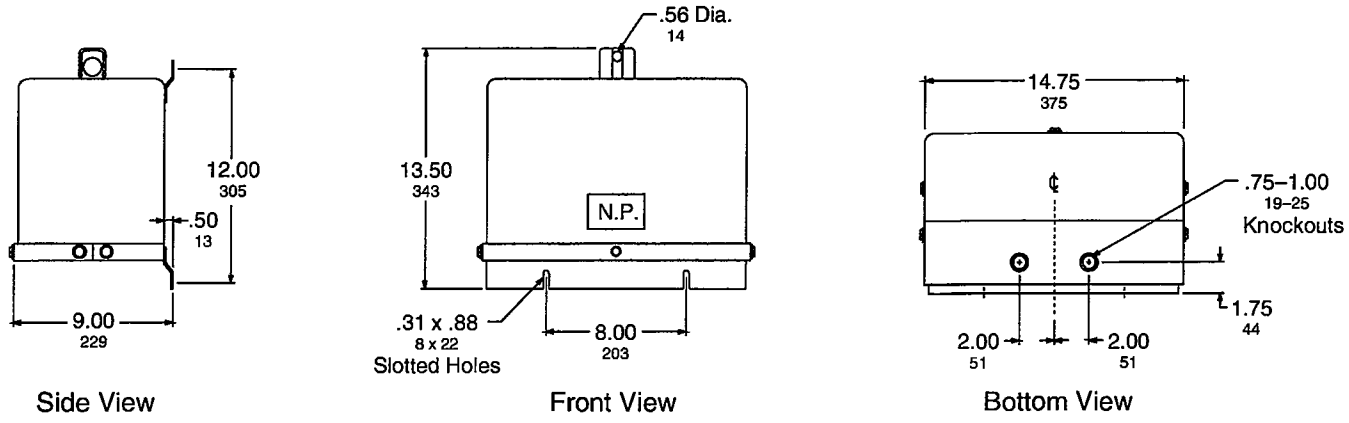
Enclosure 8A—General Purpose Transformer: 1.50 kVA—120/240 V Secondary Current



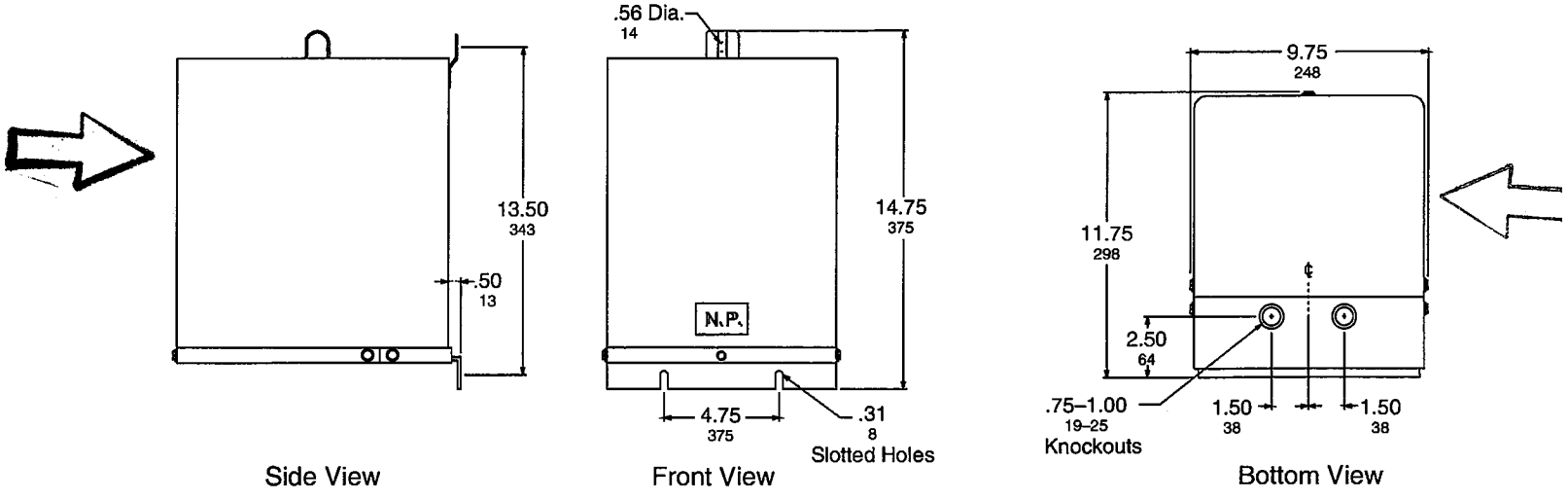
Enclosure 9A—General Purpose Transformer: 2.00 kVA—120/240 V Secondary Current



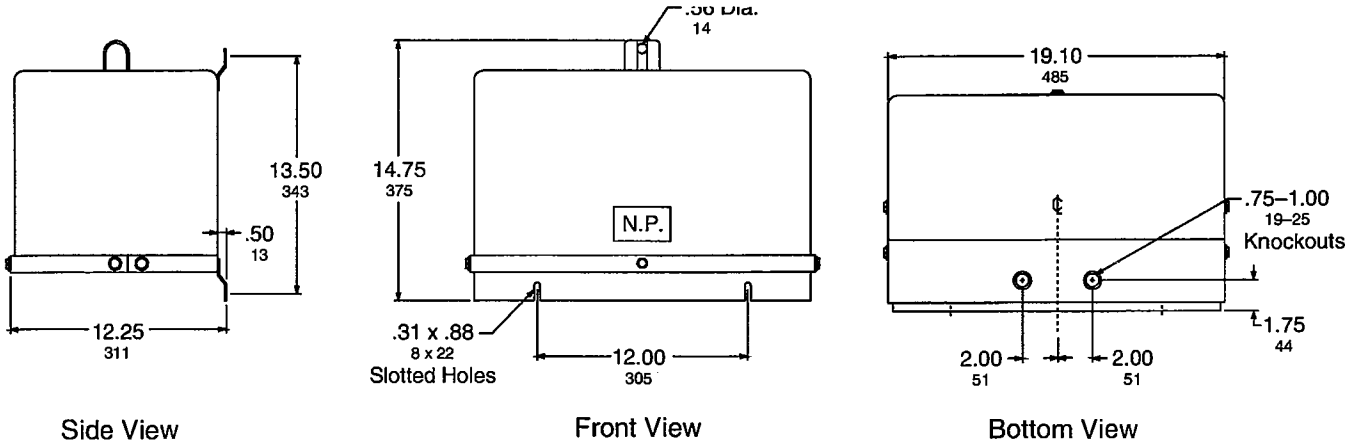
Enclosure 10A—General Purpose Transformer: 3.00 kVA—120/240 V Secondary Current



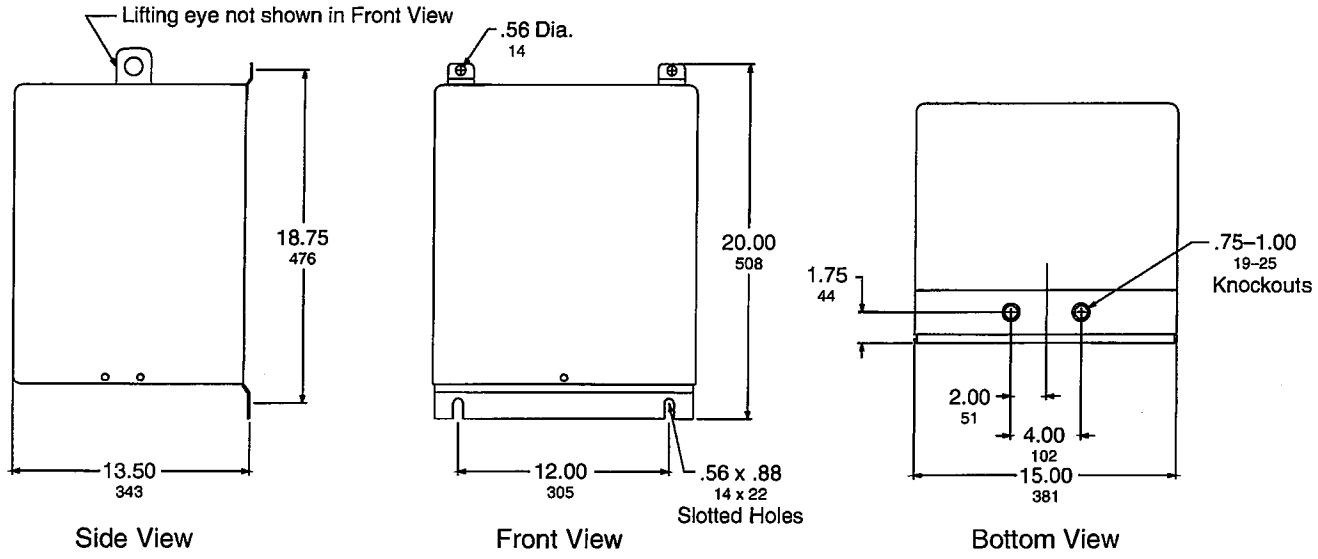
Enclosure 12C—Dry Type Transformer: 3.00–6.00 kVA—Encapsulated NEMA Type 3R



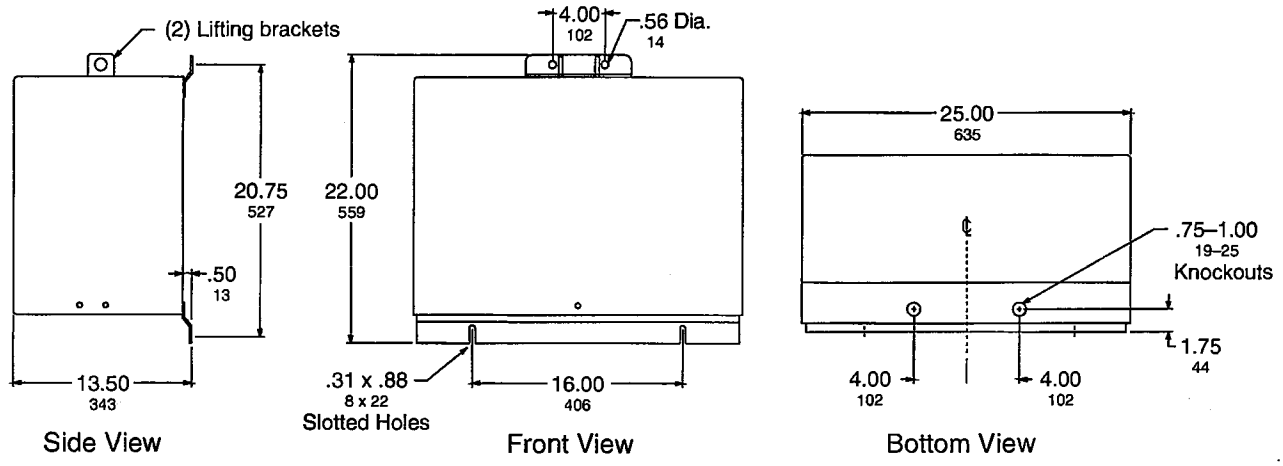
Enclosure 13B—General Purpose Transformer: 5.00–10.00 kVA—120/240 V Secondary Current



Enclosure 14C—Dry Type Transformer: 9.00–15.00 kVA—Encapsulated NEMA Type 3R

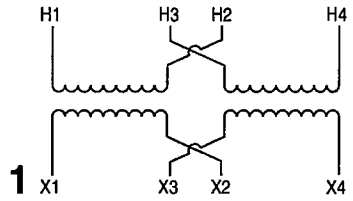


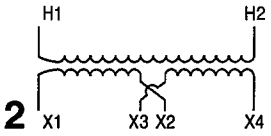
Enclosure 15B—General Purpose Transformer—Encapsulated NEMA Type 3R

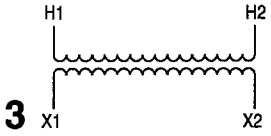


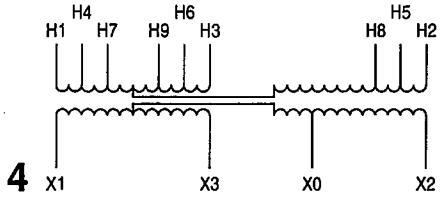
Enclosure 16C—Dry Type Transformer: 30.00 kVA—Encapsulated NEMA Type 3R

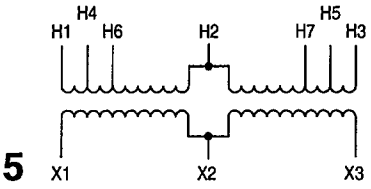
Wiring Diagrams

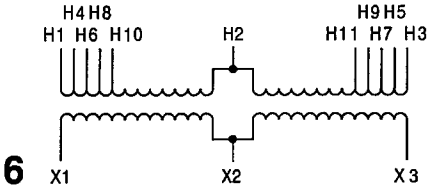


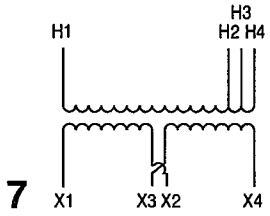


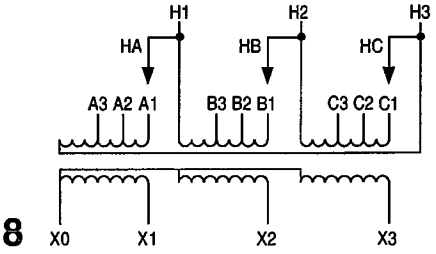


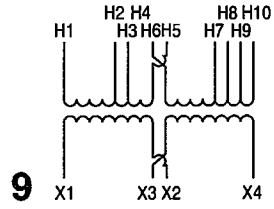












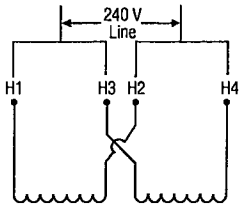
Application Data

NOTE: For transformers with non-standard kVA ratings, increase the size to the next largest standard rating.

Single-Phase Connections—240 x 480 to 120/240 V

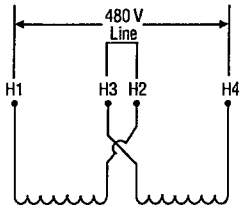
Primary Connections

240 V Service



Connect H1 and H3
Connect H2 and H4
Connect lines to H1-H3 and H2-H4

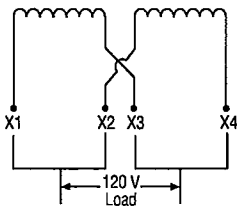
480 V Service



Connect H3 and H2
Connect H1 and H4
Connect lines to H1 and H4

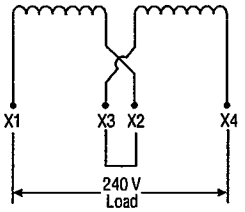
Secondary Connections

120 V 2-Wire Circuit



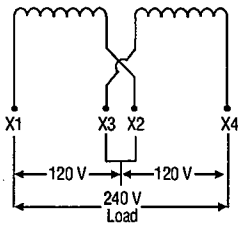
Connect X1 and X3
Connect X2 and X4
Connect Load to X1-X3 and X2-X4

240 V 2-Wire Circuit



Connect X3 and X2
Connect Load to X1 and X4

120/240 V 3-Wire Circuit

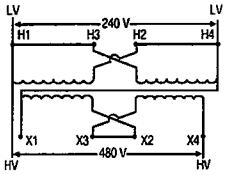


The junction of X3-X2 may be used as the neutral of a 3-wire system and must be bonded to the nearest earth ground per NEC requirements.

The following diagrams show special ways that standard 240 x 480-120/240 single phase transformers can be connected for special applications.

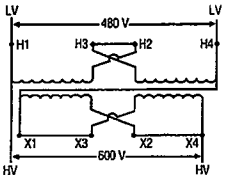
Single Unit Connected as Auto Transformer
240V to 480V
kVA Capacity = 2 x Nameplate kVA

$$\frac{\text{Load kVA}}{2} = \text{kVA Rating of Transformer Required}$$



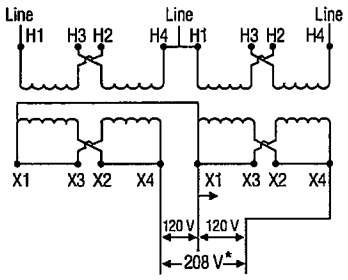
Single Unit Connected as Auto Transformer
480V to 600V
kVA Capacity = 5 x Nameplate kVA

$$\frac{\text{Load kVA}}{5} = \text{kVA Rating of Transformer Required}$$



Two unit transformers connected in "Hoppy Hookup" for single phase lighting and single phase power loads from three phase supply.

This connection allows changeover of existing single phase service to three phase service without changing existing lighting panels or secondary neutrals. The neutral current will be the same as with the original single phase service rather than increasing by the factor of 1.73 (= $\sqrt{3}$).



** Secondary voltage is 120/208 V, 3-wire only, NOT 120/240 V, 3-wire.*

NOTE: The primary common current will be the $\sqrt{3}$ x the current in the other two lines.

For 480 V primary—Connect H2 to H3 in each unit

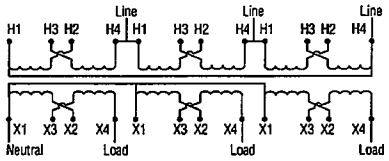
For 240 V primary—Connect H3 to H1 and H2 to H4 in each unit

Secondary kVA capacity = Total nameplate kVA of both transformers

Three Phase Connections

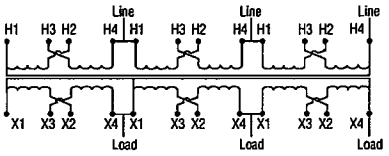
NOTE: For transformers with non-standard kVA ratings, increase the size to the next largest standard rating, using single phase 240 x 480 to 120/240.

Three Units Connected Delta-Wye



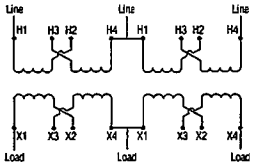
- For 480 V Delta primary—Connect H3 to H2 in each phase
- For 240 V Delta primary—Connect H3 to H1 and H2 to H4 in each phase
- For 416Y/240 V secondary—Connect X3 to X2 in each phase
- For 208Y/120 V secondary—Connect X3 to X1 and X2 to X4 in each phase
- Three phase kVA capacity = Total kVA of three units

Three Units Connected Delta-Delta



- For 480 V Delta primary—Connect H3 to H2 in each phase
- For 240 V Delta primary—Connect H3 to H1 and H2 to H4 in each phase
- For 240 V Delta secondary—Connect X3 to X2 in each phase
- For 120 V Delta secondary—Connect X3 to X1 and X2 to X4 in each phase
- Three phase kVA capacity = Total kVA of three units

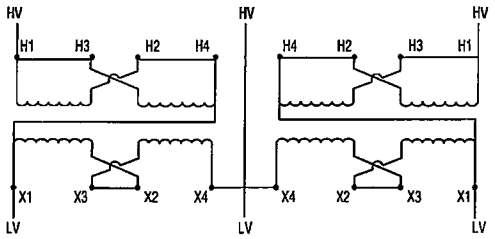
Two Units Connected Open-Delta



$$\frac{\text{Load kVA}}{1.73} = \text{kVA of Each Single Phase Unit}$$

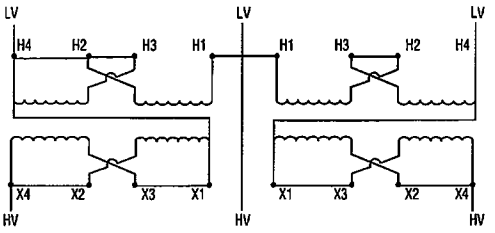
- For 480 V Delta primary—Connect H3 to H2 in each phase
- For 240 V Delta primary—Connect H3 to H1 and H2 to H4 in each phase
- For 240 V Delta secondary—Connect X3 to X2 in each phase
- For 120 V Delta secondary—Connect X3 to X1 and X2 to X4 in each phase
- Three Phase kVA capacity = Total kVA of Two units x 0.86

Two Units Connected as Open Delta Auto Transformer for Three Phase Operation for 240–480 or 480–240
kVA Capacity = (Total kVA of Both Units x 2) x .86



$$\frac{\text{Load kVA}}{3.44} = \text{kVA of Each Single Phase Unit}$$

Two Units Connected as Open-Delta Auto Transformer for Three Phase Operation for 600–480, 480–600, 480–380, or 380–480



kVA Capacity: 480–600; 600–480

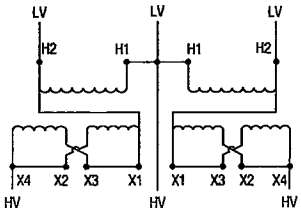
$$\frac{\text{Load kVA}}{8.6} = \text{kVA of Each Single Phase Unit}$$

kVA Capacity: 480–380; 380–480

$$\frac{\text{Load kVA}}{6.88} = \text{kVA of Each Single Phase Unit}$$

Two Units Connected as Open-Delta Auto Transformer for Three Phase Operation for 575–480 or 480–400

The following diagram shows special ways that standard 600–120/240 single phase transformers can be connected for special applications.



kVA Capacity: 575–480

$$\frac{\text{Load kVA}}{8.3} = \text{kVA of Each Single Phase Unit}$$

kVA Capacity: 480–400

$$\frac{\text{Load kVA}}{6.92} = \text{kVA of Each Single Phase Unit}$$

Specifications

Dry Type Resin Encapsulated Transformers (Sealed)

Part 1 General

1.01 Section Includes

A. Dry-type resin encapsulated distribution transformers with primary and secondary voltages up to 600 V, and capacity ratings from 3–30 kVA.

NOTE: Paragraphs and words marked in [ ] are alternates. Select only one.

1.02 References

A. NFPA 70 - National Electrical Code
B. NEMA ST20
C. UL 1561

1.03 Submittals

A. Suppliers asking consideration as an approved equal shall submit complete, warranted performance data and physical dimensions for similar transformers. Data shall be submitted for each size specified, and shall be received by the consultant engineer no less than 10 days prior to the bid due date for consideration.

1.04 Standards

A. Transformers shall be listed by Underwriters Laboratories.
B. Transformers shall conform to the requirements of ANSI/NFPA 70.
C. Transformers are to be manufactured and tested in accordance with NEMA ST20.

Part 2 Products

2.01 Manufacturers

A. Transformers shall be as manufactured by Schneider Electric or an approved equal.
B. Approved manufacturers shall be registered firms in accordance with ISO 9001:1994 SIC 3612 (US); which is the design and manufacture of low voltage dry type power, distribution and specialty transformers.

2.02 Ratings Information

A. All insulating materials are to exceed NEMA ST20 standards and be rated for a 180 °C UL-component-recognized insulation system.
B. Transformers shall be [115 °C] [80 °C] temperature rise above 40 °C ambient. [80 °C] rise transformers shall be capable of carrying a continuous 15% overload without exceeding 115 °C rise in a 40 °C ambient. Transformers 25 kVA and larger shall have a minimum of four 2.5% full capacity primary taps. Exact voltages and taps are to be as designated on the plans or the transformer schedule.
C. The maximum temperature of the top of the enclosure shall not exceed a 65 °C rise above a 40 °C ambient.
D. The transformer(s) shall be rated as indicated in the following schedule:

Identification Number(s)
kVA Rating
Voltages
Phase
Frequency

2.03 Construction

A. All cores are to be constructed of high-grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point.

B. Terminations shall consist of wire leads with a minimum insulation rating of 125 °C.

C. The transformer enclosures shall be non-ventilated and be fabricated of heavy gauge, sheet steel construction The entire enclosure shall be finished using a continuous process consisting of degreasing, cleaning, and phosphatizing by electrostatic deposition of polymer polyester powder coating, with a baking cycle to provide uniform coating of all edges and surfaces. The coating shall be UL recognized for outdoor use. The coating color shall be ANSI 49.

2.04 Sound Levels

A. Sound levels shall be warranted by the manufacturer not to exceed the following:

kVA Rating	dB Level
0–9	37
10–30	42
31–50	45
51–150	50
151–225	55

NOTE: Lower sound levels may be desirable for critical areas such as hospitals, schools, or office areas. Contact your local Schneider Electric representative for specific recommendations.

2.05 Optional Accessories

A. [Provide #316 stainless steel enclosure]

B. [Provide #304 stainless steel enclosure]

C. [Label for Class 1 Division 2, Temperature Class T3]

Part 3 Execution

3.01 Installation

A. Not used

Schneider Electric USA

1010 Airpark Center Drive
Nashville, TN 37217 USA
1-888-Square D
1-888-778-2733
www.us.SquareD.com

Replaces 7400CT9601, 09/1996

04/2008

SECTION 18
SQUARE D QO LOAD CENTER (BOM ITEM 6)

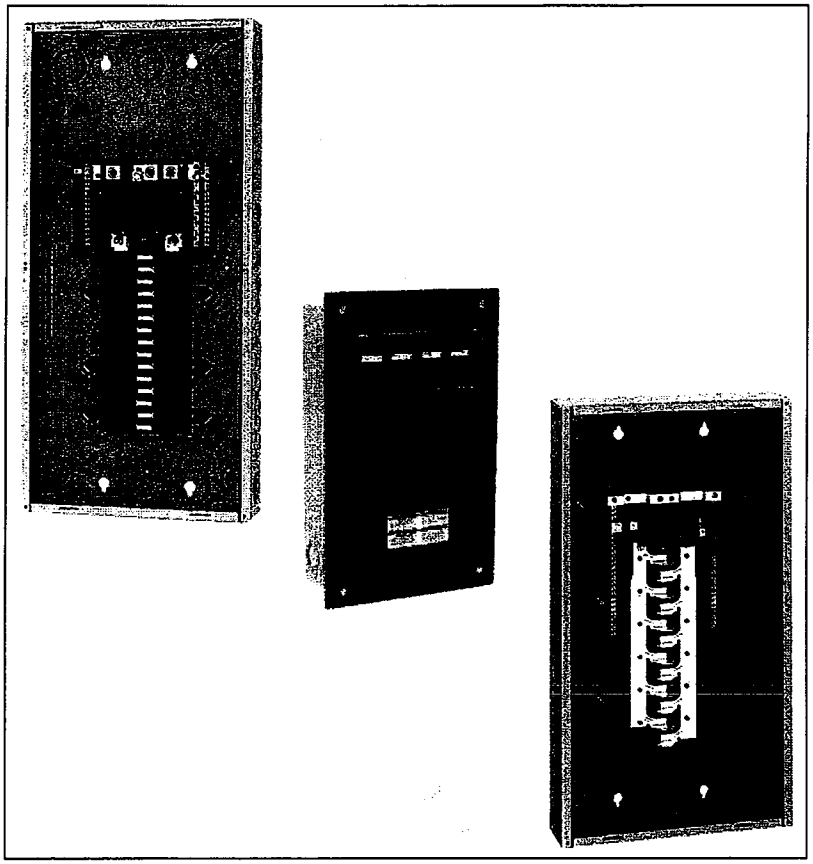
ITEM 6
LOAD CENTER ENCLOSURE
PN: QO116M100C
GROUND BAR
PN: PK16GTA

QO® and Homeline® Load Centers and Enclosures

Catalog
1100CT0501

2007

Class 1100



CONTENTS

a brand of Schneider Electric

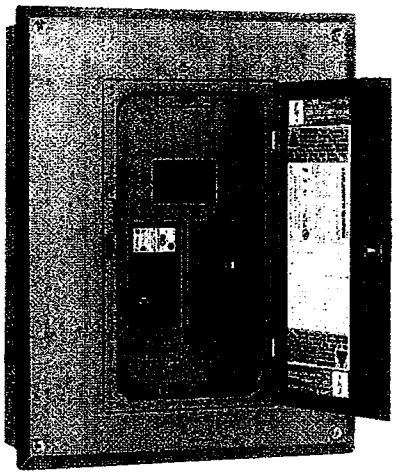
SQUARE D

TABLE OF CONTENTS

NOTE: For information on Replacement Parts with specific part numbers, go to www.schneider-electric.us, click on Product FAQ's, enter the device catalog number, click SEARCH, then look for the information required.

PRODUCT DESCRIPTION

QO® Circuit Breaker Load Centers from Square D® are Underwriters Laboratories (UL) Listed panelboards. They are designed to meet residential, commercial, and industrial requirements to protect electrical systems, equipment, and people.



QO® Circuit Breaker Load Center

Features

- Single- or three-phase construction
- 30 400 A main lug or main circuit breaker ratings
- 2 4 2 circuit indoor or outdoor versions
- Flush or surface mounting
- Aluminum bus construction on fixed mains panels
- Service entrance equipment capable panels
- Straight-in wiring to minimize service cable installation
- Convertible mains to meet changing job site requirements
- Standard 22/10 k AIR series rating on main circuit breaker panels, increasing application capability
- 65 k AIR ratings for main lugs panels for industrial applications
- 65 k AIR rating with optional main circuit breaker on three-phase panels for industrial applications
- Shielded one-piece plated copper bus construction on convertible mains panels, an industry exclusive for protection and performance
- Single captive screw interior mounting on indoor panels to ease removal
- Split branch neutral for clutter-free wiring
- Top or bottom feed by rotating convertible mains panels 180 degrees
- Top or bottom feed for three-phase convertible panels by removing main circuit breaker and rotating panel 180 degrees
- Combination slot/square drive neutral, ground, and cover screws for positive drive and improved torque
- Three grounding bar mounting locations for ease of wiring
- Automatic flush adjustment cover to speed installation
- Tangential main service knockouts that eliminate offsets
- Equipment grounding bar included with main lug load centers
- Covers sold separately
- Provisions for door lock on convertible mains panel covers
- Two branch circuit breaker twistouts that are factory removed for easier installation of circuit breakers
- Side hinge doors on outdoor convertible main panels
- Outdoor panel covers lockable with padlock
- Manual and automatic transfer switch capability

QO® and Homeline® Load Centers and Enclosures
Catalog Number Description

CATALOG NUMBER DESCRIPTION

QO® Load Centers

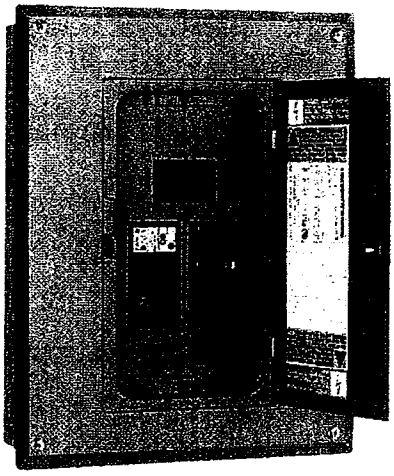
QO 1 16 M 100 C

Number Segment	Character	Description
Load Center Family	QO®	UL and NOM Listed
	CQO	CSA® Certified
Phase	1	Blank or 1 = Single
		3 = Three
Spaces / Circuits	3040	16
Mains Type	M	Main circuit breaker
	MX	Main circuit breaker for Automatic Transfer Switch
	L	Main lugs
	U	Universal mains (studs only)
Amperes	100	
Grounding Bar	Blank	Purchase separately
	G	Included
	N	Neutral installed
	T	Factory-installed
Cover	Blank	Purchase cover separately
	C	Combination flush / surface indoor cover
	DF	Flush cover with door
	DS	Surface cover with door
	F	Flush cover
	R	Rainproof
	RB	Rainproof for B hub
	S	Surface cover
Special Construction	CU	Copper bussing
	FT	Feed-thru lugs
	GP	Generator panel
	NM	Non-metallic enclosure
	R	Generator receptacle
	WG	Wide gutter riser panel

QO® Circuit Breakers

Number Segment	Character	Description
Brand	QO	Full Size
	QOT	Tandem
Number of Poles		
Amperes		
Device Name	Blank	10,000 AIR
	EPD	30 mA equipment ground fault protection
	GFI	Ground fault circuit interruption
	HID	For use on high intensity discharge lighting systems
	HM	High magnetic trip circuit breakers are recommended for applications where high initial inrush current may occur
	K	Key operated
	PL	Remote control switching capability
	SWN	Switch neutral common trip
	VH	22,000 AIR
	AFI	Arc fault circuit interruption
	CAFI	Combination arc fault circuit interruption

GENERAL INFORMATION AND APPLICATION DATA



QO® Circuit Breaker Load Center

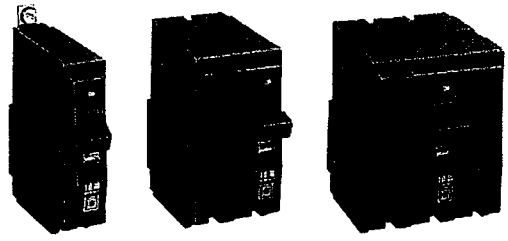
Circuit breaker load centers for use on electrical systems are UL Listed under File E-6294 (panelboards) and meet Federal Specifications W-P-115c, Type 1, Class 2 for use in government housing. Select from QO, QOT, QO-PL, QO-GFI (UL Class A ground fault protection), QO-AFI (arc fault circuit interrupter), QO-CAFI (combination arc fault interrupter), or QO-EPD (30 mA equipment ground fault protection) branch circuit breakers.

Service

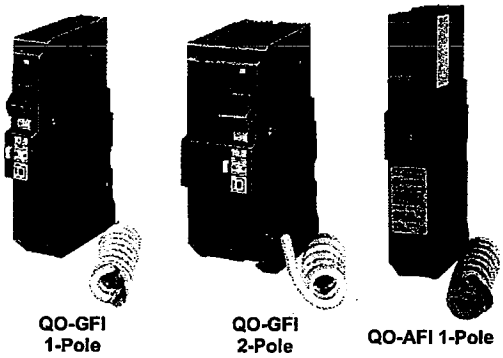
- 120 Vac, 1ϕ2W
- 120/240 Vac, 1ϕ3W
- 240 Vac delta, 3ϕ3W
- 208Y/120 Vac, 3ϕ4W
- 240/120 Vac delta, 3ϕ4W
- 240 Vac corner grounded delta, 3ϕ3W
- 48 Vdc maximum (1ϕ convertible main lug 12 4 2 circuit only)

Ratings

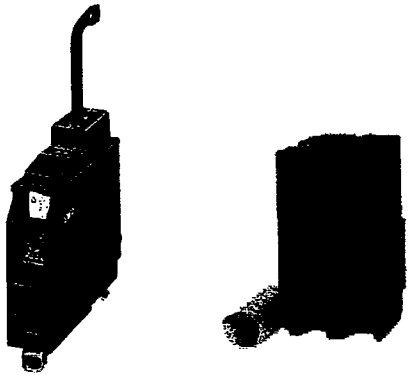
	Main Lugs	Main Circuit Breaker
Single-Phase	30 400 A	100 4 00 A
Three-Phase	60 225 A	100 2 25 A



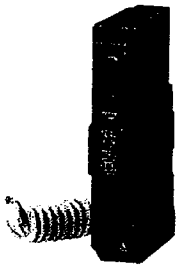
QO 1-Pole | QO 2-Pole | QO 3-Pole



QO-GFI 1-Pole | QO-GFI 2-Pole | QO-AFI 1-Pole

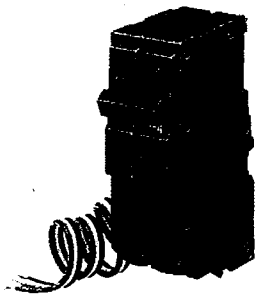


QOK, 1-Pole | QO-SWN, 1-Pole



QO-EPD 1-Pole

QO-CAFI 1-Pole

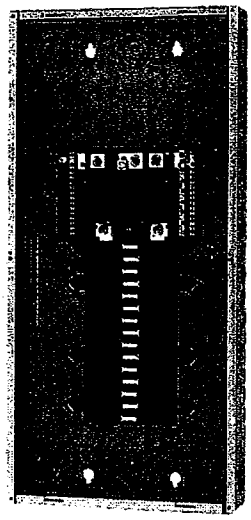


QO-PL 2-Pole

Branch Circuit Breakers

10,000 AIR	
QO	1-pole, 10 70 A
	2-pole, 10 12 5 A
	3-pole, 10 10 0 A
QOT	1-pole, 15 20 A
QO-EPD	1-pole, 15 30 A
	2-pole, 15 60 A
QO-GFI	1-pole, 15 30 A
	2-pole, 15 60 A
QO-AFI	1-pole, 15 20 A
QO-CAFI	1-pole, 15 20 A
QO-HID	1-pole, 15 50 A
	2-pole, 15 50 A
	3-pole, 15 30 A
QO-PL QO-PLILC	1-pole, 10 20 A, 30 A
	2-pole, 10 60 A
	3-pole, 15 60 A
QO-SWN	2-wire, 10 50 A
	3-wire, 10 50 A
QOK	1-pole, 10 30 A
22,000 AIR	
QO-VHGFI	1-pole, 15 30 A
QO-VH	1-pole, 15 30 A
	2-pole, 15 12 5 A
	3-pole, 15 10 0 A
QOB-VH	2-pole, 150 A [1]
	3-pole, 110 150 A [1]
42,000 AIR	
QOH	2-pole, 40 12 5 A
65,000 AIR	
QH	1-pole, 15 30 A
	2-pole, 15 30 A
	3-pole, 15 30 A

[1] For use with 300 A and 400 A load centers only. Requires PK3CA mounting kit, ordered separately.



QO130M150

Indoor Enclosures (Type 1)

Welded sheet steel with knockouts at top, bottom, back, and sides

Finish: gray baked enamel, electrodeposited over cleaned, phosphatized steel

Most 100 225 A indoor enclosures are 14.25 in. (362 mm) wide (see Dimensions and Knockouts on page 26)

300 A and 400 A indoor enclosures are 20 in. (508 mm) wide

Top or bottom feed by rotating enclosure

Indoor Covers

Doors to cover circuit breaker handles, except on 2 4, 4 8, 6 12 , and 8 16 circuit models

Shutter-type twistouts

Flush and surface covers available, sold separately

Flush covers have automatic flush adjustment

Field-installed door lock provisions available on most covers

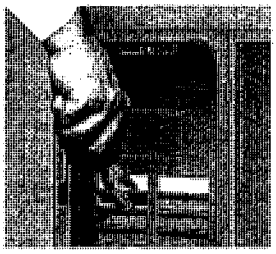
QOFP filler plates available for all covers

QOM1FP filler plates available for 100 1 25 A convertible load center covers

QOM2FP filler plates available for 150 2 25 A convertible load center covers

Q2FP filler plates available for 3-phase load center covers

Triple lead cover screws for fast cover installation



Indoor Cover

Rainproof Enclosures (Type 3R)

Complete enclosure includes interior trim and door

Welded, galvannealed steel

Finish: gray baked enamel, electrodeposited over cleaned, phosphatized, galvannealed steel

RB devices have provisions for interchangeable bolt-on hub

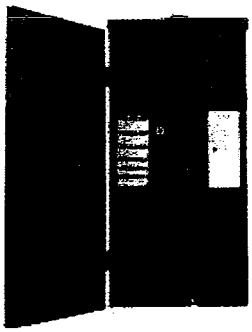
Top-centered rainproof mounting boss on the back of the enclosure simplifies installation and saves time

Stainless steel door latch on the enclosure provides secure closure and maximum durability

Convertible main panels are side-hinge door devices

Allow 1.25 in. (32 mm) on the left side for the door to open

Side-hinged door provides full wiring access without door removal

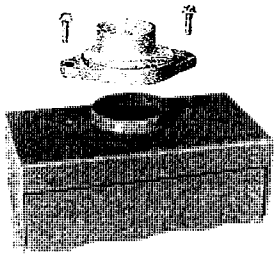


QO140M200RB

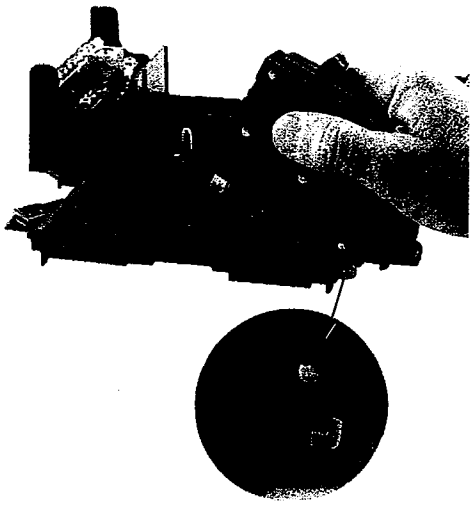
Bolt-On Hubs

Hubs available from 0.75 in. (19 mm) to 4 in. (102 mm) conduit size

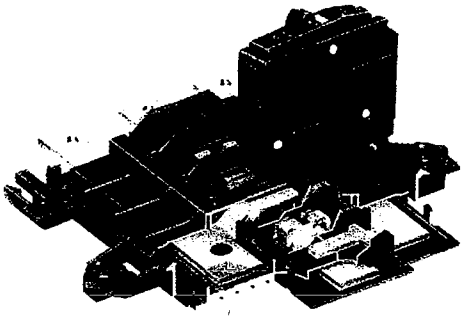
No gasket required with hubs from 0.75 in. (19 mm) to 2.50 in. (64 mm) when used on RB type load centers



Bolt-On Hubs



Tandem circuit breaker mounts on rails.



Branch Circuit Breaker

Class CTL

Class CTL load centers are UL Listed

Circuit breaker mounting rails have slots to accept tandem circuit breakers, on specified load centers

Meets paragraph 408.35 of the 2005 National Electrical Code® (NEC®)

Phasing

Load centers have distributed phase bussing

Most branch circuit breakers can be mounted in any position

Line Lugs

All lugs suitable for 75 °C copper or aluminum wires (see Main Lugs and Main Circuit Breaker Ratings on page 20)

Main lugs and main circuit breaker load centers have wire binding screw torque values on the wiring diagrams and circuit breaker labels

Neutral Assemblies

All lugs suitable for copper or aluminum wire (see Main Lugs and Main Circuit Breaker Ratings on page 20)

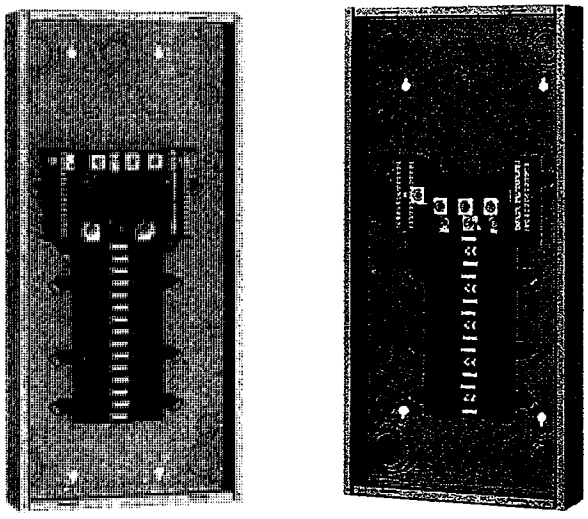
Branch neutral terminals suitable for one #14 #4 AWG copper or one #12 #4 AWG aluminum wire

Three #14 1/0 AWG copper or #14 #6 AWG aluminum terminals provided on 12 42 circuits, 100 225 A load centers

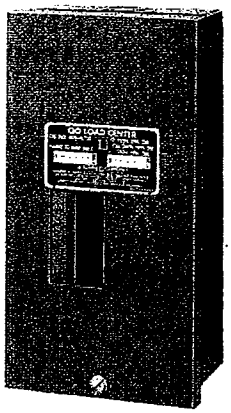
Suitable lugs provided on the neutrals for termination of the grounding conductor

All unused neutral terminals may be used to terminate bare or green equipment grounding conductors when the load center is used as service equipment:

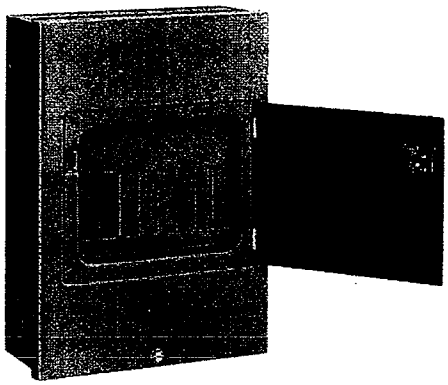
- one or two #14 # 12 AWG copper
- one or two #12 # 10 AWG aluminum



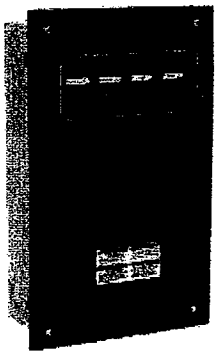
Neutral assemblies accept copper or aluminum wire.



QO24L70S



QO816L100DS



QO148L125GF

Single Phase, 2–16 Circuits, 30–125 A, Fixed Mains

UL Listed

File E-6294

Suitable for use as service equipment

75 °C wire rating (see Technical Information on page 20)

Federal Specification W-P-115c, Type 1, Class 2

CSA Certified

File LL-89066-21

For other CSA certified load centers, see Supplemental Digest 174.

