Baldwin Place Shopping Center (now Somers Commons)

WESTCHESTER COUNTY

SOMERS, NEW YORK

SITE MANAGEMENT PLAN

NYSDEC Site Number: 360023

Prepared for:

New York State Department of Environmental Conservation

Albany, New York

Prepared by:

MACTEC Engineering and Consulting, P.C.

Portland, Maine

Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date
0	1/27/2016	Original	1/27/2016
1	3/4/2016	Update of VOC analysis method NYSDEC Revision	3/4/2016

JANUARY 2016

CERTIFICATION STATEMENT

I, Jayme P Connolly, certify that I am currently a Qualified Environmental Professional as is defined in 6 NYCRR Part 375; and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Jayme P. Connolly QEP

1/27/16 DATE

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(Now SOMERS COMMONS)
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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
DER	Division of Environmental Remediation
EC	Engineering Control
ECL	Environmental Conservation Law
ELAP	Environmental Laboratory Approval Program
EWP	Excavation Work Plan
ft	feet or foot
GAC	granular activated carbon
gpm	gallon(s) per minute
GWETS	Groundwater Extraction and Treatment System
HASP	Health and Safety Plan
IC	Institutional Control
LTM	long term monitoring
MACTEC	MACTEC Engineering and Consulting, P.C.
mg/kg	milligram(s) per kilogram
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYCRR	New York Codes, Rules and Regulations
PCE	tetrachloroethene
POET	point of entry treatment

GLOSSARY OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

PRR	Periodic Review Report
psi	pounds per square inch
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision
RSO	Remedial System Optimization
SCADA	Supervisory Control and Data Acquisition
SCG	Standards, Criteria and Guidelines
Site	Baldwin Place Shopping Center site
SMP	Site Management Plan
µg/L	microgram(s) per liter
µg/m^3	microgram(s) per cubic meter
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

ES EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Baldwin Place Shopping Center site (Site), as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan (SMP):

Site Identification: Site ID: 360023 – Baldwin Place Shopping Center (now Somers Commons, Westchester, NY

Institutional Controls: (see Section 3.2)	The property may be used for restricted residential, industrial, and commercial use.
	All Engineering Controls (ECs) must be operated and maintained as specified in this SMP.
	All ECs must be inspected at a frequency and in a manner defined in the SMP.
	The use of groundwater underlying the Site is prohibited without necessary water quality treatment as determined by the New York State Department of Health and the Westchester County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the New York State Department of Environmental Conservation.
	Groundwater and other environmental monitoring must be performed as defined in this SMP.
	Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP.
	Intrusive activities implemented at the Site must be conducted in accordance with the Excavation Work Plan (EWP) appended to this SMP. Work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan and associated Community Air Monitoring Plan.
	Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP.
	Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP.
	Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Deed Restriction.
Institutional Controls (cont'd.): (see Section 3.2)	The potential for vapor intrusion must be evaluated for any buildings developed in the area within the Site boundaries and any potential impacts that are identified must be monitored or mitigated.
	Vegetable gardens and farming on the Site are prohibited.
Engineering Controls: (see Section 3.3)	Groundwater Extraction and Treatment System

Site Identification: Site ID: 360023 – Baldwin Place Shopping Center (now Somers Commons, Westchester, NY

Inspections:	Frequency
• Site-wide Inspection	Every 15 months at a minimum or annually or after severe weather conditions that may affect ECs or monitoring devices. (See Section 4.2)
• Remedial System Inspection	See Table 5.1
Monitoring:	
• Remedial System Monitoring & Sampling	See Tables 4.1 and 4.2
• Post-Remediation Media Monitoring & Sampling	See Tables 4.3 through 4.4
Maintenance:	
• Remedial System Maintenance	See Tables 4.1 and 5.1
Reporting:	
• Groundwater and Remedial System Data	Annually (See Section 7.2)
• Periodic Review Report	Annually (See Section 7.2)

Further descriptions of the above requirements are provided in detail in the latter sections of this SMP.

1.0 INTRODUCTION

1.1 GENERAL

This Site Management Plan (SMP) is a required element of the remedial program for the Baldwin Place Shopping Center (now Somers Commons) located in Somers, New York (hereinafter referred to as the "Site"). See Figure 1.1. The Site is currently in the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program Site No. 360023 which is administered by NYS Department of Environmental Conservation (NYSDEC).

Big V entered into an Order on Consent #W3-0390-90-12 dated September 1991 and Order on Consent #A3-0415-0003 dated December 1994 with the NYSDEC to remediate the Site. A figure showing the Site location and boundaries of this site is provided in Figure 1.2. The boundaries of the entire Site, as well as the boundaries of the deed restricted area, are more fully described in the metes and bounds site description that is part of the Deed Restriction provided in Appendix A.

After completion of the remedial work, some contamination was left at this site, which is hereafter referred to as "remaining contamination". Institutional and Engineering Controls (ICs and ECs) have been incorporated into the Site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. A Deed Restriction granted to the NYSDEC, and recorded with the Westchester County Clerk, requires compliance with this SMP and all ECs and ICs placed on the Site.

This SMP was prepared to manage remaining contamination at the Site. This plan has been approved by the NYSDEC, and compliance with this plan is required by the Deed Restriction. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the Site-specific implementation procedures that are required by the Deed Restriction. Failure to properly implement the SMP is a violation of the Deed Restriction;
- Failure to comply with this SMP is also a violation of Environmental Conservation Law (ECL), Title 6 of the New York Codes, Rules, and Regulations (NYCRR) Part

375 and the Order on Consent Site #W3-0390-89-12 and #A3-0415-0003 for the Site, and thereby subject to applicable penalties.

Reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in NYS. A list of contacts for persons involved with the Site is provided in Appendix B of this SMP.

This SMP was prepared by MACTEC Engineering and Consulting, P.C. (MACTEC), on behalf of the NYSDEC, in accordance with the requirements of the NYSDEC's Division of Environmental Remediation (DER)-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 2010 (NYSDEC, 2010), and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and/or ECs that are required for the remedy that has been implemented and required by the Deed Restriction for the Site.

1.2 REVISIONS

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shut-down of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the Site conditions. In accordance with the Deed Restriction for the Site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.3 NOTIFICATIONS

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

- 60-day advance notice of any proposed changes in site use that are required under the terms of the Order on Consent, 6NYCRR Part 375 and/or ECL.
- 7-day advance notice of any field activity associated with the remedial program.
- 15-day advance notice of any proposed ground-intrusive field activity pursuant to an Excavation Work Plan (EWP).
- Notice within 48-hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.

- Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the Site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the Order on Consent, and all approved work plans and reports, including this SMP.
- Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1.1 on the following page includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

Table 1.1: Notifications*

Name	**Contact Information**
NYSDEC Project Manager- Carl Hoffman	518-402-9813, carl.hoffman@dec.ny.gov
NYSDEC Section Lead – Susan Edwards	518-402-9813, susan.edwards@dec.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

1.4 RESPONSIBILITIES OF OWNER AND REMEDIAL PARTY

The responsibilities for implementing the SMP for the Baldwin Place Shopping Center (now Somers Commons), number 360023, are divided between the Site owner (and successors) and the NYSDEC. The Site owners are currently listed as: UB Somers, Inc. Property ownership changes may occur in the future; therefore, the term "owner" also applies to its successors. Roles and responsibilities of the Site owner and NYSDEC pursuant to the SMP are described in Section 3.2 (Institutional Controls).

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 SITE LOCATION AND DESCRIPTION

The Site is located in Somers, Westchester County, New York and is identified as Section 4.20 Block 1 and Lot 11 on the Westchester County Tax Map (see Figure 1.1). Per the Record of Decision (ROD) (Appendix C) (NYSDEC, 1995), the Site is an approximately 28.5-acre area and is bounded by Route 6 and Tomahawk Street to the north, vacant forested land to the south, a rail-trail and residential property to the east, and Clayton Boulevard and an apartment complex to the west (see Figure 1.2 – Site Layout Map). The boundaries of the Site, as well as the boundaries of the restricted area are more fully described in Appendix A –Deed Restriction. The Deed Restriction for the property covers 1.6 acres in the east central portion of the property (see Drawing with the Deed Restriction in Appendix A).The owner(s) of the Site parcel(s) at the time of issuance of this SMP is:

UB Somers, Inc., 321 Railroad Avenue, Greenwich, Connecticut 06830

2.2 PHYSICAL SETTING

2.2.1 Land Use

The Site consists of the following: a multi-structure shopping plaza and surrounding parking lots. The Site is zoned commercial and is currently utilized for commercial uses. Site is a multi-unit shopping center, with multiple occupants/tenants.

The properties adjoining the Site and in the neighborhood surrounding the Site primarily include commercial and residential properties. The properties immediately south of the Site include vacant properties; the properties immediately north of the Site include commercial properties; the properties immediately east of the Site include residential properties; and the properties to the west of the Site include commercial and residential properties.

2.2.2 Geology

The overburden at the Site consists of a sandy silt till and is approximately 60 feet in thickness in the source area. The till is thinnest near the western/northwestern site boundary and thickens to the south-southeast. Below the till is a thin mantle of weathered saprolitic granitic gneiss, which is underlain by the fractured granitic gneiss bedrock. The depth to competent bedrock ranges from approximately 11 feet below grade in the western portion of the Site (vicinity of MW-9S) to approximately 100 feet below grade in the eastern/southeastern portion of the Site (Aztech, 2014).

A geologic cross section is shown in Figure 2.1. Site specific boring logs are provided in Appendix D.

2.2.3 Hydrogeology

The saturated thickness of the till ranges from less than 1 foot along the western edge of the mall, to approximately 75 feet along the eastern portion of the mall. The depth to water in the till ranges from approximately 5 feet below ground surface (bgs) in the southwestern portion of the Site (i.e., at MW-2S) to 13 feet bgs just west of the source area (i.e., at MW-7S).

Although there is a groundwater divide across the Site from approximately the southwest to the northeast shallow groundwater in the vicinity of the source area is interpreted to flow primarily to the southwest, and bedrock groundwater is interpreted to flow primarily to the southeast. Vertical hydraulic gradients in the source area are in the downward direction (i.e., from the overburden into the fractured bedrock).

Groundwater contour maps are shown in Figures 2.2a (overburden) and 2.2b (bedrock). Groundwater elevation data is provided in Table 2.1. Groundwater monitoring well construction logs are provided in Appendix D.

2.3 INVESTIGATION AND REMEDIAL HISTORY

The Site was an operational dry cleaning facility from approximately 1965 through 1991. The original structure where the contaminant release occurred no longer exists and has been replaced

by a new shopping plaza. Following the closing of the dry cleaners, point of entry treatment (POET) systems were installed at nearby private residences affected by groundwater contamination. In 1989 the site was listed on the NYSDEC Registry of Inactive Hazardous Waste Disposal sites and subject to environmental investigation and remedial action.

A remedial investigation (RI) was conducted at the Site in August of 1994 by Vincent Uhl & Associates (Vincent Uhl & Associates, 1994). A Feasibility Study was completed in June of 1995 by Lawler, Matusky & Skelly Engineers. From those reports, the NYSDEC issued a ROD in 1995 calling for the removal of contaminated soils from the Site (NYSDEC, 1995) and remediation of the groundwater. The soil excavation took place in 1997 followed by the construction of a source area groundwater extraction and treatment system (GWETS) in 1998 (i.e., Plant 1). As part of the remedy, in 1999 a water distribution system was constructed on site to supply water to the adjacent Meadow Park Road community (i.e., Plant 2). When that community was subsequently connected to the public water supply in November of 2001, Plant 2 was kept online as a secondary pump and treat system. Both Plant 1 and Plant 2 ran on site treating contaminated groundwater through granular carbon vessels. In early 2011 Plant 2 was shut down.

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 8.0 - References.

The RI was conducted during the period from July 1992 through December 1993. The following activities were conducted as part of or in support of the RI:

- seismic refraction survey,
- soil gas survey;
- test boring and soil sampling;
- installation and sampling of thirteen monitoring wells;
- sampling of Meadow Park Road residential wells;
- sampling of the two Mall production wells;
- surface water and sediment sampling in nearby streams and storm drainage ways.

A residual tetrachloroethene (PCE) source area was identified in the alleyway near the back door of the dry cleaner. Residual PCE concentrations were present in both the unsaturated and saturated

soil in this area. The contamination in the unsaturated soil appeared to be limited to an area of approximately 15 by 15 feet. Shallow groundwater in the source area had a concentration of 24,000 micrograms per liter (µg/L) of PCE. PCE, originating from this source area, had also been detected in the Baldwin Place Shopping Center production wells since 1979. Two offsite areas were also identified as being impacted by site-related contaminants: part of the commercial area along Route 6 to the west and part of Meadow Park Road community to the southeast. Historic PCE concentrations in the eleven wells within the offsite impacted area ranged from 1.3 to 300 µg/L. In nine of these wells, PCE concentrations consistently or intermittently exceeded 5 µg/L, the contaminant's maximum contaminant level. The responsible party, Big V Supermarkets, Inc. maintained granular activated carbon (GAC) filter systems on each of these wells.

During February 1997, approximately 236 tons of contaminated soil were excavated from behind the dry cleaners and disposed in accordance with the plan approved by the NYSDEC (cleanup goal of 10 milligrams per kilogram [mg/kg] of PCE for saturated soil was met) (Lawler, Matusky & Skelly Engineers [LMSE], 2000). The area ultimately excavated was approximately 24 feet (east-west) by 16 feet (north-south), and extended to approximately 15 feet deep in the western portion, and to approximately 10 feet deep in the eastern portion. The installation of a groundwater pump and treat (via GAC) system (Plant 1) to capture contaminated groundwater in the source area was completed in April 1998. The aim of the pump and treat system was mainly to capture contaminants within the overburden aquifer and shallow weathered bedrock thus limiting migration of contaminants into the deeper fractured bedrock aquifer. Additional long-term pumping of the Site's water supply wells (Plant 2 consisting of wells PW-1 and PW-2) began in February 1999 to accelerate the cleanup of the bedrock aquifer. Treatment was accomplished via GAC. During this period treated water from Plant 2 was used for supply water for Baldwin Place Shopping Center, as well as temporarily for selected homes. POET systems were also used on affected private wells until connection to a community water supply became available in 2001. In 2011 Plant 2 was shut down. In December of 2011, the granular carbon vessels in Plant 2 were emptied and cleaned and the pump was taken off-line. In the spring of 2014, electrical service to Plant 2 was disconnected; the plant is scheduled for decommissioning.

2.4 REMEDIAL ACTION OBJECTIVES

The Remedial Action Objectives (RAOs) for the Site listed in the ROD dated November 1995 are as follows:

- Prevent exposure to contaminated soil;
- Prevent continued degradation of groundwater quality through migration of PCE and its break down products from soils to groundwater;
- Prevent exposure (inhalation, ingestion, and dermal) to contaminated groundwater;
- Restore groundwater quality (impacted by PCE and breakdown products) to acceptable levels within a reasonable time frame; and
- Prevent migration and discharge of site contaminants in groundwater to adjacent surface water bodies.

2.5 REMAINING CONTAMINATION

The 1997 remedial action removed significantly contaminated soils from the upper, unsaturated overburden within the source area. However, residual soil contamination remains at and in the vicinity of the source area, and groundwater in the vicinity also remains contaminated. Soil samples collected from the bottom of the excavation in 1997 and those collected in the vicinity of the source area in 2009 did not contain PCE at concentrations above the ROD cleanup goal for saturated soils of 10 mg/kg. Sampling conducted in 2015 showed elevated concentrations of PCE in soil (PCE at 54 mg/kg at a depth of 13 feet [BS/MW-101]) in the source area (see Figure 1.2 for boring locations). The deeper soils at this location were also sampled in 2015 and showed moderate impact at 22 feet depth (PCE at 0.84 mg/kg) and no impact at 56 feet depth.

Elevated concentrations of PCE have also continued to be detected in groundwater in MW-12S (deep overburden) and RW-2D (shallow bedrock), located in the source area. In 2012 well MW-12S, which monitors the deeper portion of the overburden aquifer within the source area, contained PCE at a concentration of 2800 µg/L (Aztech, 2014). There may be residual contamination in the overburden in the vicinity of this well location. Because of the silty, relatively low permeability of the overburden, the PCE is expected to have diffused into these materials and now back diffusion is likely controlling long term groundwater concentrations. Well RW-2D, is screened almost entirely in the weathered bedrock, and also shows continuing elevated concentrations of PCE

(4,600 µg/L in 2012 [Aztech, 2014)). This suggests that residual PCE contamination may also be present in the weathered bedrock and serving as a continuing source of groundwater contamination through back diffusion.

Table 2.2 summarizes the results of groundwater samples collected in June 2015 and shows concentrations of contaminants that exceed the Glass GA groundwater standards at the Site after completion of remedial action. Figure 2.3 presents the PCE concentrations detected in site groundwater in June 2015 and approximate area where PCE concentrations in groundwater exceeds its Glass GA groundwater standard (MACTEC, 2015).

Soil vapor contamination is also present in the vicinity of the source area. Elevated sub-slab soil vapor concentrations of PCE have been observed below the commercial structure located immediately to the south of the source area (Unit 6, Home Goods). Concentrations of PCE in sub-slab samples collected in January 2014 were 230 micrograms per cubic meter (µg/m^3) (SS-03) and 190 µg/m^3 (SS-04). PCE was not detected in the indoor air samples collected in 2014 (Aztech, 2014).

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 GENERAL

Since remaining contamination exists at the Site, ICs and ECs are in place to protect human health and the environment. This section describes the procedures for the implementation and management of all IC/ECs at the Site.

This section provides:

- A description of all controls on the Site;
- The basic implementation and intended role of each control;
- A description of the key components of the controls set forth in the Deed Restriction;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs, such as the implementation of the EWP (as provided in Appendix E) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the Site; and
- Other provisions related to implementation and evaluation of the performance of the remedial program.

3.2 INSTITUTIONAL CONTROLS

ICs are in place to: (1) ensure unimpeded operation of the EC systems (ground water collection system); (2) control use of the Site; and, (3) restrict future use of the groundwater. These measures help ensure that the remedy remains protective in the future. The ICs listed below have been imposed at this site pursuant to the Deed Restriction and this SMP.

The property owner (or agents) is responsible for compliance with the following obligations:

- Unless prior written approval by the NYSDEC is first obtained, the property owner shall not allow construction, use or occupancy of the Property that results in the disturbance or excavation of the Property which threatens the integrity of the ECs or which results in unacceptable human exposure to contaminated soils. Pursuant to this provision, this SMP includes excavation controls (see Section 3.2.1 and Appendix E).
- The property owner shall require that the potential for soil vapor intrusion be evaluated prior to construction of buildings in the area within the IC boundaries identified in this

SMP. The site owner shall ensure that any adverse impacts that are identified be monitored or mitigated.

- The property owner shall not disturb, remove, or otherwise interfere with the installation, use, operation, and maintenance of ECs required for the Remedy, which are described in this SMP, unless in each instance the owner first obtains a written waiver of such prohibition from the NYSDEC.
- With reasonable prior notice, the property owner must provide agents, employees or other representatives of NYS access to the site verify compliance with the restrictions identified by the Deed Restriction and to perform operation, monitoring and maintenance of the remedial system.
- The owner of the Property shall prohibit the Property from ever being used for purposes other than those specified in the Deed Restriction without the express written waiver of such prohibition by the NYSDEC.
- The owner of the Property shall prohibit the use of the groundwater underlying the Property without treatment rendering it safe for drinking water or industrial purposes, as appropriate, unless the user first obtains permission to do so from the NYSDEC.
- The owner of the Property, upon request, shall provide a periodic certification, to the NYSDEC, which will certify that: the ICs put in place are unchanged from the previous certification, that the owner has complied with the provisions of the Deed Restriction, including compliance with the SMP, that there has been no change in use of the property, unless the NYSDEC has been properly notified, and that the ECs have not been impaired.
- The owner of the Property shall continue in full force and effect any ICs required for the Remedy and maintain such controls, unless the owner first obtains permission to discontinue such controls from the NYSDEC, in compliance with the approved SMP, which is incorporated by reference herein and made enforceable hereby, subject to modifications as approved by the NYSDEC.

The following items are obligations that the NYSDEC (or its agent) is responsible for performing:

- All ECs must be operated and maintained as specified in this SMP;
- All ECs must be inspected at a frequency and in a manner defined in the SMP.
- Groundwater and other environmental or public health monitoring must be performed as defined in this SMP;
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP.

3.2.1 Excavation Controls

Prior to conducting any excavation activities in areas reasonably anticipated to encounter remaining subsurface contamination, the owner of the property must notify the NYSDEC project manager and provide the information identified below. Per Section 1.3 of this SMP, such notification must be provided at least 15 days prior to the proposed start of excavation work to allow time for NYSDEC review and for the possible development of project-specific excavation control procedures.

Notification will be made to:

NYSDEC SM Project Manager, Carl Hoffman
NYSDEC DER Remedial Bureau E
625 Broadway
Albany, NY 12233-7017
Phone: (518) 402-9813
Email: carl.hoffman@dec.ny.gov

This notification will include:

- A description of the proposed work, including the location, areal and vertical extent, plans for Site re-grading (including estimated volumes of soil/material to be imported to or exported from the site), intrusive elements or utilities to be installed below grade, or work that may impact existing ECs (extraction/monitoring wells, treatment system and supporting utilities [electric, water conveyance piping]).
- Identification of sources of any anticipated imported backfill, along with related chemical testing results (see NYSDEC DER-10).
- A schedule for the proposed work, detailing the anticipated start and completion of intrusive work.

In the event that NYSDEC determines that there is a need for more detailed project-specific excavation controls, a work plan shall be prepared by the site owner that addresses the controls and related requirements outlined in Appendix E of this SMP.

3.3 ENGINEERING CONTROLS

ECs at the Site include: the GWETS (i.e., Plant 1) and groundwater monitoring wells. These systems are described in more detail below.

3.3.1 Groundwater Extraction and Treatment System

The current GWETS was installed in 1997 at the Site for extraction and treatment of contaminated groundwater. The system was installed in 1998 and consists of: two extraction wells installed within the source area (RW-1S, an overburden well, and RW-2D, an upper bedrock well); related conveyance piping, controls, utility service connections; and, the Plant 1 treatment system. Extracted water is conveyed to the Plant 1 treatment system via subsurface piping, where the water is treated via activated carbon filtration prior to discharge to a nearby drainage ditch. Discharge and monitoring requirements are included in Appendix F – Permit Equivalent.

Procedures for operating and maintaining the GWETS system are documented in the Operation and Maintenance Plan (Section 5.0 of this SMP). As built drawings, signed and sealed by a professional engineer, are included in Appendix G – Operations and Maintenance Manual. Onsite work is completed in accordance to the Site specific Health and Safety Plan (HASP) included in Appendix H. Figure 1.2 shows the location of the ECs for the Site.

3.3.1.1 Site Access Controls

Access to Pump House 1 (Plant 1) is restricted by a six- foot chain link fence with locked gates. The fence will be inspected every 15 months at a minimum or annually to ensure the fence is in good repair.

3.3.1.2 Groundwater Monitoring and Extraction Wells

Two active extraction wells and twenty groundwater monitoring wells are currently in place at the Site (Figure 2.1). Sampling and inspection of selected wells will be conducted periodically as part of the long term monitoring (LTM) program. Procedures for LTM are provided in Section 4.0 of this SMP.

3.3.2 Criteria for Completion of Remediation/Termination of Active Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the RAOs identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10.

Conditions that may warrant discontinuing active remediation include contaminant concentrations in groundwater that: (1) reach levels that are consistently below ambient water quality standards or the Site standards, criteria, and guidelines (SCGs) as appropriate, (2) have become asymptotic over an extended period of time as accepted by the NYSDEC; or (3) the NYSDEC has determined that the remedial system has reached the limit of its effectiveness. This assessment will be based in part on contaminant levels in groundwater monitoring wells as well as remedial system operational data. Systems will remain in place until permission to discontinue their use is granted in writing by the NYSDEC.

4.0 MONITORING AND SAMPLING PLAN

4.1 GENERAL

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the Site are included in the Quality Assurance Project Plan/Field Activities Plan provided in Appendix I.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater, indoor air, soil vapor, soils);
- Assessing compliance with applicable NYSDEC SCGs, particularly groundwater standards, surface water discharge limits, and 6 NYCRR Part 375 Soil Cleanup Objectives for soil; and
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment.

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Site-wide Inspections;
- Sampling locations, protocol and frequency;
- Analytical sampling program requirements;
- Inspection and maintenance requirements for monitoring wells; and
- Monitoring well decommissioning procedures.

4.2 SITE – WIDE INSPECTION

Site-wide inspections will be performed every 15 months, concurrent with other SMP-required elements (i.e., LTM). Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Site-wide inspections will also be performed after severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form

will be completed as provided in Appendix J – Site Management Forms. The form will compile information to assess the following:

- Compliance with requirements of this SMP and the Deed Restriction;
- Compliance with ICs, including site usage;
- Whether ECs continue to perform as designed and an evaluation of the condition and effectiveness of ECs;
- Pump House 1 fence inspection;
- Whether IC/ECs continue to be protective of human health and the environment;
- Achievement of remedial performance criteria
- General site conditions at the time of the inspection; and
- If site records are up to date.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of an EC occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, verbal notice to the NYSDEC must be given by noon of the following day. In addition, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the Site by a qualified environmental professional, as determined by the NYSDEC. Written confirmation must be provided to the NYSDEC within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

4.3 TREATMENT SYSTEM MONITORING AND SAMPLING

4.3.1 Remedial System Monitoring

Monitoring of the GWETS will be performed on a routine basis, as identified in Table 4.1 Remedial System Monitoring Requirements and Schedule (see below) when it is operating. Modification to the frequency or sampling requirements will require approval from the NYSDEC. A visual inspection of the GWETS will be conducted during each monitoring event. Unscheduled inspections and/or sampling may take place when a suspected failure of the GWETS has been reported or an emergency occurs that is deemed likely to affect the operation of the system. GWETS components to be monitored include, but are not limited to, the components included in Table 4.1 below.

Table 4.1 – Remedial System Operational Monitoring Requirements and Schedule

Remedial System Component	Monitoring Parameter	Operating Range	Monitoring Schedule
Extraction Well RW-1S	Flow Rate	0 – 5 GPM	Once Every Two Weeks
	Water Level	8 – 15 FT	Once Every Two Weeks
Extraction Well RW-2D	Flow Rate	0 – 5 GPM	Once Every Two Weeks
	Water Level	9.1 – 14.1 FT	Once Every Two Weeks
Bag Filters	Pressure Differential	0 – 10 PSI	Once Every Two Weeks
GAC	Pressure Differential	0 – 3 PSI	Once Every Two Weeks

psi = pounds per square inch

gpm = gallon(s) per minute

ft = feet or foot

A complete list of components to be inspected is provided in the Inspection Checklist, provided in Appendix J - Site Management Forms. If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, as per the Operation and Maintenance Plan, is required.

4.3.2 Remedial System Sampling

Samples shall be collected from the GWETS on a routine basis when it is operational. Sampling locations, required analytical parameters and schedule are provided in Table 4.2 – Remedial System Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Table 4.2 – Remedial System Operational Sampling Requirements and Schedule

Sampling Location	Analytical Parameters			Schedule
	VOCs (USEPA Method 8260)*	pH (SM 4500-H)	pH (onsite analysis)	
RW-1S Effluent	X	X	X	Quarterly
RW-1D Effluent	X	X	X	Quarterly
GAC Lead Vessel Effluent	X	X	X	Quarterly
GAC Lag Vessel Effluent (Discharge to Outfall 002)	X	X	X	Quarterly

VOCs = volatile organic compounds
USEPA = United States Environmental Protection Agency
*Or an alternate method as approved by NYSDEC, such as USEPA method 601/602

Detailed sample collection and analytical procedures and protocols are provided in Appendix I – Quality Assurance Project Plan/ Field Activities Plan.

4.4 MEDIA MONITORING AND SAMPLING

Samples shall be collected from on-site groundwater monitoring wells, off-site residential monitoring wells, and soil vapor/air sample locations on a routine basis. Sampling locations, required analytical parameters and schedule are provided in Table 4.3 – Media Sampling Requirements and Schedule. All sampling activities will be recorded in a field book and associated sampling log as provided in Appendix J - Site Management Forms. Other observations (e.g., groundwater monitoring well integrity, etc.) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Detailed sample collection and analytical procedures and protocols are provided in Appendix I – Quality Assurance Project Plan/ Field Activities Plan.

4.4.1 Groundwater Monitoring

Groundwater monitoring will be performed from the two extraction wells quarterly, and from 10 on-site monitoring wells approximately every 15 months to assess groundwater quality, changes in contaminant distribution, and changes in concentration trends. In addition to the on-site monitoring wells, four off-site private residential monitoring wells (no longer used for drinking water) will also

be sampled to evaluate groundwater quality in the vicinity of Meadow Park Road, where contaminants have historically been detected. The network of monitoring wells monitors upgradient, source area, cross-gradient, and downgradient groundwater conditions at the Site. Table 2.2 summarizes the on-site wells identification number, as well as the location, depths, and screened intervals of the wells. On-site well locations are presented on Figure 1.2. Monitoring well construction logs are included in Appendix D of this document. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Prior to sampling, a synoptic round of water levels will be measured at the wells listed in Table 4.3. Measurements will be made from the top of the well riser, or if not present, top of well casing. Groundwater samples will be collected using passive diffusion bags or other methods acceptable to NYSDEC. Samples will be analyzed by an Environmental Laboratory Approval Program (ELAP) certified laboratory following USEPA Method 8260, ensuring detection limits of 1 µg/L for most compounds (i.e. lower than the Class GA groundwater standards). If purge water is generated during sampling activities, it will be containerized and discharged into the treatment system at Plant 1, with the exception of purge water from wells MW-4S, MW-4D, MW-8S and MW-9D, which can be discharged to grassy areas in the vicinity of the wells from which it came.

The groundwater monitoring wells will be inspected during the sampling activities to check for casing or riser damage, concrete pad cracking, and/or sediment build up. If biofouling or silt accumulation is observed in the on-site and/or off-site monitoring wells, the wells will be physically agitated/surged and redeveloped. Repairs and/or replacement of wells in the monitoring well network will be performed as warranted based on assessments of structural integrity and overall performance. Additionally, unnecessary monitoring wells installed as part of the remedial program will be properly decommissioned.

The NYSDEC will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report (PRR). Well decommissioning without replacement will be done only with the prior approval of the NYSDEC. Well abandonment will be performed in accordance with NYSDEC's guidance entitled "CP-43: Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have

been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC.

Deliverables for the groundwater monitoring program are specified in Section 7.0 – Reporting Requirements.

4.4.2 Soil Vapor Intrusion Sampling

Indoor air and sub-slab vapor sampling will be performed every three years during the heating season to assess the potential for soil vapor intrusion into the commercial building adjacent to the source area. Modification to the frequency or sampling requirements will require approval from the NYSDEC. Sample locations are presented in the table below.

Table 4.4 – Soil Vapor and Indoor Air Sampling Locations

Location ID	Type	Location
SS-03	Soil Vapor	Home Goods-Hall
IA-03	Indoor Air	Home Goods-Hall
SS-04	Soil Vapor	Home Goods-Storage Room
IA-04	Indoor Air	Home Goods-Storage Room
OA-1	Outdoor Ambient Air	Outdoor Air

Soil vapor samples will be collected from two previously installed sub-slab sampling points installed in Building 6: 1) in the hallway leading to the rest rooms in the northeast corner of the Home Goods store (sample SS-03, located due south of the source area) and; 2) within the storage room of the Home Good store that is located approximately midway along, and adjacent to, the eastern wall of Building 6 (SS-04). Indoor air samples will be collected to correspond with the sub-slab vapor samples (IA-03 and IA-04). In addition, an outdoor air sample (OA-1) will be collected from the fenced in area surrounding Plant 1.

Samples will be collected in Summa type canisters with regulators set to collect the samples over an approximate eight hour period. Samples will be shipped to an ELAP certified laboratory for analysis of VOCs by USEPA Method TO-15, with a reporting limit of 1 µg/m^3 for most

compounds, with the exception of the indoor and outdoor air reporting limit for carbon tetrachloride, trichloroethene, and vinyl chloride of 0.25 µg/M^3.

Deliverables for the soil vapor intrusion sampling program are specified in Section 7.0 – Reporting Requirements.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 GENERAL

This Operation and Maintenance Plan provides a brief description of the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the Site. This Operation and Maintenance Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the Site to operate and maintain the GWETS;
- Will be updated periodically to reflect changes in site conditions or the manner in which the GWETS are operated and maintained.

Further detail regarding the Operation and Maintenance of the GWETS is provided in Appendix G - Operation and Maintenance Manual. A copy of this Operation and Maintenance Manual, along with the complete SMP, is to be maintained at the Site. This Operation and Maintenance Manual is not to be used as a stand-alone document, but as a component document of this SMP.

5.2 REMEDIAL SYSTEM (OR OTHER ENGINEERING CONTROL) PERFORMANCE CRITERIA

For a summary of the minimum operating requirements for the major components of the remedial system, such as design flow rate for recovery wells and basis for design for granulated activated carbon vessels please see Table 4.1- Remedial System Monitoring Requirements and Schedule. Any associated discharge permits or permit equivalencies are included in Appendix F.

5.3 OPERATION AND MAINTENANCE OF GROUNDWATER TREATMENT SYSTEM

The *GWETS OM&M Manual* (Appendix G) describes the measures necessary to operate, monitor, and maintain the system components of the Plant No. 1 GWETS, including the following:

- Steps necessary to allow individuals unfamiliar with the Site to operate and maintain the GWETS; and

- Provision for periodically updating the plan to reflect changes in site conditions or the manner in which the GWETS is operated and maintained.

The *GWETS OM&M Manual* (Appendix G) include information relative to the following items:

- General introduction of the GWETS;
- System design and construction information;
- Process Flow Diagram;
- System startup and testing procedures;
- Routine equipment maintenance;
- Non-routine equipment maintenance;
- System performance monitoring requirements and inspections; and
- Routine maintenance and monitoring activities with applicable schedules.

Refer to Table 5.1 (below) for a list of GWETS components to be inspected. If equipment readings are not within their normal operating range (indicated in Table 4.1), equipment is observed to be malfunctioning, or the system is not performing within specifications, maintenance and repair will be implemented per the *GWETS OM&M Manual* (Appendix G).

Table 5.1 – Remedial System Inspection Items

Unit	Operating Parameter	Unit
Recovery Well (RW-1S)	Pumping Rate	GPM
Recovery Well (RW-1D)	Pumping Rate	GPM
Filter Bags	Pressure Differential	PSI

The GWETS system has a system of warning devices as part of the Supervisory Control and Data Acquisition (SCADA) to indicate that the system is not operating properly. In the event that warning device is activated, applicable maintenance and repairs will be conducted, as specified in the Operation and Maintenance Plan, and the GWETS system will be restarted. Operational problems will be noted in the PRR to be prepared for that reporting period.

6.0 PERIODIC ASSESSMENTS/EVALUATIONS

6.1 CLIMATE CHANGE VULNERABILITY ASSESSMENT

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the Site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a summary of vulnerability assessments that will be conducted for the Site during periodic assessments, and briefly summarizes the vulnerability of the Site and/or ECs to severe storms/weather events and associated flooding.

A vulnerability assessment will be performed at an approximate 5 year frequency while active remediation is being conducted. This assessment should include, but not be limited to, a discussion of potential vulnerabilities to be assessed during periodic reviews such as the following:

- Flood Plain: Identify whether the Site is located in a flood plain, low-lying or low-groundwater recharge area.
- Site Drainage and Storm Water Management: Identify areas of the Site which may flood during severe rain events due to insufficient groundwater recharge capabilities or inadequate storm water management systems.
- Erosion: Identify any evidence of erosion at the Site or areas of the Site which may be susceptible to erosion during periods of severe rain events.
- High Wind: Identify areas of the Site and/or remedial system which may be susceptible to damage from the wind itself or falling objects, such as trees or utility structures during periods of high wind.
- Electricity: Identify the susceptibility of the Site/remedial system to power loss and/or dips/surges in voltage during severe weather events, including lightning strikes, and the associated impact on site equipment and operations.
- Spill/Contaminant Release: Identify areas of the Site and/or remedial system which may be susceptible to a spill or other contaminant release due to storm-related damage caused by flooding, erosion, high winds, loss of power etc.

- Communication: Identify vulnerabilities to communicate remotely with the Site SCADA system.

6.2 GREEN REMEDIATION EVALUATION

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of any green remediation evaluations to be completed for the Site during site management, and as reported in the PRR.

This assessment should include, but not be limited to, a discussion of items listed below, in relation to the implementation and operation and maintenance of the selected remedy. Where appropriate, quantification of these items should be provided:

- Waste Generation (describe the management of waste associated with the Site and any waste reduction projects implemented).
- Energy usage (electrical usage for operation of remedial systems, site lighting, security systems, etc.).
- Emissions (vapor-phase remedial system emissions, fuel usage for transportation to and from the Site for inspections and/or sampling, operation of gas-powered generators, etc.).
- Water usage (identify sources of decontamination water, irrigation water, etc.). The reduction of groundwater extraction will minimize saltwater intrusion.
- Land and/or ecosystems (describe any disturbances and restoration of land and/or ecosystems as part of implementation/operation of the remedy).

A Green Remediation Metrics form has been included as part of the Site Management Forms – Appendix J. Methods proposed to reduce energy consumption, resource usage, waste generation, water usage, etc. should be included in the PRR.

6.2.1 Timing of Green Remediation Evaluations

For major remedial system components, green remediation evaluations and corresponding modifications will be undertaken as part of a formal Remedial System Optimization (RSO), or at

any time that the Project Manager feels appropriate, e.g. during significant maintenance events or in conjunction with storm recovery activities.

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities. Reporting of these modifications will be presented in the PRR.

6.2.2 Remedial Systems

Remedial systems will be operated properly considering the current site conditions to conserve materials and resources to the greatest extent possible. Consideration will be given to operating rates and use of reagents and consumables. Spent materials will be sent for recycling, as appropriate.

Remedial system types and associated parameters to be evaluated include, but are not limited to:

- Groundwater extraction wells (operating rates/locations);
- Activated carbon systems (spent carbon replacement and disposal/regeneration); and
- Gas venting/collection systems.

6.2.3 Building Operations

Structures including buildings and sheds will be operated and maintained to provide for the most efficient operation of the remedy, while minimizing energy, waste generation and water consumption.

Components to be evaluated should include, but are not limited to:

- Heating/cooling systems and temperature set-points;
- Building skin, insulation and building use and occupancy;
- Ventilation;
- Lighting and plug loads; and
- Grounds and property management.

6.2.4 Frequency of System Checks, Sampling and Other Periodic Activities

Transportation to and from the Site and use of consumables in relation to visiting the Site in order to conduct system checks and or collect samples and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources.

Consideration shall be given to:

- Reduced sampling frequencies;
- Reduced site visits and system checks;
- Installation of remote sensing/operations and telemetry; and
- Coordination/consolidation of activities to maximize foreman/labor time.

6.2.5 Metrics and Reporting

As discussed in Section 7.0 and as shown in Appendix J – Site Management Forms, information on energy usage, solid waste generation, transportation and shipping, water usage and land use and ecosystems will be recorded to facilitate and document consistent implementation of green remediation during site management and to identify corresponding benefits; a set of metrics has been developed.

6.3 REMEDIAL SYSTEM OPTIMIZATION

An RSO study will be conducted any time NYSDEC determines that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document;
- The management and operation of the remedial system is exceeding the estimated costs;
- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Plume shift has potentially occurred;

- Site conditions change due to development, change of use, change in groundwater use, etc.; and,
- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the Site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

The RSO study will focuses on overall site cleanup strategy, process optimization and management with the intent of identifying impediments to cleanup and improvements to site operations to increase efficiency, cost effectiveness and remedial time frames. Green remediation technology and principals are to be considered when performing the RSO.

In the event that an RSO is to be performed an RSO report will be submitted to the NYSDEC for approval. A general outline for a RSO report is provided in Appendix K. The RSO report will document the research/investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. Selected RSO recommendations that are approved by NYSDEC shall be implemented. Additional work plans, design documents, HASPs etc., may need to be developed to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required if significant modifications are made to the remedial program.

The RSO report will be submitted, in electronic format, to the NYSDEC Central Office and Regional Office in which the Site is located.

7.0. REPORTING REQUIREMENTS

7.1 SITE MANAGEMENT REPORTS

All site management inspection, maintenance and monitoring events will be recorded on the appropriate site management forms provided in Appendix J. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the Site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of Table 7.1 and summarized in the PRR.

Table 7.1: Schedule of Interim Monitoring/Inspection Reports

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC.

Task/Report	Reporting Frequency*
Compliance Sampling Report	Quarterly (when Plant 1 is operating)
Periodic Review Report	Annually, or as otherwise determined by the NYSDEC

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air, etc);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, etc.);
- Sampling results in comparison to appropriate standards/criteria;

- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and,
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Description of non-routine activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link http://www.dec.ny.gov/chemical/62440.html.

7.2 PERIODIC REVIEW REPORT

The PRR shall be submitted annually to the NYSDEC or at another frequency as may be required by the NYSDEC. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the PRR. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the Site.
- Results of the required annual site inspections and severe condition inspections, if applicable.
- All applicable site management forms and other records generated for the Site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.
- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.
- A site evaluation, which includes the following:
  - The compliance of the remedy with the requirements of the ROD;
  - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;
  - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;
  - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan; and
  - Trends in contaminant levels in the affected media will be evaluated to determine if the remedy continues to be effective in achieving remedial goals as specified by the Decision Document.
  - Trends in operational monitoring data (preferably from inception up through the current reporting period, and considering the data types noted in the calendar year performance summary bullet below);

  - The overall performance and effectiveness of the remedy.
- A performance summary for all treatment systems at the Site during the calendar year, including information such as:
  - The number of days that each extraction was operational during the reporting period;
  - The average flow rate for each extraction point for the reporting period;
  - The totalized flow volume from each extraction well for the reporting period;
  - The contaminant mass removed by each extraction well;
  - A description of breakdowns and/or repairs along with an explanation for any significant downtime;
  - A description of the resolution of performance problems;
  - Alarm conditions;
  - Trends in equipment failure;
  - A summary of the performance, effluent and/or effectiveness monitoring; and
  - Comments, conclusions, and recommendations based on data evaluation.

The PRR report will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the Site is located, Site Control and the NYS Department of Health Bureau of Environmental Exposure Investigation.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a qualified environmental professional or Professional Engineer licensed to practice in NYS will prepare, and include in the PRR, the following certification:

"*For each institutional or engineering control identified for the Site, I certify that all of the following statements are true:*

- *The inspection of the Site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*
- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*

- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the Site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the Site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the Site is compliant with the Deed Restriction;*
- *The engineering control systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the Site remedial program and generally accepted engineering practices; and*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner/Remedial Party or Owner's/Remedial Party's Designated Site Representative] (and if the Site consists of multiple properties): *[I have been authorized and designated by all site owners/remedial parties to sign this certification] for the Site."*

7.3 CORRECTIVE MEASURES WORK PLAN

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an IC/EC, a Corrective Measures Work Plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC.

8.0 REFERENCES

AZTECH Technologies, Inc., 2014. Periodic Review Report for the Baldwin Place Mall (Sommers Common). Prepared for NYSDEC.

Lawler, Matusky & Skelly Engineers (LMSE), 2000. Report on 1997 Excavation of Contaminated Soil. Prepared for Big V Supermarkets, Inc., Florida, New York.

MACTEC Engineering and Consulting, P.C., 2015. Draft Data Gap Investigation Report. Prepared for the New York State Department of Environmental Conservation, Albany, New York. September 2015.

New York State Department of Environmental Conservation (NYSDEC), 2010. DER-10, Technical Guidance for Site Investigation and Remediation. May 2010.

NYSDEC, 1995. Record of Decision – Baldwin Place Shopping Center Site. Site Number 3-60-023.

Vincent Uhl Associates, 1994. Draft Remedial Investigation – Baldwin Place Mall. Prepared for Big V Supermarkets, Inc., Florida, New York.

TABLES

Table 2.1: Monitoring Well Construction Details

Location ID	Northing	Easting	Ground Elevation	Measuring Point Elevation	Screening Interval (ft bgs)	Screen or Open Hole	Screen Location	Depth to Water 06/29/2015 (ft bmp)	Water Elevation (ft msl)
Data from Final Remedial Investigation Report, August 1994 [1]									
RW-1S[2]	NA	NA	NA	602.03	8 - 47.5	Screen	Overburden	NA	NA
RW-2D[2]	NA	NA	NA	602.02	48 - 82.5	Screen	Competent Rock	NA	NA
MW-2S	489208.54	657911.87	601.53	604.05	1 -14	Screen	Overburden	3.33	600.72
MW-2D	489201.58	657911.87	601.66	603.41	60 - 90	Screen	Overburden	11.23	592.18
MW-3D	489928.54	658517.37	602.25	604.23	60 - 90	Screen	Overburden and Weathered Rock	12.50	591.73
MW-3DD	489916.33	658522.03	602.22	604.21	170 - 200	Open Hole	Competent Rock	10.46	593.75
MW-4S	490472.33	658342.09	609.68	611.64	3.6 - 23.6	Screen	Overburden	5.67	605.97
MW-4D	490472.33	658348.70	609.72	611.84	58.4 - 90.5	Open Hole	Competent Rock	9.77	602.07
MW-8S	490494.34	658582.67	618.28	618.02	4 - 24	Screen	Overburden	6.12	611.90
MW-9S	489830.91	657691.12	596.21	595.99	10.5 - 30.5	Screen	Weathered and Competent Rock	7.74	588.25
MW-9D	489839.13	657686.69	595.99	595.68	60 - 90	Open Hole	Competent Rock	8.11	587.57
MW-10D	489705.74	657883.78	600.52	600.22	59.5 - 90	Open Hole	Competent Rock	12.74	587.48
Data from June 2015[3] Survey									
MW-5S	915252.51	696420.56	603.45	605.47	3 - 23	Screen	Shallow Overburden	7.81	597.66
MW-7S	915251.45	696205.63	602.58	602.23	5 - 25	Screen	Overburden	11.35	590.88
MW-7M1	915244.46	696209.25	602.54	602.17	25.5 - 35.5	Screen	Weathered Rock	11.39	590.78
MW-7M2	915244.46	696209.25	602.54	602.26	39.6 - 44.6	Screen	Competent Rock	11.50	590.76
MW-7D	915199.02	696219.69	602.86	602.31	60 - 90	Open Hole	Competent Rock	12.94	589.37
MW-12S	915251.73	696371.52	603.99	606.35	20 - 39.75	Screen	Overburden	13.83	592.52
MW-12S1	915273.58	696371.16	604.41	604.01	12.2 - 22.2	Screen	Shallow Overburden	9.15	594.86
MW-12M	915273.58	696371.16	604.41	603.94	39 - 49	Screen	Deep Overburden	13.61	590.33
MW-101M	915277.71	696405.45	604.19	603.43	37.8 - 47.8	Screen	Deep Overburden	13.93	589.50
MW-101D	915277.71	696405.45	604.19	603.77	52 - 57	Screen	Overburden and Weathered Rock	24.43	579.34

Notes:
MW = monitoring well; RW = recovery (extraction) well
ft bgs = feet below ground surface
ft bmp = feet below measuring point
msl = mean sea level
NA = not available
1 = Northing/Easting = North American Datum 1927 NYSPCS East (US Survey ft); Elevations = National Geodetic Vertical Datum 1929 (US survey ft)
2 = Both RW-1S and RW-2D have transducers installed within, and transducer depths below top of casing are **42.7 ft** for RW-1S and **56 ft** for RW-2D. Water levels in these wells are monitored with the submerged transducer and the depth of water above the transducer is displayed in the treatment building. Due to possibility of faulted transducer readings, no water elevation data is presented from these wells.
3 = Northing/Easting = North American Datum 83 - NYSPCS EAST (US survey ft); Elevations = North American Vertical Datum 88 (US survey ft)

Created By : DF 9/30/2015
Checked By: CRS 11/10/15

Table 2.2: Groundwater Monitoring Results - June 2015

			Locations	MW-5S		MW-7S		MW-7M1		MW-7M2		MW-7D		MW-9S	
			Sample Date	6/30/2015		6/30/2015		6/29/2015		6/29/2015		6/30/2015		6/29/2015	
			Sample ID	360023-MW-5S		360023-MW-7S		360023-MW-7M1		360023-MW-7M2		360023-MW-7D		360023-MW-9S	
			Sample Intake Depth (ft btor)	18		18		30		42		75		17	
			Well Screen Interval (ft bgs)	3-23		5-25		25.5-35.5		39.6-44.6		60-90		10.5-30.5	
VOCs	**GA**	**Units**		Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual
2-Butanone	50*	ug/L		5	U	5	U	5	U	5	U	5	U	5	U
Acetone	50*	ug/L		5	U	5	U	5	U	5	U	5	U	5	U
Benzene	1	ug/L		1	U	1	U	1	U	1	U	1	U	1	U
Carbon disulfide	60*	ug/L		1	U	1	U	1	U	1	U	1	U	1	U
Chloroform	7	ug/L		1	U	1	U	1	U	1	U	1	U	1	U
Chloromethane	5	ug/L		1	U	1	U	1	U	1	U	1	U	1	U
Cis-1,2-Dichloroethene	5	ug/L		1	U	1	U	1	U	1	U	**3**		**2**	
Methyl Tertbutyl Ether	10*	ug/L		1	U	1	U	1	U	1	U	1	U	1	U
Tetrachloroethene	5	ug/L		**13**		**6**		**6**		1	U	**3**		**5**	
Toluene	5	ug/L		1	U	1	U	1	U	1	U	1	U	1	U
Trichloroethene	5	ug/L		**2**		1	U	1	U	1	U	**8**		**2**	
Xylenes, Total	5	ug/L		1	U	1	U	1	U	1	U	1	U	1	U

Notes:
VOCs = Volatlile Organic Compounds:
VOCs analyzed by Method 8260
1 = VOCs analyzed by Method 601/602
ug/L = micrograms per liter
(detections in bold)
Qual = Qualifier
U = not detected; D = from diluted run
ft btor= feet below top of riser
ft bgs= feet below ground surface
GA = Groundwater guidance or standard values from Technical and Operational Guidance Series (TOGS) 1.1.1, "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations" (NYSDEC, 1998).
* = Guidance value
Highlighted cell exceeds criteria
NA = not analyzed

Table 2.2: Groundwater VOC Results

			Locations	MW-9D		MW-10D		MW-12S		MW-12S1		MW-12M		MW-101D	
			Sample Date	6/29/2015		6/29/2015		6/30/2015		6/29/2015		6/30/2015		6/30/2015	
			Sample ID	360023-MW-9D		360023-MW-10D		360023-MW-12S		360023-MW-12S1		360023-MW-12M		360023-MW-101D	
			Sample Intake Depth (ft btor)	78		70		30		15		42		53	
			Well Screen Interval (ft bgs)	60-90		60-90		20-40		12.2-22.2		39-49		52-57	
VOCs	**GA**	**Units**		Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual
2-Butanone	50*	ug/L		5	U	5	U	5	U	5	U	**6**		5	U
Acetone	50*	ug/L		5	U	**5**	Z	5	U	5	U	**3**	JZ	5	U
Benzene	1	ug/L		1	U	1	U	1	U	1	U	**6**		1	U
Carbon disulfide	60*	ug/L		1	U	1	U	1	U	1	U	1	U	**2**	
Chloroform	7	ug/L		1	U	1	U	1	U	1	U	**1**		1	U
Chloromethane	5	ug/L		1	U	1	U	1	U	1	U	**2**		1	U
Cis-1,2-Dichloroethene	5	ug/L		1	U	1	U	**6**		**4**		1	U	**8**	
Methyl Tertbutyl Ether	10*	ug/L		**2**		1	U	1	U	1	U	1	U	1	U
Tetrachloroethene	5	ug/L		1	U	1	U	**2900**	D	**99**		1	U	**6**	
Toluene	5	ug/L		1	U	1	U	1	U	1	U	**4**		1	U
Trichloroethene	5	ug/L		1	U	1	U	**13**		**4**		1	U	1	U
Xylenes, Total	5	ug/L		1	U	1	U	1	U	1	U	**2**		1	U

Notes:
VOCs = Volatlile Organic Compounds:
VOCs analyzed by Method 8260
1 = VOCs analyzed by Method 601/602
ug/L = micrograms per liter
(detections in bold)
Qual = Qualifier
U = not detected; D = from diluted run
ft btor= feet below top of riser
ft bgs= feet below ground surface
GA = Groundwater guidance or standard values from Technical and Operational Guidance Series (TOGS) 1.1.1, "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations" (NYSDEC, 1998).
* = Guidance value
Highlighted cell exceeds criteria
NA = not analyzed

Table 2.2: Groundwater VOC Results

			Locations	MW-101D		MW-101M		RW-2D		RW-1S[1]	
			Sample Date	6/30/2015		6/30/2015		6/29/2015		7/9/2015	
			Sample ID	360023-MW-101DD		360023-MW-101M		360023-RW-2D		RW-1	
			Sample Intake Depth (ft btor)	53		42		--		--	
			Well Screen Interval (ft bgs)	52-57		37.8-47.8		52.5-82.5		8-47.5	
VOCs	**GA**	**Units**		Results	Qual	Results	Qual	Results	Qual	Results	Qual
2-Butanone	50*	ug/L		5	U	5	U	5	U	NA	
Acetone	50*	ug/L		5	U	5	U	5	U	NA	
Benzene	1	ug/L		1	U	1	U	1	U	NA	
Carbon disulfide	60*	ug/L		**2**		1	U	1	U	NA	
Chloroform	7	ug/L		1	U	1	U	1	U	10	U
Chloromethane	5	ug/L		1	U	1	U	1	U	10	U
Cis-1,2-Dichloroethene	5	ug/L		**9**		**6**		**15**		**22**	
Methyl Tertbutyl Ether	10*	ug/L		1	U	1	U	**2**		NA	
Tetrachloroethene	5	ug/L		**6**		**24**		**5100**	D	**890**	
Toluene	5	ug/L		1	U	1	U	1	U	NA	
Trichloroethene	5	ug/L		1	U	**1**		**81**		**81**	
Xylenes, Total	5	ug/L		1	U	1	U	1	U	NA	

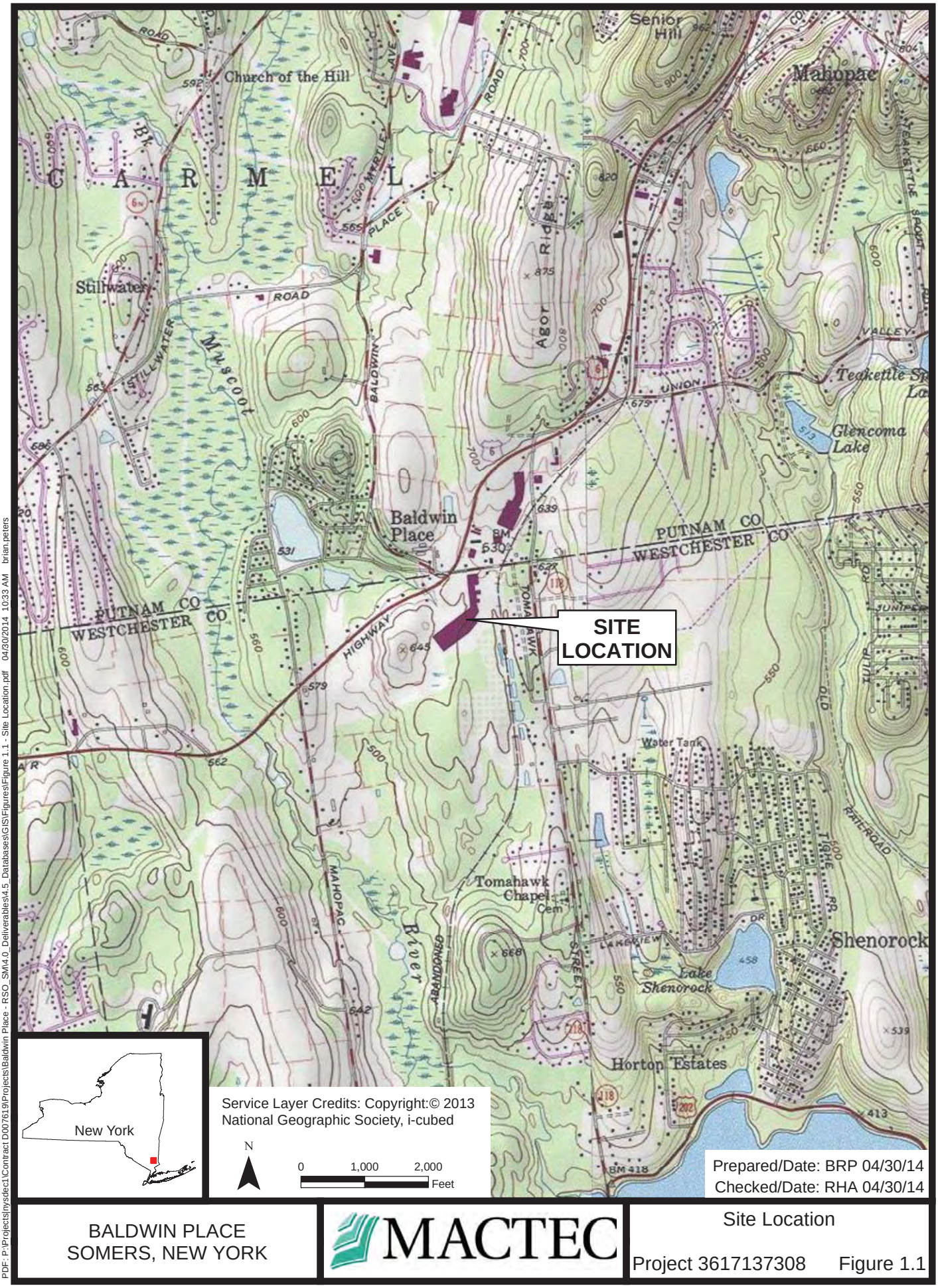
Notes:
VOCs = Volatlile Organic Compounds:
VOCs analyzed by Method 8260
1 = VOCs analyzed by Method 601/602
ug/L = micrograms per liter
(detections in bold)
Qual = Qualifier
U = not detected; D = from diluted run
ft btor= feet below top of riser
ft bgs= feet below ground surface
GA = Groundwater guidance or standard values from Technical and Operational Guidance Series (TOGS) 1.1.1, "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations" (NYSDEC, 1998).
* = Guidance value
Highlighted cell exceeds criteria
NA = not analyzed

Table 4.3: Media Sampling Requirements and Schedule

	Analytical and/or Action			
Location ID	**VOCs (Method 8260)**	**Water Levels**	**TO-15**	**Schedule**
On-Site Groundwater Wells				
RW-1S[2] (Influent)	X	X		Quarterly
RW-2D[2] (Influent)	X	X		Quarterly
MW-4S	X	X		15 Months
MW-4D	X	X		15 Months
MW-5S	X	X		15 Months
MW-7S	X	X		15 Months
MW-7D	X	X		15 Months
MW-8S	X	X		15 Months
MW-9S	X	X		15 Months
MW-9D	X	X		15 Months
MW-12S	X	X		15 Months
MW-101M	X	X		15 Months
MW-2S		X		15 Months
MW-2D		X		15 Months
MW-3D		X		15 Months
MW-3DD		X		15 Months
MW-7M1		X		15 Months
MW-7M2		X		15 Months
MW-10D		X		15 Months
MW-12S1		X		15 Months
MW-12M		X		15 Months
MW-101D		X		15 Months
Meadow Park Road (MPR) Groundwater Monitoring Wells				
13 MPR (Charles Pepi)	X	X		15 Months
6 MPR (Darrell Sorensen)	X	X		15 Months
12 MPR (Anne Mathews)	X	X		15 Months
21 MPR (Patricia Hale)	X	X		15 Months
Unit 6 (Home Goods) Air Sampling				
SS/IA-03, SS-/IA-04, OA-1			X	Every 3 Years

Notes:
MW = monitoring well; RW = recovery (extraction) well
2 = Both RW-1S and RW-2D have transducers installed within, and transducer depths below top of casing are **42.7 ft** for RW-1S and **56 ft** for RW-2D (July 2015). Water levels in these wells are monitored with the submerged transducer and the depth of water above the transducer is displayed in the treatment building. Due to possibility of faulted transducer readings, no water elevation data is presented from these wells.

FIGURES



BALDWIN PLACE
SOMERS, NEW YORK

MACTEC

Site Location

Project 3617137308 Figure 1.1

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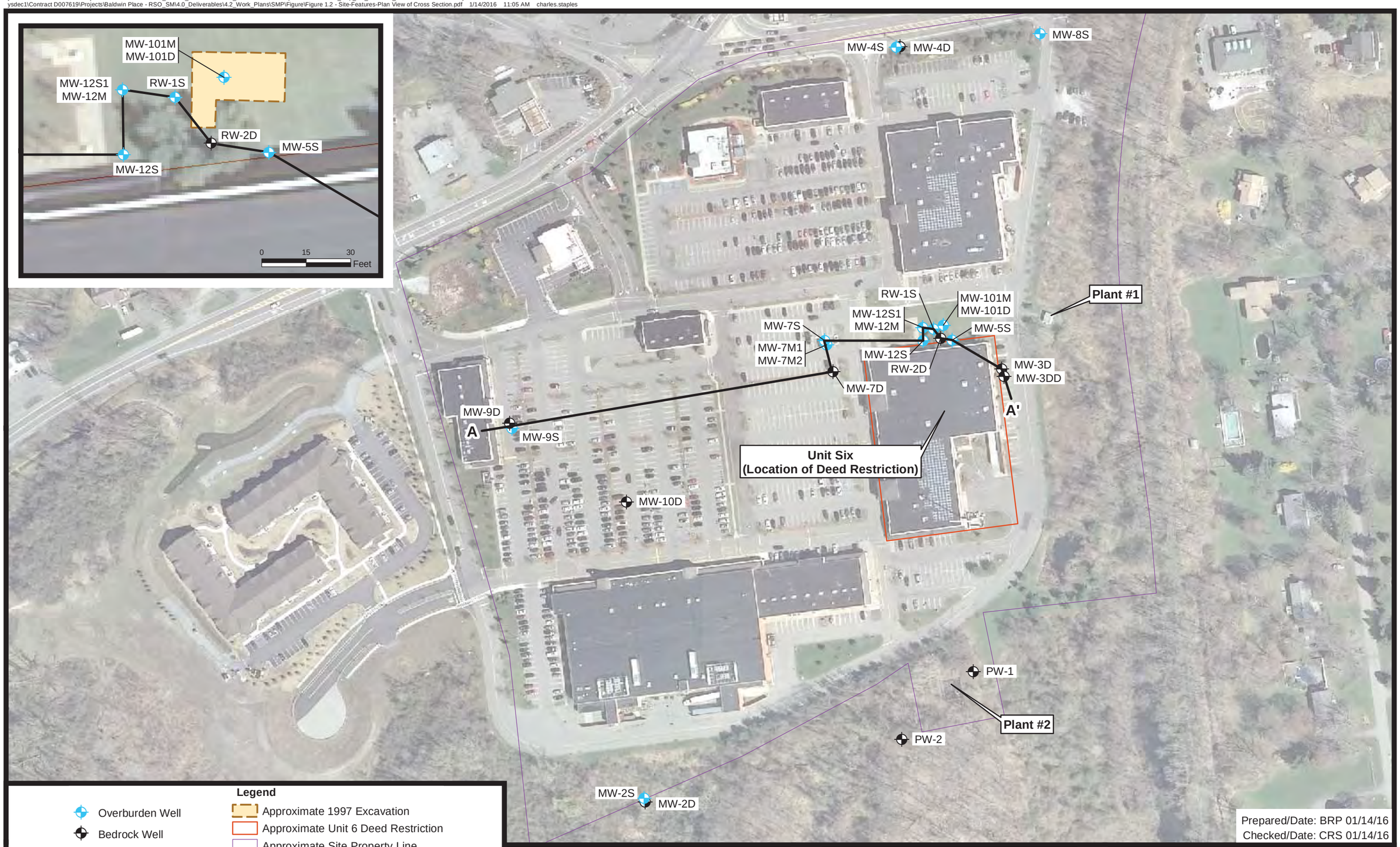
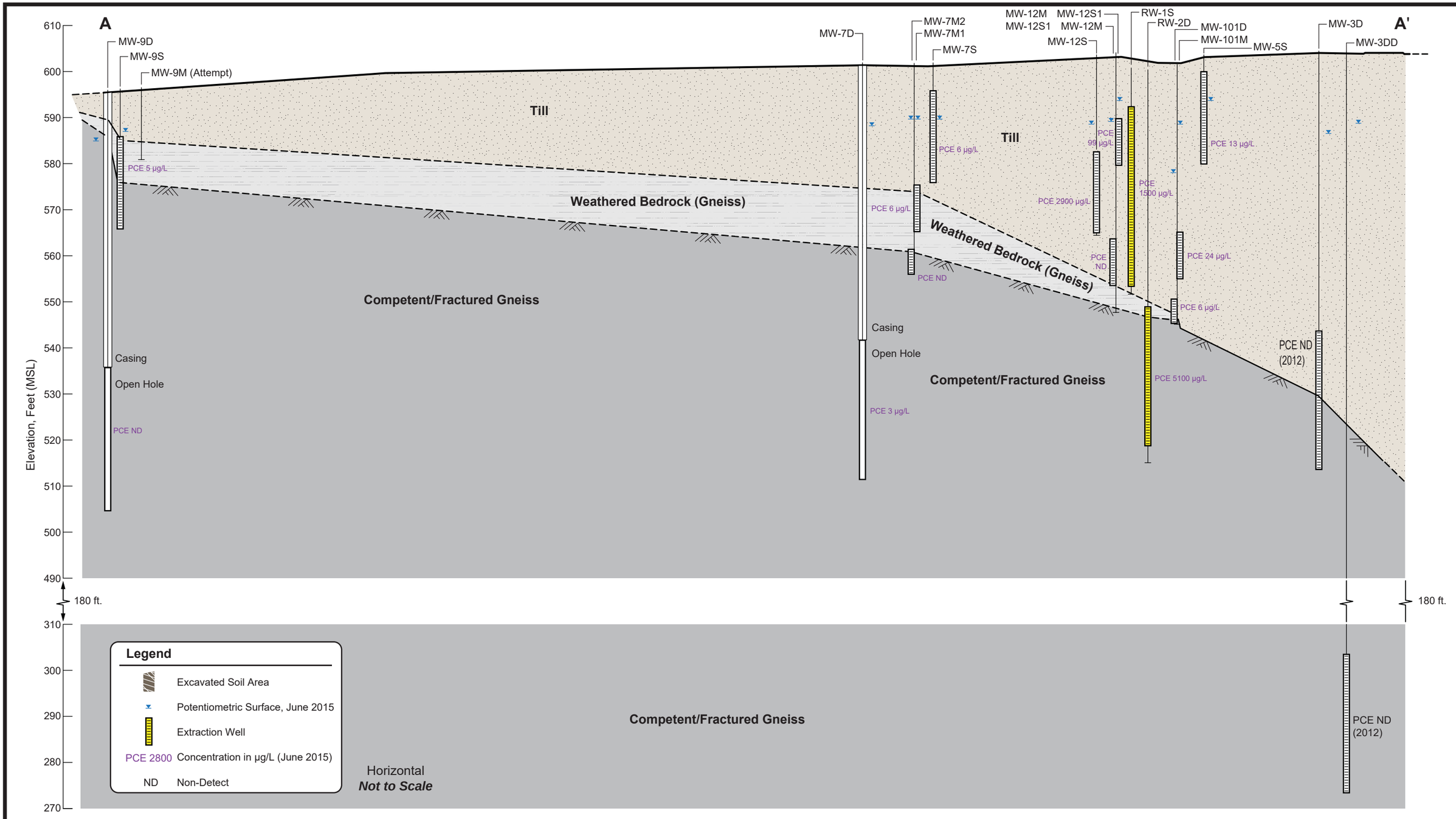
ysdec1\Contract D007619\Projects\Baldwin Place - RSO_SM\4.0_Deliverables\4.2_Work_Plans\SMP\Figure\Figure 1.2 - Site-Features-Plan View of Cross Section.pdf 1/14/2016 11:05 AM charles.staples



BALDWIN PLACE
SOMERS, NEW YORK

MACTEC

Site Features and
Plan View of Cross Section
Project 3617137308 Figure 1.2



Prepared/Date: JPH 11/17/15
Checked/Date: DF 11/17/15

Baldwin Place Shopping Center
Somers, New York

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Geologic Cross-Section A-A'

Project 3617137308

Figure 2.1

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ysdec1\Contract D007619\Projects\Baldwin Place - RSO_SM\4.0_Deliverables\4.1_Reports\Data_Gap_Investigation_Report\Figures\Figure 1.2 - Overburden GW.pdf 11/10/2015 8:52 AM brian.peters

Legend

Overburden Well — Overburden Groundwater Contour

N

0 75 150 Feet

Putnam County color digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

Prepared/Date: BRP 11/10/15
Checked/Date: DF 11/10/15

BALDWIN PLACE SHOPPING CENTER
SOMERS, NEW YORK

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Overburden Groundwater Contours
June 2015
Project 3617137308 Figure 2.2a

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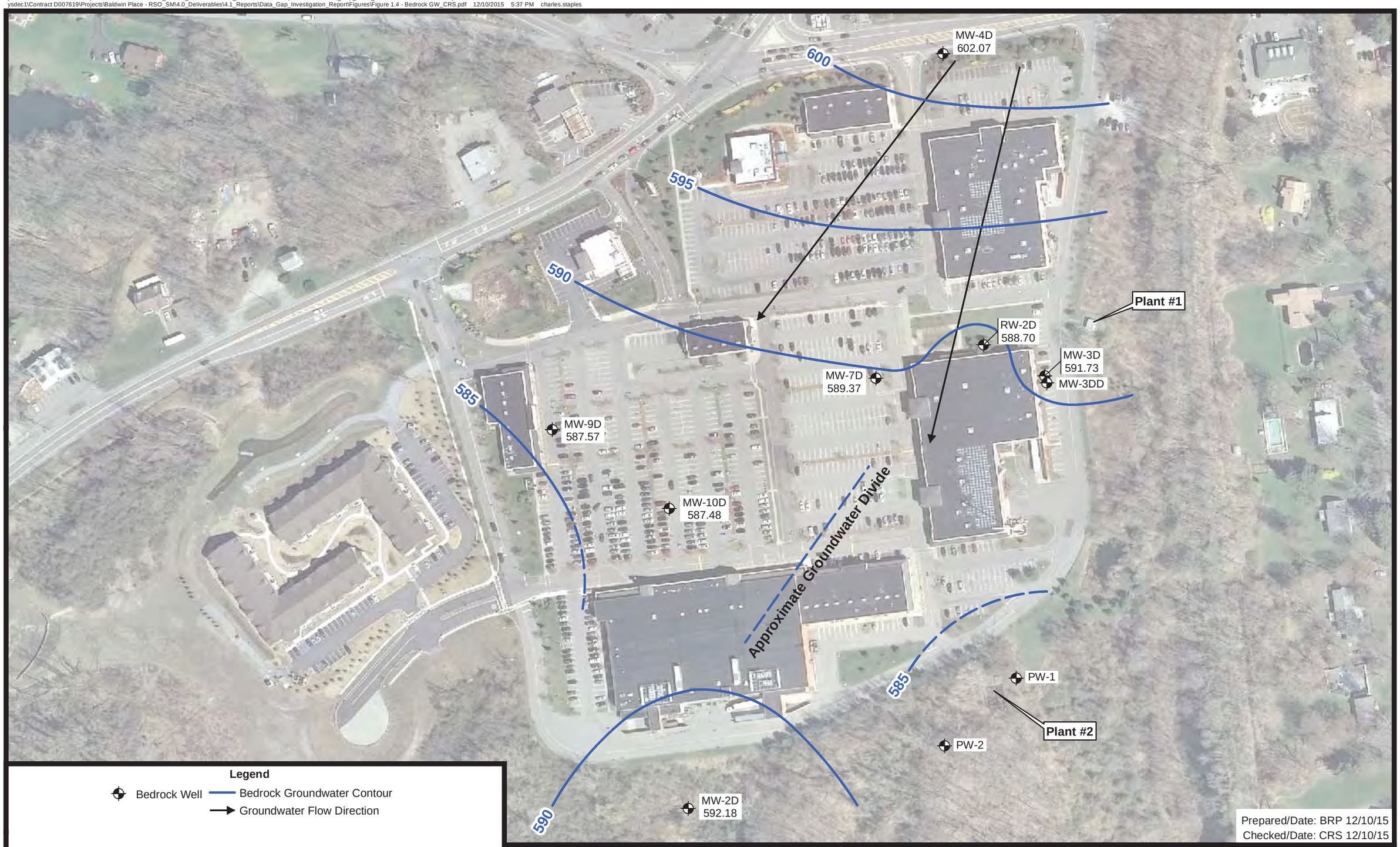
ysdec1\Contract D007619\Projects\Baldwin Place - RSO_SM\4.0_Deliverables\4.1_Reports\Data_Gap_Investigation_Report\Figures\Figure 1.4 - Bedrock GW_CRS.pdf 12/10/2015 5:37 PM charles.staples



Legend

Bedrock Well
Bedrock Groundwater Contour
Groundwater Flow Direction

N

0 75 150 Feet

Putnam County color digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

Prepared/Date: BRP 12/10/15
Checked/Date: CRS 12/10/15

BALDWIN PLACE SHOPPING CENTER
SOMERS, NEW YORK

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Bedrock Groundwater Contours
June 2015
Project 3617137308 Figure 2.2b

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Legend

- Overburden Well
- Bedrock Well
- 6 – PCE Concentration in µg/L (ND = Not Detected)
- Approximate Former Excavation
- PCE Concentration:
  - 5 µg/L
  - 100 µg/L
  - 1000 µg/L

N

0 30 60 Feet

Putnam County color digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

Prepared/Date: BRP 12/01/15
Checked/Date: CRS 12/01/15

BALDWIN PLACE SHOPPING CENTER
SOMERS, NEW YORK

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Source Area - Estimated PCE
Groundwater Plume June 2015
Project 3617137308 Figure 2.3

APPENDIX A

DEED RESTRICTION

The Office of the Westchester County Clerk: This page is part of the instrument; the County Clerk will rely on the information provided on this page for purposes of indexing this instrument. To the best of submitter's knowledge, the information contained on this Recording and Endorsement Cover Page is consistent with the information contained in the attached document.

552223073DLR001T

Westchester County Recording & Endorsement Page

Submitter Information

Name:	Frontier Abstract and Research Services, Inc.	Phone:	585-955-6111
Address 1:	30 West Broad Street	Fax:	585-955-6175
Address 2:	Suite 100	Email:	recordings@frontierabstract.com
City/State/Zip:	Rochester NY 14614	Reference for Submitter:	5053963 ub somers declaration

Document Details

Control Number: **552223073** Document Type: **Declaration (DLR)**

Package ID: 20150810000510010001 Document Page Count: **7** Total Page Count: **8**

Parties

☐ Additional Parties on Continuation page

1st PARTY		2nd PARTY	
1: UB SOMERS INC	- Other	1: NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERV	- Other
2:		2:	

Property

☐ Additional Properties on Continuation page

Street Address: 80 ROUTE 6 6 Tax Designation: 4.20-1-11.42

City/Town: SOMERS Village:

Cross- References

☐ Additional Cross-Refs on Continuation page

1: 2: 3: 4:

Supporting Documents

Recording Fees

Statutory Recording Fee:	$40.00
Page Fee:	$40.00
Cross-Reference Fee:	$0.00
Mortgage Affidavit Filing Fee:	$0.00
RP-5217 Filing Fee:	$0.00
TP-584 Filing Fee:	$0.00
Total Recording Fees Paid:	**$80.00**

Transfer Taxes

Consideration:	$0.00
Transfer Tax:	$0.00
Mansion Tax:	$0.00
Transfer Tax Number:	

Mortgage Taxes

Document Date:

Mortgage Amount:

Basic:	$0.00
Westchester:	$0.00
Additional:	$0.00
MTA:	$0.00
Special:	$0.00
Yonkers:	$0.00
Total Mortgage Tax:	**$0.00**

Dwelling Type: Exempt: ☐

Serial #:

RECORDED IN THE OFFICE OF THE WESTCHESTER COUNTY CLERK

Recorded: 08/10/2015 at 02:00 PM

Control Number: **552223073**

Witness my hand and official seal

Timothy C. Idoni
Westchester County Clerk

Record and Return To

☐ Pick-up at County Clerk's office

Frontier Abstract & Research Services, Inc.
30 West Broad Street
Suite 100
Rochester, NY 14614
Attn: Recording Team

DECLARATION of COVENANTS and RESTRICTIONS

THIS COVENANT is made the 15th day of June 2015, by UB Somers, Inc., a corporation organized and existing under the laws of the State of New York and having an office for the transaction of business at 321 Railroad Avenue, Greenwich, Connecticut 06830.

WHEREAS, a portion of the Baldwin Place Shopping Center now known as Somers Commons is the subject of a remedial program performed by the New York State Department of Environmental Conservation (the "Department") , namely that parcel of real property located on 80 Route 6, Unit 6 in the Town of Somers, County of Westchester, State of New York, which is part of lands conveyed by Columbia Somers, L.L.C. to UB Somers, Inc. by deed dated 06/13/2003 and recorded in the Westchester County Clerk's Office in Instrument No. 441751085, and being more particularly described in Appendix "A," attached to this declaration and made a part hereof, and hereinafter referred to as "the Property"; and

WHEREAS, the Department approved a remedy to eliminate or mitigate all significant threats to the environment presented by the contamination disposed at the Property and such remedy requires that the Property be subject to restrictive covenants.

NOW, THEREFORE, UB Somers, Inc., for itself and its successors and/or assigns, covenants that:

First, the Property subject to this Declaration of Covenants and Restrictions is as shown on a map attached to this declaration as Appendix "B" and made a part hereof.

Second, unless prior written approval by the Department or, if the Department shall no longer exist, any New York State agency or agencies subsequently created to protect the environment of the State and the health of the State's citizens, hereinafter referred to as "the Relevant Agency," is first obtained, where contamination remains at the Property subject to the provisions of the Site Management Plan ("SMP"), there shall be no construction, use or occupancy of the Property that results in the disturbance or excavation of the Property which threatens the integrity of the engineering controls or which results in unacceptable human exposure to contaminated soils.

Third, the owner of the Property shall not prevent access by the Department or its agents to the property nor disturb, remove, or otherwise interfere with the installation, use, operation, and maintenance of engineering controls required for the Remedy, which are described in the SMP, unless in each instance the owner first obtains a written waiver of such prohibition from the Department or Relevant Agency.

Fourth, the owner of the Property shall prohibit the Property from ever being used for purposes other than for Restricted Residential, Commercial or Industrial use without the express written waiver of such prohibition by the Department or Relevant Agency.

Fifth, the owner of the Property shall prohibit the use of the groundwater underlying the Property without treatment rendering it safe for drinking water or industrial purposes, as appropriate, unless the user first obtains permission to do so from the Department or Relevant Agency.

Sixth, the owner of the Property, upon request, shall provide a periodic certification, to the Department or Relevant Agency, which will certify that: the institutional controls put in place are unchanged from the previous certification, that the owner has complied with the provisions of this restrictive covenant, including compliance with the SMP, that there has been no change in use of the property, unless the Department has been properly notified, and that the engineering controls have not been impaired.

Seventh, the owner of the Property shall continue in full force and effect any institutional controls required for the Remedy and maintain such controls, unless the owner first obtains permission to discontinue such controls from the Department or Relevant Agency, in compliance with the approved SMP, which is incorporated by reference herein and made enforceable hereby, subject to modifications as approved by the Department or Relevant Agency.

Eighth, this Declaration is and shall be deemed a covenant that shall run with the land and shall be binding upon all future owners of the Property, and shall provide that the owner and its successors and assigns consent to enforcement by the Department or Relevant Agency of the prohibitions and restrictions set forth in this Declaration, and the owner and its successors and assigns hereby covenant not to contest the authority of the Department or Relevant Agency to seek such enforcement.

Ninth, any deed of conveyance of the Property, or any portion thereof, shall recite, unless the Department or Relevant Agency has consented to the termination of such covenants and restrictions, that said conveyance is subject to this Declaration of Covenants and Restrictions.

IN WITNESS WHEREOF, the undersigned has executed this instrument the day written below.

By: Willy L. Biddle

Print Name: Willing L. Biddle

Title: President Date: 6-15-15

[12/10]

STATE OF CONNECTICUT)

) s.s.: Greenwich

COUNTY OF Fairfield)

On the 15 day of June, in the year 2015, before me, the undersigned, personally appeared Willing L. Biddle, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Ellen P. Hanrahan

Notary Public State of Connecticut

Ellen P Hanrahan
NOTARY PUBLIC
State of Connecticut
My Commission Expires 5/31/18

[12/10]

Appendix A

Description of the Property

Appendix A

Property Description for Unit 6

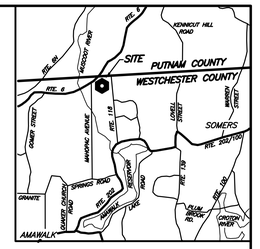
All that certain lot, piece or parcel of land situate in the Town of Somers, County of Westchester, State of New York and being more accurately bounded and described as follows:

Beginning at a point inside lands of the Baldwin Place Mall, said point of beginning being located, north 51°-55'-52" West 265.30' from the southeasterly corner of the 28.514+/- acre parcel of the Baldwin Place Mall; thence from said point of beginning and through lands of the Baldwin Place Mall on the following courses and distances; North 85°-58'-46" West 222.00'; thence North 4°-01'-14" East 320.00'; thence South 85°-58'-46" East 222.00'; thence South 4°-01'-14" West 320.00' to the point of beginning.

Containing 71,040 square feet or 1.631+/- acres.

Appendix B

Map of the Property



LOCATION PLAN

SCALE: 1"= 5000'±

DESCRIPTION FOR:
UNIT 1
LANDS OF THE BALDWIN PLACE MALL
TOWN OF SOMERS

ALL THAT CERTAIN LOT, PIECE OR PARCEL OF LAND SITUATE IN THE TOWN OF SOMERS, COUNTY OF WESTCHESTER, STATE OF NEW YORK AND BEING MORE ACCURATELY BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT INSIDE LANDS OF THE BALDWIN PLACE MALL, SAID POINT OF BEGINNING BEING LOCATED, NORTH 31°-12'-05" EAST 210.57' FROM THE SOUTHWESTERLY CORNER OF THE 28.514± ACRE PARCEL OF THE BALDWIN PLACE MALL; THENCE FROM SAID POINT OF BEGINNING AND THROUGH LANDS OF THE BALDWIN PLACE MALL ON THE FOLLOWING COURSES AND DISTANCES: NORTH 4°-01'-12" EAST 265.00'; THENCE, SOUTH 85°-58'-48" EAST 344.00'; THENCE SOUTH 4°-01'-12" WEST 248.69'; THENCE SOUTH 76°-26'-20" WEST 54.00'; THENCE NORTH 85°-58'-48" WEST 292.52' TO THE POINT OF BEGINNING.

CONTAINING 90,740 SQUARE FEET OR 2.083± ACRES.

DESCRIPTION FOR:
UNIT 2
LANDS OF THE BALDWIN PLACE MALL
TOWN OF SOMERS

ALL THAT CERTAIN LOT, PIECE OR PARCEL OF LAND SITUATE IN THE TOWN OF SOMERS, COUNTY OF WESTCHESTER, STATE OF NEW YORK AND BEING MORE ACCURATELY BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT INSIDE LANDS OF THE BALDWIN PLACE MALL, SAID POINT OF BEGINNING BEING LOCATED, SOUTH 10°-26'-01" EAST 186.20' FROM THE NORTHEASTERLY CORNER OF THE 28.514± ACRE PARCEL OF THE BALDWIN PLACE MALL; THENCE FROM SAID POINT OF BEGINNING AND THROUGH LANDS OF THE BALDWIN PLACE MALL ON THE FOLLOWING COURSES AND DISTANCES: SOUTH 85°-58'-48" EAST 92.00'; THENCE SOUTH 4°-01'-14" WEST 180.00'; THENCE NORTH 85°-58'-46" WEST 72.00'; THENCE NORTH 4°-01'-14" EAST 80.00'; THENCE NORTH 4°-01'-12" EAST 100.00' TO THE POINT OF BEGINNING.

CONTAINING 14,960 SQUARE FEET OR 0.343± ACRES.

DESCRIPTION FOR:
UNIT 3
LANDS OF THE BALDWIN PLACE MALL
TOWN OF SOMERS

ALL THAT CERTAIN LOT, PIECE OR PARCEL OF LAND SITUATE IN THE TOWN OF SOMERS, COUNTY OF WESTCHESTER, STATE OF NEW YORK AND BEING MORE ACCURATELY BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT INSIDE LANDS OF THE BALDWIN PLACE MALL, SAID POINT OF BEGINNING BEING LOCATED ON THE FOLLOWING COURSES AND DISTANCES FROM THE NORTHWEST CORNER OF THE 28.514± ACRE PARCEL OF THE BALDWIN PLACE MALL, NORTH 76°-33'-45" EAST 383.30'; THENCE SOUTH 08°-56'-58" EAST 256.17'; THENCE FROM SAID POINT OF BEGINNING AND THROUGH LANDS OF THE BALDWIN PLACE MALL ON THE FOLLOWING COURSES AND DISTANCES: SOUTH 85°-58'-46" EAST 120.00'; THENCE SOUTH 04°-01'-14" WEST 70.00'; THENCE NORTH 85°-58'-46" WEST 120.00'; THENCE NORTH 04°-01'-14" EAST 70.00' TO THE POINT OF BEGINNING.

CONTAINING 8,400 SQUARE FEET OR 0.193± ACRES.

DESCRIPTION FOR:
UNIT 4A
LANDS OF THE BALDWIN PLACE MALL
TOWN OF SOMERS

ALL THAT CERTAIN LOT, PIECE OR PARCEL OF LAND SITUATE IN THE TOWN OF SOMERS, COUNTY OF WESTCHESTER, STATE OF NEW YORK AND BEING MORE ACCURATELY BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT INSIDE LANDS OF THE BALDWIN PLACE MALL, SAID POINT OF BEGINNING BEING LOCATED ON THE FOLLOWING COURSES AND DISTANCES FROM THE NORTHEASTERLY CORNER OF THE 28.514± ACRE PARCEL OF THE BALDWIN PLACE MALL, NORTH 85°-33'-55" WEST 203.73'; THENCE NORTH 87°-18'-05" WEST 461.06'; THENCE SOUTH 21°-04'-35" WEST 60.09'; THENCE FROM SAID POINT OF BEGINNING AND THROUGH LANDS OF THE BALDWIN PLACE MALL ON THE FOLLOWING COURSES AND DISTANCES: SOUTH 85°-58'-46" EAST 160.00'; THENCE SOUTH 4°-01'-14" WEST 82.00'; THENCE NORTH 85°-58'-46" WEST 160.00'; THENCE NORTH 4°-01'-14" EAST 82.00' TO THE POINT OF BEGINNING.

CONTAINING 13,120 SQUARE FEET OR 0.301± ACRES.

DESCRIPTION FOR:
UNIT 4B
LANDS OF BALDWIN PLACE MALL
TOWN OF SOMERS

ALL THAT CERTAIN LOT, PIECE OR PARCEL OF LAND SITUATE IN THE TOWN OF SOMERS, COUNTY OF WESTCHESTER, STATE OF NEW YORK AND BEING MORE ACCURATELY BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT INSIDE LANDS OF BALDWIN PLACE MALL, SAID POINT OF BEGINNING LOCATED THE FOLLOWING COURSES AND DISTANCES FROM THE NORTHEASTERLY CORNER OF THE 28.514± ACRE PARCEL OF THE BALDWIN PLACE MALL, NORTH 85°-33'-55" WEST 203.73'; THENCE NORTH 87°-18'-05" WEST 461.06'; THENCE SOUTH 78°-11'-38" WEST 113.72'; THENCE SOUTH 64°-20'-19" WEST 97.53'; THENCE SOUTH 54°-41'-47" EAST 38.07'; THENCE FROM SAID POINT OF BEGINNING AND THROUGH LANDS OF THE BALDWIN PLACE MALL ON THE FOLLOWING COURSES AND DISTANCES: SOUTH 85°-58'-37" EAST 110.66'; THENCE NORTH 4°-01'-23" EAST 113.87' TO THE POINT OF BEGINNING.

CONTAINING 12,600 SQUARE FEET OR 0.289± ACRES.

DESCRIPTION FOR:
UNIT 5
LANDS OF THE BALDWIN PLACE MALL
TOWN OF SOMERS

ALL THAT CERTAIN LOT, PIECE OR PARCEL OF LAND SITUATE IN THE TOWN OF SOMERS, COUNTY OF WESTCHESTER, STATE OF NEW YORK AND BEING MORE ACCURATELY BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT INSIDE LANDS OF THE BALDWIN PLACE MALL, SAID POINT OF BEGINNING BEING LOCATED, SOUTH 60°-38'-49" WEST 296.15' FROM THE NORTHEASTERLY CORNER OF THE 28.514± ACRE PARCEL OF THE BALDWIN PLACE MALL; THENCE THROUGH LANDS OF THE BALDWIN PLACE MALL ON THE FOLLOWING COURSES AND DISTANCES: SOUTH 04°-01'-14" WEST 85.00'; THENCE SOUTH 20°-31'-30" WEST 168.96'; THENCE NORTH 85°-58'-46" EAST 185.00'; THENCE NORTH 04°-01'14" EAST 257.00'; THENCE SOUTH 85°-58'-46" EAST 233.00' TO THE POINT OF BEGINNING.

CONTAINING 55,993 SQUARE FEET OR 1.285± ACRES.

DESCRIPTION FOR:
UNIT 6
LANDS OF THE BALDWIN PLACE MALL
TOWN OF SOMERS

ALL THAT CERTAIN LOT, PIECE OR PARCEL OF LAND SITUATE IN THE TOWN OF SOMERS, COUNTY OF WESTCHESTER, STATE OF NEW YORK AND BEING MORE ACCURATELY BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT INSIDE LANDS OF THE BALDWIN PLACE MALL, SAID POINT OF BEGINNING BEING LOCATED, NORTH 51°-55'-52" WEST 265.30' FROM THE SOUTHEASTERLY CORNER OF THE 28.514± ACRE PARCEL OF THE BALDWIN PLACE MALL; THENCE FROM SAID POINT OF BEGINNING AND THROUGH LANDS OF THE BALDWIN PLACE MALL ON THE FOLLOWING COURSES AND DISTANCES: NORTH 85°-58'-46" WEST 222.00'; THENCE NORTH 4°-01'-14" EAST 320.00'; THENCE SOUTH 85°-58'-46" EAST 222.00'; THENCE SOUTH 4°-01'-14" WEST 320.00' TO THE POINT OF BEGINNING.

CONTAINING 71,040 SQUARE FEET OR 1.631± ACRES.

DESCRIPTION FOR:
UNIT 7
LANDS OF THE BALDWIN PLACE MALL
TOWN OF SOMERS

ALL THAT CERTAIN LOT, PIECE OR PARCEL OF LAND SITUATE IN THE TOWN OF SOMERS, COUNTY OF WESTCHESTER, STATE OF NEW YORK AND BEING MORE ACCURATELY BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT INSIDE LANDS OF THE BALDWIN PLACE MALL, SAID POINT OF BEGINNING BEING LOCATED ON THE FOLLOWING COURSES AND DISTANCES FROM THE SOUTHWESTERLY CORNER OF THE 28.514± ACRE PARCEL OF THE BALDWIN PLACE MALL; NORTH 29°-47'-09" EAST 394.08'; THENCE NORTH 73°-14'-59" WEST 255.00'; THENCE NORTH 16°-09'-00" EAST 64.37'; THENCE NORTH 19°-29'-20" WEST 112.38'; THENCE FROM SAID POINT OF BEGINNING AND THROUGH LANDS OF THE BALDWIN PLACE MALL ON THE FOLLOWING COURSES AND DISTANCES: NORTH 85°-58'-48" WEST 190.00' TO THE LINE OF UNIT 1; THENCE ALONG THE LINE OF UNIT 1, NORTH 04°-01'-12" EAST 118.75'; THENCE CONTINUING THROUGH BALDWIN PLACE MALL, SOUTH 85°-58'-48" EAST 15.00'; THENCE SOUTH 04°-01'-12" WEST 16.75'; THENCE SOUTH 85°-58'-48" EAST 175.00'; THENCE SOUTH 04°-01'-12" WEST 102.00' TO THE POINT OF BEGINNING.

CONTAINING 19,631 SQUARE FEET OR 0.451± ACRES.

DESCRIPTION FOR:
UNIT 8
LANDS OF THE BALDWIN PLACE MALL
TOWN OF SOMERS

ALL THAT CERTAIN LOT, PIECE OR PARCEL OF LAND SITUATE IN THE TOWN OF SOMERS, COUNTY OF WESTCHESTER, STATE OF NEW YORK AND BEING MORE ACCURATELY BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE EXISTING SOUTHERLY RIGHT-OF-WAY LINE, U.S. ROUTE 6 OR BIRDSALL ROAD, SAID POINT OF BEGINNING BEING LOCATED, NORTH 76°-33'-45" EAST 153.19' FROM THE NORTHWESTERLY CORNER OF THE 28.514± ACRE PARCEL, WHICH WAS THE EXISTING PARCEL FOR SHAH OIL CORP.; THENCE FROM SAID POINT OF BEGINNING AND ALONG THE SOUTHERLY RIGHT-OF-WAY LINE OF BIRDSALL ROAD OR U.S. ROUTE 6, NORTH 76°-33'-45" EAST 153.79' TO A POINT; THENCE LEAVING BIRDSALL ROAD ON LANDS OF COLUMBIA DEVELOPMENT GROUP LLC, THE FOLLOWING REMAINING COURSES AND DISTANCES: ON A CURVE TO THE RIGHT HAVING A RADIUS OF 57.00', AN ARC DISTANCE OF 17.05' TO A POINT OF COMPOUND CURVATURE, AS DEFINED BY HC CHORD, SOUTH 34°-58'-58" EAST 16.99'; THENCE CONTINUING ALONG A CURVE TO THE RIGHT HAVING A RADIUS OF 852.50', AN ARC DISTANCE OF 77.21' TO A POINT OF TANGENCY, AS DEFINED BY THE CHORD, SOUTH 20°-23'-39" EAST 77.17'; THENCE ON A TANGENT, SOUTH 16°-13'-34" EAST 56.51'; THENCE SOUTH 74°-21'-08" WEST 84.27'; THENCE SOUTH 73°-25'-46" WEST 35.84'; THENCE SOUTH 74°-10'-29" WEST 44.85'; THENCE NORTH 15°-57'-26" WEST 156.13' TO THE POINT OF BEGINNING.

CONTAINING 24,842 SQUARE FEET OR 0.570± ACRES.

REVISED	NATURE OF REVISION	CK.	REVISED	NATURE OF REVISION	CK.

COMPILATION MAP

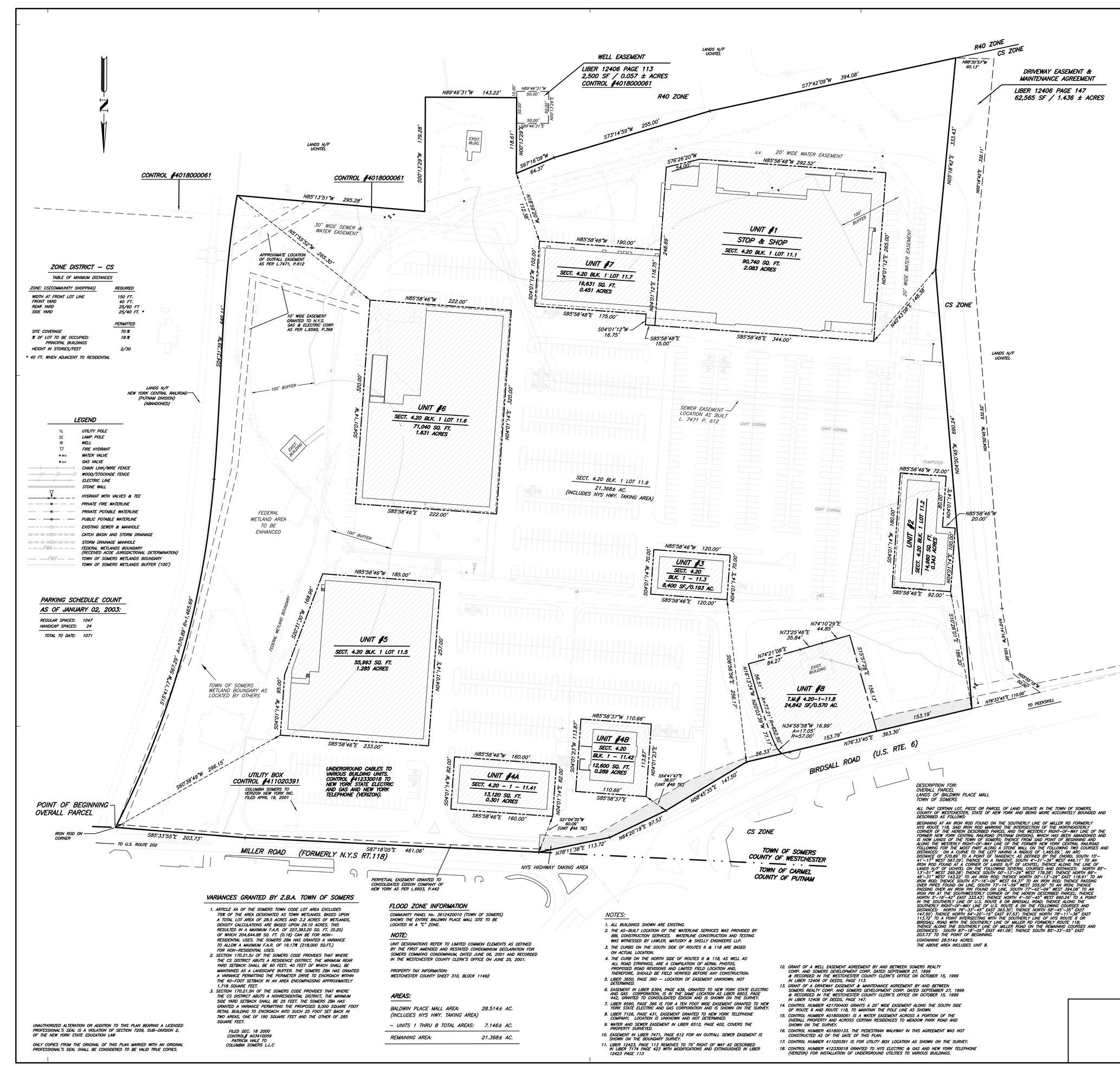
FOR

UB SOMERS, INC. & BVS ACQUISITION CO., LLC

TOWN OF SOMERS — WESTCHESTER COUNTY, N.Y.

SCALE: 1"= 50' — APRIL 13, 2009

DRAWN BY: PM	EUSTANCE & HOROWITZ, P.C.	DWG.#
CHKD BY:	P. O. BOX 42 CIRCLEVILLE, NEW YORK 10919	DISK # 090020



ZONE DISTRICT – CS

TABLE OF MINIMUM DISTANCES

ZONE: CS(COMMUNITY SHOPPING)	REQUIRED
WIDTH AT FRONT LOT LINE	150 FT.
FRONT YARD	40 FT.
REAR YARD	25/60 FT
SIDE YARD	25/40 FT. *
	PERMITTED
SITE COVERAGE	70 %
% OF LOT TO BE OCCUPIED: PRINCIPAL BUILDINGS	18 %
HEIGHT IN STORIES/FEET	2/30

* 40 FT. WHEN ADJACENT TO RESIDENTIAL

LEGEND

- UTILITY POLE
- LAMP POLE
- WELL
- FIRE HYDRANT
- WATER VALVE
- GAS VALVE
- CHAIN LINK/WIRE FENCE
- WOOD/STOCKADE FENCE
- ELECTRIC LINE
- STONE WALL
- HYDRANT WITH VALVES & TEE
- PRIVATE FIRE WATERLINE
- PRIVATE POTABLE WATERLINE
- PUBLIC POTABLE WATERLINE
- EXISTING SEWER & MANHOLE
- CATCH BASIN AND STORM DRAINAGE
- STORM DRAINAGE MANHOLE
- FWA — FEDERAL WETLANDS BOUNDARY (RECEIVED ACOE JURISDICTIONAL DETERMINATION)
- FWT — TOWN OF SOMERS WETLANDS BOUNDARY
- TOWN OF SOMERS WETLANDS BUFFER (100')

PARKING SCHEDULE COUNT AS OF JANUARY 02, 2003:

REGULAR SPACES:	1047
HANDICAP SPACES:	24
TOTAL TO DATE:	1071

UNAUTHORIZED ALTERATION OR ADDITION TO THIS PLAN BEARING A LICENSED PROFESSIONAL'S SEAL IS A VIOLATION OF SECTION 7209, SUB-DIVISION 2, OF THE NEW YORK STATE EDUCATION LAW.

ONLY COPIES FROM THE ORIGINAL OF THIS PLAN MARKED WITH AN ORIGINAL PROFESSIONAL'S SEAL SHALL BE CONSIDERED TO BE VALID TRUE COPIES.

VARIANCES GRANTED BY Z.B.A. TOWN OF SOMERS

1. ARTICLE XA OF THE SOMERS TOWN CODE LOT AREA EXCLUDES 75% OF THE AREA DESIGNATED AS TOWN WETLANDS. BASED UPON A TOTAL LOT AREA OF 28.5 ACRES AND 3.2 ACRES OF WETLANDS, DENSITY CALCULATIONS ARE BASED UPON 26.10 ACRES. THIS RESULTED IN A MAXIMUM F.A.R. OF 237,383.20 SQ. FT. (0.20) OF WHICH 204,644.88 SQ. FT. (0.18) CAN BE FOR NON-RESIDENTIAL USES. THE SOMERS ZBA HAS GRANTED A VARIANCE TO ALLOW A MAXIMUM F.A.R. OF 19.17% (218,000 SQ.FT.) FOR NON-RESIDENTIAL USES.
2. SECTION 170.21.5J OF THE SOMERS CODE PROVIDES THAT WHERE THE CS DISTRICT ABUTS A RESIDENCE DISTRICT, THE MINIMUM REAR YARD SETBACK SHALL BE 60 FEET, 40 FEET OF WHICH SHALL BE MAINTAINED AS A LANDSCAPE BUFFER. THE SOMERS ZBA HAS GRANTED A VARIANCE PERMITTING THE PERIMETER DRIVE TO ENCROACH WITHIN THE 40-FOOT SETBACK IN AN AREA ENCOMPASSING APPROXIMATELY 1,718 SQUARE FEET.
3. SECTION 170.21.5H OF THE SOMERS CODE PROVIDES THAT WHERE THE CS DISTRICT ABUTS A NONRESIDENTIAL DISTRICT, THE MINIMUM SIDE YARD SETBACK SHALL BE 25 FEET. THE SOMERS ZBA HAS GRANTED A VARIANCE PERMITTING THE PROPOSED 9,000 SQUARE FOOT RETAIL BUILDING TO ENCROACH INTO SUCH 25 FOOT SET BACK IN TWO AREAS, ONE OF 190 SQUARE FEET AND THE OTHER OF 285 SQUARE FEET.

FILED DEC. 16 2000
CONTROL # 403410059
PATRICIA HALE TO
COLUMBIA SOMERS L.L.C

FLOOD ZONE INFORMATION

COMMUNITY PANEL No. 3612420010 (TOWN OF SOMERS) SHOWS THE ENTIRE BALDWIN PLACE MALL SITE TO BE LOCATED IN A "C" ZONE.

NOTE:

UNIT DESIGNATIONS REFER TO LIMITED COMMON ELEMENTS AS DEFINED BY THE FIRST AMENDED AND RESTATED CONDOMINIUM DECLARATION FOR SOMERS COMMONS CONDOMINIUM, DATED JUNE 06, 2001 AND RECORDED IN THE WESTCHESTER COUNTY CLERK'S OFFICE ON JUNE 25, 2001.

PROPERTY TAX INFORMATION:
WESTCHESTER COUNTY SHEET 310, BLOCK 11492

AREAS:

BALDWIN PLACE MALL AREA: (INCLUDES NYS HWY. TAKING AREA)	28.514± AC.
– UNITS 1 THRU 8 TOTAL AREAS:	7.146± AC.
REMAINING AREA:	21.368± AC.

NOTES:

1. ALL BUILDINGS SHOWN ARE EXISTING.
2. THE AS-BUILT LOCATION OF THE WATERLINE SERVICES WAS PROVIDED BY BBL CONSTRUCTION SERVICES. WATERLINE CONSTRUCTION AND TESTING WAS WITNESSED BY LAWLER, MATUSKY & SKELLY ENGINEERS LLP.
3. THE CURBS ON THE SOUTH SIDE OF ROUTES 6 & 118 ARE BASED ON ACTUAL LOCATION.
4. THE CURB ON THE NORTH SIDE OF ROUTES 6 & 118, AS WELL AS ALL ROAD STRIPINGS, ARE A COMPILATION OF AERIAL PHOTOS, PROPOSED ROAD REVISIONS AND LIMITED FIELD LOCATION AND, THEREFORE, SHOULD BE FIELD VERIFIED BEFORE ANY CONSTRUCTION.
5. LIBER 3650, PAGE 360 – LOCATION OF EASEMENT UNKNOWN, NOT DETERMINED.
6. EASEMENT IN LIBER 6394, PAGE 439, GRANTED TO NEW YORK STATE ELECTRIC AND GAS CORPORATION, IS IN THE SAME LOCATION AS LIBER 6603, PAGE 442, GRANTED TO CONSOLIDATED EDISON AND IS SHOWN ON THE SURVEY.
7. LIBER 6590, PAGE 366 IS FOR A TEN FOOT WIDE EASEMENT GRANTED TO NEW YORK STATE ELECTRIC AND GAS CORPORATION AND IS SHOWN ON THE SURVEY.
8. LIBER 7126, PAGE 431, EASEMENT GRANTED TO NEW YORK TELEPHONE COMPANY, LOCATION IS UNKNOWN AND NOT DETERMINED.
9. WATER AND SEWER EASEMENT IN LIBER 6512, PAGE 402, COVERS THE PROPERTY SURVEYED.
10. EASEMENT IN LIBER 7471, PAGE 612 FOR AN OUTFALL SEWER EASEMENT IS SHOWN ON THE BOUNDARY SURVEY.
11. LIBER 12423, PAGE 113 REMOVES TO 75' RIGHT OF WAY AS DESCRIBED IN LIBER 7174 PAGE 423 WITH MODIFICATIONS AND EXTINGUISHED IN LIBER 12423 PAGE 113
12. GRANT OF A WELL EASEMENT AGREEMENT BY AND BETWEEN SOMERS REALTY CORP. AND SOMERS DEVELOPMENT CORP. DATED SEPTEMBER 27, 1999 & RECORDED IN THE WESTCHESTER COUNTY CLERK'S OFFICE ON OCTOBER 15, 1999 IN LIBER 12406 OF DEEDS, PAGE 113.
13. GRANT OF A DRIVEWAY EASEMENT & MAINTENANCE AGREEMENT BY AND BETWEEN SOMERS REALTY CORP. AND SOMERS DEVELOPMENT CORP. DATED SEPTEMBER 27, 1999 & RECORDED IN THE WESTCHESTER COUNTY CLERK'S OFFICE ON OCTOBER 15, 1999 IN LIBER 12406 OF DEEDS, PAGE 147.
14. CONTROL NUMBER 421700400 GRANTS A 20' WIDE EASEMENT ALONG THE SOUTH SIDE OF ROUTE 6 AND ROUTE 118, TO MAINTAIN THE POLE LINE AS SHOWN.
15. CONTROL NUMBER 4018000061 IS A WATER EASEMENT ACROSS A PORTION OF THE OVERALL PROPERTY AND ACROSS CERTAIN RESIDENCES TO MEADOW PARK ROAD AND SHOWN ON THE SURVEY.
16. CONTROL NUMBER 4018001133. THE PEDESTRIAN WALKWAY IN THIS AGREEMENT WAS NOT CONSTRUCTED AS OF THE DATE OF THIS PLAN.
17. CONTROL NUMBER 411020391 IS FOR UTILITY BOX LOCATION AS SHOWN ON THE SURVEY.
18. CONTROL NUMBER 412330018 GRANTED TO NYS ELECTRIC & GAS AND NEW YORK TELEPHONE (VERIZON) FOR INSTALLATION OF UNDERGROUND UTILITIES TO VARIOUS BUILDINGS.

DESCRIPTION FOR:
OVERALL PARCEL
LANDS OF BALDWIN PLACE MALL
TOWN OF SOMERS

ALL THAT CERTAIN LOT, PIECE OR PARCEL OF LAND SITUATE IN THE TOWN OF SOMERS, COUNTY OF WESTCHESTER, STATE OF NEW YORK AND BEING MORE ACCURATELY BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT AN IRON ROD FOUND ON THE SOUTHERLY LINE OF MILLER RD FORMERLY NYS ROUTE 118, SAID IRON ROD MARKING THE INTERSECTION OF THE NORTHEASTERLY CORNER OF THE HEREIN DESCRIBED PARCEL AND THE WESTERLY RIGHT-OF-WAY LINE OF THE FORMER NEW YORK CENTRAL RAILROAD (PUTNAM DIVISION), WHICH HAS BEEN ABANDONED AND IS NOW LANDS OF THE TOWN OF SOMERS; THENCE FROM SAID POINT OF BEGINNING AND ALONG THE WESTERLY RIGHT-OF-WAY LINE OF THE FORMER NEW YORK CENTRAL RAILROAD FOLLOWING FOR THE MOST PART ALONG A STONE WALL ON THE FOLLOWING TWO COURSES AND DISTANCES: SOUTH 04°-01'-14" WEST 1,465.69'; ON A CURVE TO THE LEFT HAVING A RADIUS OF 1,465.69', AN ARC DISTANCE OF 570.89' TO A POINT OF TANGENCY, AS DEFINED BY THE CHORD, SOUTH 15°-41'-17" WEST 567.29'; THENCE ON A TANGENT, SOUTH 4°-31'-39" WEST 446.11' TO AN IRON ROD FOUND AT A CORNER OF LANDS N/F OF UCHITEL; THENCE ALONG THE LINE OF LANDS N/F OF UCHITEL ON THE FOLLOWING SEVERAL COURSES AND DISTANCES: NORTH 85°-13'-51" WEST 295.28'; THENCE SOUTH 00°-13'-29" WEST 179.28'; THENCE NORTH 89°-46'-31" WEST 143.22' TO AN IRON ROD; THENCE NORTH 00°-13'-29" EAST 118.61' TO AN IRON ROD; THENCE SOUTH 67°-16'-09" WEST 64.37' TO AN IRON ROD; THENCE PASSING OVER PIPES FOUND ON LINE, SOUTH 73°-14'-59" WEST 255.00' TO AN IRON; THENCE PASSING OVER IRON PIN FOUND ON LINE, SOUTH 77°-42'-09" WEST 394.08' TO AN IRON PIN AT THE SOUTHWESTERLY CORNER OF THE HEREIN DESCRIBED PARCEL; THENCE NORTH 29°-47'-09" EAST 333.43'; THENCE NORTH 4°-50'-45" WEST 690.24' TO A POINT IN THE SOUTHERLY LINE OF U.S. ROUTE 6 OR BIRDSALL ROAD; THENCE ALONG THE SOUTHERLY RIGHT-OF-WAY LINE OF U.S. ROUTE 6 ON THE FOLLOWING COURSES AND DISTANCES: NORTH 76°-33'-45" EAST 363.30'; THENCE NORTH 58°-45'-35" EAST 147.50'; THENCE NORTH 64°-20'-19" EAST 97.53'; THENCE NORTH 78°-11'-38" EAST 113.72' TO A POINT INTERSECTING WITH THE SOUTHERLY LINE OF NYS ROUTE 6 OR BIRDSALL ROAD WITH THE SOUTHERLY LINE OF MILLER RD FORMERLY ROUTE 118; THENCE ALONG THE SOUTHERLY LINE OF MILLER ROAD ON THE REMAINING COURSES AND DISTANCES: SOUTH 87°-18'-05" EAST 461.06'; THENCE SOUTH 85°-33'-55" EAST 203.73' TO THE POINT OF BEGINNING.

CONTAINING 28.514± ACRES.
THE ABOVE AREA INCLUDES UNIT 8.

VARIANCES GRANTED BY Z.B.A. TOWN OF SOMERS

1. ARTICLE XA OF THE SOMERS TOWN CODE LOT AREA EXCLUDES 75% OF THE AREA DESIGNATED AS TOWN WETLANDS. BASED UPON A TOTAL LOT AREA OF 28.5 ACRES AND 3.2 ACRES OF WETLANDS, DENSITY CALCULATIONS ARE BASED UPON 26.10 ACRES. THIS RESULTED IN A MAXIMUM F.A.R. OF 237,383.20 SQ. FT. (0.20) OF WHICH 204,644.88 SQ. FT. (0.18) CAN BE FOR NON-RESIDENTIAL USES. THE SOMERS ZBA HAS GRANTED A VARIANCE TO ALLOW A MAXIMUM F.A.R. OF 19.17% (218,000 SQ.FT.) FOR NON-RESIDENTIAL USES.
2. SECTION 170.21.5J OF THE SOMERS CODE PROVIDES THAT WHERE THE CS DISTRICT ABUTS A RESIDENCE DISTRICT, THE MINIMUM REAR YARD SETBACK SHALL BE 60 FEET, 40 FEET OF WHICH SHALL BE MAINTAINED AS A LANDSCAPE BUFFER. THE SOMERS ZBA HAS GRANTED A VARIANCE PERMITTING THE PERIMETER DRIVE TO ENCROACH WITHIN THE 40-FOOT SETBACK IN AN AREA ENCOMPASSING APPROXIMATELY 1,718 SQUARE FEET.
3. SECTION 170.21.5H OF THE SOMERS CODE PROVIDES THAT WHERE THE CS DISTRICT ABUTS A NONRESIDENTIAL DISTRICT, THE MINIMUM SIDE YARD SETBACK SHALL BE 25 FEET. THE SOMERS ZBA HAS GRANTED A VARIANCE PERMITTING THE PROPOSED 9,000 SQUARE FOOT RETAIL BUILDING TO ENCROACH INTO SUCH 25 FOOT SET BACK IN TWO AREAS, ONE OF 190 SQUARE FEET AND THE OTHER OF 285 SQUARE FEET.

FILED DEC. 16 2000
CONTROL # 403410059
PATRICIA HALE TO
COLUMBIA SOMERS L.L.C

APPENDIX B

LIST OF SITE CONTACTS

APPENDIX B – LIST OF SITE CONTACTS

Below is a listing of pertinent Site contacts.

Name	Contact Information	Phone/Email Address
Site Owner: Urstadt Biddle Properties Inc	Thomas D. Myers Executive Vice President Counsel & Secretary 321 Railroad Avenue Greenwich, CT 06830	(203) 863-8208 TMyers@ubproperties.com
Remedial Party: NYSDEC	Susan Edwards NYSDEC -DER 625 Broadway Albany NY 12233-7017	(518) 402-9813 susan.edwards@dec.ny.gov
NYSDEC Project Manager:	Carl Hoffman NYSDEC -DER 625 Broadway Albany NY 12233-7020	(518) 402-9813 carl.hoffman@dec.ny.gov
NYSDEC Site Control:	Kelly Lewandowski Chief, Site Control Section NYSDEC -DER 625 Broadway Albany NY 12233-7020	(518) 402-9553 Kelly.Lewandowski@dec.ny.gov

APPENDIX C

RECORD OF DECISION AND BASE MAP

Department of Environmental Conservation

Division of Hazardous Waste Remediation

Baldwin Place Shopping Center Site

Site Number 3-60-023

Town of Somers

Westchester County, New York

Record of Decision

November 1995

New York State Department of Environmental Conservation

GEORGE E. PATAKI, *Governor* MICHAEL D. ZAGATA, *Commissioner*

DECLARATION STATEMENT - RECORD OF DECISION

BALDWIN PLACE SHOPPING CENTER
INACTIVE HAZARDOUS WASTE DISPOSAL SITE NO. 360023
WESTCHESTER COUNTY

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedial action for the Baldwin Place Shopping Center (BPSC), an inactive hazardous waste disposal site in the Town of Somers, Westchester County. The remedy was selected in accordance with the New York State Conservation Law (ECL). The remedy selected is not inconsistent with National Oil and Hazardous Substances Pollution Contingency Plan of March 1990 (40CFR300).

The decision is based upon the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for the Baldwin Place Shopping Center and upon public input to the Proposed Remedial Action Plan presented by the NYSDEC. A bibliography of the documents which form the Administrative Record is included in Appendix A of the ROD.

Assessment of the Site

Actual or threatened release of hazardous waste constituents from this site, if not addressed by implementing the response action selected in this ROD, presents a current or potential threat to public health and the environment.

Description of Selected Remedy

Based upon the Feasibility Study for the site and the criteria identified for evaluation of alternatives the NYSDEC has selected a remedy with the following principal elements:

- Source Removal: An estimated 135 yd^3 of highly contaminated soil behind the old dry cleaners at the BPSC will be excavated to reduce the residual tetrachloroethylene concentration in the soil to 10 parts per million (ppm).

- Supply of Potable Water: Big V, the potentially responsible party (PRP) has two options for providing potable water to the impacted homes along Meadow Park Road (MPR). In the first option Big V will install a water supply distribution system, and fund and create a new water district incorporating the existing shopping center's production wells. The new water district will include homes along MPR. The granular activated carbon (GAC) filter systems, now in use on twelve private wells on MPR, will be maintained until the impacted homes are connected to the new system. In the second option, Big V could continue to maintain the GAC filters at MPR until the regional water supply system is commissioned. Big V would reimburse the Town of Somers for the cost of design and construction of the

distribution sysytem. Under both the options, Big V will continue to maintain the GAC filter systems at the two commercial wells along Route 6.

- Connection to Alternate Water Supply: The distribution system and certain appurtenances will be designed to be an integral part of the Town's proposed regional water supply system. The PRP will obtain approval of its plans, specifications and construction from the Town Engineer and the Westchester County Health Department.

- Groundwater Treatment: Two source area wells, one shallow and one deeper well to the top of the competent bedrock, will be installed to collect and treat groundwater at the source. The water from these wells will be treated separately from the water pumped by the BPSC production wells, and the effluent will be discharged to a nearby stream.

- Contingency Plan: Numerical groundwater quality goals will be established during the remedial design to evaluate, on a yearly basis, the effectiveness of the remedy. Additional remedial actions will be taken if results fall significantly short of the goal.

New York State Department of Health Acceptance

The New York State Department of Health concurs with the remedy selected for this site as being protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action the extent practicable, and is cost effective. The remedy utilizes permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable, and satisfies preference for remedies that reduce toxicity, mobility, or volume as a principal element.

1/9/95
Date

Michael O'Toole Jr., Director
Division of Hazardous Waste Remediation

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RECORD OF DECISION

BALDWIN PLACE SHOPPING CENTER
Somers, Westchester County, New York
Site No. 360023
October 1995

SECTION 1: PURPOSE OF THE SELECTED ACTION

The New York State Department of Environmental Conservation (NYSDEC) in consultation with the New York State Department of Health (NYSDOH) has selected a remedial action for the Baldwin Place Shopping Center (BPSC).

The plan will consist of removal of soil contaminated with perchloroethylene (PCE) above 10 parts per million (ppm), groundwater treatment to address residual contamination at the source, and supply of treated water from the BPSC supply wells to affected homeowners. The effectiveness of the remedy will be evaluated against numerical criteria that will be established during the design stage. Additional remedial work will be required if results fall significantly short of the criteria.

This Record of Decision (ROD) identifies the selected remedy, summarizes the other alternatives considered, and discusses the rationale for this preference. The ROD is a summary of the information that can be found in greater detail in the Proposed Remedial Action Plan (PRAP) and other documents placed in the repositories listed on this page. The details of the PRAP were presented at a public meeting held on September 13, 1995 at the Town of Somers Hall.

NYSDEC selected this action after careful consideration of all comments submitted during the public comment period which began on August 18, 1995 and ended on September 27, 1995. Appendix B contains a responsiveness summary of the public questions regarding the PRAP.

This ROD is issued by NYSDEC as an integral component of the citizen participation provisions of the New York State Environmental Conservation Law (ECL), 6NYCRR 375 and the Federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986.

The public was provided the opportunity to review the documents at the repositories listed below to gain a more comprehensive understanding of the site and the investigations conducted to date.

Repositories

Somers Public Library
Route 139, Reis Park
Somers, NY 10589
Contact: Ms. Sirchia
914-232-5717

NYSDEC, Region 3
21 South Putt Corners Road
New PALTZ, NY 12561
Contact: Ms. Erin O'Dell-Keller
914-256-3154

SECTION 2: SITE LOCATION AND DESCRIPTION

The BPSC is a 28 acre, old, mostly vacant shopping center located in a residential/commercial area in the Town of Somers, New York. The site is bounded by U.S. Route 6 on the northwest; an undeveloped property on the south and west; an abandoned railroad embankment on the east; and a east-west oriented section of Route 118 on the north (Fig. 1).

Located in a relatively high topography, the drainage from the site is to the northwest and southeast. The eastern portion drains to a north to south flowing stream that lies between the site and the Meadow Park Road community, and is a tributary to the Muscoot River. The western portion of the site also drains to the Muscoot River, but through a south to north flowing stream that empties into a steep ravine, flows through two ponds and Lake Baldwin prior to its confluence with the Muscoot River.