Short Circuit Current Rating

UL short circuit current rating depends on lowest interrupting rating of circuit breaker installed (see Technical Information on page 20)

Interior

Tin plated aluminum bus

Tin plated copper bus is an available option on 6 12 and 8 16 circuit load centers

Tin plated copper bus is standard on 4 8 circuit load centers

Mains

Factory-installed main lugs

Top mains positioning only

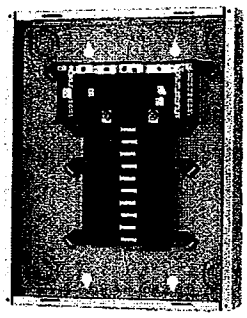
Top or bottom feed

A backfed main circuit breaker can be field-installed in 4 8 , 6 12 and 8 16 load centers using the PK2MB retaining kit

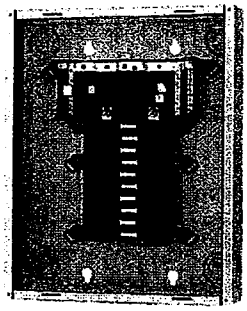
Cover

Flush- or surface-mounted cover included with load centers

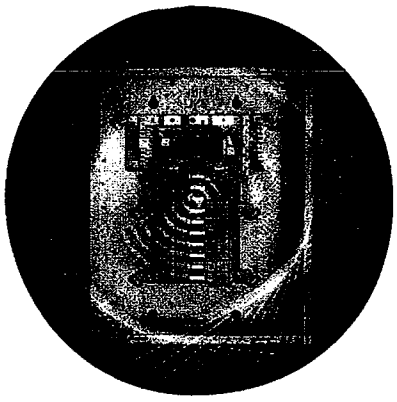
A cover with a door is an available option on 6 1 2 and 8 16 circuit load centers



Main Circuit Breaker



Main Lug



Top or bottom mains positioning. Rotate entire load center 180 degrees.

Single-Phase, 12–42 Circuits, 100–225 A, Convertible Mains

UL Listed

File E-6294

Federal Specification W-P-115c, Type 1, Class 2

Suitable for use as service equipment

75 °C wire rating (see Technical Information on page 20)

Short Circuit Current Rating

Main lugs: up to 65,000 AIR (depends on lowest interrupting rating of branch circuit breakers installed)

Main circuit breaker: 22,000 AIR standard

22,000 AIR main circuit breaker kits (refer to page 10 and Technical Information on page 20)

Interior

Shielded, one-piece tin plated copper bus

Removable interior with single, captive mounting screw

Split branch neutral with up to 50% more terminations than required

Multiple mounting locations for equipment grounding bar kits: left, right, and bottom

Main lugs load centers have equipment grounding bar kits included (not factory-installed)

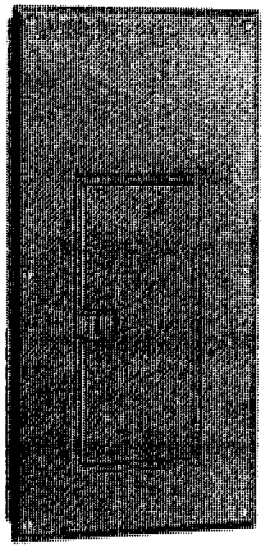
Mains

Factory-installed main lugs convertible to main circuit breaker

Load Center Amperage	Main Circuit Breaker Kit Amperage
125	50 125
150	100 15 0
200	100 20 0
225	100 22 5

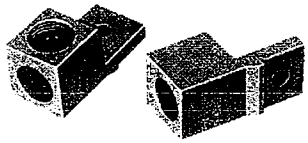
Factory-installed main circuit breaker convertible to main lugs

Main Circuit Breaker Amperage	Main Lug Kit Amperage	Load Center Amperage
100	125	100
125	125	125
150	225	150
200	225	200
225	225	225

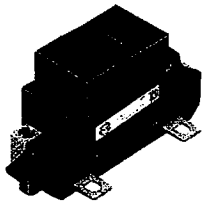


Cover

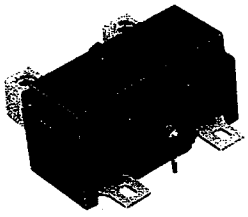
QOL125 Kit



QOL225 Kit



QOM1
Main Frame Size
50–125 A



QOM2
Main Frame Size
100–225 A

Single-Phase, 12–42 Circuits, 100–225 A, Convertible Mains, Continued

Covers

- Flush and surface covers sold separately
- Flush covers have spring-loaded interior trim for automatic flush adjustment
- Positive action, easy-open door latch

Main Lugs Kits

- Field-installable in main circuit breaker or main lugs load centers
- QOL125 kit for use in 100 125 A load centers
- QOL225 kit for use in 150 225 A load centers

Main Circuit Breaker Kits

- Field-installable in main lugs or main circuit breaker load centers
- 50 2 25 A main circuit breaker kit is 22,000 AIR series rated with 10,000 AIR branch circuit breakers

Field-Installable Main Circuit Breaker (Convertible Main Load Centers Only)

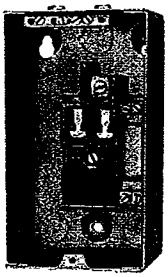
Main Circuit Breaker Ampere Rating [1]	Use with Convertible Load Center Mains Rating	22,000 AIR Main Circuit Breaker	Lug Wire Size [2] AWG/kcmil Al or Cu	Lug Torque lb-in. / N•m
QOM1 Frame Size				
50	100 125 A	QOM50VH	#12 2/0	50 lb-in. (6 N•m)
60	100 125 A	QOM60VH		
70	100 125 A	QOM70VH		
80	100 125 A	QOM80VH		
90	100 125 A	QOM90VH		
100	100 125 A	QOM100VH		
110	125 A	QOM110VH		
125	125 A	QOM125VH		
QOM2 Frame Size [3] [4]				
100	150 225 A	QOM2100VH	#4 30 0	250 lb-in. (28 N•m)
125	150 225 A	QOM2125VH		
150	150 225 A	QOM2150VH		
175	200 225 A	QOM2175VH		
200	200 225 A	QOM2200VH		
225	225 A	QOM2225VH		

1 Do not exceed the load center mains rating.

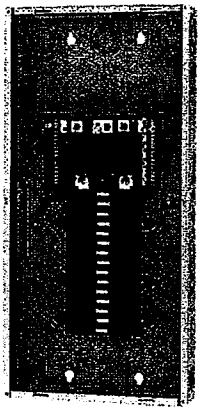
2 Wire range listed for QOM circuit breaker kits is the wire range of that circuit breaker. To find out maximum wire size permitted in a particular load center per UL, see Main Wire Size AWG/kcmil on page 20.

3 Add suffix 1021 for shunt trip.

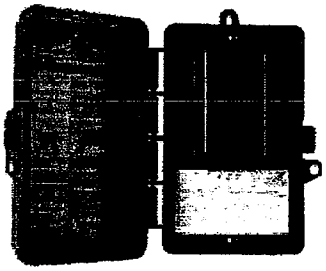
4 Add suffix 8041 for control wire taps.



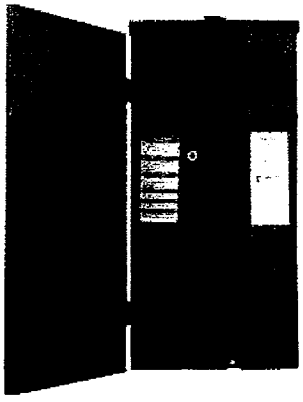
QO2L30TTS



QO130M150



QO24L60NRNM



QO1816M200FTRB

Special Purpose

Recreational Vehicle and Manufactured Housing Load Centers

- UL Listed (File E-6294) and CSA Certified (LL89066-14)
- Single-phase, 2- and 3-wire
- Factory-installed equipment grounding bar
- Covers included with load centers

Load Centers with Covers

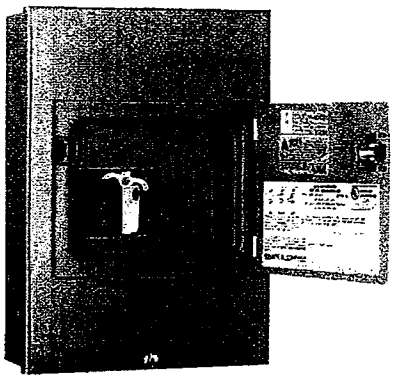
- Combination flush/surface cover included with load centers
- Equipment grounding bar included on main lug load centers
- Top or bottom feed on incoming service by rotating complete load center 180 degrees
- Convertible main load centers

Non-Metallic Load Center

- UL Listed
- Suitable for use as service equipment
- Side-hinge door device
- 10,000 AIR rating
- Single-phase, 2- and 3-wire
- Factory-installed grounding bar
- Cover included with load center
- Knockouts in bottom endwall, side and back

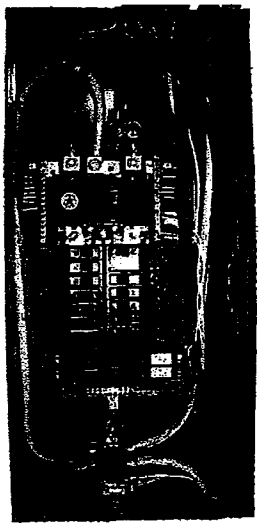
Main Circuit Breaker with Feed-Thru Lugs

- Available rainproof enclosure only
- Side hinge door devices
- Allow 1.25 in. (32 mm) on the left side for the door to open
- 125, 150, and 200 A mains rating
- 125, 150, and 200 A feed-thru lugs
- Space for up to 8 single-pole circuit breakers



QO48M60DSGP

QO® Intelligent Load Center



Wide Gutter

Generator Panels

Generator Panel Manu al Transfer

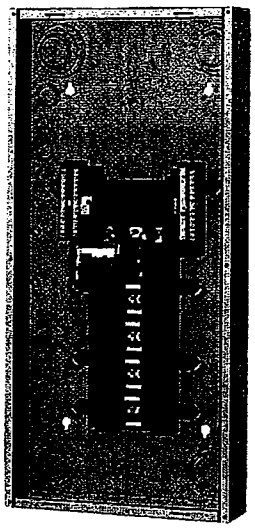
- Connects utility and standby power to installed branch circuits
- Includes two factory-installed 2-pole main circuit breakers tied together with a mechanical interlock
- 30 A and 60 A main circuit breaker versions
- Supply up to 8 branch circuits using tandem circuit breakers
- Available indoor enclosure only
- Cover with door included

Generator Panel Automatic Transfer

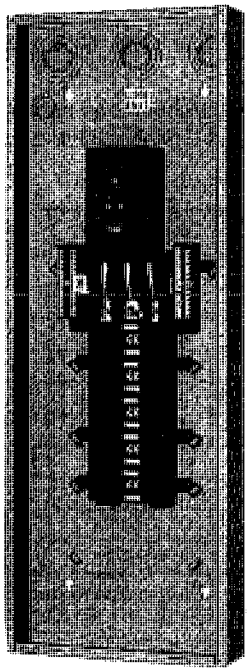
- QO® load center platform construction
- Automatic transfer from utility to back-up power source
- Transfer cycle less than 10 seconds
- Indoor and outdoor enclosures
- 120 / 240 Vac single-phase
- 150, 200 and 225 A main circuit breaker
- 42 circuit maximum construction, indoor, 28 circuit maximum outdoor
- 125 A maximum branch feeder connection to an alternative energy source
- Service entrance rated
- Manual override capability
- Easy removal of interior and transfer switch for rough in wiring
- 5-year limited warranty
- Compatible with standard load center field-installable accessories

Riser Panels

- Offset interior provides ample wire gutter space for high rise applications
- Factory-installed main lugs (125 A), convertible to main circuit breaker with standard QOC cover and optional Mono-Flat cover
- Factory-installed main lugs (200 A), convertible to main circuit breaker when used with QOC cover only
- Available in 12 to 40 circuits
- Indoor only
- Optional Mono-Flat® cover available for both 125 A and 200 A panels (sold separately)



QO330L200G



QO330MQ150

Three-Phase, 3–42 Circuits, 60–225 A, Convertible or Fixed Mains

UL Listed

- File E-6294
- Suitable for use as service equipment
- 75 °C wire rating (see Technical Information on page 19)

Short Circuit Current Rating

- Main lugs: up to 65,000 AIR (depends on lowest interrupting rating of branch circuit breakers installed)
- Main circuit breaker up to 225 A: 22,000 AIR standard; optional up to 65,000 AIR for 100 A to 225 A main circuit breakers

Mains

- Factory-installed main lugs or main circuit breaker
- Main neutral terminal located next to the phase terminals on 125 2 25 A main circuit breaker devices
- Top or bottom feed (see Technical Information on page 24)
- Fully convertible from main circuit breaker to main lugs (100 225 A)
- 100 A maximum back-fed main QO® circuit breaker; requires the use of retaining kit PK3MB

Cover

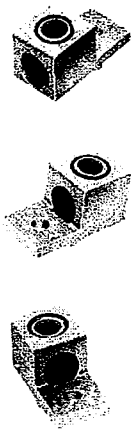
- Flush- and surface-mount covers sold separately
- Flush covers have spring-loaded interior trim for automatic flush adjustment
- Positive action, easy-to-open door latch

Interior

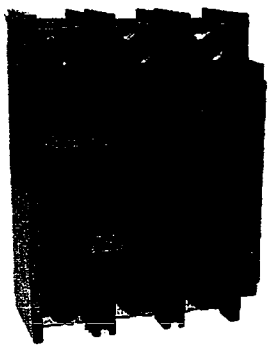
- Shielded one-piece plated copper bus on 100 2 25 A
- Removable interior with single, captive mounting screw on 100 22 5 A (indoor only)
- Main lugs load centers have equipment grounding bar kits included (not factory-installed)

Branch Neutral Termination

- Suitable for copper or aluminum wire
- Terminals suitable for one #14 #4 AWG coppe r or one #12 #4 AWG aluminum wire
- Positioned on both sides of the mains compartment
- Slot/square drive wire binding screws
- Three (3) #14 1 /0 AWG copper or #14 # 6 AWG aluminum terminations standard on 12 4 2 circuits, 100 22 5 A load centers



QOL3225
Main Lugs Kit



QDL Circuit Breaker
70–225 A

Three-Phase, 3–42 Circuits, 60–225 A, Convertible or Fixed Mains (Continued)

Main Lugs Kits

Field-installable in main circuit breaker or main lugs load centers

QOL3125 kit for use in 100 125 A load centers

QOL3225 kit for use in 150 225 A load centers

Main Circuit Breakers

Field-installable in main circuit breaker load centers

25,000 AIR QDL main circuit breakers series rated with 10,000 AIR QO® branch circuit breakers

100 225 A main circuit breakers are series rated up to 100,000 AIR (see table below) with 10,000 AIR branch circuit breakers in 30 circuit or larger main circuit breaker load centers with optional QJL main circuit breaker

Back-fed QO-VH (100 A maximum) main circuit breaker may be field installed in main lugs and main circuit breaker load centers (requires PK3MB retaining kit)

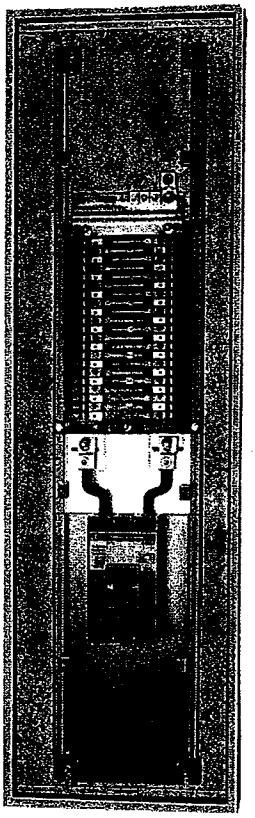
27 circuit, 100 A main circuit breaker load center includes factory-installed back-fed QO-VH main circuit breaker

Electrical accessories are not available on QDL, QGL, or QJL circuit breakers

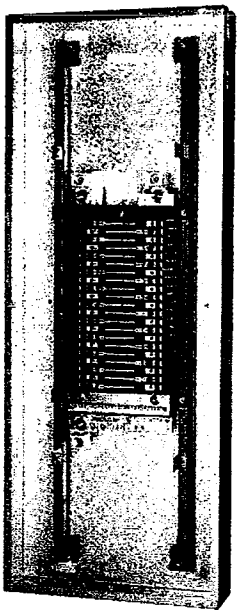
30 4 2 circuit, 125 22 5 A main circuit breaker load centers include integral QDL circuit breakers. Optional QGL and QJL circuit breakers available as shown:

Amperage	25,000 AIR	65,000 AIR	100,000 AIR [1]
70	QDL32070	QGL32070	QJL32070
80	QDL32080	QGL32080	QJL32080
90	QDL32090	QGL32090	QJL32090
100	QDL32100	QGL32100	QJL32100
110	QDL32110	QGL32110	QJL32110
125	QDL32125	QGL32125	QJL32125
150	QDL32150	QGL32150	QJL32150
175	QDL32175	QGL32175	QJL32175
200	QDL32200	QGL32200	QJL32200
225	QDL32225	QGL32225	QJL32225

[1] When these 3-pole circuit breakers are used as the main circuit breaker of a three-phase load center, the maximum AIR rating is 65,000 at 240 Vac and 100,000 at 208 Vac.



QON42MS400 and MH68



QON42LS400 and MH53

Single-Phase, 12–42 Circuits, 300–400 A, Fixed Mains

UL Listed

- File E-6294
- Suitable for use as service equipment
- 75 °C wire rating (see Technical Information on page 20)

Short Circuit Current Rating

- Main lugs: up to 65,000 AIR
- Main circuit breaker: 42,000 AIR fully rated (see Technical Information on page 20)

Mains

- Factory-installed main lugs and main circuit breaker
- Multiple wire terminals for phases and neutral
- Top or bottom mains positioning (see Technical Information on page 20)

Cover

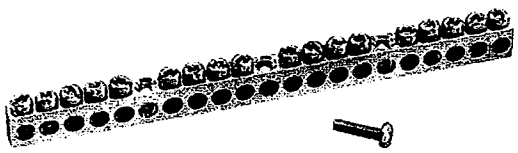
- Flush- and surface-mount covers sold separately

Interior

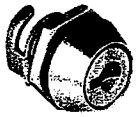
- Available in single-phase construction
- Interiors accept QO® and QOB-VH 110 150 A maximum circuit breakers (QOB-VH circuit breakers require connector kit PK3CA)
- Tin plated aluminum bus
- Tin plated copper connector fingers
- Neutral assemblies positioned opposite the mains compartment

Enclosures

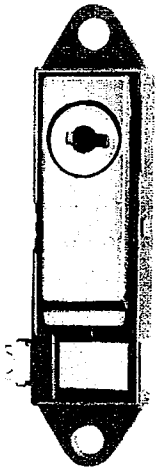
- 20 in. (508 mm) wide galvanized steel
- Embossed 0.25 in. (6 mm) standoffs
- End walls, one blank and one with knockouts, are standard; both are removable and interchangeable
- Embossed keyholes centered at both ends and in visual positioning
- Multiple grounding bar mounting locations
- Wire management braces



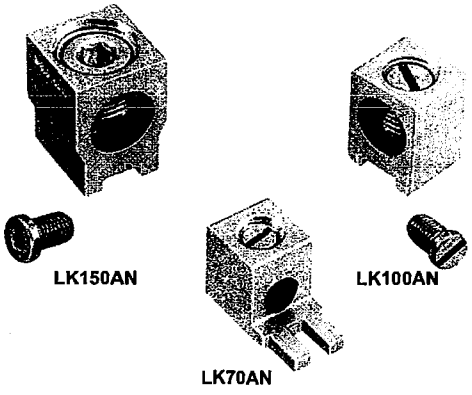
PG18GTA Grounding Bar Kit



PK6FL Flush Lock Kit



PK4FL Flush Lock Kit



Auxiliary Neutral Lugs

Accessories

Grounding Bar Kits

- Field-installable in all load centers
- Same wire size as terminals (see page 19)
- Suitable for copper or aluminum wire
- Available with #1 4/0 lug PK15GTA-L, PK18GTA-L, and PK23GTA-L (see page 19)

Flush Lock Kits

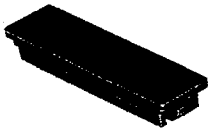
- Available for indoor load centers
- Two keys provided with each lock kit
- PK6FL for convertible 12 42 circuit load centers
- PK4FL for 300 and 400 A load centers

Auxiliary Neutral Lugs

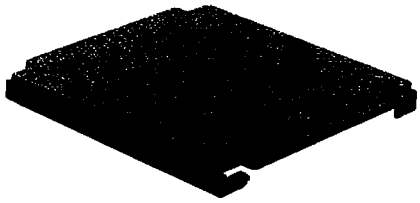
- UL Listed for copper or aluminum wire
- Field-installable on neutral assembly
  - LK70AN:#12 # 2 AWG Al or #14 #4 AWG Cu
  - LK100AN:#6 2 /0 AWG (Al/Cu)
  - LK125AN:#14 2/0 AWG (Al/Cu)
  - LK150AN:#2 3 /0 AWG (Al/Cu)
  - LK225AN:#4 3 00 kcmil (Al/Cu), use ONLY in Series S, 150 22 5 A QO® or Homeline® load center

Cover Filler Plates

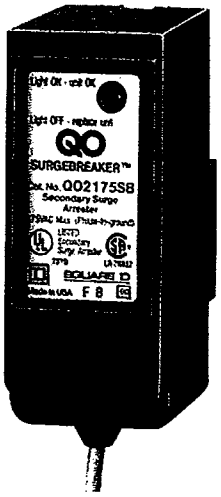
- Fast to install, snap-in type
- QOFP branch circuit
- QOM1FP for 70 125 A, single-phase, main circuit breakers
- QOM2FP for 150 22 5 A, single-phase, main circuit breakers
- Q2FP for 125 225 A, three-phase, main circuit breakers



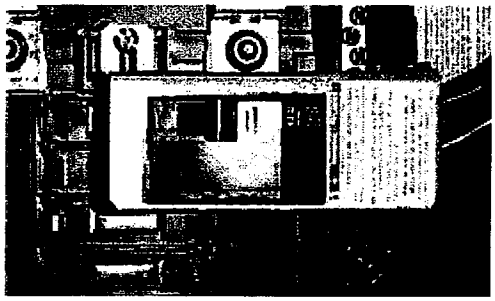
QOFP Cover Filler Plate



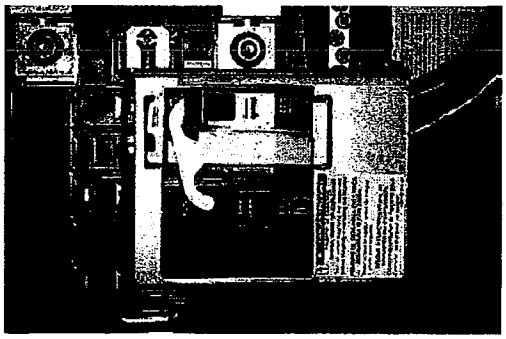
Q2FP Cover Filler Plate



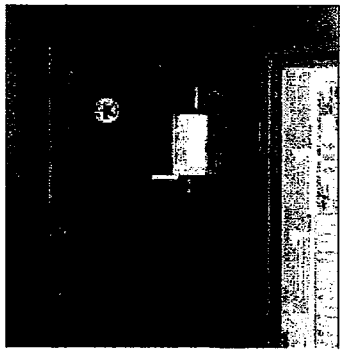
QO2175SB



Back-fed Main Circuit Breaker Retaining Kit (PK4MB2LA)



QO Manual Transfer Equipment Kit (PK4DTIM4HA)



Generator Interlock Kit Installed

Accessories (Continued)

Surgebreaker® Secondary Surge Arrester

- QO2175SB UL Listed secondary surge arrester
- Easy plug-on installation for QO® load centers
- LED indicates operational status
- Plug-on design requires two pole spaces
- Designed to protect electrical service and major household appliances, excluding electronic devices

Back-Fed Main Circuit Breaker Retaining Kits

Back-fed main circuit breaker retaining kits secure 2-pole, 10 125 A circuit breakers to single-phase or three-phase mains interiors when used as back-fed main circuit breakers. Mounting of retaining kits is based on top-feed applications.

Catalog No.	Description
PK2MB	QO 6 1 2, 4 8, and 8 16 loa d centers
PK3MB	Three-phase load centers
PK4MB2LA	Mounts on the right side of QO single-phase, 100 125 A convertible main load center, series S01 and S02. Retains one 2-pole QO circuit breaker with or without electrical accessories.
PK4MB2HA	Mounts on the right side of QO single-phase, 150 225 A convertible main load center, series S01 and S02. Retains one 2-pole QO circuit breaker with or without electrical accessories.

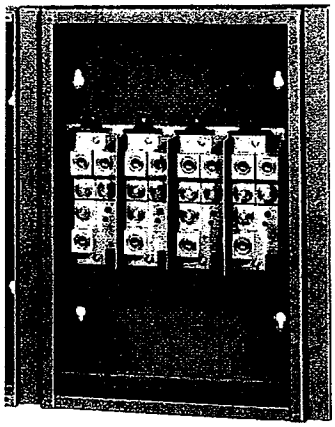
UL Listed Manual Transfer Equipment Kits

Manual transfer equipment kits secure two 2-pole, 10 125 A circuit breakers.

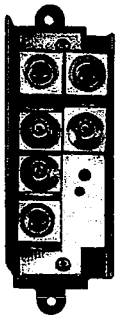
Catalog No.	Description
QO2DTI	For interlocking the handles of two 2-pole or one 2-pole and one 1-pole QO and Q1 circuit breakers mounted side-by-side so that only one circuit breaker can be ON at a time.
QO2DTIM	QO2DTI mechanical interlock attachment with retaining kits for securing two adjacent back-fed circuit breakers in dual power supply applications. Can be used with two 2-pole or one 2-pole and one 1-pole QO circuit breakers in QO816L100 load centers.
PK4DTIM4LA	Mounts on the right side of QO single-phase, 100 125 A convertible main load center, series S01 and S02. Retains two 2-pole QO circuit breakers with a QO2DTI kit included for dual power supply applications.
PK4DTIM4HA	Mounts on the right side of QO single-phase, 150 225 A convertible main load center, series S01 and S02. Retains two 2-pole QO circuit breakers with a QO2DTI kit included for dual power supply applications.
PK4DTIM4LAL	Mounts on the left side of QO single-phase, 100 1 25 A convertible main load center, series S01 and S02. Retains two 2-pole QO circuit breakers with a QO2DTI kit included for dual power supply applications.

Generator Circuit Breaker Interlock Kit

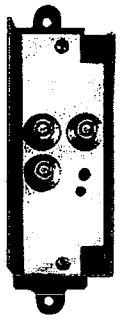
Catalog No.	Description
QOCRBGK1	For use on "G" and "S" Series NEMA Type 1 and "G", "S1" and "S2" Series NEMA Type 3R load centers. Interlocks a QOM1, 2-pole main circuit breaker of a load center (100-125 A) with a QO, 2-pole (15-125 A) branch circuit breaker. Includes a retaining kit.
QOCGK2	For use on G and S Series NEMA Type 1 and G and S1 Series NEMA Type 3R load centers. Interlocks a QOM2, 2-pole main circuit breaker of a load center (150 22 5 A) with a QO 2-pole (15 12 5 A) branch circuit breaker. Includes a retaining kit.
QORBGK2	For use on S2 Series NEMA Type 3R load centers. Interlocks a QOM2 2-pole main circuit breaker of a load center (150 225 A) with a QO 2-pole (15 1 25 A) branch circuit breaker. Includes a retaining kit.



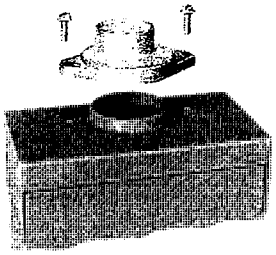
SDAG26
With Tap Kits Installed



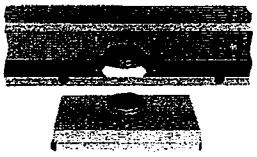
Tap Kit with
Mechanical Lugs



Tap Kit for
Crimp Lugs



RB Hub



BC200 Enclosure Coupling

Accessories (Continued)

Auxiliary Gutters and Tap Kits

Field-installable on the left or right side of load centers

Auxiliary gutters are 13.50 in. wide x 26.12 in. height x 3.75 in. deep

Conduit riser sizes: 1-3/4, 2, 2-1/2 or 3 in. (3 in. requires use of B300 bolt-on hubs)

Flush cover included with auxiliary gutter

Tap kits required for each riser wire to be tapped (see below for tap kits)

Wire range on tap kits is #4 AWG to 300 kcmil copper or aluminum

Tap kits include mechanical-type lugs or studs for crimp-type lugs

Crimp-type lugs not included in tap kits (order separately)

Auxiliary Gutter (SDAG26) to Load Center Catalog Number Reference

QO® Single-Phase	QO112L125G QO11224L125G QO112L125GC QO11224L125GC QO116L125G QO11624L125G QO120L125G QO12024L125G QO124L125G QO120L125GC	QO112M100 QO116M100 QO120M100 QO124M100 QO124M125 QO112M100C QO11220M100C QO116M100C QO120M100C
QO® Three-Phase	QO312L125G QO320L125G QO324L125G	

Tap Kits

UL Listed for Use with Auxiliary Gutter SDAG26				
Riser Wire			Tap Off Wire	
Catalog Number	Lug Type	Wire Size	Lug Type	Wire Size
SDGT30020	Mechanical	(2) #6 AWG 3 00 kcmil	Mechanical	(1) #6 AWG 2 /0 AWG
SDGT300300	Mechanical	(2) #6 AWG 3 00 kcmil	Mechanical	(1) #6 AWG 30 0 kcmil
SDGT300C10C	Crimp	(2) #4 AWG 3 00 kcmil	Crimp	(1) #8 AWG 1 /0 AWG
SDGT300C300C	Crimp	(2) #4 AWG 3 00 kcmil	Crimp	(1) #4 AWG 30 0 kcmil
QOGL20 (grounding lugs)	Mechanical	(2) #6 AWG 2/0 AWG		

Auxiliary Gutter UL Listed for Use with Standard Load Centers for Riser Applications								
	SDAG26	Flush	No	N/A	See Tap Kit			No

Bolt-On Hubs

Equipment with an RB suffix, meaning Rainproof Type 3R construction, uses the bolt-on hubs listed below. RB devices will accept 0.75 in. (19 mm) through 2.50 in. (64 mm) bolt-on hubs without the use of reducers. Off-center conduit thread openings and elongated mounting holes provide quick and easy adjustment to eliminate costly conduit offsets and bends. Hubs are suitable for use with conduit having ANSI standard taper pipe thread.

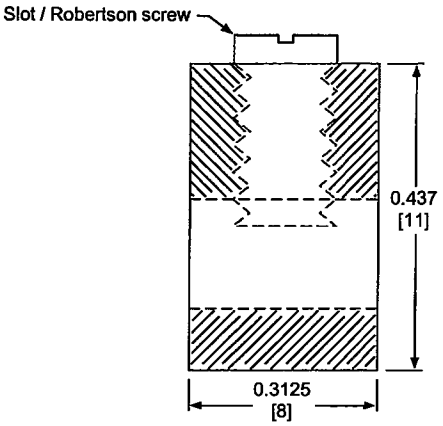
UL Listed Bolt-On Hubs for RB Devices

Conduit Size	0.75 in. 19 mm	1.00 in. 25 mm	1.25 in. 32 mm	1.50 in. 38 mm	2.00 in. 51 mm	2.50 in. 64 mm
Hub Cat. No.	B075	B100	B125	B150	B200	B250

NOTE: Closing cap (catalog number B-CAP) is provided factory-installed on each device having the RB suffix.

UL Listed Enclosure Coupling for RB Devices

Cat. No.	
BC200	Designed for connecting wireway or other enclosures to units having RB bolt-on conduit provisions. Provides a bushed opening equal to 2 inch conduit. Eliminates the need for conduit nippling.



Cross Section of Size 1 Ground Bar

Dimensions: in. [mm]

TECHNICAL INFORMATION

Grounding Bar Kits

All PK equipment grounding kits are supplied with mounting screws, necessary installation instructions, and an Equipment Grounding Terminal self-adhesive label.

Catalog Number	Total Qty.	Terminals: Quantity Each Size See "Wire Range Table" below.						Approximate Overall Length		Distance Between Mounting Holes		Mounting
		I	II	III	IV	V	VI	in.	mm	in.	mm	
PK0GTA2[1]	2						2	1.75	44	One hole	One hole	Top
PK0GTA6[2]	6					6		4.61	117	1.69	43	Top
PK3GTA1[3]	3	3						1.38	35	One hole	One hole	Top
PK4GTA[3]	4	4						1.63	41	One hole	One hole	Top
PK5GTA[4]	5	5						2.25	57	1.25	32	Top
PK7GTA[3]	7	7						2.88	73	1.25	32	Top or side
PK9GTA1[3]	9	9						3.25	83	One hole	One hole	Top
PK9GTA[3]	9	9						3.78	96	3.13	80	Top
PK12GTA[3]	12	12						4.70	119	3.13	80	Top
PK15GTA[3]	15	15						5.63	143	3.13	80	Top
PK15GTAL[5]	16	15	1					8.13	207	3.13	80	Top
PK15GTA6[6]	21	15			6			5.88	149	[7]	[7]	Top
PK18GTA[3]	18	18						6.56	167	3.13	80	Top
PK18GTAL[5]	19	18	1					8.81	224	3.13	80	Top
PK23GTA[3]	23	23						8.11	206	3.13	80	Top
PK23GTAL[5]	24	23	1					9.44	240	3.13	80	Top
PK27GTA[3,8]	27 or 26	27 26		1				9.36	238	3.13	80	Top

1 Mounting screw 40205-065-01 (one required).

2 Mounting screw 21922-18360 (two required).

3 Mounting screw 21594-14220 (two required).

4 Mounting screw 21594-14241 (two required).

5 Mounting screw 21594-14302 (two required).

6 Mounting screws 21594-14241(two required) and 21594-17121(two required).

7 3.13 in. (80 mm) on small terminals; 5.25 in. (133 mm) on large terminals.

8 PK27GTA includes one main grounding lug that mounts with two terminal screws and requires three terminals for mounting.

Size	Cu (AWG)	Al (AWG)
I	(1) #14 # 4 or (2) #14 or #12	(1) #12 #4 or (2) #12 or #10
II	(1) #1 4/ 0	(1) #1 4/0
III	(1) #6 2/ 0	(1) #6 2/0
IV	(1) #6 3/ 0	(1) #6 3/0
V	(1) #14 1 /0	(1) #14 1/0
VI	(1) #10 2/0	(1) #6 2 /0

QO® Circuit Breaker Load Centers—Class 1130
Technical Information
Main Lugs and Main Circuit Breaker Ratings

Single-Phase, Three-Wire, 120/240 Vac; Main Lugs Indoor

Mains Rating in Amps	Load Center Catalog Number	Load Center Cover Catalog Number	UL Listed Service Equipment (See notes)	Maximum UL Short Circuit Rating [1]	Main Wire Size AWG/kcmil Al/Cu	Enclosure No. (Page 26)	Top or Bottom Mains Position	UL Listed for Corner Grounded Delta Systems
Fixed Mains – Factory-Installed Main Lugs								
30	QO2L30S	Included	No	10,000 A	#12 10 Al #14 10 Cu	1	Top	No
70	QO24L70F/S	Included	B	10,000 A	#12 3 Al #14 4 Cu	2	Top	No
100	QO612L100F/S	Included	B, C	10,000 A	#8 1	4	Top	No
	QO612L100DF/S	Included	B, C	10,000 A	#8 1	4	Top	
	QO612L100DFCU/SCU	Included	B, C	10,000 A	#8 1	4	Top	
100	QO816L100F/S	Included	B, C	10,000 A	#8 1	4	Top	No
	QO816L100DF/S	Included	B, C	10,000 A	#8 1	4	Top	
	QO816L100DFCU/SCU	Included	B, C	10,000 A	#8 1	4	Top	
125	QO148L125GF/S	Included	B, C	10,000 A	#12 2 /0 Al #14 2/ 0 Cu	21	Top	No
Convertible Mains – Factory-Installed Main Lugs **QOM1 Main Frame Size – Convertible to Main Circuit Breaker – Copper Bus**								
125	QO112L125G	QOC16UF/S	B, C	65,000 A [2 3]	#6 2/ 0	6	Both	Yes
	QO11224L125G	QOC16UF/S	B, C	65,000 A [2 3]	#6 2/ 0	6	Both	
	QO116L125G	QOC24UF/S	B, C	65,000 A [2 3]	#6 2/ 0	7	Both	
	QO11624L125G	QOC24UF/S	B, C	65,000 A [2 3]	#6 2/ 0	7	Both	
	QO120L125G	QOC24UF/S	B	65,000 A [2 3]	#6 2/ 0	7	Both	
	QO12024L125G	QOC24UF/S	B	65,000 A [2 3]	#6 2/ 0	7	Both	
	QO124L125G	QOC24UF/S	B	65,000 A [2 3]	#6 2/ 0	7	Both	
	QO132L125G	QOC32UF/S	B	65,000 A [2 3]	#6 2/ 0	8	Both	
Convertible Mains – Factory-Installed Main Lugs **QOM2 Main Frame Size – Convertible to Main Circuit Breaker – Copper Bus**								
150	QO12030L125G	QOC30UF/S	B, C	65,000 A [2 3]	#6 25 0	9	Both	Yes
	QO124L150G	QOC30UF/S	B, C	65,000 A [2 3]	#6 25 0	9	Both	
	QO130L150G	QOC30UF/S	B, C	65,000 A [2 3]	#6 25 0	9	Both	
200	QO112L200G	QOC30UF/S	B, C	65,000 A [2 3]	#6 25 0	9	Both	Yes
	QO12436L200TFT	QOC40UF/S	B, C	65,000 A [2 3]	#6 25 0	10	Both	
	QO130L200G	QOC30UF/S	B, C	65,000 A [2 3]	#6 25 0	9	Both	
	QO13040L200G	QOC30UF/S	B, C	65,000 A [2 3]	#6 25 0	9	Both	
	QO140L200G	QOC40UF/S	B, C	65,000 A [2 3]	#6 25 0	10	Both	
225	QO142L225G	QOC42UF/S	B	65,000 A [2 3]	#6 30 0	11	Both	Yes
Fixed Mains – Factory-Installed Main Lugs								
400	QON12LS400 (Interior)	MHC50VF/S	C	65,000 A [4]	(1)1/0 750	15	Both	Yes
	MH50 (Enclosure)				(2)1/0 300			
	QON30LS400 (Interior)	MHC50QVF/S	No	65,000 A [4]	(1)1/0 750	15	Both	Yes
	MH50 (Enclosure)				(2)1/0 300			
	QON42LS400 (Interior)	MHC53QVF/S	No	65,000 A [4]	(1)1/0 750	17	Both	Yes
	MH53 (Enclosure)				(2)1/0 300			

1 Short circuit current rating depends on lowest AIR rating of main or branch circuit breaker installed.

2 UL Listed for 5000 A rms symmetrical short circuit rating when used in 3-phase, 240 Vac, corner grounded Delta systems, when used as main lugs load center **only**. Use 240 Vac circuit breakers only.

3 22,000 A rms symmetrical maximum when supplied by integral type QOM-VH main circuit breaker from Square D® with 22,000 A rms symmetrical minimum interrupting rating and when all installed QO® branch circuit breakers have 10,000 A rms symmetrical minimum interrupting rating.

4 UL Listed for 5000 A rms symmetrical short circuit rating when used on 3-phase, 240 Vac, corner grounded Delta systems. Use 240 Vac circuit breakers only.

B UL Listed as suitable for use as service equipment (neutral bonded at the time of installation) with field-installed service disconnect.

C UL Listed as suitable for use as service equipment (neutral bonded at the time of installation) when not more than six service disconnecting means are provided and when not used as a lighting and appliance branch circuit panelboard.

Single-Phase, Three-Wire, 120/240 Vac; Main Circuit Breaker Ind oor

Mains Rating in Amps	Load Center Catalog Number	Load Center Cover Catalog Number	UL Listed Service Equipment (See Notes)	Maximum UL Short Circuit Rating[1]	MainWireSize AWG/kcmil Al/Cu	Enclosure No. (Page 26)	Top or Bottom Mains Position	UL Listed for Corner Grounded Delta Systems
Convertible Mains – Factory-Installed Main Circuit Breaker **QOM1 Main Frame Size – Convertible to Main Lugs or Lower Amperage Main Circuit Breaker – Copper Bus**								
100	QO112M100	QOC12UF/S	A, B	22,000 A [2]	#4 1	5	Both	No
	QO116M100	QOC20U100F/S	A, B	22,000 A [2]	#4 1	6	Both	
	QO120M100	QOC20U100F/S	A, B	22,000 A [2]	#4 1	6	Both	
	QO124M100	QOC24UF/S	A, B	22,000 A [2]	#4 1	7	Both	
	QO132M100	QOC32UF	A, B	22,000 A [2]	#4 1	8	Both	
125	QO124M125	QOC24UF/S	A, B	22,000 A [2]	#4 2/0	7	Both	No
	QO132M125	QOC32UF	A, B	22,000 A [2]	#4 2/0	8	Both	
Convertible Mains – Factory-Installed Main Circuit Breaker **QOM2 Main Frame Size – Convertible to Main Lugs or Lower Amperage Main Circuit Breaker – Copper Bus**								
150	QO12030M150	QOC30UF/S	A, B	22,000 A [2]	#4 250	9	Both	No
	QO124M150	QOC30UF/S	A, B	22,000 A [2]	#4 250	9	Both	
	QO130M150	QOC30UF/S	A, B	22,000 A [2]	#4 250	9	Both	
	QO132M150	QOC40UF/S	A, B	22,000 A [2]	#4 250	10	Both	
200	QO12040M200	QOC30UF/S	A, B	22,000 A [2]	#4 250	9	Both	No
	QO124M200	QOC30UF/S	A, B	22,000 A [2]	#4 250	9	Both	
	QO130M200	QOC30UF/S	A, B	22,000 A [2]	#4 250	9	Both	
	QO13040M200	QOC30UF/S	A, B	22,000 A [2]	#4 250	9	Both	
	QO140M200	QOC40UF/S	A, B	22,000 A [2]	#4 250	10	Both	
	QO142M200	QOC42UF/S	A, B	22,000 A [2]	#4 250	11	Both	
225	QO140M225	QOC42UF/S	A, B	22,000 A [2]	#4 300	11	Both	No
	QO142M225	QOC42UF/S	A, B	22,000 A [2]	#4 300	11	Both	
Fixed Mains – Factory-Installed Main Circuit Breaker								
300	QON42MS300	MHC68VF/S	A	42,000 A [3]	(1)#4 500	16	Both	Yes
	MH68 (Enclosure)				(2)#4 3/0			
400	QON42MS400	MHC68VF/S	A	42,000 A [3]	(1)#4 600	16	Both	Yes
	MH68 (Enclosure)				(2)#4 250			

1 Short circuit current rating depends on lowest AIR rating of main or branch circuit breaker installed.

2 22,000 A rms symmetrical maximum when supplied by integral type QOM-VH main circuit breaker from Square D® with 22,000 A rms symmetrical minimum interrupting rating and when all installed QO® branch circuit breakers have 10,0000 A rms symmetrical minimum interrupting rating. 65,000 A rms symmetrical maximum when main lugs kits are installed.

3 UL Listed for 5000 A rms symmetrical short circuit current rating when used in 3-phase, 240 Vac, corner grounded Delta systems. Use 240 Vac circuit breakers only.

A UL Listed as suitable for use as service equipment (neutral bonded at the time of installation) with factory-installed service disconnect.

B UL Listed as suitable for use as service equipment (neutral bonded at the time of installation) with field installed main lugs when not more than six disconnecting means are provided and when not used as a lighting and appliance branch circuit panelboard. See NEC Article for Lighting and Appliance Branch Circuit Panelboard.

QO® and Homeline® Load Centers and Enclosures
Technical Information

Single-Phase, Three-Wire, 120/240 Vac; Main Lugs Rainproof

Mains Rating in Amps	Load Center Catalog Number	Load Center Cover Catalog Number [1]	UL Listed Service Equipment (See Notes)	Maximum UL Short Circuit Rating [2]	Main Wire Size AWG/kcmil Al/Cu	Enclosure No. (Page 27)	Top or Bottom Mains Position	UL Listed for Corner Grounded Delta Systems
Fixed Mains – Factory-Installed Main Lugs								
40	QO2L40RB	Included	B	10,000 A	#12 6 #14 10	1R	Top	No
60	QO24L60NRNM	Included	B	10,000 A	#14 4	1NM	Top	No
70	QO24L70RB	Included	B	10,000 A	#12 3 #14 4	1R	Top	No
100	QO612L100RB	Included	B, C	10,000 A	#8 1	2R	Top	No
	QO612L100TRB	Included	B, C	10,000 A	#8 1	2R	Top	
	QO612L100RBCU	Included	B, C	10,000 A	#8 1	2R	Top	
100	QO816L100RB	Included	B, C	10,000 A	#8 1	2R	Top	No
	QO816L100RBCU	Included	B, C	10,000 A	#8 1	2R	Top	
125	QO148L125GRB	Included	B, C	10,000 A	#12 2/0 #14 2/0	15R	Top	No
Convertible Mains – Factory-Installed Main Lugs **QOM1 Main Frame Size – Convertible to Main Circuit Breaker – Copper Bus**								
125	QO112L125GRB	Included	B, C	65,000 A [3 4]	#6 2/0	3R	Top	Yes
	QO11224L125GRB	Included	B, C	65,000 A [3 4]	#6 2/0	3R	Top	
	QO11624L125GRB	Included	B, C	65,000 A [3 4]	#6 2/0	4R	Top	
	QO124L125GRB	Included	B, C	65,000 A [3 4]	#6 2/0	4R	Top	
Convertible Mains – Factory-Installed Main Lugs **QOM2 Main Frame Size – Convertible to Main Circuit Breaker – Copper Bus**								
150	QO130L150GRB	Included	B, C	65,000 A [3 4]	#6 250	6R	Top	Yes
200	QO112L200GRB	Included	B, C	65,000 A [3 4]	#6 250	5R	Top	Yes
	QO130L200GRB	Included	B, C	65,000 A [3 4]	#6 250	6R	Top	
	QO13040L200GRB	Included	B, C	65,000 A [3 4]	#6 250	6R	Top	
	QO140L200GRB	Included	B, C	65,000 A [3 4]	#6 250	7R	Top	Yes
225	QO142L225GRB	Included	B, C	65,000 A [3 4]	#6 300	8R	Top	Yes

1 Convertible mains load center has a side-hinge door. Allow 1.25 in. (32 mm) on the left side for the door to open.

2 Short circuit current rating depends on lowest AIR rating of main or branch circuit breaker installed.

3 UL Listed at 5000 A rms symmetrical short circuit current rating when used in 3-phase, corner grounded, Delta systems, when used as main lugs load center **only**. Use 240 Vac circuit breakers only.