The site is underlain by glacial till, weathered bedrock, and bedrock. The till comprises the uppermost geologic and water bearing unit. The till is thin near the western/ north-western site boundaries and thickens to the south/ south-east. Below the glacial till is approximately 20 ft of weathered bedrock. The depth to competent bedrock ranges from 22 ft below ground surface in the western part to about 100 ft in the east/ south-east.

There is a naturally occurring groundwater divide in the vicinity of the main mall building which is oriented in a southwest to northwest direction. The resulting bi-directional flow of groundwater in both the shallow and deeper bedrock systems is to the southeast and west/northwest.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

Prior to 1965, the site was an orchard. The BPSC was built in 1965. BPSC has two wells : one 260 ft deep and the other 400 ft deep for a total capacity of 115 gallons per minute (gpm). A dry cleaner is known to have operated on the premises since 1967. The on-site dry cleaner came under scrutiny in 1979 as a result of county-wide investigation of sites vulnerable to dry-cleaning chemical (perchloroethylene [PCE]) contamination. In the process Westchester County Health Department (WCHD) discovered PCE in BPSC wells, but no evidence of disposal was found. Subsequent sampling in 1984 confirmed earlier results (less than 50 parts per billion [ppb] the State drinking water guidance value at the time). Big V Supermarkets acquired the shopping center in 1986.

An environmental assessment by LBG , Inc. in 1988 on behalf of the owners confirmed earlier WCHD sampling results. Effective January 1989 the drinking water standard for PCE was changed to 5 ppb. At this time PCE was also detected in the on-site McDonald well at 21 ppb. LBG concluded there was insufficient information to identify the source of the PCE contamination.

To confirm LBG findings, the NYSDEC and the WCHD re-sampled the mall supply well and the McDonald's well in late 1988 and found the gasoline additive methyl tert-butyl ether (MTBE) in McDonald's well at 320 ppb. The WCHD directed McDonalds to shut down the well and procure water from an alternate source. The NYSDEC's Spills Prevention Unit conducted the MTBE investigation and ordered the adjoining service stations to implement a pump and treat remedy. The McDonalds well resumed operation

in 1993 after being equipped with a granular activated carbon (GAC) filter system by the Mobil Oil Corporation. An extensive sampling effort by the WCHD from 11/88 through 1/89, detected PCE in several homeowner wells on Meadow Park Road and in four commercial wells along Route 6 (Fig. 2).

In April 1989, Big V supermarkets installed a GAC system on BPSC's two water supply wells.

Based upon review of WCHD's sampling data, the NYSDEC concluded that the dry cleaner was the most likely source of the PCE contamination in the area, and in October 1989 placed BPSC as a Class 2 site on the State's Registry of Inactive Hazardous Waste Sites. The presence of PCE in the soil was later confirmed by a limited soil gas investigation in June 1991.

SECTION 4: CURRENT STATUS

Pursuant to an Order On Consent entered into on August 4, 1992, Big V Supermarkets conducted a Remedial Investigation (RI) under the supervision of and in accordance with a work plan approved by the NYSDEC. The fieldwork for the RI was performed from July 1992 through December 1993. The RI Report was finalized in August 1994 and presented to the public at a meeting in Somers Town Hall on August 30, 1994. A final Feasibility Study (FS) report was submitted in June 1995. A public meeitng was held on September 13, 1995 in Somers Town Hall to present the PRAP.

An Interim Remedial Measure (IRM) was conducted at the site before the RI commenced. An IRM is implemented when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS. Under an Order on Consent, dated September 12, 1991, Big V Supermarkets initially installed four individual point-of-use (POU) Granular Activated Carbon (GAC) filters and assumed maintenance of a fifth GAC filter on affected private wells where the drinking water quality exceeded the State standard of 5 ppb. Big V also commenced quarterly monitoring at all 19 Meadow Park Homes (MPR) homes. Four additional filters were installed on the basis of the quarterly monitoring results. In September 1994, at the request of the Town of Somers, Big V installed filters at three additional homes where PCE was detected at less than the 5 ppb standard. A total of 12 GAC filters have been installed.

SECTION 5: ENFORCEMENT STATUS

The Potential Responsible Party (PRP) for the site is Big V supermarkets, Inc. , Florida, New York. The PRP has entered into an Order on Consent with the NYSDEC to implement, operate, maintain, and monitor the remedy in accordance with the ROD.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6NYCRR 375-1.10. These goals are established under the guideline of meeting all standards, criteria, and guidance (SCGs) and protecting human health and the environment.

At a minimum, the remedy selected should eliminate all significant threats to the public health and to the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The goals selected for this site are:

- Prevent exposure (inhalation, ingestion, and dermal) to soils containing unacceptable levels of PCE and its break down products.

- Prevent continued degradation of groundwater quality through migration of PCE and its break down products from soils to groundwater.

- Prevent exposure (inhalation, ingestion, and dermal) to groundwater contaminated at unacceptable levels with PCE and its break down products.

- Restore groundwater quality (impacted by PCE and its break down products) to acceptable levels within a reasonable time frame.

- Prevent migration and discharge of site contaminants in groundwater to adjacent surface water bodies.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

Five potential remedial alternatives for the BPSC site were identified and screened by Big V in its report entitled **Feasibility Study, Baldwin Place Mall, Somers, New York dated June 1995.** Of the five, Alternative No. 2 was eliminated from further evaluation. A summary of the detailed analysis of the remaining four alternatives follows.

7.1: Description of Alternatives

The potential remedies are intended to address the contaminated soils and groundwater at the site.

Alternative No. 1 (No Further Action):

The no further action alternative is evaluated as a requirement and as a basis for comparison. This alternative recognizes the IRM that had already taken place at the site. It requires continued monitoring only, to evaluate the effectiveness of the IRM.

No Further Action, in this case, would mean continuing with pumping of the BPSC production well at its current low pumping rate of 3.8 gallons per minute (gpm) to meet the water supply needs for the mostly vacant shopping center. It would also mean continuing with the Point of Use GAC filters at the affected homeowners/ commercial wells.

Alternative 1 probably would be protective of human health through institutional measures (deed and development restrictions) to prevent direct contact with the contaminants that remain at site; however, the potential for human exposure remains. Also, the contaminants would continue to leach further into groundwater and migrate off site. For these reasons, the No Further Action Alternative is not acceptable.

Present Worth:	$2, 075, 000
Capital Cost:	$ *none*
Annual O&M:	$ 135,000

(The above is based on operating and maintaining individual POU GAC filters and conducting groundwater monitoring for 30 years. The discount rate used for the present worth calculation is 5% per year).

Alternative No. 3: Source Area Excavation

This alternative consists of excavation of 95 yd^3 of contaminated soils at the source area to achieve 1.4 ppm cleanup level for TCE in the unsaturated soils in accordance with TAGM No.4046, and 50 ppm in the saturated soils; increased recovery (20 gpm) of groundwater from the BPSC production wells with on-site treatment; and, installation of a distribution system to provide on-site treated water to the homes on Meadow Park Road. The sustained pumping of the BPM production wells at rates higher than the current usage, as proposed in the remedy, would result in a substantial elimination

of the groundwater divide at the site. As a result, the groundwater flow in the bedrock aquifer would increase toward the BPM production wells and the off-site migration of contamination would be reduced. This alternative would be protective of human health and the environment.

Present Worth:	$1, 820,000
Capital Cost:	$ 828,000
Annual O&M:	
first year	$ 170,000
years 2 through 5	$ 93,000
years 6 through 20	$ 47,000
years 21 through 30	$ 46,000

The monitoring program included under both Alternatives 3 and 4 (below) would consist of quarterly sampling of select on-site monitoring wells for the first five years and annual sampling of these wells for an additional 25 years. The sampling of individual homes would cease after the water supply distribution system starts functioning, which is expected to take place one year after implementation of the source area remedy. The BPSC's two production wells would be tested in accordance with the requirements of 10 NYCRR Chapter 1, Part 5 for the duration of their use as a drinking water supply after which they would be included in the monitoring program.

Alternative No. 4: Source Area Excavation with Source Area Recovery Wells

This alternative consists of two low gpm recovery wells in addition to the remedy described in Alternative No. 3 above. The groundwater model estimates indicates that the source area recovery wells would remediate the groundwater in the source area in 10 to 15 years as compared to 25 to 30 years under Alternative 3.

This alternative would be protective of human health and the environment.

Present Worth:	$2,130,000
Capital Cost:	$ 940,000
Annual O&M:	
first year	$ 189,000
years 2 through 5	$ 112,000
years 6 through 15	$ 66,000
years 16 through 20	$ 47,000
years 21 through 30	$ 46,000

The technologies included in Alternative 4 would not pose any problems in implementation. Disposal of excavated soils and the water pumped and collected during excavation would require acceptance from a permitted treatment and disposal facility. The supply of treated water to Meadow Park Road may impact the implementability of this Alternative since a new water district would have to be created and approved by the NYSDOH, the WCHD, and the Town of Somers.

Alternative No. 5: Source Area Excavation with Source Area Recovery Wells, Western Site Recovery Well and Southeastern Site Recovery Wells

This alternative provides for a continuation of the point of use filters and includes two additional recovery wells compared to Alternative 4. The southeastern well would operate at 15 gpm and the western well at 20 gpm. The pumping rate for the BPSC wells is 15 gpm as opposed to 20 gpm in either Alternative 3 or 4. Unlike Alternatives 3 and 4, the monitoring and maintenance program for Alternative 5 would provide for a quarterly sampling of homeowner wells for the first 20 years and annually thereafter.

Present Worth	$2,669,000
Capital Costs	$ 768,000
Annual O&M	

years 1 through 5	$ 179,000
years 6 through 15	$ 133,000
years 16 through 20	$ 100,000
years 21 through 30	$ 39,000

The groundwater model shows that the deployment of the southeastern and western recovery wells would not substantially expedite groundwater cleanup.

7.2 Evaluation of Remedial Alternatives

The criteria used to compare the potential remedial alternatives are defined in the regulation that directs the Remediation of inactive hazardous waste sites in New York State (6NYCRR Part 375). For each of the criteria, a brief description is provided followed by an evaluation of the alternatives against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is contained in the Feasibility Study.

The first two evaluation criteria are termed threshold criteria and must be satisfied in order for an alternative to be considered for selection.

1. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether or not a remedy would meet applicable environmental laws, regulations, standards, and guidance.

Alternative No. 1 (no further action) would not meet this criterion as the chemical specific ARARs for the site (Class GA groundwater standards and the federal and State MCLs for drinking water) would not be achieved within the 30-year time frame considered for evaluation of Alternatives.

Excavation of 95 yd^3 of contaminated soil from unsaturated and saturated zones in the source area under Alternatives 3, 4, and 5 would satisfy this criterion. The unsaturated soils would be cleaned to NYSDEC's objective of 1.4 ppm. A similar objective for saturated soils has not been established. Below the water table, the intent of the cleanup objective is to protect the groundwater quality. This intent would be substantially satisfied by the removal of 95 yd^3 of the contaminated soil.

The class GA groundwater standards and NY State MCLs for PCE and its degradation products would be achieved by any of Alternatives 3, 4, or 5 in varying time frames.

There are no promulgated ambient air quality standards for the contaminants of concern at this site under federal or State regulations. OSHA standards would be followed during excavation.

Both Alternatives 3 and 4 would meet the requirements of 10 NYCRR Sub-Part 5-1 and the Ten State Standards for the design, maintenance, and monitoring of a public water distribution system. Alternative 5 does not include a water distribution system.

The construction of the water distribution system across the eastern stream would cause some disturbance to the wetlands, but measures would be taken to minimize the disturbance and restore the wetlands.

The excavated soils and the water pumped and collected during excavation (under Alternative 3, 4 or 5) would be treated and disposed off site.

2. Protection of Human Health and the Environment. This criterion is an overall evaluation of the health and environmental impacts to assess whether each alternative is protective.

Alternative No. 1 would not satisfy this criterion since contamination would continue to

leach into the groundwater and migrate off site. Alternative No. 1 is therefore dropped from further consideration.

All three Alternatives 3, 4 and 5 would be protective of human health and the environment through excavation of the source area and removal of contaminants from groundwater by increased pumping and ongoing monitoring. Water, which meets State drinking water standards, would be provided to affected homes under Alternatives 3 and 4 by transporting on-site treated water, and under Alternative 5 by the continuation of point-of-use (POU) filters.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared among alternatives.

Excavation of PCE contaminated soils would pose some potential short term (two weeks) risks to remediation workers. This risk would be the same under Alternatives 3, 4 or 5. Engineering controls, air monitoring and use of personal protective equipment during construction would keep this risk to a minimum.

The installation of a water distribution system, and recovery wells under Alternatives 3 and 4 would take approximately 12 weeks, and would have minimal on or off site construction related impacts. The construction of recovery wells under Alternative 5 would take approximately 10 weeks.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of alternatives after implementation of the response actions. If wastes or treated residuals remain on site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the controls intended to limit the risk, and 3) the reliability of these controls.

All three Alternatives (3,4 and 5) would permanently remove contaminated soils to an off-site facility. The three alternatives differ in their expected remediation time frames. These are as follows:

Plume Location	Time (years) under Alternatives No.3	No.4.	No.5
Source Area	25-30	10-15	10-15
BPSC wells	17-18	15-17	15-17
Meadow Park	20	20	15-20
Western Site	NS	NS*	21-22

* NS= Not simulated

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

All three Alternatives (3,4 and 5) would remove contaminated soils from the source area in the same manner. Soils from the source would be treated by either incineration or thermal desorption at an off-site permitted treatment facility.

Extracted groundwater would be treated using GAC filters, thereby reducing the volume of contaminated media. Periodic removal of spent carbon would ultimately reduce the toxicity of the remaining contaminants.

6. Implementability. The technical and administrative feasibility of implementing each alternative is evaluated. Technically, this includes the difficulties associated with the construction, the reliability of the technology, and the ability to monitor the effectiveness of the remedy. Administratively, the availability of the necessary personal and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc.

The technologies inherent in all three Alternatives are readily implementable. The supply of treated water from the site to Meadow Park Road under Alternatives 3 and 4, however, requires compliance with additional administrative procedures which may delay implementation of the water supply option. The use of POU GAC filters and their essential monitoring and maintenance would continue until a new water supply is available.

7. Cost. Capital and operation and maintenance costs are estimated for each alternative and compared on a present worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision. The costs for each alternative are presented in Table 1.

This final criterion is considered a modifying criterion and is taken into account after evaluating those above. It is focused upon after public comments on the Proposed Remedial Action Plan have been received.

8. Community Acceptance - Concerns of the community regarding the RI/FS reports and the Proposed Remedial Action Plan were evaluated. A "Responsiveness Summary" has been prepared (Appendix B) that describes all the public comments received and how the Department addressed or intends to address the concerns raised.

SECTION 8: SUMMARY OF THE SELECTED REMEDY

Based upon the results of the RI/FS, and the evaluation presented in Section 7, the NYSDEC is proposing Alternative No. 4, with the following modifications, as the remedy for this site:

- An estimated quantity of 135 yd^3 of contaminated soil in the source area will be excavated instead of the 95 yd^3 proposed in Alternatives 3, 4 or 5 (Fig. 3). This is based on a cleanup goal of 10 ppm in the saturated soil as opposed to 50 ppm. The clean-up goal of 10 ppm is proposed because it provides an optimal marginal benefit (Fig. 4). The lower cleanup level will also provide a greater measure of confidence than will a cleanup level of 50 ppm in view of possible gaps in the soil contamination data.

Post-excavation samples will be collected at the bottom of the excavation for evaluation of further remedial action as necessary.

- Contingency plans will be put in place to evaluate the need for southeastern and western recovery wells. The wells will be installed and commissioned if the implemented remedy substantially fails to achieve projected contamination reductions based on a set of criteria to be developed by Big V and approved by NYSDEC during the remedial design phase.

The NYSDEC's selected remedy, therefore, consists of the following elements:

1. A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of

the remedial program. Numerical groundwater quality goals will be established during the remedial design to evaluate the effectiveness of the remediation on a yearly basis.

2. Source Removal: All contaminated soil in the saturated zone will be excavated to a cleanup level of 10 ppm. An estimated 135 yd^3 of soil will be excavated. The depth of excavation will be 15 ft. Post excavation samples will be collected to determine the need for further remediation. The excavated soil and the water pumped and collected during excavation will be treated off site by incineration or thermal desorption.

3. Supply of Potable Water: The PRP will have one of the following two options: 1) Install a distribution system (Fig. 5), and fund and create a new water district incorporating the BPSC production wells. The new water district will have to meet all requirements of 10NYCRR, Chapter I, Part 5. The PRP will supply the on-site treated water to all 19 MPR residential properties; **or** 2) Continue with individual POU GAC filters at residential properties until the Town of Somers provides an alternate source of water supply. The cost of the design and construction of the distribution system to the MPR properties will then be reimbursed by Big V to the Town of Somers.

Under both options the PRP will continue to maintain the GAC filter systems at affected commercial properties along Route 6 until the groundwater quality is restored to drinking water standards or an alternate source of water supply is available in the area. Any additional wells along Route 6 that also contain levels of PCE above drinking water standards and determined to be from the BPSC will be provided with GAC filters.

4. Connection to Alternate Water Supply: A Regional Water Supply system planned by the WCHD and the Town of Somers is expected to be available for connection to affected homes in the Meadow Park Road Area in two to five years. The PRP and the NYSDEC agree that connection to a permanent Regional Water Supply System (when available) will be the selected water supply option in the long term. The distribution system and certain appurtenances will be designed to be an integral part of the Town's proposed regional water supply system. The PRP will obtain approval of its plans, specifications and construction from the Town Engineer and the Westchester County Health Department.

5. Groundwater Treatment: Two source area wells, one shallow and one deeper well to the top of the competent bedrock, will be installed to capture vertical leakage as well as lateral flow passing under the source area. The water from these wells will be treated separately from the water pumped by the BPM production wells, and the effluent will be discharged to a nearby stream.

The two wells may be combined into one continuously screened well if, during the design, it is proven that the capture of the contamination plume is thereby improved.

Year-by-year numerical groundwater quality goals will be established during the design phase of the remediation to evaluate the effectiveness of the groundwater remedial program. The recovery rates of the BPSC and the source area wells required to optimally capture the on-site plume will be determined by pump tests. The location(s) of the source area well(s) will be based on soil and groundwater analysis, and the characteristics of the bedrock. The design of the source well/s will require NYSDEC approval.

The BPM wells are expected to pump at 20 gpm during remediation, but fine tuning of the

source and BPM wells will be likely once the system is running.

6. Contingency Plan: If the implemented remedy, and any subsequent adjustments to the workings of the BPSC and source area wells fail to substantially accomplish the numerical groundwater quality goals approved by NYSDEC during the design phase, installation of additional pumping well(s) or other enhancements to the remedial system will be considered. Big V will implement such enhancements as are considered appropriate by NYSDEC.

The NYSDEC believes the above remedy meets the selection criteria and is in the best interest of the public and the environment.

The projected costs of the selected remedy are as follows:

Construction Cost:	$1,074,000
O&M costs per year are as follows:	
First year only:	$ 189,000
Years 2 through 5:	$ 112,000
Years 6 through 15:	$ 66,000
Years 16 through 20:	$ 47,000
Years 21 through 30:	$ 46,000

Present Worth: $2,264,000
Based on a 30 year life
and a 5% interest rate.

The above cost estimates are based on supply of on-site treated water to Meadow Park Road homes, incorporating BPSC wells into a new water district to be created by the PRP under the requirements of 10NYCRR, Part 5. The distribution system installed by the PRP will be connected to the Regional Water District (when implementable) for permanent long term supply of potable water to the affected homes.

After the impacted properties are connected to Regional Water District, the BPSC wells will continue to pump and treat groundwater. Big V may chose to use some or all of the treated water for the BPSC. Any surplus treated water will be discharged to a nearby stream.

A long term monitoring program will be instituted to monitor the effectiveness of the selected remedy. This long term monitoring program will be a component of the operations and maintenance for the site and will be developed as part of the remedial design.

Lawler, Matusky & Skelly Engineers
One Blue Hill Plaza • Pearl River, New York 10965
ENVIRONMENTAL SCIENCE & ENGINEERING CONSULTANTS

Location Map

BALDWIN PLACE MALL

FIGURE
1-1

FIG. 1

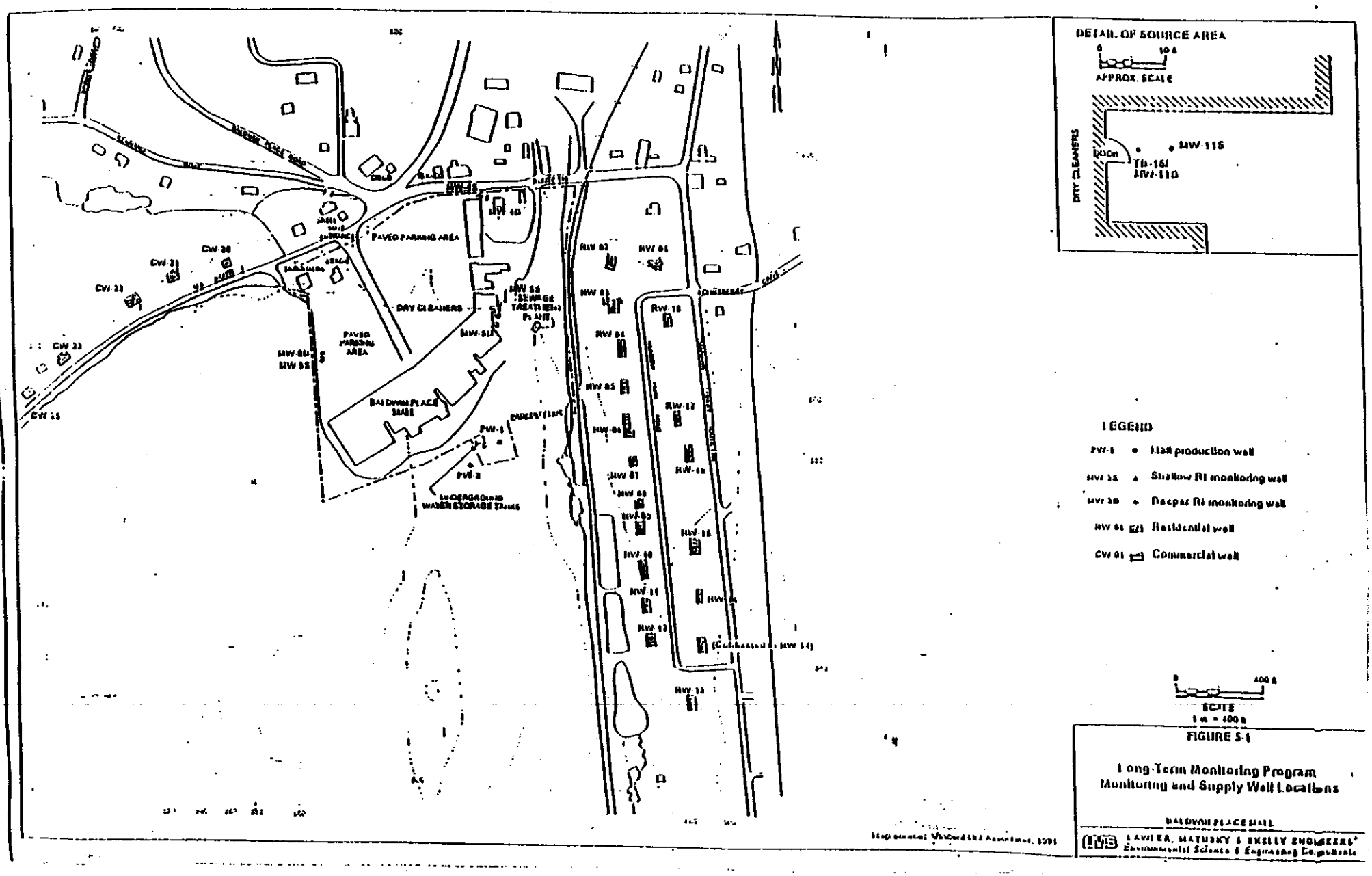
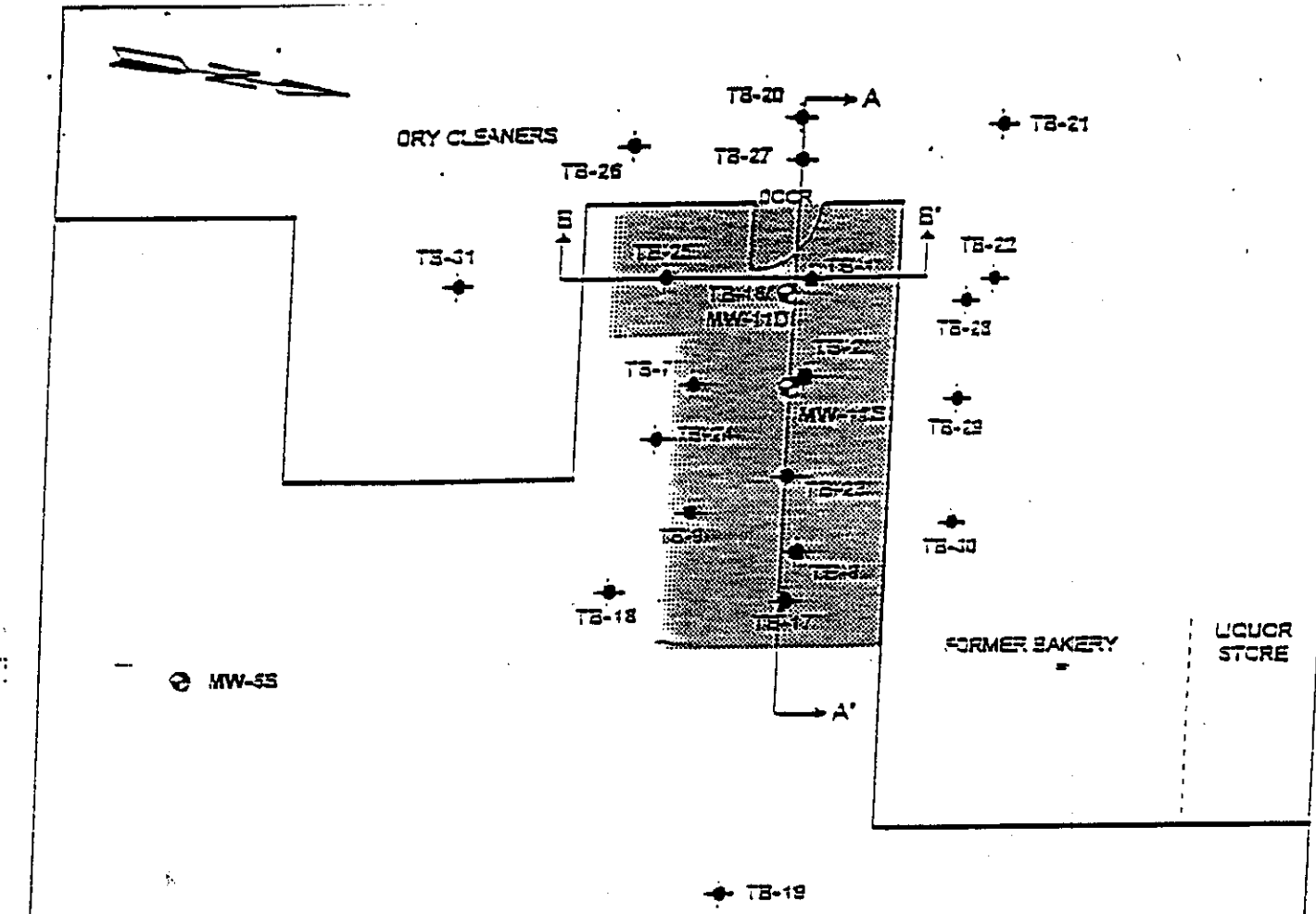

DETAIL OF SOURCE AREA
APPROX. SCALE
DRY CLEANERS
MW-11S
TB-16J
MW-11D
PAVED PARKING AREA
DRY CLEANERS
PAVED PARKING AREA
BALDWIN PLACE MALL
PW-1
PW-2
LEGEND
PW-1 Mall production well
MW 1S Shallow RI monitoring well
MW 3D Deeper RI monitoring well
RW 01 Residential well
CW 01 Commercial well
SCALE
1 in = 400 ft
FIGURE 5-1
Long-Term Monitoring Program
Monitoring and Supply Well Locations
BALDWIN PLACE MALL
LAWLER, MATUSKY & SKELLY ENGINEERS
Environmental Science & Engineering Consultants

FIG. 2



LEGEND

- Monitoring well location
- Test boring location
- Area of soils exceeding cleanup objective of 10 mg/kg PCE
- A A' Cross-section location

0 10 ft

APPROXIMATE SCALE
1 in = 10 ft

Map source: Vincent Ulli Associates

Lawler, Matusky & Skelly Engineers
One Blue Hill Plaza • Pearl River, New York 10965
ENVIRONMENTAL SCIENCE & ENGINEERING CONSULTANTS

Excavation of Soils Exceeding 10 mg/kg PCE
BALDWIN PLACE MALL

Figure 4

FIG. 3

BALDWIN PLACE SHOPPING CENTER

MARGINAL BENEFIT ANALYSIS – SOIL CLEANUP

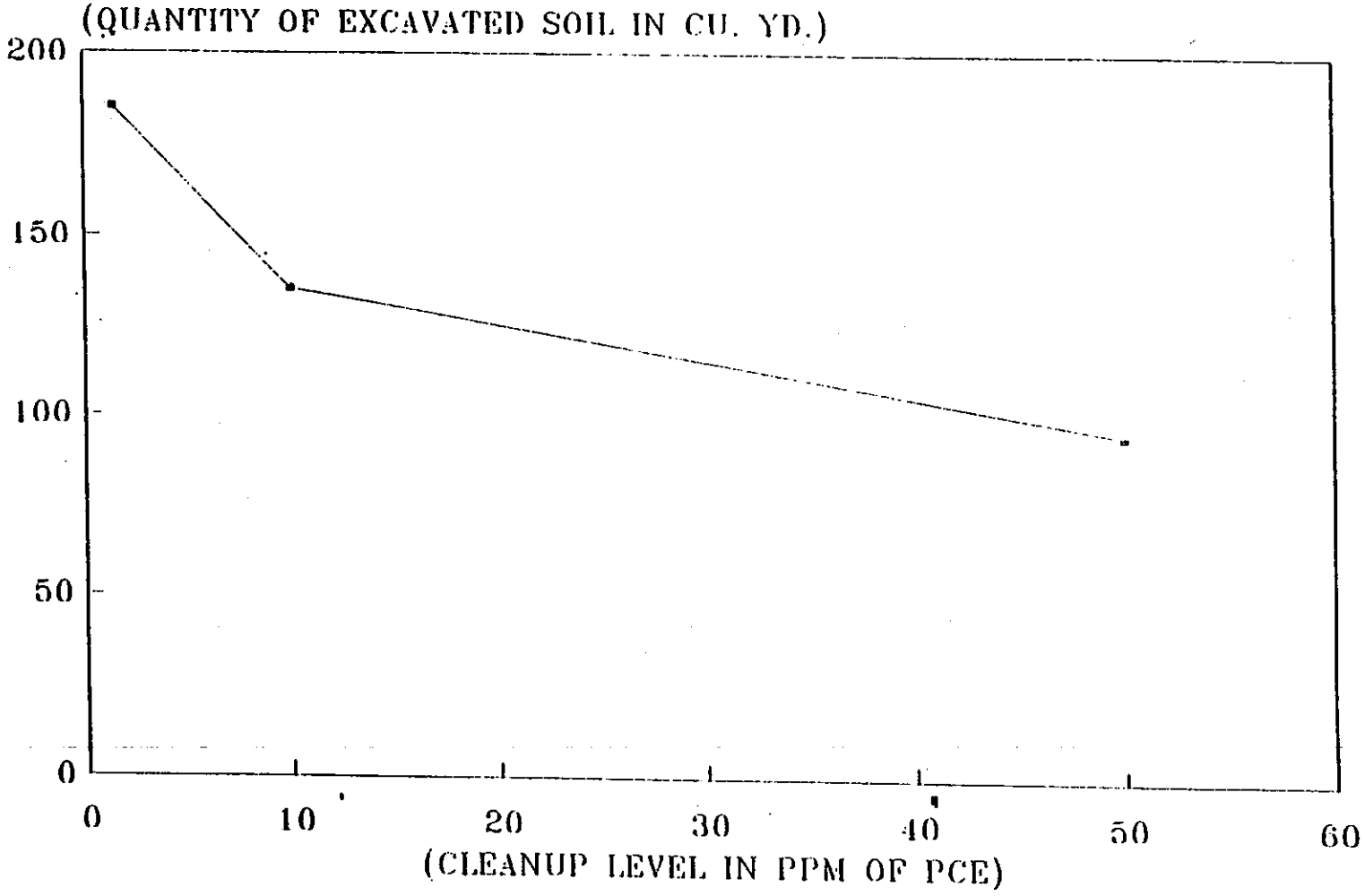


FIG. 4

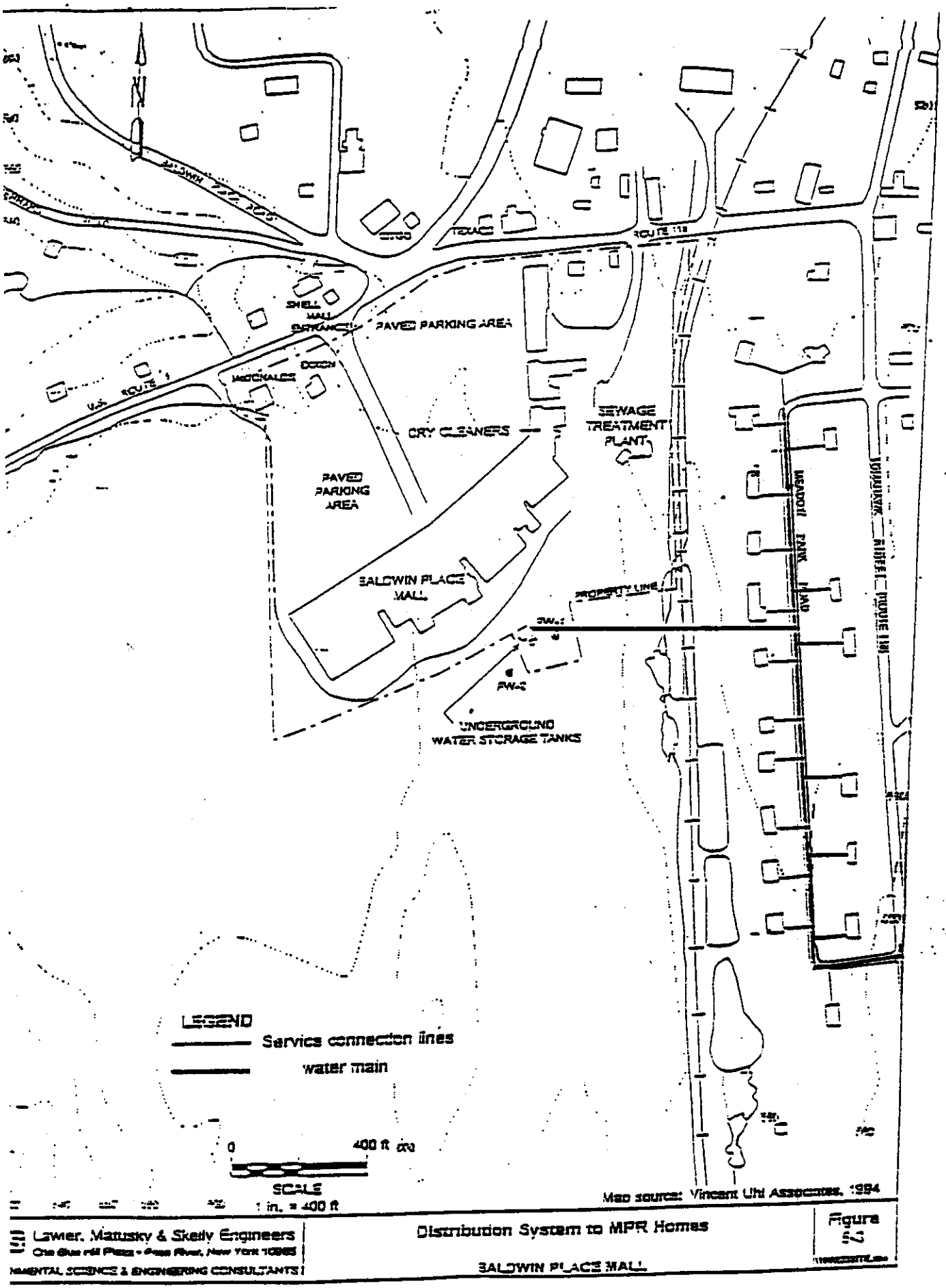

N
TEXACO
ROUTE 110
SHELL
PAVED PARKING AREA
MCDONALDS
DOCK
U.S. ROUTE 1
DRY CLEANERS
SEWAGE TREATMENT PLANT
PAVED PARKING AREA
MEADOW PARK ROAD
BALDWIN PLACE MALL
PROPERTY LINE
PW-1
PW-2
UNDERGROUND WATER STORAGE TANKS
LEGEND
Service connection lines
water main
0
400 ft
SCALE
1 in. = 400 ft
Map source: Vincent Uhl Associates, 1994
Lawler, Matusky & Skelly Engineers
Distribution System to MPR Homes
Figure
BALDWIN PLACE MALL

FIG. 5

SUMMARY OF SIGNIFICANT PCE CONCENTRATIONS

IN SOIL

LOCATION	DEPTH (FT.)	CONC. OF PCE (ppm)
TB-1	2-4	1,200
TB-1	6-8	4,500
TB-2	2-4	660
TB-8	6-6.5	410
TB-16	6-8	130
TB-16	10-10.7	500
TB-16	12-13	270
TB-16	14-15	1,300
TB-17	8-10	43

TABLE 1

MONITORING WELLS

WITH

SIGNIFICANT PCE CONCENTRATION

WELL #	CONCENTATION OF PCE (ppb)	DATE ANALYZED
MW-3S	7	5/18/93
MW-5S	300	5/18/93
MW-5D	910	5/18/93
MW-7S	30	5/20/93
MW-9S	850	5/19/93
MW-9D	300	5/20/93
MW-10D	37	5/20/93
MW-11S	24,000	12/22/93
MW-11D	3,200	12/22/93

TABLE 2

RESIDENTIAL & COMMERCIAL WELLS

WITH

SIGNIFICANT PRE-FILTER PCE CONCENTRATIONS

WELL #	CONCENTRATIONS OF PCE (ppb)
RW-05	42
RW-07	26
RW-08	30
RW-09	53
RW-10	17
RW-11	9
RW-15	13
RW-16	17
RW-17	16
CW-20	98
BPM-PW1	66
BPM-PW2	66

NOTE: Information extracted from May 1995 analytical results

TABLE 3

APPENDIX A

BIBLIOGRAPHY OF ADMINISTRATIVE RECORDS

BALDWIN PALCE SHOPPING CENTER

	Description of Report	Date	Prepared by:
•	Ground Water Investigation	May 1989	J. Robert Folchetti
•	Water Supply & Treatment Alternatives	Oct 1989	Malcolm Pirnie
•	Hazardous Waste Site Classification	Mar 1990	Malcolm Pirnie
•	Interim Site Characterization	Dec 1992	Vincent Uhl & Assoc.
•	Remedial Investigation (Vols. I to IV)	Aug 1994	Vincent Uhl & Assoc.
•	Source Area Delineation Program	Nov 1994	Vincent Uhl & Assoc.
•	Feasibility Study	Jun 1995	Lawler, Matusky & Skelly

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APPENDIX B

Responsiveness Summary

The New York State Department of Environmental Conservation (NYSDEC) held a public meeting on September 13, 1995 at the Somers Town Hall to discuss the Proposed Remedial Action Plan (PRAP) and to receive public comments. The meeting was held during the comment period, which began on August 18, 1995 and ended on September 27, 1995.

Present at the meeting were representatives from NYSDEC, the New York State Department of Health (NYSDOH), the Town of Somer's Supervisor, and the consultants to Big V Supermarkets, Lawler, Matusky and Skelly.

NYSDEC's responses to the questions raised at the meeting or received in writing are listed below. For clarity the questions and responses are grouped under topical headings, and may not be *ad verbatim* quotes.

Questions Regarding the Technical Aspects of the PRAP

Question #1: I am concerned that there is another source of contamination. Auto body shops use chemicals that are almost identical to those used by dry cleaners. Were soil samples taken from the north side of Route 118 near the auto body shop, or from the catch basin, or the drainage pipe leading onto the Big V site?

Response: The bulk of the soil sampling was done behind the dry cleaners. However, there were about six or seven soil borings done near Route 118 and others in front of the mall parking lot. There were some catch basin samples taken during the Remedial Investigation. The NYSDEC is, however, going to inspect the site with the questioner to determine the need for investigating other possible sources of the contamination.

Question #2: Do we have an estimate of when the contamination was first released into the soil? If you do not have an estimate, how can you project the time period needed to remedy the site?

Response: We do not have any record of when or over what period of time the contamination was actually released into the ground. However, it is not essential to know the timeframe of the contamination release to estimate the length of time required for cleanup. The time estimated to cleanup the site is based on factors such as the current distribution of contamination, groundwater usage in the area, flow of groundwater, and soil and bedrock characteristics.

Question #3: The treated water from the on-site contamination source recovery wells is to be discharged into the unnamed stream. Does this stream drain into Lake Shenorock?

Response: Yes

Question #4: What is the frequency of monitoring the discharge?

Response: The specifics of the discharge monitoring program, such as sampling frequency and effluent qualtiy will be decided during the design of the remedial action and will be based upon the provisions

governing the State Pollution Discharge Elimination Systems (SPDES).

Question #5: Since the unnamed stream flows into the Amawalk Reservoir, a New York City water supply source, will the city be notified?

Response: Yes

Question #6: Will the BPSC supply wells be treating the same contaminated groundwater that is now being treated by the individual point-of-use (POU) filters at the impacted homes?

Response: Yes.

Question #7: If the contamination plume were to spread to other homeowners' wells in the future, would the water distribution system be extended to these homes?

Response: Big V would be required to provide either a POU filter or extend the distribution system to the affected homes. The choice would largely depend on the location of the newly contaminated wells in relation to the distribution system and the associated cost of extending the distribution system or providing POU filters.

Question #8: After the remedy is implemented, will the bedrock aquifer remain polluted?

Response: The increased pumping rate at the BPSC wells and the operation of the deeper well at the source will remove a substantial mass of contamination in the bedrock. There will, however, be some contamination in the bedrock that will be out of reach of the remedial system. Once the source of contamination is removed, the concentration of contamination in groundwater is expected to decrease with time over the total area of the plume.

Question #9: Will the contamination continue to flow further to the south?

Response: Groundwater that is outside the influence of the BPSC supply wells and the source recovery wells will continue to follow its natural flow direction. This implies that a certain portion of the plume will continue to flow away from the site. The concentration, of contaminants is expected to decrease once the remedial system starts operating.

Question #10: What reason do you have to believe that it will decrease?

Response: It must be remembered that a considerable reduction in the mass of contamination will have already taken place because of removal of the contaminated soil, thus preventing further releases of contaminants. In the zone of influence of the remedial system, the source recovery and supply wells will draw in contaminated water for treatment. Over a period of time the mass of contamination will be reduced and, therefore, its concentration in the groundwater will be reduced as well.

The plume outside the zone of influence of the remedial system has a relatively smaller mass of contamination. The natural recharge and movement of the groundwater will reduce the concentration over a period of time.

Question #11: If the cleanup does not substantially meet the goal established during the design stage, will the DEC modify the remedial system?

Response: Yes

Question #12: Once Big V forms the water district that will be served from the Baldwin Place Mall (BPSC) wells, will the Town take over and run the system?

Response: That decision has not been made. The possibility of incorporating the BPSC wells into the Shenorock Water District, and using its personnel to operate the BPSC wells is being considered by the Town.

Questions regarding costs of the remedial system

Question #13: How much of the cost of the remedial system and its operation will have to be borne by the public?

Response: The public will not bear any of the costs associated with the remedial action. The costs of design and construction of the distribution system, its connection to the homes on MPR, the operation and maintenance of the BPSC wells and the two commercial filters along Route 118 will all be borne by Big V.

Question #14: If the BPSC wells are incorporated into the Shenorock Water District, will the impacted homeowners have to pay the water bills?

Response: No. The incorporation would be for the purpose of using the Shenorock Water wells personnel to operate the BPSC wells. Big V would continue to bear the costs of operation and maintenance.

Questions Regarding the Construction of the Town's Regional Water Supply System and the Redevelopment of the Mall

These topics are outside the purview of the remedial action. Questions raised on these topics at the meeting, and the responses provided to them by the Town's Supervisor and the NYSDEC are recorded here as information incidental to the ROD process

Question #15: How long will it take for the Water District #2 to be extended to Meadow Park Road (MPR)?

Response: The approval process can take one year to eighteen months, and the construction between six months to a year.

Question #16: Doesn't the State have the authority to order, as part of the PRAP, Big V Supermarket to connect the Town to this water system now?

Response: Extension of the Water District No.2 is planned to serve a larger area than is necessary for the remediation of the site and supply of potable water to the impacted homes. As such it is not a cost-effective remedy.

Question #17: Can the long term plans to extend a regional water district be sped up to accommodate the people in the area?

Response: The plans to expand Water District No.2 are being processed as fast as possible.

Question #18: If the State were to order the construction necessary to extend the regional water district on a permanent basis i.e. extend the Water District No. 2, would it expedite the process?

Response: No. State involvement would not make the process any quicker. Unfortunately setting up a water district extension is a lengthy process that requires numerous approvals. When you lay out the approvals from the State Comptroller and the County Board of Legislators, securing design and construction bonding, approvals of design by various authorities, and actual construction and hookup on a time line, you will note that two years is not a long time.

Question #19: Who pays for the extension of Water District No.2?

Response: All those who will be served by it. The Town will levy a tax on each homeowner in proportion to the homeowner's property value. It is the Town's concept that Big V will pay the share of cost that would otherwise have been levied on the MPR residents.

Question #20: Who will pay the water bill once Water District No.2 is extended and the impacted homes are hooked upto it?

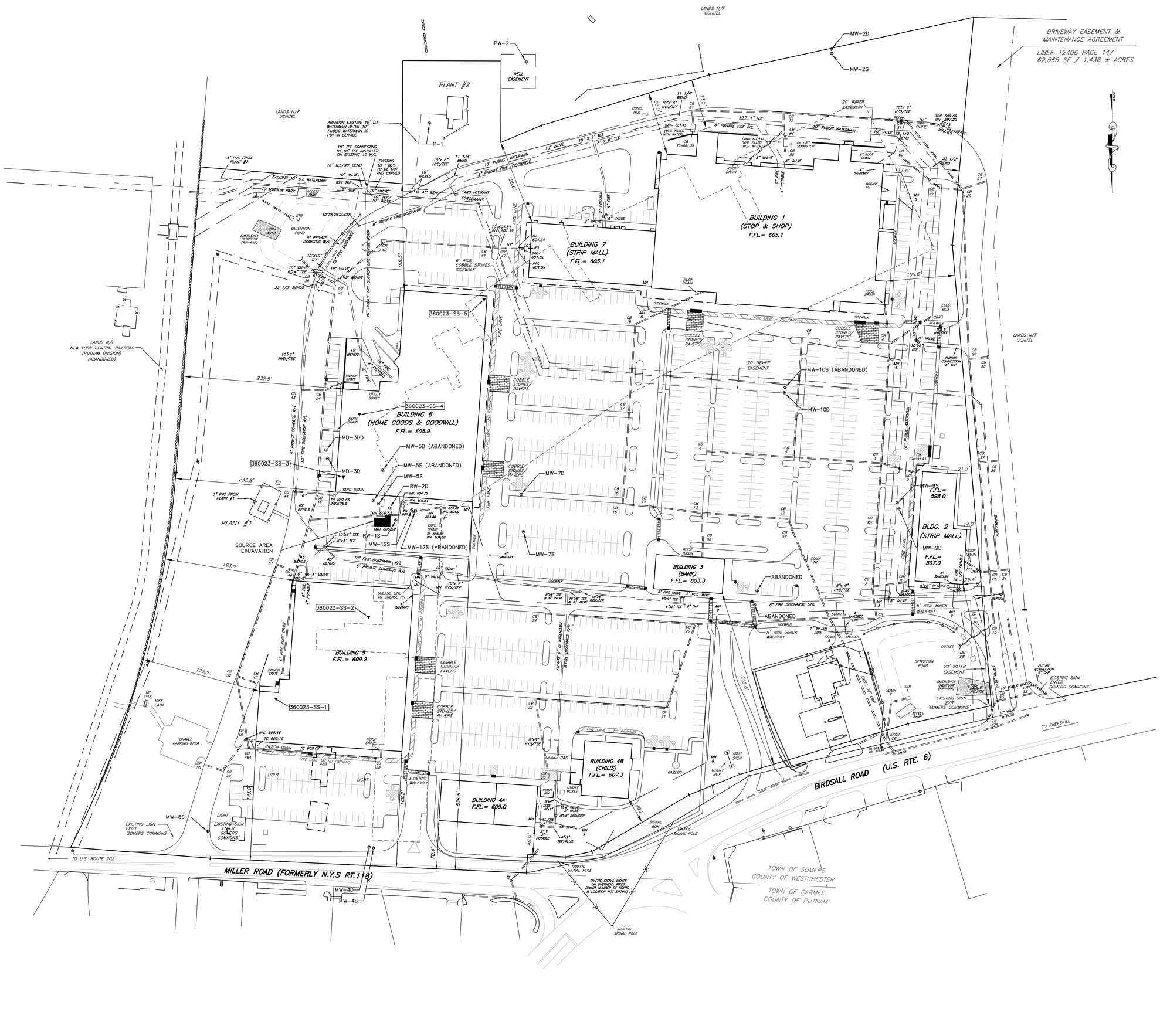
Response: At the September 13, 1995 public meeting, the Town Supervisor stated that it is the Town's position that the residents of Meadow Park Road will not have to pay for their water. The Town and Big V will have to settle the responsibility of paying water usage costs between themselves.

Question #21: Has anybody researched bringing in the water line from Yorktown?

Response: Yes. The reason why the decision was made to bring water from County District No.2 was because several other areas between Amawalk and Baldwin Place also require service. Bringing in waterline from Yorktown would not have been the most cost-effective solution.

Question #22: When is the mall going to be redeveloped? Is the State involved in this decision?

Response : The Town has decided that approval of the development of the Mall would be contingent upon the signing of the Record of Decision by the NYSDEC. The State has a minor role in the overall approval of the plans to develop the Mall, except to ensure that the development is scheduled and designed so as not to adversely affect the remedial action.



HDR

Henningson, Durham & Richardson, Architecture and Engineering, P.C. In Association with HDR Engineering, Inc.

LEGEND:

360023-SS-2 — LOCATION OF SUB-SLAB VAPOR PROBE

MW-12S — MONITORING WELL

ORIGINAL SHOPPING CENTER FOOTPRINT

Notes:

Existing site plan information is based on a survey and CAD file drawing dated April 18, 2007 provided by Eustance & Horowitz P.C. The footprint of the former shopping center building is digitized from a print of "Site Survey" (October 20, 1986), superimposed upon the Eustance & Horowitz P.C. site plan; because of paper stretch and possible change of scale for the 1986 print, the position of the former building is approximate.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
BALDWIN PLACE MALL
NYSDEC SITE NO. 36-0023
SOMERS, NEW YORK

ISSUE	DATE	DESCRIPTION
–	–	–

PROJECT NUMBER: 39762
PROJECT MANAGER: S. B.
DRAWN BY: W. P. S.

0 25' 50' 100'

SIGNATURE DATE

WARNING: It is a violation of the New York State Education Law for any person unless acting under the direction of a licensed professional engineer, to alter any item on these plans in any way. If alterations to these plans are made, the alterations shall be made in accordance with 145-subsection 7209 of the New York State Education Law.

BASE MAP

SCALE: 1" = 50'

-

FILENAME: –

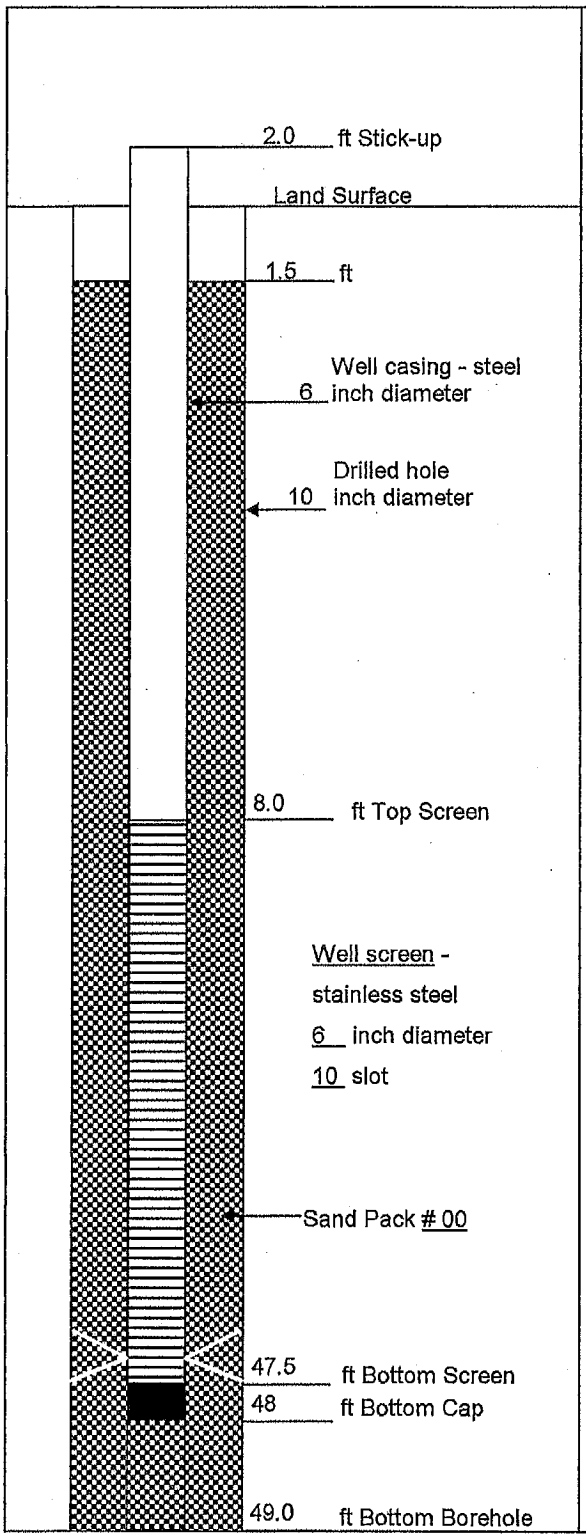
C:\PWworking\PRTT\dms7780401\C-101.dwg, Layout: 1, 5/14/2008 - 11:16:33 PM, ANSI E (1:1)

APPENDIX D

WELL CONSTRUCTION

WELL CONSTRUCTION LOG

RW-1S
Baldwin Place Mall



Project: Baldwin Place Mall Well: RW-1S

Town: Baldwin Place

County: Westchester, NY

Permit No.:

Land Surface Elevation and Datum:

_____ feet (amsl) ☐ Surveyed

☐ Estimated

Installation Dates: Dec 17-18, 1997

Drilling Method: DTH

Drilling Contractor: S. Stothoff

Drilling Fluid: air

Development Technique: submersible pump

Development Date: Dec 18,19,23, 1997

Fluid Loss During Drilling:

Water Removed During Development: 600 gal

Static Depth to Water: 6 ft bgs

Pumping Depth to Water:

Pumping Duration: total of 5 hrs

Yield: 1 gpm

Specific Capacity:

Well Purpose: Recovery

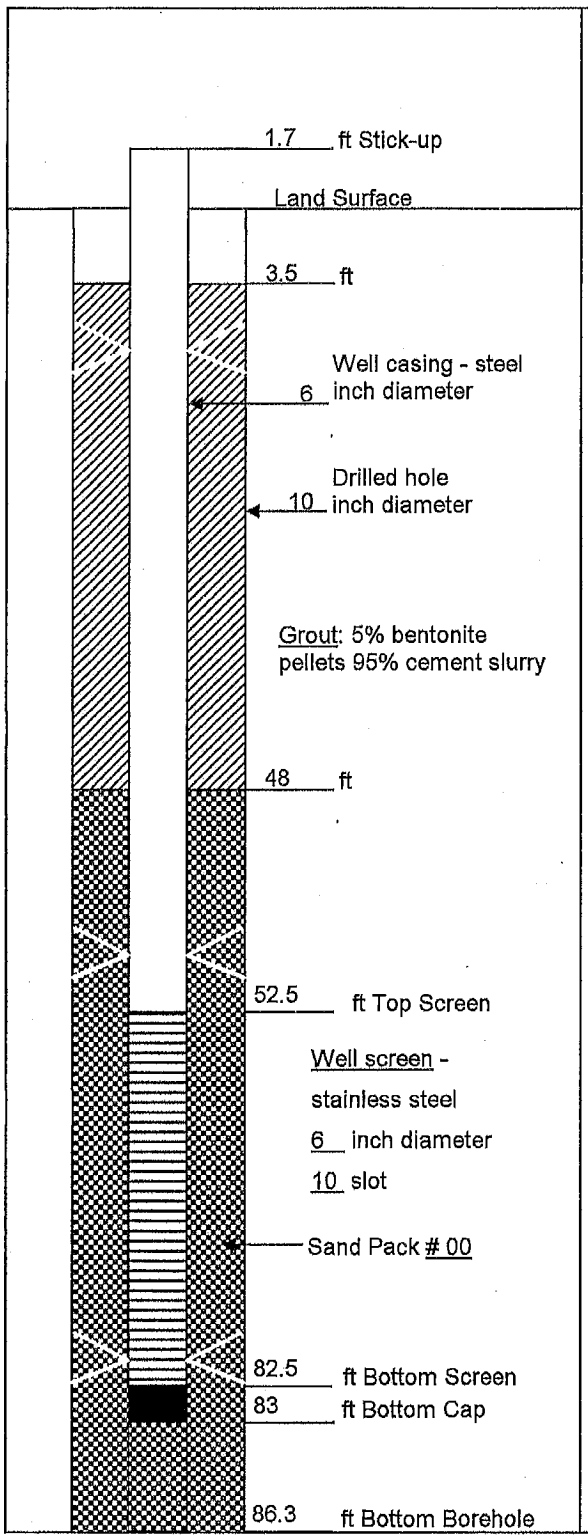
Remarks: split spoons at 10, 15, 25, 35, 45;
30 bags of Morie #00 sand poured through a
1 inch tremie line

Prepared By: EK

VINCENT UHL ASSOCIATES

WELL CONSTRUCTION LOG

RW-2D
Baldwin Place Mall



Project: Baldwin Place Mall Well: RW-2D

Town: Baldwin Place

County: Westchester, NY

Permit No.:

Land Surface Elevation and Datum:

_____ feet (amsl) ☐ Surveyed

☐ Estimated

Installation Dates: Dec 16-22, 1997

Drilling Method: DTH

Drilling Contractor: S. Stothoff

Drilling Fluid: air

Development Technique: submersible pump

Development Date: Dec 22-23, 1997

Fluid Loss During Drilling:

Water Removed During Development: 250 gal

Static Depth to Water: 8 ft bgs

Pumping Depth to Water:

Pumping Duration: total of 2 hrs

Yield: 1 gpm

Specific Capacity:

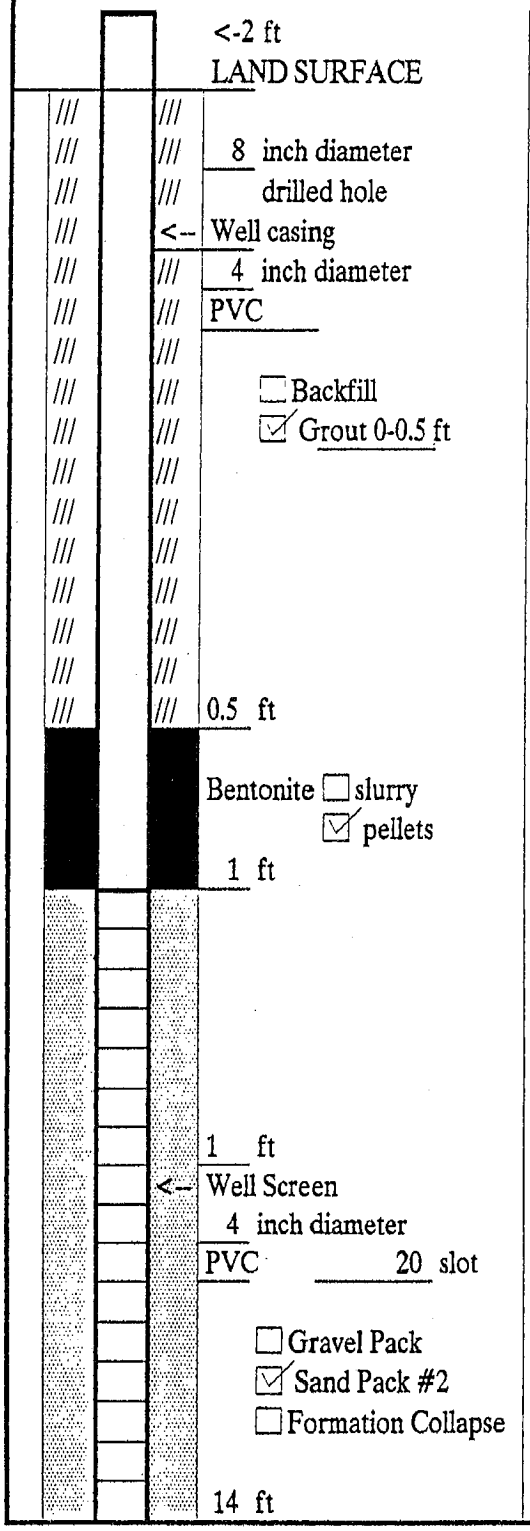
Well Purpose: Recovery

Remarks: Top 40 ft drilled with 12 inch hammer, rest to the bottom with 10 inch; used ~20 bags of sand, 28 bags cement, 144 lb bentonite; sand placed through a 1" tremie pipe; split spoons at 27, 40, 50, 60, 81 ft

Prepared By: EK

VINCENT UHL ASSOCIATES

UNCONSOLIDATED WELL CONSTRUCTION LOG



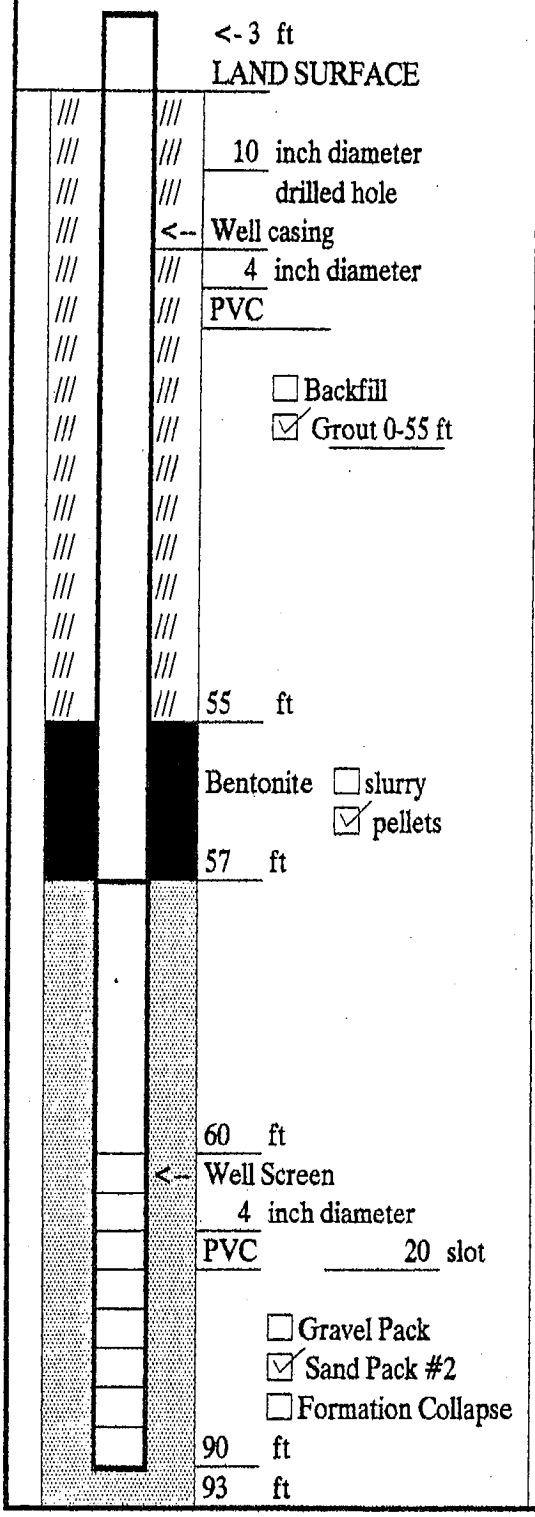
Project	BIG V/BPM	Well	MW-2S
Town/City	Baldwin Place		
County	Westchester	State	NY
Permit No.	N/A		
Land-Surface Elevation and Datum	601.53 feet (amsl)	☑ Surveyed ☐ Estimated	
Installation Dates:	July 29, 1992		
Drilling Method:	Air Hammer		
Drilling Contractor:	Samuel Stothoff		
Drilling Fluid:	Air		
Development Technique and Date:	Submersible pump and hand bailing. 8-12-92		
Fluid Loss During Drilling:	N/A		
Water Removed During Development:	20 Gallons		
Static Depth to Water:	3.67 ft. bmp		
Pumping Depth to Water:	10.85 ft. bmp		
Pumping Duration:	8 Minutes		
Yield:	1 gpm		
Specific Capacity:	0.13 gpm/ft.		
Well Purpose:	Monitoring Groundwater Quality		

Remarks:
amsl = above mean sea level
bmp = below measuring point (top of 4-inch diameter PVC casing)
gpm = gallons per minute

*Note: 8-inch diameter protective steel casing installed.

Prepared By: KJM

UNCONSOLIDATED WELL CONSTRUCTION LOG



Project	BIG V/BPM	Well	MW-2D
Town/City	Baldwin Place		
County	Westchester	State	NY
Permit No.	N/A		
Land-Surface Elevation and Datum	601.66 feet (amsl)	☑ Surveyed ☐ Estimated	

Installation Dates:	July 27-29, 1992
Drilling Method:	Air Hammer
Drilling Contractor:	Samuel Stothoff
Drilling Fluid:	Air
Development Technique and Date:	Submersible pump 8-7-92
Fluid Loss During Drilling:	N/A
Water Removed During Development:	870 Gallons
Static Depth to Water:	13.69 ft. bmp
Pumping Depth to Water:	55.79 ft. bmp
Pumping Duration:	87 Minutes
Yield:	10 gpm
Specific Capacity:	0.24 gpm/ft.
Well Purpose:	Monitoring Groundwater Quality

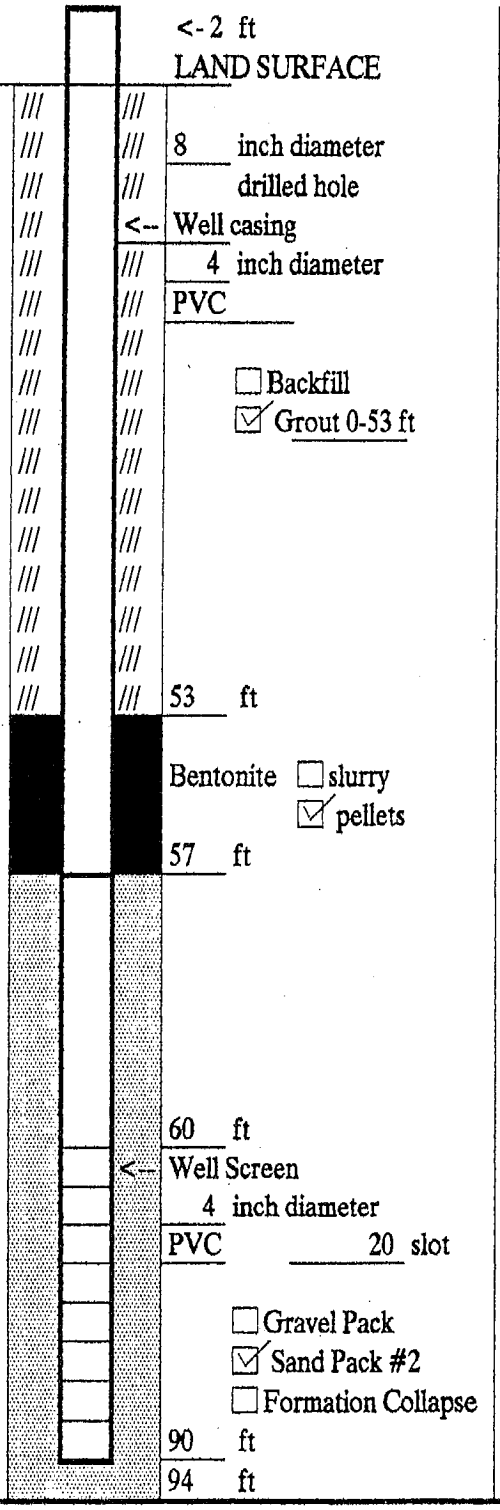
Remarks:
amsl = above mean sea level
bmp = below measuring point (top of 4-inch diameter PVC casing)
gpm = gallons per minute

*Note: 8-inch diameter protective steel casing installed.

Prepared By: KJM

VINCENT UHL ASSOCIATES

UNCONSOLIDATED WELL CONSTRUCTION LOG



Project	BIG V/BPM	Well	MW-3D
Town/City	Baldwin Place		
County	Westchester	State	NY
Permit No.	N/A		
Land-Surface Elevation and Datum	602.25 feet (amsl)	☑ Surveyed ☐ Estimated	

Installation Dates:	August 11, 1992
Drilling Method:	Air Hammer
Drilling Contractor:	Samuel Stothoff
Drilling Fluid:	Air
Development Technique and Date:	Submersible pump 8-15-92
Fluid Loss During Drilling:	N/A
Water Removed During Development:	120 Gallons
Static Depth to Water:	12.59 ft. bmp
Pumping Depth to Water:	84.00 ft. bmp
Pumping Duration:	40 Minutes
Yield:	3 gpm
Specific Capacity:	0.04 gpm/ft.
Well Purpose:	Monitoring Groundwater Quality

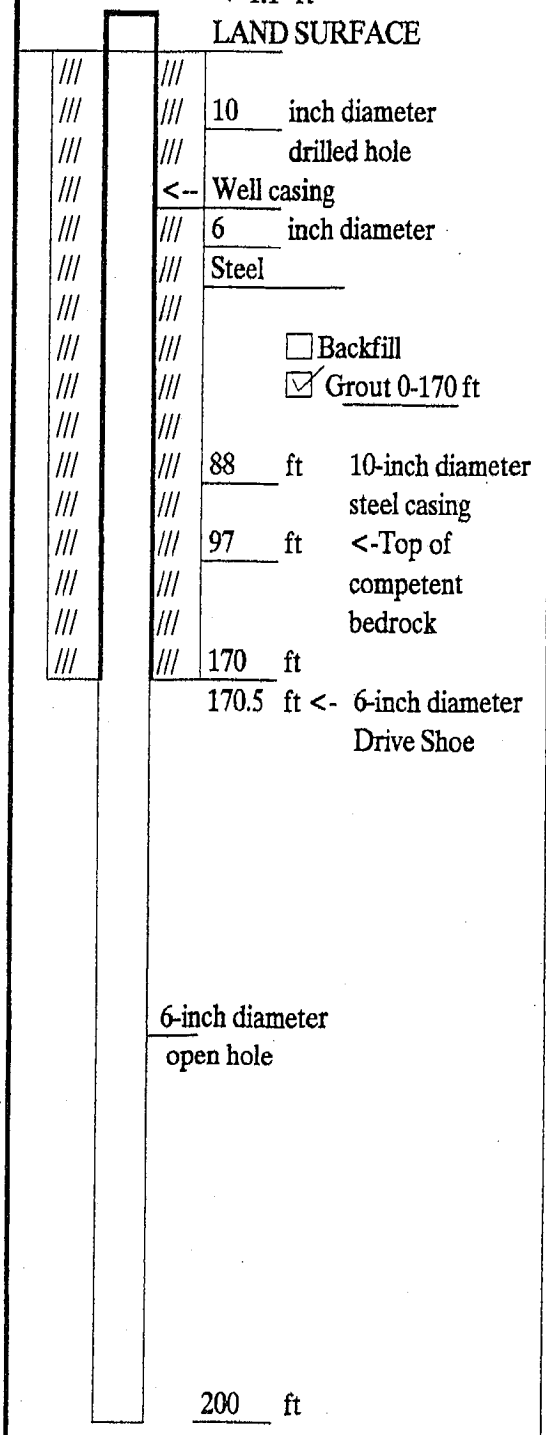
Remarks: amsl = above mean sea level
bmp = below measuring point (top of 4-inch diameter PVC casing)
gpm = gallons per minute

*Note: 8-inch diameter protective steel casing installed.

Prepared By: KJM

VINCENT UHL ASSOCIATES

BEDROCK WELL CONSTRUCTION LOG



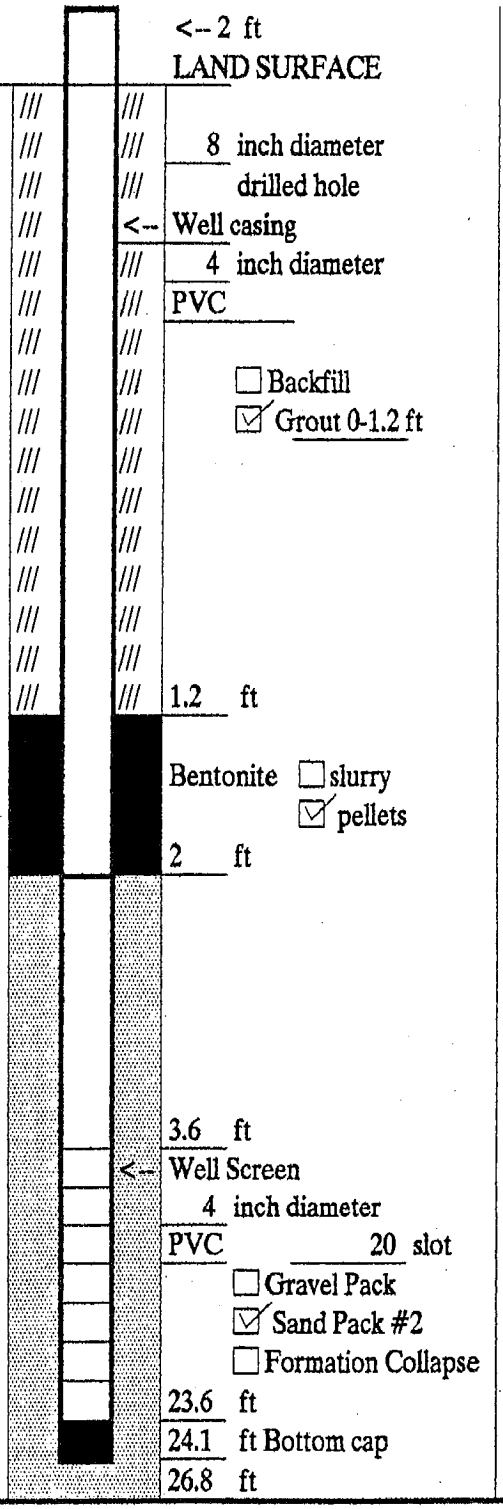
Project:	BIG V/BPM	Well:	MW-3DD
Town/City:	Baldwin Place		
County:	Westchester	State:	NY
Permit No.:	N/A		
Land-Surface Elevation:		☑ Surveyed	
and Datum	602.22 feet (amsl)	☐ Estimated	
Installation Dates	August 6-7 and 10-13, 1992		
Drilling Method:	Air Hammer		
Drilling Contractor:	Samuel Stothoff		
Drilling Fluid:	Air		
Development Technique and Date:		Air lift 8-14-92	
Fluid Loss During Drilling:		N/A	
Water Removed During Development:		14 Gallons	
Static Depth to Water:		NM	
Pumping Depth to Water:		NM	
Pumping Duration:		140 Minutes	
Yield:		0.10 gpm	
Specific Capacity:		NM	
Well Purpose:		Monitoring Groundwater Quality	

Remarks: amsl = above mean sea level
NM = not measured
gpm = gallons per minute

Prepared by: KJM

VINCENT UHL ASSOCIATES

UNCONSOLIDATED WELL CONSTRUCTION LOG



<-- 2 ft
LAND SURFACE

8 inch diameter
drilled hole
<-- Well casing
4 inch diameter
PVC

☐ Backfill
☑ Grout 0-1.2 ft

1.2 ft

Bentonite ☐ slurry
☑ pellets
2 ft

3.6 ft
<-- Well Screen
4 inch diameter
PVC 20 slot
☐ Gravel Pack
☑ Sand Pack #2
☐ Formation Collapse
23.6 ft
24.1 ft Bottom cap
26.8 ft

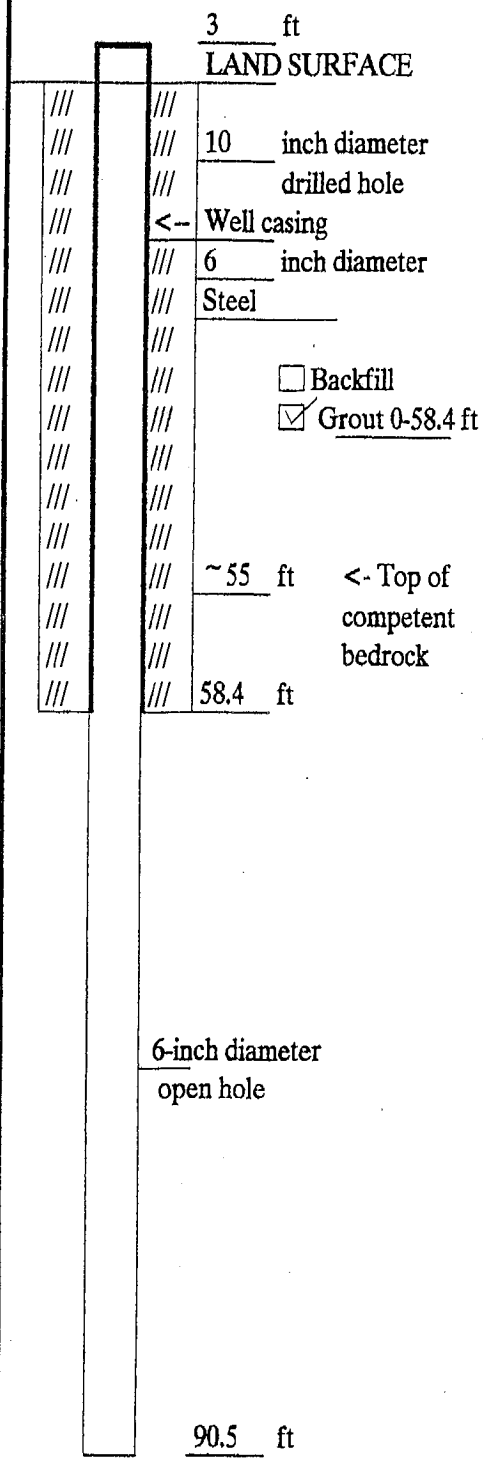
Project	BIG V/BPM	Well	MW-4S
Town/City	Baldwin Place		
County	Westchester	State	NY
Permit No.	N/A		
Land-Surface Elevation and Datum	609.68 feet (amsl)	☑ Surveyed ☐ Estimated	
Installation Dates:	August 5, 1992		
Drilling Method:	Air Hammer		
Drilling Contractor:	Samuel Stothoff		
Drilling Fluid:	Air		
Development Technique and Date:	Submersible pump and hand bailing. 08-12-92		
Fluid Loss During Drilling:	N/A		
Water Removed During Development:	57 Gallons		
Static Depth to Water:	7.35 ft. bmp		
Pumping Depth to Water:	22.35 ft. bmp		
Pumping Duration:	25 Minutes		
Yield:	2.3 GPM		
Specific Capacity:	0.14 gpm/ft.		
Well Purpose:	Monitoring Groundwater Quality		

Remarks:
amsl = above mean sea level
bmp = below measuring point (top of 4-inch PVC casing)
gpm = gallons per minute

*Note: 8-inch diameter protective steel casing installed.

Prepared By: KJM

BEDROCK WELL CONSTRUCTION LOG



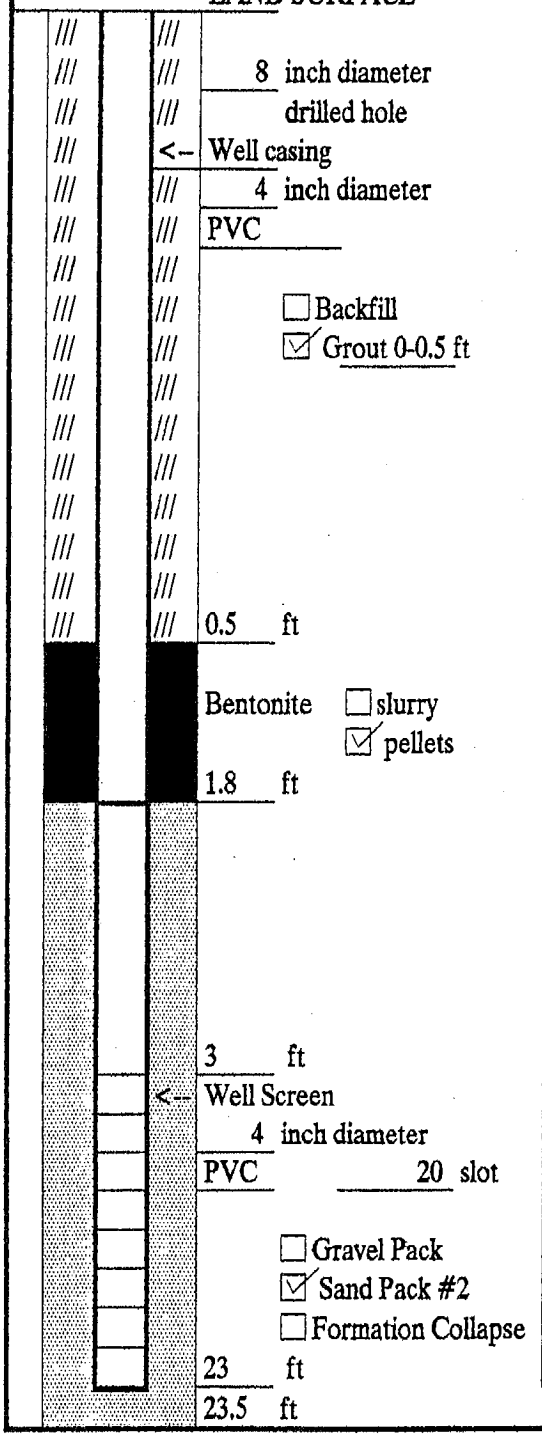
Project:	BIG V/BPM	Well:	MW-4D
Town/City:	Baldwin Place		
County:	Westchester	State:	NY
Permit No.:	N/A		
Land-Surface Elevation:		☑ Surveyed	
and Datum	609.72 feet (amsl)	☐ Estimated	
Installation Dates	August 3-4, 1992		
Drilling Method:	Air Hammer		
Drilling Contractor:	Samuel Stothoff		
Drilling Fluid:	Air		
Development Technique and Date:	Submersible pump 8-12-92		
Fluid Loss During Drilling:	N/A		
Water Removed During Development:	550 Gallons		
Static Depth to Water:	9.42 ft. bmp		
Pumping Depth to Water:	60.97 ft. bmp		
Pumping Duration:	55 Minutes		
Yield:	10 gpm		
Specific Capacity:	0.19 gpm/ft.		
Well Purpose:	Monitoring Groundwater Quality		

Remarks: amsl = above mean sea level
bmp = below measuring point (top of 6-inch diameter steel casing)
gpm = gallons per minute

Prepared by: KJM

VINCENT UHL ASSOCIATES

UNCONSOLIDATED WELL CONSTRUCTION LOG



Project	BIG V/BPM	Well	MW-5S
Town/City	Baldwin Place		
County	Westchester	State	NY
Permit No.	N/A		
Land-Surface Elevation and Datum	603.36 feet (amsl)	☑ Surveyed ☐ Estimated	

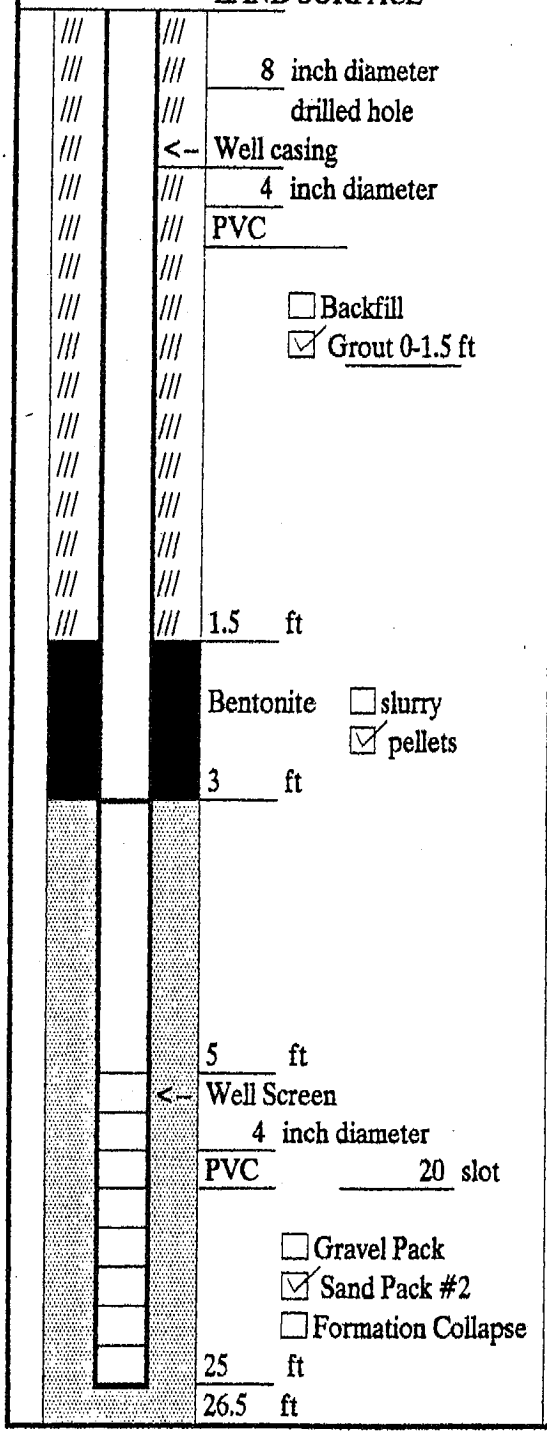
Installation Dates:	August 5, 1992
Drilling Method:	Air Hammer
Drilling Contractor:	Samuel Stothoff
Drilling Fluid:	Air
Development Technique and Date:	Submersible pump 8-15-92
Fluid Loss During Drilling:	N/A
Water Removed During Development:	240 Gallons
Static Depth to Water:	2.31 ft. bmp
Pumping Depth to Water:	21.17 ft. bmp
Pumping Duration:	60 Minutes
Yield:	4 gpm
Specific Capacity:	0.212 gpm/ft.
Well Purpose:	Monitoring Groundwater Quality

Remarks: amsl = above mean sea level
bmp = below measuring point (top of 4-inch diameter PVC casing)
gpm = gallons per minute

*Note: Flush mount cover installed.

Prepared By: KJM

UNCONSOLIDATED WELL CONSTRUCTION LOG



Project	BIG V/BPM	Well	MW-7S
Town/City	Baldwin Place		
County	Westchester	State	NY
Permit No.	N/A		
Land-Surface Elevation and Datum	602.07 feet (amsl)	☑ Surveyed ☐ Estimated	

Installation Dates:	August 4 and 5, 1992
Drilling Method:	Air Hammer
Drilling Contractor:	Samuel Stothoff
Drilling Fluid:	Air
Development Technique and Date:	Submersible pump 8-12-92
Fluid Loss During Drilling:	N/A
Water Removed During Development:	165 Gallons
Static Depth to Water:	7.35 ft. bmp
Pumping Depth to Water:	22.40 ft. bmp
Pumping Duration:	75 Minutes
Yield:	2.20 gpm
Specific Capacity:	0.14 gpm/ft.
Well Purpose:	Monitoring Groundwater Quality

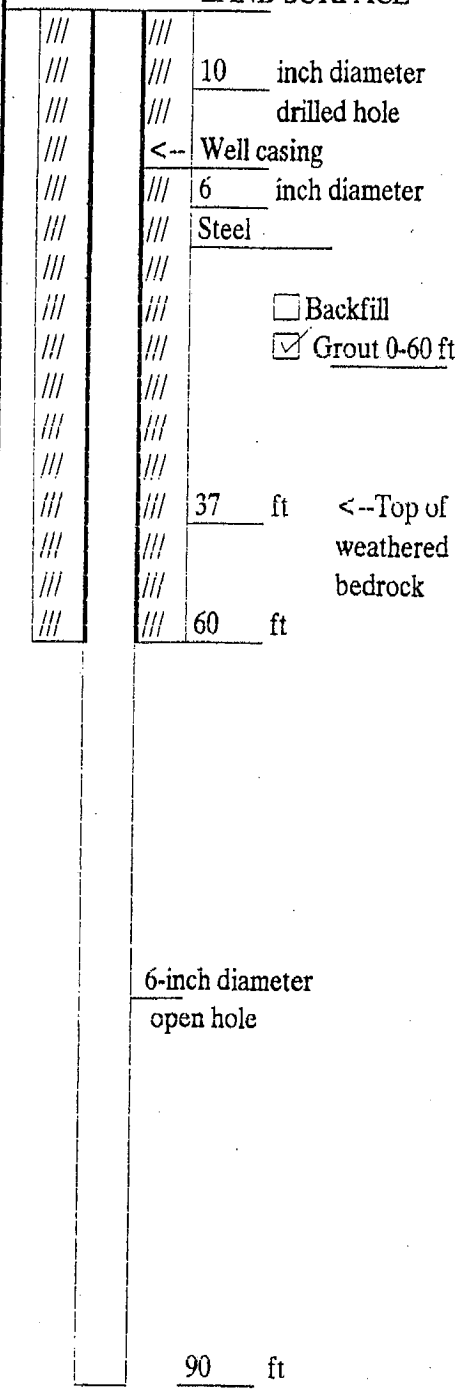
Remarks: amsl = above mean sea level
bmp = below measuring point (top of 4-inch diameter PVC casing)
gpm = gallons per minute

*Note: Flush mount cover installed.

Prepared By: KJM

VINCENT UHL ASSOCIATES

BEDROCK WELL CONSTRUCTION LOG



Project: BIG V/BPM Well: MW-7D
Town/City: Baldwin Place
County: Westchester State: NY
Permit No.: N/A
Land-Surface Elevation: ☑ Surveyed
and Datum 602.18 feet (amsl) ☐ Estimated

Installation Dates: April 12 and April 13, 1993
Drilling Method: Air Hammer
Drilling Contractor: Samuel Stothoff
Drilling Fluid: Air

Development Technique and Date: Submersible pump 4-27-93

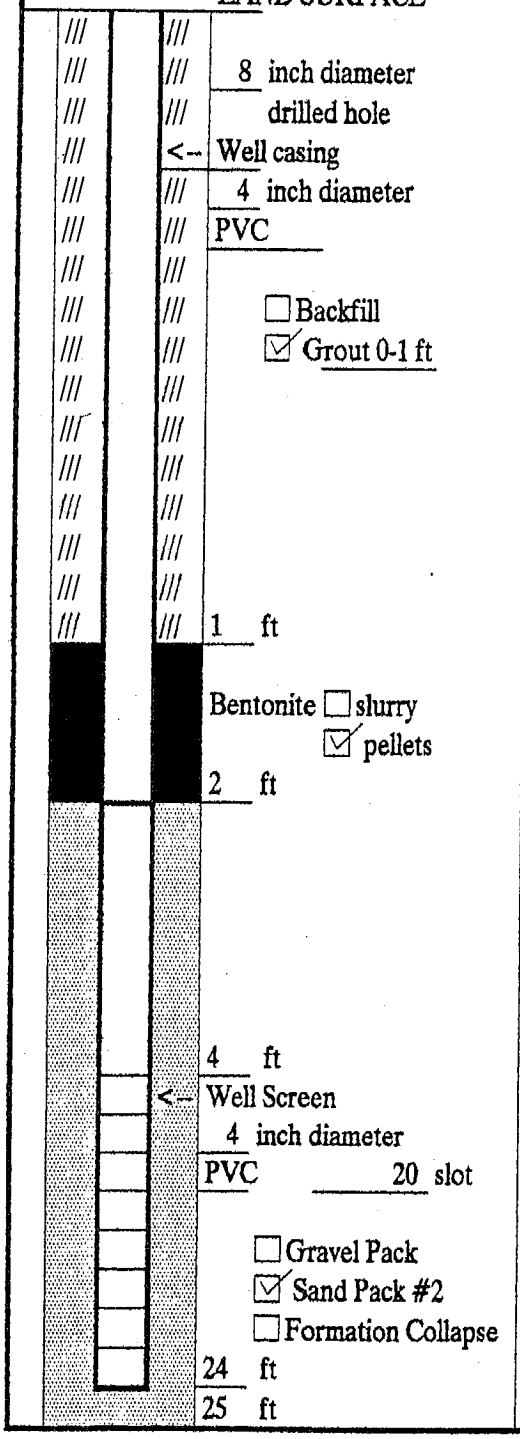
Fluid Loss During Drilling: N/A
Water Removed During Development: 65 Gallons
Static Depth to Water: 5.75 ft. bmp
Pumping Depth to Water: 41.88 ft. bmp
Pumping Duration: 62 Minutes
Average Yield: 1 gpm
Specific Capacity: 0.028 gpm/ft.
Well Purpose: Monitoring Groundwater Quality

Remarks: amsl = above mean sea level
bmp = below measuring point (top of 6-inch diameter steel casing)
gpm = gallons per minute

*Note: Flush mount cover installed.

Prepared by: KJM

UNCONSOLIDATED WELL CONSTRUCTION LOG



Project	BIG V/BPM	Well	MW-8S
Town/City	Baldwin Place		
County	Westchester	State	NY
Permit No.	N/A		
Land-Surface Elevation and Datum	618.28 feet (amsl)	☑ Surveyed ☐ Estimated	

Installation Dates:	August 4, 1992
Drilling Method:	Air Hammer
Drilling Contractor:	Samuel Stothoff
Drilling Fluid:	Air
Development Technique and Date:	Hand bailed 8-13-92 and 8-15-92
Fluid Loss During Drilling:	N/A
Water Removed During Development:	45 Gallons
Static Depth to Water:	6.00 ft. bmp
Pumping Depth to Water:	N/A
Devlopment Duration:	55 Minutes
Yield:	N/A
Specific Capacity:	NM
Well Purpose:	Monitoring Groundwater Quality

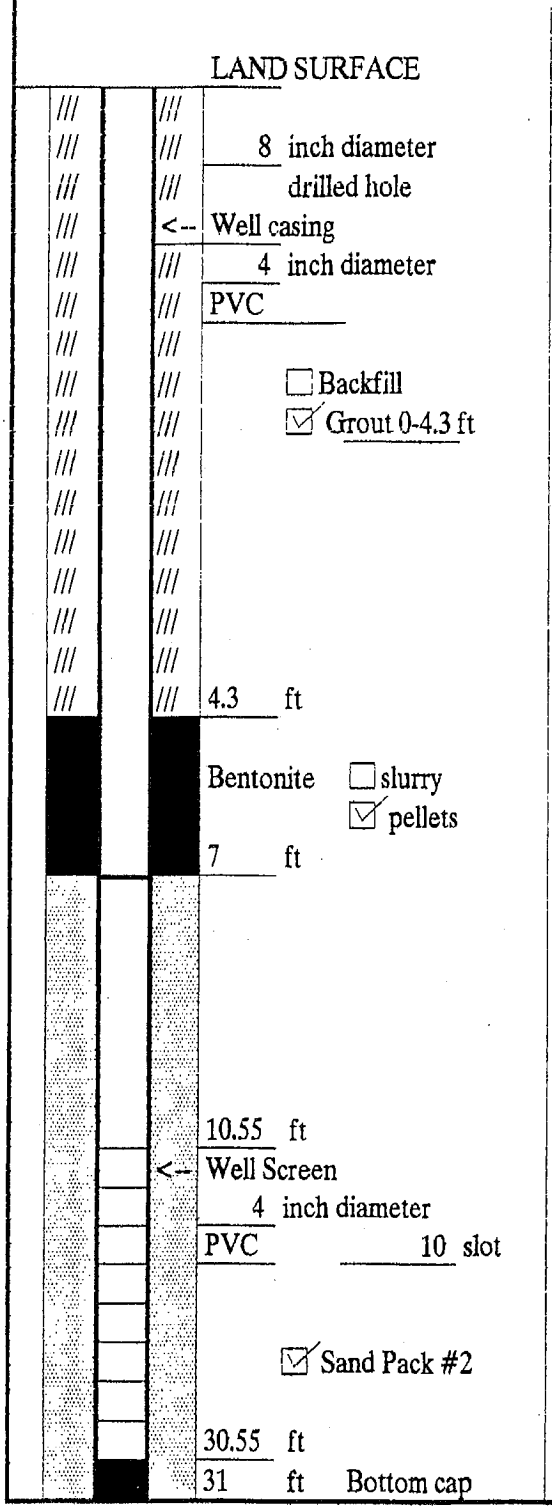
Remarks: amsl = above mean sea level
bmp = below measuring point (top of 4-inch diameter PVC casing)
NM = not measured

*Note: Flush mount cover installed.

Prepared By: KJM

VINCENT UHL ASSOCIATES

UNCONSOLIDATED WELL CONSTRUCTION LOG



Project	BIG V/BPM	Well	MW-9S
Town/City	Baldwin Place		
County	Westchester	State	NY
Permit No.	N/A		
Land-Surface Elevation and Datum	596.21 feet (amsl)	☑ Surveyed ☐ Estimated	

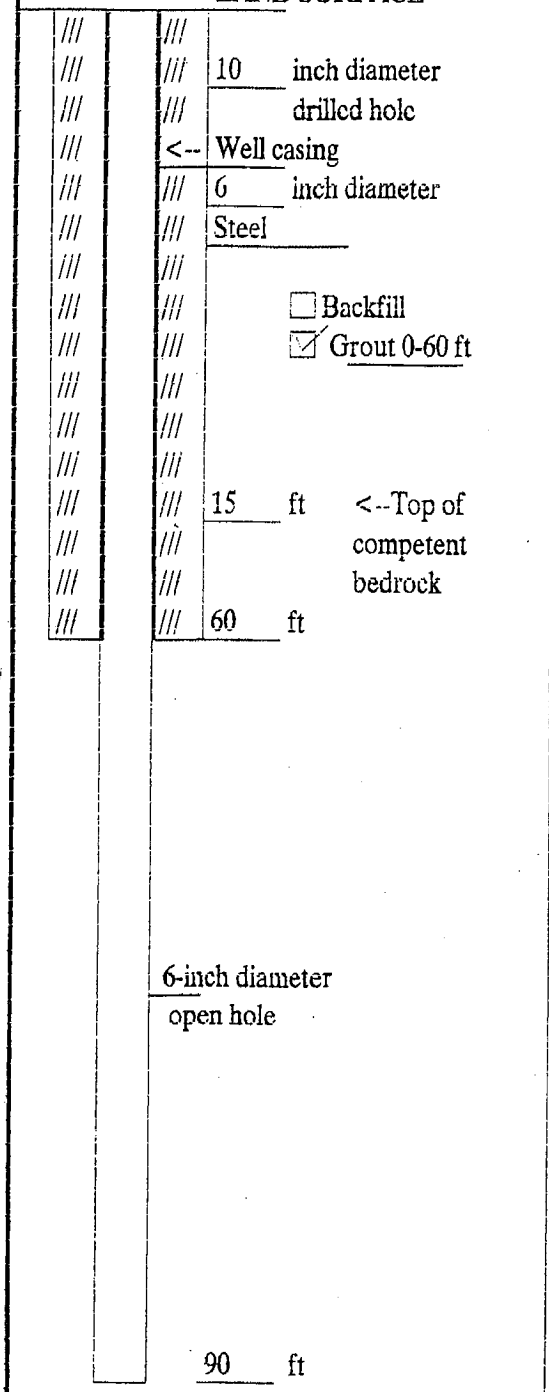
Installation Dates:	April 21, 1993
Drilling Method:	Air Hammer
Drilling Contractor:	Samuel Stothoff
Drilling Fluid:	Air
Development Technique and Date:	Submersible pump 4-27-93
Fluid Loss During Drilling:	N/A
Water Removed During Development:	323 Gallons
Static Depth to Water:	3.86 ft. bmp
Pumping Depth to Water:	9.53 ft. bmp
Pumping Duration:	52 Minutes
Average Yield:	6.6 gpm
Specific Capacity:	1.16 gpm/ft.
Well Purpose:	Monitoring Groundwater Quality

Remarks: amsl = above mean sea level
bmp = below measuring point (top of 4-inch diameter PVC casing)
gpm = gallons per minute

*Notes: Flush mount cover installed.
Ten-inch diameter drilled hole to 14 feet below land surface.

Prepared By: KJM

BEDROCK WELL CONSTRUCTION LOG



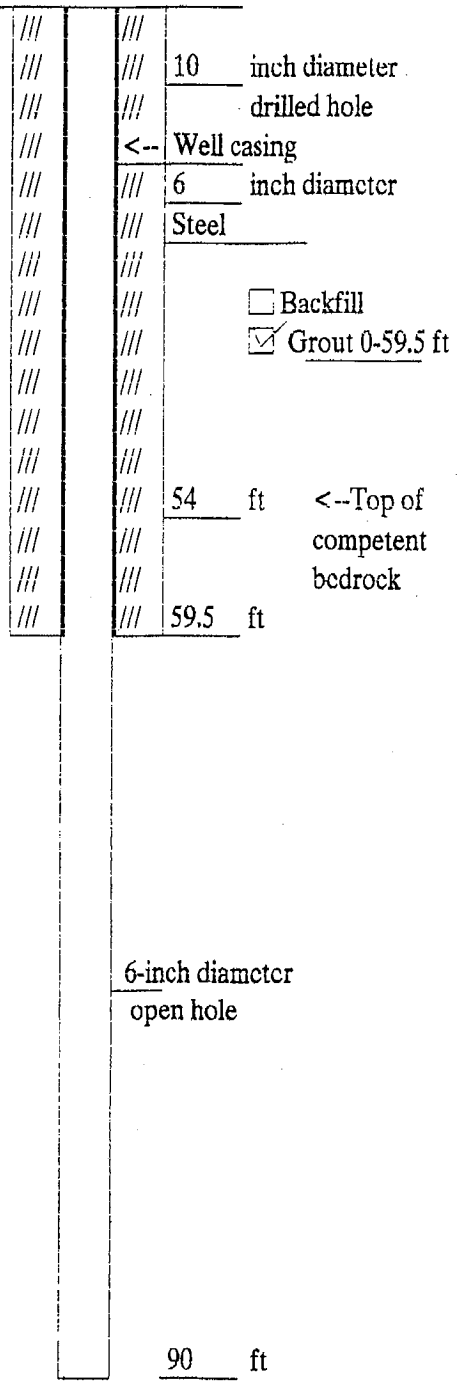
Project:	BIG V/BPM	Well:	MW-9D
Town/City:	Baldwin Place		
County:	Westchester	State:	NY
Permit No.:	N/A		
Land-Surface Elevation:		☑ Surveyed	
and Datum	595.99 feet (amsl)	☐ Estimated	
Installation Dates	April 19 and April 20, 1993		
Drilling Method:	Air Hammer		
Drilling Contractor:	Samuel Stothoff		
Drilling Fluid:	Air		
Development Technique and Date:	Submersible pump 4-26-93		
Fluid Loss During Drilling:	N/A		
Water Removed During Development:	90 Gallons		
Static Depth to Water:	3.08 ft. bmp		
Pumping Depth to Water:	81.26 ft. bmp		
Pumping Duration:	45 Minutes		
Yield:	2 gpm		
Specific Capacity:	0.026 gpm/ft.		
Well Purpose:	Monitoring Groundwater Quality		

Remarks: amsl = above mean sea level
bmp = below measuring point (top of 6-inch diameter steel casing)
gpm = gallons per minute

*Note: Flush mount cover installed.

Prepared by: KJM

BEDROCK WELL CONSTRUCTION LOG



Project: BIG V/BPM Well: MW-10D

Town/City: Baldwin Place

County: Westchester State: NY

Permit No.: N/A

Land-Surface Elevation: ☑ Surveyed

and Datum 600.52 feet (amsl) ☐ Estimated

Installation Dates	April 20 to April 22, 1993
Drilling Method:	Air Hammer
Drilling Contractor:	Samuel Stothoff
Drilling Fluid:	Air
Development Technique and Date:	Submersible pump 4-27-93
Fluid Loss During Drilling:	N/A
Water Removed During Development:	255 Gallons
Static Depth to Water:	8.12 ft. bmp
Pumping Depth to Water:	65.00 ft. bmp
Pumping Duration:	62 Minutes
Average Yield:	5 gpm
Specific Capacity:	0.088 gpm/ft.
Well Purpose:	Monitoring Groundwater Quality

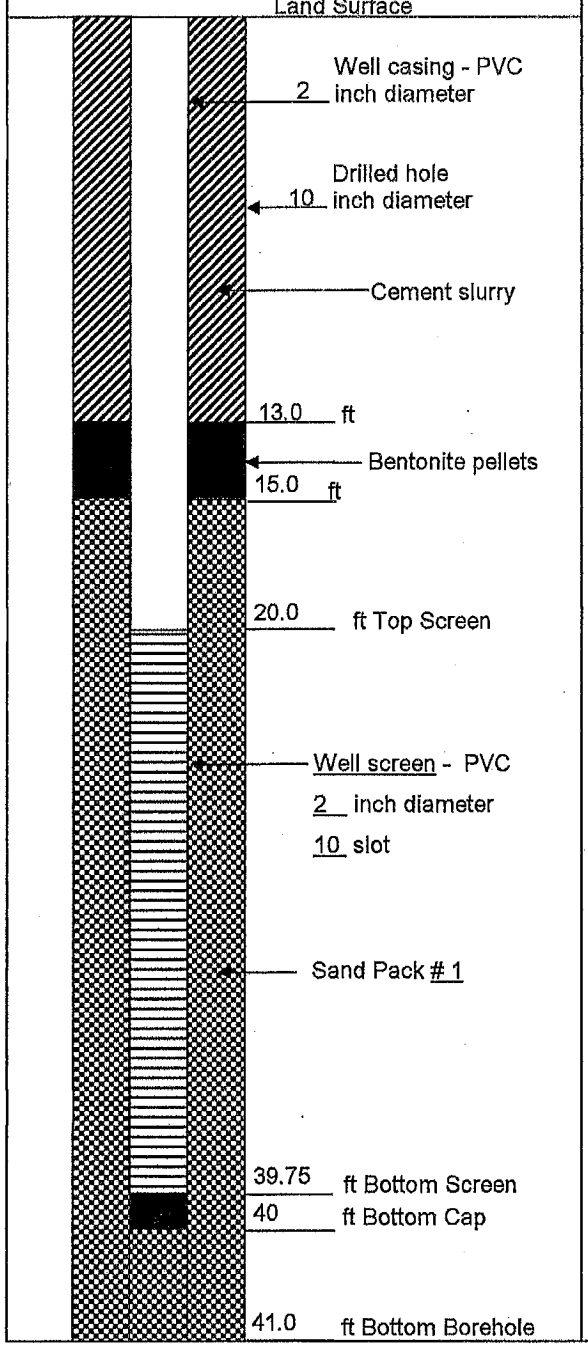
Remarks: amsl = above mean sea level
bmp = below measuring point
(top of 6-inch diameter steel casing)
gpm = gallons per minute

*Note: Flush mount cover installed.

Prepared by: KJM

WELL CONSTRUCTION LOG

MW-12S
Baldwin Place Mall



Project: Baldwin Place Mall Well: MW-12S

Town: Baldwin Place

County: Westchester, NY

Permit No.:

Land Surface Elevation and Datum:

_____ feet (amsl) ☐ Surveyed

☐ Estimated

Installation Dates: Dec 22-23, 1997

Drilling Method: DTH

Drilling Contractor: S. Stothoff

Drilling Fluid: air

Development Technique: bailing

Development Date: Dec 23, 1997

Fluid Loss During Drilling:

Water Removed During Development: 20 gal

Static Depth to Water:

Pumping Depth to Water:

Pumping Duration:

Yield:

Specific Capacity:

Well Purpose: Monitoring

Remarks: split spoons at 5, 15, 25, 35.5; because of boulders used 10 inch bit instead of 6 inch; sand placed though 1" tremie line, #1 sand up to 16.5 ft, then #00 sand up to 15 ft

Prepared By: EK

VINCENT UHL ASSOCIATES

WELL CONSTRUCTION DIAGRAM
BALDWIN PLACE SHOPPING CENTER
SOMERS, NY

LOCATION ID: MW-7 WELLS
MW-7M2 & MW-7M1

Project Name:	BALDWIN PLACE SHOPPING CENTER		
Project Location:	SOMERS, NY		
Project Number:	3617137308	Task Number	.05
Subcontractor:	ADT	Drilling Method:	SONIC
Development Method:	PUMP & SURGE	Development Date:	6-5-15
Bucking Posts/Ballards:	N/A		

Notes: '6" CASING USED TO BEDROCK: 4" CASING USED IN BEDROCK
• TILL EXTENDS FROM -1' TO -27'
• WEATHERED BEDROCK FROM -27' TO -40.5': BEDROCK @ 40.5'

Date Started: 6-1-15 Date Completed: 6-2-15
Logged By: T. Longley
Checked By: JKR Checked Date: 7/22/15

Measuring Point Information
Measuring Point (MP) Type: GROUND SURFACE
MP Elevation (ft): See Below

Item	Depth BMP (ft) (BGS)	Elevation (ft)
Stickup	—	—
Riser Pipe (Shallow Well)	-0.38	602.17
Riser Pipe (Deep Well)	-0.27	602.26
GS Elevation	0"	602.54
Top of Well Seal	-2	600.5
Top of Sand Pack	-25	577.5
Top of Screen	-25.5	577.0
WEATHERED BEDROCK (SOIL-LIKE)	-27	575.5
Base of Screen/End Cap	-35.5	567.0
Top of Well Seal	-37	565.5
Top of Sand Pack	-39	563.5
Top of Screen	-39.6	562.9
BEDROCK	-40.5	562.0
Base of Screen/End Cap	-44.6	557.9
Bottom of Sand Pack	-45	557.5
Bottom of Exploration	-45	557.5

Description	
Lock Identification	N/A: BOLTED
Stickup Casing Type:	FLUSH
Stickup Casing Diameter:	8"
Surface Seal Type:	CONCRETE
Backfill/Grout Type:	SAND
Riser Pipe Type (both):	SCH 40 PVC
Riser Pipe ID (both):	2"
Borehole Diameter:	6" TO ROCK: 4" IN ROCK
Type of Seal (both):	BENTONITE PLUG
Screen Type (both):	SCH 40 PVC
Screen ID (both):	2"
Screen Slot Size(both):	0.010"
Screen Length (both):	SEE LEFT
Filter/Sand Pack Type (both):	#1 FILPRO
Fallback/Backfill:	—

NOT TO SCALE

MACTEC
511 CONGRESS ST., PORTLAND, ME

WELL CONSTRUCTION DIAGRAM
BALDWIN PLACE SHOPPING CENTER
SOMERS, NY

LOCATION ID: MW-12 WELLS
MW-12M & MW-12S1

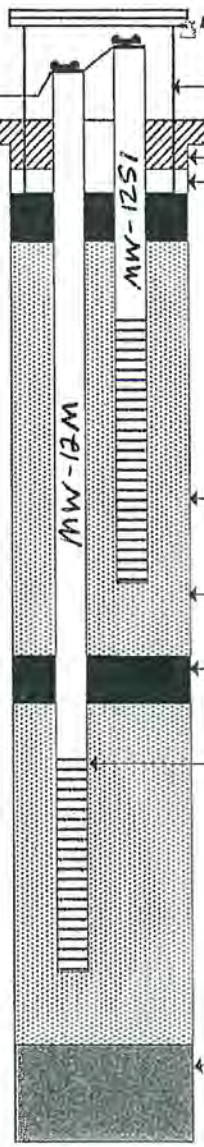
Project Name:	BALDWIN PLACE SHOPPING CENTER		
Project Location:	SOMERS, NY		
Project Number:	3617137308	Task Number	.05
Subcontractor:	ADT	Drilling Method:	SONIC
Development Method:	PUMP & SURGE	Development Date:	6-8-15
Bucking Posts/Ballards:	N/A		

Date Started: 6-3-15 Date Completed: 6-3-15
Logged By: T. Longley
Checked By: JKR Checked Date: 7/22/15

Measuring Point Information
Measuring Point (MP) Type: GROUND SURFACE
MP Elevation (ft): see below

Notes:
- 6" CASING USED TO 50'; 4" CASING USED TO 55'
- FROM -28 TO -38, ALTERNATING LAYERS OF SAND & BENTONITE
- TILL EXTENDS FROM -2' TO -50'

Item	Depth BMP (ft) (BGS)	Elevation (ft)
Stickup	—	—
Riser Pipe (Shallow Well)	-0.4	604.01
Riser Pipe (Deep Well)	-0.4	603.94
GS Elevation	0"	604.41
Top of Well Seal	-2	602.4
Top of Sand Pack	-9	595.4
Top of Screen	-12.2	592.2
Base of Screen/End Cap	-22.2	582.2
Top of Well Seal	-35-28	576.4
Top of Sand Pack	-38	566.4
Top of Screen	-39	565.4
Base of Screen/End Cap	-49	555.4
Bottom of Sand Pack	-55'	549.4
Bottom of Exploration	-55	549.4



Description	
Lock Identification	N/A: BOLTED
Stickup Casing Type:	FLUSH
Stickup Casing Diameter:	8"
Surface Seal Type:	CONCRETE
Backfill/Grout Type:	SAND
Riser Pipe Type (both):	SCH 40 PVC
Riser Pipe ID (both):	2"
Borehole Diameter:	6" TO Rock; 4" IN Rock
Type of Seal (both):	BENTONITE PLUG
Screen Type (both):	SCH 40 PVC
Screen ID (both):	2"
Screen Slot Size(both):	0.010"
Screen Length (both):	SEE LEFT
Filter/Sand Pack Type (both):	#1 FILPRO
Fallback/Backfill:	—

NOT TO SCALE

MACTEC
511 CONGRESS ST., PORTLAND, ME

FRACTURED BEDROCK: -50' TO -54'
COMPETENT BEDROCK: -54'

WELL CONSTRUCTION DIAGRAM
BALDWIN PLACE SHOPPING CENTER
SOMERS, NY

LOCATION ID: MW-101 WELLS
MW-101D & MW-101M

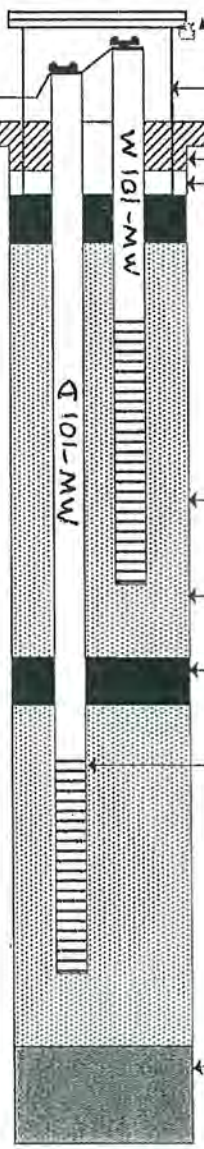
Project Name:	BALDWIN PLACE SHOPPING CENTER		
Project Location:	SOMERS, NY		
Project Number:	3617137308	Task Number	.05
Subcontractor:	ADT	Drilling Method:	SONIC
Development Method:	PUMP & SURGE	Development Date:	6-8-15
Bucking Posts/Ballards:	N/A		

Notes:
- 6" CASING USED TO BEDROCK; 4" CASING USED IN ROCK
- FROM -32 TO -2, ALTERNATING SAND & BENTONITE LAYERS
- TILL EXTENDS FROM BOTTOM OF FILL @-12' TO -50'

Date Started: 6-4-15 Date Completed: 6-5-15
Logged By: T. Longley
Checked By: JKR Checked Date: 7/22/15

Measuring Point Information
Measuring Point (MP) Type: GROUND SURFACE
MP Elevation (ft): See below

Item	Depth BMP (ft) (Ground Surface)	Elevation (ft)
Stickup	—	✓
Riser Pipe (Shallow Well)	-0.75	603.43
Riser Pipe (Deep Well)	-0.45	603.77
GS Elevation	0"	604.19
Top of Well Seal	-32	572.2
Top of Sand Pack	-35	569.2
Top of Screen	-37.8	566.4
Base of Screen/End Cap	-47.8	556.4
Top of Well Seal	-48	556.2
Top of Sand Pack	-50	554.2
Top of Screen	-52	552.2
TRANSITION ZONE OF COBBLEY TILL	-50	554.2
SOLID BEDROCK	-55	549.2
Base of Screen/End Cap	-57	547.2
Bottom of Sand Pack	-57	547.2
Bottom of Exploration	-57	547.2



Description	
Lock Identification	N/A: BOLTED
Stickup Casing Type:	FLUSH
Stickup Casing Diameter:	8"
Surface Seal Type:	CONCRETE
Backfill/Grout Type:	SAND
Riser Pipe Type (both):	SCH 40 PVC
Riser Pipe ID (both):	2"
Borehole Diameter:	6" TO ROCK; 4" IN ROCK
Type of Seal (both):	BENTONITE PLUG
Screen Type (both):	SCH 40 PVC
Screen ID (both):	2"
Screen Slot Size(both):	0.010"
Screen Length (both):	SEE LEFT
Filter/Sand Pack Type (both):	#1 FILPRO
Fallback/Backfill:	—

NOT TO SCALE

MACTEC
511 CONGRESS ST., PORTLAND, ME

APPENDIX E

EXCAVATION WORK PLAN

APPENDIX E – EXCAVATION WORK PLAN (EWP)

E-1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the site owner or their representative will notify the NYSDEC. A listing of site-related contact information is provided in Appendix B.

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120;
- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in Appendix H of this SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

E-2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based (e.g. photoionization detector) soil screening will be performed by a qualified environmental professional during all excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the COC.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site as soil beneath a cover or if the material can be used as cover soil. Further discussion of off-site disposal of materials and on-site reuse is provided in Section D-7 of this Appendix.

E-3 SOIL STAGING METHODS

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC.

E-4 MATERIALS EXCAVATION AND LOAD-OUT

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the site.

Loaded vehicles leaving the site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

A truck wash will be operated on-site, as appropriate. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the site until the activities performed under this section are complete Truck wash waters will be collected and disposed of off-site in an appropriate manner.

Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the site are clean of dirt and other materials derived from the site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

E-5 MATERIALS TRANSPORT OFF-SITE

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

A materials transport plan describing the trucking routes and indicated on mapping will be provided to the NYSDEC for approval prior to the start of excavation activities. All trucks loaded with site materials will exit the vicinity of the site using only these approved truck routes. This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; (f) overall safety in transport; and (g) community input.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project site.

Egress points for truck and equipment transport from the site will be kept clean of dirt and other materials during site remediation and development.

Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

E-6 MATERIALS DISPOSAL OFF-SITE

All material excavated and removed from the site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of material from this site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials from this site will not occur without formal NYSDEC approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C/D recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

E-7 MATERIALS REUSE ON-SITE

'Reuse on-site' means reuse on-site of material that originates at the site and which does not leave the site during the excavation. Material reuse on-site will comply with the requirements of NYSDEC DER-10 Section 5.4(e)4.

Prior to the reuse of materials on-site, a reuse plan will be submitted for approval to the NYSDEC. The following topics should be covered in the materials re-use plan:

- Procedure for determining if reuse is appropriate;
- Sampling (methods and analytical);
- Stockpile segregation scheme for on-site reuse; and
- Size of stockpiles, location (figure).

The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for reuse on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the site will not be reused on-site.

E-8 FLUIDS MANAGEMENT

All liquids to be removed from the site, including but not limited to, excavation dewatering, decontamination waters and groundwater monitoring well purge and development waters, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the site, and will be managed off-site, unless prior approval is obtained from NYSDEC.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a SPDES permit.

E-9 SITE RESTORATION

After the completion of soil removal and any other invasive activities, a demarcation layer, consisting of orange snow fencing material, will be replaced to provide a visual reference to the top of the remaining

contamination zone, the zone that requires adherence to special conditions for disturbance of remaining contaminated soils defined in this SMP. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in an updated SMP.

E-10 BACKFILL FROM OFF-SITE SOURCES

A plan for using backfill from off-site sources shall be submitted to the NYSDEC for approval prior to placement of material. This plan shall describe all methods for the import, handling and placement of backfill material from off-site. The requirements for backfill used at the site shall be consistent with the backfill requirements provided in DER-10.