4 22,000 A rms symmetrical maximum when supplied by integral type QOM-VH main circuit breaker from Square D® with 22,000 A rms symmetrical minimum interrupting rating and when all QO® installed branch circuit breakers have 10,000 A rms symmetrical minimum interrupting rating.

B UL Listed as suitable for use as service equipment (neutral bonded at the time of installation) with field-installed service disconnect.

C UL Listed as suitable for use as service equipment (neutral bonded at the time of installation) when not more than six service disconnecting means are provided and when not used as a lighting and appliance branch circuit panelboard. See NEC Article for Lighting and Appliance Branch Circuit Panelboard.

Single-Phase, Three-Wire, 120/240 Vac; Main Circuit Breaker Rainproof

Mains Rating in Amps	Load Center Catalog Number	Load Center Cover Catalog Number [1]	UL Listed Service Equipment (See Notes)	Maximum UL Short Circuit Rating [2]	Main Wire Size AWG/kcmil Al/Cu	Enclosure No. (Page 27)	Top or Bottom Mains Position	UL Listed for Corner Grounded Delta Systems
Convertible Mains – Factory-Installed Main Circuit Breaker QOM1 Main Frame Size – Convertible to Main Lugs or Lower Amperage Main Circuit Breaker – Copper Bus								
100	QO112M100RB	Included	A, D	22,000 A [3]	#6 2/0	3R	Top	No
	QO116M100RB	Included	A, D	22,000 A [3]	#6 2/0	4R	Top	
	QO120M100RB	Included	A, D	22,000 A [3]	#6 2/0	4R	Top	
125	QO124M125RB	Included	A, D	22,000 A [3]	#6 2/0	4R	Top	No
Convertible Mains – Factory-Installed Main Circuit Breaker QOM2 Main Frame Size – Convertible to Main Lugs or Lower Amperage Main Circuit Breaker – Copper Bus								
150	QO12030M150RB	Included	A, D	22,000 A [3]	#4 250	5R	Top	No
	QO130M150RB	Included	A, D	22,000 A [3]	#4 250	6R	Top	
200	QO12040M200RB	Included	A, D	22,000 A [3]	#4 250	5R	Top	No
	QO130M200RB	Included	A, D	22,000 A [3]	#4 250	6R	Top	
	QO140M200RB	Included	A, D	22,000 A [3]	#4 250	7R	Top	
Convertible Mains – Factory-Installed Main Circuit Breaker with Feed-Thru Lugs QOM1/QOM2 Frame Size – Convertible to Main Lugs or Lower Amperage Main Circuit Breaker – Copper Bus								
125	QO1612M125FTRB [4]	Included	A, D	22,000 A [3]	#4 2/0	3R	Top	No
150	QO1816M150FTRB [4]	Included	A, D	22,000 A [3]	#4 250	6R	Top	No
200	QO1816M200FTRB [4]	Included	A, D	22,000 A [3]	#4 250	6R	Top	No

1 Convertible mains load center has a side-hinge door. Allow 1.25 in. (32 mm) on the left side for the door to open.

2 Short circuit current rating depends on lowest AIR rating of main or branch circuit breaker installed.

3 22,000 A rms symmetrical maximum when supplied by integral type QOM-VH main circuit breaker from Square D® with 22,000 A rms symmetrical minimum interrupting rating and when all installed QO® branch circuit breakers have 10,000 A rms symmetrical minimum interrupting rating. 65,000 A rms symmetrical maximum when main lug kits installed.

4 QO1612M125FTRB provided with QOM1 frame main circuit breaker. QO1816M150/200FTRB provided with QOM2 frame main circuit breaker.

A UL Listed as suitable for use as service equipment (neutral bonded at time of installation) with factory-installed service disconnect.

D UL Listed as suitable for use as service equipment (neutral bonded at the time of installation) with field-installed main lugs when not more than six service disconnecting means are provided and when not used as a lighting and appliance branch circuit panelboard. See NEC Article for Lighting and Appliance Branch Circuit Panelboard.

3-Phase, 4-Wire, 208Y/120 Vac; 3-Phase, 4-Wire, 240/120 Vac, Delta;
3-Phase, 3-Wire, 240 Vac, Delta; Main Lugs, Main Circuit Breaker In door

Mains Rating in Amps	Load Center Catalog Number	Load Center Cover Catalog Number	UL Listed Service Equipment (See Notes)	Maximum UL Short Circuit Rating [1]	Main Wire Size AWG/kcmil Al/Cu		Enclosure No. (Page 26)	Top or Bottom Mains Position	UL Listed for Corner Grounded Delta Systems
Fixed Mains – Factory-Installed Main Lugs – Copper Bus									
60	QO403L60NF/S	Included	B	22,000 A [1]		#10-6	13	Top	No
125	QO312L125G [2]	QOC16UF/S	B, C	65,000 A [1]	#6 2 /0	#6 2/ 0	6	Both	No
	QO320L125G [2]	QOC24UF/S	B, C	65,000 A [1]	#6 2 /0	#6 2/ 0	7	Both	
	QO324L125G [2]	QOC24UF/S	B, C	65,000 A [1]	#6 2 /0	#6 2/ 0	7	Both	
200	QO318L200G [2]	QOC30UF/S	B, C	65,000 A [1]	#6 250	#6 2 50	9	Both	No
	QO330L200G [2]	QOC30UF/S	B, C	65,000 A [1]	#6 250	#6 2 50	9	Both	
225	QO342L225G [2]	QOC42UF/S	B	65,000 A [1]	#6 300	#6 3 00	11	Both	No
Convertible Mains – Factory-Installed QDL Main Circuit Breaker – Copper Bus									
100	QO327M100 [3]	QOC30UF/S	A, D	22,000 A	#4 2 /0	#4 2/ 0	9	Both	No
125	QO330MQ125 [2 4]	QOC342MQF/S	A, D	100,000 A [5 6]	#4 300	#4 3 00	12	H	No
150	QO330MQ150 [2 4]	QOC342MQF/S	A, D	100,000 A [5 6]	#4 300	#4 3 00	12	H	No
	QO342MQ150 [2 4]	QOC342MQF/S	A, D	100,000 A [5 6]	#4 300	#4 3 00	12	H	
200	QO330MQ200 [2 4]	QOC342MQF/S	A, D	100,000 A [5 6]	#4 300	#4 3 00	12	H	No
	QO342MQ200 [2 4]	QOC342MQF/S	A, D	100,000 A [5 6]	#4 300	#4 3 00	12	H	
225	QO342MQ225 [2 4]	QOC342MQF/S	A, D	100,000 A [5 6]	#4 300	#4 3 00	12	H	No

1 Short circuit current rating depends on lowest AIR rating of branch circuit breaker installed.

2 Certified to IEC 60439-1 for use on 415Y/240 Vac 3-phase 4-wire, 3,000 SCCR when QODX ... branch circuit breakers are used and 10,000 SCCR when QO...VS branch circuit breakers are used. CE marked.

3 Includes factory-installed back-fed QO3100VH main circuit breaker.

4 Mains positioning from top to bottom feed: first rotate the main circuit breaker 180 degrees, then rotate the complete load center 180 degrees.

5 100,000 A rms at 208 Vac symmetrical maximum when type QJL main circuit breaker from Square D® with 100,000 A rms minimum interrupting rating is installed and when all installed QO® and Q1 branch circuit breakers have 10,000 A rms symmetrical minimum interrupting rating.

6 25,000 A rms symmetrical maximum when supplied by integral type QDL main circuit breaker from Square D® with 25,000 A rms minimum interrupting rating and when all installed QO® and Q1 branch circuit breakers have 10,000 A rms symmetrical minimum interrupting rating.

A UL Listed as suitable for use as service equipment (neutral bonded at the time of installation) with factory-installed service disconnect.

B UL Listed as suitable for use as service equipment (neutral bonded at the time of installation) with field-installed service disconnect.

C UL Listed as suitable for use as service equipment (neutral bonded at the time of installation) when not more than six service disconnecting means are provided and when not used as a lighting and appliance branch circuit panelboard. See NEC Section 384-14.

D UL Listed as suitable for use as service equipment (neutral bonded at the time of installation) with field-installed main lugs, when not more than six service disconnecting means are provided and when not used as a lighting and appliance branch circuit panelboard. See NEC Article for Lighting and Appliance Branch Circuit Panelboard.

Mains Rating in Amps	Load Center Catalog Number	Load Center Cover Catalog Number	UL Listed Service Equipment (See Notes)	Maximum UL Short Circuit Rating [1]	MainWireSize AWG/kcmil Al/Cu	Enclosure No. (Pages 26 and 27)	Top or Bottom Mains Position	UL Listed for Corner Grounded Delta Systems
Load Center with Cover – 1-Phase, 3-Wire, 120/240 Vac – UL Listed; Complete QO® Load Center – Box, Interior and Combination Cover (in one package)								
Convertible Mains – Factory-Installed Main Lugs; QOM1 Main Frame Size – Convertible to Main Circuit Breaker – Copper Bus								
125	QO112L125GC	Included	B, C	65,000 A [2 3]	#4 2 /0	6	Both	Yes
	QO11224L125GC	Included	B, C	65,000 A [2 3]	#4 2 /0	6	Both	Yes
	QO120L125GC	Included	B, C	65,000 A [2 3]	#4 2 /0	7	Both	Yes
Convertible Mains – Factory-Installed Main Lugs; QOM2 Main Frame Size – Convertible to Main Circuit Breaker – Copper Bus								
150	QO130L150TC	Included	B, C	65,000 A [2 3]	#4 2 50	9	Both	Yes
200	QO13040L200GC	Included	B, C	65,000 A [2 3]	#4 2 50	9	Both	Yes
Convertible Mains – Factory-Installed Main Circuit Breaker – 22,000 RMS Symmetrical Amperes Short Circuit Current Rating QOM1 Main Frame Size – Convertible to Main Lugs – Copper Bus								
100	QO112M100C	Included	A, D	22,000 A [2]	#4-1/0	5	Both	Yes
	QO11220M100C	Included	A, D	22,000 A [2]	#4-1/0	5	Both	Yes
	QO116M100C	Included	A, D	22,000 A [2]	#4-1/0	6	Both	Yes
	QO120M100C	Included	A, D	22,000 A [2]	#4-1/0	6	Both	Yes
Convertible Mains – Factory-Installed Main Circuit Breaker – 22,000 RMS Sym. Amperes Short Circuit Current Rating QOM2 Main Frame Size – Convertible to Main Lugs – Copper Bus								
150	QO12030M150C	Included	A, D	22,000 A [2]	#4 2 50	9	Both	No
	QO130M150C	Included	A, D	22,000 A [2]	#4 2 50	9	Both	No
200 A	QO12040M200C	Included	A, D	22,000 A [2]	#4 2 50	9	Both	No
	QO130M200C	Included	A, D	22,000 A [2]	#4 2 50	9	Both	No
	QO13040M200C	Included	A, D	22,000 A [2]	#4 2 50	9	Both	No
	QO140M200C	Included	A, D	22,000 A [2]	#4 2 50	10	Both	No
Non-Metallic 1-Phase, 3-Wire, 120/240 Vac – Main Lugs Only								
60	QO24L60NRNM	Included	B, C	10,000 A	#14 4	1NM	Bottom	No
Riser, 1-Phase, 3-Wire, 120/240 Vac – Factory-Installed Main Lugs – Offset Interior Wide Gutter QOM1/QOM2 [4] Main Frame Size – Convertible to Main Circuit Breaker – Copper Bus [3]								
125	QO11224L125WG	QOC20UFWG	B, C	65,000 A [2]	#4 2 /0	14	Both	Yes
	QO12030L125WG		B	65,000 A [2]	#4 2 /0	14	Both	
200	QO13040L200WG	QOC30UFW	B, C	65,000 A	#4 2 50	23	Both	Yes
Generator Panel, 1-Phase, 3-Wire, 120/240 Vac – Factory-Installed Main Circuit Breakers with Mechanical Interlock								
30	QO48M30DSGP	Included	No	10,000 A	#14 8	4	Bottom	No
60	QO48M60DSGP		A	10,000 A	#8 2	4	Bottom	
Generator Panel - Use with Automatic Transfer Switch, 1-Phase, 3-Wire, 120 / 240 Vac, Factory- / Field-Installed Main Circuit Breaker – 22,000 RMS Sym. Amperes Short Circuit Current Rating [5]								
150	QO13842MX150	QOC38MXUF	A	22,000 A	#4-250	12	Both	No
200	QO13842MX200		A	22,000 A	#4-250	12	Both	No
225	QO13842MX225		A	22,000 A	#4-250	12	Both	No
	QO13842UX225		B	22,000 A	#4-250	12	Both	No
150	QO11428MX150FTRB[6]	Included	A	22,000 A	#4-250	7R	Both	No
200	QO11428MX200FTRB[6]	Included	A	22,000 A	#4-250	7R	Both	No
	QO11428UX200FTRB[6]	Included	B	22,000 A	#4-250	7R	Both	No

1 Short circuit current rating depends on lowest AIR rating of main or branch circuit breaker installed.

2 22,000 A rms symmetrical maximum when supplied by integral type QOM-VH main circuit breaker from Square D® with 22,000 A rms symmetrical minimum interrupting rating and when all installed QO® branch circuit breakers have 10,000 A rms symmetrical minimum interrupting rating.

3 UL Listed for 5000 A rms symmetrical short circuit rating when used in 3-phase, 240 Vac, corner grounded Delta systems, when used as main lugs load center **only**. Use QO-H 240 Vac circuit breakers only.

4 QOM2 Load Center is ONLY convertible to main circuit breaker when used with QOC cover.

5 One main circuit breaker is included with panel. Alternate source main circuit breaker (QO 125 A max.) must be ordered separately. Automatic transfer switch and generator kit for secondary power sources are ordered through a Kohler® authorized dealer or contractor.

6 Side-hinge door device allow 1.25 in. (32mm) on the left side for the door to open.

A UL Listed as suitable for use as service equipment (neutral bonded at the time of installation) with factory-installed service disconnect.

B UL Listed as suitable for use as service equipment (neutral bonded at the time of installation) with field-installed service disconnect.

C UL Listed as suitable for use as service equipment (neutral bonded at the time of installation) when not more than six service disconnecting means are provided and when not used as a lighting and appliance branch circuit panelboard. See NEC Article for Lighting and Appliance Branch Circuit Panelboard.

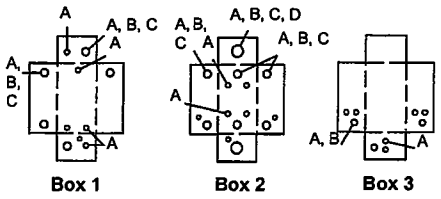
D UL Listed as suitable for use as service equipment (neutral bonded at the time of installation) with field-installed main lugs and not more than six service disconnecting means are provided and when not used as a lighting and appliance branch circuit panelboard. See NEC Article for Lighting and Appliance Branch Circuit Panelboard.

Box No.	Indoor Dimensions W in.	W mm	H in.	H mm	D in.	D mm
1	3.81	97	6.72	171	3.00	76
2	4.81	122	9.30	236	3.19	81
3	4.81	122	9.30	236	3.19	81
4	8.88	226	12.57	319	3.80	97
5	14.25	362	14.92	379	3.75	95
6	14.25	362	17.92	455	3.75	95
7	14.25	362	20.92	531	3.75	95
8	14.25	362	26.04	661	3.75	95
9	14.25	362	29.86	758	3.75	95
10	14.25	362	33.78	858	3.75	95
11	14.25	362	37.98	965	3.75	95
12	14.25	362	39.37	1000	3.75	95

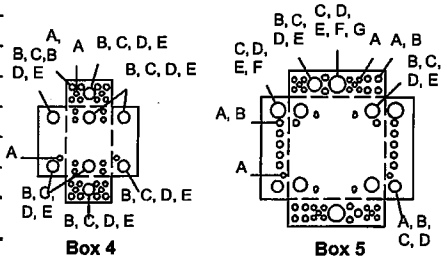
Box No.	Indoor Dimensions W in.	W mm	H in.	H mm	D in.	D mm
13	5.88	149	13.12	333	3.38	86
14	14.25	362	20.92	531	3.75	95
15	20.00	508	50.00	1270	5.75	146
16	20.00	508	68.00	1727	5.75	146
17	20.00	508	53.00	1346	5.75	146
18	5.88	149	16.12	409	3.38	86
19	7.56	192	23.12	587	4.25	108
20	9.62	244	26.12	663	4.75	121
21	8.88	226	14.80	376	3.80	97
22	8.55	217	23.92	608	3.95	100
23	14.25	362	29.86	758	3.75	95

Knockouts

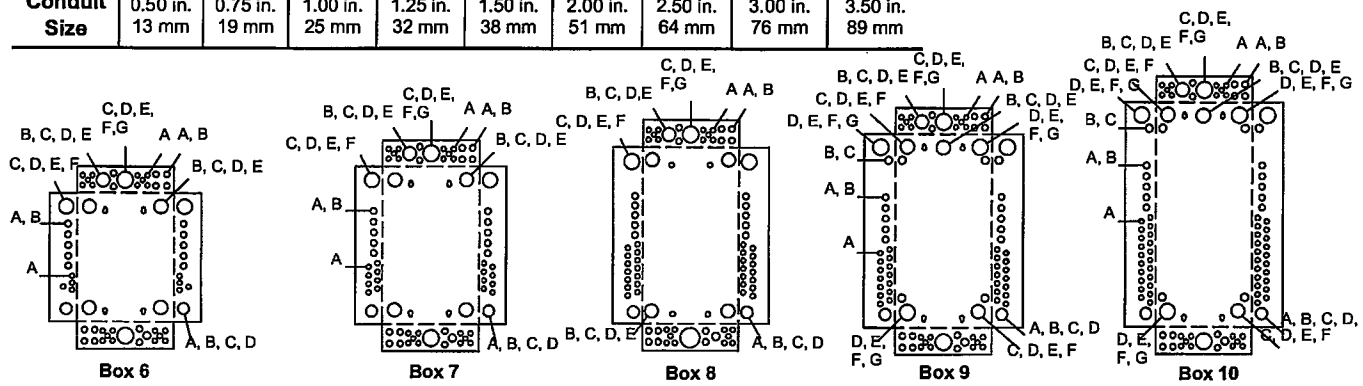
Symbol	A	B	C	D	E	F	G	H	I
Conduit Size	0.50 in. 13 mm	0.75 in. 19 mm	1.00 in. 25 mm	1.25 in. 32 mm	1.50 in. 38 mm	2.00 in. 51 mm	2.50 in. 64 mm	3.00 in. 76 mm	3.50 in. 89 mm



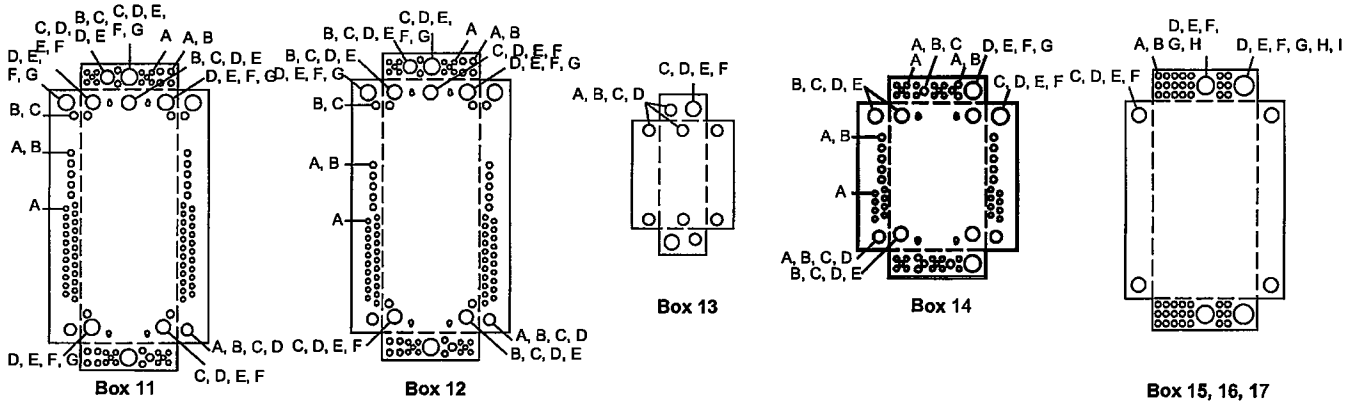
Box 1 Box 2 Box 3



Box 4 Box 5

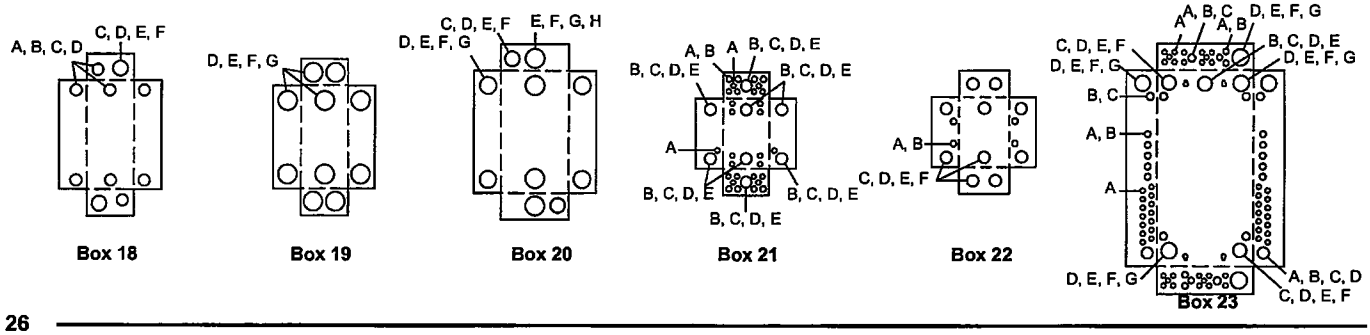


Box 6 Box 7 Box 8 Box 9 Box 10



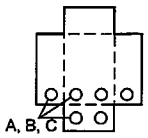
Box 11 Box 12 Box 13 Box 14

Box 15, 16, 17

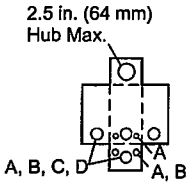


Box 18 Box 19 Box 20 Box 21 Box 22 Box 23

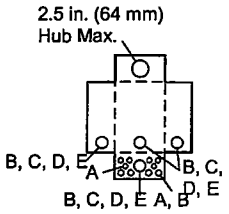
OUTDOOR DIMENSIONS AND KNOCKOUTS



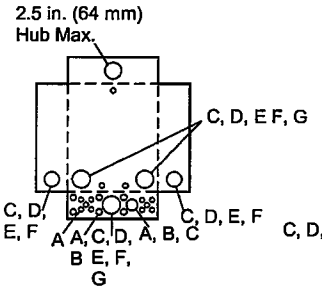
Box 1NM



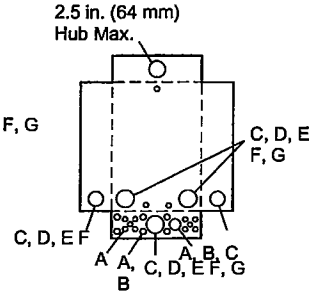
Box 1R



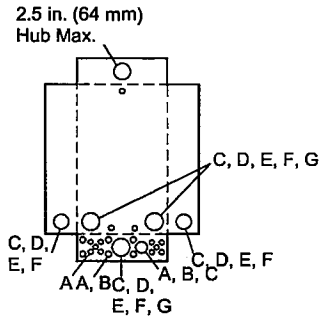
Box 2R



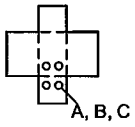
Box 3R, 4R



Box 5R



Box 6R, 7R, 8R



Box 9R

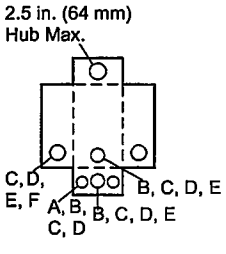
Outdoor Dimensions

Box No.	W		H		D	
	in.	mm	in.	mm	in.	mm
1NM	6.52	166	8.79	223	3.90	99
1R[1]	4.88	124	9.38	238	4.00	102
2R	8.88	226	12.65	321	4.27	108
3R	14.75	375	18.92	481	4.52	115
4R	14.75	375	22.06	560	4.52	115
5R	14.75	375	26.04	661	4.52	115
6R	14.75	375	29.86	758	4.52	115
7R	14.75	375	33.78	858	4.52	115
8R	14.75	375	37.98	965	4.52	115
9R	4.56	116	6.50	165	3.88	99
10R	6.92	176	13.18	335	4.12	105
11R	7.56	192	192	590	4.75	121
12R	9.62	244	26.24	666	5.50	140
13R	6.92	176	16.18	411	4.12	105
14R	14.75	375	39.37	1000	4.52	115
15R	8.88	226	14.80	376	4.27	108
16R	8.55	217	24.75	629	4.16	106

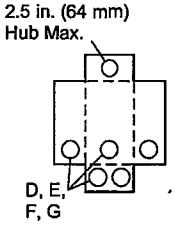
[1] HOME250SPA top endwall has no hub opening.

Knockouts

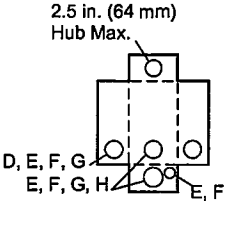
Symbol	A	B	C	D	E	F	G	H
Conduit Size	0.50 in. 13 mm	0.75 in. 19 mm	1.00 in. 25 mm	1.25 in. 32 mm	1.50 in. 38 mm	2.00 in. 51 mm	2.50 in. 64 mm	3.00 in. 76 mm



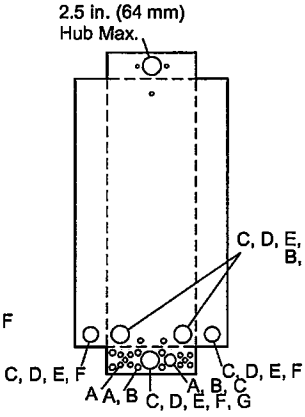
Box 10R, 13R



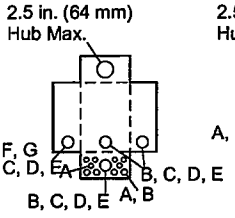
Box 11R



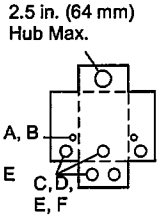
Box 12R



Box 14R



Box 15R



Box 16R

QO SINGLE-PHASE LABELS

The labels below represent typical labels. Information may not be applicable or may change without notice. See the actual label in the load center for the latest information.

QO Single-Phase Box Label Sample

Number of circuits maximum.
Enclosure catalog number.
Catalog number of covers; flush or surface.
See panelboard interior for the catalog number.
Voltage ratings.
Amperage rating.

Wire range for lug torque data table.

Short circuit ratings.
Short circuit ratings and additional of replacement circuit breakers.

UL Listing.

QO® LOAD CENTER

See Panelboard Interior for Catalog No.
Box Cat. No. / Caja No. de Catalogo: BX18C
Use Cover Cat. No. /
Utilice la Cubierta No. de Catalogo: QOC16US or/or QOC16UF
Mains 125A max.
Lina principal de 125A maximo.
See main or service disconnect rating if installed.
240 V ~ Max. 1Ø, 50 / 60 Hz.
24 circuit max. / 24 circuitos maximo.
Type 1 Enclosure
Gabinete Tipo 1
For installation, repairs or alterations, Call an electrical contractor or electrician.

LUG TORQUE DATA

See circuit breakers and field installed units for wire binding screw torque

	Wire Range (AWG/kcmil)	Torque (in/lbs.)
Line Neutral Lug	4 - 2/0 CU/AL	50
Main Lug	6 - 2/0 CU/AL	50
Alternate Main Breaker	See Main Breaker	See Main Breaker

Branch Neutral and Equipment Ground Bar

Wire Range (AWG)	Torque (in./lbs.) Bar with 2 screw sizes		Bar with 1 screw size
1/0 - 3 CU / AL	Large 50	Small	
4 CU / AL	Large 45	Small	35
6 CU / AL	Large 45	Small 25	35
8 CU / AL	Large 40	Small 10	25
10-14 CU, 10-12 AL	Large 35	Small 10	20

Equipment Ground Combinations

Two 14 or 12 CU, Two 12 AL	35	10	25
Two 10 AL	35		25

SHORT CIRCUIT RATING
RMS Symmetrical Amperes at 120 / 240 V ~ Maximum

Panel Rating	Remote Main	Integral Main	Branch (min.) Cat. prefix
*65,000	—	Lugs	65,000 / QH
*42,000	—	Lugs	42,000 / QOH
*22,000	—	Lugs	22,000 / QO..VH
*10,000	—	Lugs	10,000 / QO, QOT & Q1
**5,000	—	Lugs	5,000 / QO...H (2 pole)
100,000	–100-200A,300V T Fuse	Lugs	10,000 / QO & QOT
42,0000	QOH	Lugs	10,000 / QO & QOT
22,000	Q2...H, KD, QO...VH	Lugs	10,000 / QO & QOT
65,000	KG	Lugs	10,000 / QO & QOT
22,000	—	QOM...VH	10,000 / QO, QOT & Q1

** 240 v ~ 3Ph. 3W. Grounded B* phase requires 240 V ~ branch breakers.
* The rating is equal to the lowest interrupting rating of any circuit breaker installed. Refer to branch breaker for individual ratings. Additional or replacement branch circuit breakers, main breaker, or service disconnect MUST have an interrupting rating equal to or greater than that of the circuit breaker with the lowest interrupting rating presently installed. See panelboard interior for breaker types.

Underwriter's Laboratories, Inc.®
LISTED
Electric Cabinet Box
Issue No. V-2813

Install loose label with Spanish translation on back of cover.
Adhiera la etiqueta suelta con las traducciones en espanol en la parte posterior del frente.
Please read information before installing
Por favor lea la informacion antes de instalar.

SQUARE D COMPANY®
001021 15 40265-381-03

QO Single-Phase Wiring Diagram Sample

Service Equipment marking.
Use of unused neutral branch terminal for equipment grounding, service equipment application only.

Installation of back-fed main circuit breaker and required kit.
Alternate wiring diagram for main circuit breaker or main lug.

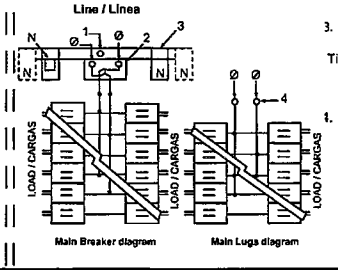
Type of circuit breakers from Square D that may be used in this panelboard.

Load center accessories.
Neutral lug for 1/0 AWG or larger wire.

Suitable for use with 75°C Copper or Aluminum main conductors. See branch breakers for branch wire ratings.

* Suitable for use as service equipment when service disconnect (main breaker) is installed.
* Suitable for use as service equipment when not more than six main disconnecting means are provided and when not used as a lighting and appliance branch circuit panelboard. See Article 384-14 of the NEC.
* When used as service equipment, all unused neutral terminals may be used for terminating equipment ground wires.

1. Box bonding when required. / Conexion a la caja cuando fuese necesario.
2. Main breaker type: QOM1 or QOM1A. / Interruptor automatico principal tipo: QOM1 o QOM1A.



3. Service ground when required. / Tierra de acometida cuando fuese necesario
4. Main lugs kit no: QOL125. / No. de accesorio de las zapatas principales: QOL125.

Two single poles. One plug on space or may use one single pole. One two pole requires two spaces.
Torque Note: When main breaker or main lug connector mounting nuts are loosened or removed, retighten to 75 lbs./in. torque.
Equipment Grounding Terminals

Load Center Accessories - Kits

PK4MB2LA	Back-fed Main Cir. Brkr. Retaining
QO2175SB	Plug-On Surge Arrestor *
SDSA1175	1 Phase Surge Arrestor
QOSAMK	SDSA1175 Mounting Bracket
QOL2125	1 Phase Plug-on Subfeed Lugs *
PK9–27GTA(L)	Equipment Ground Bar
PKGTAB	Equipment Ground Bar Insulator
LK70AN	70A Max. Neutral Lug
LK100AN	125A Max. Neutral Lug
QOL125	Main Lugs
PK6FL	Indoor Cover Lock

* May plug on two adjacent spaces.

Torque Note: When interior mounting screw is loosened or removed, retighten to 35 lbs./in.

SQUARE D COMPANY®
Made in U.S.A. 15 40265-668-02

QO THREE-PHASE LABEL SAMPLES

The labels below represent typical labels. Information may not be applicable or may change without notice. See the actual label in the load center for the latest information.

QO Three-Phase Box Label Sample

Number of circuits maximum.
Enclosure catalog number.
Catalog number of covers; flush or surface.
See panelboard interior for the catalog number.
Voltage ratings.
Amperage rating.

Wire range for lug torque data table.

Short circuit ratings.
Short circuit ratings and additional of replacement circuit breakers.

UL Listing.

QO® LOAD CENTER
See Panelboard interior for Catalog No.
Box Cat. No. / Caja No. de Catalogo:
BX338C
Use Cover Cat. No. /
Utilice la Cubierta No. de Catalogo:
QOC42US or/or QOC42UF
Mains 225A / Lina principal de 225A maximo.
See main or service disconnect rating if installed.
240 V ~ Max. 3Ø, 50 / 60 Hz.
42 circuit max. / 42 circuitos maximo.
Type 1 Enclosure
Gabinete Tipo 1
240V, 3PH, 3W: For this system neutral is not used and only breakers rated 240V are to be used. 240V, 3PH, 4W: When wired for delta system, phase "B" must be 208V to neutral. Breaker poles connected to phase "B" must be rated 240V. 1PH: Single pole breakers can not be connected to phase B.

LUG TORQUE DATA
See circuit breakers and field installed units for wire binding screw torque

	Wire Range (AWG/kcmil)	Torque (in/lbs.)
Line Neutral Lug	4 - 300 CU/AL	250
Main Lug	4 - 300 CU/AL	250
Alternate Main Breaker	See Main Breaker	See Main Breaker

Branch Neutral and Equipment Ground Bar

Wire Range (AWG)	Torque (in./lbs.) Bar with 2 screw sizes		Bar with 1 screw size
1/0 - 3 CU / AL	Large 50	Small	
4 CU / AL	Large 45	Small	35
6 CU / AL	Large 45	Small 25	35
8 CU / AL	Large 40	Small 10	25
10-14 CU, 10-12 AL	Large 35	Small 10	20

Equipment Ground Combinations

Two 14 or 12 CU, Two 12 AL	35	10	25
Two 10 AL	35		25

SHORT CIRCUIT RATING
RMS Symmetrical Amperes at 120 / 240 V ~ Maximum

Panel Rating	Remote Main	Integral Main	Branch (min.)/ Cat. prefix
*65,000	----	Lugs	65,000 / QH
*42,000	----	Lugs	42,000 / QOH
*22,000	----	Lugs	22,000 / QO,VH
*10,000	----	Lugs	10,000 / QO&Q1,QO...H
**5,000	----	Lugs	5,000 / QO...H(2 POLE)
100,000	100-200A,300V T Fuse	Lugs	10,000 / QO
22,000	KO, QO...VH	Lugs	10,000 / QO
22,000	Q2...H	Lugs	10,000 / QO (10A-50A)
65,000	KG	Lugs	10,000 / QO
65,000	----	KG	10,000 QO&Q1
22,000	----	KD	10,000 QO&Q1
22,000	----	QO...VH	10,000 / QO

** 240 v ~ 3Ph. 3W. Grounded "B" phase requires 240 V ~ branch breakers.
* The rating is equal to the lowest interrupting rating of any circuit breaker installed. Refer to branch breaker for individual ratings. Additional or replacement branch circuit breakers, main breaker, or service disconnect MUST have an interrupting rating equal to or greater than that of the circuit breaker with the lowest interrupting rating presently installed. See panelboard interior for breaker types.

Underwriter's Laboratories, Inc.®
LISTED
Electric
Cabinet Box
Issue No. V-2813

For installation, repairs or alterations, Call an electrical contractor or electrician.
Install loose label with Spanish translation on back of cover.
Adhiera la etiqueta sauelat con la traduccion en Español en la parte posterior de la cubierta.
Please read information before installing.
Por favor lea la información antes de instalor.

SQUARE D COMPANY®
001021 [15] 40265-381-03

QO Three-Phase Wiring Diagram Sample

Service Equipment marking.
Use of unused neutral branch terminal for equipment grounding, service equipment application only.

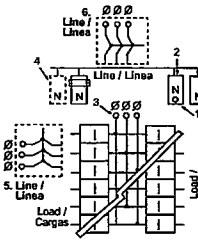
Alternate wiring diagram for main circuit breaker or main lug.
Installation of back-fed main circuit breaker and required kit.

Type of circuit breakers from Square D that may be used in this panelboard.

Load center accessories.
Neutral lug for 1/0 AWG or larger wire.

Suitable for use with 75°C Copper or Aluminum main conductors. See branch breakers for branch wire ratings.

* Suitable for use as service equipment when service disconnect (main breaker) is installed.
* Suitable for use as service equipment when not more than six main disconnecting means are provided and when not used as a lighting and appliance branch circuit panelboard. See Article 384-14 of the NEC.
* When used as service equipment, all unused neutral terminals may be used for terminating equipment ground wires.



1. Box bonding when required. / Conexión a la caja cuando fuese necesario.
2. Service ground when required. / Tierra de acometida cuando fuese necesario
3. Main lugs kit no: QOL3225. / No. de accesorio de las zapatas principales: QOL3225.
4. Lug kit when installed. / Accesorio de la zapata, cuando se instala.
5. Back fed main circuit breaker when installed. / Interruptor automático principal de alimentación posterior, cuando se instala.
6. Integral main circuit breaker when installed. / Interruptor automático integral principal, cuando se instala.

One single pole. One plug on space. One two pole requires two plug on spaces. One three pole requires three plug on spaces.
Torque Note: When main breaker or main lug connector mounting nuts are loosened or removed, retighten to 75 lbs./in. torque.
Equipment Grounding Terminals

Load Center Accessories - Kits

PK3MB	Back-fed Main Cir. Brkr. Retaining
SDSA3650	3 Phase Surge Arrestor
QO60SL	1 Phase Plug-on Subfeed Lugs *
QO2125SL	1 Phase Plug-on Subfeed Lugs *
QO3125SL	3 Phase Plug-on Subfeed Lugs +
PK9-27GTA(L)	Equipment Ground Bar
PKGTAB	Equipment Ground Bar Insulator
LK100AN	125A Max. Neutral Lug
LK150AN	150A Max. Neutral Lug
QOL3225	Main Lugs
PK6FL	Indoor Cover Lock

* May plug on two adjacent spaces.
+ May plug on three adjacent spaces.
Torque Note: When interior or main breaker mounting screws are loosened or removed, retighten to 35 lbs./in.

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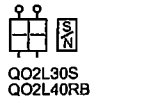
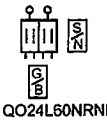
WIRING DIAGRAMS



QO2L30S
QO2L40RB

QO2L30TTS

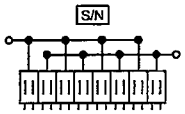


QO24L60NRNM

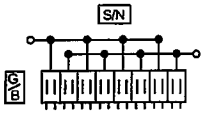
QO24L70F/S
QO24L70RB

QO24L70TS

QO24L50TTS



QO816L100F/S
QO816L100DF/S
QO816L100DFCU/SCU
QO816L100RB
QO816L100RBCU



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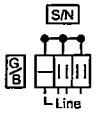
QO816L100DTF/S



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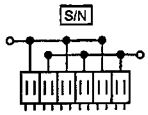
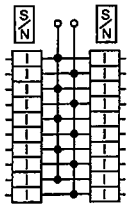
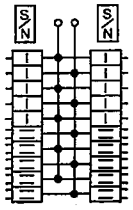


QO612L100F/S
QO612L100DF/S
QO612L100DFCU/SCU
QO612L100RB
QO612L100RBCU



QO120L125G
QO120L125GC



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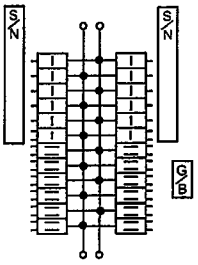

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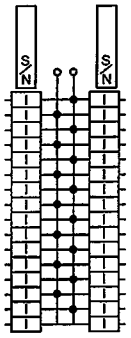
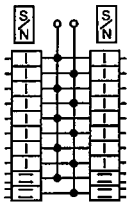
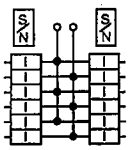


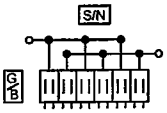
QO132L125G



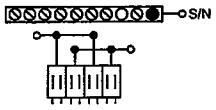
QO12024L125G
QO12030L125WG



QO112L125G
QO112L125GC
QO112L125GRB
QO112L200G
QO112L200GRB



QO612L100TF/S
QO612L100DTF/S
QO612L100TRB



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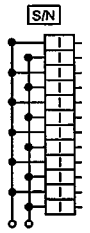
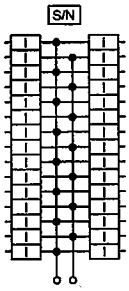
QO148L125GRB



QON12LS400



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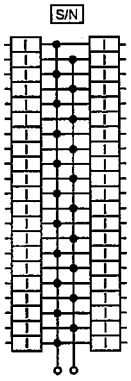
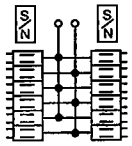
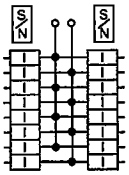


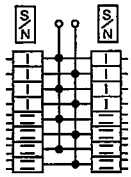
QON42LS400



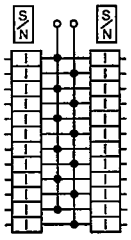
QO11224L125G
QO11224L125GRB
QO11224L125WG
QO11224L125GC



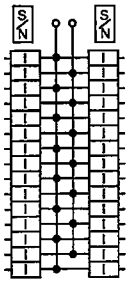
QO116L125G



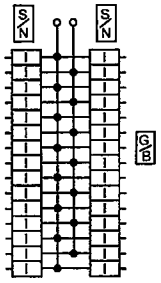
QO11624L125G
QO11624L125GRB



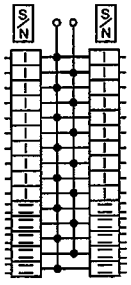
QO124L125G
QO124L150G
QO124L125GRB



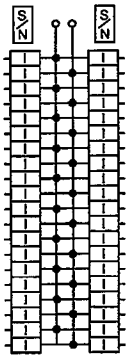
QO130L150G
QO130L200G
QO130L150GRB
QO130L200GRB



QO130L150TC



QO13040L200G
QO13040L200GRB
QO13040L200GC
QO13040L200WG



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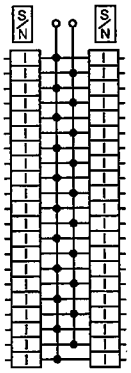
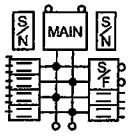


QO142L225G
QO142L225GRB

1-Phase, 3-Wire Main Lugs



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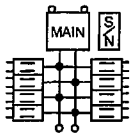

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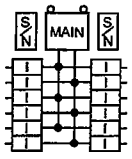
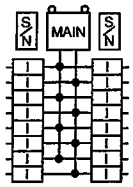
QO1816M200FTRB



QO112M100
QO112M100RB
QO112M100C



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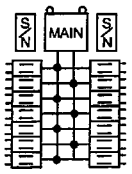

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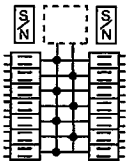

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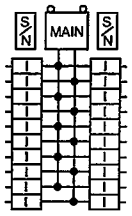

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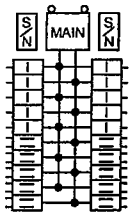
QO120M100RB
QO120M100C



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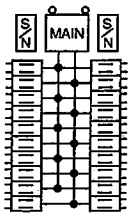

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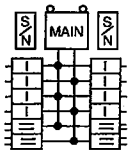
QO12040M200C



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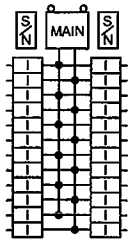
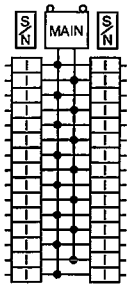


QO124M125
QO124M125RB
QO124M150
QO124M200
QO124M100



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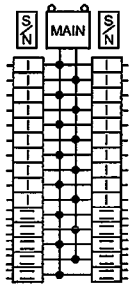
QO130M200
QO130M150RB
QO130M150C
QO130M200C
QO130M200RB



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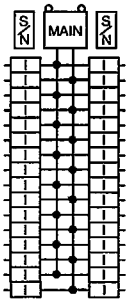

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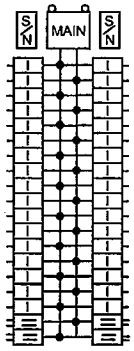

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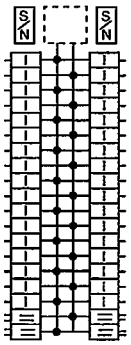
QO13842MX225



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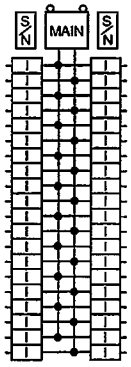

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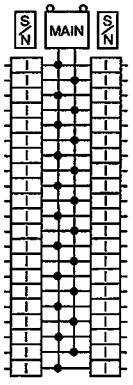
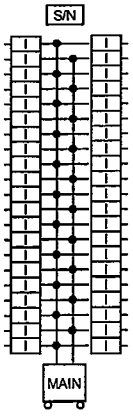
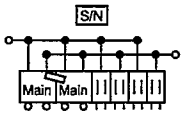
QO140M200RB
QO140M200C



QO142M200
QO142M225
QO142M225RB



QON42MS300
QON42MS400



QO48M30DSGP
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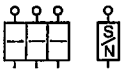
1-Phase, 3-Wire Main Circuit Breakers



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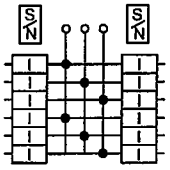

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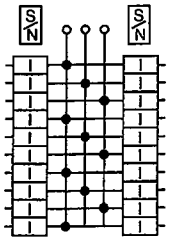
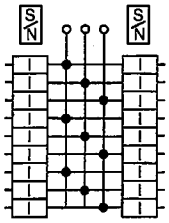


QO320L125G
QO320L125GRB



QO318L200G
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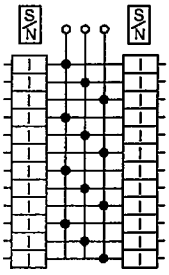
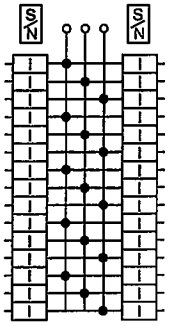
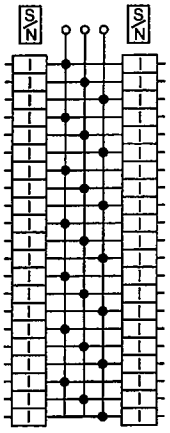


QO324L125G

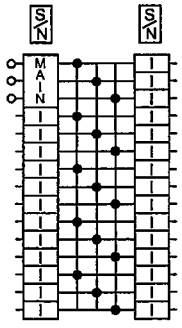


QO330L200G
QO330L200GRB

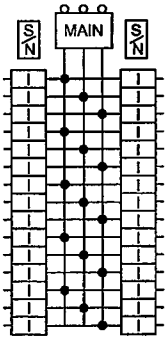


QO342L225G
QO342L225GRB

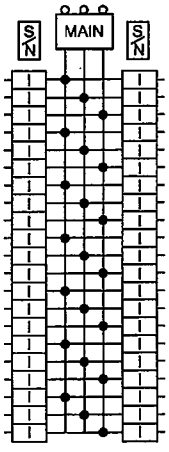
3-Phase, 4-Wire Main Lugs



QO327M100
QO327M100RB



QO330MQ125
QO330MQ150
QO330MQ200
QO330MQ125RB
QO330MQ150RB
QO330MQ200RB

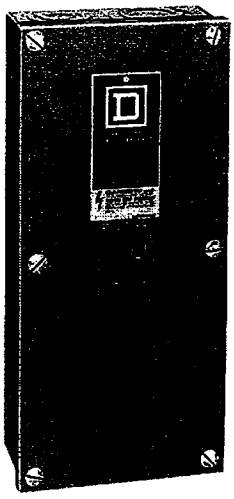


QO342MQ150
QO342MQ200
QO342MQ225
QO342MQ200RB
QO342MQ225RB

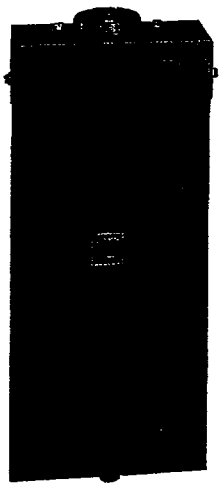
3-Phase, 4-Wire Main Circuit Breakers

TABLE OF CONTENTS

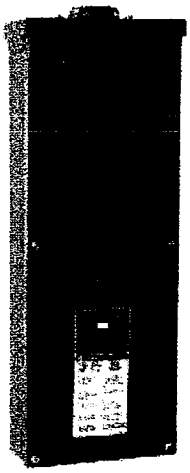
NOTE: For information on Replacement Parts with specific part numbers, go to www.schneider-electric.us, click on Product FAQ's, enter the device catalog number, click SEARCH, then look for the information required.



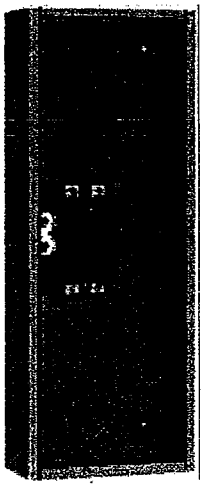
QO2100BNS



QO2100BNRB



QOM22225NRB



Q22200NS
With Cover Removed
(Order Q-Frame Circuit Breaker Separately)

GENERAL INFORMATION AND APPLICATION DATA

Type

Enclosed molded case circuit breakers are UL® Listed; File E136861, for enclosures and File E10027 for circuit breakers.

Molded case circuit breakers meet Federal Specifications W-C-375-B.

Enclosed molded case switches are UL Listed under File E59921.

Service

120/240 Vac, 1ϕ3W
240 Vac, 1ϕ2W
240 Vac, 1ϕ3W
240/120 Vac, 3ϕ4W
208Y/120 Vac, 3ϕ4W

Ratings

Enclosed Molded Case Circuit Breakers	
QO	10,000 A
QOM2	22,000 A
QB	10,000 A
QD	25,000 A
QG	65,000 A
QJ	65,000 A @ 240 V or 100,000 A @ 208Y / 120

Enclosure

Type 1 indoor general purpose

Welded sheet steel with knockouts at top, bottom, back and sides

Finish: gray baked enamel, electrodeposited over cleaned, phosphatized steel

Padlock provisions for locking circuit breaker handle in ON (I) or OFF (O) position

Flush or surface mount covers

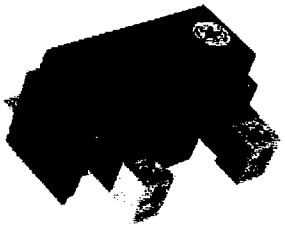
Type 3R Rainproof

Welded, galvannealed sheet steel

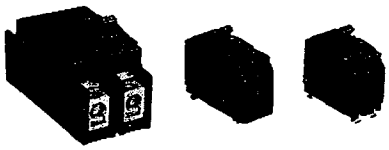
Finish: gray baked enamel, electrodeposited over cleaned, phosphatized, galvannealed steel

Provisions to padlock cover closed

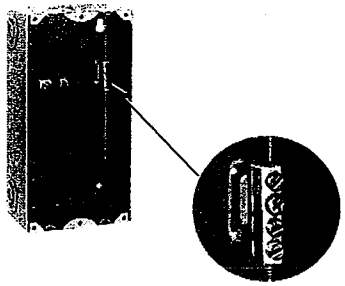
RB devices have provisions for interchangeable bolt-on hubs



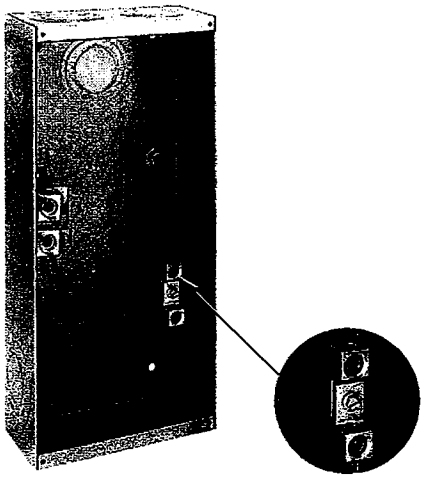
QOM2200VH



Circuit Breakers



Factory-installed equipment grounding bar.



PKOGTA2 field installed.

Circuit Breakers

Visi-Trip® indication (QO® circuit breakers)

Lugs suitable for aluminum or copper wire
(refer to catalog sections listed below:)

QO	Class 730
QB, QD, QG and QJ	Class 734
QOM2	Class 736
Molded-case switches	Class 601

Knockouts

Located in back, side and bottom of all devices

Equipment Grounding Bar

Field-installable PKOGTA2

Suitable for #6 AWG 2/0 aluminum or #10 AWG 2/0 AWG copper wire

Neutral Assemblies

Insulated, groundable (except QO2TR)

Suitable for aluminum or copper wire

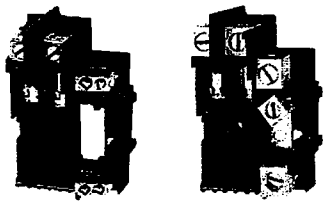
Grounding terminal provided

Bolt-On Hubs

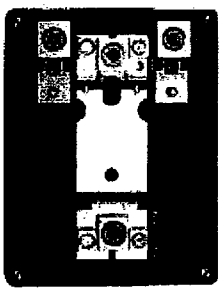
Hubs available from 0.75 in. (19 mm) to 2.50 in. (64 mm) conduit size

Off-center thread openings keep conduit close to wall

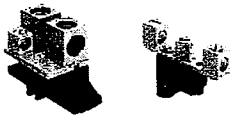
No gasket required with hubs



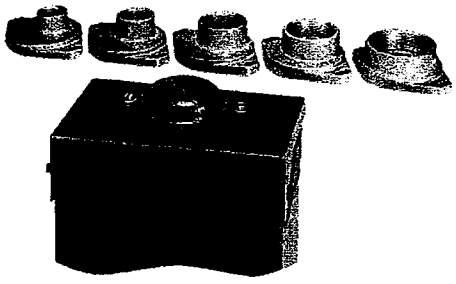
QO Base Assemblies



QOM2 Base



Neutral Assemblies



Hubs

TECHNICAL INFORMATION

Enclosed Molded-Case Circuit Breaker Ratings

Service	Rating in Amperes	Enclosure		Enclosure No. (Page 37)	Circuit Breaker [1]			Neutral Assembly Terminal Wire Size AWG/kcmil	
		Type 1 Catalog Number	Type 3R Catalog Number		Catalog Number	UL® Listed Interrupting Rating in RMS Amps Symmetrical	Terminal Lug Wire Size AWG/kcmil	Neutral Terminals	Grounding Terminals
Enclosed Circuit Breaker Mounting Base									
GB 240 Vac	60 A [2]		QO2TR [3]	1R	QO210 to QO260	10,000 AIR	#14 4 Al or Cu [4]		#14 8 Al or Cu
Enclosed Circuit Breakers									
SN 120/240 Vac	100 A	QO2100BNF/S [5]	QO2100BNRB [5]	1, 2R	QO QO-PL QO-GFI	10,000 AIR	#12 1 Al or #14 1 Cu	#12 1 Al or #14 1 Cu	#12 2 Al or #14 2 Cu
					QO-VH	22,000 AIR			
	125 A	QO2125BNF/S [5]	QO2125BNRB [5]	2, 3R	QO QO-PL QO-GFI	10,000 AIR	#12 2/0 Al #14 2/0 Cu	#12 2/0 Al #14 2/0 Cu	
					QO-VH	22,000 AIR			
	100-225 A	QOM22225NF/S [6]	QOM22225NRB [6]	6, 6R	QOM2-VH	22,000 AIR	4 - #4 250 kcmil Al/Cu	2 - #4 250 kcmil 4 - #14 2/0 Al or Cu	2 - #6 2/0 Al 2 - #10 2/0 Cu
SN 240 Vac	100 A	QO3100BNF/S [5]	QO3100BNRB [5]	1, 2R	QO QO-PL QO-GFI	10,000 AIR	#12 1 Al or #14 1 Cu	#12 1 Al or #14 1 Cu	#12 2 Al or #14 2 Cu
					QO-VH	22,000 AIR			
SN 2-pole 240 Vac Max.	100-225 A	Q22200NS [7 8]	Q22200NRB [7 8]	3, 4R	QBL QDL QGL QJL	10,000 AIR 25,000 AIR 65,000 AIR 100,000 AIR	#4 300 Al or Cu	#4 2 50 Al or Cu	#12 1/0 Al or #14 1/0 Cu
		Q23225NF/S [8]	Q23225NRB [8]	4, 5R				#4 3 00 Al or Cu	
SN 3-pole 240 Vac	100-225 A	Q23225NF/S [8]	Q23225NRB [8]	4, 5R	QBL QDL QGL QJL	10,000 AIR 25,000 AIR 65,000 AIR 100,000 AIR [9]		#4 3 00 Al or Cu	

1 Order circuit breaker separately.

2 Not suitable for service equipment.

3 Top endwall has no hub opening; back and bottom feed only.

4 Load terminals use #6 maximum.

5 Enclosures will accept QO circuit breakers with factory-installed accessories.

6 Enclosure will accept QOM2 circuit breaker with factory-installed accessories.

7 Accepts 200 A maximum, 2-pole Q-frame circuit breakers.

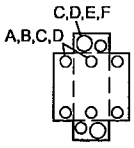
8 Equipment grounding kit factory-installed.

9 When these 3-pole circuit breakers are mounted in an enclosure, the maximum AIR rating is 65,000 at 240 Vac and 100,000 at 208 Vac.

DIMENSIONS AND KNOCKOUTS

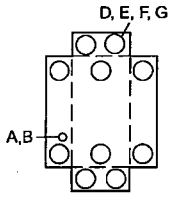
Enclosure No.	Dimensions					
	W		H		D	
	in.	mm	In.	mm	in.	mm
1	5.88	149	13.12	333	3.38	86
2	5.88	149	16.12	409	3.38	86
1R	4.56	116	6.50	165	3.88	99
2R	6.92	176	13.12	333	4.12	105
3R	6.92	176	16.12	409	4.12	105
3	7.56	192	23.12	587	4.25	108
4	9.62	244	26.12	663	4.75	121
4R	7.56	192	23.24	590	4.75	121
5R	9.62	244	26.24	666	5.50	140
6	8.55	217	23.92	608	3.95	100
6R	8.55	217	24.75	629	4.16	106

Knockouts								
Symbol	A	B	C	D	E	F	G	H
Conduit Size	0.50 in. 13 mm	0.75 in. 19 mm	1.00 in. 25 mm	1.25 in. 32 mm	1.50 in. 38 mm	2.00 in. 51 mm	2.50 in. 64 mm	3.00 in. 76 mm

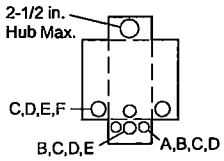


Box 1, 2

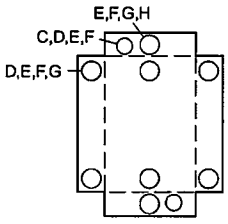
Box 1R



Box 3



Box 2R, 3R



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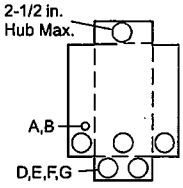

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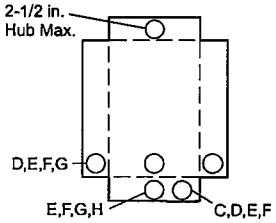

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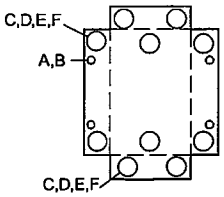

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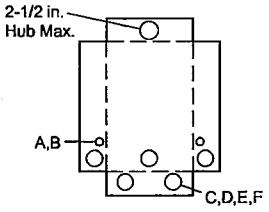

Box 6R

Outdoor Dimensions and Knockouts

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NOTE: For information on Replacement Parts with specific part numbers, go to www.schneider-electric.us, click on Product FAQ's, enter the device catalog number, click SEARCH, then look for the information required.

Schneider Electric USA

1601 Mercer Road
Lexington, KY 40511 USA
1-888-SquareD
(1-888-778-2733)
www.us.SquareD.com

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03/2007

SECTION 19
SQUARE D CIRCUIT BREAKER (BOM ITEM 7)

Product Data Sheet

S29450

CIRCUIT BREAKER AUXILIARY SWITCH

ITEM 7

SQUARE D
by Schneider Electric

Availability **Stock Item: This item is normally stocked in our distribution facility.**

Technical Characteristics

Circuit Breaker Type	Standard
General Application	Provides a Remote Signal Indicating the Circuit Breaker Contacts are Open or Closed, Auxiliary Switch 1A/1B, Trip indication, Overcurrent indication
Ampere Rating	6A
Marketing Trade Name	Powerpact
Voltage Rating	600VAC
For Use With	Molded Case Breakers

Shipping and Ordering

Category	01250 - Circuit Breakers, Accessories for M, P & R Frame Breakers, UL/IEC
Discount Schedule	DE2
GTIN	00785901506416
Package Quantity	1
Weight	0.07 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	CN

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

* SEE DRAWING 446476-1-102, ITEM (7) FOR LOCATION

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Schneider Electric

THERMAL/MAGNETIC CIRCUIT-BREAKERS

MULTI-9™ C60N UL489 MINIATURE CIRCUIT BREAKERS

Merlin Gerin

- 1-2-3 Pole Configurations
- Small Size: Less Than ¾" Per Pole (0.71")
- Interrupt Rating 10KA @ 120VAC (1P), 240VAC (2 or 3P); 5KAC @ 240VAC (1P)
- DC Rating 10KA @ 60VDC (1P) and 125VDC (2P)
- Common Tripping of All Poles
- Padlock Attachment In the "Off" Position Only

This series is a UL489 version of the C60N family of DIN mount circuit protectors. Meets global applications and code requirements including UL, IEC and CSA. CE compliant. Features C trip curve for typical loads; magnetic release operates between 7 and 10 times ampere rating. Box lug terminals. D. Curve (10-14 times handle rating) and a variety of accessories also available; go *online or call.*

3-Pole

1-Pole

Mfg. Part No.	No. of Poles	Current (A)	Stock No.	Price Each 1-5	Price Each 6-14
60101	1	1	30C9349	109.44	102.60
60103	1	2	30C9351	109.44	102.60
60104	1	3	30C9352	109.44	102.60
60105	1	4	30C9353	109.44	102.60
60106	1	5	30C9354	109.44	102.60
60107	1	6	30C9355	99.81	93.57
60108	1	7	30C9356	99.81	93.57
60109	1	8	30C9357	99.81	93.57
60110	1	10	30C9358	99.81	93.57
60112	1	15	30C9360	99.81	93.57
60113	1	20	30C9361	99.81	93.57
60115	1	30	30C9363	105.08	98.50
60138	2	3	30C9369	235.51	220.79
60140	2	5	30C9371	235.51	220.79
60144	2	10	30C9375	215.39	201.93
60146	2	15	30C9377	215.39	201.93
60147	2	20	30C9378	215.39	201.93
60148	2	25	30C9379	215.39	201.93
60149	2	30	30C9380	225.01	210.95

(60823)

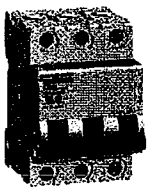
MULTI-9 C60N UL 1077 SUPPLEMENTARY PROTECTORS

Merlin Gerin

RoHS Compliant Available

NEW

- Intended for use within equipment where branch circuit protection is already provided or not needed
- C-Curve types are dual rated for UL 1077 and UL 489A for DC Telecom applications
- Suitable for reverse feeding
- 10K AIR @ 120/240VAC; 5K AIR @ 480Y/277



Magnetic release operates between 7 and 10 times rating.

Mfg. Part No.	No. of Poles	Current (A)	Stock No.	Price Each 1-5	Price Each 6-14
● MG24425	1	1	42M2331	78.18	73.92
● MG24426	1	2	96F2008	78.18	73.92
● MG24428	1	4	96F2010	---	---
● MG17414	1	5	1681249	90.29	85.22
● MG24430	1	6	96F2011	78.18	73.92
● MG24432	1	10	96F2013	78.18	73.92
● MG17416	1	15	1681251	93.05	87.98
● MG24443	2	2	96F2016	168.56	159.37
● MG17444	2	5	1681274	200.81	189.88
● MG24520	2	6	29M8594	200.81	189.88
● MG24448	2	8	96F2020	163.56	154.37
● MG24452	2	20	29M8579	200.81	189.88
● MG17449	2	60	1681279	191.90	181.57
● MG24464	3	6	96F2027	244.29	230.98
● MG24466	3	10	96F2029	244.29	230.98
● MG17469	3	60	1681293	325.16	307.46
● MG17406	1	15	1681242	90.29	85.22

Magnetic release operates between 10 and 14 times rating.

Mfg. Part No.	No. of Poles	Current (A)	Stock No.	Price Each 1-5	Price Each 6-14
● MG24519	2	4	1681454	200.81	189.88
● MG17456	2	15	1681284	200.81	189.88
● MG24525	2	20	32M7192	166.02	157.08
● MG24528	2	40	1681463	206.33	195.09
● MG24538	3	10	1681472	239.88	226.98
● MG24541	3	20	1681475	239.88	226.98

➤CONTINUED➤

MULTI-9 C60N UL 1077 SUPPLEMENTARY PROTECTORS (CONT.)

Mfg. Part No.	No. of Poles	Current (A)	Stock No.	Price Each 1-5	Price Each 6-14
● MG24545	3	50	1681478	311.35	294.39
● MG17474	3	60	1681298	268.82	254.34

ACCESSORIES

Mfg. Part No.	Description	Stock No.	Price Each Each	Price Each 2-4
● MG26928	Supplementary Protector Alarm Switch	96F2031	62.38	58.29
● MG26885	Multi 9 Mounting Kit	1681514	16.09	18.09
MG27046	Multi 9 Rotary Handle	17C7955	134.11	125.29
MG27047	Multi 9 Door Interlock Handle	17C7956	111.25	103.93

(7A349)

THERMAL MAGNETIC CIRCUIT BREAKERS

NEW

RoHS Compliant Available

SQUARE D Schneider Electric

Fig. 1

Fig. 2

Fig. 3

Fig. 4

- 15 to 250A ratings
- Voltage: 600VAC / 250VDC
- Dual-break rotating contacts reduce the amount of peak current during a short circuit fault
- Reduced let-through currents
- Integral push-to-trip button
- Field installable accessories and trip units available below
- Dimensions (H x D): 163 x 87 mm
- Width: 70 mm (2-pole), 105 mm (3-pole)

INTERRUPTING RATINGS (UL / CSA / NOM)

	240 VAC	480 VAC	600 VAC	250 VDC	500 VDC
D	25 kA	18 kA	14 kA	20 kA	-
G	65 kA	35 kA	18 kA	20 kA	20 kA

H-FRAME

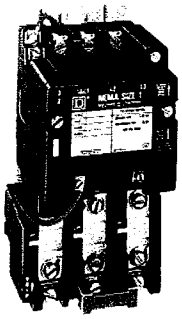
Mfg. Part No.	Fig.	No. of Poles	Current (A)	Stock No.
● HDL26015	1	2	15	20KD019
● HDL26020	1	2	20	20KD020
● HDL26025	1	2	25	20KD021
● HDL26030	1	2	30	20KD022
● HDL26040	1	2	40	20KD024
● HDL26050	1	2	50	20KD025
● HDL26060	1	2	60	20KD026
● HDL26070	1	2	70	20KD027
● HDL26080	1	2	80	20KD028
● HDL26100	1	2	100	20KD029
● HDL26125	1	2	125	20KD030
● HDL26150	1	2	150	20KD031
● HGL26015	1	2	15	20KD118
● HGL26020	1	2	20	20KD119
● HGL26025	1	2	25	20KD120
● HGL26030	1	2	30	20KD121
● HGL26040	1	2	40	20KD123
● HGL26050	1	2	50	20KD125
● HGL26060	1	2	60	20KD126
● HGL26070	1	2	70	20KD127
● HGL26080	1	2	80	20KD128
● HGL26100	1	2	100	20KD130
● HGL26125	1	2	125	20KD132
● HGL26150	1	2	150	20KD133
● HDL36015	2	3	15	20KD032
● HDL36020	2	3	20	20KD033
● HDL36025	2	3	25	20KD034
● HDL36030	2	3	30	20KD035
● HDL36035	2	3	35	20KD036
● HDL36040	2	3	40	20KD037
● HDL36045	2	3	45	20KD038
● HDL36050	2	3	50	20KD039
● HDL36060	2	3	60	20KD040
● HDL36070	2	3	70	20KD041
● HDL36080	2	3	80	20KD042
● HDL36090	2	3	90	20KD043

➤CONTINUED➤

5

SECTION 20
SQUARE D FULL VOLTAGE STARTER (BOM ITEM 8)

Full Voltage Starters—NEMA Rated



Type SCO3
Size 1, 3-Pole Starter

Schneider Electric offers express shipping for factory modified NEMA Type 1 and Type 12/3R Enclosed Starters. When you need them fast, our Laser™ Delivery program is the answer to getting your product when you need it most. Ask for Laser™ Delivery, then select the product and the modifications you need when you place your order. It's as easy as that!

General Information

Type S magnetic starters are used for full-voltage starting and stopping of AC squirrel cage motors. Motor overload protection is provided via melting alloy type thermal overload relays. Type S starters are available in NEMA Sizes 00 through 7, and are designed for operation at 600 Vac, 50 to 60 Hz.

Solid State Overload Relay Protection (MOTOR LOGIC®)

These ambient insensitive overload relays are available on Sizes 00 through 6 and standard on size 7. They provide phase loss, phase unbalance protection. To order, add Form **H10** (for Class 10), **H20** (for Class 20), or **H30** (for selectable trip class protection). For more information about MOTOR LOGIC, see pages 16-91, 16-111 and 16-112.

3-Pole Polyphase—600 Vac Maximum—50–60 Hz

Note that prices shown do not include thermal units. Devices require 3 thermal units (Sizes 00–6). Standard trip thermal units are **$21.50** each. See page 16-125 for selection information.

Table 16.42:

NEMA Size	Continuous Current Ratings	Motor Voltage	Max. Hp	Open Type		NEMA 1 General Purpose Enclosure		NEMA 4 & 4X Watertight, Dusttight Brushed Stainless Steel Enclosure (Size 0-5)▲		NEMA 4X Watertight, Dusttight, Corrosion-Resistant Glass-Polyester Enclosure	
				Type		Type		Type		Type	
00	9	200 230 460 575	1-1/2 1-1/2 2 2	SAO12■		SAG12■		Use Size 0		Use Size 0	
0	18	200 230 460 575	3 3 5 5	SBO2■		SBG2■		SBW12■		SBW22■	
1	27	200 230 460 575	7-1/2 7-1/2 10 10	SCO3■		SCG3■		SCW13■		SCW23■	
2	45	200 230 460 575	10 15 25 25	SDO1■		SDG1■		SDW11■		SDW21■	
3	90	200 230 460 575	25 30 50 50	SEO1■		SEG1■		SEW11■		SEW21■	
4	135	200 230 460 575	40 50 100 100	SFO1■		SFG1■		SFW11■		SFW21■	
5	270	200 230 460 575	75 100 200 200	SGO1■		SGG1■		SGW11■		—	—
6	540	200 230 460 575	150 200 400 400	SHO2■		SHG2■		SHW2■		—	—
7	810	200 230 460 575	— 300 600 600	SJO2■		SJG2■		SJW2■		—	—

▲ Size 6 and 7 are rated NEMA 4 only, painted sheet steel.
■ Coil voltage code must be specified to order this product. Refer to standard coil voltage codes shown below.

Table 16.43: Coil Voltage Codes

Voltage		Code	Price Adder
60 Hz	50 Hz		
24♦	—	V01	No Charge
120★	110	V02	No Charge
208	—	V08	No Charge
240	220	V03	No Charge
277	—	V04	No Charge
480	440	V06	No Charge
600	550	V07	No Charge
Specify	Specify	V99	35.60

♦ 24 V coils are not available on Sizes 4–7. On Sizes 00-3, where 24 V coils are available, **Form S** (separate control) must be specified (i.e., order as 8536SBO2V01S).
★ 120 Volt Polyphase contactors are wired for separate control. **Form S** (separate control) must be specified (i.e., order as 8536SCO2V02S).
Note: For voltage codes used with control transformers, see page 16-110.
Form S (separate control) is used when a separate source of power is available for the control (coil) voltage.
Form S is supplied at no charge.

Dimensions ..... page 16-23
Factory Modifications (Forms) ..... page 16-109
Separate Enclosures (Class 9991) ..... page 16-102
Replacement Parts (Class 9998) ..... page 16-114
Type S Accessories (Class 9999) ..... page 16-117

For How to Order Information, see page 16-12.

SECTION 21
SQUARE D CONTRACTOR, 2 POLE, 120 VAC COIL (BOM ITEM 9)

Table 16.40: 600 Vac Maximum—50–60 Hz

NEMA Size	Continuous Current Ratings	Motor Voltage	Max. Hp	Open Type		NEMA 1 General Purpose Enclosure		NEMA 4 & 4X –Watertight, Dusttight, Brushed Stainless Steel Enclosure (Size 0-5)▲	
				Type	$ Price	Type	$ Price	Type	$ Price
1-Pole Single Phase									
0	18	115 230	1 2	SBO5■		SBG5■	360.00	SBW15■	860.00
1	27	115 230	2 3	SCO5■		SCG5■	432.00	SCW15■	945.00
2-Pole Single Phase									
00	9	115 230	1/3 1	SAO11■		SAG11■	318.00	Use Size 0	
0	18	115 230	1 2	SBO1■		SBG1■	404.00	SBW11■	903.00
1	27	115 230	2 3	SCO1■		SCG1■	476.00	SCW11■	989.00
2	45	115 230	3 7-1/2	SDO1■		SDG1■	975.00	SDW11■	1998.00
3	90	— —	— —	SEO1■		SEG1■	1601.00	SEW11■	3054.00
4	135	—	—	SFO1■		SFG1■	3765.00	SFW11■	6245.00
5	270	—	—	SGO1■		SGG1■	7952.00	SGW11■	11087.00
6	540	—	—	SHO1■		SHG1■	22266.00	SHW1■	29388.00
7	810	—	—	SJO1■		SJG1■	30285.00	SJW1■	37407.00
4-Pole Polyphase									
0	18	200 230 460 575	3 3 5 5	SBO3■	527.00	SBG3■	561.00	SBW13■	1074.00
1	27	200 230 460 575	7-1/2 7-1/2 10 10	SCO3■	599.00	SCG3■	633.00	SCW13■	1146.00
2	45	200 230 460 575	10 15 25 25	SDO3■	1139.00	SDG3■	1287.00	SDW13■	2712.00
3	90	200 230 460 575	25 30 50 50	SEO3■	1823.00	SEG3■	2114.00	SEW13■	3965.00
4	135	200 230 460 575	40 50 100 100	SFO3■	4757.00	SFG3■	5360.00	SFW13■	8864.00
5-Pole Polyphase									
0	18	200 230 460 575	3 3 5 5	SBO4■	684.00	SBG4■	719.00	SBW14■	1229.00
1	27	200 230 460 575	7-1/2 7-1/2 10 10	SCO4■	755.00	SCG4■	788.00	SCW14■	1301.00
2	45	200 230 460 575	10 15 25 25	SDO4■	1710.00	SDG4■	1857.00	SDW14■	3281.00
3	90	200 230 460 575	25 30 50 50	SEO4■	2735.00	SEG4■	3024.00	SEW14■	4877.00
4	135	200 230 460 575	40 50 100 100	SFO4■	6579.00	SFG4■	7182.00	SFW14■	10688.00

▲ Size 6 and 7 are rated NEMA 4 only, painted sheet steel.
■ Coil voltage code must be specified to order this product. Refer to standard coil voltage codes listed on page 16-13.

Dimensions ..... page 16-23
Factory Modifications (Forms)..... page 16-109
Separate Enclosures (Class 9991)..... page 16-102
Replacement Parts (Class 9998) ..... page 16-114
Type S Accessories (Class 9999)..... page 16-117

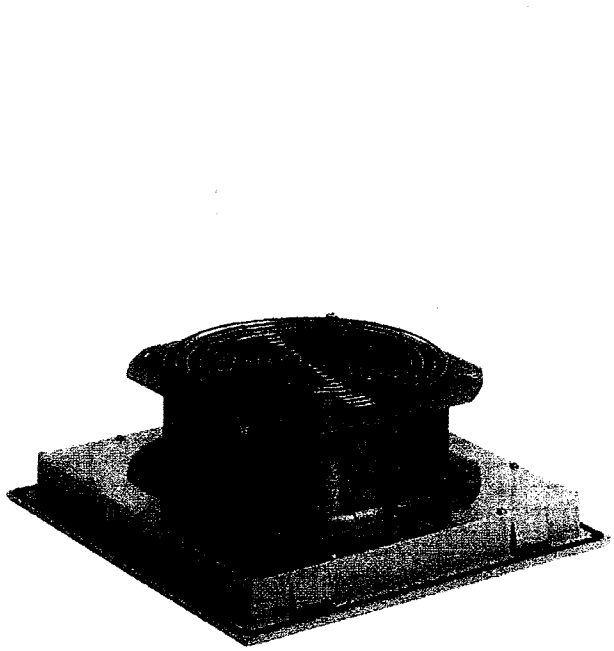
For How to Order Information, see page 16-12.

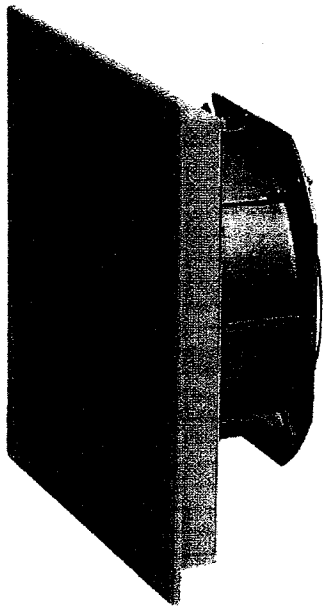
SECTION 22
SQUARE D MCCLEAN SIDE MOUNT FILER FAN (BOM ITEM 11)

Filter Fan Collection

ST13 303 CFM (515 m³/hr.) Thin Side-Mount Filter Fan

ITEM 11A
11B
~~11C~~
ATEMO
OK





Industry Standards

UL/cUL recognized; File no. 235470

CE, CSA (fan motor only)
Type 12, IP54 standard
Type 12, IP55 optional

Features

- Free airflow up to 303 CFM (515 m³/hr.)
- Approximate size 13 in. (325 mm)
- Click-fit design quickly installs into enclosure wall; no tools or screws required
- Thin depth to minimize cabinet intrusion
- Enclosure side wall mounting
- Reverse airflow option to increase static pressure
- Standard foam-in-place gasket
- Similar cut-out sizes as other filter fan manufacturers
- Terminal wire connections
- Simple snap-open grille for easy filter replacement

Finish

- RAL 7035 light-gray UV-resistant plastic standard
- RAL 9011 black UV-resistant plastic optional

Notes

Visit www.McLeanCoolingTech.com to download 2D and 3D CAD drawings into the overall design of your electronic system.

Filter Fan Collection

Performance Data **ST13 303 CFM (515 m³/hr.) Thin Side-Mount Filter Fan - Standard and Reverse**

ELECTRICAL DATA				
Rated Voltage	**115**	**230**	**115 Rvrs**	**230 Rvrs**
Frequency (Hz)	50 / 60	50 / 60	50 / 60	50 / 60
Nominal Current Maximum (Amps)	.58 / .70	.29 / .35	.58 / .70	.29 / .35
Power Consumption Maximum (Watts)	64 / 80	64 / 80	64 / 80	64 / 80
Power Connection	Terminal Block			
TYPE 12 / IP54 FILTER FANS				
RAL 7035 Light Gray:				
Item	20056	20058	20062	20064
Model	**ST1316414**	**ST1326414**	**ST1316414R**	**ST1326414R**
RAL 9011 Black:				
Item	20057	20061	20063	20065
Model	**ST1316413**	**ST1326413**	**ST1316413R**	**ST1326413R**
Free Airflow (CFM / m³/hr.)	303 / 515	303 / 515	303 / 515	303 / 515
Airflow with 1 Exhaust Grille (CFM / m³/hr.)	209 / 355	209 / 355	209 / 355	209 / 355
Airflow with 2 Exhaust Grilles (CFM / m³/hr.)	249 / 422	249 / 422	249 / 422	249 / 422
TYPE 12 / IP55 FILTER FANS				
RAL 7035 Light Gray:				
Item	20184	20186	20188	20193
Model	**ST1316514**	**ST1326514**	**ST1316514R**	**ST1326514R**
RAL 9011 Black:				
Item	20185	20187	20192	20194
Model	**ST1316513**	**ST1326513**	**ST1316513R**	**ST1326513R**
Free Airflow (CFM / m³/hr.)	277 / 470	277 / 470	277 / 470	277 / 470
Airflow with 1 Exhaust Grille (CFM / m³/hr.)	191 / 325	191 / 325	191 / 325	191 / 325
Airflow with 2 Exhaust Grilles (CFM / m³/hr.)	219 / 372	219 / 372	219 / 372	219 / 372
FILTER FAN UNIT CONSTRUCTION				
Fan RPM	2550 / 2800	2550 / 2800	2550 / 2800	2550 / 2800
Sound Pressure (dBA)	60	60	60	60
Operating Temperature Range:				
Maximum (°F / °C)	131 / 55	131 / 55	131 / 55	131 / 55
Minimum (°F / °C)	14 / -10	14 / -10	14 / -10	14 / -10
Service Life (hours)	40,000	40,000	40,000	40,000
Unit Dimensions - H x W x D (in. / mm)	12.72 x 12.72 x 4.8 / 323 x 323 x 122			
Cut-Out Dimensions - H x W (in. / mm)	11.50 x 11.50 / 292 x 292			
Weight (lb. / kg)	7.5 / 3.4			
TYPE 12 / IP54 EXHAUST GRILLES				
RAL 7035 Light Gray:				
Item / Model	19986 / SG1300404			
RAL 9011 Black:				
Item / Model	19987 / SG1300403			
TYPE 12 / IP55 EXHAUST GRILLES				
RAL 7035 Light Gray:				
Item / Model	20088 / SG1300504			
RAL 9011 Black:				
Item / Model	20092 / SG1300503			
ACCESSORIES				
Replacement Filters:				
Type 12 / IP54 Item	33599			
Type 12 / IP55 Item	20198 / 10100067H			
Thermostat Item	21803 / TWR60			
Stainless Steel Washdown Shroud Item / Model	20183 / SH1300005			

Above airflow rates at 60 Hz; see performance curves for airflow at 50 Hz and more details.

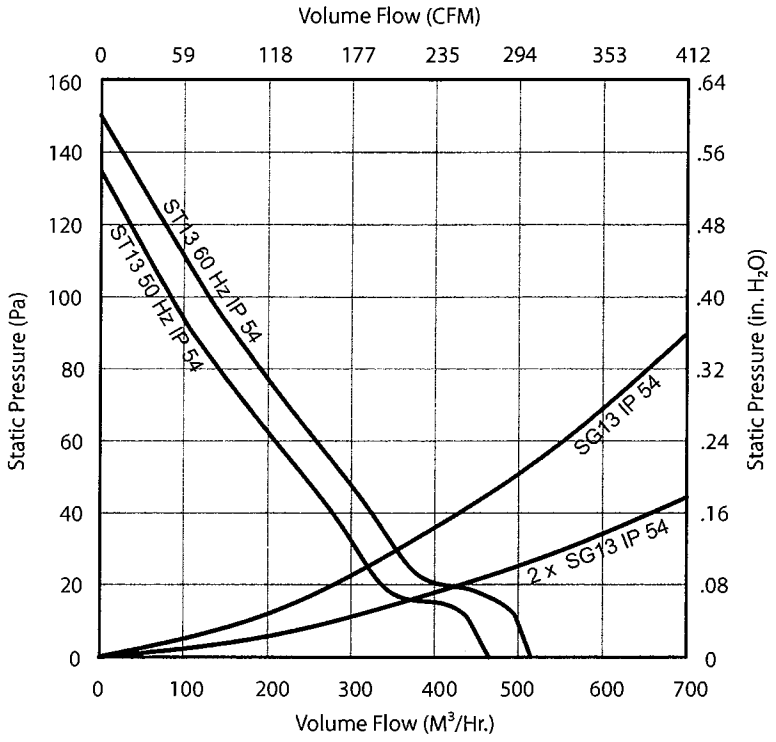
Unit depth is from the back edge of the grille to the back of the fan.

Exhaust Grilles sold separately.

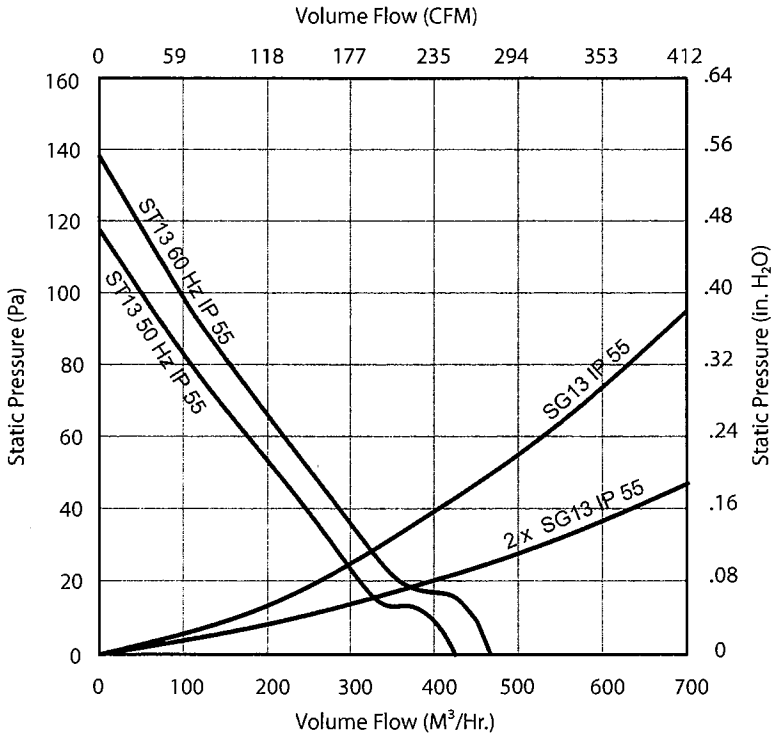
Filter Fan Collection

ST13 303 CFM (515 M^3/Hr.) Thin Side-Mount Filter Fan Performance Curve

TYPE 12 / IP 54 Filter Fan

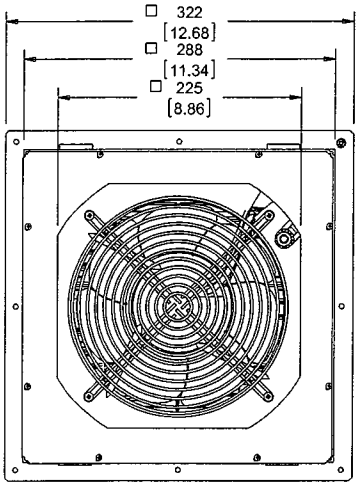


TYPE 12 / IP 55 Filter Fan

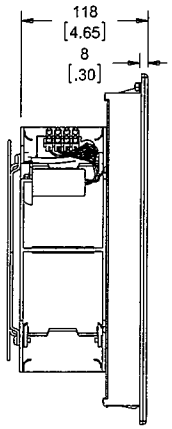


Filter Fan Collection

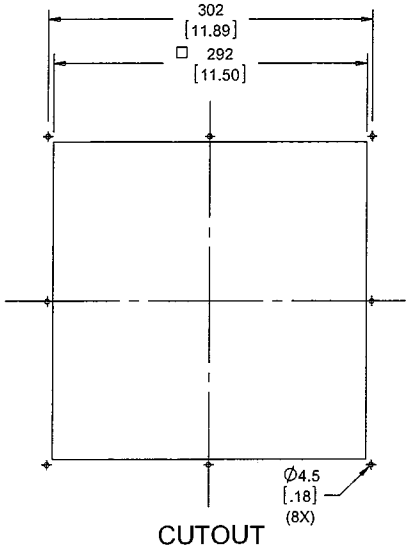
FILTER FAN



BACK VIEW

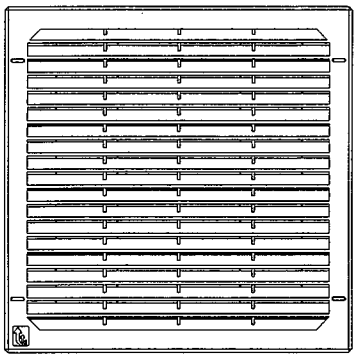


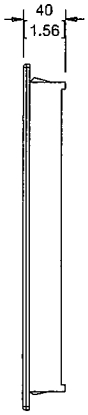
SIDE VIEW



CUTOUT

EXHAUST GRILLE





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Order Exhaust Grille Kit separately

Visit **www.McLeanCoolingTech.com** to download 2D and 3D CAD drawings into the overall design of your electronic system.