The plan should contain the following:

- Source area approval process
  - Sources of backfill material
- Source area background check
- DOT Certification
  - Chemical sampling
- Analytes
- Frequency
  - Imported Soil Chemical Quality Standards
- Applicability of protection of groundwater SCOs
- Applicability of protection of ecological resources SCOs
- Stockpile procedures for imported backfill material
  - Size of stockpiles, cover, etc.

All materials proposed for import onto the site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the site. A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the site.

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d). Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by NYSDEC. Solid waste will not be imported onto the site.

Trucks entering the site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

E-11 STORMWATER POLLUTION PREVENTION

Prior to the start of excavation, a Stormwater Pollution Prevention Plan (SPPP) that conforms to the requirements of the NYSDEC Division of Water guidelines and NYS regulations will be required. Once an SPPP has been compiled, it shall be included as part of the update to the SMP and EWP.

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.

Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

E-12 EXCAVATION CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides and PCBs), unless the site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the Periodic Review Report.

E-13 COMMUNITY AIR MONITORING PLAN

Prior to the start of excavation activities a Community Air Monitoring Plan (CAMP) that is in conformance with DER-10 will be required. The CAMP, at a minimum, should include:

- Details of the perimeter air monitoring program;
- Action levels to be used;
- Methods for air monitoring ;
- Analytes measured and instrumentation to be used;
- A figure of the location(s) of all air monitoring instrumentation. A figure showing specific locations must be presented for monitoring stations based on generally prevailing wind conditions, with a note that the exact locations to be monitored on a given day will be established based on the daily wind direction.

Prevailing wind locations will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and at least two downwind monitoring stations.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

E-14 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors off-and on-site. If nuisance odors are identified at the site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the remedial party's Remediation Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

E-15 DUST CONTROL PLAN

A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated on-site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-site roads will be limited in total area to minimize the area required for water truck sprinkling.

E-16 OTHER NUISANCES

A plan for rodent control will be developed and utilized by the contractor prior to and during site clearing and site grubbing, and during all remedial work.

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

APPENDIX F

SPDES PERMIT EQUIVALENT

New York State Department of Environmental Conservation
Division of Water
Bureau of Water Permits, 4th Floor
625 Broadway, Albany, New York 12233-3505
Phone: (518) 402-8111 • **FAX:** (518) 402-9029
Website: www.dec.state.ny.us

MEMORANDUM

TO: Janet Brown, DER, Region 3 - New Paltz

FROM: Bruce Terbush, Bureau of Water Permits BET

SUBJECT: Baldwin Place Shopping Center, DER Site No. 3-60-023
Groundwater Pump and Treat Systems

DRAINAGE BASIN: 13/02

DATE: March 28, 2007

Attached are effluent criteria for the reissuance of the SPDES Permit Equivalent Effluent Criteria for the Baldwin Place Shopping Center Groundwater Pump and Treat Systems located in Somers, New York.

Review of the existing monitoring data reveals periodic exceedances of the 0.001 mg/l effluent criteria for tetrachloroethylene. The facility must be advised of this and be required to take appropriate steps to operate within these effluent criteria.

Please note that pH limits have not been removed as requested as these are conventional limits which are included in all SPDES permits or permit equivalents. Additionally, the revisions noted in your March 8, 2007 e-mail have been made.

The Division of Water does not have any regulatory authority over a discharge from a State, PRP, or Federal Superfund Site. The Division of Environmental Remediation will be responsible for ensuring compliance with the attached effluent criteria and approval of all engineering submissions. Additional Condition (1) identifies the appropriate DER Section Chief as the place to send all effluent results, engineering submissions, and modification requests. The Regional Water Engineer should be kept appraised of the status of these discharges and, in accordance with the attached criteria, receive a copy of the effluent results for informational purposes.

If you have any questions, please call me at (518) 402-8235.

cc: (w/att) Lenny Meyerson, Regional Water Manager, Region 3
A Fuchs

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning March 1, 2007

and lasting until February 28, 2012

the discharges from treatment facilities to a tributary of Muscoot River [water index number H-31-P44-14-3, Class C] shall be limited and monitored by the operator as specified below:

Outfall Number and Parameter	Discharge Limitations		Units	Minimum Monitoring Requirements	
	Daily Avg.	Daily Max		Measurement Frequency	Sample Type
Outfall 002 - Treated Groundwater Remediation					
Flow	Monitor	Monitor	GPM	Continuous	Meter
pH (range)	6.0 to 9.0		SU	Quarterly	Grab
Total 1,2- Dichloroethylene	NA	0.010	mg/l	Quarterly	Grab
Methyl tert butyl ether	NA	0.050	mg/l	Quarterly	Grab
Tetrachloroethylene	NA	0.001	mg/l	Quarterly	Grab
Trichloroethylene	NA	0.010	mg/l	Quarterly	Grab

Outfall Number and Parameter	Discharge Limitations		Units	Minimum Monitoring Requirements	
	Daily Avg.	Daily Max		Measurement Frequency	Sample Type
Outfall 003 - Treated Groundwater Remediation					
Flow	Monitor	Monitor	GPM	Continuous	Meter
pH (range)	6.0 to 9.0		SU	Monthly	Grab
Total 1,2- Dichloroethylene	NA	0.010	mg/l	Monthly	Grab
Tetrachloroethylene	NA	0.001	mg/l	Monthly	Grab
Trichloroethylene	NA	0.010	mg/l	Monthly	Grab

Additional Conditions:

(1) The discharge rate may not exceed the effective or design treatment system capacity. All monitoring data, engineering submissions and modification requests must be submitted to:

Ms. Janet Brown
NYSDEC - Region 3, Division of Environmental Remediation
21 South Putt Corners Road
New Paltz, NY 12561
Phone: (845) 256-3826

With an annual sampling data summary sent to:

Regional Water Manager
NYSDEC - Region 3
100 Hillside Avenue, Suite 1W
White Plains, NY 10603-2860
Phone: (914) 428-2505

(2) Only contaminated groundwater from this site is authorized for treatment and discharge.

(3) Authorization to discharge is valid only for the period noted above but may be renewed if appropriate. A request for renewal must be received 6 months prior to the expiration date to allow for a review of monitoring data and reassessment of monitoring requirements.

(4) Both concentration (mg/l or µg/l) and mass loadings (lbs/day) must be reported to the Department for all parameters except flow and pH.

(5) For Outfall 002: to comply with the monitoring requirements specified on page 1, samples and measurements shall be taken from the activated carbon treatment system effluent prior to the discharge to the unnamed tributary of the Muscoot River at Latitude 41° 20' 37" and Longitude 73°45' 19".

(6) For Outfall 002: if a discharge limitation for any parameter is exceeded the measurement frequency for all parameters shall be monthly, until a period of 4 consecutive sampling events shows no exceedances at which point quarterly monitoring may resume.

(7) For Outfall 003: to comply with the monitoring requirements specified on page 1, samples and measurements shall be taken from the activated carbon treatment system effluent prior to the discharge to the unnamed tributary of the Muscoot River at Latitude 41° 20' 30" and Longitude 73°45' 19".

(8) Any use of corrosion/scale inhibitors, biocidal-type compounds, or other water treatment chemicals used in the treatment process must be approved by the department prior to use.

(9) This discharge and administration of this discharge must comply with the substantive requirements of 6NYCRR Part 750.

APPENDIX G

O&M MANUAL

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Region 3
New Paltz, New York

BALDWIN PLACE MALL
PLANT No. 1 GROUNDWATER PUMP & TREAT SYSTEM
OPERATION AND MAINTENANCE MANUAL

NYSDEC SITE No. 36-0023

March 1998
Revision 1: July 2004

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Environmental Science & Engineering Consultants
One Blue Hill Plaza
Pearl River, NY 10965

Project No. 1044-001

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CHAPTER 1

INTRODUCTION

1.1 USERS GUIDE

The Somers Common (formerly Baldwin Place Mall) Plant No. 1 Groundwater Pump & Treat System is designed to pump water containing volatile organic compounds (VOCs) from the ground and treat this water by activated carbon adsorption. Proper operation and maintenance of the system are required for satisfactory plant operation to avoid adverse impact on the environs.

The purposes of this manual are to familiarize personnel with the equipment and facilities provided and to recommend operation and maintenance procedures for effective and economical functioning of the facility. The manual provides essential technical information and guidance and is intended to be used as a tool by plant operating and management personnel.

In order to remain a complete and flexible source of information, this manual must be reviewed and updated continuously as systems are started up, expanded, or altered. To facilitate these modifications, the manual's text is typed so that personnel can make handwritten additions, changes, and clarifications directly to the text, which should be periodically retyped.

In an attempt to account for any inconsistencies in the text of this manual, the words **should**, **shall**, and **must** are to be considered **mandatory**.

The manual is divided into 10 chapters. A brief description of the content of each chapter follows.

Chapter 1, Introduction, provides a general description of operational and managerial responsibilities, a brief history of the site, and the design basis for the treatment system and a brief description of the purpose of each major piece of equipment.

Chapter 2, Monitoring and Analysis Requirements, describes the required sampling program, analytical methods, data analysis, record keeping and reporting.

Chapter 3, Treatment Process, provides a description of the individual treatment processes, operation, and controls.

Chapter 4, Electrical and Instrumentation, describes the electrical power supply and distribution to the treatment facility. The electrical power supply requirements are described for each major piece of equipment.

Chapter 5, Auxiliary and Support Systems, describes the design of the treatment building.

Chapter 6, Maintenance, identifies and inventories all equipment requiring routine maintenance. A maintenance schedule is provided for each piece of equipment based on the manufacturer's recommendations. This chapter refers to appendices that contain detailed installation, operation, and maintenance instructions provided by the equipment manufacturer.

Chapter 7, Troubleshooting, outlines potential problems, probable causes, and corrective actions that should be taken when and if such problems develop.

Chapter 8, Emergency Response Procedures, describes process and general emergencies and provides a list of telephone numbers for staff use in the event of an emergency.

Chapter 9, Safety, outlines the requirements for a comprehensive safety program and summarizes safety procedures and practices. This chapter addresses first aid, personal hygiene, personnel protective equipment, and the safe use of tools, equipment, and electrical systems.

This manual includes by reference the construction drawings prepared in 1998 by Lawler, Matusky & Skelly Engineers LLP (LMS).

1.2 OPERATIONAL AND MANAGERIAL RESPONSIBILITIES

Until August 6, 2003, Big V Supermarkets, Inc. (Big V) had responsibility for the groundwater remediation at the site. On that date the bankruptcy judge overseeing the liquidation of Big V's assets ended the asset's funding of the operation. Accordingly, the NYSDEC has assumed direct responsibility for the continued operation. Through

subcontract from Miller Environmental Group, NYSDEC has engaged LMS to be the Operations Services Contractor (system operator). LMS is also the system Engineer, and provides engineering and review services to NYSDEC.

The NYSDEC project manager will:

- Have a general knowledge of the system.
- Interface with nearby property owners and tenants when/if necessary.
- Oversee the system operator.
- Provide for transition and continuity in contracts.
- Review and coordinate purchase orders, expenditure requisitions, and hazardous waste manifests and forms.
- Approve changes in system operations based on the Engineer's recommendation.

The System Operator will:

- Assure compliance with permit requirements for system operation.
- Have detailed knowledge of the system.
- Make mechanical/electrical adjustments in accordance with the O&M Manual.
- Make other adjustments in accordance with directions.
- Act as troubleshooter.
- Respond to alarms.
- Provide routine maintenance within skill levels and O&M Manual requirements.
- Oversee repair contractors.
- Handle record keeping and data summary.
- Perform system monitoring, sampling, and water level measurements.

The Engineer will:

- Review process operations and make recommendations to NYSDEC.

- Review monitoring and pump well hydraulic and chemical data to determine that the system is meeting the remedial objectives, and recommend additional actions to Big V to achieve these objectives.

1.3 **SITE HISTORY**

Somers Common (formerly Baldwin Place Mall) (the Site) is a 28-acre shopping center, located in the Town of Somers, Westchester County, New York. The address of the Site is 80 Route 6, Baldwin Place, NY 10505.

A localized area of the Site has soil contaminated primarily with perchloroethylene (also referred to as tetrachloroethylene, or PCE) and, to a lesser extent, trichloroethylene (TCE) and environmental degradation products of PCE and TCE, most notably 1,2-dichloroethylene (DCE). The New York State Department of Environmental Conservation (NYSDEC) has concluded that the contamination is a result of activities by a former dry cleaner that had leased space at the Site. Methyl tert butyl ether (MTBE) is also present in the groundwater in a portion of the site as a result of gasoline spills from adjacent and nearby service stations. The downgradient areas have groundwater contaminated with these constituents.

NYSDEC has listed the Site as an Inactive Hazardous Waste Site (ID No. 36-0023). A remedial investigation/feasibility study (RI/FS) was subsequently completed to address the soil and groundwater contamination. On 9 November 1995 NYSDEC issued its Record of Decision (ROD). Big V entered into a NYSDEC consent order to implement the work in the ROD, which requires the following steps to remediate the presence of PCE and related compounds at the Site:

- Excavation of source area contaminated soils. The purpose of this step is to remove the source of contamination to the groundwater.

- Installation and operation of a groundwater pump and treat system to capture residual contaminated groundwater in the overburden aquifer in the source area. An additional purpose of the step is to capture chemical

that might leach into the groundwater from any residual contaminated soil left in place from the excavation and thereby prevent further contamination of the underlying rock aquifer. This pump and treat system, referred to as Plant No. 1, is the subject of this O&M manual

- Additional pumping of the Site's water supply wells to effectuate further remediation of the Site's rock aquifer beyond that provided by the excavation and source area pump and treat. The additional pumping will speed up the cleanup of the rock aquifer. Groundwater contamination beyond the control of the water supply wells would be allowed to dissipate, given that the excavation and source area pump and treatment steps will prevent further contamination of the rock aquifer. The ROD envisioned that approximately 20 gallons per minute (gpm) of additional pumpage from the supply wells would be required to meet this objective, but that there would have to be additional testing to refine the estimate and determine the actual pump rate. This testing demonstrated that the pumping rate should be 30 to 35 gpm.

- Continued maintenance of the point-of-use activated carbon water treatment systems in the houses along Meadow Park Road, or connection to a community water supply system initially supplied by the Site's own water supply system.

The excavation was completed in February 1997. Construction of the overburden pump and treatment system (Plant No. 1, the subject of this O&M manual) was completed in March 1998. This system was started in April 1998, and has operated continuously since then, except for occasional shutdowns for maintenance.

Plant No. 2 started production in 1998. The facility was also upgraded in 1998 to provide a source of potable water supply to Meadow Park Road. From January 1999 to November 2001, Plant No. 2 served the dual objective of supplying Meadow Park Road and withdrawing additional groundwater for the remediation of the Site. After November 2001, Meadow Park Road was connected to a public water supply and the connection between Plant No. 2 and the water transmission line was severed. The facility is now run only as a pump & treat system. A number of the components of Plant No. 2 are no longer active, since they were installed as part of the supply system to Meadow Park Road.

1.4 **DESIGN BASIS FOR THE TREATMENT SYSTEM**

The groundwater remediation effectuated by the system is achieved through the pumping of

contaminated groundwater from two recovery wells. The depths and flow rates for these wells were determined during the RI/FS. The contaminated water is then treated in a new treatment building prior to discharge to an adjacent stream. Figure 1-1 presents a schematic of the treatment system.

The VOC concentrations influent to the treatment system shown below were projected based on worst-case, flow-weighted concentrations from the individual pumping wells.

	RW-1S	RW-2D	COMBINED	EFFLUENT LIMIT
Flow (gpm)	0.5	3	3.5	no limit
DCE (µg/l)	61	28	33	10
MTBE (µg/l)	<10	11	10	50
PCE (µg/l)	24,000	3200	6200	10
TCE (µg/l)	160	15	36	10
pH (SU)	7.2-7.6	7.5-11.4	7.5-11.9	6-9

As indicated, the required removals for VOCs are 70% (DCE), 0% (MTBE), 99.8% (PCE), and 72% (TCE). The raw water concentrations are worst-case projections that might be achieved during initial operation of the system. Long-term concentrations will most likely be lower by at least an order of magnitude.

A high worst-case pH is possible based an 11.4 SU reading in well MW-3D. This unusually high pH is probably not representative of the actual groundwater, which is near neutral over most of the site. Therefore, no treatment is proposed at this time to correct for high pH.

Based on literature evaluations of similar operations, activated carbon has been selected to treat the wastewater. Calgon Flowsorb (or equal) activated carbon will be provided. Calgon's projected performance is described in the brochure presented in the appendix of this report. As indicated, 0.13 lb of PCE can be absorbed by 1 lb of carbon at the projected influent loading rate. Coarse (50-micron) and fine (5-micron) bag filters will be provided upstream of the activated carbon to reduce the potential for plugging of the carbon.

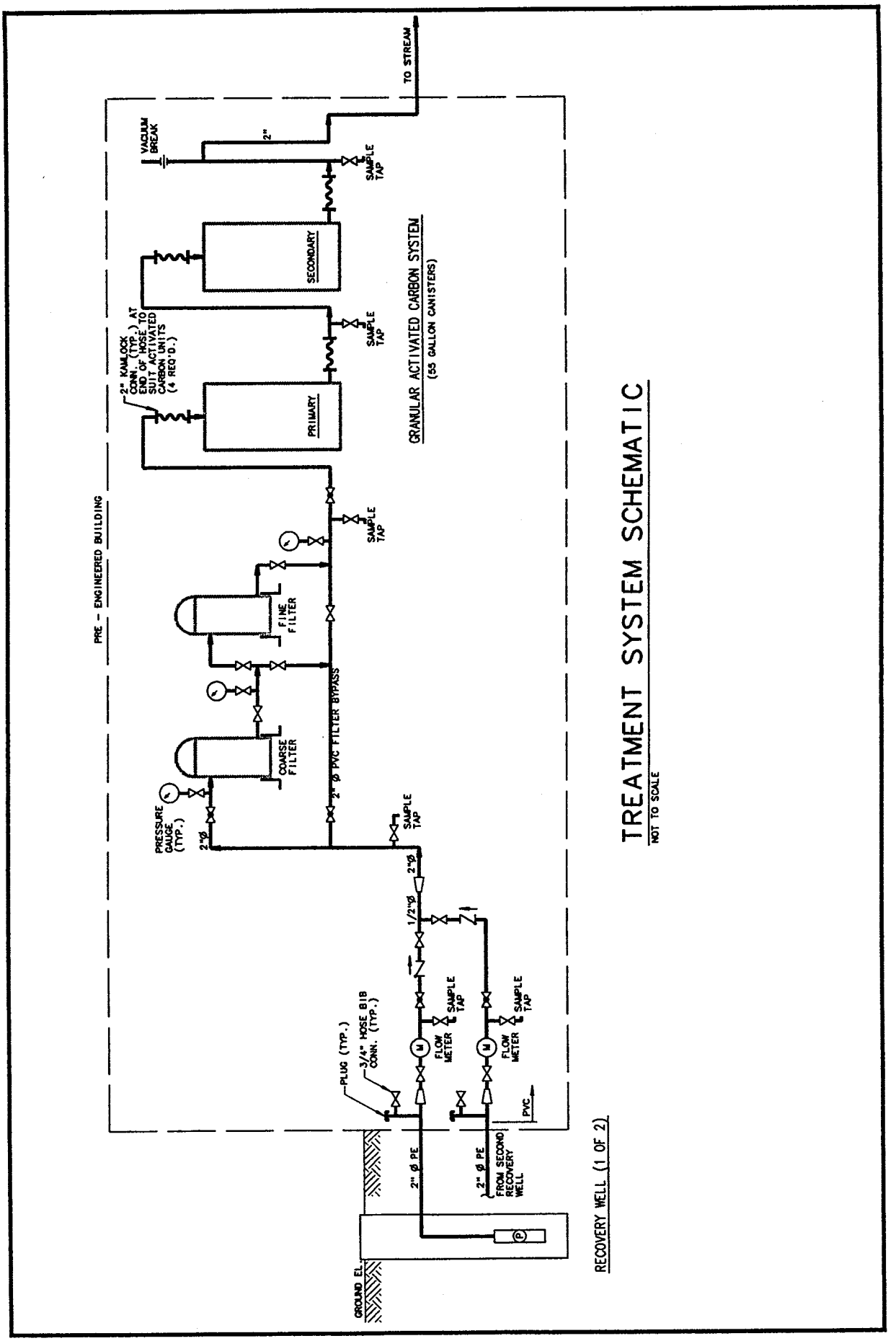
Two 165-lb carbon units will be provided in series. After VOCs break through the first (upstream) unit at concentrations in excess of the effluent limitations, the carbon will be

rebedded. Rebedding consists of:

1. Disposing of the old upstream unit
2. Placing the old downstream unit in the upstream position
3. Installing a new unit in the downstream position

Based on Calgon's calculations and the worst-case loading of 6200 µg/l of PCE, theoretically, the first rebed will not be needed until 81 days after startup. In order to fully describe absorptive capacity, water samples should be collected from the system on a relatively frequent basis for the first six weeks of operation. After that time, less frequent sampling can be conducted in accordance with the schedule described in Chapter 2.

Figure 1-1


TREATMENT SYSTEM SCHEMATIC
NOT TO SCALE
RECOVERY WELL (1 OF 2)
PRE - ENGINEERED BUILDING
GRANULAR ACTIVATED CARBON SYSTEM
(55 GALLON CANISTERS)
TO STREAM
VACUUM BREAK
2"
SAMPLE TAP
SECONDARY
PRIMARY
2" KAMLOCK CONN. (TYP.) AT END OF HOSE TO SUIT ACTIVATED CARBON UNITS (4 REQ'D.)
FINE FILTER
COARSE FILTER
PRESSURE GAUGE (TYP.)
2"Ø
2" Ø PVC FILTER BYPASS
1/2"Ø
FLOW METER
PLUG (TYP.)
3/4" HOSE BIB CONN. (TYP.)
PVC
2" Ø PE
FROM SECOND RECOVERY WELL
GROUND EL.

CHAPTER 2

MONITORING AND ANALYSIS REQUIREMENTS

2.1 INTRODUCTION

Laboratory and analysis requirements can be divided into those needed for operation of the treatment process and those required by NYSDEC's State Pollutant Discharge Elimination System (SPDES) permit-equivalent for discharge. (A copy of the permit-equivalent is presented in Appendix A.) Outfall 002 is the discharge from Plant No. 1. (Outfall 003 is the discharge from Plant No. 2.)

2.2 PERMIT-EQUIVALENT REQUIRED SAMPLING

The permit -equivalent requires routine sampling of the treated effluent from the remediation system. Following system start-up, samples are to be collected weekly for twelve weeks, and, assuming there is no noncompliance, quarterly thereafter. If there is any noncompliance, the sampling frequency will then again have to be increased, as noted in Appendix A. Samples are to be analyzed on-site for pH and at an off-site New York certified laboratory by either EPA Method 601 or an equivalent method. Certification must be maintained for conducting the pH analyses.

Written records of sampling and testing shall be made to show the following:

- The date, exact place, and time of sampling or measurements
- The individual(s) who performed the sampling or measurements
- The date(s) analyses were performed
- The individual(s)who performed the analyses
- The analytical techniques or methods used
- The results of such analyses

Chain-of-custody sheets are to be completed for samples shipped off-site. The operator shall periodically calibrate and perform manufacturer's recommended maintenance

procedures on all monitoring and analytical instrumentation (i.e., the pH monitoring equipment) to ensure accuracy of measurements. Accuracy of the equipment must be verified and reported to the NYSDEC regional office at least annually.

2.3 **DISCHARGE LIMITATIONS**

The discharge limitations for VOCs are (in units of mg/l, expressed as daily maximums):

Total-1,2-DCE	0.010
MTBE	0.050
PCE	0.010
TCE	0.010

The above are limitations issued by NYSDEC. However, the system has been designed to reduce contaminant concentration to below detection (<0.001 mg/l).

In addition to the above limitations on the allowable concentrations of VOC's in the treated effluent, there is a limitation for pH, which is to be maintained in the range of 6 to 9. However, the treatment system is not designed to adjust for pH.

2.4 **REPORTING**

Reports on compliance sampling shall be submitted to NYSDEC quarterly, consistent with the requirements of the permit-equivalent. In the event that noncompliance with the permit-equivalent is discovered, the reporting requirements described in that document are to be immediately adhered to.

2.5 **GENERAL SYSTEM MONITORING**

General system monitoring consists of the following:

- Recording flow rates. The water meter is of the totalizer type. The meter readings are to be recorded on the Routine Monitoring Form (Figure 2-1). In addition, instantaneous flows are to be recorded for the pumping well by use of a stopwatch. This information is required for the reports to NYSDEC and to identify problems with the pumping system.

- Recording pressure gauge readings. This information is used to determine

FIGURE 2-1

ROUTINE OPERATIONS REPORT

Baldwin Place Mall Groundwater Recovery Well Treatment Systems

Date: _____ **PLANT # 1**

Time: _____

	TRANSDUCER WATER LEVEL (ft.)		WATER METER		RUN TIME (hrs/min)	TOTALIZER/ RUN TIME (gal/min)
	TARGET	READING	TOTALIZER (gallons)	PUMP RATE (gal/min)		
RW-1S	8 - 15					
RW-2D	9.1 - 14.1					

	TIME SINCE LAST READING (min)	PUMPAGE SINCE LAST READING (gal)	AVERAGE FLOW RATE SINCE LAST READING (gal/min)
RW-1S			
RW-2D			

	BAG FILTER PRESSURE READINGS			BAGS REPLACED	PUMPS ON
	INFLUENT	BETWEEN	EFFLUENT		
Gauge:					

PLANT # 2

Time:	TOTALIZER READING (gal)	PUMPAGE SINCE LAST READING (gal)	INSTANTANEOUS PUMP RATE (gal/min)

	FILTER PRESSURE READINGS			FILTERS REPLACED	EFFLUENT pH (monthly)
	INFLUENT	EFFLUENT	DIFFERENTIAL		
Gauge:					

	CARBON VESSEL PRESSURE READINGS (psi)			LEAD POSITION	POLISHING POSITION
	GAC 1		GAC 2		
Top: Bottom:					

NOTES:

_____

_____

_____

_____

OPERATOR: _____

when the sediment filter cartridges need to be replaced and whether there is plugging of the activated carbon.

Following the initial 12 week start-up of the system, the monitoring described above should be conducted at a frequency of once every two week. However, there may be some short term circumstances that require adjustment of the frequency (for example, problems with the well control system).

In order to evaluate the performance of the activated carbon treatment system, samples are to be collected from the discharge from each pumping well and from the between carbon filters sample tap. The schedule is as follows. During the first week of operation samples will be collected from each pumping well and between the carbon filters for analysis by Method 601. During the next three weeks of operation, between-filters samples will be collected at the rate of once a week. During Week 6, samples will be collected from the combined influent and between filters. For the remainder of the year, samples will be collected from the individual pump wells and between filters when the quarterly groundwater monitoring is being conducted.

CHAPTER 3

TREATMENT PROCESSES

3.1 RECOVERY WELLS AND TRANSMISSION LINES

3.1.1 Description

Remediation of the groundwater is effectuated through the removal of contaminated groundwater from the overburden and weathered bedrock by two pumping wells, designated as RW-1S and RW-2D. Both wells were constructed in December 1997 under the general contract for the construction of the pump and treat system. The drilling and construction logs are presented in Appendix B. The wells have the following characteristics:

	RW-1S	RW-2D
Approx. Depth Below Grade (ft)	49	83
Casing Length (ft)	7	51
Screen length (ft)	40	30
Casing Stick-up (ft)	-2	-2
Diameter (in.)	6	6
Screen Description	10 Slot S.S.	10 Slot S.S.

Groundwater is removed from the wells by submersible pumps which discharge via 1-in. diameter polyethylene risers to pitless adaptors located inside 4-ft-deep chambers at the well heads. The positions of the pumps are stabilized by torque arresters. Water then flows from the pitless adaptors through 2 in. diameter force mains to the treatment building where the water flow is controlled and metered. The mechanical systems from the submersible pumps to the force mains have the following characteristics:

	RW-1S	RW-2D
Pump model	Grundfos #5E5	Grundfos #5E5
Horsepower	1/3	1/3
Outlet size (in.)	1	1
Riser diameter (in.)	1	1

	RW-1S	RW-2D
Pump depth (ft below grade)	38	58
Pitless adaptor size (in.)		2
Force main diameter (in.)		2
Transducer depth (ft below casing)		
Design	38	60
Current (April 2004)	42.7	56 (not confirmed)

Other components in the well are electric power cables to the pump motors and pressure transducer/signal cables attached to the pump risers (Section 3.1.2). A safety cable independently connects the pump to the casing as additional protection from loss of the pump into the well bottom.

The pumping system has been designed to achieve an average 0.5 and 3 gpm recovery from RW-1S and RW-2D, respectively. Water levels in the wells fluctuate because of differences between pump and well yields. Therefore, a control system is provided to turn the pumps on and off.

Water levels are monitored with a submerged transducer and the depth of water above the transducer is displayed in the treatment building. Pump-ON, Pump-OFF, and high and low water alarm settings are determined in terms of height of water above the transducer. During the design of the system, target depths were established based on initial modeling of the groundwater. In order to increase system yield, depths were subsequently lowered during the ensuing years:

	DISTANCE FROM TOP OF CASING (ft)			
	RW-1S		RW-2D	
	DESIGN	CURRENT	DESIGN	CURRENT
Low water alarm	31	36.7	54	49.7
Low water pump-OFF	28	34.7	52	46.9
High water pump-ON	13	27.7	42	41.9
High water alarm	10	22.7	38	40.9

Attempts have recently been made to lower the operating levels even further. However, pump cavitation occurred faster than expected, and the settings were reestablished to the levels noted

above. The control panel for the pumping wells displays water levels in terms of feet above the transducer. Based on transducer depths below top of casing of 42.7 feet for RW-1S and 56 feet for RW-2D, the following are the current controller set points:

	FEET ABOVE TRANSDUCER	
	RW-1S	**RW-2D**
Low water alarm	6	8.1
Low water pump-OFF	8	9.1
High water pump-ON	15	14.1
High water alarm	20	15.1

It is possible to change the transducer depth, but in order to do so, the alarm and control settings must be adjusted at the treatment building, and this O&M manual must be updated.

The throttling valves in the treatment building that control the pumping rates should be adjusted to achieve maximum flow rates while at the same time avoiding water level fluctuations that would result in excessively frequent shutting down and turning on of the pumps. The maximum cycling frequency should be four times an hour.

The pump, riser, and cables (except safety cable) are removed from the well as a single unit. Removal is accomplished by the use of a T-puller which can be fabricated from -1 in. diameter steel pipe with a NPT threaded end. The threaded end of the puller is inserted into the well casing and is then screwed into the top of the pitless adaptor. The T-handle of the puller is then lifted up by a minimum of two workers (a hoist will help), and the riser top then unseats from the stationary half of the pitless adaptor. The riser and well internals are then lifted out of the well. In order to complete the removal, the electric power and transducer cables need to be decoupled at the splices near the top of the well casing. The operator should pull the pumps and risers as needed for inspection and external and internal cleaning. The pumps should be removed and cleaned at least annually[1] and more frequently if clogging on these units becomes apparent, as indicated by an inability of the system to draw down the well water levels with open throttling

[1] As of the preparation of this revision to the O&M manual, the RW-1S riser is seized to the pitless adaptor. Since the pump has been free of sediment build-up and fouling for the previous few years, a decision has been made not to remove the pump for cleaning and risk breaking the pitless adaptor. The pump will be removed when there is a demonstrated need to do so.

valves. Calibration of the transducers should be checked and corrected as necessary or at least annually.

3.1.2 **Operation and Controls**

Each of the recovery wells is controlled in a similar manner. A Hand-Off-Automatic (HOA) switch is located on the Main Control Panel (MCP). In the Hand mode, the pump will run. In the Off mode, the pumps will be off. In the Auto mode, the pumps will be controlled by the level in the wells.

The level in the wells is measured by a submersible pressure transducer. The transducer sends a signal to a transmitter located in the Treatment Facility. The transmitter converts this signal to a 4-20 mA signal which is linearly related to the level. This signal is transmitted to the PLC and the level recorder in the MCP. Logic in the PLC is used for the start and stop commands for the pumps. High and low setpoint contacts are provided on the Well Level control panel.

The high and low level setpoints may be modified by following the instructions for the control panel, which are presented in Appendix C.

The discharge from each well is measured with a 5/8-inch totalizing water meter: Model 25 Record all Cold Water Thermoplastic Disc Meter, manufactured by Badger Meter, Inc. The meters should be cleaned with water on-site on a quarterly basis.

The treatment system is also used to manage contaminated water generated during the sampling of certain monitoring wells. During these sampling events, the recovery wells are shut down. Drum pumps (connected to flexible hoses attached to the piping inside the treatment building) are used to evacuate the drums of purge water into the treatment system. Check valves in the recovery well pumps keep the purge water from backing into the recovery wells and thereby direct the purge water through the treatment system.

The building has a concrete-lined floor sump used to collect water that spills to the floor from time to time. Sump water can be pumped into the treatment system through the same means utilized for the monitoring well purge water.

3.2 **FILTRATION**

3.2.1 **Description**

Course (50-micron) and fine (5-micron) bag filters are provided upstream of the activated carbon to reduce the potential of plugging of the carbon. The units are housed in steel containers and are rated at 80 gpm with a 1 psi pressure drop across the filter for clean water. Each unit has a removable strainer. The filters are Model FCB-11, manufactured by Parker. Pressure gages are provided before, between and after the two filters. Although valves are provided to allow replacement of one filter while allowing flow to continue to the other filter so as to avoid a plant shutdown during filter replacements, actual practice has always been to shut down the plant and replace both at the same time.

3.2.2 **Operation and Controls**

The need for a filter bag replacement is based on the pressure drop across the unit, as measured by the difference in readings of the pressure gages on either side of the unit. Pressure readings should be recorded to allow tracking of the sediment buildup in the cartridges. The pressure loss which prompts a replacement was initially targeted at 10 psi. The current procedure is now to replace the bags after the quarterly groundwater monitoring well sampling, because of the treatment of the turbid pre-sampling purge water through the treatment system.

Operation of the filters consists of replacement of the filter bags to avoid excessive pressure build-up. The general procedure for replacement consists of (1) isolation of the target unit by closing the appropriate shutoff valves, (2) opening of the container, (3) removal of the old filter bag while allowing as much excess water to remain in the container, (4) removal and cleaning of the strainer, (5) inspection and replacement of O-rings and seals, if necessary, installation of a new filter bag, and (6) reassembly. The manufacturer's instructions for this activity are presented in Appendix C.

The used filters are to be placed in a plastic drum and then the drum lid is to be closed. The accumulation period to fill a drum with used filters and other miscellaneous hazardous waste articles generated by the project is approximately two years. Hazardous waste manifesting and record-keeping regulations are applicable. The waste category is F002. The EPA ID No. for the

site is NYD000098558.

3.3 GRANULAR ACTIVATED CARBON (GAC) ADSORPTION

3.3.1 Description

Removal of the groundwater contaminants is achieved with GAC. The GAC system consists of two 165-lb drums of activated carbon, DSR-A, manufactured by Calgon Carbon Corporation. (As of the preparation of this O&M manual, activated carbon manufactured by General Carbon Corp. is being used on a trial basis.) The units are returnable, meaning that the spent carbon is shipped off-site in the original drum in which the carbon was delivered. The drum openings are 2-inch FNPT and are connected to the treatment plant piping through camlock fittings. The fittings are presently attached to rigid pipe; however, as of the preparation of this O&M plan, consideration is being given to replacing some of the hard-pipe with flexible hoses. The maximum pressure allowed in the drums is 3 psi. Therefore, the pressure gage upstream of the carbon filters has an interlock with the main control panel, which will shut down the recovery wells in the event of high pressure. The treatment system will allow higher pressures; however, different drums would have to be utilized.

3.3.2 Operation and Controls

Manufacturer's instructions (Appendix C) specify that a new carbon unit must be pre-wetted for 48 hours prior to installation. The standard method to pre-wet a drum is to introduce clean water (from the plant effluent) into the outlet connection and allow the drum to sit off-line for 48 hours, after which the drum is drained and then refilled. Experience has shown that the system works adequately without pre-wetting the carbon, apparently because the system loading is small relative to the capacity of the drums. Because pre-wetting requires a separate operator visit, this procedure is not employed to reduce cost.

The two 165-lb carbon units are installed in series, i.e., water flows through an upstream unit and then into a downstream unit. The upstream unit is referred to as the primary filter, and the downstream unit is referred to as the polishing filter. After VOCs break through the first (upstream) unit at concentrations in excess of the effluent limitations, the carbon will be rebedded. Rebedding consists of:

(1) Disposing of the old upstream unit
(2) Placing the old downstream unit in the upstream position
(3) Installing a new unit in the downstream position

Chemical breakthrough between drums is monitored as specified in Chapter 2. Rebeds are conducted when there are detectable VOCs in the effluent from the upstream filter, or mechanical reasons (e.g., suspected plugging of the carbon) dictate a replacement. In general, a rebed would not be conducted until after the VOC concentrations between-drums reach the limits presented in the permit-equivalent. However, based on the time required to obtain fresh carbon, the schedule for the next between-filters sampling, and the experience with the frequency of past rebeds, the operator may schedule a rebed before or after the upstream filter effluent concentrations reach the permit-equivalent limits.

With lower than projected hydraulic loading and slowly subsiding influent concentrations, experience with the system shows that the time between rebeds is on the order of one year. Experience has also shown that the recovery well water is relatively corrosive and will rust through the Calgon drums before between-drums chemical breakthrough is evident. Therefore, rebeds are currently being driven by the physical condition of the drums, rather than the chemical loading. At present, other drums are being examined to determine if they are more corrosion-resistant.

The used carbon is to be managed as a hazardous waste. Hazardous waste manifesting and record-keeping regulations are applicable. The waste category is F002. The EPA ID No. for the site is NYD000098558.

CHAPTER 4

ELECTRICAL AND INSTRUMENTATION

4.1 GENERAL

The only motors for the system are those for the well pumps, which are both 1/3 HP, 240 volts, single phase.

Where conduits are run outdoors or below grade, extra heavy wall, Schedule 80 PVC conduit is used. All conduit installed indoors is heavy wall, Schedule 40 PVC.

All wire on the project is Type XHHW-2, which has a flame-retardant, moisture resistant, thermoset insulation. This type of insulation is suitable for both dry and damp locations.

4.2 INTERIOR ELECTRICAL DISTRIBUTION SYSTEM

Electric power is provided by New York State Electric & Gas Company (NYSEG). A 100 ampere, 120/240 volt, 1 phase, 3 wire service is brought from the utility meter to the main breaker of the Main Distribution Panel (MDP) located in the treatment house. The MDP is a twelve circuit load center, with a 100 A main circuit breaker in a NEMA 1 enclosure.

Circuit breakers on the MDP feed lighting, receptacles, unit heater, and Pump Control Panel. (See panel schedule on interior door of MDP for exact locations).

4.3 EXTERIOR ELECTRICAL DISTRIBUTION SYSTEM

The service entrance is derived from an overhead service drop from NYSEG Pole #3. The service entrance feeder is run down Pole #3 to underground conduit which leads to NYSEG metering equipment and then to the main circuit breaker on the MDP.

Power and control wiring to the recovery wells is run underground in conduit from the front of the building to the RW-2D well vault. At RW-2D, the power and control wiring

for RW-1S is continued to the well vault for RW-1S. Power and control wiring are run in separate conduits (1 in. PVC).

4.4 PUMP CONTROL PANEL

The Pump Control Panel (PCP) is located in the treatment building and provides control and alarm functions for the two well pumps. The PCP can be operated in either manual mode or automatic mode. When operated in manual mode the well pumps are controlled by toggling a seletor switch from either AUTO or OFF to HAND. When the selector switch is the HAND position, pumps will run continuously regardless of the level of water in the respective well. The selector switch is equipped with a spring return mechanism that will toggle the selector switch to the OFF position when released from the HAND position. When the system is operated in the AUTO mode, the well pumps are controlled by independent microprocessor-based controllers. The controllers scale the input from pressure sensing level transducers, located in each well, to the column of water above the well pump, measured and displayed in feet. At programmed levels of water column, the controller will signal the well pumps to start and stop. Additionally, the controllers will provide alarm indication on high and low water level and continuous level indication. The PCP is equipped with combination magnetic motor starters, control and time delay relays, indicating lights, run time meters, reset pushbuttons and a connection to a remote flashing beacon, located over the front door of the building.

An annunciator panel is also located on the PCP. When an alarm condition occurs, the outside red light will go on. The alarm lights on the panel are as follows:

- Pump RW-1S Run
- Pump RW-2D Run
- Power On
- High water in RW-1S
- Low water in RW-1S
- High water in RW-2D
- Low water in RW-2D
- High GAC inlet pressure

The alarm for the High GAC inlet pressure will cause both recovery wells to be shutdown until the filter is replaced or the high pressure is rectified. None of the alarms effect system operation.

4.5 INSTUMENTATION AND CONTROL DEVICES

Level sensing in each well is achieved by way of a KSPI Series 710 pressure sensing level transducer. The unit has a submersible 316 stainless steel housing with an isolated silicon pressure cell. The unit is capable of sensing water levels between 0 and 100 ft of water column and produces a 4-20 mA output signal. The transducer comes with a remote aneroid bellow and terminal strip for easy termination of the transducer cable assemble.

Pressure sensing at the inlet of the GAC unit is achieved by way of a SPDT brass bourdon tube pressure switch. The switch has an adjustable deadband, adjustable operating range (1-35 psig), NEMA 1 enclosure, and 4A, 120V, mercury switch.

4.6 LIGHTING

The lighting in the facility is composed of two Daybright R41241 fluorescent fixtures. Each of the lamps is 40 watts. The fixtures are controlled by switches by the door.

4.7 HEATING AND VENTILATING

The treatment facility is heated by a 7.5 KW, 1Ø, 240V heater, controlled by a built-in thermostat.

CHAPTER 5

AUXILIARY AND SUPPORT SYSTEMS

5.1 TREATMENT BUILDING

The treatment is a preengineered manufactured building from Parkline, Inc. The building walls are supported on a continuous-grade beam wall, and the building slab-on-grade is free floating. The concrete floor has a machine-troweled finish. The floor slab is sloped toward a floor sump, provided to contain stray drainage inside the building. Exterior doors are manufacturer's standard and include matching trim. Insulation is provided in the walls and ceiling and around the grade beam. Gutters and leaders have been provided.

5.2 SANITARY AND OTHER WASTEWATER

There are no sanitary facilities for the treatment building.

5.3 POTABLE WATER

The building is not supplied with potable water. Water needed for cleaning can be obtained from the final effluent sample tap or by importing water with a container.

CHAPTER 6

MAINTENANCE

6.1 GENERAL

Maintenance is the function of sustaining or restoring the equipment so that it performs its intended job effectively, safely, and economically. Efficient maintenance of the treatment facilities requires a well-planned maintenance management system. The system, when implemented properly, should reduce breakdowns, extend equipment life, and encourage efficient manpower utilization.

6.1.1 Types of Maintenance

The three types of maintenance are preventive, corrective, and overhaul:

- ***Preventive*** - Routine or scheduled care and inspection to prevent a breakdown or prolong equipment life

- ***Corrective*** - Unscheduled tasks required to restore equipment to operating condition following a breakdown or malfunction

- ***Overhaul*** - Major repairs, alterations, and replacement of parts to restore a unit to service or to correct an operational problem

Preventive maintenance of equipment is generally performed while it is in operation to maintain performance, reduce equipment wear, and extend equipment life. Routine inspection, scheduled lubrication, and minor equipment adjustments are typical preventive maintenance tasks. In general, preventive maintenance does not require removal of the equipment from operation. However, in some cases the removal of equipment components to accomplish the prescribed maintenance during an outage of the equipment may be necessary. Preventive maintenance should be performed in accordance with procedures and schedules recommended by equipment manufacturers in their O&M manuals. See List of Manufacturers' O&M manuals, presented in Appendix B.

Corrective maintenance is required for minor repairs and nonroutine maintenance functions,

such as replacing worn belts, bearings, or brushes after a breakdown, or when routine inspection indicates a need for a corrective task performance to ensure continued reliability of function of the equipment.

Overhaul requires a complete disassembly of a piece of equipment. The equipment is carefully inspected; repaired or replaced in whole or in part, as required; and reassembled, tested, and restored to service. Overhaul usually is a more costly and time-consuming task and is sometimes awarded to an outside contractor to expedite restoration to service of a special equipment item.

6.1.2 **Maintenance Management Plan**

The maintenance management plan consists of the following basic features:

1. Equipment Identification:

    - Equipment Schedule (Table 6-1)

2. Maintenance Planning and Schedule:

    - Maintenance Schedule (Table 6-2)
    - Inspection Log (Table 2-1)

3. Storeroom and Inventory System:

    - Recommended Spare Parts List (Table 6-3)

6.1.2.1 ***Equipment Identification***. The initial step in development of a maintenance management plan consists of a complete inventory schedule of all mechanical and electrical equipment in the plant. To have an effective maintenance plan, records of equipment must be kept to allow access to all pertinent information**.**

6.1.2.2 ***Maintenance Planning and Schedule***. Efficient maintenance requires the proper planning and scheduling of preventive maintenance and, to the extent possible, of corrective maintenance, repairs, and alterations. To facilitate planning and scheduling, a schedule

TABLE 6-1

EQUIPMENT SCHEDULE

DESCRIPTION	MANUFACTURER	MODEL NO.
RW-1S well pump	Grundfos	Redi-Flo 5E5
RW-2D well pump	Grundfos	Redi-Flo 5E5
RW-1S water meter	Badger Meter	25
RW-1D water meter	Badger Meter	25
Bag filter	Carbitrol	PFB-80 (50µ)
Bag filter	Carbitrol	PFB-80 (5µ)
Activated carbon	Calgon	Flowsorb DSR-A
Pressure gauges	Amelek	630
Lights	Day Bright	R41241
Pitless adaptor	Cambell	B-10X
Building	Parkline	Order #70967
Transducer	KSPI	Series 710
Pressure switch	Mercoid	DA-31-153-4
Pump controller	Precision Digital	PD-690-3-17
Annunciator	Precision Digital	PD 141AFO
Warning light	Federal Signal	371L-12-R
Space heater	Chromalox	FP479-1
Control panel	McIntosh Controls*	File No. MCIMILRI-FPL

*Additiona parts/equipment are installed in the panel. Refer to Appendix B.

TABLE 6-2

MAINTENANCE SCHEDULE

Well pumps	Clean at least annually
Transducers	Clean at least annually
Water meters	Clean quarterly
Other equipment	Nonroutine, as needed

TABLE 6-3

RECOMMENDED SPARE PARTS

NO.	ITEM
1	Well pump (spare motor not needed)
1	Drum of activated carbon (required during system startup); the need for a spare drum will be decided after carbon exhaustion rates are more precisely estimated
1 to 10	Bag filter - 50 micron
1 to 10	Bag filter - 5 micron

chart board, work order system, daily or weekly work sheets, and general priority schedule sheet may be used. A well-planned and scheduled program should incorporate the following considerations:

- The manufacturers' O&M manuals are generally the best guide for preventive maintenance instructions and should be used accordingly. The actual frequency of maintenance will conform ***at least*** to the manufacturer's maintenance schedule. However, actual frequency of maintenance for each piece of equipment should be determined based on the plant overall maintenance schedule.

- Preventive maintenance specified by the manufacturer will be scheduled and implemented.

- Routine preventive maintenance tasks should be included as part of the standard operating procedures (SOPs) to the maximum possible extent.

- The maintenance program should consider priority. Overhaul and corrective maintenance are generally of higher priority than preventive as they affect the immediate functioning of the plant. The amount of work and time required for the overhaul and corrective maintenance can be initially estimated based on manufacturer's input and general experience and subsequently modified after sufficient maintenance data are recorded.

- Staffing size and capability must be such that all manufacturer-specified operation and maintenance can be accomplished. Excess work or work beyond normal plant capabilities, due to limitations in expertise, maintenance equipment, and manpower, should be performed by the manufacturer's representative or by an approved contractor.

- The maintenance schedule should be flexible to allow for changes in accordance with immediate needs and conditions. For example, indoor and outdoor tasks should be scheduled so that weather conditions will not affect the progress of maintenance work.

- Seasonal tasks such as snow removal, minor road and walkway repairs, exterior painting, and lawn and landscaping work, and long-term work, such as pavement and road repairing, fencing, and painting, should be considered in the program.

- The ability to handle emergency conditions and repairs should be evaluated. Based on a review of the capabilities of maintenance staff, availability of tools and parts, and possible emergency conditions, the need for assistance from outside contractors can be determined. Advance arrangements for outside assistance should be made.

A schedule for preventive maintenance can be used in scheduling all maintenance work. Preventive maintenance planned for each month can be filled in and moved or rescheduled to another day if corrective or overhead maintenance is required.

6.1.2.3 ***Storeroom and Inventory System***. A storage area should be set up in the treatment building to store spare parts, equipment, special tools, and supplies. Quantities of spare parts, chemicals, and supplies to be maintained depend on the nature of the equipment, delivery time, consumption rate, and plant overall maintenance budget. Stock must be replenished immediately or no longer than 30 days from the date of use. The equipment manufacturer's recommendations are normally the best source of information for determining the needs for spare parts and supplies. See Recommended Spare Parts List, Table 6-3.

6.2 PROTECTIVE COATING

All exposed metal surfaces, both internal or external, must be adequately protected against deterioration due to corrosion. Application of protective coating on exposed surfaces is a common method of corrosion prevention. When installed, all equipment, piping, structural steel, ironwork, and miscellaneous items such as valves, fittings, supports, hangers, etc., are coated with protective paints. These coatings must be carefully maintained. Examination of protective coatings should be part of the routine inspection schedule. Repainting should be done whenever necessary. Quality of the replacement paint should be at least equal to or better than the original coating and applied in complete accordance with the manufacturer's instructions.

6.3 WASTE DISPOSAL/REUSE

The procedures for disposal of used bag filters and carbon are detailed in Chapter 3. All other trash should be bagged and removed from the Site at least monthly.

CHAPTER 7

TROUBLESHOOTING

7.1 GENERAL

This chapter deals with troubleshooting procedures for the Treatment Facility equipment. It is intended to provide a starting point in the troubleshooting process. This information is to be used to determine the symptoms and recommend solutions or appropriate steps to remedy the situation. Each occurrence of a symptom should be logged and dated. The frequency of a particular occurrence should be noted.

Refer to the manufacturers' O&M manuals in Appendix B before attempting any maintenance procedures.

The following is a general list of major equipment and their possible problems and causes:

7.2 FILTRATION SYSTEM

A. *High-Pressure Drop*

1. Clogged bag filters
2. Valves may not be fully opened
3. Obstruction in piping
4. Closed valves

B. *Leaks*

1. Piping leak
2. Gaskets or o-rings not properly seated or worn

7.3 **GRANULAR ACTIVATED CARBON UNITS**

A. *High Pressure*

1. Excessive accumulation of solids on surface of bed within bed
2. Improper operation of upstream pretreatment for particulate removal
3. Air entrapment within bed
4. Gas generation with bed as a result of biological activity
5. Faulty gauge readings
6. Malfunction in process valves after the rebed
7. Restriction in piping

B. *Low Pressure*

1. Rupture
2. Valve leakage

C. *Carbon Fines in Treatment Water*

1. Negative-pressure during draining
2. Faulty screen

D. *Bacterial Action in Beds*

1. Microbial growth

E. *Leakage*

1. High pressure

CHAPTER 8

EMERGENCY RESPONSE PROCEDURES

8.1 PROCESS EMERGENCIES

Process emergencies include equipment failures and various adverse operating conditions. Response to such emergencies is covered in Chapters 3 and 4.

8.2 GENERAL EMERGENCIES

General emergencies, such as power failures and equipment failures, should be responded to by the operator who discovers them if he is knowledgeable of the correct response procedure. For every emergency, someone higher in the chain of command should be notified.

8.3 EMERGENCY TELEPHONE NUMBERS

The following list of emergency telephone numbers has been prepared for the use of the staff in the event of an emergency that requires outside assistance. This list should be reviewed at least annually to verify that the numbers are current.

Telephone Company:	Not applicable; no telephone service	
Electric Company:	New York State Electric & Gas	(800) 572-1131
Water:	Not applicable; no water service	
Medical Emergency:	Putnam Hospital Center Stonleigh Avenue Carmel, NY	(845) 279-5711 Ambulance: 911
Police:	Somers Police Department	Emergency: 911 All other calls: (914) 232-9622
Fire	Fire District Lincolndale	Emergency: 911 All other calls: (914) 248-7411

Poison Control:		1-800-962-1253
Toxic substance spills, oil spills, and pollutant discharges (U.S. Gov't):		(800) 424-8802
New York State Department of Environmental Conservation	To report discharge non-compliance:	(845) 332-1835 (Regional Water Engineer) & (518) 457-7362

CHAPTER 9

SAFETY

9.1 GENERAL

9.1.1 Background

Workers engaged in operations at the Treatment Facility must be trained and certified in accordance with the requirements of 29 CFR 1910.120 - Health & Safety at Hazardous Waste Sites. In keeping with the requirements of this regulation, a Health & Safety Plan (HASP) must be prepared for these operations. A copy of the HASP is presented in Appendix C.

The safety record at wastewater treatment facilities is far poorer than the hazards inherent in operating and maintaining these facilities would indicate. This poor record is attributable to several misconceptions and deficiencies, as follows:

- Management has not taken an aggressive stance in pursuing a safety program and ensuring that work is done safely.
- Personnel do not appreciate the dangers in working with wastewater and mechanical equipment.
- Personnel do not have safety equipment or do not use such equipment.
- Personnel do not follow safety rules either through ignorance or carelessness.

The Occupational Safety and Health Act (OSHA) of 1970 emphasizes that safety should be built into treatment works and that safe practices should become commonplace. Management has a responsibility to set up and run a safety program in conformance with OSHA guidelines and requirements.

9.1.2 Purpose

This chapter outlines the requirements for a comprehensive safety program and summarizes safety procedures and practices. This presentation is intended to be a starting point for developing a safety program. It is the responsibility of the operator to implement a safety program and to

continue to support it.

9.2 **SAFETY PROGRAM**

9.2.1 **Safety Officer**

The operator should assign a safety officer for the treatment plant. The safety officer will have overall charge of the safety program. Ordinarily, the plant superintendent will be the safety officer. The safety officer should have the authority to enforce safety rules and discipline persons who do not follow safety procedures.

9.2.2 **Program Elements**

1. ***Policy.*** A written policy and program should be prepared by management. The safety officer should detail the program to make it specifically applicable to the treatment facility.

2. ***Records.*** A written injury report should be prepared for every injury sustained by anyone at the plant. The injury records should be used to analyze hazards and procedures to improve them so accidents and injuries do not reoccur.

3. ***Safety Inspections.*** Safety inspections should be made periodically but not less than once a year. A report should be prepared, preferably by an outside consultant, identifying hazards and recommending corrective action.

4. ***Safety Training.*** Whenever new procedures, equipment, or processes are introduced at the plant, all personnel should receive training in their proper use. Periodic safety meetings should be held.

5. ***Hazardous Locations.*** The safety officer should maintain and update a record of hazardous locations at the plant and safe procedures to follow in these areas. Employees should be informed of these hazards, and suitable signs and notices should be posted warning of the hazards.

6. ***Enforcement.*** Safety rules should be enforced by all supervisory personnel. Any employee who consistently and repeatedly violates safety rules should be discharged.

7. ***Equipment.*** Management is responsible for maintaining a stock of safety equipment and safe tools for use at the plant.

8. ***Hiring Practices.*** Potential employees should be screened for possible safety problems that could result from improper mental attitude or physical condition.

9. ***Emergency Telephone Numbers.*** The telephone numbers of the nearest fire department, ambulance service, hospital, and doctor should be posted on employee bulletin boards. All employees should be made aware of these outside resources and of the procedures for calling outside assistance.

9.2.3 **Safety References**

The following safety reference should be maintained at the plant site for use by all personnel:

- "Safety in Wastewater Works," Water Pollution Control Federation, Manual of Practice No. 1

Additional references are desirable, as follows:

- "Operation of Wastewater Treatment Plants," Water Pollution Control Federation
- "Safety in the Design, Operation, and Maintenance of Wastewater Treatment Works," U.S. Environmental Protection Agency

9.2.4 **Safety Equipment**

- Gloves
- Hard hats
- Protective glasses

9.2.5 **First Aid**

Introduction

First aid is immediate and temporary care given to the victim of an accident or sudden illness until professional services can be obtained. The primary objective of first aid is to save lives through the prevention of heavy blood loss, maintenance of breathing, prevention of further injury, and prevention of shock.

A first aid program is not a substitute for medical help but rather a supplement until medical help

is obtained.

Program Requirements

Management is responsible for organizing and implementing a first aid program. The program should consist of several elements, as discussed below.

Management should provide first aid training and periodic refresher training to employees. All employees should be trained in the appropriate response when medical help is required. The procedures to follow when calling for medical assistance and emergency phone numbers should be posted in areas frequented by operators so that the required information is on hand when needed.

First aid information must be readily available for employee use. Appendix C contains excerpts of the first aid summary from the 1983 Water Pollution Control Federation Manual of Practice No. 1, updated from the American Red Cross Community First Aid & Safety, Copyright 1993, by the National Red Cross. A first aid kit should be available at least when there are operations (i.e., beyond just reading meters and gauges). Appendix C has a list of recommended contents. Many types of kits are available from various manufacturers. A record should be made each time the kit is used, and it should be restocked as needed.

Chemical Health and Safety

The following chemicals are used in the treatment of groundwater at the Baldwin Place Mall Treatment Facility:

- Activated carbon

Appendix C includes the Material Safety Data Sheet (MSDS) for the activated carbon. The MSDS lists precautionary measures to be taken and emergency treatment or first aid for contact with the specific chemicals.

9.3 **PERSONAL HYGIENE**

Work at a wastewater treatment facility is not inherently more hazardous than at other plants as long as simple rules of hygiene are followed, as stated below:

- Do not smoke while working.
- Wash hands before the end of the work day and before eating or smoking.

9.4 **PERSONNEL PROTECTIVE EQUIPMENT**

Personal protective equipment includes articles such as gloves, hard hats, steel-toed shoes, and coveralls. This equipment is used to protect the body from injury and from offensive or hazardous materials. Hard hats and steel-toed shoes should be worn if construction is underway at the plant or if machinery is being hoisted using the crane and hoist. Safety glasses, gloves, and coveralls should be worn for handling chemicals and other noxious materials. Other safety equipment, such as dust masks for work in dusty areas and rubber gloves and aprons when handling corrosive chemicals, should be worn as appropriate.

9.5 **USE OF TOOLS**

Proper use and handling of tools will prevent many accidents. Basic rules for using and handling tools are as follows:

- Always select the appropriate tools for the job. Never use a makeshift tool.
- Check the condition of a tool before using it, and repair or replace it if it is defective.
- Allow power tools to stop completely before making adjustments. Pull the plug before changing accessories on power tools.
- Do not use tools on moving machinery. Stop the machine before making adjustments.
- Check the clearance at the work place to make sure there is sufficient space to use the tool.
- Have a steady footing so that there is no hazard of slipping, stumbling, or falling.
- Do not wear rings and do not wear loose clothing when working with any power tools.
- Carry sharp or pointed tools in covers. Be sure they are pointed away from the body, in case of a fall.
- Wear eye protection when using impact tools on hard, brittle material.

- After using tools, wipe them clean and place them in their proper places, where they will not be damaged or create a work hazard.

- Do not lay tools on top of step ladders, or in other places from which they might fall on someone below.

- Learn and use the right way to work with all hand tools.

- Use tools made of nonsparking material where fire is a hazard. Do not use electrical tools in the presence of flammable gases.

9.6 **EQUIPMENT OPERATION**

The basic rules for operating equipment are as follows:

- Only authorized employees should operate equipment.

- Be completely familiar with the manufacturer's operating instructions.

- Allow equipment to come to a complete stop before making repairs.

- Follow special safety procedures applicable to each piece of equipment.

- Do not use rotating equipment unless safety guards are in place.

- Use noise protection when working around noisy equipment.

9.7 **REPAIR PRACTICES**

Repairs and maintenance to equipment require that special practices be followed, as described below.

9.7.1 **Prerepair Period**

- Always stop machinery or drivers before cleaning, adjusting, or making any repairs.

- Lock the switch gear in the open position so that no one can start the equipment while it is being worked on. Place a tag on the switch reading "Do

Not Operate," and sign and date the tag.

- Remove guards only after the machinery has stopped.

- Where counterbalanced or weighted devices are used, make certain that the devices are blocked to prevent accidental movement.

- Set up portable blowers or ensure that ventilation is adequate for the repairs being made. See Section 9.9 for working in a confined space.

9.7.2 **Repair Period**

- Verify that lighting is adequate to do the job.