ITEM 11B

Fan Accessories

Filter Fan Accessory Selection Guide

Match the right accessory to your filter fan.

Exhaust Grille

Model	Item	Fits Fan Packages
SG0400404	19976	All SF04 RAL 7035 Models
SG0400403	19977	All SF04 RAL 9011 Models
SG0500404	19978	All SF05 IP54 RAL 7035 Models
SG0500403	19981	All SF05 IP54 RAL 9011 Models
SG0500504	20082	All SF05 IP55 RAL 7035 Models
SG0500503	20083	All SF05 IP55 RAL 9011 Models
SG0900404	19982	All SF09 IP54 RAL 7035 Models
SG0900403	19983	All SF09 IP54 RAL 9011 Models
SG0900504	20084	All SF09 IP55 RAL 7035 Models
SG0900503	20085	All SF09 IP55 RAL 9011 Models
SG1000404	19984	All SF10 IP54 RAL 7035 Models
SG1000403	19985	All SF10 IP54 RAL 9011 Models
SG1000504	20086	All SF10 IP55 RAL 7035 Models
SG1000503	20087	All SF10 IP55 RAL 9011 Models
SG1300404	19986	All SF13 IP54 RAL 7035 Models
SG1300403	19987	All SF13 IP54 RAL 9011 Models
SG1300504	20088	All SF13 IP55 RAL 7035 Models
SG1300503	20092	All SF13 IP55 RAL 9011 Models

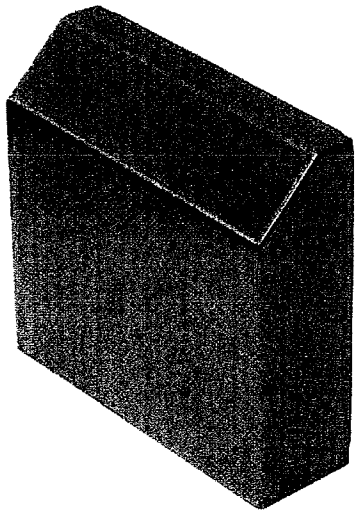
Replacement Filter

Model	Item	Fits Fan Packages
10100059H	20201	All SF04 Models
10100060	33569	All SF05 IP54 Models
10100064H	20195	All SF05 IP55 Models
10100061	33579	All SF09 IP54 Models
10100065H	20196	All SF09 IP55 Models
10100062	33589	All SF10 IP54 Models
10100066H	20197	All SF10 IP55 Models
10100063	33599	All SF13 IP54 Models
10100067H	20198	All SF13 IP55 Models

Wash-Down Shroud

Model	Item	Fits Fan Packages
SH0500005	20177	All SF05 Models
SH0900005	20178	All SF09 Models
SH1000005	20182	All SF10 Models
SH1300005	20183	All SF13 Models

Wind-Driven Rain & Wash-Down Shroud



Features

- Protects filter fan and exhaust grille from wind-driven rain and high-pressure hose water
- Significantly reduces the possibility of enclosure water infiltration when used in combination with high-density IP55 Z-filter
- Sizes to cover SF05, SF09, SF10 and SF13 filter fans and SG05, SG09, SG10 and SFG3 exhaust grilles
- Mounts separately over filter fan and exhaust grille

Finish

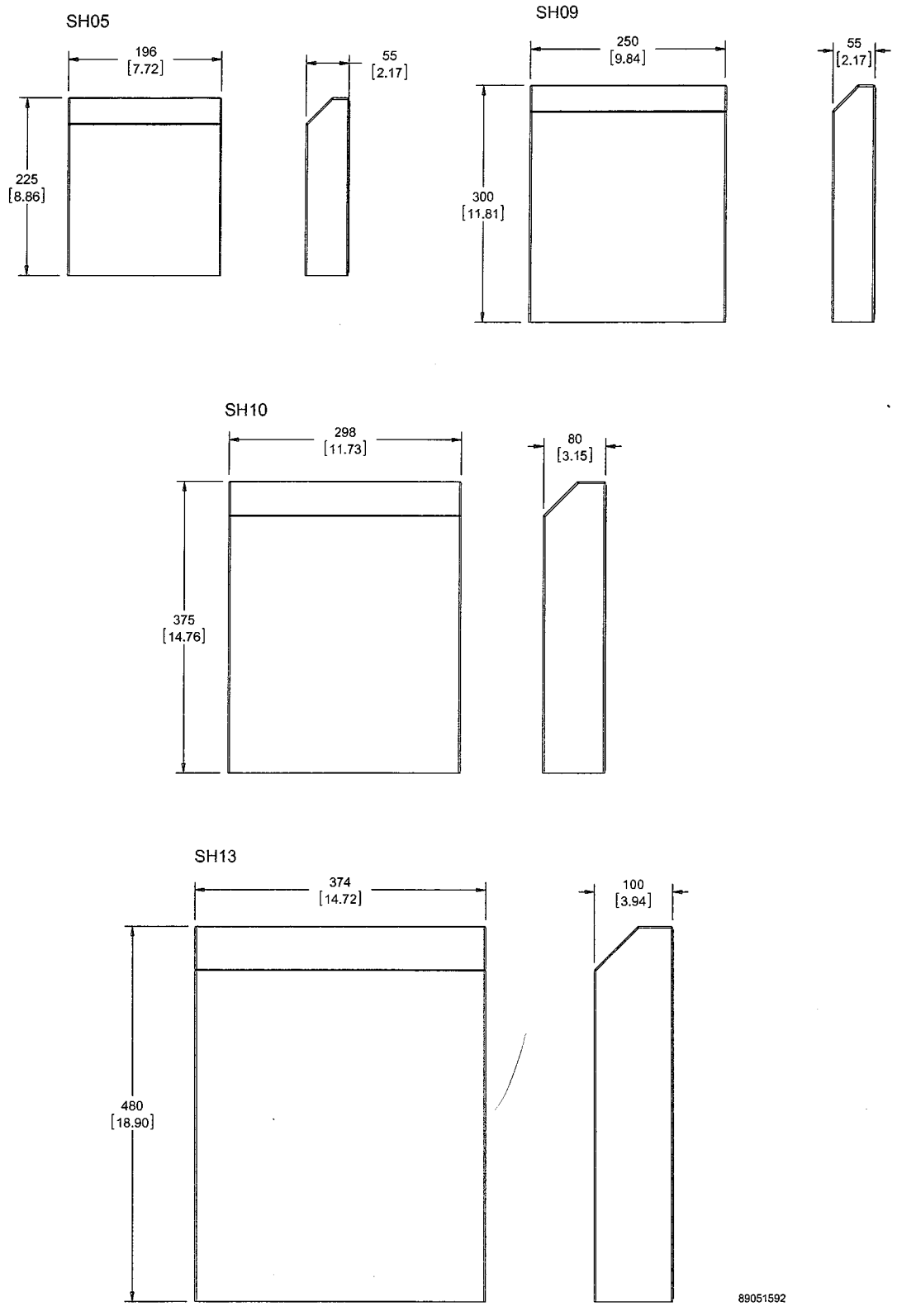
- Stainless steel standard
- RAL 7035 light-gray on galvanized metal optional
- RAL 9011 black on galvanized metal optional

* DO WE NEED TWO SHROUDS, ONE FOR FAN SIDE, OTHER EXHAUST?

Performance Data

FILTER FAN / EXHAUST GRILLE SHROUD				
Provides protection for:				
Filter Fan	SF05	SF09	SF10 / ST10	SF13 / ST13
Exhaust Grille	5G05	SG09	SG10	SG13
Stainless Steel Shroud:				
Item	20177	20178	20182	20183
Model	**SH0500005**	**SH0900005**	**SH1000005**	**SH1300005**
RAL 7035 Light Gray	Available as special order upon request			
RAL 9011 Black	Available as special order upon request			
SHROUD CONSTRUCTION				
Stainless Steel	304 stainless steel			
Painted	Powder coated painted galvanized sheet metal			

Fan Accessories



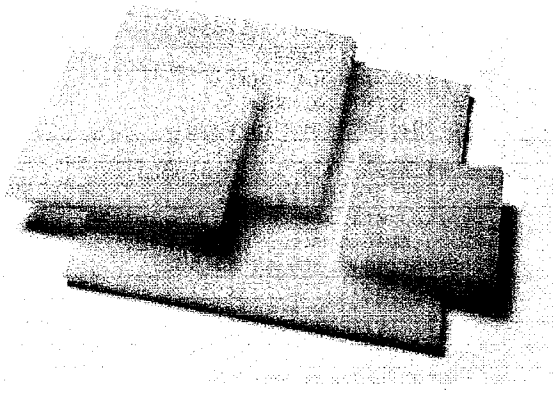
Visit **www.McLeanCoolingTech.com** to download 2D and 3D CAD drawings into the overall design of your electronic system.

Electromagnetic (EMI/RFI) Shielding

Fan Accessories

- Protects against electromagnetic (EMI/RFI) interference
- Available as an option on SF04, SF05, SF09, SF10 and SF13 filter fans and SG04, SG05, SG09, SG10 and SG13 exhaust grilles
- Order as an option with filter fan and exhaust grille
- Contact your customer service representative for part numbers and prices

Replacement Filter Mats

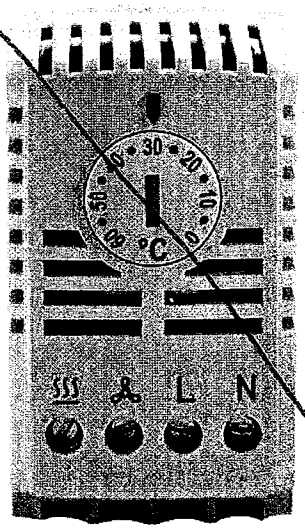


- Type 12 / IP54 filter option provides protection against dust infiltration
- IP55 filter adds additional protection against moisture
- See individual product pages for catalog and item numbers to order

Replacement Filter		
Model	**Item**	**Fits Fan Packages**
10100059H	20201	All SF04 Models
10100060	33569	All SF05 IP54 Models
10100064H	20195	All SF05 IP55 Models
10100061	33579	All SF09 IP54 Models
10100065H	20196	All SF09 IP55 Models
10100062	33589	All SF10 IP54 Models
10100066H	20197	All SF10 IP55 Models
10100063	33599	All SF13 IP54 Models
10100067H	20198	All SF13 IP55 Models

Fan Accessories

Thermostat Controller TH100



Features

- Saves energy, reduces filter replacement frequency and extends filter fan life
- Terminal block connection
- Controls SF04, SF05, ST/SF10 and ST/SF13 Filter Fans
- 38-mm DIN rail mounting bracket (according to EN 60715) and screws included

Finish

- RAL7035 light gray
- Plastic housing UL94 V-0

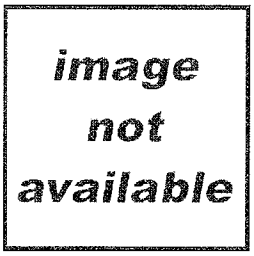
Notes

Caution: When setting the temperature of the break contact (NC) and the changeover contact (CO) to use it as a break contact, care must be taken to add the maximum hysteresis (that consists of the switching difference and the operating tolerance) to the required minimum temperature. For instance, if the temperature in the enclosure may not fall below 5 C, the controller must be set to 5+7+3=15 C (with a switching) difference of 4-7 k and tolerance of +/- 3 k.

TEMPERATURE CONTROLLER	
Item / Model	**21803 / TWR60**
Control Range (°F / °C)	-4 / -20 to 104 / 40 or 32 / 0 to 140 / 60 or 68 / 20 to 176 / 80 (see type plate)
Switching Differences:	
Bimetal controllers	Approx. 1 k, approx. 3 k, 4-7 k (see type plate)
Capillary controllers	less than 7 k
Contact	Snap contact as break contact = NC Make contact = NO Changeover contact = CO (see type plate)
Switching Capacity:	
Break contact/make contact	100V...250V / 10(2)A, at 4 max. 30 W
Changeover contact - heating	100V...250V / 10(2)A, at 4 max. 30 W
Changeover contact - cooling	100V...250V / 15(2)A, at 4 max. 30 W
Supply Voltage	**Controller (CO) requires 230V**
Protection	IP20
Switchpoint Tolerance	+/- 3k
Sensor	Bimetal
Power Connection	Terminal screws 0.5 to 2.5 mm²
Bimetal Controller Ambient Temperature:	
T40	-4 / -20 to 104 / 40
T60	32 / 0 to 140 / 60
T80	68 / 20 to 176 / 80
Storage Temperature (°F / °C)	-4 / -20 to 140 / 60
Unit Dimensions - H x W x D (in. / mm)	2.52 x 1.46 x 1.81 / 64 x 37 x 46
Weight (ounces / grams)	1.8 / 50

SECTION 23
ALLEN BRADLEY PILOT LIGHT, 120 VAC RED (BOM ITEM 13)

Item# 862703



Email to a Friend

Description:
ALLEN BRADLEY 800T-QH10A 30.5mm Type 4/13 Pilot Light, Full Voltage, No Test Option, LED, Amber, 120V AC

Manufacturer:ALLEN BRADLEY

Catalog Number:800T-QH10A

Minimum Order Quantity: 1EA

Order Multiple (Case) Quantity: 1EA

Currently shipping within:8 to 12 Days

Your Price: $125.95 / EA

Log Me In

Qty: EA Add to Cart

More Information

Bought Together | Substitute Items | Availability | Tech Specs | Additional Resources | My Part Numbers

Get the Technical Specifications for this product...

Attribute	Value
Master UPC	66246825564
Package Weight	0.3
UNSPSC	39121512
Long Description	NO TEST; SIZE 30.5 MM; LAMP INPUT 120 VAC/VDC FULL VOLTAGE; LED LAMP; LENS STYLE/SIZE ROUND; LENS COLOR AMBER; PLASTIC LENS; NEMA 1/4/12/13 IP65/66; APPROVAL UL CSA; 800T MODEL
Manufacturer UCC Number	662468
PGC3	B8
PROD NAME	PILOT LIGHT
Sellers Class	PP
12-DIGIT UPC	662468255646
Brand Name	AB-SAP
Green Product	No

DOWN	800T-X503	800H-W102	HAND-OFF-AUTO	800T-X511	800H-W151
EMERG. STOP (Yellow)	800T-X504Y	–	HIGH	800T-X512	800H-W107
EMERG. STOP (Red)*	800T-X504	800H-W372	HIGH-LOW	800T-X513	800H-W030
EMERGENCY STOP (Red)*	800T-X648	800H-W373	HIGH-OFF-LOW	800T-X514	800H-W058
FAST	800T-X505	800H-W104	IN	800T-X515	800H-W108
FEED START	800T-X566	800H-W007	INCH	800T-X516	800H-W109
FEED STOP	800T-X567	800H-W377	JOG	800T-X517	800H-W110

* These legend plates do not comply with E-stop standards that specify a yellow background, such as IEC 60947-5-5 and NFPA 79.

Standard Legends, Continued

Marking	Aluminum, Type 4/13	Grey Plastic, Type 4/4X	Marking	Aluminum, Type 4/13	Grey Plastic, Type 4/4X
	Cat. No.	Cat. No.		Cat. No.	Cat. No.
JOG FORWARD	800T-X518	800H-W111	RAISE-LOWER	800T-X536	800H-W034
JOG REVERSE	800T-X519	800H-W112	RAISE-OFF-LOWER	800T-X537	800H-W156
JOG RUN	800T-X520	800H-W135	RESET	800T-X538	800H-W121
JOG-SAFE-RUN	800T-X522	800H-W051	REVERSE	800T-X539	800H-W122
JOG-STOP-RUN	800T-X521	800H-W057	RUN	800T-X540	800H-W123
LEFT-RIGHT	800T-X523	800H-W036	RUN-INCH	800T-X634	800H-W037
LOCAL-REMOTE	800T-X638	–	RUN-JOG	800T-X541	800H-W032
LOW	800T-X524	800H-W113	SAFE-RUN	800T-X542	800H-W033
LOWER	800T-X526	800H-W115	SPEED❄	800T-X608	800H-W081
OFF	800T-X527	800H-W116	SLOW	800T-X544	800H-W125
OFF-COOLANT-ON	800T-X528	800H-W052	SLOW-FAST	800T-X545	800H-W136
OFF-ON	800T-X529	800H-W133	SLOW-OFF-FAST	800T-X546	800H-W157
ON	800T-X530	800H-W117	START	800T-X547	800H-W126
ON-OFF	800T-X622	–	START-JOG	800T-X548	800H-W138
OPEN	800T-X531	800H-W118	START-STOP	800T-X549	800H-W137
OPEN-CLOSE	800T-X532	800H-W134	STOP (Red)	800T-X550	800H-W371
OPEN-OFF-CLOSE	800T-X533	800H-W153	STOP-START	800T-X551	800H-W038
OUT	800T-X534	800H-W119	TEST	800T-X554	800H-W128
POWER ON	800T-X639	800H-W001	UP	800T-X556	800H-W009
RAISE	800T-X535	800H-W120	UP-DOWN	800T-X557	800H-W039
			UP-OFF-DOWN	800T-X558	800H-W160

❄ Potentiometer type with graduated markings.

SECTION 24
ALLEN BRADLEY THREE POSITION “HAND-OFF-AUTO” SELECTOR SWITCH (BOM ITEM 15)

Product Data Sheet

9422ATEN102

Switch A2 Handle+Mech No Fuse 100A 600Va

Availability **Non-Stock Item: This item is not normally stocked in our distribution facility.**

Technical Characteristics

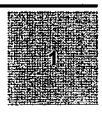
Ampere Rating	100A
Style	Rod Operated - Variable Depth/Flange Mounted
Approvals	UL Recognized - CSA Certified
Fuse Clip Amperes	Non Fusible
Fuse Type	Non Fusible
Handle Type	6" Handle Included (9422A2)
Horsepower Rating	25HP@200Vac - 30HP@230Vac - 60HP@460Vac - 75HP@575Vac - 20HP@250Vdc(max)
Mounting Type	Flange

Shipping and Ordering

Category	21732 - Disconnect Switches, Flange Mounted
Discount Schedule	CP1
GTIN	00785901353225
Package Quantity	1
Weight	10 lbs.
Availability Code	Non-Stock Item: This item is not normally stocked in our distribution facility.
Returnability	N
Country of Origin	MX

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

Schneider Electric

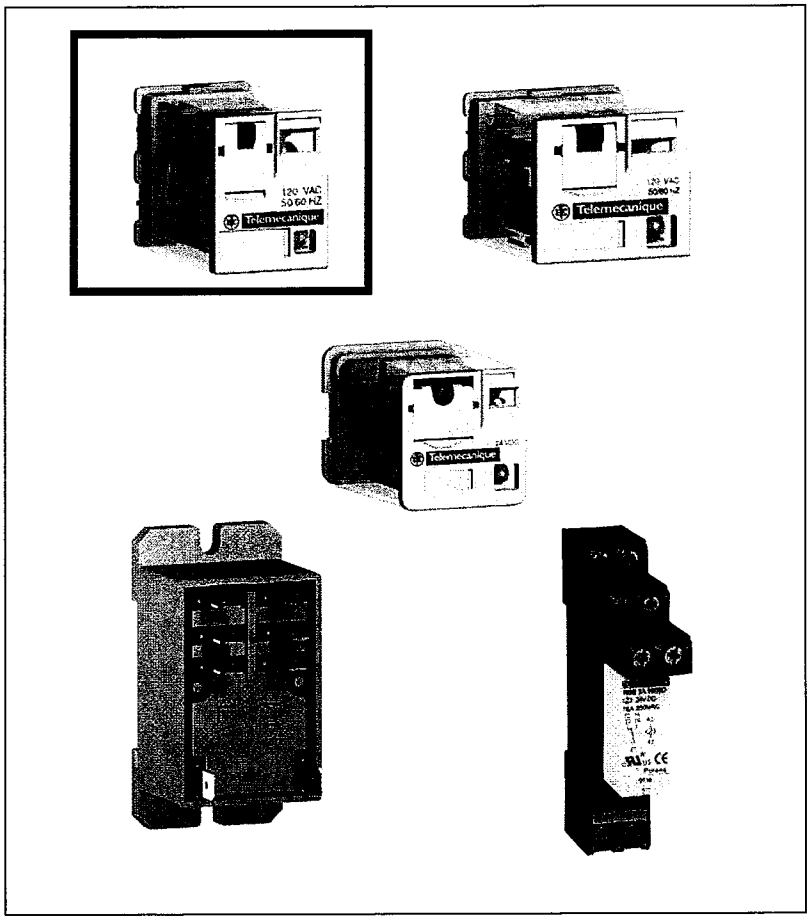


SECTION 25
SQUARE D RELAY W/BASE, 120 VAC COIL (BOM ITEM 16 & 16A)

Zelio® Plug-in Relays
RXM, RPM, RUM, RPF, RSB

Catalog
June
06

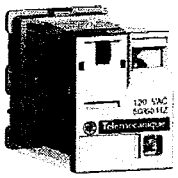
Class 8501



CONTENTS

a brand of Schneider Electric

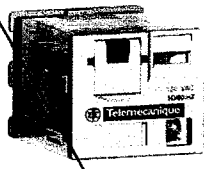
Telemecanique


RXM ●AB2F7

RXM Miniature Relays (page 4)

2 pole relays; 12A
3 pole relays; 10A
4 pole relays; 6A
4 pole relays; 3A (low level)

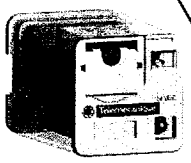
- Mechanical "relay status" indicator on all relays
- Pilot light option available
- Manual operator on all relays
- Built-in marking area


RPM 32F7

RPM Miniature Power Relays (page 12)

1 pole relays; 15A
2 pole relays; 15A
3 pole relays; 15A
4 pole relays; 15A

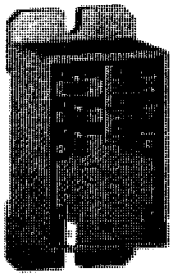
- Mechanical "relay status" indicator on all relays
- Pilot light option available
- Manual operator on all relays
- Built-in marking area


RUM ●●AB2B7

RUM Universal Relays (page 20)

2 pole relays; 8-pin, tube type;10A
3 pole relays; 11-pin, tube type;10A
2 pole relays; 8 blade type; 10A
3 pole relays; 11 blade type; 10A

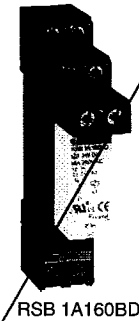
- Mechanical "relay status" indicator on all relays
- Pilot light option available
- Manual operator on all relays
- Built-in marking area


RPF 2B●●

RPF Power Relays (page 28)

Two Form C contacts; 30A
Two Normally Open contacts; 30A

- DIN track mountable
- Can be mounted directly to a panel

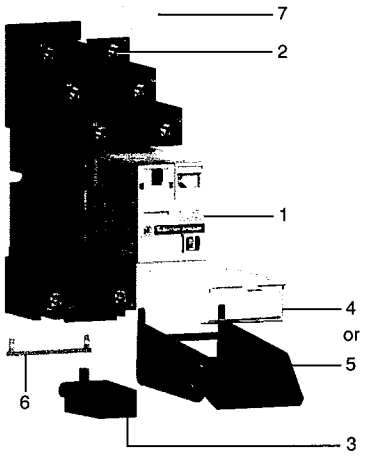

RSB 1A160BD
+ RSZ E1S48M

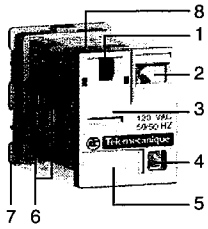
RSB Interface Relays (page 31)

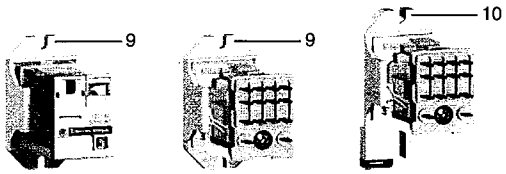
Two Form C contacts; 8A
One Form C contact; 12A
One Form C contact; 16A

General Technical Information (page 36)

Relay contact types
Utilization categories
Protection categories
Protection modules







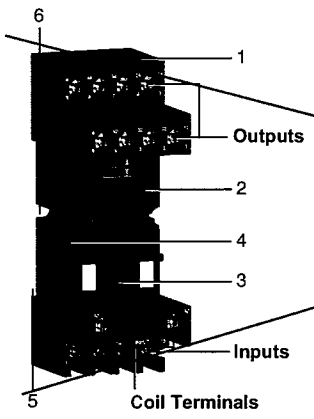
Product Description

The RXM miniature relay range consists of:

1. 12 A relays with 2 C/O contacts, 10 A relays with 3 C/O contacts, 6 A relays with 4 C/O contacts, and 3 A "low level" relays with 4 C/O contacts. All these relays have the same dimensions.
2. Sockets with mixed or separate contact terminals.
3. Protection modules (diode, RC circuit or varistor). All these modules are common to all sockets.
4. A metal hold-down clip for all sockets.
5. A plastic hold-down clip for all sockets.
6. A 2-pole bus jumper that can be used on sockets with separate contact terminals to simplify wiring when creating a jumper between the coil terminals.
7. Clip-in markers for all the sockets except RXZ E2M114.

Relay Description

1. Spring return push button for testing the contacts (green: DC, red: AC).
2. Mechanical "relay status" indicator.
3. Removable lock-down door enabling forced maintaining of the contacts for test or maintenance purposes. During operation, this lock-down door must always be in the closed position.
4. Bipolar LED (depending on version) indicating the relay status.
5. Removable marker for relay identification.
6. Four notches for DIN rail mounting adapter or panel mounting adapter.
7. Eight, eleven, or fourteen pins.
8. Area by which the product can be easily gripped.
9. Mounting adapter enabling direct mounting of the relay on a panel.
10. Mounting adapter enabling direct mounting of the relay on a DIN rail.

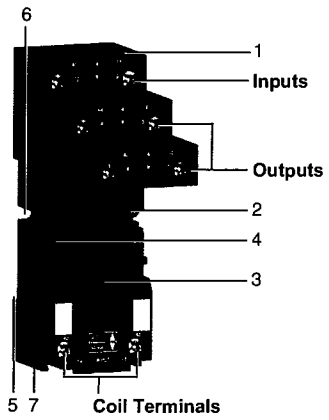


Socket Description

Sockets with Mixed Contact Terminals

1. Connection by screw clamp terminals or box lug connector.
2. Fourteen female contacts for the relay pins.
3. Location for protection modules.
4. Locking components for plastic and metal hold-down clips.
5. Locating slot for mounting on DIN rail.
6. Two or four mounting holes for panel mounting.

NOTE: The inputs are mixed with the relay coil terminals, with the outputs being located on the opposite side of the socket.



Sockets with Separate Contact Terminals

1. Box lug connector.
2. Eight, eleven, or fourteen female contacts for the relay pins.
3. Location for protection modules.
4. Locking components for plastic and metal hold-down clips.
5. Locating slot for mounting on DIN rail.
6. Two mounting holes for panel mounting.
7. Location for bus jumpers (see mounting on sockets on page 10).

NOTE: The inputs and outputs are separated from the relay coil terminals.

General Characteristics

Conforming to standards		IEC/EN 61810-1 (iss. 2), UL 508, CSA C22-2 n° 14
Product certifications		cULus File E164862 CCN NLDX, NLDX7; cURus File E164862 CCN NLDX2, NLDX8; CSA pending; CE; RoHS compliant
Ambient air temperature around the device	Storage	-40–185 °F (-40–85 °C)
	Operation	-40–131 °F (-40–55 °C)
Vibration resistance	Conforming to IEC/EN 60068-2-6	> 6 gn (10–50 Hz)
Degree of protection	Conforming to IEC/EN 60529	IP 40
Shock resistance conforming to IEC/EN 60068-2-27	Opening	10 gn
	Closing	5 gn
Protection category (see page 36)		RT I
Mounting position		Any

Insulation characteristics

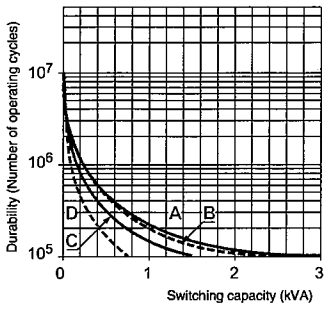
Rated insulation voltage (Ui)		250 V (IEC), 300 V (UL, CSA)
Rated impulse withstand voltage (Uimp)		3.6 kV (1.2/50 µs)
Dielectric strength (rms voltage)	Between coil and contact	2,500 Vac
	Between poles	2,500 Vac
	Between contacts	1,500 Vac

Contact characteristics

Relay type			**RXM 2AB●●●**	**RXM 3AB●●●**	**RXM 4AB●●●**	**RXM 4GB●●●**
Number and type of contacts (see page 11)			2 C/O	3 C/O	4 C/O	4 C/O
Contact materials			AgNi			AgAu
Conventional thermal current (Ith)	For ambient temperature ≤ 131 °F (55 °C)		12 A	10 A	6 A	3 A
Rated operational current	Conforming to IEC in utilization category AC-1	N/O	12 A	10 A	6 A	2 A
		N/C	6 A	5 A	3 A	1 A
	Conforming to UL (resistive@277 Vac)		12 A	10 A	6 A	3 A
Maximum operating rate In operating cycles/hour	No load		18,000			
	Under load		1,200			
Switching voltage	Maximum		250 Vac/Vdc			
Switching capacity	Minimum		10 mA on 17 V			2 mA on 5 V
	Maximum		3,000 VA	2,500 VA	1,500 VA	750 VA
Utilization coefficient			20%			
Mechanical durability in millions of operating cycles			10			
Electrical durability in millions of operating cycles	Resistive load		0.1			

Electrical Durability of Contacts

Resistive load AC



A=RXM 2AB●●● B=RXM 3AB●●● C=RXM 4AB●●● D=RXM 4GB●●●

Coil characteristics

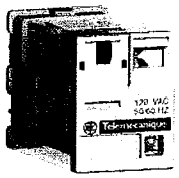
Average consumption		AC	1.2 VA
		DC	0.9 W
Drop-out voltage threshold		AC	⩾ 0.15 Uc
		DC	⩾ 0.1 Uc
Operating time (response time)	Between coil energization and making of the N/O contact	AC	20 ms
		DC	20 ms
	Between coil de-energization and making of the N/C contact	AC	20 ms
		DC	20 ms

Coil voltage Uc			**12 V**	**24 V**	**48 V**	**110 V**	**120 V**	**125 V**	**220 V**	**230 V**	**240 V**
Relay coil voltage codes			**JD**	**BD**	**ED**	**FD**	**–**	**GD**	**MD**	**–**	**–**
DC	Average resistance at 68 °F (20 °C) ± 10%		160 Ω	650 Ω	2,600 Ω	11,000 Ω	–	11,000 Ω	14,000 Ω	–	–
	Operating voltage limits	Min.	9.6 V	19.2 V	38.4 V	88 V	–	100 V	176 V	–	–
		Max.	13.2 V	26.4 V	52.8 V	121 V	–	138 V	242 V	–	–
Relay coil voltage codes			**–**	**B7**	**E7**	**–**	**F7**	**–**	**M7**	**P7**	**U7**
AC	Average resistance at 68 °F (20 °C) ± 15%		–	180 Ω	770 Ω	–	4,430 Ω	–	15,000 Ω	15,000 Ω	15,500 Ω
	Operating voltage limits	Min.	–	19.2 V	38.4 V	–	96 V	–	176 V	184 V	192 V
		Max.	–	26.4 V	52.8 V	–	132 V	–	242 V	253 V	264 V

Socket characteristics

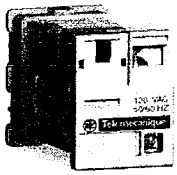
Socket type		**RXZ E2S108M**	**RXZ E2S111M**	**RXZ E2S114M**	**RXZ E2M114**	**RXZ E2M114M**
Relay types used		**RXM 2●●●●●**	**RXM 3●●●●●**	**RXM 4●●●●●**	**RXM 2●●●●●**[1] **RXM 4●●●●●**	**RXM 2●●●●●**[1] **RXM 4●●●●●**
Product certifications		cURus File E172326 CCN SWIV2, SWIV8; CSA (pending); CE; RoHS compliant				
Conventional thermal current (Ith)		12 A	10 A			
Degree of protection	Conforming to IEC/EN 60529	IP 20				
Connection	Solid wire without cable end	1 conductor: AWG 20–12 (0.5–2.5 mm²) 2 conductors: AWG 20–14 (0.5–1.5 mm²)				
	Flexible wire with cable end	1 conductor: AWG 24–14 (0.2–2.5 mm²) 2 conductors: AWG 24–16 (0.2–1.5 mm²)				
	Flexible wire without cable end	1 conductor: AWG 24–14 (0.2–2.5 mm²) 2 conductors: AWG 24–16 (0.2–1.5 mm²)				
Maximum tightening torque		5.3 lbf-in (0.6 N●m) (M3 screw)				
Contact terminal arrangement		Separate			Mixed	
Bus jumper Ith: 5 A		Yes			No	

[1] When mounting relay RXM 2●●●●● on socket RXZ E2M●●●●, the thermal current must not exceed 10 A.


RXM ●AB2F7

Miniature relays without LED (sold in lots of 10)

	Number and type of contacts - Thermal current (Ith)								
	2 C/O -12 A			3 C/O - 10 A			4 C/O - 6 A		
Coil Voltage	Catalog Number	Weight lb.	Weight kg	Catalog Number	Weight lb.	Weight kg	Catalog Number	Weight lb.	Weight kg
12 Vdc	RXM 2AB1JD	0.08	0.037	RXM 3AB1JD	0.08	0.038	RXM 4AB1JD	0.08	0.036
24 Vdc	RXM 2AB1BD	0.08	0.037	RXM 3AB1BD	0.08	0.038	RXM 4AB1BD	0.08	0.036
48 Vdc	RXM 2AB1ED	0.08	0.037	RXM 3AB1ED	0.08	0.038	RXM 4AB1ED	0.08	0.036
110 Vdc	RXM 2AB1FD	0.08	0.037	RXM 3AB1FD	0.08	0.038	RXM 4AB1FD	0.08	0.036
220 Vdc	–	–	–	–	–	–	RXM 4AB1MD	0.08	0.036
24 Vac	RXM 2AB1B7	0.08	0.037	RXM 3AB1B7	0.08	0.038	RXM 4AB1B7	0.08	0.036
48 Vac	RXM 2AB1E7	0.08	0.037	RXM 3AB1E7	0.08	0.038	RXM 4AB1E7	0.08	0.036
120 Vac	RXM 2AB1F7	0.08	0.037	RXM 3AB1F7	0.08	0.038	RXM 4AB1F7	0.08	0.036
230 Vac	RXM 2AB1P7	0.08	0.037	RXM 3AB1P7	0.08	0.038	RXM 4AB1P7	0.08	0.036
240 Vac	–	–	–	–	–	–	RXM 4AB1U7	0.08	0.036
Miniature relays with LED (sold in lots of 10)									
12 Vdc	RXM 2AB2JD	0.08	0.037	RXM 3AB2JD	0.08	0.038	RXM 4AB2JD	0.08	0.036
24 Vdc	RXM 2AB2BD	0.08	0.037	RXM 3AB2BD	0.08	0.038	RXM 4AB2BD	0.08	0.036
48 Vdc	RXM 2AB2ED	0.08	0.037	RXM 3AB2ED	0.08	0.038	RXM 4AB2ED	0.08	0.036
110 Vdc	RXM 2AB2FD	0.08	0.037	RXM 3AB2FD	0.08	0.038	RXM 4AB2FD	0.08	0.036
125 Vdc	–	–	–	–	–	–	RXM 4AB2GD	0.08	0.036
24 Vac	RXM 2AB2B7	0.08	0.037	RXM 3AB2B7	0.08	0.038	RXM 4AB2B7	0.08	0.036
48 Vac	RXM 2AB2E7	0.08	0.037	RXM 3AB2E7	0.08	0.038	RXM 4AB2E7	0.08	0.036
120 Vac	RXM 2AB2F7	0.08	0.037	RXM 3AB2F7	0.08	0.038	RXM 4AB2F7	0.08	0.036
230 Vac	RXM 2AB2P7	0.08	0.037	RXM 3AB2P7	0.08	0.038	RXM 4AB2P7	0.08	0.036


RXM 4GB2F7

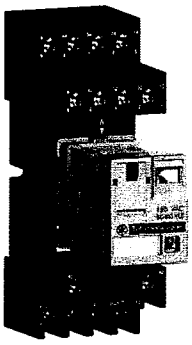
Miniature relays with low level contacts, without LED (sold in lots of 10)

Number and type of contacts - Thermal current (Ith)			
4 C/O -3 A			
Coil Voltage	Catalog Number	Weight lb.	Weight kg
12 Vdc	RXM 4GB1JD	0.08	0.036
24 Vdc	RXM 4GB1BD	0.08	0.036
48 Vdc	RXM 4GB1ED	0.08	0.036
110 Vdc	RXM 4GB1FD	0.08	0.036
24 Vac	RXM 4GB1B7	0.08	0.036
48 Vac	RXM 4GB1E7	0.08	0.036
120 Vac	RXM 4GB1F7	0.08	0.036
230 Vac	RXM 4GB1P7	0.08	0.036

Miniature relays with low level contacts, with LED (sold in lots of 10)

Number and type of contacts - Thermal current (Ith)			
4 C/O -3 A			
Coil Voltage	Catalog Number	Weight lb.	Weight kg
12 Vdc	RXM 4GB2JD	0.08	0.036
24 Vdc	RXM 4GB2BD	0.08	0.036
48 Vdc	RXM 4GB2ED	0.08	0.036
110 Vdc	RXM 4GB2FD	0.08	0.036
24 Vac	RXM 4GB2B7	0.08	0.036
48 Vac	RXM 4GB2E7	0.08	0.036
120 Vac	RXM 4GB2F7	0.08	0.036
230 Vac	RXM 4GB2P7	0.08	0.036
240 Vac	RXM 4GB2U7	0.08	0.036

See page 8 for sockets and accessories.



RXZ E2M114M with relay RXM 4AB2P7TQ

Miniature relays without LED (sold in lots of 100)

Coil Voltage	Number and type of contacts - Thermal current (Ith)					
	2 C/O - 12 A			4 C/O - 6 A		
	Catalog Number	Weight		Catalog Number	Weight	
		lb.	kg		lb.	kg
12 Vdc	–	–	–	RXM 4AB1JDTQ	0.08	0.036
24 Vdc	RXM 2AB1BDTQ	0.08	0.037	RXM 4AB1BDTQ	0.08	0.036
48 Vdc	–	–	–	RXM 4AB1EDTQ	0.08	0.036
110 Vdc	–	–	–	RXM 4AB1FDTQ	0.08	0.036
220 Vdc	–	–	–	RXM 4AB1MDTQ	0.08	0.036
24 Vac	RXM 2AB1B7TQ	0.08	0.037	RXM 4AB1B7TQ	0.08	0.036
48 Vac	–	–	–	RXM 4AB1E7TQ	0.08	0.036
120 Vac	RXM 2AB1F7TQ	0.08	0.037	RXM 4AB1F7TQ	0.08	0.036
230 Vac	RXM 2AB1P7TQ	0.08	0.037	RXM 4AB1P7TQ	0.08	0.036
Miniature relays with LED (sold in lots of 100)						
24 Vdc	–	–	–	RXM 4AB2BDTQ	0.08	0.036
24 Vac	RXM 2AB2B7TQ	0.08	0.037	RXM 4AB2B7TQ	0.08	0.036
230 Vac	RXM 2AB2P7TQ	0.08	0.037	RXM 4AB2P7TQ	0.08	0.036

RXZ E2S114M with relay RXM 4AB2F7TQ

Sockets (sold in lots of 10)

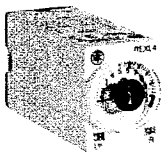
Contact terminal arrangement	Connection	Relay type	Catalog Number	Weight	
				lb.	kg
Mixed	Screw clamp terminals	RXM 2●●●● [1] RXM 4●●●●	RXZ E2M114 [2]	0.11	0.048
	Box lug connector	RXM 2●●●● [1] RXM 4●●●●	RXZ E2M114M [2]	0.12	0.056
Separate	Box lug connector	RXM 2●●●●	RXZ E2S108M [3]	0.13	0.058
		RXM 3●●●●	RXZ E2S111M [2]	0.15	0.066
		RXM 4●●●●	RXZ E2S114M [2]	0.15	0.070

[1] When mounting relay RXM 2●●●●● on socket RXZ E2M●●●●, the thermal current must not exceed 10 A.
[2] Thermal current Ith: 10 A
[3] Thermal current Ith: 12 A

RXM 041●●7

Protection modules (sold in lots of 20)

Description	Voltage	For use with	Catalog Number	Weight	
				oz.	g
Diode	6–250 Vdc	All sockets	RXM 040W	0.11	3.0
RC circuit	24–60 Vac	All sockets	RXM 041BN7	0.35	10.0
	110–240 Vac	All sockets	RXM 041FU7	0.35	10.0
Varistor	6–24 Vac/Vdc	All sockets	RXM 021RB	1.06	30.0
	24–60 Vac/Vdc	All sockets	RXM 021BN	1.06	30.0
	110–240 Vac/Vdc	All sockets	RXM 021FP	1.06	30.0



RE XL4●●

Timing relays

Description	For use with	Catalog Number	Weight	
			lb.	kg
2 timed C/O contacts (function A—On-delay)	Sockets RXZ E●●●●●	RE XL2●● [4]	0.09	0.042
4 timed C/O contacts (function A—On-delay)		RE XL4●● [4]	0.09	0.042

[4] Please refer to the *Zelio® Time - Timers* catalog (9050CT0001R2/05).

RXZ 400

Accessories (sold in lots of 10)

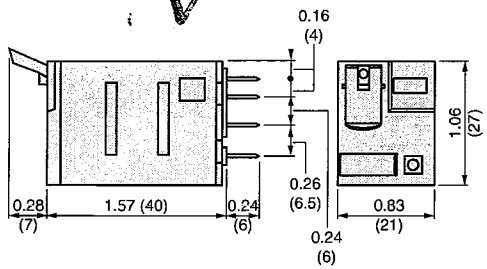
Description	For use with	Catalog Number	Weight	
			oz.	g
Metal hold-down clip	All sockets	RXZ 400	0.04	1.0
Plastic hold-down clip	All sockets	RXZ R335	0.18	5.0
Bus jumper, 2-pole (Ith: 5 A)	All sockets with separate contacts	RXZ S2	0.18	5.0
Mounting adapter for DIN rail [5]	All relays	RXZ E2DA	0.14	4.0
Mounting adapter for mounting directly to a panel	All relays	RXZ E2FA	0.07	2.0
Clip-in markers	All relays (sheet of 108 markers)	RXZ L520	2.82	80.0
	All sockets except RXZ E2M114	RXZ L420	0.04	1.0

[5] Test button becomes inaccessible.