- Maintain sufficient labor and hoisting equipment on the job to handle heavy objects.

- Secure unbolted heavy objects when it is necessary for maintenance personnel to leave the work area.

- Place substantial blocking under any equipment suspended or supported by jacks or a chain hoist before commencing actual work.

- Keep aisles and open spaces on the floor free of tools and other objects.

- Keep goggles within easy reach, and wear them when eye protection is needed.

9.7.3 **Lubrication Practices**

- When lubrication must be done while the equipment is in motion, make certain the lubricant fittings are at least 1 ft (0.33 m) from dangerous moving parts, or extend a pipe from the fitting to a point outside the guard. If these conditions do not exist, stop the machinery prior to lubrication.

- Apply only enough oil or grease to give good lubrication without overflow in order to prevent slippery conditions on the floor.

- If grease or oil is spilled, wipe it up immediately.

- Never point a grease gun at anyone and never shoot grease into the hand.

- Take advantage of each lubrication to inspect the condition of all visible machine parts. Report unsafe conditions at once.

- Replace all guards immediately after lubrication and before starting the equipment.

- Before starting a machine, be certain that personnel are clear of danger and that parts are free to move without damage.

9.7.4 **Use of Solvents**

- Be sure that ventilation is adequate in an area where solvents are to be used. Do not use solvents in confined places (tanks, wet wells, manholes) without good mechanical ventilation.

- If possible, use only solvents having flash points above 38°C (100°F).

- Exercise caution in the use of solvents when their complete composition is not stated on the container.

- Do not use gasoline or other low flash-point or highly toxic cleaning agents without special precautions.

- Keep a suitable fire extinguisher near at hand and ready to use.

- Wear protective equipment when handling solvents.

- Do not smoke when using solvents.

- Call a doctor immediately if a solvent is swallowed.

9.8 **ELECTRICAL EQUIPMENT USE AND REPAIR**

The basic rules for using and repairing electrical equipment follow.

9.8.1 **General Rules**

- Allow only authorized employees to work on electrical equipment.

- Provide adequate illumination, identification, working space, and insulation around all electrical equipment.

- Turn off all electric power, ground all high-voltage points, and make certain power cannot be accidentally restored while working on electrical equipment.

9.8.2 **Switchboards and Panels**

- Provide auxiliary illumination if adequate illumination does not exist for the front of all switchboards and for the back of those that have parts or equipment requiring adjustment, repair, or replacement.

- If clear operating space of adequate size and secure footing about all switchboards and motor control equipment do not exist, use extra care when performing maintenance operations.

- When working on switchboards, use insulating mats on the floor at all times.

- Allow only qualified and authorized personnel access to open switchboards.

- Make certain that all electrical equipment, including switchboard frames, is well grounded at all times.

- Display at all times permanent and conspicuous warning signs for panels carrying more than 600 V.

- Use extreme caution where fully enclosed, shockproof panels do not exist and where such equipment is not provided with interlocks, so that when the power is on the equipment cannot be opened.

- Open, tag ("Do Not Operate"), and lock switches open when anyone is working on the equipment that the switches control.

9.8.3 **Motors**

Generally, safety practices with respect to motors are similar to those for other machinery:

- Before working on a motor, be sure the power is shut off, the master switch is locked open, and it is tagged "Do Not Operate."

- Before starting equipment, be sure that tools and other loose equipment are not left in the motor or any location where they may interfere with operation.

9.9 **CONFINED SPACE ENTRY**

A confined space is an enclosed area into or from which rapid entry or exit is not possible; it has inadequate natural ventilation; it could contain a hazardous atmosphere; and it is not intended for continuous employee occupancy. Manholes, tanks, and wet wells are considered confined spaces. Confined spaces are to be classified as permit-required or non-permit spaces. The well head chambers are only 4 ft deep with 2-ft-diameter access. Vapor accumulation in excess of applicable employee exposure limits is not expected, and if any vapors do accumulate, they would quickly dissipate once the access cover is opened. Accordingly, the chambers are non-permit required confined spaces. The basic access procedure is to wait at least 5 min after removing the cover before entering the chamber.

APPENDIX A

PERMIT-EQUIVALENT DOCUMENTS

Stuart Bassell

From: Stuart Bassell
Sent: Wednesday, March 13, 2002 12:55 PM
To: 'Gianna Aiezza @ NYSDEC'
Subject: Baldwin Place - SPDES permit-equivalent renewal

I received the renewal today. The permit requires that monitoring data be submitted to the Albany O&M support section. In his September 28, 2000 letter to me, George Momberger instructed me to submit all such material directly to Jim Schreyer. Unless I hear from you otherwise, I will continue to do so.

Stuart E. Bassell, P.E.
Project Manager
Lawler, Matusky & Skelly Engineers LLP
One Blue Hill Plaza
Pearl River, NY 10965
phone: 845-735-8300 ext. 258
fax: 845-735-7466
e-mail: SBassell@lmseng.com <mailto:SBassell@lmseng.com>
website: www.lmseng.com <http://www.lmseng.com/>

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 3
21 South Putt Corners Road, New Paltz, New York 12561-1696
Phone: (845) 256-3153 • **FAX:** (845) 255-3414
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

RECEIVED
MAR 13 2002
Lawler, Matusky & Skelly Engineers LLP

722-019
cc: Charles Culver
Phil Sitler
Vince Wahl
Barry Babcock
SEB

March 12, 2002

Stuart E. Bassell, P.E.
Lawler, Matusky & Skelly Engineers
One Blue Hill Plaza
PO Box 1509
Pearl River, NY 10965

Re: SPDES Equivalent Permit Extension
Baldwin Place Shopping Center
Inactive Hazardous Waste Disposal Site No. 3-60-023

Dear Mr. Bassell:

Attached is the SPDES equivalent permit extension for the above referenced site, as requested. Please note that the iron limit and monitoring requirements have been deleted from the permit equivalent. However, because of the magnitude of the flow from the site, monitoring frequencies for outfall 003 have not been relaxed to quarterly, but retained as monthly. Also, please note the addresses for monitoring data and engineering submissions, and include a copy of all submissions to Jim Schreyer at the NYSDEC Region 3 Office.

If you have any questions, please feel free to contact me at (845) 256-3153.

Sincerely,

Gianna Aiezza
Project Manager

cc: R. Pergadia
J. Schreyer
G. Rider
T. Rudolph
A. Eaton
C. Culver, Big V

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning March 1, 2002

and lasting until February 28, 2007
the discharges from the treatment facility to water index number H-31-P44-14-3, Class D tributary of the Muscoot River shall be limited and monitored by the operator as specified below:

Outfall Number and Parameter	Discharge Limitations		Units	Minimum Monitoring Requirements	
	Daily Avg.	Daily Max		Measurement Frequency	Sample Type
Outfall 002 - Treated Groundwater Remediation Discharge: (PLANT 1)					
Flow	Monitor	Monitor	GPD	Continuous	Meter
pH (range)	6 to 9		SU	Quarterly	Grab
Total 1,2 Dichloroethylene		0.010	mg/l	Quarterly	Grab
Methyl tert butyl ether		0.050	mg/l	Quarterly	Grab
Tetrachloroethylene		0.001	mg/l	Quarterly	Grab
Trichloroethylene		0.010	mg/l	Quarterly	Grab

Outfall Number and Parameter	Discharge Limitations		Units	Minimum Monitoring Requirements	
	Daily Avg.	Daily Max		Measurement Frequency	Sample Type
Outfall 003 - Treated Groundwater Remediation Discharge: (PLANT 2)					
Flow	Monitor	Monitor	GPD	Continuous	Meter
pH (range)	6 to 9		SU	Monthly	Grab
Total 1,2-Dichloroethylene		0.010	mg/l	Monthly	Grab
Tetrachloroethylene		0.001	mg/l	Monthly	Grab
Trichloroethylene		0.010	mg/l	Monthly	Grab

Additional Conditions:

(1) Discharge is not authorized until such time as an engineering submission showing the method of treatment is approved by the Department. The discharge rate may not exceed the effective or design treatment system capacity. All monitoring data, engineering submissions and modification requests must be submitted to:

Chief - Operation Maintenance and Support Section
Bureau of Hazardous Site Control
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, N.Y. 12233-7010

With a copy sent to:

Region 3 Water Engineer
NYSDEC Region 3 Suboffice
200 White Plains Road, 5th Floor
Tarrytown, NY 10591-5805

(2) Only site generated wastewater is authorized for treatment and discharge.

(3) Authorization to discharge is valid only for the period noted above but may be renewed if appropriate. A request for renewal must be received 6 months prior to the expiration date to allow for a review of monitoring data and reassessment of monitoring requirements.

(4) Both concentration (mg/l or µg/l) and mass loadings (lbs/day) must be reported to the Department for all parameters except flow and pH.

(5) For Outfall 002: to comply with the monitoring requirements specified above, samples and measurements shall be taken from Activated Carbon treatment system effluent prior to discharge to discharge to the unnamed tributary of the Muscoot River at Latitude 41°20'37" and Longitude 73°45'19".

(6) For Outfall 002, if a discharge limitation for any parameter is exceeded the measurement frequency for all parameters shall be weekly, until a period of 4 consecutive sampling events shows no exceedances at which point quarterly monitoring may resume.

(7) For Outfall 003: to comply with the monitoring requirements specified above, samples and measurements shall taken from shopping center water supply treatment system effluent prior to discharge to the unnamed tributary of the Muscoot River at Latitude 41°20'30" and Longitude 73°45'19".

(8) For Outfall 003, if a discharge limitation for any parameter is exceeded the measurement frequency for all parameters shall be weekly, until a period of 4 consecutive sampling events shows no exceedances at which point monthly monitoring may resume.

(9) Any use of corrosion/scale inhibitors or biocidal-type compounds used in the treatment process must be approved by the department prior to use.

(10) This discharge and administration of this discharge must comply with the attached General Conditions.

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Hazardous Site Control, Room 252
50 Wolf Road, Albany, New York 12233-7010
Phone: (518) 457-8807 • **FAX:** (518) 457-8989
Website: www.dec.state.ny.us

John P. Cahill
Commissioner

cc: 722-016
SEB
Josh Burrow
Vince Uhl
Barry Babcock

SEP 28 2000

Mr. Stuart E. Bassell, P.E.
Lawler, Matussky & Skelly Engineers, LLP
One Blue Hill Plaza
P.O. Box 1509
Pearl River, NY 10965

Dear Mr. Bassell:

RE: Baldwin Place Shopping Center, NYS Site ID 3-60-023

Until further notice Mr. James Schreyer, of our Region 3 office, has been selected to manage O&M for the above referenced project. Please direct all future correspondence to Mr. Schreyer at the address given below.

NYS Department of Environmental Conservation
21 South Putt Corners Road
New Paltz, NY 12561-1696

Should you have any questions, please do not hesitate to contact me at (518) 457-7308.

Sincerely,

George F. Momberger
Environmental Engineer

cc: J. Rider
J. Schreyer

spoke with O&M 10/5/00
confirm that this supercedes
Christiboba Vanderveer letter 4/9/13

BE PART OF THE COUNT
¡SEA PARTE DE LA CUENTA!

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233 -3505

RECEIVED
FEB 11 1997
NYS-DEC
REGION 3-NEW PALTZ

John P. Cahill
Acting Commissioner

To: Ram Pergadia, Division of Environmental Remediation
Region 3, New Paltz

From: Angus Eaton, Chief - Chemical Systems Section, BWP, DOW

Subject: Balwin Place Shopping Center/Big V Supermarkets
Site No. 3-60-023

Date: February 7, 1997

In response to your request dated July 29, 1996 to me, attached please find effluent criteria for the above noted groundwater remediation discharge.

The DOW does not have any regulatory authority over a discharge from a State, PRP, or Federal Superfund Site. DER will be responsible for ensuring compliance with the attached effluent criteria and approval of all engineering submissions. Footnote 1 identifies the Bureau of Site Control as the place to send all effluent results, engineering submissions and modification requests. The Regional Water Engineer should be kept appraised of the status of this discharge and, in accordance with the attached criteria, receive a copy of the effluent results for informational purposes.

If you have any questions, please call me a 7-6717.

Attachments (Effluent Criteria, General Conditions)

cc: Regional Water Engineer (w/Effluent Criteria)
Steve Hammond
A. Eaton, DOW
Al Bromberg, DOW

Post-it® Fax Note 7671	Date	# of pages ▶
To Stu Bassell	From K Pergadia	
Co./Dept.	Co.	
Phone #	Phone #	
Fax #	Fax #	

91-20-2a (1/89)

Site No.: 3 - 60 - 023
Part 1, Page 1 of 2

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning March 1, 1997

and lasting until February 28, 2002

the discharges from the treatment facility to water index number H-31-P44-14-3, Class D tributary of the Muscoot River shall be limited and monitored by the operator as specified below:

Outfall Number and Parameter	Discharge Limitations		Units	Minimum Monitoring Requirements	
	Daily Avg.	Daily Max		Measurement Frequency	Sample Type
Outfall 002 - Treated Groundwater Remediation Discharge: — PUMP & TREAT					
Flow	Monitor	Monitor	GPD	Continuous	Meter
pH (range)	6 to 9		SU	Quarterly	Grab
Total 1,2 Dichloroethylene		0.010	mg/l	Quarterly	Grab
Methyl tert butyl ether		0.050	mg/l	Quarterly	Grab
Tetrachloroethylene		0.010	mg/l	Quarterly	Grab
Trichloroethylene		0.010	mg/l	Quarterly	Grab

Outfall Number and Parameter	Discharge Limitations		Units	Minimum Monitoring Requirements	
	Daily Avg.	Daily Max		Measurement Frequency	Sample Type
Outfall 003 - Treated Groundwater Remediation Discharge:					
Flow	Monitor	Monitor	GPD	Continuous	Meter
pH (range)	6 to 9		SU	Monthly	Grab
Iron (total recoverable)		0.30	mg/l	Monthly	Grab
Total 1,2-Dichloroethylene		0.010	mg/l	Monthly	Grab
Tetrachloroethylene		0.010	mg/l	Monthly	Grab
Trichloroethylene		0.010	mg/l	Monthly	Grab

Additional Conditions:

(1) Discharge is not authorized until such time as an engineering submission showing the method of treatment is approved by the Department. The discharge rate may not exceed the effective or design treatment system capacity. All monitoring data, engineering submissions and modification requests must be submitted to:

Chief - Operation Maintenance and Support Section
Bureau of Hazardous Site Control
Division of Environmental Remediation
NYSDEC
50 Wolf Road
Albany, N.Y. 12233-7010

With a copy sent to:

Joseph Marcogliese
Region 3 Water Engineer
NYSDEC Region 3 Suboffice
200 White Plains Road, 5th Floor
Tarrytown, NY 10591-5805

(2) Only site generated wastewater is authorized for treatment and discharge.

(3) Authorization to discharge is valid only for the period noted above but may be renewed if appropriate. A request for renewal must be received 6 months prior to the expiration date to allow for a review of monitoring data and reassessment of monitoring requirements.

(4) Both concentration (mg/l or µg/l) and mass loadings (lbs/day) must be reported to the Department for all parameters except flow and pH.

(5) For Outfall 002: to comply with the monitoring requirements specified above, samples and measurements shall be taken from Activated Carbon treatment system effluent prior to discharge to discharge to the unnamed tributary of the Muscoot River at Latitude 41°20'37" and Longitude 73°45'19".

(6) For Outfall 002 the minimum measurement frequency for all the parameters (except flow) shall be quarterly following a period of 12 consecutive weekly sampling events showing no exceedances of the stated discharge limitations. If a discharge limitation for any parameter is exceeded the measurement frequency for all parameters shall again be weekly, until a period of 4 consecutive sampling events shows no exceedances at which point quarterly monitoring may resume.

(7) For Outfall 003: to comply with the monitoring requirements specified above, samples and measurements shall be taken from shopping center water supply treatment system effluent prior to discharge to the unnamed tributary of the Muscoot River at Latitude 41°20'30" and Longitude 73°45'19".

(8) For Outfall 003 the minimum measurement frequency for all the parameters (except flow) shall be monthly following a period of 12 consecutive weekly sampling events showing no exceedances of the stated discharge limitations. If a discharge limitation for any parameter is exceeded the measurement frequency for all parameters shall again be weekly, until a period of 4 consecutive sampling events shows no exceedances at which point monthly monitoring may resume.

(9) Any use of corrosion/scale inhibitors or biocidal-type compounds used in the treatment process must be approved by the department prior to use.

(10) This discharge and adminstration of this discharge must comply with the attached General Conditions.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

APPENDIX A

GENERAL CONDITIONS (Consent Orders)*

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* This version of General Conditions is intended to be incorporated as Appendix A of all Consent Orders for site remediation projects where a State Pollutant Discharge Elimination System permit is not required but where the order authorizes the treatment and discharge of wastewaters to the surface or groundwaters of New York State.

1. GENERAL PROVISIONS

a. This order, or a true copy, shall be kept readily available for reference at the wastewater treatment facility.

b. A determination has been made on the basis of a submitted plans, or other available information, that compliance with the provisions specified in this order will reasonably protect classified water use and assure compliance with applicable water quality standards. Satisfaction of these provisions notwithstanding, if operation pursuant to the order causes or contributes to a condition in contravention of State water quality standards, or if the Department determines, on the basis of notice provided by the operator and any related investigation, inspection or sampling, that a modification of the order is necessary to prevent impairment of the best use of the waters or to assure maintenance of water quality standards or compliance with other provisions of ECL, the Department may require such a modification and may require abatement action to be taken by the operator and may also prohibit the noticed act until the order has been modified.

c. All discharges authorized by this order shall be consistent with the terms and conditions of this order. Facility expansion or other modifications, treatment and disposal system changes which will result in new or increased discharges of pollutants into the waters of the state must be reported by submission of a formal request for modification of this order. The discharge of any pollutant, not identified and authorized, or the discharge of any pollutant more frequently than, or at a level in excess of, that identified and authorized by this order shall constitute a violation of the terms and conditions of this order. Facility modifications which result in decreased discharges of pollutants must be reported by submission of written notice to the Department.

d. Where the operator becomes aware that he/she failed to submit any relevant facts or submitted incorrect information prior to or in pursuit of this order or in any report to the Department, the operator shall promptly submit such facts or information.

e. It shall not be a defense for an operator in an enforcement action that it would have been necessary to halt or reduce the authorized activity in order to maintain compliance with the conditions of this order, unless directed by the Department to continue the activity.

f. The filing of a request for a modification of this order, or a notification of planned changes or anticipated noncompliance, does not stay any condition of this order.

g. The operator shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, suspending, or revoking this order, or to determine compliance with this order. The operator shall also furnish to the Department, upon request, copies of records required to be kept by this order.

2. SPECIAL REPORTING REQUIREMENTS

Dischargers must notify the Department as soon as they know or have reason to believe:

a. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant (USEPA Priority Pollutants plus phenols, total) which is not specifically controlled in the order, pursuant to General Provision 1 (c) herein: For the purposes of this section, recurrent accidental or unintentional spills or releases on a frequent basis shall be considered to be a discharge.

b. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the order, if that discharge will exceed five times the maximum concentration value reported for that pollutant in the information submitted prior to this order; or the level established by the Department.

c. That they will begin to use any toxic pollutant which was not reported prior to this order and which is being or may be discharged to waters of the state.

3. EXCLUSIONS

a. The issuance of this order by the Department and the receipt thereof by the operator does not supersede, revoke or rescind an order or modification thereof on consent or determination by the Commissioner issued heretofore by the Department or any of the terms, conditions or requirements contained in such order or modification thereof unless specifically intended by said order.

b. The issuance of this order does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations; nor does it obviate the necessity of obtaining the assent of any other jurisdiction as required by law for the discharge authorized.

c. Unless specifically authorized in this order, the construction of any onshore or offshore physical structures or facilities or the undertaking of any work in any navigable waters is not approved.

4. REPORTING NONCOMPLIANCE

a. Anticipated noncompliance. The operator shall give advance notice to the Department of any planned changes in the authorized facility or activity which may result in noncompliance with this order as soon as the operator becomes aware that non-compliance will be unavoidable.

b. Immediate and twenty-four hour reporting. The operator shall report any noncompliance which may endanger health or the environment. Any unusual situation, caused by a deviation from normal operation or experience (e.g. upsets, bypasses, inoperative treatment process units, spills or illegal chemical discharges or releases to the collection system) which create a potentially hazardous condition shall be orally reported immediately. Other information shall be provided orally within 24 hours from the time he or she becomes aware of the circumstances. A written noncompliance report shall also be provided within five (5) days of the time the operator becomes aware of the circumstances. The written noncompliance report shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent the noncompliance and its reoccurrence.

(1) The following shall be included as information which must be reported within 24 hours under paragraph (b) above:

(I) any unanticipated bypass which violates any effluent limitation in the order;

(II) any upset which violates any effluent limitation in the order;

(III) violation of a maximum daily discharge limitation for any of the pollutants listed by the Department in the order to be reported within 24 hours.

(2) The Department may waive, at their discretion, the written report on a case-by-case basis if the oral report has been received within 24 hours.

(3) Reports required by this section shall be filed with the Department's regional office having jurisdiction over the facility. During weekends and holidays, oral noncompliance reports, required by this paragraph, may be made at (518) 457-7362.

c. Duty to mitigate. The operator shall take all reasonable steps to minimize or prevent any discharge in violation of this order which has a reasonable likelihood of adversely affecting human health or the environment.

5. INSPECTION AND ENTRY

The operator shall allow the Commissioner of the Department, the New York State Department of Health, the County Health Department, or their authorized representatives, upon the presentation of credentials and other documents as may be required by law, to:

a. enter upon the operator's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this order;

b. have access to and copy, at reasonable times, any records that must be kept under the conditions of this order, including records maintained for purposes of operation and maintenance;

c. inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this order, and

d. sample or monitor at reasonable times, for the purposes of assuring compliance with this order or as otherwise authorized by the Environmental Conservation Law, any substances or parameters at any location.

6. SPECIAL PROVISIONS - NEW OR MODIFIED DISPOSAL SYSTEMS

a. Prior to construction of any new or modified waste disposal system or modification of a facility generating wastewater which could alter the design volume of, or the method or effect of treatment or disposing of the wastes from an existing waste disposal system, the operator shall submit to the Department or its designated field office for review, an approvable engineering report, plans, and specifications which have been prepared by a person or firm licensed to practice Professional Engineering in the State of New York.

b. The construction of the above new or modified disposal system shall not start until the operator receives written approval of the system from the Department or its designated field office.

c. The construction of the above new or modified disposal system shall be under the general supervision of a person or firm licensed to practice Professional Engineering in New York State. Upon completion of construction, that person or firm shall certify to the Department or its designated field office that the system has been fully completed in accordance with the approved engineering report, plans and specifications and letter of approval; and the operator shall receive written acceptance of such certificate from the Department or designated field agency prior to commencing discharge.

d. The Department and its designated field offices review wastewater disposal system reports, plans, and specifications for treatment process capability only, and approval by either office does not constitute approval of the system's structural integrity.

7. MONITORING, RECORDING, AND REPORTING

7.1 GENERAL

a. The operator shall comply with all recording, reporting, monitoring and sampling requirements specified in this order and such other additional terms, provisions, requirements or conditions that the Department may deem to be reasonably necessary to achieve the purposes of the Environmental Conservation Law, or rules and regulations adopted pursuant thereto.

b. Samples and measurements taken to meet the monitoring requirements specified in this order shall be representative of the quantity and character of the monitored discharges. Composite samples shall be composed of a minimum of 8 grab samples, collected over the specified collection period, either at a constant sample volume for a constant flow interval or at a flow-proportioned sample volume for a constant time interval, unless otherwise specified in this order. For GC/MS Volatile Organic Analysis (VOA), aliquots must be combined in the laboratory immediately before analysis. At least 4 (rather than 8) aliquots or grab samples should be collected over the specified collection period. Grab sample means a single sample, taken over a period not exceeding 15 minutes.

c. Accessable sampling locations must be provided, maintained and identified by the operator. New sampling locations shall be provided if proposed or existing locations are deemed unsuitable by the Department or its designated field agency.

d. Actual measured values of all positive analytical results obtained above the Practical Quantitation Limit (PQL)[1] for all monitored parameters shall be recorded and reported, as required by this order; except, for parameters which are limited in this order to values below the PQL, actual measured values for all positive analytical results above the Method Detection Limit (MDL)[2] shall be reported.

e. The operator shall periodically calibrate and perform manufacturer's recommended maintenance procedures on all monitoring and analytical instrumentation to insure accuracy of measurements. Verification of maintenance shall be logged into the daily record book(s) of the facility. The operator shall notify the Department's regional office immediately if any required instrumentation becomes inoperable. In addition, the operator shall verify the accuracy of their measuring equipment to the Department's Regional Office annually.

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1 Practical Quantitation Limit (PQL) is the lowest level that can be measured within specified limits of precision and accuracy during routine laboratory operations on most effluent matrices.

2 Method Detection Limit (MDL) is the level at which the analytical procedure referenced is capable of determining with a 99% probability that the substance is present. This value is determined in distilled water with no interfering substances present. The precision at this level is +/- 100%.

7.2 SIGNATORIES AND CERTIFICATION

a. All reports required by this order shall be signed as follows:

(1) for a corporation: by a responsible corporate officer. For the purposes of this section, a responsible corporate officer means:

(i) a president, secretary, treasurer, or a vice president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making function for the corporation, or

(ii) the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars),if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(2) for a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or.

(3) for a municipality, state, federal, or other public agency: by either a principal or executive officer or ranking elected official. For purposes of this section, a principal executive officer of a federal agency includes: (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency; or

(4) a duly authorized representative of the person described in items (1), (2), or (3). A person is a duly authorized representative only if:

(i) the authorization is made in writing by a person described in paragraph (a)(1), (2), or (3) of this section;

(ii) the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and

(iii) the written authorization is submitted to the Department.

b. Changes to authorization: If an authorization under subparagraph (a)(4) of this section is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of subparagrapph (a)(4) of this section must be submitted to the Department prior to or together with any reports, information, or applications to be signed by an authorized representative.

c. Certification: Any person signing a report shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision, in accordance with a system, designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the order or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations."

7.3 RECORDING OF MONITORING ACTIVITIES AND RESULTS

a. The operator shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this order, and records of all data used to complete the application for this order, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Department at any time.

b. Records of monitoring information shall include:

(1) the date, exact place, and time of sampling or measurements;

(2) the individual(s) who performed the sampling or measurements;

(3) the date(s) analyses were performed;

(4) the individual(s) who performed the analyses;

(5) the analytical techniques or methods used; and

(6) the results of such analyses.

7.4 TEST AND ANALYTICAL PROCEDURES

a. Monitoring and analysis must be conducted using test procedures promulgated, pursuant to 40 CFR Part 136, except:

(1) should the Department require the use of a particular test procedure, such test procedure will be specified in this order.

(2) should the operator desire to use a test method not approved herein, prior Department approval is required, pursuant to paragraph (b) of this section.

b. Application for approval of test procedures shall be made to the **Director of DEC's Division of Water**, and shall contain:

(1) the name and address of the applicant or the responsible person making the discharge, identification of this particular order and the telephone number of applicant's contact person;

(2) the names of the pollutants or parameters for which an alternate testing procedure is being requested, and the monitoring location(s) at which each testing procedure will be utilized;

(3) justification for using test procedures, other than those approved in paragraph (a) of this section; and

(4) a detailed description of the alternate procedure, together with:

(i) references to published studies, if any, of the applicability of the alternate test procedure to the effluent in question;

(ii) information on known interferences, if any; and

(5) a comparability study, using both approved and proposed methods. The study shall consist of 8 replicates of 3 samples from a well mixed waste stream for each outfall if less than 5 outfalls are involved, or from 5 outfalls if 5 or more outfalls are involved. Four (4) replicates from each of the samples must be analyzed using a method approved in paragraph (a) of this section, and four replicates of each sample must be analyzed using the proposed method. This results in 24 analyses per outfall up to a maximum of 120 analyses. A statistical analysis of the data must be submitted that shall include, as a minimum:

(i) calculated statistical mean and standard deviation;

(ii) a test for outliers at the mean ± 3 standard deviations level. Where an outlier is detected, an additional sample must be collected and 8 replicates of the sample must be analyzed as specified above;

(iii) a plot distribution with frequency counts and histogram;

(iv) a test for equality among with-in sample standard deviation;

(v) a check for equality of pooled with-in sample variance with an F-Test;

(vi) a t-Test to determine equality of method means; and

copies of all data generated in the study.

Additional information can be obtained by contacting the Bureau of Technical Services & Research (NYSDEC, 50 Wolf Road, Albany, New York 12233 - 3502).

8. DISPOSAL SYSTEM OPERATION AND QUALITY CONTROL

8.1 GENERAL

a. The disposal system shall not receive or be committed to receive wastes from unapproved sources, nor wastes beyond its design capacity as to volume and character of wastes treated, nor shall the system be materially altered as to: type, degree, or capacity of treatment provided; disposal of treated effluent; or treatment and disposal of separated scum, liquids, solids or combination thereof resulting from the treatment process without written approval of the Department of Environmental Conservation or its designated field office.

b. The operator shall, at all times, properly operate and maintain all facilities and systems of treatment and control (or related appurtenances) which are installed or used by the operator to achieve compliance with the conditions of this order. Proper operation and maintenance also includes as a minimum, the following: 1) A preventive/corrective maintenance program. 2) A site specific action orientated operation and maintenance manual for routine use, training new operators, adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of installed backup or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of the order.

c. The operator shall not discharge floating solids or visible foam.

8.2 BYPASS

a. Definitions:

(1) "Bypass" means the intentional or unintentional diversion of waste stream(s) around any portion of a treatment facility for the purpose or having the effect of reducing the degree of treatment intended for the bypassed portion of the treatment facility.

(2) "Severe property damage" means substantial damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which would not reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypass not exceeding limitations:

The operator may allow any bypass to occur which does not cause effluent limitations to be violated, but only if it also is for essential maintenance, repair or replacement to assure efficient and proper operation. These bypasses are not subject to the provisions of pargraph (c) and (d) of this section, provided that written notice is submitted prior to bypass (if anticipated) or as soon as possible after bypass (if unanticipated), and no public health hazard is created by the bypass.

c. Notice:

(1) Anticipated bypass - If the operator knows in advance of the need for a bypass, it shall submit prior written notice, at least forty five (45) days before the date of the bypass.

(2) Unanticipated bypass - The operator shall submit notice of an unanticipated bypass as required in Section 4, paragraph b. of this Part (24 hour notice).

d. Prohibition of bypass:

(1) Bypass is prohibited, and the Department may take enforcement action against a operator for bypass, unless:

(I) bypass was unavoidable to prevent loss of life, personal injury, public health hazard, or severe property damage;

(II) there were no feasible alternatives to the bypass such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal period of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance or if designed and installed backup equipment which could have prevented or mitigated the impact of the bypass is not operating during the bypass; and

(III) the operator submitted notices as required under paragraph (c) of this section and, excepting emergency conditions, the proposed bypass was accepted by the Department.

8.3 UPSET

a. Definition:

"Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with order effluent limitations because of factors beyond the reasonable control of the operator. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

b. Effect of an upset:

An upset constitutes an affirmative defense to an action brought for noncompliance with such order effluent limitations if the requirements of paragraph (c) of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset:

An operator who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operation logs, or other relevant evidence that:

(1) an upset occurred and that the operator can identify the cause(s) of the upset;

(2) the facility was at the time being properly operated; and

(3) the operator submitted notice of the upset as required in Section 4, paragraph b of this part (24 hour notice).

(4) the operator complied with any remedial measures required under Section 4, paragraph d of this part.

d. Burden of proof:

In any enforcement proceeding the operator seeking to establish the occurrence of an upset has the burden of proof.

8.4 SPECIAL CONDITION - DISPOSAL SYSTEMS WITH SEPTIC TANKS

If a septic tank is installed as part of the disposal system, it shall be inspected by the operator or his agent for scum and sludge accumulation at intervals not to exceed one year's duration, and such accumulation will be removed before the depth of either exceeds one-fourth (1/4) of the liquid depth so that no settleable solids or scum will leave in the septic tank effluent. Such accumulation shall be disposed of in an approved manner.

8.5 SLUDGE DISPOSAL

The storage or disposal of collected screenings, sludges, other solids, or precipitates separated from the authorized discharges and/or intake or supply water by the operator shall be done in such a manner as to prevent creation of nuisance conditions or entry of such materials into classified waters or their tributaries, and in a manner approved by the Department. Any live fish, shellfish, or other animals collected or trapped as a result of intake water screening or treatment should be returned to their water body habitat. The operator shall maintain records of disposal on all effluent screenings, sludges and other solids associated with the discharge(s) herein described. The following data shall be compiled and reported to the Department or its designated field office upon request:

a. the sources of the materials to be disposed of;

b. the approximate volumes, weights, water content and (if other than sewage sludge) chemical composition;

c. the method by which they were removed and transported, including the name and permit number of the waste transporter; and

d. their final disposal locations.

APPENDIX B

MANUFACTURERS' OPERATION AND MAINTENANCE MANUALS

APPENDIX B

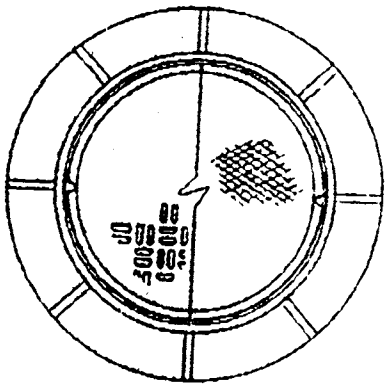
MANUFACTURERS' OPERATION AND MAINTENANCE MANUALS

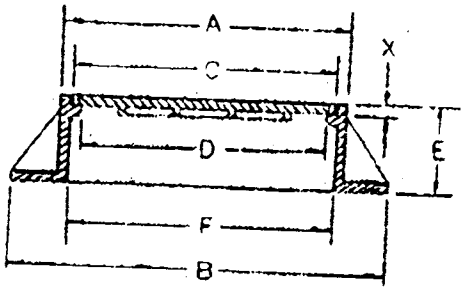
PAGE	DESCRIPTION
1	manhole frame and cover
2 - 13	well pump
14	pitless adaptor
15	torque resistor
16 - 17	water meter
18	pressure gauge
19	ball valve
20	check valve
21	unistrut
22	sample tap (needle valve)
23 - 25	pvc
26	pvc tees and elbows
27	pvc bushings
28 - 29	pvc pressure pipe
30	globe valve
31 - 32	polyethylene pipe
33 - 35	anti-siphon break
36 - 37	hose bib
38 - 41	mercoid pressure switch
42 - 64	transducer
64 - 71	bag filter
72 - 76	activated carbon
77 -86	space heater

87 -88	ceiling light
89 - 90	warning light
91	control panel layout
92	control panel parts list
93	not used
94 - 97	control panel wiring diagram
98 - 99	control panel box
100 – 102D	not used
102F – 102L	circuit breaker
101	frame circuit breaker
102	full voltage starter
103	time delay fuse
104	transformer
105	not used
106	not used
107 - 108	relay
109	selector switch
110	contact block
111	binary switch
112	time delay relay
113	pilot light
114 - 115	elapsed time meter
116 - 147	well controller
148 - 155	annunciator
156 - 159	magnetic contactor and starter
160 - 165	not used
166	not used
167	surge protector

168	liqua-seal connectors
169	conduit clamps
170	flexible steel conduit
171 - 172	conduit
173	junction box
174	pipe clamps
175	straps and hangers
176	electric wire
177	stainless steel rope

GENERAL FOUNDRIES INC.





ITEM NUMBER	DIMENSIONS IN INCHES						
	A	B	C	D	E	F	X
12441*	26-1/2	32	24	22-3/8	4	22-3/8	1-3/8
12461	26-1/2	34	24	22-3/8	6	24	1-3/8
12471	26-3/4	34	24	22-1/2	7	24-7/16	1-3/8
12481	26-1/2	34	24	22-3/8	8	24-5/8	1-3/8
12661	26	34	25-3/4	24	6	26-5/8	1-3/8
12681	27-7/8	34-1/2	25-3/4	24	8	27	1-3/8
13241**	33-3/4	38	32	30-1/4	4	30-1/4	1-1/2
13261	33-3/8	39	31-5/8	29-3/4	6	32-1/2	1-3/4
13271	33-1/2	43	32	30	6-1/2	32	1-1/2
13281	33-5/8	39	31-5/8	29-3/4	8	32-1/2	1-3/4

*REVERSIBLE TYPE FRAME.

**COVER WITH TWO DROP HANDLES BUILT IN.

NOTE: MOST ABOVE ITEMS ARE AVAILABLE IN SEWER, DRAIN, STORM OR NO MARKING.

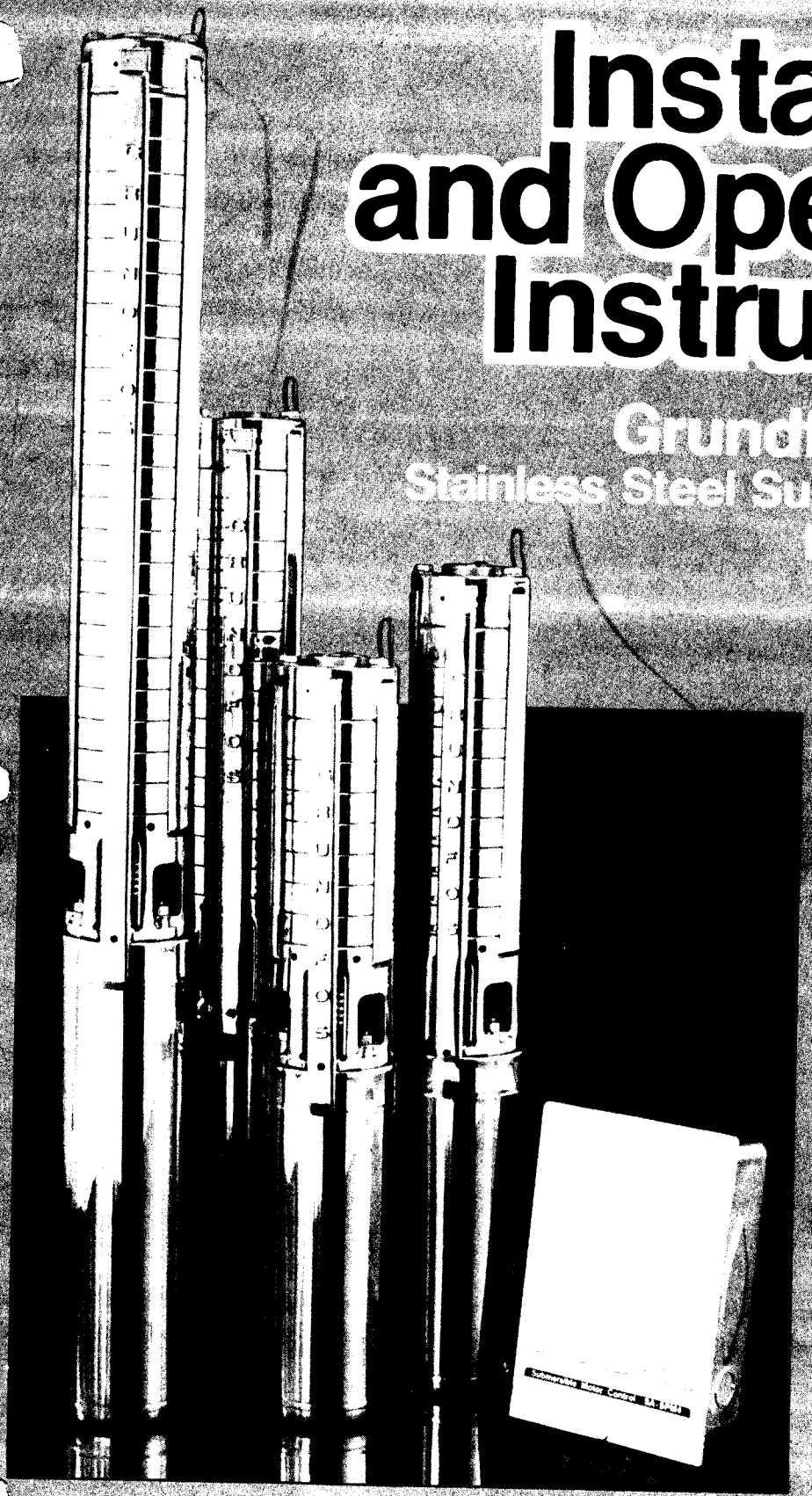
HEAVY DUTY MANHOLE FRAME AND COVER

STRAIGHT TYPE FRAME

SUITABLE FOR A.A.S.H.T.O. H20.S16 HIGHWAY LOADING.

Installation and Operating Instructions

Grundfos Redi-Flo4 Stainless Steel Submersible Pumps for Environmental Applications



1. Shipment Inspection — Page 1
2. Pre-Installation Checklist — Page 1
3. Wire Cable Type — Page 2
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Please leave these instructions with the pump

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Installation and Operating Instructions

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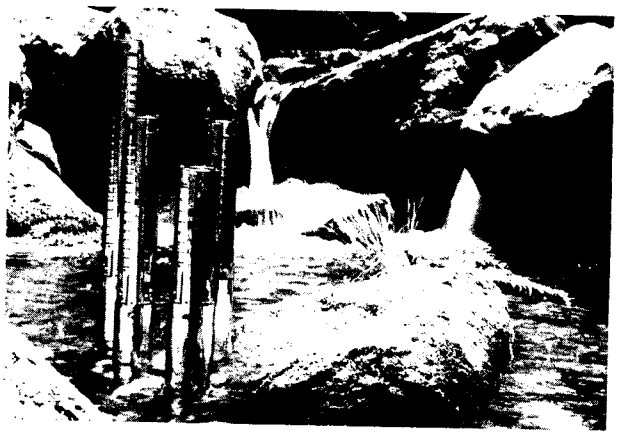
Installation and Operating Instructions

GRUNDFOS

Redi-Flo4

Your Grundfos Redi-Flo4 Environmental Pump is of the utmost quality. Combined with proper installation, your Grundfos pump will give you many years of reliable service.

To ensure the proper installation of the pump, carefully read the complete manual before attempting to install the pump.



SECTION 1.

Shipment Inspection

Examine the components carefully to make sure no damage has occurred to the pump-end, motor, cable or control box during shipment.

This Grundfos Redi-Flo4 Environmental Pump should remain in its shipping carton until it is ready to be installed. The carton is specially designed to protect it from damage. During unpacking and prior to installation, **make sure that the pump is not contaminated, dropped or mishandled.**

The motor is equipped with an electrical cable. **Under no circumstance should the cable be used to support the weight of the pump.**

You will find a loose data plate wired to the pump. It should be securely mounted at the well or attached to the control box.

SECTION 2.

Pre-Installation Checklist

Before beginning installation, the following checks should be made. They are all critical for the proper installation of this submersible pump.

☑ A. CONDITION OF THE WELL

If the pump is to be installed in a new well, the well should be fully developed and bailed or blown free of cuttings and sand. Dispose of discharged materials in accordance with the specific job site requirements. The stainless steel construction of the Redi-Flo4 Environmental Pump makes it resistant to abrasion; however, no pump, made of any material, can forever withstand the destructive wear that occurs when constantly pumping sandy groundwater.

Determine the maximum depth of the well, and the drawdown level at the pump's maximum capacity. Pump selection and setting depth should be based on this data.

The inside diameter of the well casing should be checked to ensure that it is not smaller than the size of the pump and motor.

☑ B. CONDITION OF THE WATER

Redi-Flo4 pumps are designed for pumping cold groundwater that is free of air or gases. Decreased pump performance and life expectancy can occur if the groundwater is not cold or contains air or gases.

☑ C. INSTALLATION DEPTH

Pumping sand or well sediment can occur when the pump motor is installed lower than the top of the well screen or within five feet of the well bottom. This can reduce the performance and life expectancy of the pump and should be avoided.

If the pump is to be installed in a lake, containment pond, tank or larger diameter well, the water velocity passing over the motor must be sufficient to ensure proper motor cooling. The minimum recommended water flow rates which ensure proper cooling are listed in Table A.

☑ D. ELECTRICAL SUPPLY

The motor voltage, phase and frequency indicated on the motor nameplate should be checked against the actual electrical supply.

SECTION 3.

Wire Cable Type

The type of wire used between the pump and control box should be approved for submersible pump applications. The conductor insulation should have a continuous Teflon® jacket with no splices and must be suitable for use with submersible pumps.

SECTION 4.

Installation

The riser pipe or hose should be properly sized and selected based on estimated flow rates and friction-loss factors.

A back-up wrench should be used when attaching a riser pipe or metallic nipple to the pump. The pump should only be gripped by the flats on the top of the discharge chamber. **The body of the pump, cable guard or motor should not be gripped under any circumstance.**

If steel riser pipe is used:

An approved pipe thread compound should be used on all joints. Make sure the joints are adequately tightened in order to resist the tendency of the motor to loosen the joints when stopping and starting.

When tightened, the first section of the riser pipe must not come in contact with the check valve retainer in the discharge chamber of the pump.

After the first section of the riser pipe has been attached to the pump, the lifting cable or elevator should be clamped to the pipe. **Do not clamp the pump.** When raising the pump and riser section, be careful not to place bending stress on the pump by picking it up by the pump-end only.

Make sure that the electrical cables are not cut or damaged in any way when the pump is being lowered in the well.

The drop cable should be secured to the riser pipe at frequent intervals using an approved clip or tape to prevent sagging, looping and possible cable damage.

If plastic or flexible riser pipe is used:

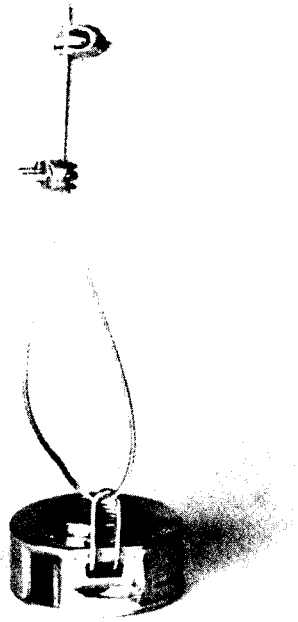
Use the correct compound recommended by the pipe manufacturer or specific job specifications. Besides making sure that joints are securely fastened, the use of a torque arrester is recommended when using these types of pipe.

Do not connect the first plastic or flexible riser section directly to the pump. Always attach a metallic nipple or adapter into the discharge chamber of the pump. When tightened, the threaded end of the nipple or adapter must not come in contact with the check valve retainer in the discharge chamber of the pump.

The drop cable should be secured to the riser pipe at frequent intervals using an approved clip or tape to prevent sagging, looping and possible cable damage.

IMPORTANT- Plastic and flexible pipe tend to stretch under load. This stretching must be taken into account when securing the cable to the riser pipe. Leave enough slack between clips or taped points to allow for this stretching. This tendency for plastic and flexible pipe to stretch will also affect the calculation of the pump setting depth. If the depth setting is critical, check with the manufacturer of the pipe to determine how to compensate for pipe stretch.

When these types of pipe are used, it is recommended that a safety cable be attached to the pump to lower and raise it. The discharge piece of Redi-Flo4 submersibles is designed to accommodate this cable. (Figure 4)



Protect the well from contamination:

While installing the pump, proper care should be used not to introduce foreign objects or contaminants into the well. The well should be finished off above grade to protect against surface water from entering the well, causing contamination.

NOTE: Teflon® is a registered trademark of DuPont.

SECTION 5.

Electrical

WARNING: To reduce the risk of electric shock during operation of this pump requires the provision of acceptable grounding. If the means of connection to the supply connected box is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor, at least the size of the circuit supplying the pump, to the grounding screw provided within the wiring compartment.

All electrical work should be performed by a qualified electrician in accordance with the latest edition of the National Electrical Code, local codes and regulations.

Verification of the electrical supply should be made to ensure the voltage, phase and frequency match that of the motor. Motor voltage, phase, frequency and full-load current information can be found on the nameplate attached to the motor. Motor electrical data can be found in Table C.
If voltage variations are larger than ± 10%, do not operate the pump.
Direct on-line starting is used due to the extremely fast run-up time of the motor (0.1 second maximum), and the low moment of inertia of the pump and motor. Direct on-line starting current (locked rotor amp) is between 4 and 6.5 times the full-load current.

Engine-Driven Generators

If the Redi-Flo4 pump is going to be operated using an engine driven generator, we suggest the manufacturer of the generator be contacted to ensure the proper generator is selected and used. See Table B for generator sizing guide.

Control Box, Single-Phase Motors

Single-phase motors must be connected as indicated in the motor control box. A typical single-phase wiring diagram using a Grundfos control box is shown. (Figure 5-A)

High Voltage Surge Arresters

A high voltage surge arrester should be used to protect the motor against lightning and switching surges. The correct voltage-rated surge arrester should be installed on the supply(line) side of the control box.(Figure 5-B) **The arrester must be grounded in accordance with the National Electric Code, local codes and regulations.**

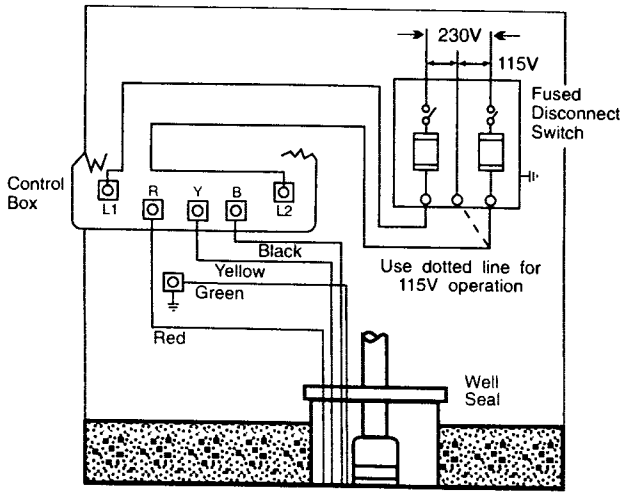
Control Box and Surge Arrester Grounding

The control box shall be permanently grounded in accordance with the National Electrical Code and local codes or regulations. The ground wire should be a bare copper conductor at least the same size as the drop cable wire size. The ground wire should be run as short a distance as possible and be securely fastened to a true grounding point.

True grounding points are considered to be: a grounding rod driven into the water strata, steel well casing submerged into the water lower than the pump setting level, and steel discharge pipes without insulating couplings. If plastic discharge pipe and well casing are used, a properly sized bare copper wire should be connected to a stud on the motor and run to the control panel. Do not ground to a gas supply line. Connect the grounding wire to the ground point first and then to the terminal in the control box.

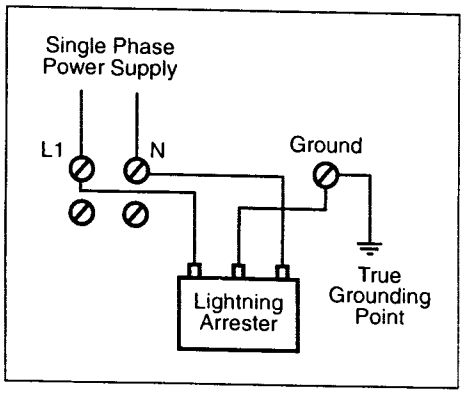
Wiring Checks

Before making the final wiring connections of the drop cable to the control box terminal, it is a good practice to check the insulation resistance to ensure that the cable is good. Measurements for a new installation must be at least 1,000,000 ohm. Do not start the pump if the measurement is less than this. If it is higher, finish wiring and verify that all electrical connections are made in accordance with the wiring diagram. Check to ensure the control box and high voltage surge arrester have been grounded.



Single Phase Wiring Diagram for Grundfos Control Boxes

(Figure 5-A)



Single Phase Hookup

(Figure 5-B)

SECTION 6.

Start-Up

After the pump has been set into the well and the wiring connections have been made, the following procedures should be performed.

A. Attach a temporary horizontal length of pipe with installed gate valve to the riser pipe.

B. If required, make provisions to capture discharged fluids for disposal.

C. Adjust the gate valve one-third open.

D. Start the pump and let it operate until the water runs clear of sand and silt.

E. As the water clears, slowly open the gate valve in small increments until the desired flow rate of clear water is reached. The pump should not be operated beyond its maximum flow rating and should not be stopped until the groundwater runs clear.

F. If the groundwater is clean and clear when the pump is first started, the valve should still be opened until the desired flow rate is reached.

G. Disconnect the temporary piping arrangements and complete the final piping connections.

H. Under no circumstances should the pump be operated for any prolonged period of time with the discharge valve closed. This can result in motor damage due to overheating. A properly sized relief valve should be installed at the well head to prevent the pump from running against a closed valve.

I. Start the pump and test the system. Check and record the voltage and current draw on each motor lead.

Operation

A. The pump and system should be periodically checked for water quantity, pressure, drawdown, periods of cycling, and operation of controls. **Under no circumstances should the pump be operated for any prolonged periods of time with the discharge valve closed.** This can result in motor and pump damage due to overheating.

A properly sized relief valve should be installed at the well head to prevent the pump from running against a closed valve.

B. If the pump fails to operate, or there is a loss of performance, refer to Troubleshooting, Section 7.

SECTION 7.

Troubleshooting

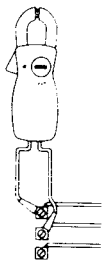
The majority of problems that develop with submersible pumps are electrical, and most of these problems can be corrected without pulling the pump from the well. The following charts cover most of the submersible service work. As with any troubleshooting procedure, start with the simplest solution first; always make all the above-ground checks before pulling the pump from the well.

Usually only two instruments are needed – a combination voltmeter/ammeter, and an ohmmeter. These are relatively inexpensive and can be obtained from most water systems suppliers.

WHEN WORKING WITH ELECTRICAL CIRCUITS, USE CAUTION TO AVOID ELECTRICAL SHOCK. It is recommended that rubber gloves and boots be worn and that care is taken to have metal control boxes and motors grounded to power supply ground or steel drop pipe or casing extending into the well. WARNING: Submersible motors are intended for operation in a well. When not operated in a well, failure to connect motor frame to power supply ground may result in serious electrical shock.

Preliminary Tests

SUPPLY VOLTAGE



How to Measure

By means of a voltmeter, which has been set to the proper scale, measure the voltage at the control box. On single-phase units, measure between line and neutral.

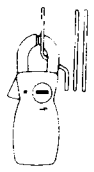
What it Means

When the motor is under load, the voltage should be within ± 10% of the nameplate voltage. Larger voltage variation may cause winding damage.

Large variations in the voltage indicate a poor electrical supply and the pump should not be operated until these variations have been corrected.

If the voltage constantly remains high or low, the motor should be changed to the correct supply voltage.

CURRENT MEASUREMENT



How to Measure

By use of an ammeter, set on the proper scale, measure the current on each power lead at the control box. See the Electrical Data, Table C, for motor amp draw information.

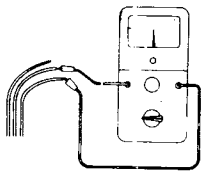
Current should be measured when the pump is operating at a constant discharge pressure with the motor fully loaded.

What it Means

If the amp draw exceeds the listed service factor amps (SFA), check for the following:

1. Loose terminals in control box or possible cable defect. Check winding and insulation resistances.
2. Too high or low supply voltage.
3. Motor windings are shorted.
4. Pump is damaged causing a motor overload.

WINDING RESISTANCE



How to Measure

Turn off power and disconnect the drop cable leads in the control box. Using an ohmmeter, set the scale selectors to Rx1 for values under 10 ohms and and Rx10 for values over 10 ohms.

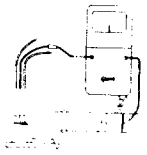
Zero-adjust the meter and measure the resistance between leads. Record the values.

Motor resistance values can be found in the Electrical Data, Table C. Cable resistance values are in Table D.

What it Means

If all the ohm values are normal, and the cable colors correct, the windings are not damaged. If any one ohm value is less than normal, the motor may be shorted. If any one ohm value is greater than normal, there is a poor cable connection or joint. The windings or cable may also be open. If some of the ohm values are greater than normal and some less, the drop cable leads are mixed. To verify lead colors, see resistance values in Electrical Data, Table C.

INSULATION RESISTANCE



How to Measure

Turn off power and disconnect the drop cable leads in the control box. Using an ohm or mega ohmmeter, set the scale selector to Rx100K and zero-adjust the meter.

Measure the resistance between the lead and ground (discharge pipe or well casing, if steel).

What it Means

For ohm values, refer to table below. Motors of all Hp, voltage, phase and cycle duties have the same value of insulation resistance.

OHM VALUE	MEGAOHM VALUE	CONDITION OF MOTOR AND LEADS
		Motor not yet installed:
2,000,000 (or more)	2.0	New Motor
1,000,000 (or more)	1.0	Used motor which can be reinstalled in the well.
		Motor in well (Ohm readings are for drop cable plus motor):
500,000 - 1,000,000	0.5 - 1.0	A motor in reasonably good condition.
20,000 - 50,000	0.02 - 0.5	A motor which may have been damaged by lightning or with damaged leads. Do not pull the pump for this reason.
10,000 - 20,000	0.01 - 0.02	A motor which definitely has been damaged or with damaged cable. The pump should be pulled and repairs made to the cable or the motor replaced. The motor will still operate, but probably not for long.
less than 10,000	0 - 0.01	A motor which has failed or with completely destroyed cable insulation. The pump must be pulled and the cable repaired or the motor replaced. The motor will not run in this condition.

Troubleshooting Chart

FAULT	POSSIBLE CAUSES	HOW TO CHECK	HOW TO CORRECT
A. Pump Does Not Run	**1.** No power at pump panel.	Check for voltage at panel.	If no voltage at panel, check feeder panel for tripped circuits.
	2. Fuses are blown or circuit breakers are tripped.	Remove fuses and check for continuity with ohmmeter.	Replace blown fuses or reset circuit breaker. If new fuses blow or circuit breaker trips, the electrical installation and motor must be checked.
	3. Defective controls.	Check all safety and pressure switches for operation. Inspect contact in control devices.	Replace worn or defective parts.
	4. Motor and/or cable are defective.	Turn off power. Disconnect motor leads from control box. Measure the lead to lead resistances with the ohmmeter (Rx1). Measure lead to ground values with ohmmeter (Rx100K). Record measured values.	If open motor winding or ground is found, remove pump and recheck values at the surface. Repair or replace motor or cable.
	5. Defective capacitor.	Turn off the power, then discharge capacitor. Disconnect leads and check with an ohm-meter (Rx100K). When meter is connected, the needle should jump forward and slowly drift back.	If there is no needle movement, replace the capacitor.
B. Pump Runs But Does Not Deliver Water	**1.** Groundwater level in well is too low or well is collapsed.	Check well drawdown.	Lower pump if possible. If not, throttle discharge valve and install water level control.
	2. Integral pump check valve is blocked.	Install pressure gauge, start pump, gradually close the discharge valve and read pressure at shut-off. After taking reading, open valve to its previous position. Convert PSI to feet (For water: PSI x 2.31 ft/PSI = _____ ft.), and add to this the total vertical distance from the pressure gauge to the water level in the well while the pump is running. Refer to the specific pump curve for the shut-off head for that pump model. If the measured head is close to the curve, pump is probably OK.	If not close to the pump curve, remove pump and inspect discharge section. Remove blockage, repair valve and valve seat if necessary. Check for other damage. Rinse out pump and reinstall.
	3. Inlet strainer is clogged.	Same as B.2 above.	If not close to the pump curve, remove pump and inspect. Clean strainer, inspect integral check valve for blockage, rinse out pump and reinstall.
	4. Pump is damaged.	Same as B.2 above.	If damaged, repair as necessary. Rinse out pump and reinstall.
C. Pump Runs But at Reduced Capacity	**1.** Drawdown is larger than anticipated.	Check drawdown during pump operation.	Lower pump if possible. If not, throttle discharge valve and install water level control.
	2. Discharge piping or valve leaking.	Examine system for leaks.	Repair leaks.
	3. Pump strainer or check valve are clogged.	Remove pump and inspect.	Clean, repair, rinse out pump and reinstall.
	4. Pump worn.	Same as B.2 above.	If not close to pump curve, remove pump and inspect.

Troubleshooting (continued)

FAULT	POSSIBLE CAUSES	HOW TO CHECK	HOW TO CORRECT
D. Pump Cycles Too Much	**1.** Pressure switch is not properly adjusted or is defective.	Check pressure setting on switch and operation. Check voltage across closed contacts.	Re-adjust switch or replace if defective.
	2. Level control is not properly set or is defective.	Check setting and operation.	Re-adjust setting (refer to manufacturer data). Replace if defective.
	3. Plugged snifter valve or bleed orifice.	Examine valve and orifice for dirt or corrosion.	Clean and/or replace if defective.
E. Fuses Blow or Circuit Breakers Trip	**1.** High or low voltage.	Check voltage at pump panel. If not within ± 10%, check wire size and length of run to pump panel.	If wire size is correct, contact power company. If not, correct and/or replace as necessary.
	2. Control box wiring and components.	Check that control box parts match the parts list. Check to see that wiring matches wiring diagram. Check for loose or broken wires or terminals.	Correct as required.
	3. Defective capacitor.	Turn off power and discharge capacitor. Check using an ohmmeter (Rx100K). When the meter is connected, the needle should jump forward and slowly drift back.	If no meter movement, replace the capacitor.
	4. Starting relay (Franklin single phase motors only).	Check resistance of relay coil with an ohmmeter (Rx1000). Check contacts for wear.	Replace defective relay.