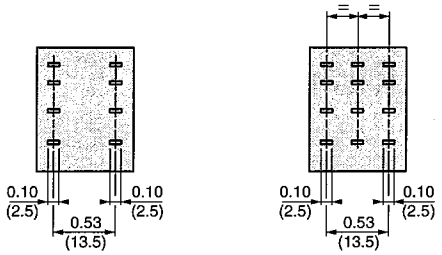
Relays

RXM ●●●●●● | **RXM 2** | **RXM 3** | **RXM 4**

Common view

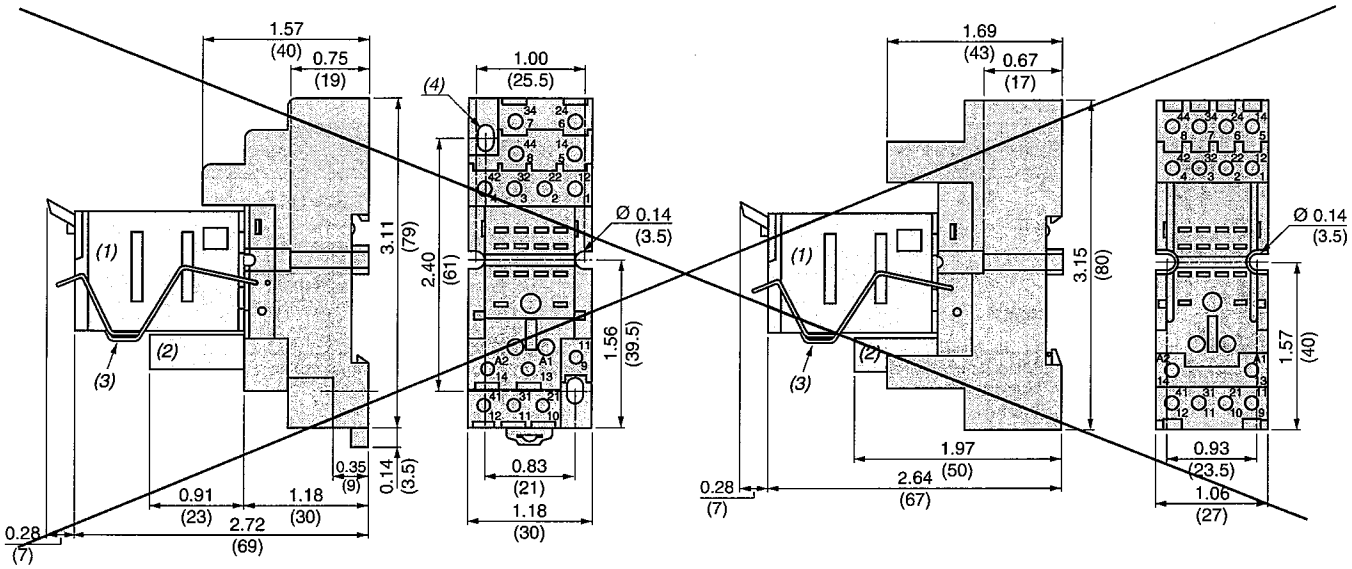


Pin side view



Sockets

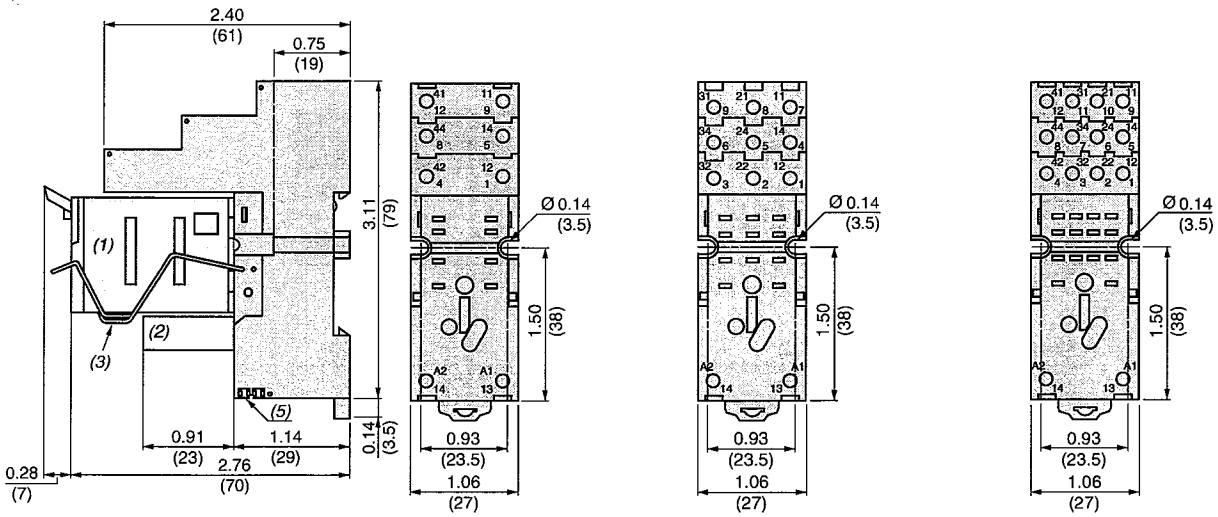
RXZ E2M114 | **RXZ E2M114M**



RXZ E2S●●●● | **RXZ E2S108M** | **RXZ E2S111M** | **RXZ E2S114M**

Common side view

Pin side view

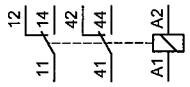


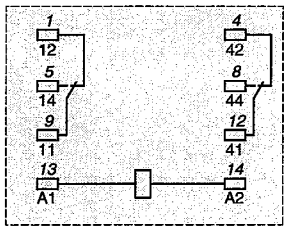
(1) Relays
(2) Add-on protection module
(3) Hold-down clip
(4) 2 elongated holes Ø 0.14 x 0.26 (3.5 x 6.5)
(5) 2 bus jumpers

Dimensions = Inches (mm)

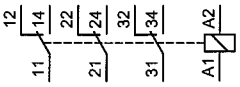
Miniature relays

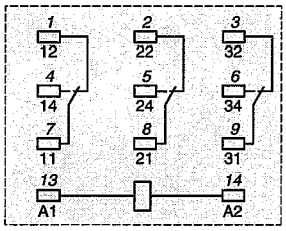
RXM 2●●●●●



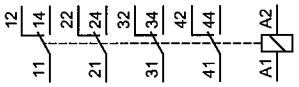


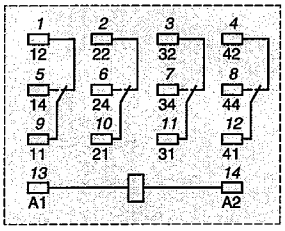
RXM 3●●●●●



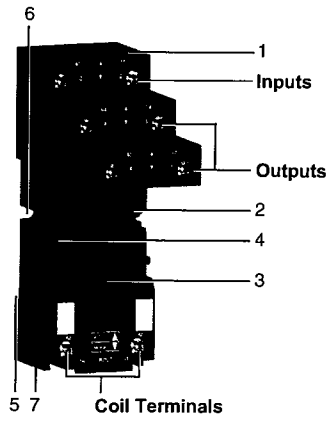


RXM 4●●●●●





Numbers shown in *italics* correspond to NEMA marking. Viewed from pin end.



Sockets with Separate Contact Terminals

1. Box lug connector.
2. Eight, eleven, or fourteen female contacts for the relay pins.
3. Location for protection modules.
4. Locking components for plastic and metal hold-down clips.
5. Locating slot for mounting on DIN rail.
6. Two mounting holes for panel mounting.
7. Location for bus jumpers (see mounting on sockets on page 10).

NOTE: The inputs and outputs are separated from the relay coil terminals.

General Characteristics

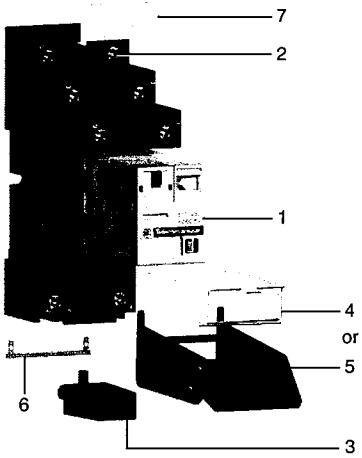
Conforming to standards		IEC/EN 61810-1 (iss. 2), UL 508, CSA C22-2 n° 14
Product certifications		cULus File E164862 CCN NLDX, NLDX7; cURus File E164862 CCN NLDX2, NLDX8; CSA pending; CE; RoHS compliant
Ambient air temperature around the device	Storage	-40–185 °F (-40–85 °C)
	Operation	-40–131 °F (-40–55 °C)
Vibration resistance	Conforming to IEC/EN 60068-2-6	> 6 gn (10–50 Hz)
Degree of protection	Conforming to IEC/EN 60529	IP 40
Shock resistance conforming to IEC/EN 60068-2-27	Opening	10 gn
	Closing	5 gn
Protection category (see page 36)		RT I
Mounting position		Any

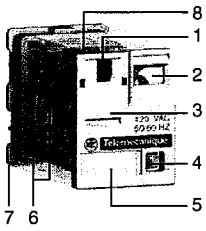
Insulation characteristics

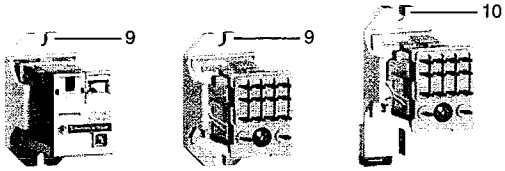
Rated insulation voltage (Ui)		250 V (IEC), 300 V (UL, CSA)
Rated impulse withstand voltage (Uimp)		3.6 kV (1.2/50 µs)
Dielectric strength (rms voltage)	Between coil and contact	2,500 Vac
	Between poles	2,500 Vac
	Between contacts	1,500 Vac

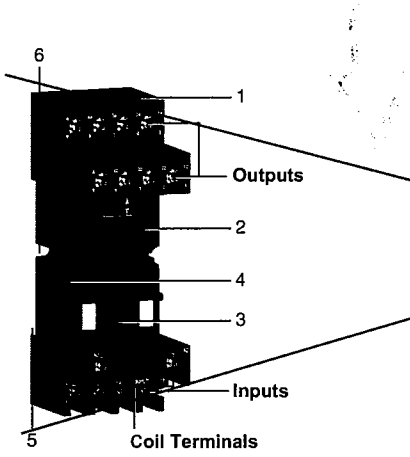
Contact characteristics

Relay type			**RXM 2AB●●●**	**RXM 3AB●●●**	**RXM 4AB●●●**	**RXM 4GB●●●**
Number and type of contacts (see page 11)			2 C/O	3 C/O	4 C/O	4 C/O
Contact materials			AgNi			AgAu
Conventional thermal current (Ith)	For ambient temperature ≤ 131 °F (55 °C)		12 A	10 A	6 A	3 A
Rated operational current	Conforming to IEC in utilization category AC-1	N/O	12 A	10 A	6 A	2 A
		N/C	6 A	5 A	3 A	1 A
	Conforming to UL (resistive@277 Vac)		12 A	10 A	6 A	3 A
Maximum operating rate In operating cycles/hour	No load		18,000			
	Under load		1,200			
Switching voltage	Maximum		250 Vac/Vdc			
Switching capacity	Minimum		10 mA on 17 V			2 mA on 5 V
	Maximum		3,000 VA	2,500 VA	1,500 VA	750 VA
Utilization coefficient			20%			
Mechanical durability in millions of operating cycles			10			
Electrical durability in millions of operating cycles	Resistive load		0.1			









Product Description

The RXM miniature relay range consists of:

1. 12 A relays with 2 C/O contacts, 10 A relays with 3 C/O contacts, 6 A relays with 4 C/O contacts, and 3 A "low level" relays with 4 C/O contacts. All these relays have the same dimensions.
2. Sockets with mixed or separate contact terminals.
3. Protection modules (diode, RC circuit or varistor). All these modules are common to all sockets.
4. A metal hold-down clip for all sockets.
5. A plastic hold-down clip for all sockets.
6. A 2-pole bus jumper that can be used on sockets with separate contact terminals to simplify wiring when creating a jumper between the coil terminals.
7. Clip-in markers for all the sockets except RXZ E2M114.

Relay Description

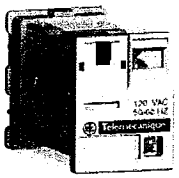
1. Spring return push button for testing the contacts (green: DC, red: AC).
2. Mechanical "relay status" indicator.
3. Removable lock-down door enabling forced maintaining of the contacts for test or maintenance purposes. During operation, this lock-down door must always be in the closed position.
4. Bipolar LED (depending on version) indicating the relay status.
5. Removable marker for relay identification.
6. Four notches for DIN rail mounting adapter or panel mounting adapter.
7. Eight, eleven, or fourteen pins.
8. Area by which the product can be easily gripped.
9. Mounting adapter enabling direct mounting of the relay on a panel.
10. Mounting adapter enabling direct mounting of the relay on a DIN rail.

Socket Description

Sockets with Mixed Contact Terminals

1. Connection by screw clamp terminals or box lug connector.
2. Fourteen female contacts for the relay pins.
3. Location for protection modules.
4. Locking components for plastic and metal hold-down clips.
5. Locating slot for mounting on DIN rail.
6. Two or four mounting holes for panel mounting.

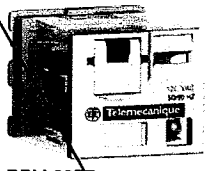
NOTE: The inputs are mixed with the relay coil terminals, with the outputs being located on the opposite side of the socket.


RXM ●AB2F7

RXM Miniature Relays (page 4)

2 pole relays; 12A
3 pole relays; 10A
4 pole relays; 6A
4 pole relays; 3A (low level)

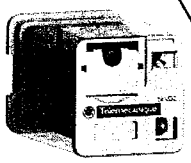
- Mechanical "relay status" indicator on all relays
- Pilot light option available
- Manual operator on all relays
- Built-in marking area


RPM 32F7

RPM Miniature Power Relays (page 12)

1 pole relays; 15A
2 pole relays; 15A
3 pole relays; 15A
4 pole relays; 15A

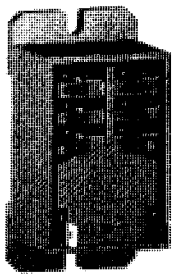
- Mechanical "relay status" indicator on all relays
- Pilot light option available
- Manual operator on all relays
- Built-in marking area


RUM ●●AB2B7

RUM Universal Relays (page 20)

2 pole relays; 8-pin, tube type;10A
3 pole relays; 11-pin, tube type;10A
2 pole relays; 8 blade type; 10A
3 pole relays; 11 blade type; 10A

- Mechanical "relay status" indicator on all relays
- Pilot light option available
- Manual operator on all relays
- Built-in marking area


RPF 2B●●

RPF Power Relays (page 28)

Two Form C contacts; 30A
Two Normally Open contacts; 30A

- DIN track mountable
- Can be mounted directly to a panel


RSB 1A160BD
+ RSZ E1S48M

RSB Interface Relays (page 31)

Two Form C contacts; 8A
One Form C contact; 12A
One Form C contact; 16A

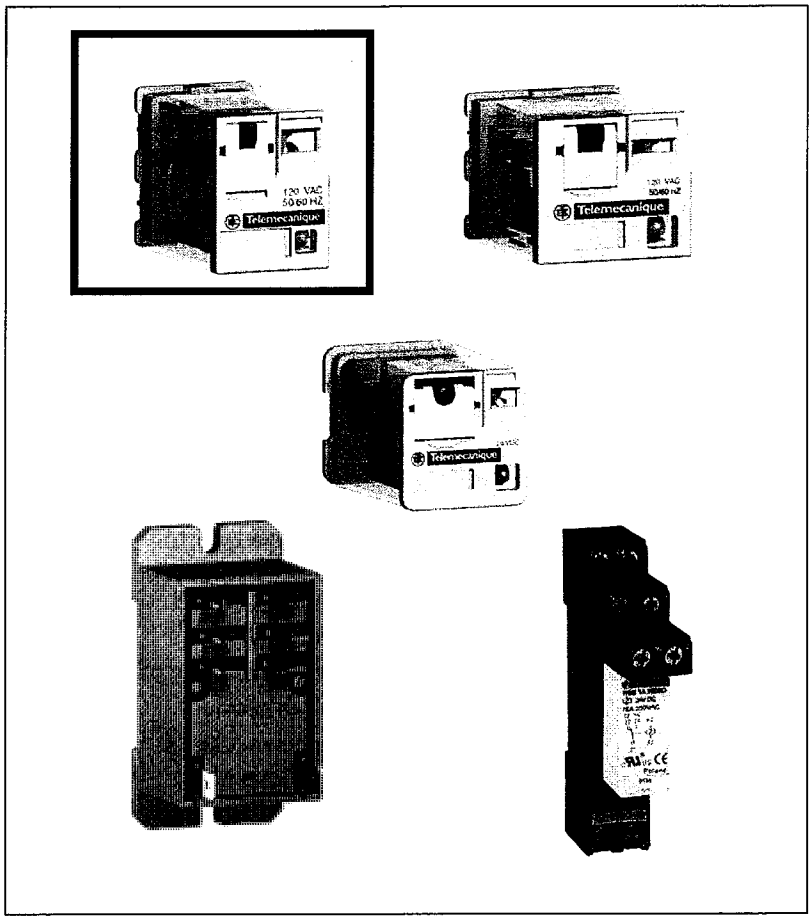
General Technical Information (page 36)

Relay contact types
Utilization categories
Protection categories
Protection modules

Zelio® Plug-in Relays
RXM, RPM, RUM, RPF, RSB

Class 8501

Catalog
June
06



CONTENTS

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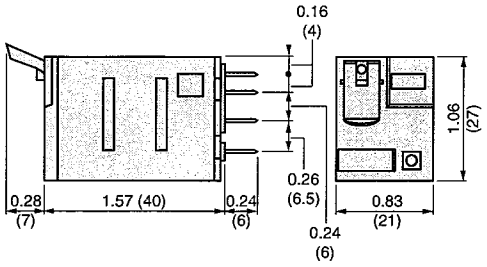
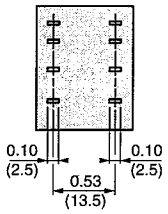
Telemecanique

Relays

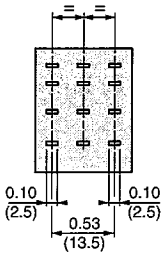
RXM ●●●●●● — Common view



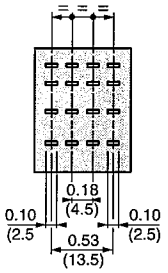
RXM 2 — Pin side view



RXM 3

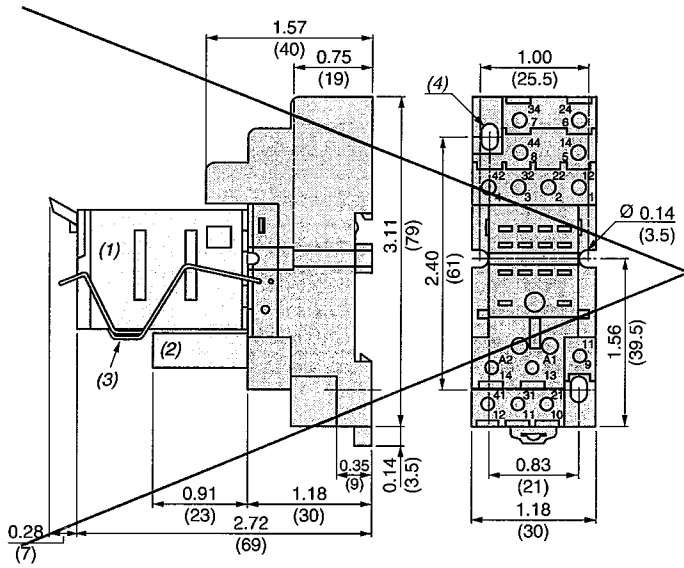


RXM 4

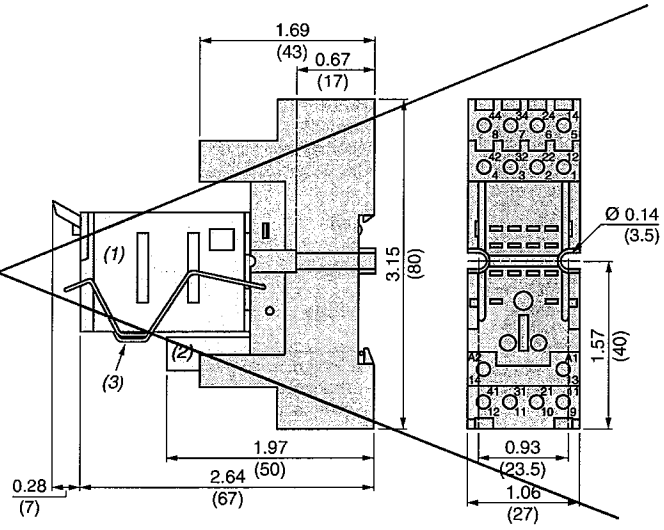


Sockets

RXZ E2M114

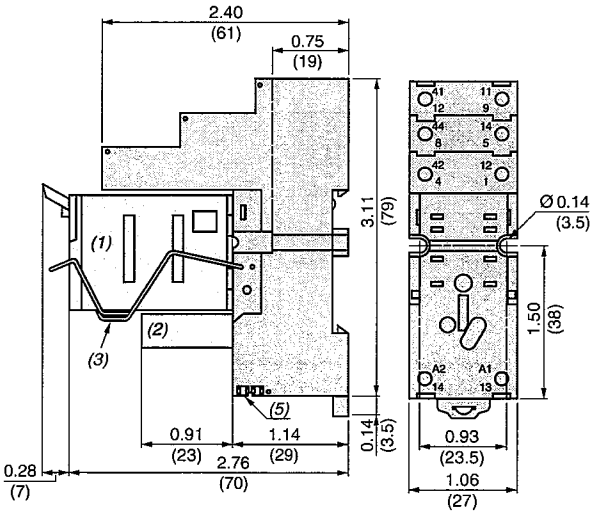


RXZ E2M114M

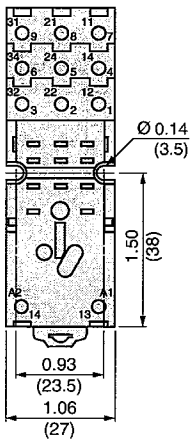


RXZ E2S●●●●

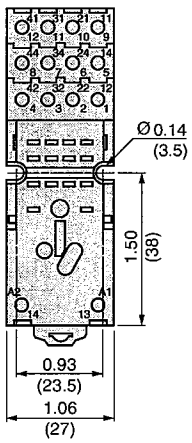
RXZ E2S108M — Common side view



RXZ E2S111M — Pin side view

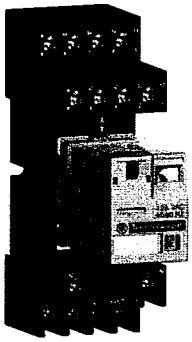


RXZ E2S114M



(1) Relays
(2) Add-on protection module
(3) Hold-down clip
(4) 2 elongated holes Ø 0.14 x 0.26 (3.5 x 6.5)
(5) 2 bus jumpers

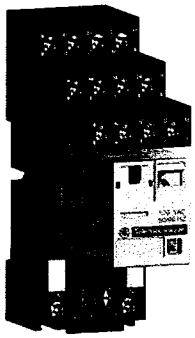
Dimensions = Inches / (mm)



RXZ E2M114M with relay RXM 4AB2P7TQ

Miniature relays without LED (sold in lots of 100)

	Number and type of contacts - Thermal current (Ith)					
	2 C/O - 12 A			4 C/O - 6 A		
Coil Voltage	Catalog Number	Weight		Catalog Number	Weight	
		lb.	kg		lb.	kg
12 Vdc	–	–	–	RXM 4AB1JDTQ	0.08	0.036
24 Vdc	RXM 2AB1BDTQ	0.08	0.037	RXM 4AB1BDTQ	0.08	0.036
48 Vdc	–	–	–	RXM 4AB1EDTQ	0.08	0.036
110 Vdc	–	–	–	RXM 4AB1FDTQ	0.08	0.036
220 Vdc	–	–	–	RXM 4AB1MDTQ	0.08	0.036
24 Vac	RXM 2AB1B7TQ	0.08	0.037	RXM 4AB1B7TQ	0.08	0.036
48 Vac	–	–	–	RXM 4AB1E7TQ	0.08	0.036
120 Vac	RXM 2AB1F7TQ	0.08	0.037	RXM 4AB1F7TQ	0.08	0.036
230 Vac	RXM 2AB1P7TQ	0.08	0.037	RXM 4AB1P7TQ	0.08	0.036
Miniature relays with LED (sold in lots of 100)						
24 Vdc	–	–	–	RXM 4AB2BDTQ	0.08	0.036
24 Vac	RXM 2AB2B7TQ	0.08	0.037	RXM 4AB2B7TQ	0.08	0.036
230 Vac	RXM 2AB2P7TQ	0.08	0.037	RXM 4AB2P7TQ	0.08	0.036

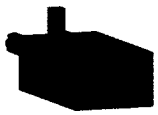


RXZ E2S114M with relay RXM 4AB2F7TQ

Sockets (sold in lots of 10)

Contact terminal arrangement	Connection	Relay type	Catalog Number	Weight	
				lb.	kg
Mixed	Screw clamp terminals	RXM 2●●●● [1] RXM 4●●●●	RXZ E2M114 [2]	0.11	0.048
	Box lug connector	RXM 2●●●● [1] RXM 4●●●●	RXZ E2M114M [2]	0.12	0.056
Separate	Box lug connector	RXM 2●●●●	RXZ E2S108M [3]	0.13	0.058
		RXM 3●●●●	RXZ E2S111M [2]	0.15	0.066
		RXM 4●●●●	RXZ E2S114M [2]	0.15	0.070

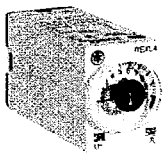
[1] When mounting relay RXM 2●●●●● on socket RXZ E2M●●●●, the thermal current must not exceed 10 A.
[2] Thermal current Ith: 10 A
[3] Thermal current Ith: 12 A



RXM 041●●7

Protection modules (sold in lots of 20)

Description	Voltage	For use with	Catalog Number	Weight	
				oz.	g
Diode	6–250 Vdc	All sockets	RXM 040W	0.11	3.0
RC circuit	24–60 Vac	All sockets	RXM 041BN7	0.35	10.0
	110–240 Vac	All sockets	RXM 041FU7	0.35	10.0
Varistor	6–24 Vac/Vdc	All sockets	RXM 021RB	1.06	30.0
	24–60 Vac/Vdc	All sockets	RXM 021BN	1.06	30.0
	110–240 Vac/Vdc	All sockets	RXM 021FP	1.06	30.0



RE XL4●●

Timing relays

Description	For use with	Catalog Number	Weight	
			lb.	kg
2 timed C/O contacts (function A—On-delay)	Sockets RXZ E●●●●●	RE XL2●● [4]	0.09	0.042
4 timed C/O contacts (function A—On-delay)		RE XL4●● [4]	0.09	0.042

[4] Please refer to the *Zelio® Time - Timers* catalog (9050CT0001R2/05).

RXZ 400

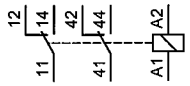
Accessories (sold in lots of 10)

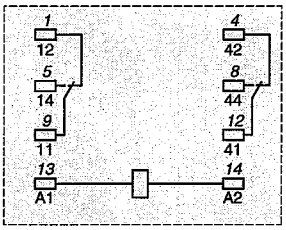
Description	For use with	Catalog Number	Weight	
			oz.	g
Metal hold-down clip	All sockets	RXZ 400	0.04	1.0
Plastic hold-down clip	All sockets	RXZ R335	0.18	5.0
Bus jumper, 2-pole (Ith: 5 A)	All sockets with separate contacts	RXZ S2	0.18	5.0
Mounting adapter for DIN rail [5]	All relays	RXZ E2DA	0.14	4.0
Mounting adapter for mounting directly to a panel	All relays	RXZ E2FA	0.07	2.0
Clip-in markers	All relays (sheet of 108 markers)	RXZ L520	2.82	80.0
	All sockets except RXZ E2M114	RXZ L420	0.04	1.0

[5] Test button becomes inaccessible.

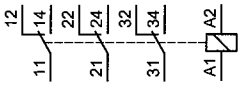
Miniature relays

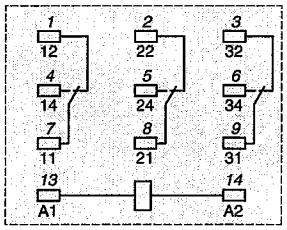
RXM 2●●●●●



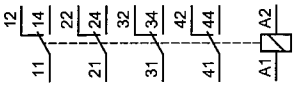


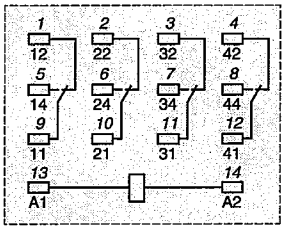
RXM 3●●●●●





RXM 4●●●●●





Numbers shown in *italics* correspond to NEMA marking. Viewed from pin end.

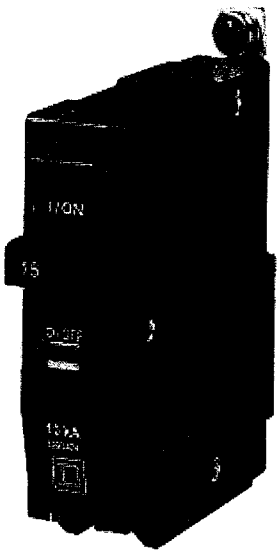
SECTION 26
SQUARE D CIRCUIT BREAKER, 15 AMP, SINGLE POLE 120/240 VAC
(BOM ITEM 21)

Schneider Electric

QOB115 Circuit Breaker

MINIATURE CIRCUIT BREAKER (QOB) STANDARD, 15A, 1-POLE, 120/240 VAC, 1-PHASE, 10KA

Stock Item: This item is normally stocked in our distribution facility.



- **Product Information (#)**

Features and Specifications

Approvals: UL Listed - CSA Certified

Circuit Breaker Type: Standard

For Use With: NQ & NQOD Panelboards/Interiors

Ampere Rating: 15A

Features: VISI-TRIP trip indication

HACR Rated: Yes

General Application: Provides overload and short circuit protection

Wire Size: #14 to #8 AWG(Al/Cu)

Width: 0.75 Inches

Phase: 1-Phase

Height: 3.00 Inches

Marketing Trade Name: QO

Short Circuit Current Rating: 10kA

Depth: 2.91 Inches

Voltage Rating: 120/240VAC

Space Required: 1

Mounting Type: Bolt-On

Switching Duty Rated: Yes

Terminal Type: Pressure Plate

Number of Poles: 1-Pole

Type: QOB

Documents and Downloads

- **Product Data Sheet** (datasheet.cfm?partnumber=QOB115)
- **Residential Products Catalog** (http://ecatalog.squared.com/pubs/Circuit Protection/Miniature Circuit Breakers/QO-QOB Circuit Breakers/0110PL9401.pdf)
- **QO and QOB Miniature Circuit Breakers** (http://ecatalog.squared.com/pubs/Circuit Protection/Miniature Circuit Breakers/QO-QOB Circuit Breakers/0730CT9801R108.pdf)

View all documents and downloads in the Technical Library » (http://ecatalog.squared.com/techlib/)

Ordering and Shipping Information

- **Category** 00015 - Circuit Breakers, 1 Pole: 10 - 70 Amp, 2 Pole: 10 - 125 Amp, 3 Pole: 10 -160 Amp, Type QO
- **Discount Schedule** DE2
- **Article Number** 785901416708
- **Package Qty** 10
- **Weight (lbs.)** 0.28
- **Availability Code** S
- **Returnability** Y

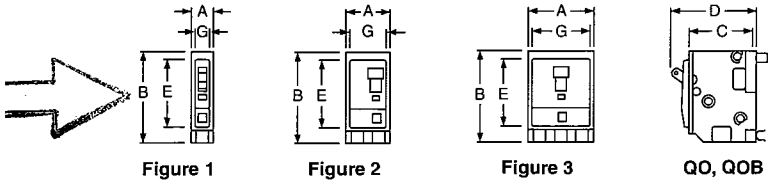


Figure 1 Figure 2 Figure 3 QO, QOB

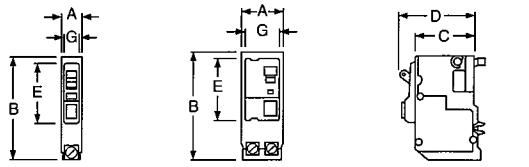


Figure 4 Figure 5 QO-GFI, QO-PL QO-EPD

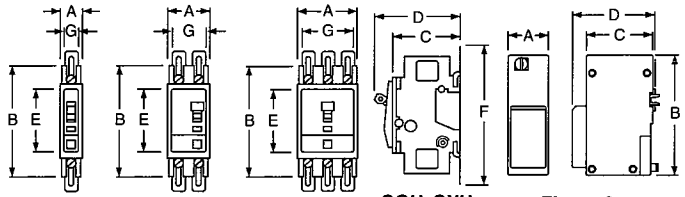


Figure 6 Figure 7 Figure 8 QOU, QYU Low Ampere Figure 9 QO-PLPS

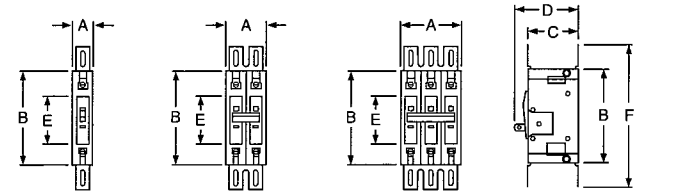


Figure 10 Figure 11 Figure 12 QOU High Ampere

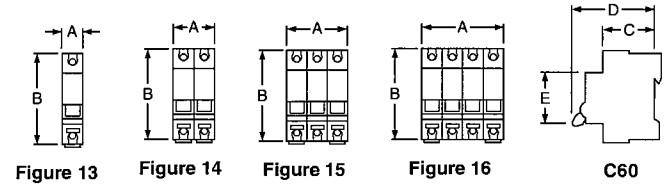


Figure 13 Figure 14 Figure 15 Figure 16 C60

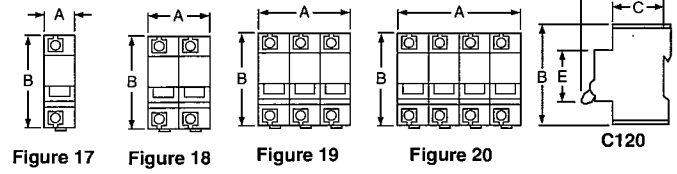


Figure 17 Figure 18 Figure 19 Figure 20 C120

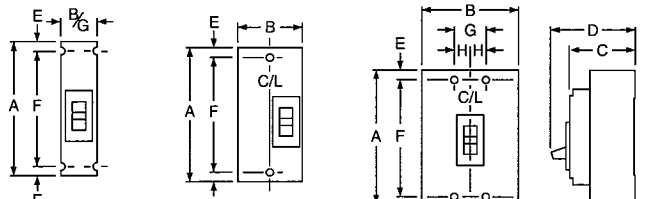


Figure 21 Figure 22 Figure 23

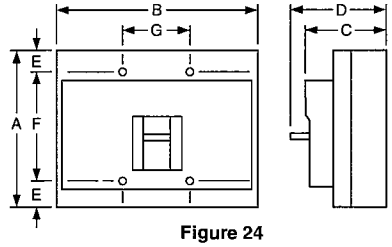


Figure 24

Table 7.141: QO®, QOU, Multi 9™ Circuit Breakers

Circuit Breaker Cat. No. Prefix	Poles	Fig. No.	Dimensions—Inches						
			A	B	C	D	E	F	G
QO, QOB	1	1	0.75	3.00▲	2.31	2.91	2.25	—	0.59
	2	2	1.50	3.00▲	2.31	2.91	2.25	—	1.34
	3	3	2.25	3.00▲	2.31	2.91	2.25	—	2.09
QOB-VH 150 A QOB-VH 110–150 A	2	2	3.0	5.72	2.53	4.90	3.78	—	2.85
	3	3	4.50	5.72	2.53	4.90	3.78	—	4.35
QO-PL QO-GFI QO-EPD	1	4	0.75	4.12■	2.31	2.91	2.25	—	0.59
	2	5	1.50	4.12■	2.31	2.91	2.25	—	1.34
	3	5	2.25	4.12■	2.31	2.91	2.25	—	2.09
QOU QYU Low Ampere	1	6	0.75	4.05♦	2.38	2.98	2.25	5.00★	0.62
	2	7	1.50	4.05♦	2.38	2.98	2.25	5.00★	1.37
	3	8	2.25	4.05★	2.38	2.98	2.25	5.00△	2.12
QOU High Ampere	1	10	0.75	4.45	2.37	2.96	2.25	6.78	—
	2	11	1.50	4.45	2.37	2.96	2.25	6.78	—
	3	12	2.25	4.45	2.37	2.96	2.25	6.78	—
Multi 9™ C60N	1	13	0.71	3.19	1.73	2.76	1.77	—	—
	2	14	1.42	3.19	1.73	2.76	1.77	—	—
	3	15	2.13	3.19	1.73	2.76	1.77	—	—
	4	16	2.84	3.19	1.73	2.76	1.77	—	—
QO-PLPS Power Supply	2	9	1.45	4.35	2.42	3.11	—	—	—

▲ 35–70 A is 3.12 in; 80–100 A 2P and 70–100 A 3P are 3.50 in.
■ QO-PL is 4.55 in.
♦ 80–100 A 1P and 80–125 A 2P are 4.45 in
★ 80–100 A 1P and 80–125 A 2P are 6.78 in.
▼ 70–100 A 4.45 in.
△ 70–100 A is 6.78 in.

Table 7.142: QB, QD, QG, QJ, Q4, FA, FI, KA, KC, KI, LA, LC, LI, LE, LX, LXI, MA Circuit Breakers

Circuit Breaker Cat. No. Prefix	Poles	Fig. No.	Dimensions—Inches							
			A	B	C	D	E	F	G	H
QB, QD, QG, QJ	2	22	6.47	3.00	3.02	3.93	□	4.25	—	—
	3	23	6.47	4.50	3.02	3.93	□	4.25	1.50	0.75
FAL, FHL	1	21	6.00	1.50	3.16	4.13	0.44	5.13	1.50	—
	2	22	6.00	3.00	3.16	4.13	0.44	5.13	—	—
	3	23	6.00	4.50	3.16	4.13	0.44	5.13	1.50	0.75
FIL, KAL, KCL, KHL, KIL	2 & 3	23	8.00	4.50	3.66	4.75	0.44	7.13	1.50	0.75
Q4L, LAL, LHL	2 & 3	23	11.00	6.00	4.06	5.84	0.88	9.25	2.00	1.00
LIL, LEL, LXL, LXIL, LCL	2 & 3	24	11.86	7.50	5.48	6.74	0.55	10.75	2.50	
MAL, MHL	2 & 3	23	14.00	9.00	4.53	6.50	1.66	10.69	3.00	1.50

□ Dimensions E are 1.59 in at ON end and 0.63 in at OFF end.

Table 7.143: Shipping Weights◊

Frame Size	Approx. Shipping Weight (Lbs.)	Frame Size	Approx. Shipping Weight (Lbs.)
FAL, FHL 1P	2	KIL	9
FAL, FHL 2P	3	LAL, LHL	15
FAL, FHL 3P	5	LEL, LIL, LXL, LXIL, LCL	25
FIL	8	Q4L	15
QB, QD, QG, QJ	4	MAL, MHL	34
KAL, KHL	7		

◊ All weights are for 3P circuit breakers unless otherwise noted.

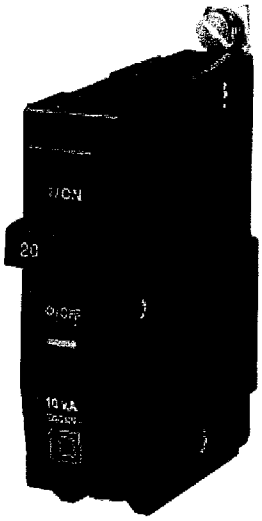
SECTION 27
SQUARE D CIRCUIT BREAKER, 20 AMP, SINGLE POLE 120/240 VAC (BOM ITEM 22)

Schneider Electric

QOB120 Circuit Breaker

MINIATURE CIRCUIT BREAKER (QOB) STANDARD, 20A, 1-POLE, 120/240 VAC, 1-PHASE, 10KA

Stock Item: This item is normally stocked in our distribution facility.



- **Product Information (#)**

Features and Specifications

Approvals: UL Listed - CSA Certified

Circuit Breaker Type: Standard

For Use With: NQ & NQOD Panelboards/Interiors

Ampere Rating: 20A

Features: VISI-TRIP trip indication

HACR Rated: Yes

General Application: Provides overload and short circuit protection

Type: QOB

Number of Poles: 1-Pole

Wire Size: #14 to #8 AWG(Al/Cu)

Phase: 1-Phase

Height: 3.00 Inches

Width: 0.75 Inches

Marketing Trade Name: QO

Short Circuit Current Rating: 10kA

Depth: 2.91 Inches

Voltage Rating: 120/240VAC

Space Required: 1

Switching Duty Rated: Yes

Mounting Type: Bolt-On

Terminal Type: Pressure Plate

Documents and Downloads

- **Product Data Sheet** (datasheet.cfm?partnumber=QOB120)
- **Residential Products Catalog** (http://ecatalog.squared.com/pubs/Circuit Protection/Miniature Circuit Breakers/QO-QOB Circuit Breakers/0110PL9401.pdf)
- **QO and QOB Miniature Circuit Breakers** (http://ecatalog.squared.com/pubs/Circuit Protection/Miniature Circuit Breakers/QO-QOB Circuit Breakers/0730CT9801R108.pdf)

View all documents and downloads in the Technical Library » (http://ecatalog.squared.com/techlib/)

Ordering and Shipping Information

- **Category** 00015 - Circuit Breakers, 1 Pole: 10 - 70 Amp, 2 Pole: 10 - 125 Amp, 3 Pole: 10 -160 Amp, Type QO
- **Discount Schedule** DE2
- **Article Number** 785901416722
- **Package Qty** 1
- **Weight (lbs.)** 0.28
- **Availability Code** S
- **Returnability** Y

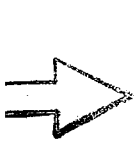


Figure 1

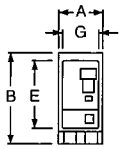


Figure 2

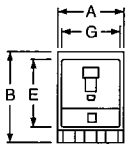
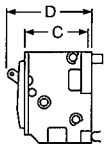


Figure 3



QO, QOB

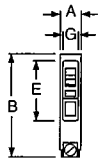
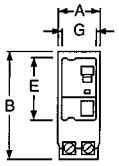


Figure 4



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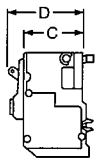
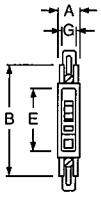


QO-GFI, QO-PL
QO-EPD



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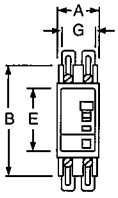

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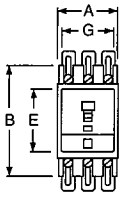

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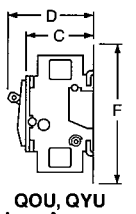


QOU, QYU
Low Ampere

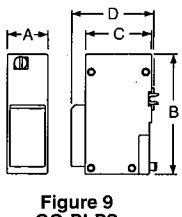
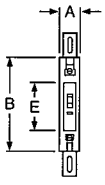


Figure 9
QO-PLPS



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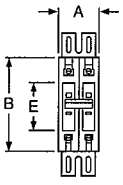

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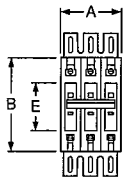

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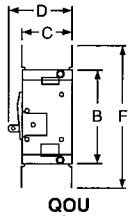
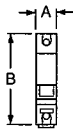


QOU
High Ampere



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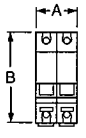

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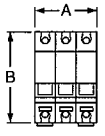

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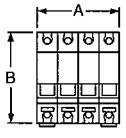

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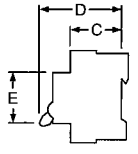
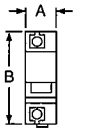


C60



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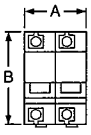

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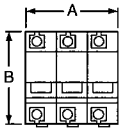

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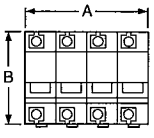

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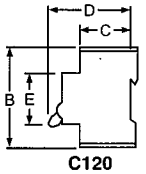

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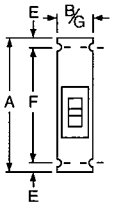

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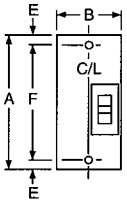

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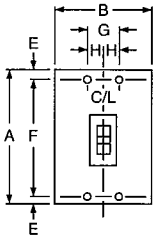

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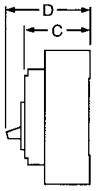


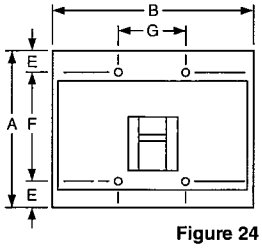


Figure 24

Table 7.141: QO®, QOU, Multi 9™ Circuit Breakers

Circuit Breaker Cat. No. Prefix	Poles	Fig. No.	Dimensions—Inches						
			A	B	C	D	E	F	G
QO, QOB	1	1	0.75	3.00▲	2.31	2.91	2.25	—	0.59
	2	2	1.50	3.00▲	2.31	2.91	2.25	—	1.34
	3	3	2.25	3.00▲	2.31	2.91	2.25	—	2.09
QOB-VH 150 A QOB-VH 110–150 A	2	2	3.0	5.72	2.53	4.90	3.78	—	2.85
	3	3	4.50	5.72	2.53	4.90	3.78	—	4.35
QO-PL QO-GFI QO-EPD	1	4	0.75	4.12■	2.31	2.91	2.25	—	0.59
	2	5	1.50	4.12■	2.31	2.91	2.25	—	1.34
	3	5	2.25	4.12■	2.31	2.91	2.25	—	2.09
QOU QYU Low Ampere	1	6	0.75	4.05♦	2.38	2.98	2.25	5.00★	0.62
	2	7	1.50	4.05♦	2.38	2.98	2.25	5.00★	1.37
	3	8	2.25	4.05★	2.38	2.98	2.25	5.00△	2.12
QOU High Ampere	1	10	0.75	4.45	2.37	2.96	2.25	6.78	—
	2	11	1.50	4.45	2.37	2.96	2.25	6.78	—
	3	12	2.25	4.45	2.37	2.96	2.25	6.78	—
Multi 9™ C60N	1	13	0.71	3.19	1.73	2.76	1.77	—	—
	2	14	1.42	3.19	1.73	2.76	1.77	—	—
	3	15	2.13	3.19	1.73	2.76	1.77	—	—
	4	16	2.84	3.19	1.73	2.76	1.77	—	—
QO-PLPS Power Supply	2	9	1.45	4.35	2.42	3.11	—	—	—

▲ 35–70 A is 3.12 in; 80–100 A 2P and 70–100 A 3P are 3.50 in.
■ QO-PL is 4.55 in.
♦ 80–100 A 1P and 80–125 A 2P are 4.45 in
★ 80–100 A 1P and 80–125 A 2P are 6.78 in.
▼ 70–100 A 4.45 in.
△ 70–100 A is 6.78 in.

Table 7.142: QB, QD, QG, QJ, Q4, FA, FI, KA, KC, KI, LA, LC, LI, LE, LX, LXI, MA Circuit Breakers

Circuit Breaker Cat. No. Prefix	Poles	Fig. No.	Dimensions—Inches							
			A	B	C	D	E	F	G	H
QB, QD, QG, QJ	2	22	6.47	3.00	3.02	3.93	□	4.25	—	—
	3	23	6.47	4.50	3.02	3.93	□	4.25	1.50	0.75
FAL, FHL	1	21	6.00	1.50	3.16	4.13	0.44	5.13	1.50	—
	2	22	6.00	3.00	3.16	4.13	0.44	5.13	—	—
	3	23	6.00	4.50	3.16	4.13	0.44	5.13	1.50	0.75
FIL, KAL, KCL, KHL, KIL	2 & 3	23	8.00	4.50	3.66	4.75	0.44	7.13	1.50	0.75
Q4L, LAL, LHL	2 & 3	23	11.00	6.00	4.06	5.84	0.88	9.25	2.00	1.00
LIL, LEL, LXL, LXIL, LCL	2 & 3	24	11.86	7.50	5.48	6.74	0.55	10.75	2.50	
MAL, MHL	2 & 3	23	14.00	9.00	4.53	6.50	1.66	10.69	3.00	1.50

□ Dimensions E are 1.59 in at ON end and 0.63 in at OFF end.

Table 7.143: Shipping Weights◊

Frame Size	Approx. Shipping Weight (Lbs.)	Frame Size	Approx. Shipping Weight (Lbs.)
FAL, FHL 1P	2	KIL	9
FAL, FHL 2P	3	LAL, LHL	15
FAL, FHL 3P	5	LEL, LIL, LXL, LXIL, LCL	25
FIL	8	Q4L	15
QB, QD, QG, QJ	4	MAL, MHL	34
KAL, KHL	7		

◊ All weights are for 3P circuit breakers unless otherwise noted.

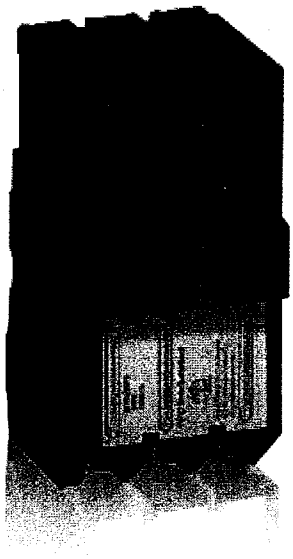
SECTION 28
SQUARE D CIRCUIT BREAKER, 15 AMP, SINGLE POLE 120/240 VAC, GFI (BOM ITEM 23)

QO® and QOB Miniature Circuit Breakers with Ground Fault Protection

Integrated design combines UL-approved circuit breaker with 5 mA, 30 mA or 100 mA ground fault protection

Ground faults can occur when electrical equipment is worn, defective or accidentally misused. Square D® QO and QOB miniature circuit breakers with ground fault protection provide load level detection that isolates only the affected circuit when a ground leakage occurs. Applying branch breakers with integral ground fault protection allows users to quickly identify the ground leakage's current location and address the problem before it escalates to hazardous levels.

Square D QO EPD 3-pole Miniature Circuit Breaker



Square D QO and QOB miniature circuit breakers with ground fault protection provide enhanced protection of a system's wiring and sensitive electronic components. Low levels of fault current can injure or harm personnel and damage sensitive electronic equipment yet remain insufficient to operate the thermal-magnetic functions of the circuit breaker.

A ground fault exists when an unintended path is established between the normal current carrying conductors and metallic or conductive surfaces, which are bonded to or in direct contact with earth. Ground faults can initially conduct only a low level of current flow that is well below the thermal ampere frame rating of the protective circuit breaker. However, when a ground fault continues undetected, it can escalate causing significant heat and mechanical damage. Sensing and interrupting the flow of low level, phase-to-ground faults provides enhanced protection of personnel and equipment.

In an integrated design, the Square D QO and QOB miniature circuit breakers with ground fault protection provide conventional UL 489-listed circuit breakers with built-in ground fault sensors. No separate modules or devices are required. Three levels of ground fault protection are available to meet your specific application needs. The QO and QOB ground fault circuit interrupter (QOB GFI) meets the UL definition for people protection with the ground fault protection set at 5 mA. For equipment protection, Square D QO and QOB equipment protection devices (QOB EPD) are available with either 30 mA or 100 mA ground fault protection.

Improve system reliability and safety

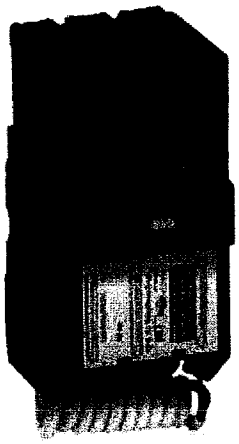
Save space and installation time

Standardize equipment designs

SQUARE D®

by Schneider Electric

Square D QO GFI 3-pole Miniature Circuit Breaker



Conductors

Maximum conductor length is 250 feet; wire sizes for box lug include the following:

Amperage	Aluminum (AWG/kcmil)	Copper (AWG/kcmil)
15 – 30	#12 – #8	#14 – #8
40, 50 and 60	#12 – #4	#14 – #6

The Square D QO and QOB GFI and QO and QOB EPD product lines now include 3-pole devices. Please reference the current versions of our Digest (Document Number 0100PL0901) and the QO and QOB Miniature Circuit Breaker Catalog (Document Number 0730CT9801) for more information on these product lines. For the Canadian market, the Schneider Electric Electrical Distribution Catalog (Document Number S0110CT0901EP RO) is also available.

QOB GFI catalog numbers

All provided with 5 mA setting on ground fault sensors. Omit the "B" in the third position of the catalog number for plug-on type.

Amperage	1-pole		2-pole	3-pole
	10 kA AIR	22 kA AIR	10 kA AIR	10 kA AIR
15	QOB115GFI	QOB115VHGFI	QOB215GFI	QOB315GFI
20	QOB120GFI	QOB120VHGFI	QOB220GFI	QOB320GFI
25	QOB125GFI	QOB125VHGFI	QOB225GFI	—
30	QOB130GFI	QOB130VHGFI	QOB230GFI	QOB330GFI
40	—	—	QOB240GFI	QOB340GFI
50	—	—	QOB250GFI	QOB350GFI
60	—	—	QOB260GFI	—

QOB EPD catalog numbers

All provided with an AIR of 10 kA. Omit the "B" in the third position of the catalog number for plug-on type.

Amperage	1-pole	2-pole	3-pole	
	30 mA	30 mA	30 mA	100 mA
15	QOB115EPD	QOB215EPD	QOB315EPD	QOB315EPE
20	QOB120EPD	QOB220EPD	QOB320EPD	QOB320EPE
25	QOB125EPD	QOB225EPD	—	—
30	QOB130EPD	QOB230EPD	QOB330EPD	QOB330EPE
40	—	QOB240EPD	QOB340EPD	QOB340EPE
50	—	QOB250EPD	QOB350EPD	QOB350EPE
60	—	QOB260EPD	—	—

Factory installed accessories

Ring terminals

Replaces standard box lug with a ring terminal on the load side of the device

Suffix	Poles	Amperage
-5237	1, 2, 3	10 – 30
-5238	1, 2	35 – 60
	3	35 – 50

Auxiliary and alarm switches

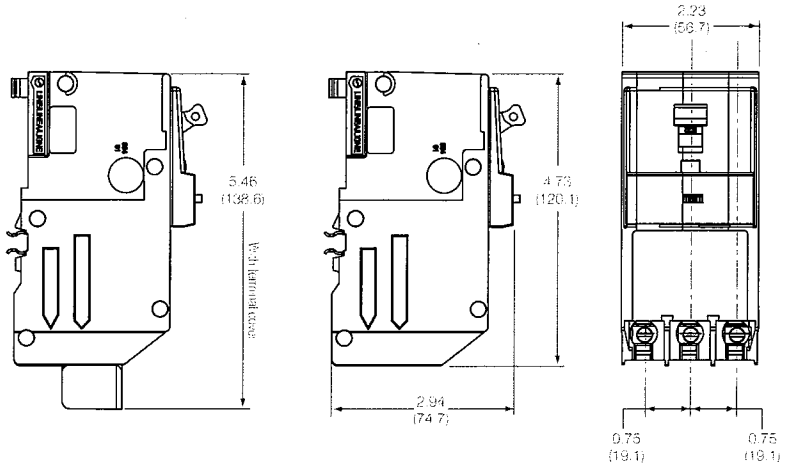
120 Vac maximum voltage, 5 A maximum load

Suffix	Function	Contact
-1200	Auxiliary	1A
-1201	Auxiliary	1B
-2100	Alarm	1A

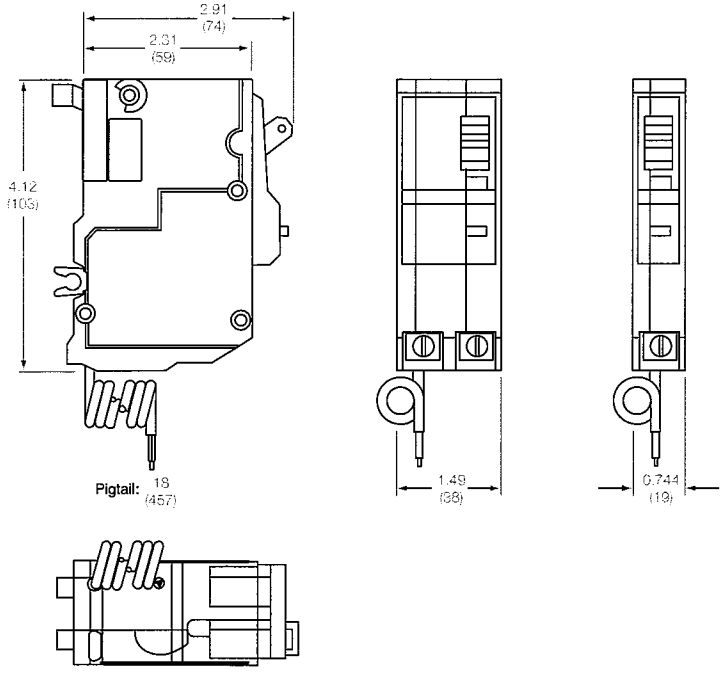
Standard QO and QOB field-installable accessories are also applicable to these devices.

Dimensions

Type QO GFI and QO EPD circuit breaker: 3-pole



Type QO GFI and QO EPD circuit breaker: 1- and 2-pole



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It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

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UNPACKING

Remove the Packing List and verify that you have received all equipment. If you have any questions about the shipment, please call OMEGA Customer Service Department at 1-800-622-2378 or (203) 359-1660.

When you receive the shipment, inspect the container and equipment for any signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

QUICK SET-UP GUIDE

1) Determine what function the panel meter is to perform, e.g., rate display with alarm, batch control, totalizer, etc.

2) Ensure compatibility with sensor. The DPF70 panel meters require a pulse (or contact closure) input. The pulse must exceed 3 VDC and drop below 1 VDC. If necessary, as in the case of paddle wheel, turbine meter or other types of inductive pick-up sensors, a signal conditioner or pulse amplifier (such as FLSC-AMP) can be used.

3) The wiring is explained on pages 3 and 4. The 12 VDC output can be used to power the FLSC-AMP. For the DPF75, a single input at pin 5 can be jumpered to pin 6: input B will be the grand total.

4) The relay function can be altered by cutting and/or soldering jumper traces as shown on page 5.

5) There are two main operating modes: RUN, PROGRAM. (See page 6 for a summary). In the RUN mode, the view key allows you to toggle the display for rate, batch and grand total. The PRE A, PRE B keys allow you to see and set the relay trigger points. The lock key allows you to lock and unlock the keypad functions by entering the lock-out code.

   The PROGRAM mode must be accessed to set up the function of the display. In this mode, the RST key enters the displayed value into memory. The PRGM key toggles the selections and the arrow keys bump that digit up to the next value or change the decimal point location.

PROGRAMMING EXAMPLE

For this example, let's assume you have an FP-5300 paddle wheel sensor, an FP-5310 1" fitting, the FLSC-AMP pulse amplifier and DPF75. You want to see flow rate (GPM) batch and grand total. The signal K-factor is 183.66 pulses/gallon, (from the manual for the FP-5300 flow sensor). Here are the programming steps you will see, starting on page 1.

FACTOR STEP 1: DPF75, DPF76, & DPF78

A,) Set the decimal point for "dPFA" to allow two decimal places using the UP arrow key.
B.) Enter the K-factor next: 183.66, using the arrow keys.
C.) Do the same for "dPFB" (DPF75 only).
D,) Choose "HI CPS", as the input will exceed 40 Hz (DPF78 only).

COUNTER STEP 2: DPF75, DPF76:

A,) Reset to zero "rST 0" will allow us to count up. "SET Pr" counts down from the preset value.
B.) To read the total in whole gallons, set the decimal point to the far right.
C.) Since you do not want to sum or take the difference of two inputs, choose "A SEP B" (DPF75 only).
D.) The frequency will exceed 40 Hz, so you will need to select "HI CPS". "LO CPS" provides debounce filtering for contact closures.

RATE STEP 3: DPF75, DPF78

A.) Select "SCALE" to engage the K-factor.
B.) Select "=60".
C.) Normalize at 1.5 seconds.
D.) Set 4 significant figures.
E.) Set 02 sec delay.

LOCK STEP 4: DPF75, DPF76 & DPF78

Before you finish this step, write down your personal lock-out code and store it in a safe place. Here is where you select and enter the code and what will be locked. To lock the meter you must wait until you are in the RUN mode. Press the "LOCK" key, use the arrows to display your code, then Enter. Repeat to unlock.

RELAYS STEP 5: DPF75

The DPF76 relays can only trigger on batch or total. The DPF78 relays can only trigger on rate. The DPF75 relays can be programmed to trigger on rate or total. The relay setpoints for rate or total for all versions with relays are set with the PRE A and PRE B buttons. When the relays are set for non-latching, the batch total will automatically reset at the batch preset. The programming is now complete. Here is what you will see with 100 Hz input frequency (equal to 32.66 GPM flow rate). The rate is: "r 32.66". The batch will continuously increase: ("480"); the grand total will also continuously increase ("...4.8.0"). Notice that the decimals points for the grand total are inverted - all are lit except where the decimal point is actually located.

To read total gallons to a tenth of a gallon: in Step 2, change the dPLoC to allow one decimal place "XXX.X" for the counter. But this will cause a shift in the rate display so you will also need to shift the K-factor in Step 1. Change the K-factor to 18.366 to read the correct units. Now the 100 Hz signal will yield "r 32.66", "480.0", ". . 4.8.00.".

DESCRIPTION & SPECIFICATIONS

DESCRIPTION:

The OMEGA DPF70 is a dual input (channel A and B) counter/ratemeter, each with its own 5 digit dividing scale factor. The two 5 AMP preset relay outputs can be programmed by the user to apply to the "A" total counter, the "A" ratemeter, or the "B" counter or the net total of A and B inputs. The user can view the Net Total of "A+B", the Net Total of "A-B", the rate of A, or A and B counters separately. The "DPF75" version shows rate and total (as described above). The "DPF76" is exclusively a counter and the "DPF78" is exclusively a ratemeter.

SPECIFICATIONS:

DISPLAY

6 digit, 0.55" High LED

INPUT POWER:

110 VAC ± 15% or 11 to 15 VDC
220 VAC ± 15% or 11 to 15 VDC

CURRENT:

250 mA DC max. or 6.5 VA AC

OUTPUT POWER (AC powered units only)

+12 VDC @ 50 mA, unregulated -10 + 50%

TEMPERATURE:

Operating: +32°F (0°C) to +130 F (+54°C)
Storage: -40 F (-40°C) to +200°F (93°C)

DIMENSIONS: See next page.

WEIGHT:

2 Lbs. (1 kg)

MEMORY

EEPROM stores data for 10 years if power is lost.

INPUTS:

3: High Impedance DC pulse input Open or 0-1 VDC (low), 4-30 VDC (high), 10 KOhm imp. 10 KHz max. speed. Accepts simultaneous inputs.

3M: Mag. Input, Input A only, accepts 30mV input (50 V max. P/P) signals 10 KOhm imp. 5 KHz max. (Input B, 4-30V)

3MB: Mag. Input, Inputs A & B, accepts 30mV input (50 V max. P/P) signals 10 KOhm imp. 5 KHz max.

5: 4-30 V Count pulses on Input A, 4-30 V Direction Control input (level) on Input B.

5M: 30 mV Count pulses on Input A (50 V max. P/P) 4-30 V Direction Control input (level) on Input B

9: Quadrature, accepts 4-30 V pulses with 90°phase shift for direction detection.

9MB: Quadrature, accepts 30 mV (50 V max. P/P) pulses with 90°phase shift for direction detection.

NOTE: The Mag. inputs have filtering as follows: up to 300hz @30mV, 5KHz @ .25V to 50V max.

RESET:

Front Panel:

Resets displayed value and control output

Remote:

4-30 VDC negative edge resets COUNTER "A" and control output

K FACTOR/SCALING

In the standard unit a fixed K-Factor is used to convert the input pulses to engineering units. The 5 digit K-Factor dividers, with decimal keyed into any position, allow easy direct entry of any K-Factor from 0.0001 to 99999. Separate factors may be entered for the 2 separate input channels.

CONTROL OUTPUTS:

Relays:

2 each N.O. Relay; 5 Amps120/240 VAC or 28 VDC. (N.C. relay contacts and NPN transistor output available with solder jumpers. Transistor output is internally pulled up to 10 VDC through relay coil, sinks from 10 VDC to .5 V @ 100 mA)

Analog Output:

An optional 4-20mA (0-20mA) output is available for the DPF70 series. The output can be programmed to track rate or total. This feature is available by adding suffix A to the part number. Connections are via a 2 terminal pluggable screw connector.
Programming is accomplished by using the front panel in conjunction with rear dip switches.
Accuracy: 50uA worst case.
Compliance Voltage: 3 to 30 VDC non inductive.

RS232/RS422SERIAL INTERFACE

If the serial interface option is supplied, up to 99 units can be linked together. (The terminal addressing the unit must be capable of driving all loads in the loop.) Unit status and new set points can be communicated by serial communication. Mode changes, however, must always be made on the front panel. Data is transmitted at selected baud rates using standard seven bit ASCII characters and parity with two additional bits of “Start” and “Stop” to make up the standard ten bit character.

Data is received and transmitted over standard EIA RS232 or RS422 levels. Each 10 bit character is made up of a start bit, 7 bit ASCII code, parity bit and stop bit. Unit number, baud rate and parity are entered in the “Program Setting” set up mode and remain in memory even if power is off.

Note that the input impedance of RS232 is 3K or 7K Ohm worst case. The terminal addressing the unit must be capable of driving all loads in the loop. RS422 input impedance is much higher and there is usually no problem driving 25 units. Unit serial transmit line remains in a high impedance “OFF” state until addressed.

PRESETS

Two control outputs are provided. To set relay values, press “menu” button until “Relay” appears on the display, the A and B outputs can be assigned to the ratemeter (high/low), one preset for rate and one for total, or two presets (2 stage shut off) on the A and B counters. A 5 digit value can be entered for both presets and the decimal point location is the same as the counter. The outputs can be set to energize from 0.1 to 99.9 seconds or latch (0.0). If a value other than 0.0 is entered, the counters will auto reset at the preset . In the A-B or A+B versions, the relays will be assigned to either net total or A rate.

LOCKOUT

Unauthorized front panel changes can be prevented by entering a user selected 5 digit code, in the “LOC” , . mode. The front panel can be completely locked out or the presets can remain accessible.

RATEMETER

Accurate to 4 1/2 digits (±1 display digit). The rate meter can be programmed to accept almost any number of pulses per unit of measurement, sample from 2 to 24 seconds maximum, and auto-range up to 5 digits of significant information. In the “RPS” mode, the ratemeter displays in units per second, and in the “scale” mode, units per hour or per minute. The unit will display the rate of the A Input only.

COUNTER

The two 6-digit counters can count at 10Khz speed. Each can have a 5-digit dividing scale factor. The counter advances on the positive edge of each pulse. Count up or down modes available, as are quadrature inputs from encoders for position or length measurement. The unit can be programmed to view the net value of "A+B" or "A-B", or A and B as separate counters.

HOW TO MOUNT THE UNIT

The unit is designed to be mounted with a gasket providing a water tight seal. Two mounting brackets are provided to secure the unit to the panel. A panel less than .1" may distort if the clamps are screwed too tightly.

Slide the body of the unit through the rubber gasket. Insert the unit into the panel. As shown in "FIG. A", slide the brackets up the groove to press against the back of the panel. Insert screws into rear of brackets and tighten them evenly and alternately. Do not over tighten! A normal level of torque is required. Maximum torque should be 3" pounds.

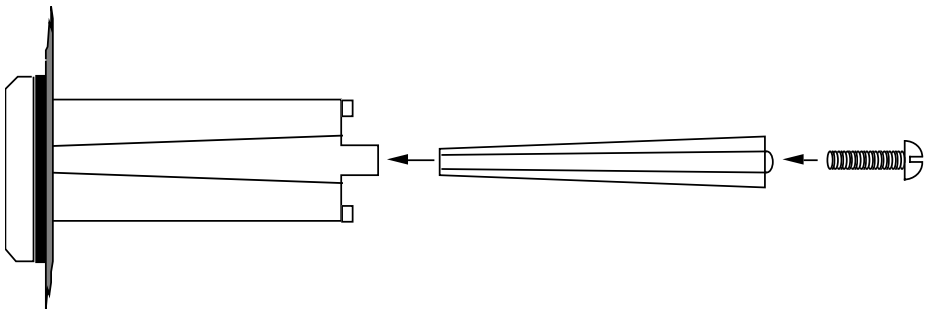
This product is designed to be panel mounted and is NEMA 4 rated if proper mounting procedures are followed and the required and supplied hardware is correctly used.

If the panel in which the unit is mounted is less than .125 of an inch thick, the possibility exists that there will be some flexing. Should this flexing occur, the resulting deformation of the panel could cause a loss of the water tight seal. In case this should occur, the use of silicone or other sealant would be recommended.

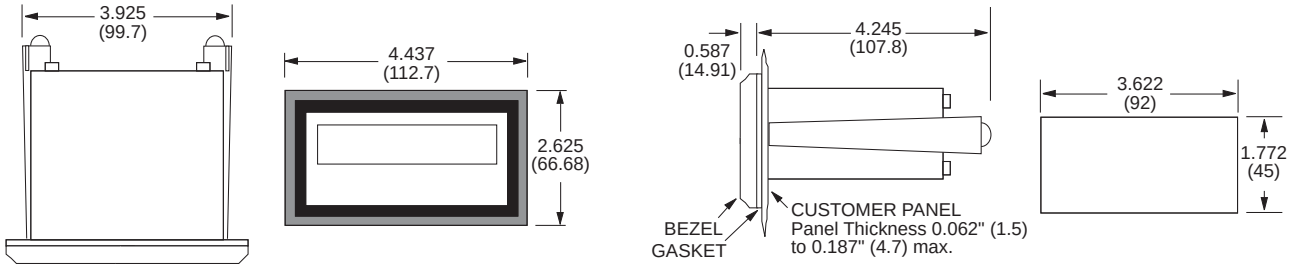
This product is designed to the NEMA 4 rated. However, the fact that we are unable to control either the location in which the device is installed or the actual installation itself requires that the company's liability shall extend only to the repair or replacement of a defective product.

We are prepared to offer additional assistance in those special situations where normal mounting methods do not seem to satisfy the customers needs. This assistance may be obtained by calling the factory and asking for Application Engineering.

FIG. A



DIMENSIONS



Dimensions in inches (mm)

WIRING

The rear terminal contains 12 screw terminals for connecting #14 to #28 gauge wire.

The unit is controlled by a microprocessor and, therefore, an electrically "noisy" environment could cause operating problems. The input power line should not be common to power lines for motors, pumps, contactors, etc.

The unit is designed to be immune from line or RF voltage interference. In some environments voltage spikes of over 100 volts, even 1000 volts, can occur. When common to a power line driving motors voltage fluctuations can be extreme and rapid. Lines driving DC or AC solenoids, relays, or actuators can also cause problems.

Four sources of noise can occur:

1) AC power line noise - If the unit cannot be connected to a clean power source, an inductive load suppressing device (MOV as GE # V130LA1 or Resistor Capacitor as Paktron # .2 uf/220 ohm @ 400V) can be installed. Although locating the suppressor across the AC supply at the unit should help, best results are obtained by connecting the suppressor across the leads of the "load" at the device causing the spike.

2) Input line noise -The noise is carried on the input and D.C. ground lines. Make sure the input wires are never run into the unit in a bundle with power input lines. Also, keep these input lines isolated from inductive lines from devices drawing heavy loads. If there is a possibility of electrical noise, we recommend using shielded cable, with the shield being hooked to the D.C. ground terminal on the instrument, and to "earth" at one point in the circuit, preferably at the D.C. ground terminal of the unit.

3) Output lines - The unit has two relay outputs. When these outputs are used to run external relays or solenoids, spikes can be generated upon activation. This noise can spread through the instrument causing operating problems. If the source is a D.C. operated device, a general purpose diode (IN4004) placed across the solenoid prevents electrical noise spikes. Connect the cathode (banded side) to the more positive side of the coil. If the source is an A.C. operated device, use a MOV or Resistor Capacitor across the coil.

4) 12 VDC output supply - Noise can be generated on the 12 VDC output supply if it is used to drive inductive loads or if the current draw exceeds 50 mA. Insure that all inductive loads have a diode (such as IN4004) across the coil and that the current does not exceed 50 mA.

UP/DOWN CONTROL AND QUADRATURE INPUTS

QUADRATURE INPUT:
When programming the counter section for quadrature input, you must set the unit for A net B and A sub B (see step 2 in programming section). This insures proper operation. The rate can only be viewed in one direction. If the unit is a ratemeter only (DPF78), connect only one of the quadrature channels to Input A (pin 5).

UP/DOWN CONTROL:
When using the up/down control option, Input A (pin 5) is the count input and Input B (pin 6) is the up/down control (direction) input. The counter must be set for A net B and A sub B (see step 2 in programming section).
When the direction input is high (4-30VDC) the count inputs will count up, when the direction input is low (open or less than 1VDC) the count inputs will count down. The direction input must precede the count input by 1 msec when the unit is set for low CPS and 1 usec when set for high CPS.

CONNECTING AC / DC POWER

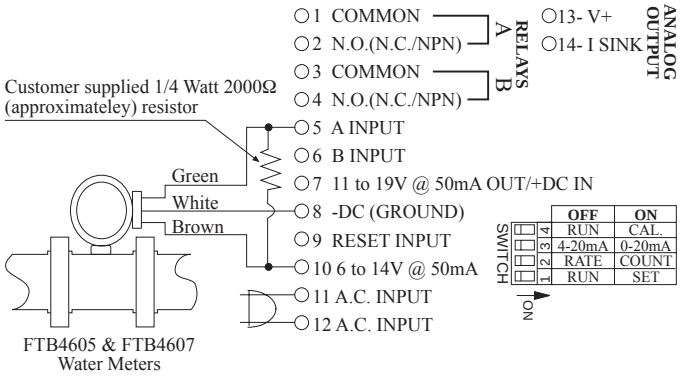
NOTE: Connect power only after other connections are finished. Do not touch the live AC power terminals! The unit has been designed with an isolated AC input. Thus, polarity is not a concern for the AC input. The chassis is plastic, therefore earth ground is not used. For D.C. operation, connect + 12V to pin 7 and - D.C. to pin 8.

WIRING CONSIDERATIONS

Connecting the DPF70 Series to Omega Flowmeters and Amplifiers:

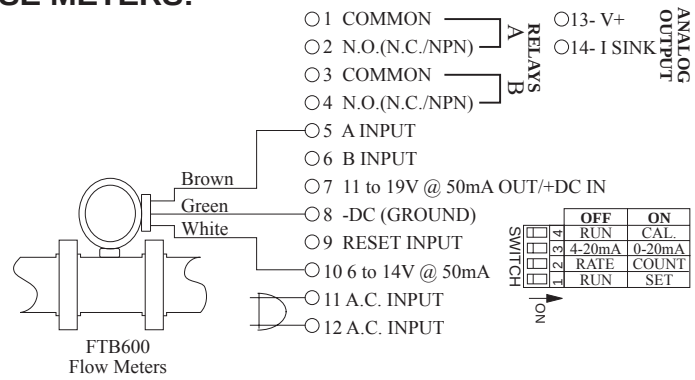
FTB4605 & **FTB4607** Water Meters:
DO NOT USE PIN 7 WITH THESE METERS!

Connections:



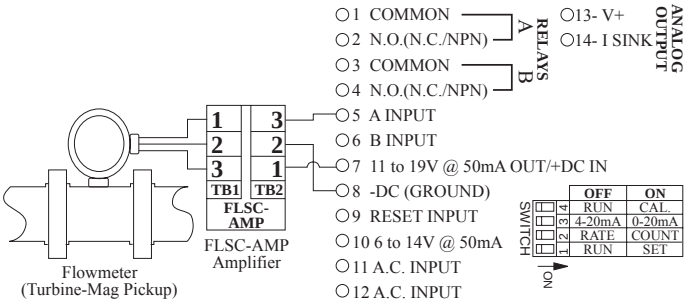
FTB600 Series Flow Meters:
DO NOT USE PIN 7 WITH THESE METERS!

Connections:



FLSC-AMP Amplifier:

Connections:



WHAT CAN YOU VIEW?

1) "A sub B" - If you have selected the "A sub B" mode, pressing "view" shows:
   A) The net result of subtracting input B from input A. Pulses on input B will subtract (count down). Pulses on input A will add (count up) if "reset to 0" is selected, if "set to preset" is selected, input A will subtract (count down).
   B) The rate of input A.

2) "A add B" - If you have selected "A add B" mode, pressing "view" shows:
   A) The net result of adding "A" and "B" inputs. Pulses on input B will add (count up). Pulses on input A will add (count up) if "reset to 0" is selected, if "set to preset" is selected input A will subtract (count down).
   B) The rate of input A.

3) "A sep B" - If you have selected " A sep B" mode, pressing "view" shows:
   A) The total counts of input A. If "reset to 0" is selected A counts up, if "set to preset" is selected A will count down.
   B) The rate of input A.
   C)* The total counts of input B. B will always count up.

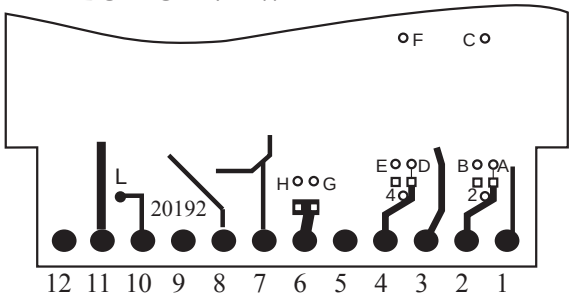
NOTE: In "A sep B" mode, B can be used in 3 ways:
   1) As a separate totalizing counter
   2)** As a Batch Total Counter for input A
   3)** As a Grand Total Counter for input A

NOTE:
 * All decimal points are inverted when "B total" is being displayed.
** See below on how to modify for Batch Count and "B" as a Grand Total Counter.

OUTPUT JUMPER SELECTIONS

	FUNCTION	MODIFICATION	
	"A" RELAY N.C. OUTPUT	CUT AT "A"	JUMPER "B" TO "2"
	"B" RELAY N.C. OUTPUT	CUT AT "D"	JUMPER "E" TO "4"
*	"A" PRESET TRANSISTOR (NPN)	CUT AT "A"	JUMPER "C" TO "2"
*	"B" PRESET TRANSISTOR (NPN)	CUT AT "D"	JUMPER "F" TO "4"
	"B" AS BATCH COUNTER	SELECT "A SEP B"	JUMPER "H" TO "G"
	"B" AS GRAND TOTAL COUNTER	SELECT "A SEP B"	CONNECT PULSES TO "A" & "B"

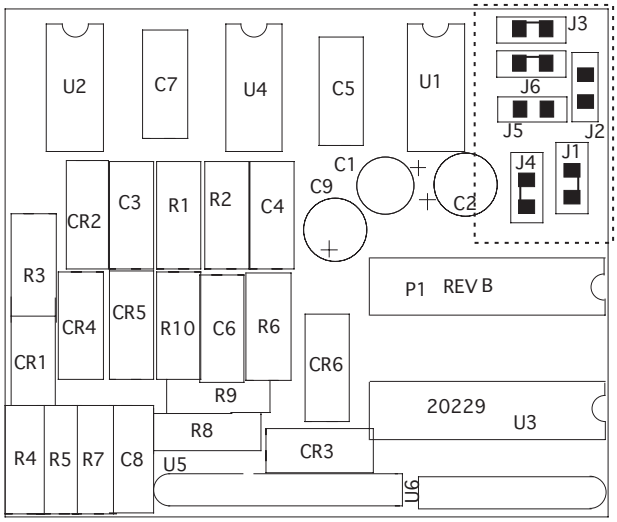
BOTTOM VIEW AT TERMINAL



* The unit must be removed from the case to access jumpers C & F, all other jumpers can be accessed by removing the plastic extender.

NOTE: All three pads at jumpers 2 and 4 are connected.

MILLIVOLT INPUT OPTION JUMPER SELECTIONS

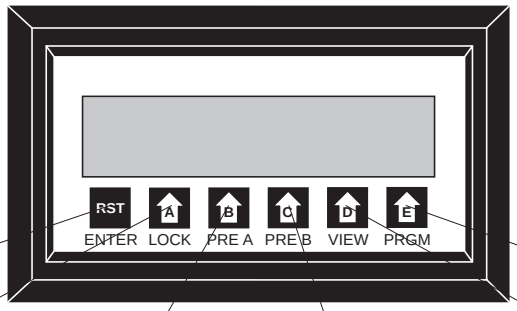


If the unit has the millivolt input bd.# 20229, A & B inputs can be separately solder jumper programmed to accept either a low millivolt or 4-30 V input. Each unit shipped is programmed according to part number. If solder jumpers are made, the part number should be modified to reflect the changes made

C=CLOSE, O=OPEN

	4-30V INPUT	**Millivolt** INPUT
Input A	J1-O, J2-C, J3-O	J1-C, J2-O, J3-C
InputB	J4-O, J5-C, J6-O	J4-C, J5-O, J6-C

OPERATING THE FRONT PANEL



Press to ENTER in the programming mode.
Press to RESET displayed total in operating mode.

Press to "enter" LOCK code to LOCK and UNLOCK front panel.

Press to view or change Preset A

Press to view or change Preset B

Press to alternately view A Rate& Net Total or A Rate, A Total & B Total.

Press to cycle through PROGRAM choices;
Press to step through set up choices in program mode.

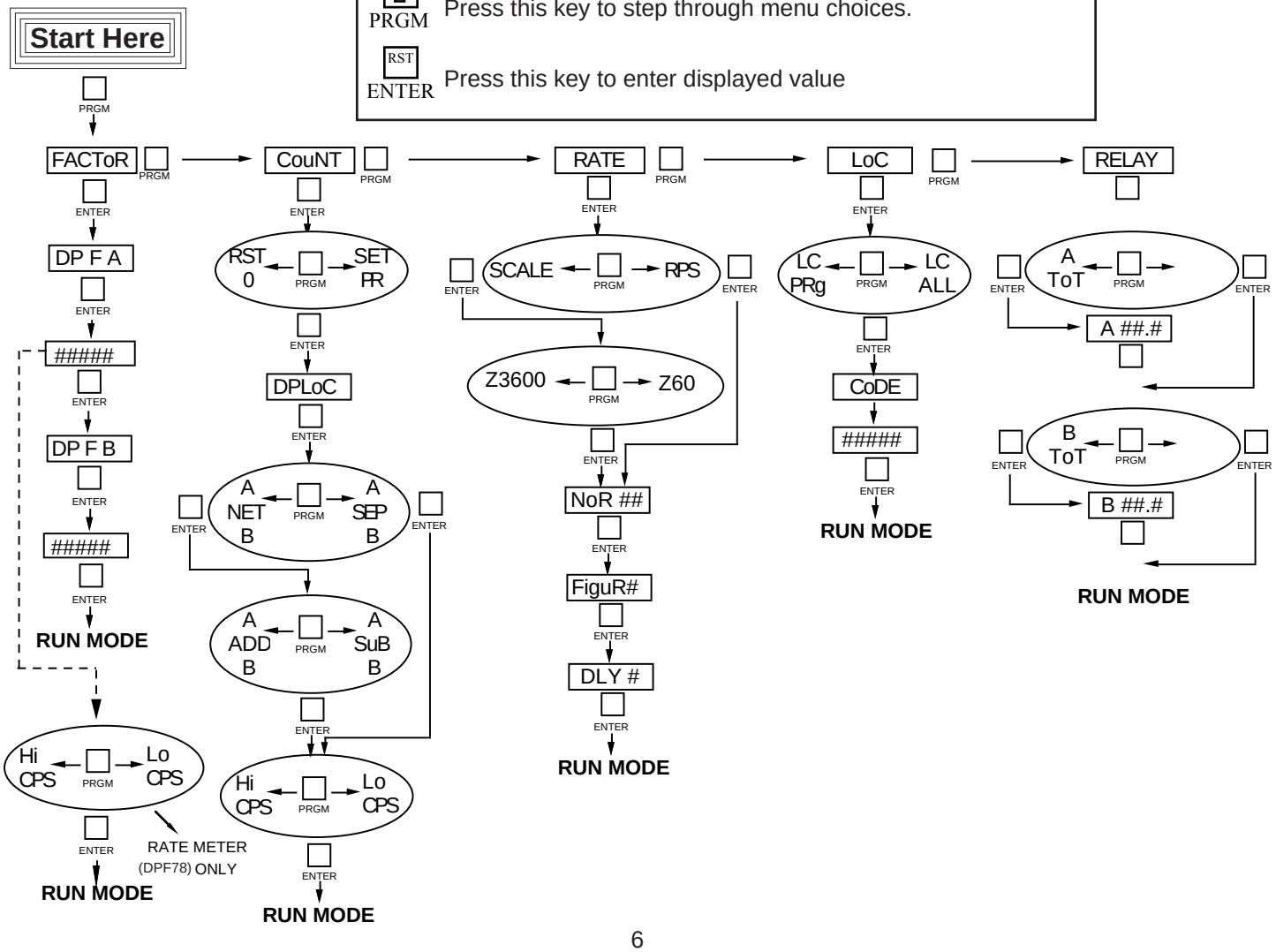
Use keys A, B, C, D, & E to advance digits during a numeric entry sequence.

PROGRAMMING FLOWCHART

NOTE: Several programming selections will not appear with DPF76 and DPF78 units.

PRGM Press this key to step through menu choices.

RST ENTER Press this key to enter displayed value



PROGRAM CODES AND DESCRIPTIONS

The following is a list of abbreviations as they appear on the display and front panel of the unit.

ABBREVIATION	DESCRIPTION
FACtor	SCALING FACTOR - For A and B Inputs. Each input has a separate 5 digit dividing scale factor.
dPFA	DECIMAL POINT FOR FACTOR A - Enter location of decimal point for scaling Factor A by pressing the button under the digit where the decimal is desired.
dPFb	DECIMAL POINT FOR FACTOR B - Enter location of decimal point for scaling Factor B by pressing the button under the digit where the decimal is desired.
Count	PORTION OF MENU FOR SETTING COUNTER VARIABLES
rSt 0	RESET TO 0 - Counter will reset to 0. Input A will count up from 0. Input B will subtract (count down) in A Sub B mode. Input B will add (count up) in A Add B mode.
SEt Pr	SET TO PRESET - Counter will reset to preset A. Input A will count down from preset A. Input B will count up (add) in "A add B" mode and input B will count down (subtract) in "A sub B" mode.
dPLoC	DECIMAL POINT LOCATION - Enter desired location of decimal by pushing the button under the digit where the decimal is desired. Changing the decimal will change the decimal location in the A & B counters as well as the rate display.
AnEtb	NET RESULT OF ADDING OR SUBTRACTING A & B INPUTS
ASEPb	A & B INPUTS ARE SEPARATE - A & B are not added or subtracted.
ASubb	A SUBTRACT B - The number of scaled pulses from Input B are subtracted from the number of scaled pulses from Input A. (-99999 TO 999999)
AAddb	A ADD B - The number of scaled pulses from the A Input are added to the number of scaled pulses from the B Input.
HiCPS	HIGH COUNTS PER SECOND - This sets the unit for high count speeds (0-9.99KHz)
LoCPS	LOW COUNTS PER SECOND – This sets the unit for contact debounce filtering (0-40Hz)
rAtE	PORTION OF MENU FOR SETTING RATE VARIABLES
rPS	RATE PER SECOND - The display will read in rate per second.
SCALE	SCALING - Allows unit to display rate per minute or rate per hour.
÷ 60	DIVIDE K FACTOR BY 60 - This sets the unit for rate per minute; equal to 60 times rate per second.
÷ 3600	DIVIDE K FACTOR BY 3600 - This sets the unit for rate per hour; equal to 3600 times rate per second.
nor##	NORMALIZING FACTOR - Normalizes (averages) the data being received. Higher settings provide more normalizing (averaging) for a more stable display. Derived from the equation: (Old Data x "NOR" + New Data) / ("NOR" + 1)
FiGur ##	SIGNIFICANT FIGURE - This sets the amount (1-5) of meaningful figures the unit will display. (RATE DIS PLAY ONLY). FOR EXAMPLE: If "2" is set as the figure, a rate of 273.45 will be displayed as 270.
dLY##	DELAY FACTOR - The amount of time (02 to 24 sec.) the unit will "look" for valid data, before the display defaults to zero. (RATE DISPLAY ONLY)

LoC LOCK - This portion of the menu allows you to:
1) lock the program (presets are still accessible)
2) lock all (presets and program are locked).

LCPr9 LOCK PROGRAM - This will lock the program and allow the presets to be changed when the unit is in the lock mode.

LC ALL LOCK ALL - This will lock the program and the presets when the unit is in the locked mode. The presets can be viewed, but not changed.

CodE LOCK CODE - This message (code) will flash on display for approximately 3 seconds. It will be followed by a 5 digit number (xxxxx). The number you enter here will be the code to lock and unlock the unit.

rELAY RELAY - This portion of the menu allows you to set your relay operation variables.

A tot RELAY A FOR TOTALIZER - When this is selected relay A will activate when the net total has reached Preset A ("A NET B" Mode). Relay A will activate when the total of input A reaches preset A ("A SEP B" Mode).

A rAtE RELAY A FOR RATE - When this is selected relay A will activate when the Rate of input A equals or exceeds preset A when in "A NET B" or "A SEP B" mode. The relay will drop out when the rate of A falls below preset A.

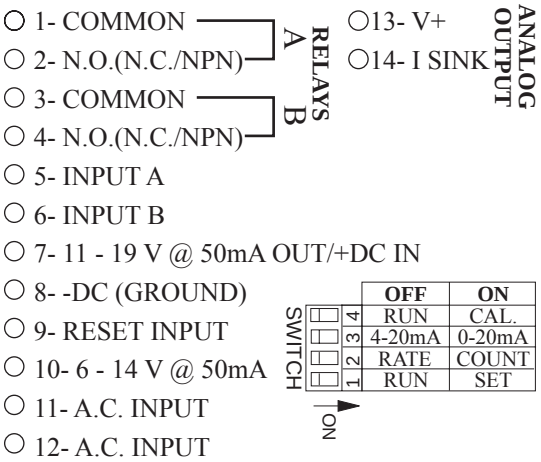
A##.# RELAY A DURATION - This message will appear when "A TOT" is selected. It is the duration which the relay will remain energized (00.1 to 99.9 sec). If 00.0 is selected, the relay will latch until reset. When the duration is not at 00.0, the unit will autorecycle.

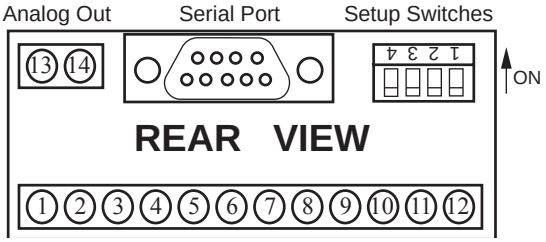
b tot RELAY B FOR TOTALIZER - When this is selected relay B will activate when the net total has reached preset B ("A NET B" Mode). Relay B will activate when the total of input B has reached preset B ("A SEP B" Mode).

b rAtE RELAY B FOR RATE - When this is selected relay B will activate when the rate of input A equals or exceeds preset B when in "A NET B" or "A SEP B" mode. The relay will drop out when the rate of A falls below preset B.

b##.# RELAY B DURATION - Follow same procedure as A ##.#.