Table A

Minimum Water Flow Requirements for Submersible Pump Motors

MOTOR DIAMETER	CASING OR SLEEVE I.D. IN INCHES	MIN. FLOW PAST THE MOTOR (GPM)
4"	4	1.2
	5	7
	6	13
	7	21
	8	30

NOTES: 1. A flow inducer or sleeve must be used if the water enters the well above the motor or if there is insufficient water flow past the motor.

2. The minimum recommended water velocity over 4" motors is 0.25 feet per second.

Table B

Guide for Engine-Driven Generators in Submersible Pump Applications

	MINIMUM KILOWATT RATING OF GENERATOR FOR THREE-WIRE SUBMERSIBLE PUMP MOTORS	
MOTOR HP	EXTERNALLY REGULATED GENERATOR	INTERNALLY REGULATED GENERATOR
0.33 HP	1.5 KW	1.2 KW
0.50	2.0	1.5
0.75	3.0	2.0
1.0	4.0	2.5
1.5	5.0	3.0

NOTES:

1. Table is based on typical 80°C rise continuous duty generators with 35% maximum voltage dip during start-up of single phase motors.
2. Contact the manufacturer of the generator to assure the unit has adequate capacity to run the submersible motor.
3. If the generator rating is in KVA instead of kilowatts, multiply the above ratings by 1.25 to obtain KVA.

Table C

Electrical Data - 60 Hz Submersible Pump Motors

GRUNDFOS MOTORS

4 Inch (Two Wire) Motors - Control Box Not Required

60 Hz

HP	Ph	VOLT	Ser. Fact.	Circ. Brk. or Stnd. Fuse	Dual Element Fuse	AMPERAGE Full Load	AMPERAGE Lock Rotor	AMPERAGE S.F. Amps	FULL LOAD Eff.	FULL LOAD Power Factor	Line-to-Line Resistance(Ohms) Blk-Yel Delta	Line-to-Line Resistance(Ohms) Red-Yel Delta	KVA Code **	Maximum Thrust (lbs)	GRUNDFOS PART NO.
SINGLE PHASE															
1/3	1	230	1.75	15	5	3.0	25.5	4.4	47.3	63.0	6.8-8.2		S	750	79.952301
1/2	1	230	1.60	15	7	4.3	34.5	5.9	50.6	64.7	5.2-6.3		R	750	79.952302
3/4	1	230	1.50	20	9	6.6	40.5	8.0	57.0	70.0	3.2-3.8		N	750	79.952303
1	1	230	1.40	25	12	8.0	47.4	9.6	59.8	74.3	2.5-3.1		M	750	79.952304
1 1/2	1	230	1.30	35	15	10.6	60.8	13.1	64.3	77.2	1.9-2.3		L	750	79.952305

4 Inch (Three Wire) Motors

SINGLE PHASE

1/3	1	230	1.75	15	5	3.0	14.0	4.4	47.0	63.0	6.8-8.3	17.3-21.1	L	750	79.453301
1/2	1	230	1.60	15	7	4.3	20.0	5.9	50.7	64.6	4.7-5.7	15.8-19.6	L	750	79.453302
3/4	1	230	1.50	20	9	6.6	30.8	8.0	57.3	70.0	3.2-3.9	14-17.2	L	750	79.453303
1	1	230	1.40	25	12	8.0	36.3	9.6	59.8	74.5	2.6-3.1	10.3-12.5	K	750	79.453304
1 1/2	1	230	1.30	30	15	9.7	44.0	11.5	67.5	84.1	1.9-2.3	7.8-9.6	H	750	79.453305

Franklin Motors

(refer to the Franklin Submersible Motors Application Maintenance Manual)

Table D
Total Resistance of Drop Cable (OHMS)

The values shown in this table are for copper conductors. Values are for the total resistance of drop cable from the **Control box to the motor and back.**

To determine the resistance:

1. Disconnect the drop cable leads from the control box.
2. Record the size and length of drop cable.
3. Determine the cable resistance from the table.
4. Add drop cable resistance to motor resistance. Motor resistances can be found in the Electrical Data Chart, Table C.
5. Measure the resistance between each drop cable lead using an ohmmeter. Meter should be set on Rx1 and zero-balanced for this measurement.
6. The measured values should be approximately equal to the calculated values.

Wire Resistances

Distance From Control Box to Pump Motor (FT.)	12 AWG Wire Resistance (OHMS)	14 AWG Wire Resistance (OHMS)
10	0.03	0.05
20	0.06	0.10
30	0.10	0.15
40	0.13	0.21
50	0.16	0.26
60	0.19	0.31
70	0.23	0.36
80	0.26	0.41
90	0.29	0.46
100	0.32	0.51
110	0.36	0.57
120	0.39	0.62
130	0.42	0.67
140	0.45	0.72
150	0.49	0.77
160	0.52	0.82
170	0.55	0.87
180	0.58	0.93
190	0.62	0.98
200	0.65	1.03

Redi-Flo4

LIMITED WARRANTY

Redi-Flo4 Environmental Pumps manufactured by GRUNDFOS Pumps Corporation (GRUNDFOS) are warranted to the original user only to be free of defects in material and workmanship for a period of 18 months from date of installation, but not more than 24 months from date of manufacture. GRUNDFOS' liability under this warranty shall be limited to repairing or replacing at GRUNDFOS' option, without charge, F.O.B. GRUNDFOS' factory or authorized service station, any product of GRUNDFOS manufacture. GRUNDFOS will not be liable for any costs of removal, installation, transportation, or any other charges which may arise in connection with a warranty claim. Products which are sold but not manufactured by GRUNDFOS are subject to the warranty provided by the manufacturer of said products and not by GRUNDFOS' warranty. GRUNDFOS will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with GRUNDFOS' printed installation and operating instructions.

To obtain service under this warranty, the defective product must be returned to the distributor or dealer of GRUNDFOS products from which it was purchased together with proof of purchase and installation date, failure date, and supporting installation data. Unless otherwise provided, the distributor or dealer will contact GRUNDFOS or an authorized service station for instructions. Any defective product to be returned to GRUNDFOS or a service station must be sent freight prepaid; documentation supporting the warranty claim and/or a Return Material Authorization must be included if so instructed.

GRUNDFOS WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, OR EXPENSES ARISING FROM INSTALLATION, USE OR ANY OTHER CAUSES. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH EXTEND BEYOND THOSE WARRANTIES DESCRIBED OR REFERRED TO ABOVE.

Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages and some jurisdictions do not allow limitations on how long implied warranties may last. Therefore, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.

GRUNDFOS

GRUNDFOS PUMPS CORPORATION • 2555 Clovis Avenue • Clovis, CA • 93612
Area Centers: Allentown, PA • Atlanta, GA • Chicago, IL • Clovis, CA • Dallas, TX • Seattle, WA
(800) 333-1366 • FAX (800) 333-1363
Canada: Mississauga, Ontario • **Mexico:** Apodaca, N.L.

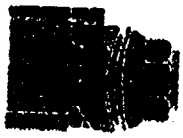
LRF-IO-001 | Rev. 1/97
PRINTED IN USA

Campbell
Pitless Adapters

M1

part	drop pipe	casing o.d.	with suspart**	master ctn
B-10	1	5-9/16 to 7	970	12
B-80	1	8-5/8	970	6
B-20	1-1/4	5-9/16 to 7	800	6
B-120	1-1/4	8-5/8	800	6
SP-10*	1	5-9/16 to 7	970	12
BP-20*	1-1/4	5-9/16 to 7	800	6
B-10X	1	5-9/16 to 7	970	12
B-80X	1	8-5/8	970	6
B-20X	1-1/4	5-9/16 to 7	800	6
B-120X	1-1/4	8-5/8	800	6
BP-10X*	1	5-9/16 to 7	970	12
BP-20X*	1-1/4	5-9/16 to 7	800	6

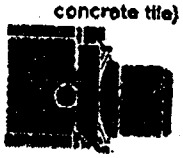
PITLESS ADAPTER (B-series)



U.S. PAT. NO. 3,847,217

BF-10	1	-	970	12
BF-10X	1	-	970	12
BF-20	1-1/4	-	800	6
BF-20X	1-1/4	-	800	6

PITLESS ADAPTER (BF-series for concrete tile)

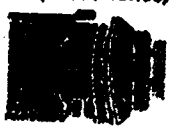


Concrete Tile models do not include external gasket, collar, or nut.

U.S. PAT. NO. 3,847,217

B-300	1	5-9/16 to 7	800	12
B-380X	1	8-5/8	800	12

PITLESS ADAPTER (B-300 series)



U.S. PAT. NO. 3,847,217

features

- All-American, highest-quality certified red-brass castings and precision machining for years of dependable service.
- Funnel-top female casting and tapered male slide for easier mating in well.
- Unique flanged gasket/collar seals tightly against casing and nipple
- Your choice of replacement leather seals or Teflon coated O-rings (X-models).

part	catalog page	for these pitless adapters:
OR26T	M1	B-10X, B-80X, BP-10X, BF-10X
	M2	S-10X, SP-10X, SF-10X
	M3	BA-10X, BA-80X, BAP-10X, BC-10X BC-80X, BCP-10X, JB-55X, JB-75X
OR27T	M1	B-20X, B-120X, BP-20X, BF-20X
	M2	S-20X, SP-20X, SF-20X
	M3	JB-55X, JB-75X
OR28T	M2	S-70X, S-130X, S-140X, SP-70X, SF-70X
OR34T	M1	B-300X, B-380X

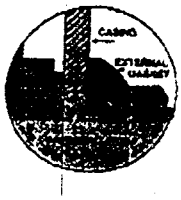
REPLACEMENT PRESSURE SEAL O-RING

L-1	M1	B-10, B-80, BP-10, BF-10
	M2	S-10,S-50,S-80,SP-10, SF-10
	M3	JB-55, JB-75
L2	M1	B-20, B-120, BP-20, BF-20
	M2	S-20, S-60, S-120, SP-20, SF-20
	M3	JB-55, JB-75
L3	M2	S-70, S-130, S-140, SP-70, SF-70

REPLACEMENT PRESSURE SEAL LEATHER

* For installations requiring a pressurized point of attachment, a small hole between internal and external seals is utilized to maintain positive pressure at seal.

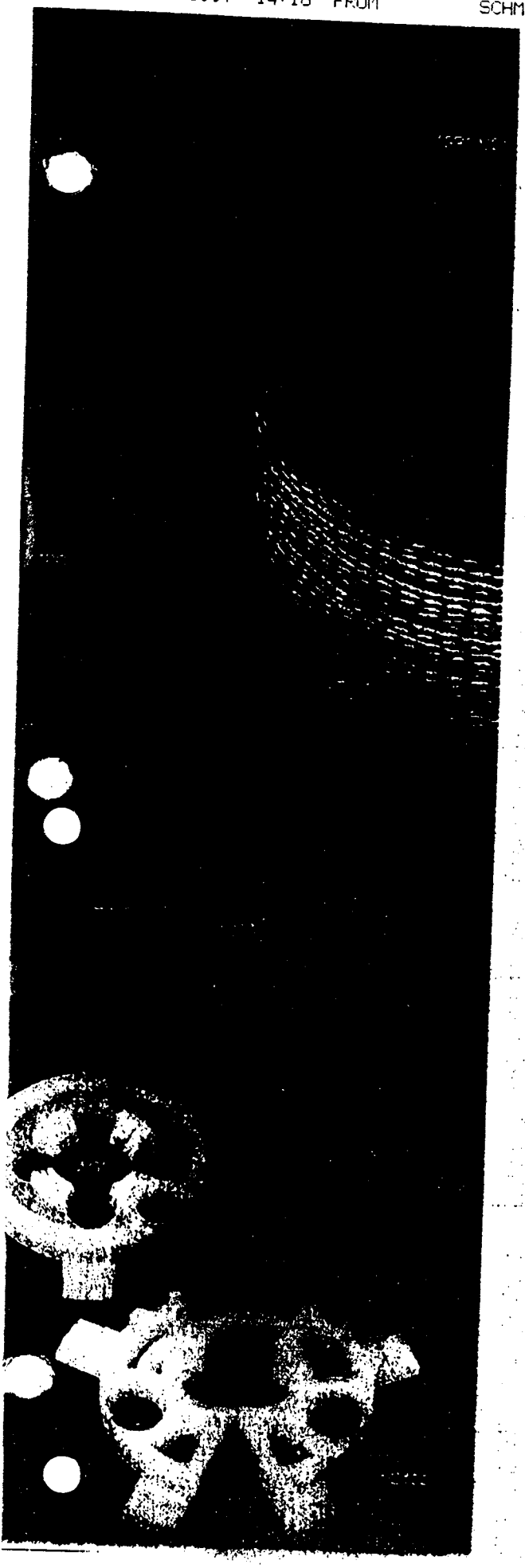
** Feet of Schedule 40 steel pipe filled with water.



Certified by Pitless Adapter Division of Water Systems Council (PAS-1 and PAS-2).

Campbell Manufacturing, Inc.
Spring & Railroad Streets
Bechtelsville, PA 19505
800-523-0224, Fax 610-369-3580

9563288 P.03
SCHMIDT'S WHOLESALE TO



Campbell
Installation Accessories

part	drop pipe	casing i.d	pcs/pkg
WG100	1	4 to 6	48
WG125	1-1/4	4 to 6	48

SELF-CLAMPING WIRE & PIPE PROTECTOR

Slips around pipe where needed, squeezes together with a pair of pliers and stays put...without tape or hose clamps. Won't slip, slide, float or tilt.

- Molded, one-piece construction of virgin thermoplastic resin.
- Two large, snap-in holes to isolate wire and safety rope.
- Smooth edges to avoid damage to electrical cable.
- Open areas in design prevent "piston action" when pulling pump.
- Ready for use in 6" well casings (adaptable to 4" and 5" installations by cutting off tabs).
- Fits standard galvanized pipe and 125-200 lb. poly pipe.

US PAT NO 4 483 395
CAN PAT NO 1,205,738

WG6	1 or 1-1/4	4 to 6	100

SNAP-IN CABLE GUARD

Molded polyethylene cable guards protect submersible wire from abrading against sides of well. Easy snap-in feature eliminates need for "fishing" wires through holes.

TS48*	1 or 1-1/4	4 to 8	12	**TORQUE STOP (flexible pvc)**
TS48B	1 or 1-1/4	4 to 8	Bulk	

*Includes 2 stainless steel clamps

Installed directly above submersible pump to protect pump from starting torque damage. Injection molded from FDA-approvable PVC.

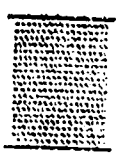
TRC*	1 or 1-1/4	4 to 8	28	**TORQUE RESISTOR (buna-n rubber)**
TRCB	1 or 1-1/4	4 to 8	Bulk	

*Includes 2 stainless steel clamps.

Installed directly above submersible pump to protect pump from starting torque damage.

part	type	length	pcs/pkg
BSR500	braided	500 ft.	1
BSR1000	braided	1000 ft.	1
BSR3000	braided	3000 ft	1
TSR500	twisted	500 ft.	1
TSR1000	twisted	1000 ft.	1
TSR3000	twisted	3000 ft.	1

SAFETY ROPE



All rope is 1/4" polypropylene, tested to exceed 1000 lbs.

Campbell Manufacturing, Inc.
Spring & Railroad Streets
Bechtelsville, PA 19505
800-523-0224, Fax 610-369-3580

Drawing #3

VALUE = QUALITY • CUSTOMER SERVICE • FAIR PRICE

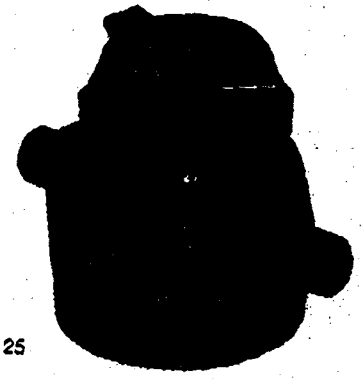
RD-T-5/8 PL

1-93

Size 5/8" (DN 15mm) Recordall® Cold Water Thermoplastic Disc Meter

BadgerMeter
Utility Division

TECHNICAL BRIEF



Model 25

SPECIFICATIONS

Typical Operating Range (100% ± 1.5%)	1/2 - 25 GPM (1.9 to 95 l/m)
Low Flow (Min. 98.5%)	1/4 GPM (1.0 l/m)
Maximum Continuous Operation	15 GPM (57 l/m)
Pressure Loss at Maximum Continuous Operation	4.2 PSI at 15 GPM (0.29 bar at 57 l/m)
Maximum Operating Temperature	80°F (26°C)
Maximum Operating Pressure	150 PSI (10 bar)
Measuring Element	Nutating disc, positive displacement
Register Type	Straight reading, permanently sealed magnetic drive standard. Remote reading or Automatic Meter Reading units optional.
Register Capacity	10,000,000 Gallons, 1,000,000 Cubic Feet, 100,000 m^3. 6 odometer wheels.
Meter Connections	Available in bronze and thermoplastic to fit 5/8" spud thread bore diameter sizes. See table below.

METER SPUD AND CONNECTION SIZES

Size Designation	x	"L" Laying Length	"B" Bore Dia.	Coupling Nut and Spud Thread	Tailpiece Pipe Thread (NPT)
5/8"	x	7½"	5/8"	3/4" (5/8")	1/2"

MATERIALS

Meter Housing	Thermoplastic
Housing Bottom Plate	Thermoplastic
Measuring Chamber	Thermoplastic
Disc	Thermoplastic
Strainer	Thermoplastic
Disc Spindle	Stainless Steel
Magnet	Ceramic
Magnet Spindle	Stainless Steel
Register Lid and Shroud	Thermoplastic
Generator Housing	Thermoplastic

DESCRIPTION

APPLICATIONS: For use in measurement of potable cold water in residential, commercial and industrial services where flow is in one direction only.

OPERATION: Water flows through the meter's strainer and into the measuring chamber where it causes the disc to nutate. The disc, which moves freely, nutates on its own ball, guided by a thrust roller. A drive magnet transmits the motion of the disc to a follower magnet located within the permanently sealed register. The follower magnet is connected to the register gear train. The gear train reduces the disc nutations into volume totalization units displayed on the register dial face.

OPERATING PERFORMANCE: The Badger Recordall Disc meters meet or exceed registration accuracy for the low flow rates (95%), normal operating flow rates (100 ± 1.5%), and maximum continuous operation flow rates as specifically stated by AWWA Standard C710.

CONSTRUCTION: Badger Recordall Disc meter construction, which complies with ANSI/AWWA standard C710, consists of three basic components: meter housing, measuring chamber, and permanently sealed register. The water meter is thermoplastic with externally-threaded spuds. A corrosion-resistant thermoplastic material is used for the measuring chamber.

To simplify maintenance, the register, measuring chamber, and strainer can be replaced without removing the meter housing from the installation. No change gears are required for accuracy calibration. Interchangeability of parts among like-sized meters also minimizes spare parts inventory investment.

MAGNETIC DRIVE: Direct magnetic drive, through the use of high-strength magnets, provides positive, reliable and dependable register coupling for straight-reading, remote or automatic meter reading options.

SEALED REGISTER: The standard register consists of a straight-reading odometer-type totalization display, 360° test circle with center sweep hand and flow finder to detect leaks. Register gearing consists of self-lubricating thermoplastic gears to minimize friction and provides long life. Permanently sealed; dirt, moisture, tampering and lens fogging problems are eliminated. Multi-position register simplifies meter installation and reading. Generator-type remote reading and automatic meter reading systems are available for all Recordall Disc meters. (See back of sheet for additional information.) All reading options are removable from the meter without disrupting water service.

TAMPER-PROOF FEATURES: Customer removal of the register to obtain free water can be prevented when the optional tamper-detection seal wire screw or TORX® tamper resistant seal screw is added to the meter. Both can be installed at the meter site or at the factory.

MAINTENANCE: Badger Recordall Disc meters are designed and manufactured to provide long-term service with minimal maintenance. When maintenance is required, it can be performed easily either at the meter installation or at any other convenient location. As an alternative to repair by the utility, Badger offers various maintenance and meter component exchange programs to fit the needs of the utility.

CONNECTIONS: Tailpieces/Unions for installations of meters on various pipe types and sizes, including misaligned pipes, are available as an option.

DRAWING #3

Remote/Automatic Meter Reading Systems

Remote Reading

The Badger ROM system generates and transmits an electrical pulse up to 5000 feet from the meter to a remote totalizer register without use of external power. See reference chart ROM-1-3. The generator which incorporates test circle and odometer-type totalizer is submersible. The remote register design permits resetting to any desired reading in the field and can be sealed to prevent tampering. See Bulletin ROM-T-5 for detail.

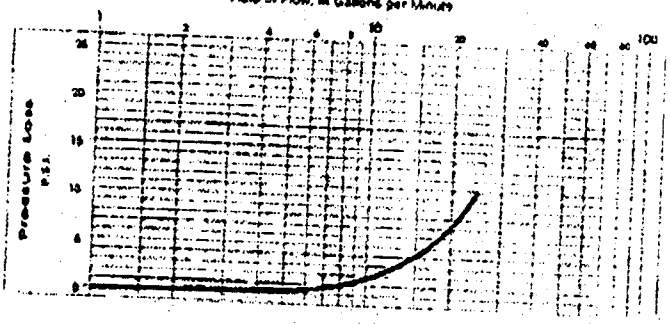
AMR

The TRACE® radio frequency system or the ACCESSplus® telephone system easily integrate with all Recordall Disc meters. Both technologies provide an efficient meter data retrieval and information management system. The TRACE Transponder and ACCESSplus Remote Module connect to the High Resolution Transmitter register assembly. Complete turnkey systems, including hardware and software, are available to provide a wide range of meter reading information. See Bulletins G-101 (TRACE) and G-102 (ACCESSplus) for details.

TRACE® is a registered trademark of American Meter Company.

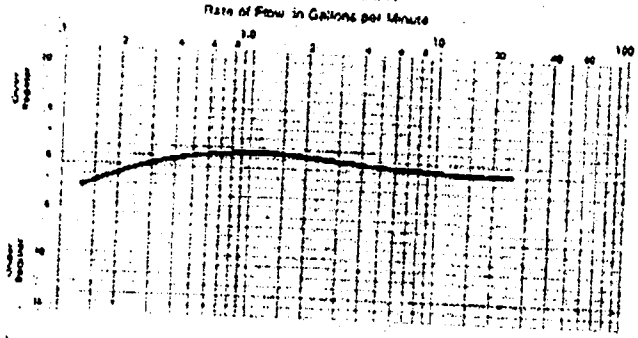
PRESSURE LOSS CHART

Rate of Flow, in Gallons per Minute



ACCURACY CHART

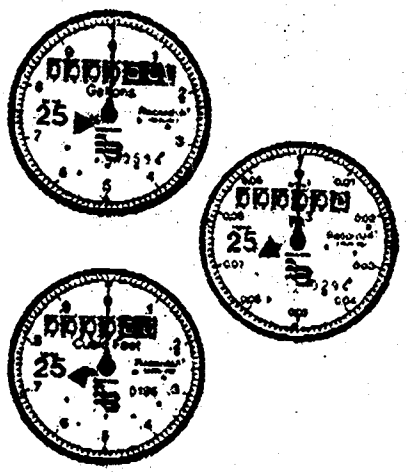
Rate of Flow in Gallons per Minute

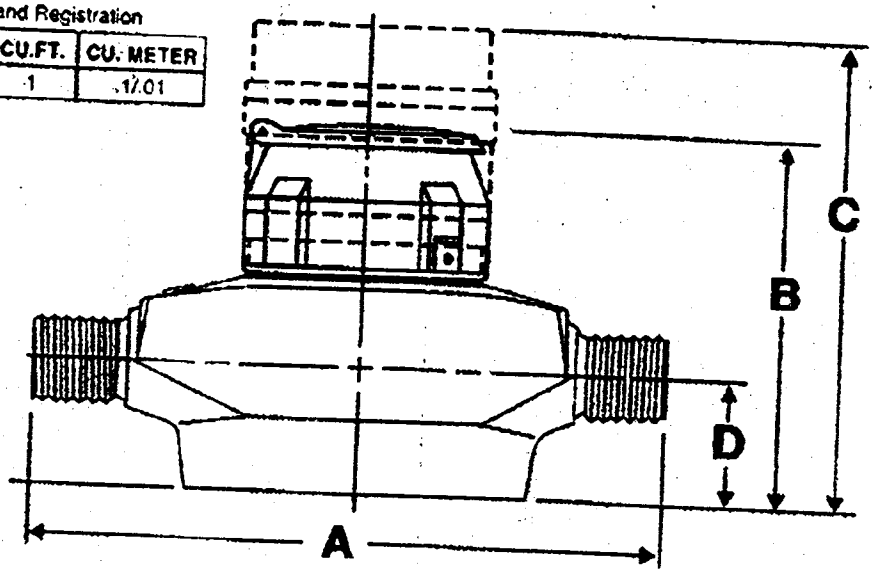


METER SIZE	METER MODEL	A LAYING LENGTH	B HEIGHT REG.	C HEIGHT GEN./HRT	D CENTERLINE BASE	WIDTH	APPROX. SHIPPING WEIGHT
⅝" (15mm)	25	7½" (190mm)	5 1/16" (128mm)	6 7/16" (163mm)	1¾" (44mm)	4 9/16" (122mm)	2½ lb. (1.0kg)

Sweep Hand Registration

MODEL	GALLON	CU.FT.	CU. METER
M25	10	1	.1/.01





North/East Region
4545 West Brown Deer Road
P.O. Box 23099
Milwaukee, WI 53223-0099
(414) 355-0400 / (800) 876-3837
Fax: (414) 355-3659

South/East Region
P.O. Box 814149
Dallas, TX 75381-4149
(214) 416-3525 / (800) 616-3837
Fax: (214) 416-7993

Western Region
1313 Redwood Way, Suite 125
Petaluma, CA 94954
(707) 664-8740 / (800) 656-3837
Fax: (707) 664-8264

BadgerMeter, Inc. Utility Division
P.O. Box 23099, Milwaukee, WI 53223-0099
Fax: (414) 355-2544
An independently owned American company.

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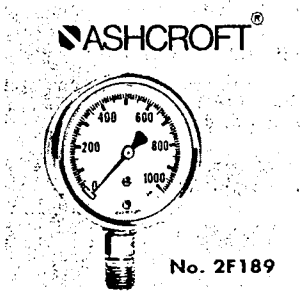
DRAWING #3

2½" STANDARD ALL STAINLESS STEEL PRESSURE GAUGE

- Ashcroft brand
- 1/4" NPT mole lower sock-
- Polycarbonate window
- Economical corrosion resistant stainless
- 3-2-3% accuracy
- 316SS bourdon tube
- Compact size to fit restricted areas
- Patented spring suspended movement steel case, bourdon tube and socket

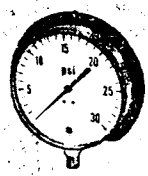


No. 2F189

Range PSI	Ashcroft Models	Stock No.	List	Each	Shpg. Wt.
30	63-1008S	2F189	$44.10	$33.10	0.3
60	63-1008S	2F197	44.10	33.10	0.3
100	63-1008S	2F183	44.10	33.10	0.3
200	63-1008S	2F187	44.10	33.10	0.3
300	63-1008S	2F191	44.10	33.10	0.3
400	63-1008S	2F199	44.10	33.10	0.3
30	63-1008S	2F185	44.10	33.10	0.3
30	63-1008S	2F193	44.10	33.10	0.3
1000	63-1008S	2F195	44.10	33.10	0.3

MECHANICAL CONTRACTOR'S GAUGE

AMETEK



No. 1X726

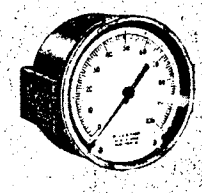
The Series 5105 contractor's gauge is designed for a wide variety of industrial application, but is especially suited for heating and air conditioning systems. Rugged gauge case is made of aluminum to provide the protection needed in corrosive atmospheres.

- 4½" size
- Aluminum case with blow-out grommet, black finish
- Aluminum ring, friction fit, black finish
- Aluminum pointer, adjustable, black finish
- Steel dial, white background with black markings
- Acrylic window
- Precision geared brass movement
- Phosphor bronze bourdon tube
- 1/4" ANPT, LM, brass connection
- ± 1/2-1-1 0.5% of span accuracy (exceeds Grade A ANSI-ASME B40.1)

PSI Range	U.S. Gauge Model	Stock No.	List	Each	Shpg. Wt.
	5105	1X726	$60.00	$16.00	1.0
	5105	1X728	60.00	16.00	1.0
0-100	5105	1X730	60.00	16.00	1.0
0-220	5105	1X732	60.00	16.00	1.0
0-300	5105	1X734	60.00	16.00	1.0
0-1000	5105	1X736	60.00	16.00	1.0

GENERAL PURPOSE RECEIVER GAUGES

AMETEK



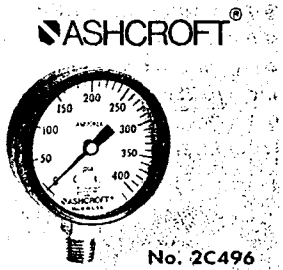
No. 1X475

- Black finish, steel case (black connected with U/Clamp)
- On 2½" gouge threaded, polycarbonate ring and window
- On 3½" acrylic, beveled window, brass, threaded, black finish ring
- Brace plates, pinion, arbor, link screw, sector, link, and minimum stop movement
- Phosphor bronze bourdon tube
- ±1% of span accuracy (.12 PSI) over middle half or scale. Balance of scale is ±2% of span (.24 PSI)

Range PSI	U.S. Gauge Model	Stock No.	List	Each	Shpg. Wt.
2½" DIAL 1/4" NPT CENTER BACK CONNECTED					
100	1370	1X475	$55.00	$52.20	0.4
2½" DIAL, 1/4" NPT LOWER CONNECTED					
100	1370	1X477	45.00	41.50	0.4
3½" DIAL, 1/4" NPT CENTER BACK CONNECTED					
100	1370	1X479	65.00	62.75	0.6
0-10 Sq. Root	1370	1X483	65.00	62.75	0.6
3½" DIAL, 1/4" NPT LOWER CONNECTED					
100	1370	1X481	65.00	62.75	0.6
0-10 Sq. Root	1370	1X487	55.00	52.80	0.6

2½" AGRICULTURAL AMMONIA PRESSURE GAUGES

- Ashcroft brand
- Stainless steel bourdon tube/steel socket
- 1/4" NPT lower connection
- Glass window eliminates fogging
- 3-2-3% accuracy
- Painted steel case
- 100% leak tested
- Patented spring suspended movement



No. 2C496

Pressure Range PSI	Ashcroft Model	Stock No.	List	Each	Shpg. Wt.
60	25-1005M	2C498	$10.00	$16.00	1.0
150	25-1005M	2C494	40.00	16.00	1.0
400	25-1005M	2C496	40.00	16.00	1.0

PVC/CPVC/Polypropylene/Chem-Aire/PVDF BALL VALVES

150 psi at 73°F

Installation and Maintenance Instructions

UNION-END BALL VALVES
Tru-Bloc — True Union (Mod. "C")
Tru-Bloc — Single Union (Mod. "C")
Multi-Port* (3-Way 3-Position) (Mod. "B")
Diverter* (3-Way 2-Position) (Mod. "B")

INSTALLATION

Chemtrol union end ball valves can be fitted with socket, threaded, or flanged end connections. When joining union end valves, or when flanging End Connectors, **NEVER MAKE THE JOINT TO THE END CONNECTORS WHILE THEY ARE ATTACHED TO THE VALVE BODY.** Remove the Union Nuts and End Connectors from the valve cartridge first. In order to prevent mishaps with the Union Nut, slide it (smallest bore first) over the pipe or Nipple and Flange Stub (when flanging) before making the joint to the End Connector.

Threaded-End Valves — Refer to the plastic thread joining instructions in the Chemtrol Thermoplastic Piping Technical Manual for proper joining techniques. **Caution: Do not overtighten threads. Usually, one to two turns beyond hand tight using a suitable strap-wrench if necessary, is sufficient. (ANSI B1.20.1 defines hand tight as 4 to 5 threads for sizes through 2" and 5 to 5½ threads for sizes over 2".)**

Socket-End Valves (PVC/CPVC and Chem-Aire) — Refer to the solvent cement joining instructions in the Chemtrol Thermoplastic Piping Technical Manual for proper joining techniques. **Caution: Do not allow Purple Primer or Solvent Cement to come in contact with the sealing face of the End Connectors. When joining the fixed end of a Single Union Valve, place the Ball in the open position to allow for proper drying and to avoid Primer or Solvent Cement contacting internal components of the valve.**

For PP or PVDF valves, refer to the heat fusion joining instructions in the Chemtrol Thermoplastic Piping Technical Manual for proper joining techniques. **Caution: Chemtrol valves require special heat fusion tools to make proper connections.** These tools can be found in the Chemtrol Fitting Guide.

Flanged-End Valves — Refer to the plastic Flange joining instructions in the Chemtrol Thermoplastic Piping Technical Manual for proper joining techniques. **Caution: Do not overtighten Flanges. When flanging the fixed end of Single Union Valves, care should be taken to properly align the Flange bolt holes, unless Van Stone type Flanges are used.**

Valve Cartridge — After allowing the proper joint curing time, end connections may be joined to the valve cartridge. The Ball should be turned so that the Handle is perpendicular to the Body. "O"-rings provide the seal between the valve faces and the End Connectors faces. **Ensure that these "O"-rings are clean and in their proper grooves before slipping the valve cartridge between its End Connectors.** Slide the Union Nuts over the End Connectors and screw onto the valve cartridge threads, no more than hand tight. **Caution: The "Adjust" end of the valve should normally be installed facing upstream.**

Adjustment — With the Handle still in the closed or perpendicular position, tighten the Union Nuts on the valve ends. Each of the Union Nuts must apply adequate force on its End Connector to prevent shell leaks at the "O"-ring face seals on each end of the body. Obviously, further tightening of the Union Nuts should stop shell leaks at these locations if the "O"-rings have been properly seated in their grooves. If unable to adjust the Nut by hand, a suitable strap wrench may be used. **Caution: Do not overtighten. Usually, ¼ turn or less adjustment is sufficient to restore the valve to sealing condition. Immediately after adjustment, return the handle to the open position, allowing solvent vapors to dissipate.**

Note: Misalignment of adjacent piping can result in loss of seal at end connections. Always properly adjust union ends prior to final bolt-up of flanges or hangers and supports.

MAINTENANCE

Should a valve need repair, depressurize and drain the system on both sides of the valve. Loosen the valve Union Nuts and slide them back over the End Connections. To minimize downtime, it may be advisable to have a replacement valve cartridge ready to install in place of the one to be repaired. Disassemble valve cartridge as follows:

1) Set Ball in closed position.

2) Using a suitable spanner wrench, remove the Seal Carrier by rotating counterclockwise. If the valve is not a Mod. "C" Tru-Bloc style, this step may be omitted.

3) Insert a soft blunt instrument into the valve end marked with the Flow arrow and push the Ball and Seal Carrrier out of the valve end marked with the Adjust arrow.

4) Remove the Handle from the Stem by pulling upward and away from the Body.

5) Push the Stem into the body and remove through the open Body end.

6) Examine all parts and replace any damaged or worn components. If the Body is damaged, we recommend replacing the entire valve cartridge.

7) Reassemble valve in reverse order.

Replacement Parts Lists for Chemtrol union-end type ball valves may be found this page. The valve should be properly identified before selecting replacement parts. **Caution: Valve repair should only be performed by qualified maintenance personnel. Contact your nearest Chemtrol distributor should further information be required.**

"O"-Ring Kits - In the event o-ring replacement becomes necessary, contact factory for proper size and material information.

TFE Seat Kits — Each kit contains two seats. **Note correct seat orientation before removing old seats.**

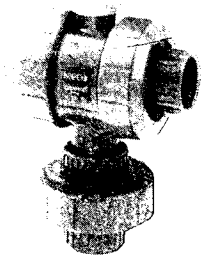
To determine suitability of Chemtrol valves in your application, consult the Chemtrol Chemical Resistance Guide.

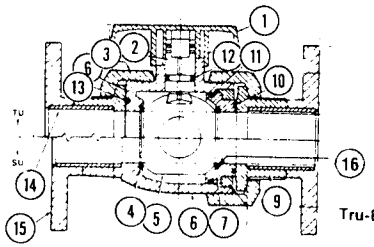
TRUE UNION

SINGLE UNION

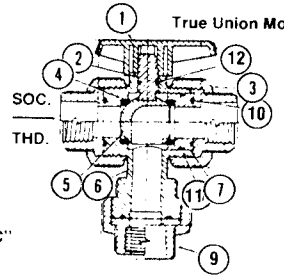
REPLACEMENT PARTS LIST

PART	MULTIPORT/DIVERTER
1. Handle Lever	
2. Stem	
3. Union Nut	
4. Seat (2)	
5. Ball	
6. Body — TU or SU, Socket or SU, Thread	
7. Seal Carrier	
9. End Connector — Socket, or Thread	
10. "O"-Ring — Carrier End (TU or SU)	
11. "O"-Ring — Carrier O.D. (TU or SU)	
12. "O"-Ring — Stem (TU or SU)	
13. "O"-Ring — Body End (TU only)	
14. Plain End Pipe Nipple — SPG x SPG	
15. Flange — Socket	
16. "O"-Ring — Carrier Seat Energizer (Mod. "C" only)	
17. Stem Friction Washer (4" & 6")	
18. Handle Bolt (4" & 6")	



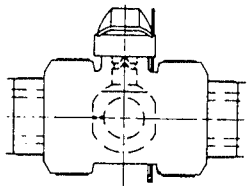


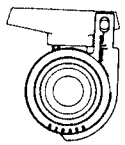
Tru-Bloc Mod. "C"



True Union Model "B"

Safety vent lock-out valve (shown below) is used for Chem-Aire service as optional equipment on 1/2, 3/4 and 1" sizes. Must be installed with flow arrow in correct orientation.





PRESSURE RATINGS

The maximum pressure rating for Chemtrol valves, regardless of size, is 150 psi at 73°F. As with all other thermoplastic piping components, the maximum non-shock operating pressure is related to temperature. Above 100°F refer to the chart below.
Note: For vacuum or throttling service, consult factory.

Maximum Operating Pressure (psi) vs. Temperature

Operating Temperature (°F)	PVC	CPVC	PP	PVDF	CHEM-AIRE
100	150	150	150	150	150
110	135	140	140	150	124
120	110	130	130	150	98
130	75	120	118	150	71*
140	50	110	105	150	45*
150	N.R.	100	93	140	N.R.
160	N.R.	90	80	133	N.R.
170	N.R.	80	70	125	N.R.
180	N.R.	70	50	115	N.R.
190	N.R.	60	N.R.	106	N.R.
200	N.R.	50	N.R.	97	N.R.
250	N.R.	N.R.	N.R.	50	N.R.
280	N.R.	N.R.	N.R.	25	N.R.

N.R. Not Recommended *3" 4" N.R. above 120°F

Do not use or test PVC, CPVC, PP OR PVDF Valves with compressed air or other gases. See Chemtrol Chem-Aire™ literature for more information about a shatter-resistant thermoplastic piping system specifically designed for compressed air and other gases. (See Chem-Aire PSI rating this page).

FOR SERVICE INFO CALL 800-343-5455 OR 502-775-6431

Installation and Maintenance Instructions

True-Union Ball Check and Foot Valves

INSTALLATION

Chemtrol union-end check/foot valves can be fitted with socket, threaded, or flanged end connections. When joining union-end valves, or when flanging End Connectors, **NEVER MAKE THE JOINT TO THE END CONNECTORS WHILE THEY ARE ATTACHED TO THE VALVE BODY.** Remove the Union Nuts and End Connectors from the valve cartridge first. In order to prevent mishaps with the Union Nut, slide it (smallest bore first) over the pipe or Nipple and Flange hub (when flanging) before making the joint to the End Connector.

Check valves should be installed at least four feet from the discharge side of a pump. Ball chatter and internal damage may result if fluid flow is too turbulent. Also, in keeping with good mechanical design practice, the upper threshold of fluid flow recommended from Chemtrol products is five feet per second.

Caution: The valves may be installed vertically or horizontally (refer to table on this page for minimum seating head requirements), but the molded-in Flow arrow on the valve cartridge must be installed in the direction of the fluid flow such that reverse flow will be checked. For vent valve applications contact customer service for PP floating ball arrrangement.

Threaded-End — Refer to the plastic thread joining instructions in the Chemtrol Thermoplastic Piping Technical Manual for proper joining techniques. **Caution: Do not overtighten threads. Usually, one to two turns beyond hand tight using a suitable strap-wrench if necessary, is sufficient. (ANSI B1.20.1 defines hand tight as 4 to 5 threads for sizes through 2" and 5 to 6¼ threads for sizes over 2".)**

Socket-End Valves (PVC/CPVC and Chem-Aire) — Refer to the solvent cement joining instructions in the Chemtrol Thermoplastic Piping Technical Manual for proper joining techniques. **Caution: Do not allow Purple Primer or Solvent Cement to come in contact with the sealing face of the End Connectors or internal components of the valve.**

For PP or PVDF valves, refer to the heat fusion joining instructions in the Chemtrol Thermoplastic Piping Technical Manual for proper joining techniques. **Caution: Chemtrol valves require special heat fusion tools to make proper connections.** These tools can be found in the Chemtrol Fitting Guide.

Flanged-End Valves — Refer to the plastic Flange joining instructions in the Chemtrol Thermoplastic Piping Technical Manual for proper joining techniques. **Caution: Do not overtighten Flanges.**

Valve Cartridge — After allowing the proper joining curing time, end connections may be joined to the valve cartridge. "O"-rings provide the seal between the valve faces and the End Connectors faces. **Ensure that these "O" -rings are clean and in their proper grooves before slipping the valve cartridge between its End Connectors.** Slide the Union Nuts over the End Connectors and screw onto the valve cartridge threads, no more than hand tight. See adjustment section this page.

Foot Valve Conversion — Foot Valves may be obtained as factory assembled units or they can be field converted from Ball Check Valves. Screen Housing Assemblies may be installed in place of the regular Union Nut and End Connector on the supply side of the valve to convert it to a Foot Valve.

Adjustment — Adjustment to the seating action is not required. However, each of the Union Nuts must apply adequate force on its End Connector to prevent shell leaks at the "O"-ring face seals on each end of the Body.

Obviously, further tightening of the Union Nuts should stop shell leaks at these locations if the "O"-rings have been properly seated in their grooves. If unable to adjust the Nut by hand, a suitable strap wrench may be used. **Caution: Do not overtighten. Usually, ¼ turn or less adjustment is sufficient to restore the valve to sealing condition.**

MAINTENANCE

Should a valve need repair, depressurize and drain the system on both sides of the valve. Loosen the valve Union Nuts and slide them back over the End Connections. To minimize downtime, it may be advisable to have a replacement valve cartridge ready to install in place of the one to be repaired. Disassemble valve cartridge as follows:

1) Insert a soft blunt instrument into the downstream end of the valve and push the Ball and Seal Carrier out of the upstream end of the valve.

2) Examine all parts and replace any damaged or worn components with new replacement parts. If the Body is damaged, we recommend replacing the entire valve cartridge.

Replacement Parts List for Chemtrol union-end type ball Check and Foot valves may be found this page. The valve should be properly identified before selecting replacement parts. **Caution: Valve repair should only be performed by qualified maintenance personnel. Contact your nearest Chemtrol distributor should further information be required.**

Valve Seat — The fluid seal between the Ball and Body Seat (chamfered shoulder) is affected by a standard "O" ring located in a groove in the Body Seat. This Seat Seal is included in the "O" ring Kit which is identified in the Replacement Parts List.

"O"-Ring Kits - In the event o-ring replacement becomes necessary, contact factory for proper size and material information.

To determine suitability of Chemtrol valves in your application, consult the Chemtrol Chemical Resistance Guide.

Valve Size	Minimum Seating Head Ft — H_2O	
	Vert.	Horiz.
1/2	6	7
3/4	6	7
1	4	5
1 1/4	4	5
1 1/2	4	5
2	4	5
3	3	4
4	3	4

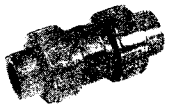
Do not use or test PVC, CPVC, PP OR PVDF Valves with compressed air or other gases. See Chemtrol Chem-Aire™ literature for more information about a shatter-resistant thermoplastic piping system specifically designed for compressed air and other gases.

REPLACEMENT PARTS LIST

PART
1. Union Nut (2)*
2. End Connector — Socket (2)* or Thread (2)*
3. Ball
4. Body
5. Seal Carrier
6. "O"-Ring — End Seal (2)
7. "O"-Ring — Carrier Seal
8. "O"-Ring — Seat Seal
9. Plain End Pipe Nipple (2)*
10. Flange — Socket (2)*
11. Foot Valve Screen Housing Assy.

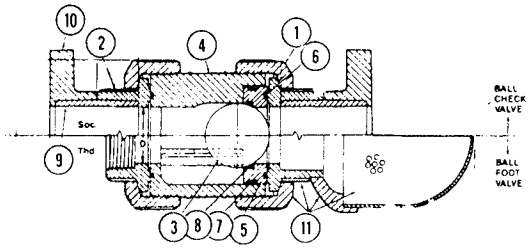
VALVE MODELS

BALL CHECK



BALL FOOT

* Ball Check Valves have two (2) of each end connection component. One Set of end connection components is replaced with a Screen Housing Assembly on the receiving end of the Body to create a Foot Valve.



PRESSURE RATINGS

The maximum pressure rating for Chemtrol valves, flanges, and unions, regardless of size, is 150 psi at 73 F. As with all other thermoplastic piping components, the maximum non-shock operating pressure is related to temperature. Above 100 F refer to the chart below.

Maximum Operating Pressure (psi) vs. Temperature

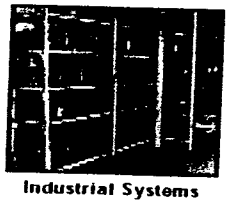
Operating Temperature (F)	PVC	CPVC	PP	PVDF
100	150	150	150	150
110	135	140	140	150
120	110	130	130	150
130	75	120	118	150
140	50	110	105	150
150	N.R.	100	93	140
160	N.R.	90	80	133
170	N.R.	80	70	125
180	N.R.	70	50	115
190	N.R.	60	N.R.	106
200	N.R.	50	N.R.	97
250	N.R.	N.R.	N.R.	50
280	N.R.	N.R.	N.R.	25

N.R. Not Recommended

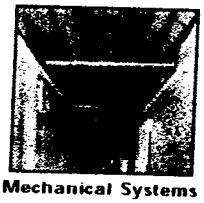
FOR SERVICE INFO CALL 800-343-5455 OR 502-775-6431

STORAGE EQUIPMENT

UNISTRUT® METAL FRAMING

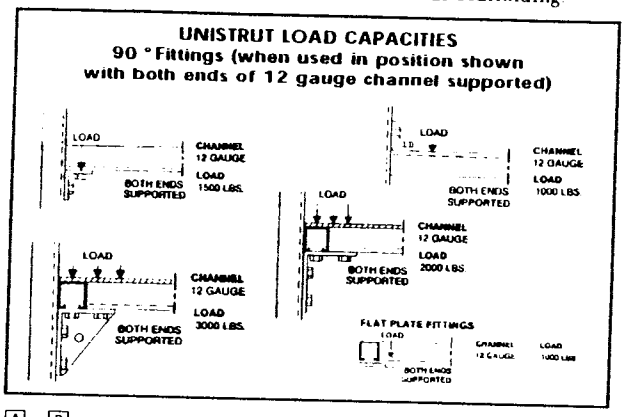


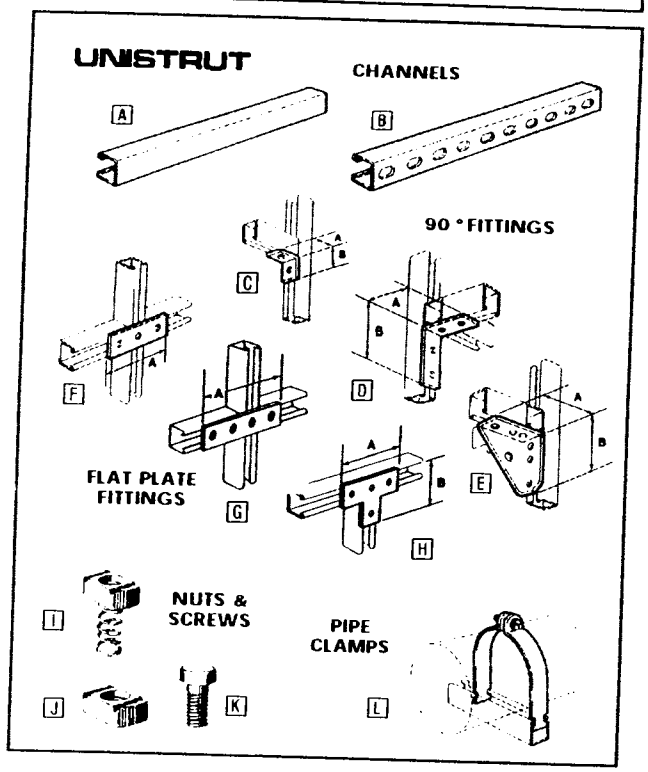
Industrial Systems



Mechanical Systems

The basic Unistrut® connection, a simple nut and bolt connecting a fitting to continuous channel, has evolved into a comprehensive engineering building system of standard components of metal framing. Systems for mechanical, industrial, and electrical supports have been developed to prove the potential of what can be built to meet your needs. Not to be used as scaffolding.





A, B Channels. Roll formed from 12 gauge low carbon strip steel. One side of channel has a continuous open slot with inturned lips. Attachments (described below) are secured to the framing member with hardened, toothed, slotted nuts which engage the lips. Channels are 1⅝" x 1⅝" x 10' long. No. 4A974 has slots on backside of channel measuring 9/16 x 1⅛" on center.

C thru H Fittings. Connect framing channels with other attachments. Fittings are punch pressed from 1/4" thick hot rolled, pickled and oiled steel plate for a smooth surface. All fittings 1⅝" wide x 1/4" thick. Conform to ASTM specification A575.

C, D, E 90 ° Angle Fittings. No. 4A979 joins two channel members perpendicular. No. 4A980 joins three channel members perpendicular. No. 4A981 joins channel members for heavy duty applications.

F, G, H Flat Plate Fittings. No. 4A976 is used to join channel members in a cross configuration. No. 4A977 is for joining channel members in a cantilever configuration. No. 4A978 is a "T" shaped fitting used to joint channels in a "T" configuration.

Unistrut® Finishes. All channels and fittings are carefully cleaned and phosphatized after production and a uniform coat of highly effective rust inhibiting acrylic enamel paint is applied and baked on. Color is Perma-Green. The finish will withstand 400 hours of exposure to salt spray in accordance with ASTM designation B-117.

I thru K Nuts & Screws. Made from case-hardened steel. Nuts are 1/2". Available with or without spring which serves to hold nut in place while securing it. Screw is 1/2 x 15/16" hex head. Electro-galvanized finish. Sold in packages of 25.

L Pipe Clamps. 1/2, 3/4, and 1" clamps support rigid thin wall steel conduit. Connect to the continuous open slot of channels to support pipe. Clamps are punch pressed from strip steel and electro-galvanized (zinc) finished. Fed. Spec. No. QQ-Z-325C Type I class 3. Sold in packages of 10.

Key	Description	Dimensions A	Dimensions B	Unistrut Model	Stock No.	List	Each	Lot	Lot Qty.	Shpg. Wt.
A	10 ft. Channel, nonslotted	—	—	P1000-GR	4A975	$30.91	$28.10	$26.70	12	19.0
B	10 ft. Channel, slotted	—	—	P1000T-GR	4A974 -	35.56	32.35	30.73	12	19.0
C	90° Fitting, 2 hole	2"	1⅞"	P1026-GR	4A979 *	1.39	1.26	1.20	30	0.4
D	90° Fitting, 4 hole	3½	4⅛	P1325-GR	4A980	2.43	2.21	2.10	30	0.8
E	90° Fitting, 7 hole	4	4	P2484-GR	4A981	4.52	4.11	3.90	30	1.3
F	Flat Plate Fitting, 3 hole	5⅜		P1066-GR	4A976	1.65	1.50	1.43	30	0.6
G	Flat Plate Fitting, 4 hole	7¼		P1067-GR	4A977	2.19	1.99	1.89	30	0.7
H	Flat Plate Fitting, "T"	5⅛	3½	P1031-GR	4A978	3.40	3.09	2.94	30	0.8
I	Spring Nut, ½"			P1010-EG	4A985	23.51*	21.37*	20.30*	4	2.8
J	Nut, ½"	—	—	P3010-EG	4A986	19.45*	17.68*	16.80*	4	2.6
K	Hex Head Cap Screw, ½"	—	—	HHCS050094-EG	4A987	10.62*	9.65*	9.17*	4	2.0
L	Pipe Clamp, ½"	—	—	P1211-EG	4A982	8.13†	7.39†	7.02†	4	1.1
L	Pipe Clamp, ¾"	—	—	P1212-EG	4A983	9.21†	8.37†	7.95†	4	1.5
L	Pipe Clamp, 1"			P1213-EG	4A984	10.33†	9.39†	8.92†	4	1.7

(*) Priced and sold in packages of 25. (†) Priced and sold in packages of 10.

Chemcock and Calibrated Needle Valves PVC

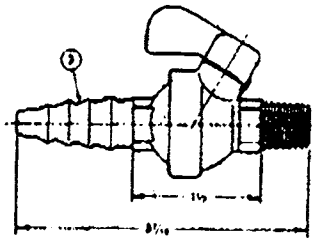
150 psi at 73°F water — non-shock — full port

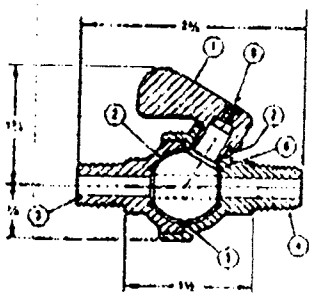
The Chemtrol Chemcock Valve is ideal for laboratories, monitoring systems, sampling, and a variety of other applications as original equipment. Its (4.8) calculated fluid flow coefficient (Cv) is based on the laying length being equivalent to ¼" Schedule 80 pipe.

REPLACEMENT PARTS LIST

PART	MATERIAL
1. Handle	PVC
2. Ball/Stem	PVC
3. Body End — Hose or Thread	PVC
4. Body Half — Stem Side	PVC
5. "O"-Ring — Body Seal	FPM (Viton)
6. "O"-Ring — Ball Seals (2)	FPM (Viton)
7. "O"-Ring — Stem Seal	FPM (Viton)
8. Handle Screw	Cadmium Plated Steel

Approx. Weight 0.08 Lbs.





CHEMTROL FIGURE NO.	
A45CC-V	¼" Hose x ¼" MPT
M45CC-V	¼" MPT x ¼" MPT

Features
- Easily adaptable to any type of connection.
- Opens and closes with only a quarter turn.
- Replaceable FPM "O"-ring seats and seals.
- Corrosion-resistant all thermoplastic PVC construction
- No sticking or galling.
- Full port design.

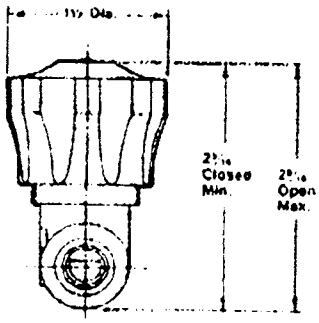
150 psi at 73°F water — non-shock

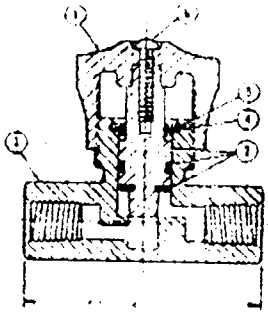
The Chemtrol Calibrated Needle Valve is ideally suited to the fine regulation of liquid flow required in instrumentation and laboratory work. The flow through the ¼" valve can be accurately adjusted by observing the knob handle exposing numerals molded on the valve body.

REPLACEMENT PARTS LIST

PART	MATERIAL
1. Adjustment Knob	PVC
2. Stem Assembly	PVC w/TFE Seat Seal & FPM Stem Seal
3. Body	PVC
4. Retainer Washer	PVC
5. Snap Ring	Stainless Steel
6. Screw	Stainless Steel

Approx. Weight 0.13 Lbs.





CHEMTROL FIGURE NO.	
T45CN-V	¼" FPT x ¼" FPT

Features
- Precise flow measurement.
- Positive stop for safe operation.
- Teflon seat prevents wear on needle.
- All thermoplastic PVC Construction.

KNOB POSITION	GPM @ CONSTANT 50 PSI
8	.85
7	1.41
6	1.79
5	2.15
4	2.42
3	3.15
2	4.40
1	4.50

NOTES: For specific relationship of pressure/temperature ratings, refer to ENGINEERING DATA page 7. And for CHEMTROL VALVE STANDARDS, see page 10. Installation and maintenance instructions for these valves appear on page 84.

Do not use or test the products in this catalog with compressed air or other gases. See Chemtrol Chem-Aire™ literature for information about shatter-resistant thermoplastic piping system specifically designed for compressed air and other gases.

PRESSURE RATINGS OF CHEMTROL PRODUCTS

Pipe and Fittings

In order to determine the pressure rating for a product system, first find the plastic material and schedule (wall thickness - see page 6 for additional information) of pipe and fittings in the heading of the Maximum Nonshock Operating Pressure table below. Then, locate the selected joining method in the subheading of the table and go down the column to the value across from a particular pipe size, listed in the far left column. This will be the maximum non-shock operating pressure at 73°F for the defined product system.

MAXIMUM NONSHOCK OPERATING PRESSURE (psi) AT 73°F

Nominal Pipe Size	Schedule 40 PVC & CPVC	Schedule 80 PVC & CPVC		Schedule 80 Polypropylene		Schedule 80 PVDF	
	Socket End	Socket End	Threaded End	Thermo-Seal Joint	Threaded End	Thermo-Seal Joint	Threaded End
½	600	850	420	410	20	580	290
¾	480	690	340	330	20	470	250
1	450	630	320	310	20	430	210
1¼	320	520	260	280	20	—	—
1½	330	470	240	250	20	326	160
2	280	400	200	200	20	270	140
2½	300	430	210	—	—	—	—
3	260	370	190	180	20	250	N.R.
4	220	320	160	160	20	220	N.R.
6	180	260	N.R.	140	N.R.	180	N.R.
8	180	250[2]	N.R.	—	—	—	—
10	140	200	N.R.	—	—	—	—
12	130	230	N.R.	—	—	—	—

[1] For more severe service, an additional correction factor may be required.
[2] 8" CPVC Tee, 90° Ell and 45° Ell rated at ½ of value shown. Pressure rating of 175 psi can be obtained by factory overwrapping with glass and polyester. Consult Customer Service for delivery information.
[3] Recommended for intermittent drainage pressure not exceeding 20 psi.
N.R.—Not Recommended.

As implied by the preceding, the pressure for all thermoplastic piping is a function of temperature. For pipe and fitting applications above 73°F, refer to the table at the top of the next column for the Temperature Correction Factors. To determine the maximum non-shock pressure rating at an elevated temperature, simply multiply the base pressure rating obtained from the upper table by the correction factor from the upper table in the next column. Below 73°F the pressure rating will be the same as the base pressure in the table above.

Temperature Correction Factors

Operating Temperature (°F)	FACTORS PVC	CPVC	PP	PVDF
70	1.00	1.00	1.00	1.00
80	0.90	0.96	0.97	0.95
90	0.75	0.92	0.91	0.87
100	0.62	0.85	0.85	0.80
110	0.50	0.77	0.80	0.75
115	0.45	0.74	0.77	0.71
120	0.40	0.70	0.75	0.68
125	0.35	0.66	0.71	0.66
130	0.30	0.62	0.68	0.62
140	0.22	0.55	0.65	0.58
150	N.R.	0.47	0.57	0.52
160	N.R.	0.40	0.50	0.48
170	N.R.	0.32	0.28	0.45
180	N.R.	0.25		0.42
200	N.R.	0.18	N.R.	0.36
210	N.R.	0.15	N.R.	0.33
240	N.R.	N.R.	N.R.	0.25
280	N.R.	N.R.	N.R.	0.18

[1] Recommended for intermittent drainage pressure not exceeding 20 psi.
N.R.—Not Recommended.

Valves and Flanges

The maximum pressure rating for Chemtrol valves, flanges and unions, regardless of size, is 150 psi at 73°F. As with all other thermoplastic piping components, the maximum non-shock operating pressure is related to temperature. Above 100°F, refer to the chart below.