TERMINATIONS





CALCULATING SCALE FACTORS

There are two separate dividing scale factors, one for input "A" and one for input "B". The factor to enter is the number of pulses per the desired unit of measurement. The factor ranges from 0.0001 to 99999. The factor is the same for rate and count on input "A". Because the "units per second", "minute", or "hour" are field programmable from the keypad, scale factor calculations for the ratemeter are easy. Here are some examples:

SCALING FACTOR EXAMPLES:

BATCHING: You want to count the number of batches (10 boxes each) being loaded onto a pallet.
Solution - Dial in a scale factor of 10.

UNIT COUNTING: You pick up a notch on a paper roll (1 pulse per shaft revolution). Each revolution equals 3 feet. To find the number of pulses per foot, simply divide "1 pulse" by "3 feet" (1÷ 3 = .3333).
Solution - One foot equals 0.3333 pulses, enter this as the scale factor and the display will read in feet.

RATE: The shaft of a motor has a flywheel with 10 spokes. A prox switch is mounted to sense 10 pulses per revolution. RPM of the shaft is the desired readout.
Solution: Enter a Factor of 10 and for every 10 pulses, "1" will appear on the display. Set rate per second, minute or hour as desired.

A conveyor carrying bottles must be controlled for bottle speed. For each revolution of the front roller, three bottles travel by. Thus, one revolution equals 3 bottles. A wheel with seven spokes is mounted on the roller. The user can't sense bottles because they are traveling through a washer, so a sensor is placed at the roller, sensing seven pulses per revolution of the shaft, which equals 3 bottles per revolution.
To calculate the scale factor (7 ppr ÷ 3 bottles) = 2.3333 scale divider. Set rate per second, minute or hour as desired.

A flow meter is generating 52.6 pulses per gallon. The desired readout is in liters. Since there are 3.785 liters per gallon, divide 52.6 by 3.785 to find the number of pulses per liter (52.6 ÷ 3.785 = 13.897).
Enter 13.789 as the scale factor so the display will read in liters.

An aluminum sheeting plant has a cut to length application to customer specification. A ten pulse per revolution encoder with a 12" wheel is used to sense. The travel of aluminum sheets is in inches. Thus, after 10 pulses, you want 12 to appear on the display. Thus, 10 ÷ 12 = .8333. Enter .8333 as your scale factor.

PROGRAMMING

	PRESS	DISPLAY	REMARKS
STEP 1 **SETTING SCALING FACTORS**	□ **PRGM**	FACtor	This section of the menu is used to set up the scaling factors for inputs A & B.
	□ **ENTER**	dPFA	This sets the decimal for factor A. Press the arrow key under the digit where the decimal is desired. To clear the decimal, press the arrow key furthest to the right (PRGM) .
	□ **ENTER**	#####	This is the scaling factor for input A. To change, press the arrow key under the digit(s) to change. Press ENTER to enter the displayed value.
THIS SECTION WILL ONLY APPEAR IN THE RATE METER ONLY VERSION (DPF78)	□ **ENTER**	Hi CPS or Lo CPS	This section will only appear in the RATE only version. Press the PRGM key to choose HIGH CPS (0-9.99KHz) or LOW CPS (0-40Hz). Press the ENTER key to enter the displayed choice.
	□ **ENTER**	dPFb	This sets the decimal for factor B. Press the arrow key under the digit where the decimal is desired. To clear the decimal, press the arrow key furthest to the right (PRGM) .
	□ **ENTER**	#####	This is the scaling factor for input B. To change, press the arrow key under the digit(s) to change. Press ENTER to enter the displayed value.

	PRESS	DISPLAY	REMARKS
STEP 2 **SETTING THE COUNTER**	**PRGM**	FACtor	
	PRGM	Count	This section of the menu sets up the counter information.
	ENTER	rSt 0 or SEt Pr	Press the PRGM key to choose RST 0 (reset to 0, count up) or SET PR (set to preset, count down), press the ENTER key to enter the displayed choice.
DPF75 & DPF76 ONLY	**ENTER**	dPLoC	This sets the decimal location for the A & B counters. Press the arrow key under the desired digit location. To clear the decimal, press the arrow key furthest to the right. Press the ENTER key to enter the displayed location.
	ENTER	AnEtb or ASEPb	Press the program key to choose A NET B (add or subtract A & B) or A SEP B (view A & B as separate counters). Press the ENTER key to enter the displayed choice.
	ENTER	ASubb or AAddb	This section will only appear if A NET B was selected. Choose A SUB B (A subtract B) or A ADD B. Press the ENTER key to enter the displayed choice.
	ENTER	HiCPS or LoCPS	Press the PRGM key to choose HIGH CPS (0-9.99KHz) or LOW CPS (0-40Hz). Press the ENTER key to enter the displayed choice.

STEP 3

SETTING THE RATE

DPF75 & DPF78 ONLY

PRESS	DISPLAY	REMARKS
PRGM	FACtor	
PRGM	Count	
PRGM	rAtE	This section of the menu is used to set up the rate information.
ENTER	rPS or SCALE	Press the PRGM key to choose RPS (rate per second) or SCALE (RPM, RPH). Press ENTER to enter displayed choice.
ENTER	÷60 or ÷3600	Press PRGM to choose ÷60 (RPM) or ÷3600 (RPH). Press ENTER to enter displayed choice.
ENTER	nor ##	This sets the normalizing (averaging) factor. Press the arrow keys under the desired digits to change. Press ENTER to enter displayed value.
ENTER	FiGur #	This sets the number of significant figures to be displayed. Press the arrow key under the digit to change. Press ENTER to enter displayed value.
ENTER	dLY #.#	This sets the delay time (0.0 to 9.9) that the unit will "look" for valid input data before the display falls to 0. Press the arrow key under the digits to change. Press ENTER to enter displayed value.

	PRESS	DISPLAY	REMARKS
STEP 4 **SETTING LOCK**	PRGM	FACtor	
	PRGM	Count	
	PRGM	rAtE	
	PRGM	LoC	This section of the menu is used to set up the lockout type and code.
	ENTER	LC PG or LC ALL	LC PG = Locks program but presets and reset are accessible. LC ALL= Locks entire keypad. Press the PRGM button to toggle between choices; Press ENTER to enter displayed choice.
	ENTER	CodE Flashes followed by: #####	After CODE flashes the display will show the existing lock code. To change the code press the key under each digit to be changed. Press ENTER to enter displayed value.
SETTING THE LOCK STATUS	LOCK	CodE Flashes followed by: 0	Key in the lock code (see programming step 4) by pressing the keys under the digits to be changed. Press the ENTER key to enter the displayed code.
	ENTER	LoC or unLoC	After the code is entered the unit will display LOC (unit is locked) or UN LOC (unit is unlocked). This message will be displayed for approximately 3 seconds before the unit returns to the run mode.

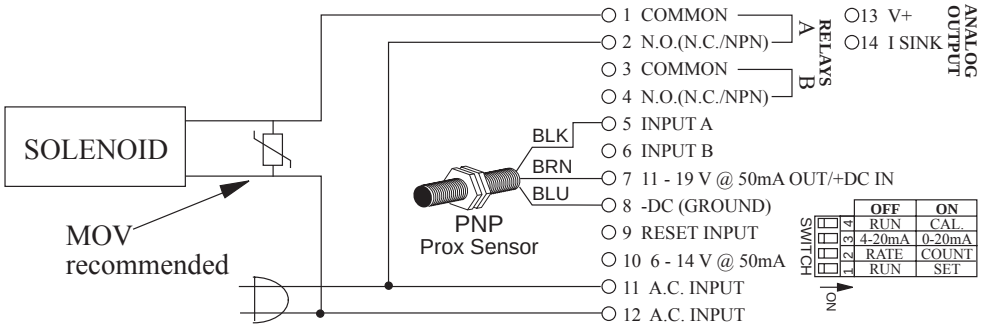
	PRESS	DISPLAY	REMARKS
STEP 5 **SETTING THE RELAYS**	PRGM	FACtor	
	PRGM	Count	
	PRGM	rAtE	
	PRGM	LoC	
	PRGM	rELAY	This section sets up the relay information.
This step will only appear on DPF75	ENTER	A tot or A rAtE	Press the PRGM key to choose A TOT (A assigned to total) or A RATE (A assigned to rate). Press ENTER when the desired choice is displayed.
	ENTER	A ##.#	This is the duration (.1 to 99.9 sec) that relay A will remain energized. If 00.0 is selected, the relay will latch until reset.
This step will only appear on DPF75	ENTER	b tot or b rAtE	Press the PRGM key to choose B TOT (B assigned to total) or B RATE (B assigned to rate). Press ENTER when the desired choice is displayed.
	ENTER	b ##.#	This is the duration (.1 to 99.9 sec) that relay B will remain energized. If 00.0 is selected, the relay will latch until reset.
SETTING THE PRESETS	**PRE A**	PrE A Followed by last PRE A entered	PRE A = Preset A (Final Preset); The set point at which output A will trigger. If the displayed value is not the desired preset, press the key(s) under the digit to be changed.
	PRE B	PrE b Followed by last PRE A entered	PRE B = Preset B (Prewarn); The set point at which output B will trigger. If the displayed value is not the desired preset, press the key(s) under the digit to be changed.

OUTPUT WIRING

The following diagrams detail the connection of the relay and analog output options. Each relay consist of a form A contact (Normally Open). NPN transistor or Normally Closed contacts are available with solder jumpers (see Jumper Options).

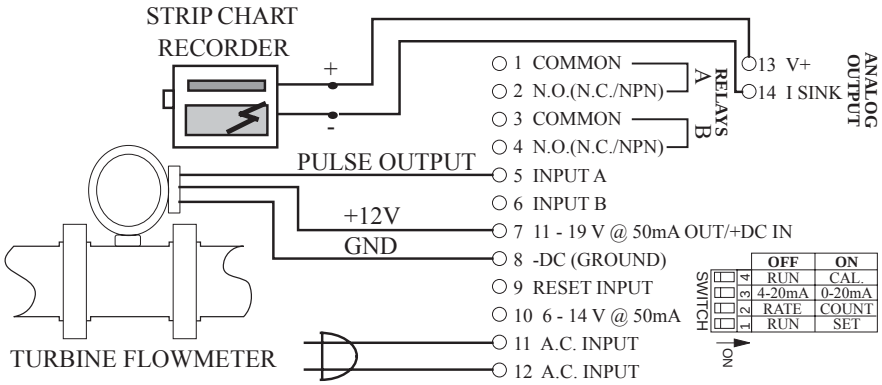
SOLENOID (Single Stage)

Use Relay A (pins 1 & 2) for single stage preset. When the count or rate (selectable) reaches Preset A, Relay A will energize. When Relay A closes, current passes through the solenoid for activation. When operating AC solenoids, we recommend the use of an MOV to reduce inductive kickback (use a diode for DC solenoids).



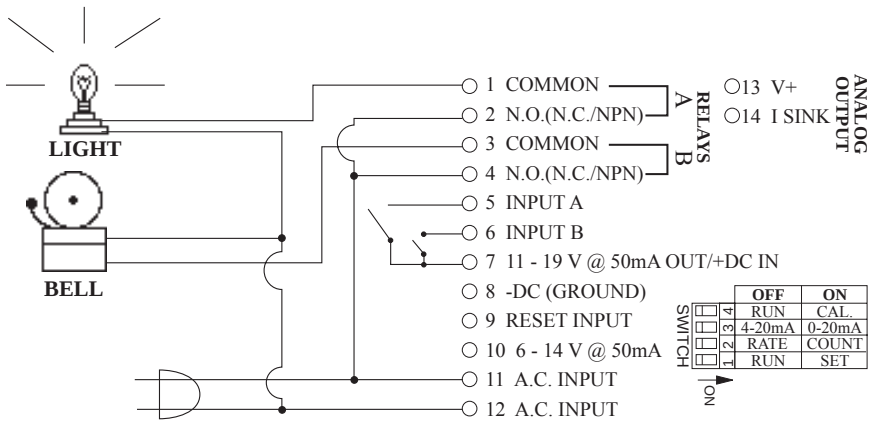
ANALOG OUTPUT

The analog output can be selected to output 4-20 mA or 0-20 mA and can be selected to track the rate or count. Pin 13 supplies 12 to 18V to power the current loop. Pin 14 supplies the current sinking driver. When connecting a strip chart recorder, make connections as follows:



ALARMS

The relays can be used to trigger alarms which warn the operator that a batch is complete or the rate has exceeded a set speed. The outputs are programmable to be assigned for rate or count. When assigned to the count, the relays can have a user selectable on time (duration) or can be latched until reset.



ANALOG OUTPUT OPTION

Description:
An optional 4-20mA (0-20mA) output has been added to the DPF70 series. The output can be programmed to track rate or total. This feature is available by adding suffix A to the part number. Connections are via a 2 terminal pluggable screw connector.

Connections: (see FIG. 1)
PIN13 supplies the 12 to 18 VDC to power the current loop.
PIN14 is the control sink driver

Accuracy:
50uA worst case

Compliance Voltage:
3 to 30 VDC non conductive

Setup:
The optional analog output feature uses 4 dip switches on the back for setup. These switches are used as follows:
SW1 - View or change "set low" and/or "set high" values
SW2 - Select output for rate or total
SW3 - Select 4-20mA or 0-20mA
SW4 - Calibrate the unit.
After the regular parameters shown in the programming flowchart have been set, locate the 4 switches on the back of the unit. (see FIG. 1)

Switch Settings:
SWITCH 1: Enter Analog Low & High (normally off)
Switch 1 is used to load in the low (4mA or 0mA) and/or the high (20mA) output settings. With power on, set switch 1 ON (up).

LOW SETTING is viewed or changed by pressing PRE A. If the displayed value is correct, press ENTER. If not, press buttons A through E to step to the desired value and press ENTER. (disregard the display which will show the last count reading).

HIGH SETTING is viewed or changed by pressing PRE B. If the displayed value is correct, press ENTER. If not, press buttons A through E to step to desired value and press ENTER.

Return switch 1 to OFF (down) position, PRE A and PRE B buttons now function to view or change relay trip values.

SWITCH 2: Select Count or Rate

SW2 OFF (down): Analog output follows rate
SW2 ON (up): Analog output follows count

SWITCH 3: Select 4-20mA or 0-20mA

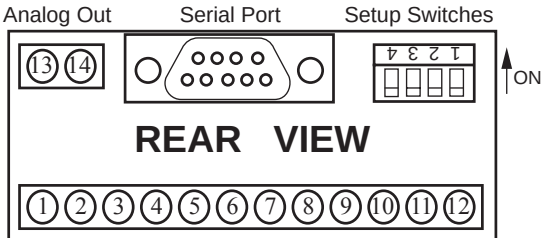
SW3 OFF (down): Selects 4-20mA output range
SW3 ON (up): Selects 0-20mA output range

SWITCH 4: Calibrate (normally off)
Switch 4 is used for calibration. Calibration is done at the factory and should not be needed (see SWITCH 1 to enter high and low values). If recalibration is desired, a calibrated 20mA ammeter with 1uA resolution is needed. Attach the "+" lead of the meter to pin 13 and the "-" lead to pin 14. Set switch 4 ON (up). The unit will output approximately 20.000mA and a decimal will light in the third position. Read the output using the ammeter. Press PRE A. If the display is the same as the ammeter reading, press ENTER. If not, press buttons A through E to step to ammeter reading and ENTER. (Disregard display which now shows the last count reading with decimal point in third position) Return switch 4 to OFF (down) position.

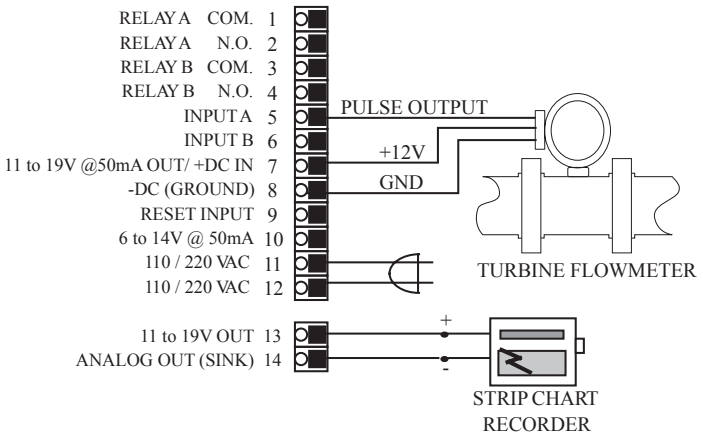
RS232 & RS422 Operation:
When the unit is suppled with RS232 or RS422, the analog output "low" and "high" settings can be accessed and changed through the serial port. The codes are as follows:

AL Unit will display (transmit) analog out "low" value.
AL(S)XXXXX Unit will load analog out "low" with entered number. (S) = space
AH Unit will display (transmit) analog out "high" value.
AH(S)XXXXX Unit will load analog out "high" with entered number. (S) = space

FIG. 1



Typical Wiring:



INTERFACE CARD RS 232/422 OPERATION

RS 232/422 SET-UP:

All serial communication mode changes must be done through serial communications. Mode changes cannot be done through the front panel. To initialize the unit, place a jumper between pin 7(+12V)[bottom board] and pin 1(init) [DB -9 connector] on initial power up. The unit defaults to: 300 baud rate,"MARK" parity and device number 01. To enter the program mode you must set your terminal for 300 baud rate and "MARK" parity. Next, type D1(s), **(s)= space bar**. The unit will echo back "DEVICE #1:". Now type EP (enter program) and a carriage return (ENTER). The unit will echo back "PROGRAM SETTING". You are now in the programming mode.

SETUP PROCEDURE:

The following sections consist of the communications setup options as they appear in the menu. (If you wish to exit the program mode, at any time you can hit the "escape key" (Hex Code: 1B) and the unit will save the changes made but not effect the remaining data values.) When each section of the setup menu is displayed, the current data will appear in the < > signs. If you wish to change the data, type in the number of the desired choice and press return (ENTER). If you wish to keep the current data, simply press return.

DEVICE NUMBER:

Each unit in the hook-up must be assigned it's own device number (1 to 99). Zero is reserved for a dedicated hook-up to only one terminal, and it's transmit output line remains in an "on" active state. The device number is entered in the program mode. The unit will prompt you:

DEVICE# <XX>?

If XX is the desired device number press return (ENTER), if not enter the desired number after the question mark and press return (ENTER).

BAUD RATE:

The baud rate is the speed at which data is transmitted, expressed in bits per second. Baud rates of 300, 600, 1200, 2400, 4800 or 9600 are available. When in the baud rate section of the menu, the unit will list :

BAUD RATES:
1:300 2:600 3:1200
4:2400 5:4800 6:9600
then prompt you:
BAUD RATE <300>?

Press return (ENTER) if this is the desired baud rate or enter the assigned number of one of the six possible baud rates. If an invalid baud rate is entered the unit will prompt you to choose another baud rate. This will occur until a valid baud rate is entered or escape is pressed.

PARITY:

Parity is a bit of information that is inserted before the stop bit and is used to help check if the transmission is correct. When setting the parity you may select "ODD" (parity bit is logic 0 if total number of logic 1's in the first seven data bits is odd), "EVEN" (parity bit is logic 0 if total number of logic 1's in the first seven data bits is even), "MARK" (parity bit is always logic 1 - High / Mark) or "SPACE" (parity bit is always logic 0 - Low / Space). If a "MARK" parity is chosen, it will appear that two stop bits are used. Use the "MARK" parity with terminals using parity "OFF" or "NONE". These terminals ignore the parity. The unit does not check the parity but does transmit the parity chosen. When setting the parity, the unit will print:

PARITIES:
MARK-0 SPACE-1 EVEN-2 ODD-3
Then the unit will prompt you:
PARITY<MARK>?

If this is the desired parity press return (ENTER), if it isn't enter the number of the desired parity then press return (ENTER).

STROBE LIST:

The serial interface card is also equipped with a strobe line. When the strobe line is triggered, a chosen set of data will be transmitted to be displayed or printed. The selections for the display list are entered in the program mode. Enter "1" to add selections to the list and enter "0" to delete selections from the list. The seven available items for the strobe display list are: (1) Preset A, (2) Preset B, (3) K-Factor A, (4) K-Factor B, (5) Rate of A, (6) Count A, (7) Count B. In the "A net B" mode Count A will display the Net Count and Count B is an invalid command and the unit will transmit useless data. When setting the strobe list the unit will print :

ENTER STROBE LIST:
DO NOT DISPLAY-0 DISPLAY-1
The unit will prompt you:
PRESET A<DISPLAY>?
PRESET B<DISPLAY>?
K-FACTOR A<DISPLAY>?
K-FACTOR B<DISPLAY>?
RATE<DISPLAY>?
COUNT A<DISPLAY>?
COUNT B<DISPLAY>?

If the above choices are entered, when the strobe line is triggered (3-30V positive pulse) the unit will transmit:

DEVICE# 1:
PA XXXXX
PB XXXXX
KA XXXXX
KB XXXXX
DR XXXXXX
DA XXXXXX
DB XXXXXX
(SEE COMMANDS BELOW FOR DESCRIPTION OF COMMAND CODES).

Each time the strobe line gets triggered the unit will transmit this data unless the program mode is entered and the strobe list altered.

After these four items have been entered they will remain unaltered unless the program mode is entered again and the values changed. The unit is now set and must be addressed by its device number to come on line again.

SERIAL INPUT COMMANDS:

To get a unit on line you must address it by its device number. This is done by typing DXX(S), XX= device number. The unit comes on line and echoes back DEVICE# XX. Insure that "DEVICE# XX:" is received before requests are sent. The unit is now ready to receive a command or string of commands separated by a space. A carriage return (enter) will enter the commands and processing of requests begins. The carriage return (Hex Code "D") puts the unit "off line" after data is processed.

COMMANDS:

EP.....Unit will enter program mode.
DA.....Unit will display (transmit) Count A.
DB.....Unit will display (transmit) Count B.
DR.....Unit will display (transmit) rate A.
KA.....Unit will display K-factor A.
†*KA(S)XXXXX....Unit will load K-factor A with entered number.
KB.....Unit will display K-factor B
†*KB(S)XXXXX....Unit will load K-factor B with entered number.
PA.....Unit will display Preset A.
†PA(S)XXXXX....Unit will load Preset A with entered number.
PB.....Unit will display Preset B
†PB(S)XXXXX....Unit will load Preset B with entered number.
RA.....Counter A will reset
†*RA(S)XXXXXX...Unit will set Counter A to entered number.
RB.....Counter B will reset.
†*RB(S)XXXXXX...Unit will reset Counter B to entered number.

***THE UNIT WILL RECOGNIZE A DECIMAL IF ONE IS PLACED IN ANY OF THESE DATA VALUES.**

†THE UNIT WILL ONLY RECOGNIZE THE LAST FIVE DIGITS ENTERED (SIX DIGITS FOR RA & RB).

The following is an example of requests and responses:

Transmit from terminal	Receive from unit (s)=Space
D5(s) [Unit #5 Activated]	DEVICE# 5:
PA(s)12345(s)PA	PA 12345 PA
KA(s)1576(s)KA	KA 1576 KA
KB(s)6751(s)KB	KB 6751 KB
RA(s)RB[RETURN]	RA RB

(UNIT PRESETS AND A & B K-FACTORS ARE SET AND BOTH COUNTERS ARE RESET)

12345
1576
6751

SERIAL INTERFACE OPERATION:

Data is received and transmitted over standard EIA RS232 or RS422 levels. Each ten bit character is made up of a start bit, seven bit ASCII code, a parity bit and a stop bit. Device number, baud rate, parity and strobe list are entered in the program setup mode and will remain in memory even if power is lost.

The input impedance of RS232 is 3KΩ to 7KΩ worst case. The terminal addressing the unit must be capable of driving all loads in the loop. The input impedance of RS422 is much higher and there should be no problem driving as many as 99 units. The transmit line remains in a high impedance "off" state until addressed. Only one unit is to be on line at a time!!! More than one unit on line could damage the unit or destroy the transmitted data.

When the unit is active (on line) it will operate in a full duplex, echo back mode, so that data sent from the terminal will be transmitted back for verification. When the unit is "on line", use the proper serial transmit commands to request data or set a new value. Up to 80 characters of data can be linked together and transmitted to the unit in a string as long as there is a space between the commands. If an error is made, a correction can be made by back spacing and retyping correct data before the return (enter) is sent. Once a return (enter) is sent, the unit begins processing the data and will transmit the requested data on a non-priority basis over the data transmit line. A keypad entry or incoming data will halt the data communication cycle. Therefore, there should be a pause after data is requested to insure that all data has been transmitted before making another request or addressing another unit. If the unit is not busy, it should not take longer than 300 msec to process each request. To find the cycle time to process and transmit a request, calculate the bit transmit time by using this formula: [(1÷ baud rate) x (80) + .005] x number of requests made. This time will be extended if the unit must service the front keypad. If transmission has not started within two seconds after data is requested, it can be assumed that there is a problem. The unit transmits a carriage return and line feed after each data value. Any new communication must be started with DXX(S) (device number and space).

RS232/RS422 - IBM-PC INTERFACE:

The following program is for IBM basic to set up RS232/RS422 on serial port (#1) at 300 baud. Run this program after connecting the serial interface connections.

```
10 SCREEN 0,0:WIDTH 80

20 CLS:CLOSE

30 OPEN "COM1:300,n,7,1,CS,DS,CD" AS #1

40 ON ERROR GOTO 110

50 B$=INKEY$

60 IF B$< >"" THEN PRINT #1,B$;

70 IF EOF (1) THEN 50

80 A$=INPUT$  (LOC(1),#1)

90 PRINT A$;

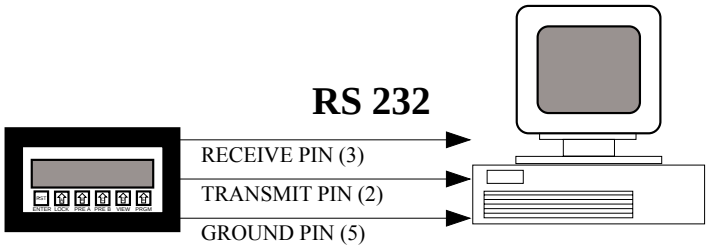
100 GOTO 50

110 RESUME
```

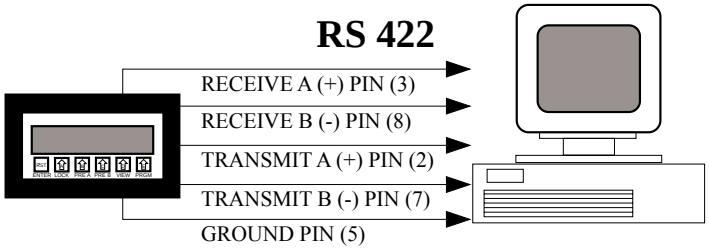
RS232 / RS422 WIRING

COMPUTER HOOKUP:

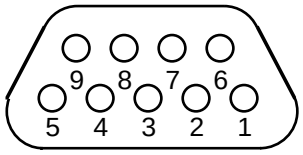
RS 232: When connecting the unit to a computer with RS 232 communication, only three connections are needed. These connections are: Receive data, Transmit data and Ground. The connections should be made as follows:



DP -9 CONNECTOR	COMPUTER
Transmit data (pin 2)	Receive data
Receive data (pin 3)	Transmit data
Ground (pin 5)	Ground



RS 422: When connecting the unit to a computer with RS 422, five connections are needed. These connections are: Receive data A (+), Receive data B (-), Transmit data A (+), Transmit data B (-) and Ground. The connections should be made as follows:

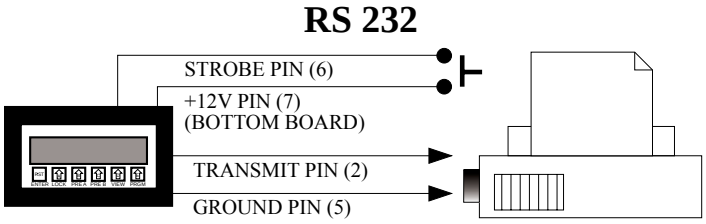


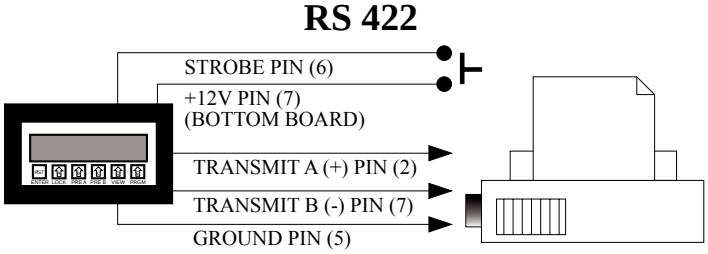
DP -9 CONNECTOR	COMPUTER
Transmit data A(+) (pin 2	Receive data A(+)
Transmit data B(-) (pin 7)	Receive data B(-)
Receive data A(+) (pin 3)	Transmit data A(+)
Receive data B(-) (pin 8)	Transmit data B(-)
Ground (pin 5)	Ground

RS 232	RS 422
1. INITIALIZE	1. INITIALIZE
2. TRANSMIT	2. TRANSMIT A (+)
3. RECEIVE	3. RECEIVE A (+)
4. N/C	4. N/C
5. GROUND	5. GROUND
6. STROBE	6. STROBE
7. N/C	7. TRANSMIT B (-)
8. N/C	8. RECEIVE B (-)
9. N/C	9. N/C

PRINTER HOOKUP:

When connecting the unit to a printer, you must first program the desired baud rate, parity and strobe list with a computer. After the unit is programmed it can be connected to the printer. Connect the transmit line(s) of the unit to the receive line(s) of the printer and be sure that both devices have common grounds. When the strobe line is triggered the unit will transmit the selected strobe list which you had previously programmed.





TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSES	SOLUTIONS
Power is applied to unit but the display does not light.	1. AC or DC power wiring is incorrect.	1. Recheck power wiring
Unit works, but occasionally the display freezes or skips counts.	1. Line noise is affecting the processor due to a current spike or surge.	1. Use a different power supply or install a surge suppressor.
Input signal is connected but the unit does not count or display rate.	1. Input wiring is incorrect. 2. Scale factors are incorrect. 3. Transmitting device is defective. 4. Wrong debounce filtering selected. 5. Unit is defective.	1. Recheck input wiring. 2. Recheck scale factors and factor calculations. 3. Replace transmitting device. 4. Recheck debounce filtering selection "hi cps" or "lo cps". 5. To confirm set scale factors at one and connect a wire to pin #7 and touch it to pin # 5 (input A). Each time pin #5 is touched counter A should count once. If not, call OMEGA. (this test will not work on units with quadrature input)
Rate is displaying: r FFFFF.	1. The unit is trying to display a number which it can't (too small or too large). 2. Line noise affected unit on power up.	1. Check scaling factor, if it is correct, lower the number of significant figures. 2. Reprogram the unit, be sure to enter a decimal (enter one and remove it if a decimal is not desired).
Relays are not activating properly.	1. Wrong relay duration. 2. Relay set for wrong activation i.e. count instead of rate.	1. Recheck programmed relay duration. 2. Recheck programmed relay activation mode.
Counter resets before reaching 999999.	1. Relay duration is set at a value other than 00.0. This causes the counter to auto-reset at the preset.	1. If relay outputs are not being used, set the relays for rate (DPF75 only). 2. Set the relay durations to 00.0.
Various menu items are not being displayed.	1. The menu flow chart and the setup steps show the setup for the units with rate and total (DPF75). When using a unit which has only count (DPF76) or only rate (DPF78) several menu items will not be displayed.	1. The menu items which do not appear are not used for the models without the ratemeter (DPF76) or without the counter (DPF78). Therefore, disregard any menu items which appear on the flowchart and setup steps, but do not appear on the unit's display.

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MADE IN USA

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

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RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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- Turbine/Paddlewheel Systems
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- Benchtop/Laboratory Meters
- Controllers, Calibrators, Simulators & Pumps
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- Datalogging Systems
- Recorders, Printers & Plotters

HEATERS

- Heating Cable
- Cartridge & Strip Heaters
- Immersion & Band Heaters
- Flexible Heaters
- Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

- Metering & Control Instrumentation
- Refractometers
- Pumps & Tubing
- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
- pH, Conductivity & Dissolved Oxygen Instruments

ATTACHMENT A
FUNCTIONAL DESCRIPTION

SPECIFICATION NO: **13445**

SPECIFICATION TILE: **FUNCTIONAL DESCRIPTION**

PROJECT NO: **446476**

PROJECT TITLE: **VAULT WATER COLLECTION AND CONVEYANCE DESIGN**

PROJECT LOCATION: **SANBORN, NEW YORK**

CLIENT: **BP**

				APPROVALS		
Issue	**Date**	**Pages**	**Issue Description**	**Prepared**	**Checked**	**Approved**
0	11/29/11	8	Issued for Construction	ADM	WGS	JDF
B	09/12/11	8	Issued for Bid	ADM	WGS	JDF
A	04/15/11	8	Issued for NYSDEC Review	ADM	WGS	JDF

☒ Entire Specification Issued this Revision

☐ Revised Pages Only Issued this Revision

SPECIFICATION ISSUED FOR:

☐ In-House Review
☐ Client Review/Approval
☐ Information Only
☐ Purchase
☒ Construction
☐ Tender

PART 1 GENERAL

1.1 PURPOSE

A. This document provides the Functional Description for the Vault Water Collection and Conveyance Design as it relates to general operation of the system as well as PLC and OIT programming requirements.

B. This document is to be used to define the required operational and control logic, clarify the criteria for programming, and identify human factor concerns.

C. This document supersedes any conflict between other drawings and specifications.

1.2 DEFINITIONS, ABBREVIATIONS, AND ACRONYMS

A. Action Buttons: Buttons that are visually represented on the OIT screens and allow a user to perform an operation which will affect set points or other modifiable data. These actions are restricted and require appropriate authorization before any changes are permitted.

B. Actuals: Current data values such as flow rate, temperature, or pressure.

C. Data Entry Register: Register used by the OIT to enter data into the PLC. Data is typically a floating point or integer value.

D. Data Utilization Register: Register used by the PLC program to calculate or control. Typically contains floating point or integer value.

E. EQ: Equalization

F. GWTP: Groundwater Treatment Plant

G. I/O: Circuit boards and other signal conditioning hardware installed in a PLC or PC used to send and receive signals.

H. ISA: Instrumentation Society of America

I. MCC: Motor Control Center

J. MV: Manual Valve

K. Navigation Buttons: Buttons that are visually represented on the OIT screens and allow a user to change to different screen displays.

L. OIT: Operator Interface Terminal. The computer workstation(s) where operators can view, monitor, and control functions from the HMI/SCADA software.

M. PC: Personal Computer

N. PLC: Programmable Logic Controller

O. SCADA: Supervisory Control and Data Acquisition

P. SCP: Sump Control Panel

Q. SOP: Standard Operating Procedure

R. UPS: Uninterrupted Power Supply

S. URS: User Requirement Specification

T. XV: Automatic two-position (open-close) valve

1.3 APPLICABLE CODES AND STANDARDS

A. ISA S5.2 Loop Diagrams

B. ISA S51.1 Process Instrumentation Terminology

1.4 APPLICABLE RELATED SPECIFICATIONS AND LISTS

1. Instrument List
2. Equipment List

1.5 APPLICABLE RELATED DRAWINGS

A. Three (3) P&ID drawings, as follows:

446476-D-100 – P&ID Legend Sheet
446476-D-101 – P&ID Vault Water Conveyance
446476-D-102 – P&ID Filtration

B. Five (5) Instrumentation drawings, as follows:

446476-I-001 – Instrumentation Diagram PLC I/O Wiring
446476-I-002 – Instrumentation Diagram Panel Layout and BOM
446476-I-003 – Instrumentation Diagram Panel Wiring
446476-I-004 – Instrumentation Diagram Instrumentation Installation Details (Sheet 1 of 2)
446476-I-005 – Instrumentation Diagram Instrumentation Installation Details (Sheet 2 of 2)

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 SHEET 446476-D-100

A. This is a symbols and abbreviations legend sheet for the P&ID set. There are no Functional Description requirements for this sheet.

3.2 SHEET 446476-D-101

A. Vault 1

1. The Vault 1 sump pump (P-001) is located within the Metaullics manufacturing facility. P-001 conveys water from Vault 1 to the Consolidation Sump (TK-001).
2. P-001 is a single duty, constant speed submersible centrifugal pump and is equipped with an integral float-style level switch.
3. P-001 is provided with a current relay to detect run time. Run time information is brought to the GWTP PLC/HMI Computer for time trending of run time and pump cycling.
4. P-001 is provided with an Off-Auto hand switch at the SCP.
5. In Auto mode, P-001 is actuated based on the integral float level switch that operates with a fixed dead band.
6. P-001 is hard-wire interlocked with LSHH-203 to stop the pump under high-high conditions in TK-001.
7. FIQ-200 provides flow monitoring from the Vault 1 sump to TK-001. Local indication of both instantaneous flow rate and totalized flow volume is provided at SCP panel and GWTP PLC/OIT Computer.
    a. The flowrate from P-001 can be manually controlled by modulating MV-1060 and observing the FIQ-200 flow response.
8. LI-200 indicates Vault 1 level at the SCP panel and GWTP OIT Computer. LI-200 provides resolution across the first two feet of depth above the vault floor. LAHH-200 provides a high-high level alarm at the GWTP PLC.

B. Vault 2

1. The Vault 2 sump pump (P-002) is located within the Metaullics manufacturing facility. P-002 conveys water from Vault 2 to the Consolidation Sump (TK-001).
2. P-002 is a single duty, constant speed submersible centrifugal pump and is equipped with an integral float-style level switch.
3. P-002 is provided with a current relay to detect run time. Run time information is brought to the GWTP PLC for time trending of run time and pump cycling.
4. P-002 is provided with an Off-Auto hand switch at the SCP.
5. In Auto mode, P-002 is actuated based on the integral float level switches as follows:
    a. Float switch in high position starts pump.
    b. Float switch in low position stops pump.

6. P-002 is hard-wire interlocked with LSHH-203 to stop the pump under high-high conditions in TK-001.

7. FIQ-201 provides flow monitoring from the Vault 2 sump to TK-001. Local indication of both instantaneous flow rate and totalized flow volume is provided by FIQ-201. Indication is provided at the SCP and GWTP.

    a. The flowrate from P-002 can be manually controlled by modulating MV-1061 and observing the FIQ-201 flow response.

8. LI-201 indicates Vault 2 level at the SCP panel. LAHH-201 provides a high-high level alarm at the GWTP PLC. LI-201 provides resolution across the first two feet of depth above the vault floor.

C. Vault 3

1. The Vault 3 sump pump (P-003) is located within the Metaullics manufacturing facility. P-003 conveys water from Vault 3 to the Consolidation Sump (TK-001).

2. P-003 is a single duty, constant speed submersible centrifugal pump and is equipped with an integral float-style level switch.

3. P-003 is provided with a current relay to detect run time. Run time information is brought to the GWTP PLC/OIT Computer for time trending of run time and pump cycling.

4. P-003 is provided with an Off-Auto hand switch at the SCP.

5. In Auto mode, P-003 is actuated based on the integral float level switch that operates with a fixed dead band.

6. P-003 is hard-wire interlocked with LSHH-203 to stop the pump under high-high conditions in TK-001.

7. FIQ-202 provides flow monitoring from the Vault 3 sump to TK-001. Local indication of both instantaneous flow rate and totalized flow volume is provided at SCP panel and GWTP PLC/OIT Computer.

    a. The flowrate from P-003 can be manually controlled by modulating MV-1062 and observing the FIQ-202 flow response.

8. LI-202 indicates Vault 3 level at the SCP and GWTP PLC/OIT Computer. LI-202 provides resolution across the first two feet of depth above the vault floor. LAHH-202 provides a high-high level alarm at the GWTP PLC.

D. Consolidation Sump (TK-001)

1. The Consolidation Sump (TK-001) is located outside of the Metaullics manufacturing facility.

2. TK-001 receives flow contributions from Vault 1, Vault 2, and Vault 3.

3. TK-001 level transmitted by a LT-203 to LIC-203 in SCP the and GWTP PLC/OIT Computer. LAHH-203 provides a high-high level alarm at the GWTP PLC.

4. P-004 and P-005 are submersible centrifugal pumps located inside TK-001 that convey water from TK-001 to the EQ tank (TK-002) located within the GWTP building.

5. P-004 and P-005 operate in a duty-standby configuration and alternate duty after each cycle to provide even pump wear.

6. P-004 and P-005 are provided with HOA switches at the SCP. In Auto mode, LIC-203 controls the pumps as follows:

   a. High setpoint starts duty pump
   b. High-high setpoint alternates to standby pump in lag support.
   c. Low setpoint stops pumps.
   d. Alternate pumps on restart.

7. P-004 and P-005 discharge pressure is indicated locally by diaphragm-protected pressure gauges (PI-204 and PI-205).

8. LSHH-222 at TK-002 interlocks to stop P-004 and P-005 under high-high level condition in TK-002.

9. At the GWTP FIQ-206 provides flow monitoring from TK-001 to TK-002. Indication of both instantaneous flow rate and totalized flow volume is provided locally (FIT-206) and at the GWTP PLC /OIT Computer.

10. The flowrate from TK-001 to TK-002 can be manually controlled by modulating MV-1068 located downstream of FIQ-206 and observing the flow response.

E. Equalization Tank (TK-002)

1. The Equalization Tank (TK-002) is located within the GWTP building.

2. Level indication is provided for TK-002 by LIC-207 at the GWTP PLC.

3.3 SHEET 446476-D-102

A. P-006 and P-007

1. P-006 and P-007 are constant speed centrifugal pumps that feed through bag filters to the existing equalization tank (T-801).

2. P-006 and P-007 operate in a duty-standby configuration and alternate duty after each cycle to provide even pump wear.

3. P-006 and P-007 are provided with HOA switches at the MCC-1. In Auto mode, LIC-207 controls the pumps as follows:

a. High level setpoint starts duty pump
b. High-high level setpoint starts standby pumps in lag support.
c. Low slevel etpoint stops pumps.
d. Alternate pumps upon restart.

4. P-006 and P-007 discharge pressure is indicated locally by diaphragm-protected pressure gauges (PI-210 and PI-211).

5. The PLC shall be programmed for LSHH-219 interlocks to stop P-006 and P-007 under high-high level condition in T-801.

B. Bag Filtration

1. There are two (2) parallel banks of bag filters, each consisting of a pair of bag filters in a parallel configuration (BF-001/BF-002 and BF-003/BF-004)

2. BF-001/BF-002 and BF-003/BF-004 operating in a duty-standby mode based on differential pressure.

3. PT-212 transmits upstream pressure to the GWTP PLC (PI-212 provides local indication at the OIT).

4. PT-218 transmits downstream pressure to the GWTP PLC (PI-218 provides local indication at the OIT).

5. In the PLC control function YC-1 calculates the differential pressure and is displayed by DPI-212 at the GWTP OIT.

6. YC-1 automatically controls changeover between the duty-standby bag filters as follows assuming BF-001/BF-002 are in duty service and BF-003/BF-004 are in standby service (the reverse would apply if service status was reversed):

a. At a high setpoint pressure, YC-1 opens the XV-1002 and DPI-212 alarms at the GWTP OIT.
b. After XV-1002 is opened, XV-1001 is closed.
c. Operators have to clear the DPI-212 high alarm, which also alerts them of the automatic changeover and the need to replace the filter bags of the units placed into standby service.

d. DPI-212 is also provided with a high-high differential setpoint alarm.

7. The inlet pressure to each bag filter is displayed locally by diaphragm-protected pressure gauges (PI-213, PI-214, PI-215, and PI-216 for BF-001, BF-002, BF-003, and BF-004, respectively).

8. Prior to opening a bag filter for maintenance, operators must relieve internal pressure by bleeding pressure through MV-1023, MV-1027, MV-1035, or MV1036 and monitoring the associated inlet pressure gauges (PI-213, PI-214, PI-215, and PI-216 respectively).

3.4 ALARM SCREEN AND HISTORY

A. Alarm Screen

1. The alarm screen at the GWTP OIT Computer displays current information about alarm status. The current alarm status is broken down into unacknowledged, acknowledged but not resolved, and acknowledged and resolved. Alarm information for each alarm contains, but is not limited to, date and time, tag description, alarm description, current value, and indication of acknowledgement.

B. Alarm History

1. All alarms are logged in the alarm history.

C. Alarm Acknowledge

1. A general “alarm acknowledge” button is provided at the GWTP OIT Computer.

D. Alarm Dialout

1. In addition to showing alarms on the screen, the PLC will send alarms to the Auto Dialer which calls out to alert operators for the following alarms:
   a. LAHH-200, LAHH-201, LAHH-202 (Level in Metaullic Vaults)
   b. LAHH-203 (TK-001 Level)
   c. LIC-207 High-High Level Alarm (TK-002 Level)
   d. DPI-212 High-High Level Alarm (Bag Filter DP)

3.5 SYSTEM SUMMARY

A. System Summary Screen

1. The GWTP PLC summary screen is amended with relevant signals and alarms from the vault water collection and conveyance modifications made as part of this project.

3.6 ESSENTIAL OPERATION

A. Essential Operation

1. There is no backup generator to power equipment when there is a power failure. Equipment will not be powered until normal power is restored to the system.

2. An UPS is provided for the PLC and auto-dialer to maintain system monitoring and alarming in the event of a power failure for a short period of time.

++END OF SECTION++