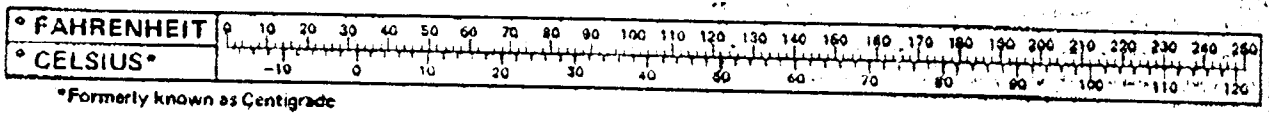
Maximum Operating Pressure (psi) vs. Temperature

Operating Temperature (°F)	PVC	CPVC	PP	PVDF
100	150	150	150	150
110	135	140	140	150
120	110	130	130	150
130	75	120	118	150
140	60	110	106	150
150	N.R.	100	93	140
160	N.R.	90	80	133
170	N.R.	80	70	125
180	N.R.	70	50	115
190	N.R.	60	N.R.	106
200	N.R.	50	N.R.	97
250	N.R.	N.R.	N.R.	50
280	N.R.	N.R.	N.R.	25

N.R.—Not Recommended

Temperature Conversions

$F = C \times 1.8 + 32$ $\quad C = (F-32) \div 1.8$



*Formerly known as Centigrade

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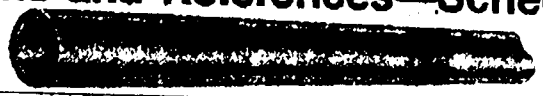
ENGINEERING DATA

Chemtrol®
A DIVISION OF NIBCO INC.

Dimensions and References—Schedule 80

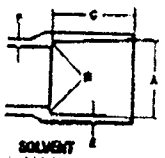
PIPE[1]
(20 ft. lengths)



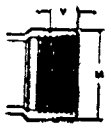
NOMINAL PIPE SIZE	APPROXIMATE WEIGHT PER 100 FT. PVC	CPVC	POLYPROPYLENE	PVDF	NOM. OUTSIDE DIAMETER (IN.)	NOM. INSIDE DIAMETER (IN.)	WALL THICKNESS (IN.) NOM.	MIN.	CROSSSECTIONAL AREA (SQ. IN.)	INTERNAL AREA (SQ. IN.)	THRESHOLD[2] FLOW (GPM)
⅛"	10.1	11.9	—	—	.540	.282	.129	.119	.187	.062	.97
¼"	20.5	24.3	14.0	24.4	.840	.526	.157	.147	.357	.217	3.39
¾"	27.8	32.9	18.9	33.0	1.050	.722	.164	.154	.457	.409	6.38
1"	40.4	48.5	27.1	48.7	1.315	.936	.1665	.179	.670	.668	10.72
1¼"	58.7	68.9	37.9	—	1.660	1.255	.2025	.191	.927	1.237	19.28
1½"	68.9	81.1	44.8	81.4	1.900	1.476	.212	.200	1.124	1.711	26.67
2"	94.5	108.6	62.3	112.6	2.375	1.933	.221	.218	1.556	2.874	44.79
2½"	144.9	165.4	—	—	2.875	2.290	.2965	.276	2.373	4.119	64.19
3"	193.8	221.3	126.6	256.4	3.500	2.864	.318	.300	3.179	6.442	100.40
4"	283.3	323.4	185.2	357.0	4.500	3.786	.357	.337	4.647	11.258	175.45
6"	541.1	618.8	358.9	714.8	6.625	5.709	.458	.432	8.873	25.598	398.93
8"	821.9	965.8	—	—	8.625	7.565	.530	.500	13.478	44.948	700.48
10"	1,227.7	—	—	—	10.750	9.493	.6285	.593	15.985	70.778	1103.03
12"	1,710.4	—	—	—	12.750	11.294	.728	.687	27.496	100.181	1561.28

[1] Dimensions shown are listed in ASTM D-1785 and F-441 for PVC and CPVC Schedule 80 Plastic Pipe, respectively.
[2] Upper Threshold Rate of Flow 5 ft./sec. fluid velocity.

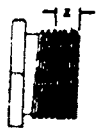
FITTINGS[1]



SOLVENT SOCKET (S)

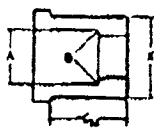


FEMALE THREADS (FPT)



MALE THREADS (MPT)

Reduced Size



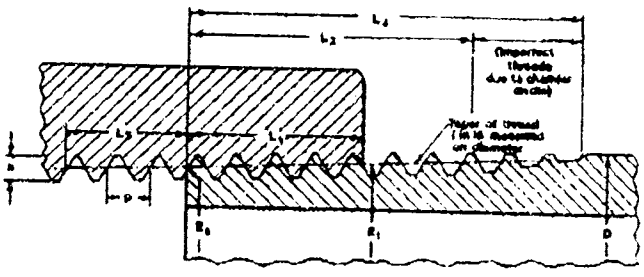
MALE END (SPG)

WALL THICKNESS

SIZE	IPS DIA	A[2]	B[2]	C[3] MIN	Y[2]	M[2] MIN	Z[2]	X	C_M[4] MIN	E[4] MIN	F[4] MIN
⅛"	.540	.662	.636	.625	.339	.840	.339	.540	.525	.119	.149
¼"	.840	.848	.836	.875	.463	1.260	.463	.840	.875	.147	.165
¾"	1.050	1.058	1.048	1.000	.482	1.500	.482	1.050	1.000	.154	.195
1"	1.315	1.325	1.310	1.125	.574	1.810	.574	1.315	1.125	.179	.225
1¼"	1.660	1.670	1.655	1.250	.584	2.200	.584	1.660	1.250	.191	.240
1½"	1.900	1.912	1.894	1.375	.594	2.500	.584	1.900	1.375	.200	.250
2"	2.375	2.387	2.369	1.500	.810	2.375	.810	2.375	1.500	.218	.275
2½"	2.875	2.589	2.868	1.750	.932	3.550	.932	2.875	1.750	.276	.345
3"	3.500	3.516	3.492	1.875	1.016	4.300	1.016	3.500	1.875	.300	.375
4"	4.500	4.518	4.491	2.250	1.084	5.430	1.084	4.500	2.250	.337	.420
6"	6.625	6.647	6.614	3.000	—	—	—	6.625	3.000	.432	.540
8"	8.625	8.656	8.610	4.000	—	—	—	8.625	4.000	.500	.625

[1] With exception of thread lengths, dimensions shown are listed in ASTM D-2467 and F-439 for PVC and CPVC Socket-Type Sch. 80 Fittings, respectively.
[2] Dimensions shown are typical mate components engagement, handtight (see L_1 in ANSI B1.20.1 Thread Spec. below) plus 1½ turns tightening, plus ½ turn allowance for relief at female entrance.
[3] Dimensions shown are not applicable for polypropylene or PVDF. Socket diameters in these materials are designed for Chemtrol thermo-seal socket fusion joining.
[4] Chemtrol fittings may exceed certain minimum ASTM dimensional requirements shown in order to insure functional satisfaction.
[5] Dimensions are listed in ASTM D-2464 and F-437 for PVC and CPVC Threaded Schedule 80 Fittings, respectively.

American Standard Taper Pipe Thread, NPT (excerpt from ANSI B1.20.1)



DO NOT THREAD SCHEDULE 40 PIPE

ANSI B16.5 DIMENSIONAL DATA FLANGES AND FLANGED FITTINGS

DIMENSIONS[3]				
		DRILLING		
Nominal Pipe Size (Inches)	Outside Diameter (Inches)	Number of Holes	Diameter of Bolt (Inches)	Diameter of Bolt Circle (Inches)
½	3.50	4	½	2.38
¾	3.88	4	½	2.75
1	4.25	4	½	3.12
1¼	4.62	4	½	3.50
1½	5.00	4	½	3.88
2	6.00	4	⅝	4.75
2½	7.00	4	⅝	5.50
3"	7.50	4	⅝	6.00
4"	9.00	8	⅝	7.50
6"	11.00	8	¾	9.50
8"	13.50	8	¾	11.75
10"**	16.00	12	⅞	14.25
12"**	19.00	12	⅞	17.00

* Two piece "Van Stone" Design or one piece Solid Design.
** Two piece "Van Stone" Design only.
[3] Dimensions and bolts conform to ANSI B16.5 for 150 lb. steel flanges.

Do not use or test the products in this catalog with compressed air or other gases. See Chemtrol Chem-Aire™ literature for information about shatter-resistant thermoplastic piping system specifically designed for compressed air and other gases.

Physical Properties of Thermoplastic Piping Materials

ASTM Test Methods	Properties	MATERIAL PVC 12454-B	CPVC 23447-B	PVDF	POLYPROPYLENE
GENERAL					
D-792	Specific Gravity	1.38	1.55	1.76	.905
D-570	Water Absorption % 24 Hrs. @ 73°F	.05	.05	.04	.02
MECHANICAL					
D-638	Tensile Strength psi @ 73°F	7,940	8,400	6,000	5,000
D-638	Modulus of Elasticity in Tension psi @ 73°F x 10^5	4.2	4.2	2.1	1.7
D-790	Flexural Strength psi	14,500	15,600	9,700	7,000
D-256	Izod Impact Strength @ 73°F (Notched)	65	3.0	3.8	1.3
THERMAL					
D-696	Coefficient of thermal Expansion in/in/°F x 10^{-5}	3.0	3.8	7.9	5.0
C-177	Thermal Conductivity BTU/HR/Sq. Ft./°F/in	1.2	.95	.79	1.2
D-648	Heat Distortion Temp. °F @ 66 psi	NA	238	284	220
D-648	Heat Distortion Temp. °F @ 264 psi	160	221	194	140
	Resistance to Heat °F at Continuous Drainage	140	210	280	180
FLAMMABILITY					
D-2863	Limiting Oxygen Index (%)	43	60	44	17
E-84	Flame Spread	15-20	15	0	NA
	Underwriters Lab Rating (Sub. 94)	94V-O	94V-O	94V-O	94HB

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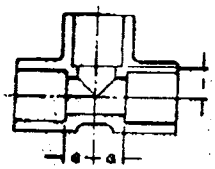
For additional dimensional detail related to pipe or fitting sockets and threads refer to pages 6 and 7.

Tees

4511 Socket TEE (S x S x S)



NOMINAL SIZE	UNIVERSAL PART NO.	CTN. QTY.	APPROX. LBS./EA.	DIM. G	DIM. G	DIM. I
¼	801-002	25	0.05	5/16	5/16	5/16
½	801-005	50	0.15	½	½	½
¾	801-007	50	0.33	11/16	11/16	11/16
1	801-010	25	0.36	¾	¾	¾
1¼	801-012	10	0.44	29/32	29/32	29/32
1½	801-015	25	0.73	1 1/16	1 1/16	1 1/16
2	801-020	20	1.05	1¼	1¼	1¼
2½	801-025	5	1.59	1 17/32	1 17/32	1 17/32
3	801-030	12	2.37	1 27/32	1 27/32	1 27/32
4	801-040	10	4.10	2 11/32	2 11/32	2 11/32
6	801-060	4	10.22	3½	3½	3½
8	801-080	1	21.05	4 3/16	4 3/16	4 3/16

4511 Reducing Socket TEE (S x S x S)

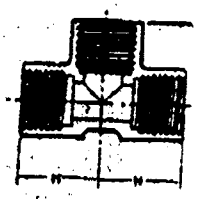
NOMINAL SIZE	UNIVERSAL PART NO.	CTN. QTY.	APPROX. LBS./EA.	DIM. G	DIM. G	DIM. I
¾ x ¾ x ½	801-101	25	0.18	½	½	5/8
1 x 1 x ½	801-130	10	0.24	17/32	17/32	17/32
1 x 1 x ¾	801-131	10	0.26	5/8	5/8	5/8
1½ x 1½ x ¾	801-210	10	0.48	21/32	21/32	1 1/32
1½ x 1½ x 1	801-211	10	0.52	¾	¾	1 1/32
2 x 2 x ½	801-247	10	0.61	19/32	19/32	5/32
2 x 2 x ¾	801-248	10	0.66	1 1/16	1 1/16	9/32
2 x 2 x 1	801-249	10	0.69	25/32	25/32	1 9/32
2 x 2 x 1½	801-251	10	0.83	1 1/16	1 1/16	1 9/32
3 x 3 x 2	801-338	5	1.73	1 11/32	1 11/32	1 27/32
4 x 4 x 2	801-420	5	2.79	1⅜	1⅜	2 11/32
4 x 4 x 3	801-422	5	3.33	1⅞	1⅞	2 11/32
6 x 6 x 4	801-632	4	7.20	2 9/16	2 9/16	3 17/32

Other Reducing Tees are produced by solvent cementing Reducer Bushings with Socket Tees. They may be ordered as factory fabrications or may be assembled in the field.

4511-12 Flanged TEE

Flanged fitting center-to-face dimensions may be found on page 18. When ordering, specify the figure number and the nominal size (e.g., 2" Schedule 80 PVC flanged tee — 4511-12 2").

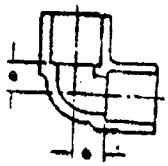
4512-3-3 Thread TEE (FPT x FPT x FPT)



NOMINAL SIZE	UNIVERSAL PART NO.	CTN. QTY.	APPROX. LBS./EA.	
¼	805-002	25	0.05	
½	805-005	25	0.16	1
¾	805-007	25	0.26	1
1	805-010	25	0.40	1
1¼	805-012	10	0.57	2
1½	805-015	10	0.80	2
2	805-020	10	1.13	2
2½	805-025	5	1.79	3
3	805-030	5	2.60	3
4	805-040	5	4.63	4

Elbows

4507 Socket 90° ELL (S x S)



NOMINAL SIZE	UNIVERSAL PART NO.	CTN. QTY.	APPROX. LBS./EA.	D
¼	806-002	25	0.01	5/
½	806-005	50	0.11	½
¾	806-007	50	0.16	
1	806-010	50	0.21	3/
1¼	806-012	25	0.30	2
1½	806-015	25	0.50	1
2	806-020	25	0.75	1
2½	806-025	5	1.16	1
3	806-030	12	1.82	1
4	806-040	12	3.17	2
6	806-060	4	7.70	3
8	806-080	2	15.57	4

4507-12 Flanged 90° ELL

Flanged fitting center-to-face dimensions may be found on page
When ordering, specify the figure number and the nominal size (e
2" Schedule 80 PVC flanged 90° — 4507-12 2").

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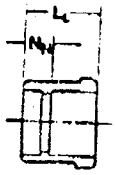
Chemtrol
A DIVISION OF NIBCO INC.

Bushings

CHEMTROL
FIG. NO.

4518 Flush Socket REDUCER BUSHING (SPG × S)

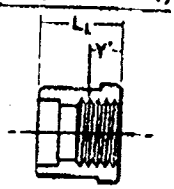


NOMINAL SIZE	UNIVERSAL PART NO.	CTN. QTY.	APPROX. LBS./EA.	DIM. L_L	DIM. N_H
½ × ¼	837-072	50	0.03	1 3/16	9/16
¾ × ½	837-101	50	0.05	1 3/16	¼
1 × ½	837-130	50	0.06	1 5/16	13/32
1 × ¾	837-131	50	0.05	1 5/16	¼
1¼ × ½	837-166	10	0.10	1 7/16	17/32
1¼ × ¾	837-167	10	0.08	1 7/16	13/32
1¼ × 1	837-168	10	0.06	1 7/16	9/32
1½ × ½	837-209	25	0.12	1 17/32	5/8
1½ × ¾	837-210	25	0.10	1 17/32	½
1½ × 1	837-211	25	0.08	1 17/32	3/8
1½ × 1¼	837-212	10	0.06	1 17/32	¼
2 × ½	837-247	25	0.25	1 11/16	25/32
2 × ¾	837-248	25	0.25	1 11/16	21/32
2 × 1	837-249	25	0.25	1 11/16	17/32
2 × 1¼	837-250	10	0.22	1 11/16	13/32
2 × 1½	837-251	25	0.20	1 11/16	9/32
2½ × ½	837-287	10	0.31	1 15/16	1 3/32
2½ × ¾	837-288	10	0.31	1 15/16	31/32
2½ × 1	837-289	10	0.31	1 15/16	27/32
2½ × 1¼	837-290	10	0.31	1 15/16	23/32
2½ × 1½	837-291	10	0.27	1 15/16	19/32
2½ × 2	837-292	10	0.24	1 15/16	7/16
3 × 1	837-335	10	0.65	2 13/32	15/16
3 × 1½	837-337	10	0.67	2 13/32	1/32
3 × 2	837-338	10	0.64	2 13/32	29/32
3 × 2½	837-339	10	0.48	2 13/32	21/32
4 × 2	837-420	10	1.14	2 13/16	15/16
4 × 2½	837-421	5	1.14	2 13/16	1 1/16
4 × 3	837-422	10	0.93	2 13/16	15/16
6 × 2	837-528	5	3.28	3 1/32	1 3/16
6 × 4	837-532	10	2.68	3 1/32	3/8
8 × 6	837-585	3	5.51	4 3/16	1 11/32

Other size reductions are produced by solvent cementing appropriate Reducer Bushings together. They may be ordered as factory fabrications or may be assembled in the field.

CHEMTROL
FIG. NO.

4518-3 Flush Spigot × Thread REDUCER BUSHING (SPG × FPT)



NOMINAL SIZE	UNIVERSAL PART NO.	CTN. QTY.	APPROX. LBS./EA.	DIM. L_L	DIM. Y*
½ × ¼	838-072	50	0.03	1 3/16	11/32
¾ × ½	838-098	50	0.04	1 9/32	11/32
¾ × ½	838-101	50	0.03	1 9/32	15/32
1 × ½	838-130	50	0.07	1 17/32	15/32
1 × ¾	838-131	50	0.05	1 17/32	15/32
1¼ × ½	838-166	10	0.14	1 11/16	15/32
1¼ × ¾	838-167	10	0.12	1 11/16	15/32
1¼ × 1	838-168	10	0.10	1 11/16	9/32
1½ × ½	838-209	10	0.21	1 25/32	15/32
1½ × ¾	838-210	10	0.19	1 25/32	15/32
1½ × 1	838-211	5	0.17	1 25/32	9/16
1½ × 1¼	838-212	10	0.12	1 25/32	19/32
2 × ½	838-247	10	0.34	1 29/32	15/32
2 × ¾	838-248	10	0.32	1 29/32	15/32
2 × 1	838-249	10	0.29	1 29/32	9/16
2 × 1¼	838-250	10	0.24	1 29/32	19/32
2 × 1½	838-251	10	0.20	1 29/32	19/32
2½ × 2	838-292	5	0.25	2 3/16	5/8
3 × 1	838-335	5	0.65	2 13/16	9/16
3 × 1½	838-337	5	0.70	2 13/16	19/32
3 × 2	838-338	5	0.67	2 7/16	5/8
3 × 2½	838-339	5	0.62	2 7/16	15/16
4 × 2	838-420	5	1.17	2 13/16	5/8
4 × 3	838-422	5	1.01	2 13/16	1 1/32

Other size reductions are produced by solvent cementing appropriate Reducer Bushings together. They may be ordered as factory fabrications or may be assembled in the field.

*Typical male component engagement, handtight (L_L) plus 1½ turns plus ½ turn chamfer.

4518-3-4 Flush Thread REDUCER BUSHING (MPT × FPT)

NOMINAL SIZE	UNIVERSAL PART NO.	CTN. QTY.	APPROX. LBS./EA.	DIM. L_L	DIM. Y*
½ × ¼	839-072	50	0.02	1 3/16	11/32
¾ × ½	839-098	50	0.04	1 5/16	11/32
¾ × ½	839-101	50	0.03	1 5/16	15/32
1 × ½	839-130	50	0.05	1 9/16	15/32
1 × ¾	839-131	50	0.05	1 9/16	15/32

Do not use or test the products in this catalog with compressed air or other gases. See Chemtrol Chem-Aire® literature for information about shatter-resistant thermoplastic piping system specifically designed for compressed air and other gases.

CRESLINE

The full-line plastic pipe and fittings people

PVC PRESSURE PIPE SCH-40 & SCH-80

FORM NO. 781 LW & HW SPECIFICATIONS
PRICES LISTED ON FORM MLP-2
PVC CEMENT ON FORM 466.
PLEASE ORDER BY PART NUMBER.

MAY, 1998

PPFA

SCH-40
PRESSURE PIPE
PVC1120
ASTM
D-1785
NSF-pw
Potable Water

SIZE	O.D.	MIN. WALL	WEIGHT PER 100'	SOCKET DEPTH INCHES	FEET PER PALLET	PALLETS PER T.L.	BELL END PART NO.
½"	.840	.109	16.18	2.000	4800	60	42015
¾	1.050	.113	21.58	2.125	4000	52	42030
1	1.315	.133	32.00	2.375	4800	32	42046
1¼	1.660	.140	43.40	2.750	3600	28	42056
1½	1.900	.145	51.06	3.000	4000	20	42070
2	2.375	.154	69.71	5.000	3000	16	47645
2½	2.875	.203	119.67	3.500	2400	12	42102
3	3.500	.216	144.82	4.000	2100	12	42111
4	4.500	.237	211.37	5.000	1280	12	47675
6	6.625	.280	374.72	6.500	560	12	47720
8	8.625	.332	581.77	7.000	400	12	47735
10	10.750	.365	802.82	7.500	240	8	47745
12	12.750	.406	1063.81	8.000	180	8	47755

STANDARD LENGTH 20' EXCEPT 4", 6", 8", 10" & 12" WHICH ARE 20' LAYING LENGTH. NOT RECOMMENDED FOR THREADING.
SCH-40 FITTINGS ARE LISTED ON FORM 786 LW.

SCH-80 PIPE IS FURNISHED IN PLAIN END (PE) 20' LENGTHS.

SCH-80
PRESSURE PIPE
PVC1120
ASTM
D-1785
NSF-pw
Potable Water

½"	.840	.147	20.63	PE	4800	60	43010
¾	1.050	.154	28.02	PE	4000	52	43025
1	1.315	.179	41.23	PE	4800	32	43045
1¼	1.660	.191	57.06	PE	3600	28	43065
1½	1.900	.200	69.19	PE	2400	32	43080
2	2.375	.218	95.89	PE	1800	24	43095
2½	2.875	.276	146.24	PE	1440	20	43115
3	3.500	.300	195.86	PE	1260	16	43120
4	4.500	.337	286.26	PE	640	20	43135
6	6.625	.432	546.56	PE	340	20	43150
8	8.625	.500	830.24	PE	200	20	43165

SCH-80 FITTINGS ARE LISTED ON FORM 781 HW.
SCH-80 PIPE IS RECOMMENDED FOR THREADING.

CRESLINE PLASTIC PIPE CO., INC.

865 Diamond Ave — Evansville, IN 47711 — 812-426-8350 — Fax 812-426-8363
264 Silver Spring Rd. — Mechanicsburg, PA 17055 — 717-766-2589 — Fax 717-697-2374
2100 South 35th St. — Council Bluffs, IA 51501 — 712-322-2284 — Fax 712-322-6673
3801 East Hwy. 31 — Corsicana, TX 75110 — 903-872-8478 — Fax 903-872-7732

PRESSURE RATINGS OF CHEMTROL PRODUCTS

Pipe and Fittings

In order to determine the pressure rating for a product system, first find the plastic material and schedule (wall thickness - see page 6 for additional information) of pipe and fittings in the heading of the Maximum Nonshock Operating Pressure table below. Then, locate the selected joining method in the subheading of the table and go down the column to the value across from a particular pipe size, listed in the far left column. This will be the maximum non-shock operating pressure at 73°F for the defined product system.

MAXIMUM NONSHOCK OPERATING PRESSURE (psi) AT 73°F

Nominal Pipe Size	Schedule 40 PVC & CPVC	Schedule 80 PVC & CPVC		Schedule 80 Polypropylene		Schedule 80 PVDF	
	Socket End	Socket End	Threaded End	Thermo-Seal Joint	Threaded[2] End	Thermo-Seal Joint	Threaded End
½	600	850	420	410	20	580	290
¾	480	690	340	330	20	470	250
1	450	680	320	310	20	430	210
1¼	370	520	260	260	20	—	—
1½	330	470	240	230	20	326	160
2	280	400	200	200	20	270	140
2½	300	420	210	—	—	—	—
3	260	370	190	190	20	250	N.R.
4	220	320	160	160	20	220	N.R.
6	180	280	N.R.	140	N.R.	190	N.R.
8	180	250[3]	N.R.	—	—	—	—
10	140	220	N.R.	—	—	—	—
12	130	230	N.R.	—	—	—	—

[1] For more severe service, an additional correction factor may be required.
[2] 6" CPVC Tee, 90° Ell and 45° Ell rated at ½ of value shown. Pressure rating of 175 psi can be obtained by factory overwrapping with glass and polyester. Consult Customer Service for delivery information.
[3] Recommended for intermittent drainage pressure not exceeding 20 psi.
N.R.—Not Recommended.

As implied by the preceding, the pressure for all thermoplastic piping is a function of temperature. For pipe and fitting applications above 73°F, refer to the table at the top of the next column for the Temperature Correction Factors. To determine the maximum non-shock pressure rating at an elevated temperature, simply multiply the base pressure rating obtained from the upper table by the correction factor from the upper table in the next column. Below 73°F the pressure rating will be the same as the base pressure in the table above.

Temperature Correction Factors

Operating Temperature (°F)	FACTORS PVC	CPVC	PP	PVDF
70	1.00	1.00	1.00	1.00
80	0.90	0.96	0.97	0.95
90	0.75	0.92	0.91	0.87
100	0.62	0.85	0.85	0.80
110	0.50	0.77	0.80	0.75
115	0.45	0.74	0.77	0.71
120	0.40	0.70	0.75	0.68
125	0.35	0.66	0.71	0.66
130	0.30	0.62	0.68	0.62
140	0.22	0.55	0.65	0.58
150	N.R.	0.47	0.57	0.52
160	N.R.	0.40	0.50	0.46
170	N.R.	0.32	0.28	0.45
180	N.R.	0.25		0.42
200	N.R.	0.18	N.R.	0.36
210	N.R.	0.15	N.R.	0.33
240	N.R.	N.R.	N.R.	0.25
280	N.R.	N.R.	N.R.	0.18

[1] Recommended for intermittent drainage pressure not exceeding 20 psi.
N.R.—Not Recommended.

Valves and Flanges

The maximum pressure rating for Chemtrol valves, flanges, and unions, regardless of size, is 150 psi at 73°F. As with all other thermoplastic piping components, the maximum non-shock operating pressure is related to temperature. Above 100°F refer to the chart below.

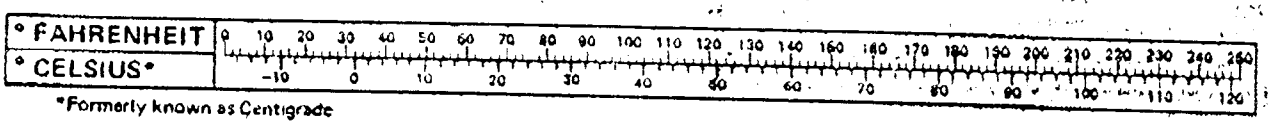
Maximum Operating Pressure (psi) vs. Temperature

Operating Temperature (°F)	PVC	CPVC	PP	PVDF
100	150	150	150	150
110	135	140	140	150
120	110	130	130	150
130	75	120	118	150
140	50	110	106	150
150	N.R.	100	93	140
160	N.R.	90	80	133
170	N.R.	80	70	126
180	N.R.	70	50	115
190	N.R.	60	N.R.	106
200	N.R.	50	N.R.	97
250	N.R.	N.R.	N.R.	50
280	N.R.	N.R.	N.R.	25

N.R.—Not Recommended

Temperature Conversions

$F = C \times 1.8 + 32$ $\quad C = (F-32) \div 1.8$



*Formerly known as Centigrade

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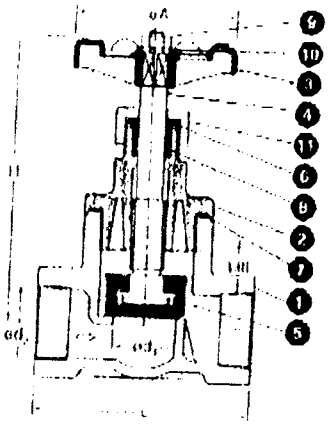
GLOBE VALVES

FEATURES

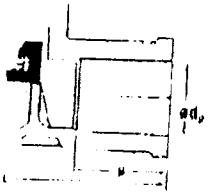
- Used for efficient, frequent throttling of flow
- Positive shut-off
- Displays excellent flow regulating characteristics throughout the entire lift of the disc
- All sizes rated for full vacuum service
- An economical valve that doesn't sacrifice dependability
- EPDM seals. Other elastomers optional
- Stainless steel reinforcing ring on body of polypropylene valve to maintain pressure rating at higher temperatures

SPECIFICATIONS

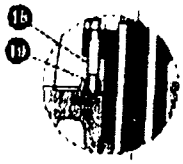
SIZE: 1/2" – 4"
MODELS: Flanged (ANSI – all sizes)
Threaded (1/2" – 2")
Socket (1/2" – 2")
BODY: PVC, PP
PLUG: EPDM
SEALS: EPDM



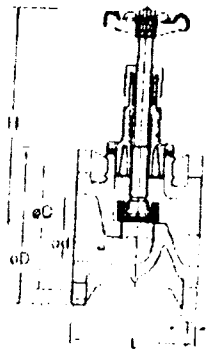
THREADED (Model A)



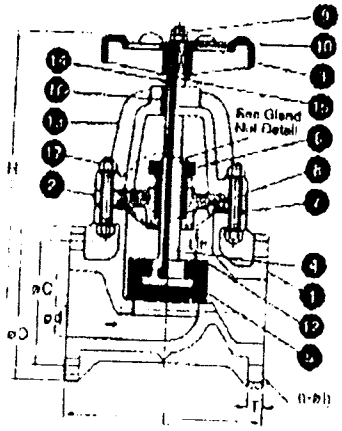
SOCKET (Model B)



Gland Nut Detail



FLANGED 1/2"–2" (Model C)



FLANGED 2 1/2"–4" (Model D)

PARTS (MODELS A, B, C)

No.	Parts	Pcs	Materials
1	Body	1	PVC, PP
2	Bonnet	1	PVC, PP
3	Handwheel	1	PP
4	Stem	1	PVC, PP
5	Disc	1	PP
6	Gland	1	PVC, PP
7	Gasket	1	EPDM
8	Stem Packing	2	EPDM
9	Nut	1	PVC/400 SS
10	Washer	1	PVC/400 SS*
11	Gland Nut	1	PVC, PP

MODEL D (Same as above with the following changes)

No.	Parts	Pcs	Materials
9	Nut	2	PVC/400 SS*
10	Washer	1	PVC/400 SS*
12	Stem Holder	1	PP
13	Stem Support	1	PP
14	Stem Sleeve	1	Steel
15	Stem w/Trapezoid Screw	1	Copper Alloy
16	Yoke Sleeve	1	Bronze
17	Bolt, Nut	4 Sets	304 SS
18	Gland Stud Bolt and Nut	2 Sets	304 SS
19	Insert	2	Brass

* 1/2" to 2" – PVC; 2 1/2" to 4" – 400 SS

PRESSURE VS TEMPERATURE (PSI)

Size (inches)	PVC			PP		
	30° F 70° F	71° F 105° F	106° F 120° F	-5° F 70° F	71° F 140° F	141° F 175° F
1/2	150	150	110	110	95	65
3/4	150	150	110	110	95	65
1	150	150	110	110	95	65
1 1/4	150	150	110	110	95	65
1 1/2	150	150	110	110	95	65
2	150	150	95	110	75	45
2 1/2	110	110	95	110	60	35
3	110	110	95	110	60	35
4	110	80	65	110	60	35

DIMENSIONS (INCHES)

Size (inches)	Flanged								Socket and Threaded									Cv Value (Gal/Min @ 1 psi pressure drop)
	Weight (lbs)	d	C	D	L	T	Lift	H (open)	Weight (lbs)	Threaded d_1	Threaded L	Socket d_2	Socket L	S	Lift	d_1	H (open)	
1/2	0.85	0.71	2.38	0.50	3.35	0.47	0.31	5.20	0.64	NPT 1/2	3.35	0.85	4.33	1.18	0.32	0.59	5.20	4.1
3/4	1.10	0.94	2.75	3.88	3.74	0.55	0.31	5.51	1.10	NPT 3/4	3.74	1.06	5.12	1.38	0.32	0.71	5.51	6.4
1	2.20	1.10	3.12	4.25	4.33	0.55	0.43	6.34	1.10	NPT 1	4.33	1.33	5.91	1.58	0.43	0.98	6.34	9.7
1 1/4	2.80	1.46	3.50	4.62	5.31	0.63	0.51	6.57	1.30	NPT 1 1/4	5.32	1.67	6.32	0.98	0.51	1.38	6.58	18.0
1 1/2	4.50	1.81	3.88	5.00	7.48	0.63	0.79	9.06	2.70	NPT 1 1/2	6.5"	1.91	6.91	0.98	0.67	1.61	9.06	27.0
2	5.30	2.05	1.75	6.00	7.87	0.83	0.94	9.92	3.50	NPT 2	7.09	2.38	7.09	1.06	0.67	2.05	10.20	29.0
2 1/2	9.25	2.64	5.50	7.00	8.86	0.71	1.38	13.58	—	—	—	—	—	—	—	—	—	57.0
3	16.00	3.07	6.00	7.50	9.45	0.71	1.38	14.13	—	—	—	—	—	—	—	—	—	78.0
4	22.00	3.94	7.50	8.66	11.42	0.71	1.57	16.50	—	—	—	—	—	—	—	—	—	116.0

SAHI/AMERICA
Rev. V-97/D
P.O. Box 853 • 35 Green Street, Malden, MA 02148 • Tel: (800) 343-3618, (781) 321-5409
Fax: (800) 426-7058 • Internet: http://www.sahi-america.com • Email: sahi@sahi-america.com

CRESLINE
The full line plastic pipe and fittings people

PE 3408 FLEXIBLE PIPE

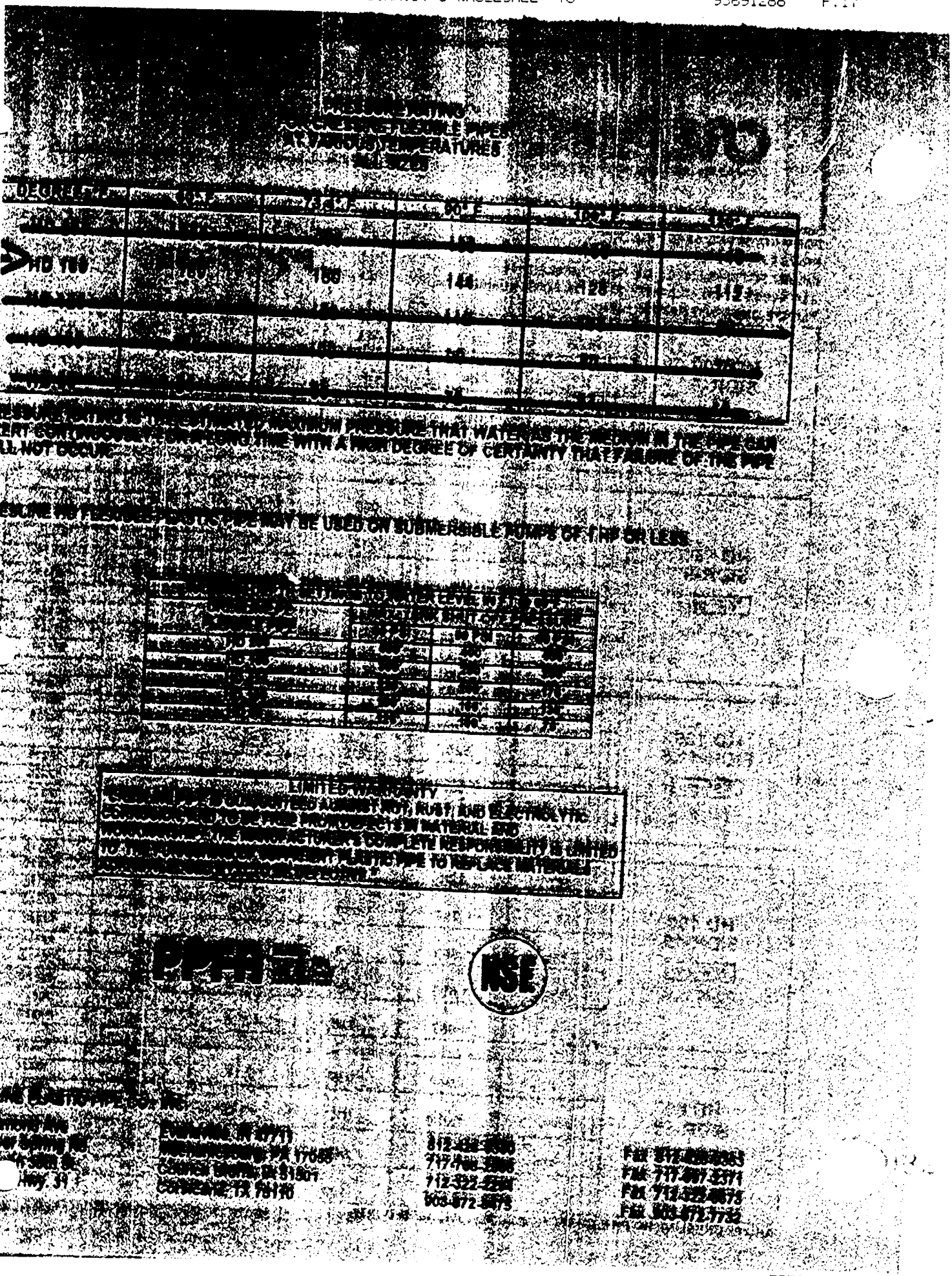
FORM NO. 161-HD SPECIFICATIONS
PRICES ARE LISTED ON FORM MLP-1.
INSERT FITTINGS LISTED ON FORM NUMBER 166.
STAINLESS STEEL CLAMPS LISTED ON FORM NUMBER 965.
PLEASE ORDER BY PART NUMBER.

JUNE, 1995

PPFA

	SIZE	I.D.	MIN. WALL	WEIGHT PER 100'	COIL LENGTHS	PART NO.
HD 200 SIDR-7 NSF-pw Potable Water	¾"			15.42	100	18006
					400	18016
	1	1.049	.150		100	18015
					300	18020
						18025
	1¼	1.380	.197	43.13	300	
HD 160 SIDR-9 NSF-pw Potable Water	¾"	.824	.092	11.67	100	18105
					400	18110
	1	1.049	.117	18.87	100	18115
					300	18120
	1¼	1.380	.153	32.44	100	18125
					300	18130
	1½	1.610	.179	44.24	100	18135
					250	18140
	2	2.067	.230	73.39	100	18145
					200	18150
HD 125 SIDR-11.5 NSF-pw Potable Water	½"	.622	.060	5.72	100	18201
					400	18205
	¾	.824	.072	8.95	100	18210
					400	18215
	1	1.049	.091	14.34	100	18216
					300	18220
	1¼	1.380	.120	24.85	100	18225
					300	18230
HD 100 SIDR-15 NSF-pw Potable Water	¾"	.824	.060	7.38	100	18310
					400	18320
	1	1.049	.070	10.78	100	18325
					300	18330
	1¼	1.380	.092	18.71	100	18365
					300	18360
	1½	1.610	.107	25.45	100	18375
					250	18380
	2	2.067	.138	42.20	100	18390
					200	18395
HD 80 SIDR-19 NSF-pw Potable Water	1"	1.049	.060	9.16	100	18420
					300	18425
	1¼	1.380	.073	14.67	200	18435
					300	18440
	1½	1.610	.085	19.91	100	18450
					250	18455
	2	2.067	.109	32.61	100	18460
					200	18465

ABOVE CRESLINE HD PIPE CONFORMS TO PE 3408, ASTM D 2239.



Series 288A

IS-288A/N388

Antisiphon Vacuum Breaker

"ATTN. INSTALLER: After installation, please leave this instruction sheet for occupant's information."

IMPORTANT: Inquire with governing authorities for local installation requirements.

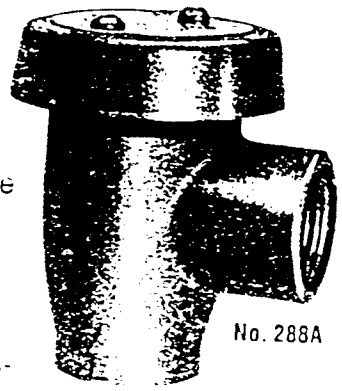
Available Models:

188A - ½" - 2" designed for irrigation systems
288A - ¼" - 3" designed for potable water systems
N388 - ¼" and ⅜" designed for fixture use

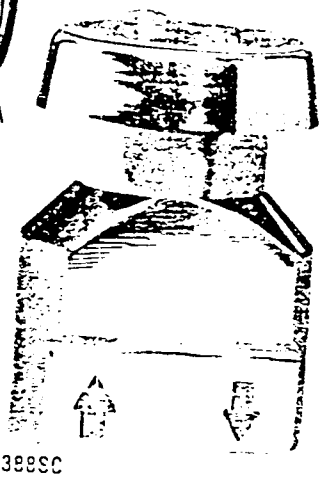
ASSE Standard 1001 | Listed by IAPMO | CSA Certified

Options:

Suffix
C - polished chrome finish
SC - satin chrome finish
Max. Temp: 180°F at 125 psi working pressure



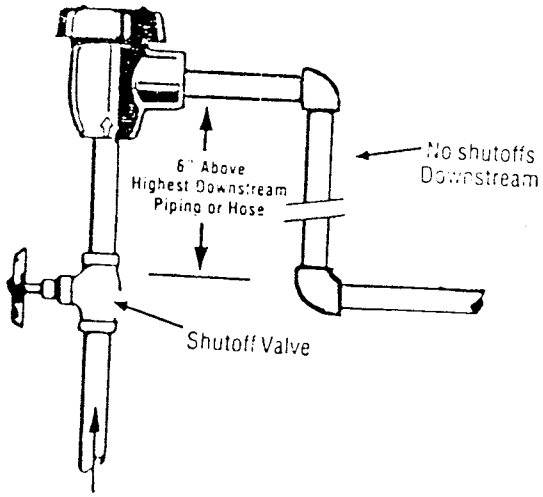
No. 288A



No. N388SC

Installation:

1. Install six (6) inches above the highest point of downstream piping or hose.
2. Use only with non-continuous pressure (pressurized a maximum of 12 out of 24 hours.)
3. No downstream shutoffs are allowed.
4. Device can spill water, install where spillage is not objectionable.



Repair Kits:

Description	Size	EDP No
RK 188-288-388 T	¼" - ⅜"	887170
RK 188-288-388 T	½"	887171
RK 188-288-388 T	¾"	887172
RK 188-288-388 T	1" - 1¼"	887173
RK 188-288-388 T	1½"	887174
RK 188-288-388 T	2"	887175
RK 288A T	2½" - 3"	887176

Total Repair kit includes: Bonnet gasket, Disc & Disc float.

CALIFORNIA PROPOSITION 65 WARNING

This product contains lead, a chemical known to the State of California to cause birth defects or other reproductive harm.

(Plumber: California law requires that this warning be given to the consumer.)

CONSUMER INFORMATION ABOUT CALIFORNIA PROPOSITION 65 WARNING

All faucets and products made of leaded brass alloys, even those that comply with U.S. Environmental Protection Agency regulations, contribute small amounts of lead to water that is allowed to stand in contact with the brass. This product complies with all E.P.A. regulations regarding the amount of lead used in plumbing brass and solder. The amount of lead contributed by any faucet/product is highest when the faucet/product is new.

The following steps will reduce potential exposure to lead from faucets and other parts of the plumbing system:

- Always run the water for a few seconds prior to use for drinking or cooking.
- Use only cold water for drinking or cooking.
- If you wish to flush the entire plumbing system of water that has been standing in the pipes or other fittings, run the cold water until the temperature of the water drops, indicating water coming from the outside main.
- If you are concerned about lead in your water, have your water tested by an EPA-certified laboratory in your area.

A LEADER IN VALVE TECHNOLOGY

Watts Industries, Inc.
Water Products Division • Safety & Control Valves
USA: 815 Chestnut Street, North Andover, MA 01845-6098
Canada: 491 Hanlan Rd., Woodbridge, Ontario L4L 3T1

ISO 9001 CERTIFIED

LIMITED WARRANTY: Watts Regulator Company warrants each product against defects in material and workmanship for a period of one year from the date of original shipment. In the event of such defects within the warranty period, the Company will, at its option, replace or recondition the product without charge. This shall constitute the exclusive remedy for breach of warranty, and the Company shall not be responsible for any incidental or consequential damages, including without limitation, damages or other costs resulting from labor charges, delays, vandalism, negligence, fouling caused by foreign material, damage from adverse water conditions, chemicals, or any other circumstances over which the Company has no control. This warranty shall be invalidated by any abuse, misuse, misapplication or improper installation of the product. THE COMPANY MAKES NO OTHER WARRANTIES EXPRESS OR IMPLIED EXCEPT AS PROVIDED IN THIS LIMITED WARRANTY.

IS-288A/N388 9610

EDP No. 1910218

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Printed in U.S.A.

Atmospheric Vacuum Breakers

Series 288A ¼" - 3"

Designed to prevent back siphonage of contaminated water into the drinking water supply.

Applications

Typical of this type of equipment are clothes and dishwashers, beverage dispensers, chemical and process tanks and similar devices.

Standards (see page 3)

Materials

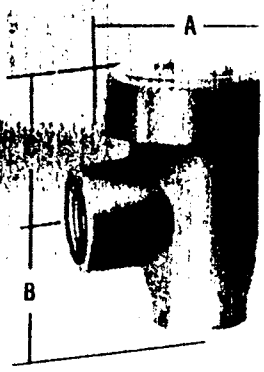
Sizes ¼" through 1" are available in either plain brass or polished chrome finish. Durable silicone disc, high heat resistance. Size ¼" through 3" standardly furnish with plain brass finish.

Pressure-Temperature

Maximum temperature 180°F at 125 lbs. working pressure. Note: This device shall not be subjected to continous pressure for more than 12 hours, per A.S.S.E. Std. 1001

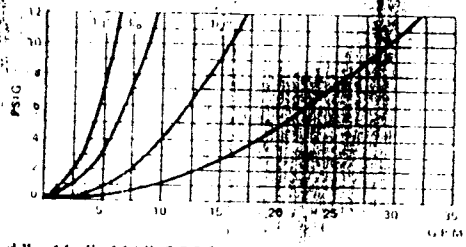
Dimensions & Weight (approximate)

No. Plain Brass	No. Polished Chrome	Size (inches)	Dimensions approx(inches) A	B	C	Weight (lbs)
288A	288A-C	¼	1 1/16	1 1/16	1 3/16	⅜
288A	288A-C	⅜	1 1/16	1 1/16	1 3/16	⅜
288A	288A-C	½	2	1 3/16	1 7/16	½
188/288A	288A-C	¾	2 1/4	1 1/2	1 7/8	1 1/8
188/288A	288A-C	1	2 1/4	1 11/16	2 1/8	1 3/4
188/288A		1¼	2 1/4	1 13/16	2 1/8	2 1/4
188/288A		1½	3 1/4	2 3/16	2 1/16	3 1/4
188/288A		2	4 1/4	2 1/2	2 1/8	5 1/4
288A		2½	6 1/4	3	4 3/8	16
288A		3	6 1/4	3 1/2	4 5/8	17 1/2

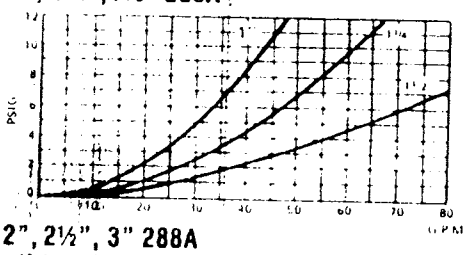


Capacity

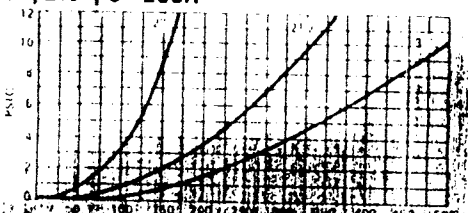
¼", ⅜", ½", ¾" 288A



1", 1¼", 1½" 288A



2", 2½", 3" 288A



For Additional information send for ES-288A.
For information on Irrigation Vacuum breakers send for IS/ES-188A

Series 289 ⅜", ½"

Spill Resistant Atmospheric Vacuum Breaker

Designed for indoor point of use applications with continuous supply pressure to prevent backsiphonage of contaminated water back into the potable water supply. Separation of the water supply from the air inlet is accomplished by means of a diaphragm seal. This feature protects against any spillage during start up operation.

Installation

The 289 is designed to be installed at the point of use. When factory installed deck/machine mounted on machine or equipment, the critical level of the 289 shall be 1" above the flood rim. If field applied for general plumbing applications, the critical level of the 289 shall be 6" above the flood rim.

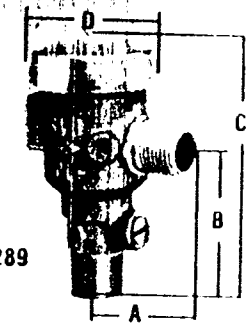
Standards (see page 3)

Pressure-Temperature

Working Temp: 33°F - 160°F,
Max. Pressure: 150 psi,
Min. Pressure 8 psi

Materials

Springs	Stainless Steel
Bonnet	PPO
Vent Disc	EPDM
Disc Holder	PPO
Body	Bronze
Diaphragm	EPDM



289

Dimensions & Weights

Size (In.)	Dimension (In.) A	B	C	D
⅜	1½	2⅜	3¼	2
½	1½	2⅜	3¼	2

For Additional information send for ES-289.

Sizes ¼", ⅜"

For bidets, shampoo sinks, dishwashers, etc.
Features bottom inlet and outlet connections, bronze
Suffix SC with satin chrome
Suffix C with polished chrome

No.	Size	Dimensions A	C-C	Weight
N388, SC, C	¼"	1¾"	¾"	[illegible]
N388, SC, C	⅜"	1¾	⅞"	[illegible]

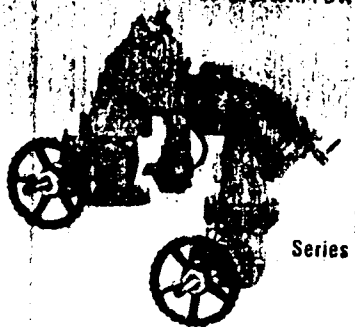
Inquire with governing authorities for local requirements

For Additional information send for ES-N388

APPLICABLE STANDARDS				
ASSE Std 1013, AWWA C511-92, IAPMO PS31, CSA B64.4	009	¼ - 3"	¼ - 3	8
ASSE Std 1013, AWWA C511-92, CSA B64.4, IAPMO PS31	909	¾ - 10"	¾ - 10	6,7
ASSE Std 1047, CSA B64.4	909RPDA	2½ - 10"	2½ - 10	11
ASSE Std 1013, AWWA C511-92, IAPMO PS 31, CSA B64.4	993	-	4	9
ASSE Std 1047	993RPDA	-	4	10
Test Kits, Air Gaps				5
ASSE Std 1015, AWWA C510-92, CSA B64.5, IAPMO PS31	007	¾"	½ - 3"	12
ASSE Std 1015, AWWA C510-92, CSA B64.5	009	2½"	2½ - 10"	13
ASSE Std 1015, AWWA C510-92, CSA B64.5	772	-	¾	14
ANSI/ASSE Std. 1048, CSA B64.5	807QCDA	¾" - 2"	¾ - 2	12
ANSI/ASSE Std. 1048, CSA B64.5	709QCDA	3 - 10"	3 - 10	16
ANSI/ASSE Std. 1048, CSA B64.5	779QCDA	-	4 - 6	16
ANSI/ASSE Std. 1024, CSA B64.6	7	-	¼ - 1½	18, 19
ANSI/ASSE Std. 1024, CSA B64.6	78	-	¾	18
ANSI/ASSE Std. 1024, CSA B64.6	A7	-	⅜, ¾	18
ANSI/ASSE Std. 1024	17	-	¾, 1	18
ANSI/ASSE Std. 1024, CSA B64.6	07S	-	1	18
ASSE Std. 1024, CSA B64.6	7C	-	⅜	20
DET EXPANSION TANKS, BALL COCK	GOV 80 THERMAL EXPANSION RELIEF VALVE			19
ANSI/ASSE Std. 1012, CSA B64.8	9DM3/M2, 911	-	½ - ¾	17
CSA Std. B64.8	9BD	-	⅜ FCT ¼, ⅜ NPTM	21
ASSE Std. 1035, CSA B64.8	NF9	-	⅜	20
ASSE Std. 1052	N9-CD	-	¼	20
CSA B64.8	N9	-	¼	20
ANSI/ASSE Std. 1001, CSA B64.1.1	288A, 289	¼" - 2"	¼ - 2	25
ANSI/ASSE Std. 1001, CSA B64.1.1	M288	-	¼ - 2	25
ANSI/ASSE Std. 1001, CSA B64.1	388A-S	-	¼ - 2	25
ANSI/ASSE 1020, CSA B64.1.2	800M4QT	½" - 2"	½ - 2	22
ANSI/ASSE 1020, CSA B64.1.2	800M4QT	½ - 2"	½ - 2	22, 23
ASSE 1056, IAPMO Classified	008QT	-	¾, ½, ¼, 1	24
ASSE Std. 1011	580, 8, NF8,H3-1	-	⅜, ½, ¾ HT	26,27
ASSE Std. 1015, CSA B64.2	FHB	-	½, ¾	27
	HWS	-	¾, 1	27
UL/FM Approved	07F	-	4 - 10	28

For Table Explanations see Index for Engineering Specifications, Tools for Approved Sizes and Product Limitations

REDUCED PRESSURE DETECTOR ASSEMBLIES
REDUCED PRESSURE ZONE BACKFLOW PREVENTERS



Series 993

DOUBLE CHECK VALVE ASSEMBLIES

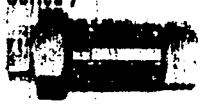
Series 773

DOUBLE CHECK DETECTOR ASSEMBLIES

Series 709DCDA

DUAL CHECK VALVE BACKFLOW PREVENTERS

Series 7



Series A7

Series 07S

SPILL-RESISTANT VACUUM BREAKERS
WITH INTERMEDIATE ATMOSPHERIC VENT

Series 9D

ATMOSPHERIC VACUUM BREAKERS

Series 289

Series 288A

PRESSURE VACUUM BREAKERS

Series 800M4QT

Series 008QT

HOSE CONNECTION VACUUM BREAKERS

Series 8

NIBCO®

CLASSIC VALVES

LIFETIME REPLACEMENT WARRANTY

NIBCO will replace any Classic plumbing valve that fails under normal use and service because of defects in material or workmanship for the life of the valve.

APPLICATIONS

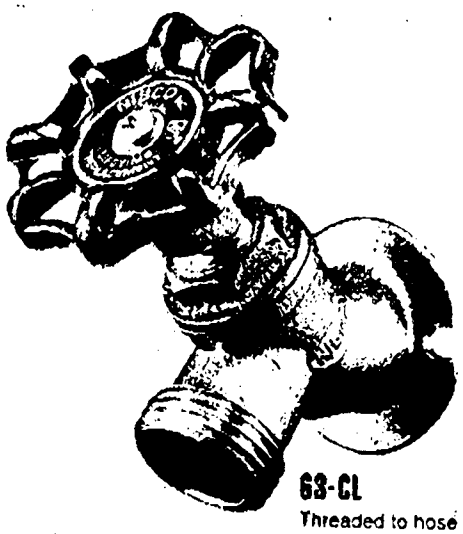
Multi-purpose shut-off valve for use in low pressure, domestic potable water systems. Patterns include stop valves, stop and waste valves, boiler drains, and angle sillcocks.

MATERIALS & CONSTRUCTION

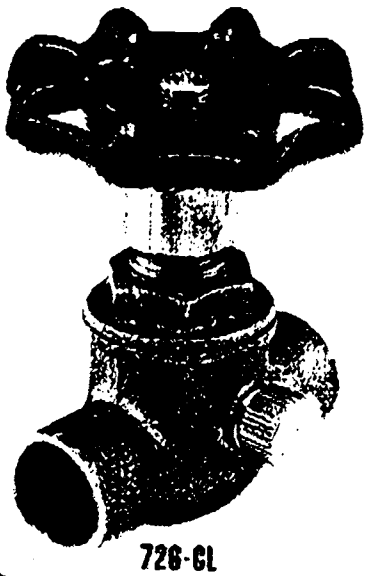
- 14% larger handwheel for improved strength and ease of operation.
- New cold-formed copper alloy stem eliminates corrosion and boosts torsional strength.
- Cast copper-based alloy body resists corrosion
- New 1⅜" cast copper-alloy bonnet permits easier removal with deep socket or open end wrench.
- New 1⅛" packnut; increased flat size for easier adjustment.
- Stem and bonnet assemblies for ½" and ¾" valves, identical and interchangeable with any body type in their respective patterns.

DESIGN CERTIFICATIONS

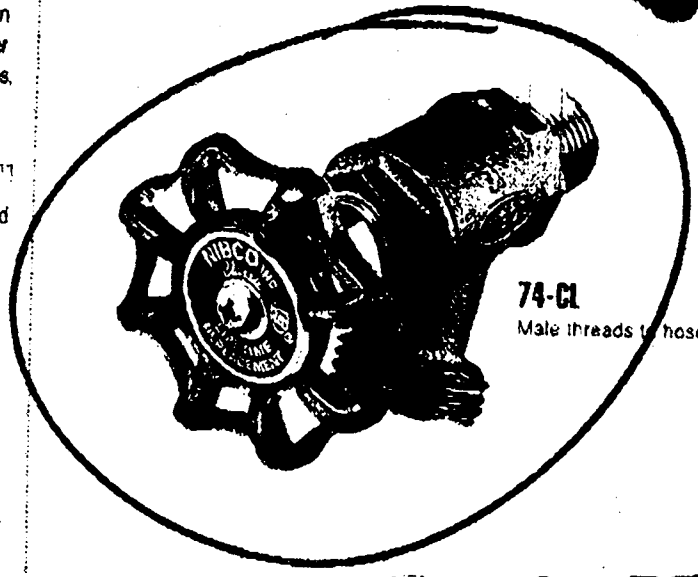
- Classic valves are listed with the International Association of Plumbing and Mechanical Officers (IAPMO), in compliance with the Uniform Plumbing Code.
- Each valve individually tested in ISO 9002 certified facility.



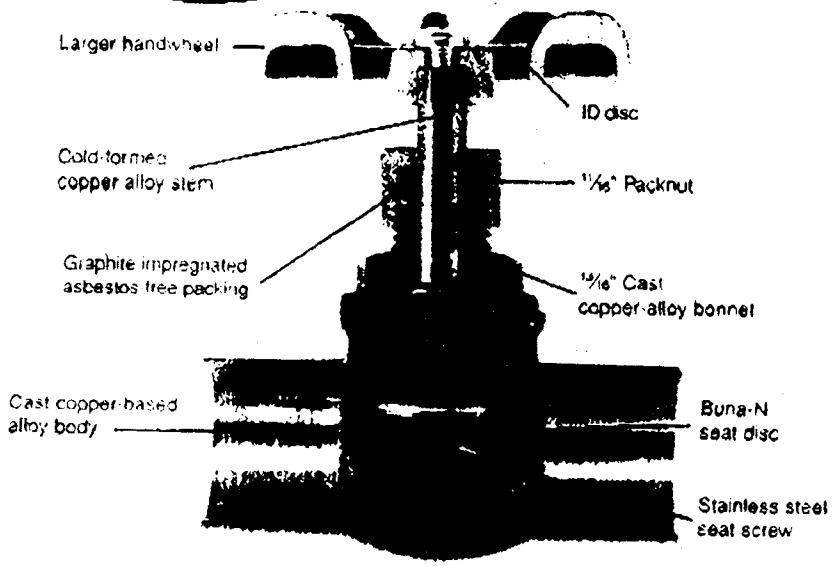
63-CL
Threaded to hose



726-GL
Copper to copper

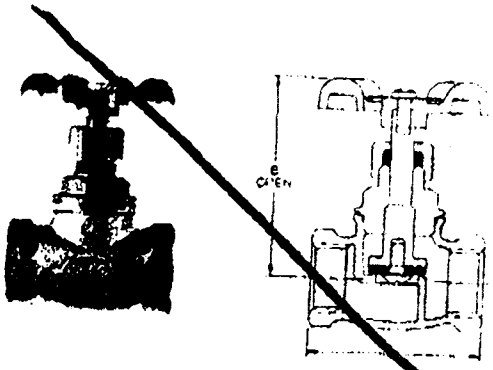


74-CL
Male threads to hose



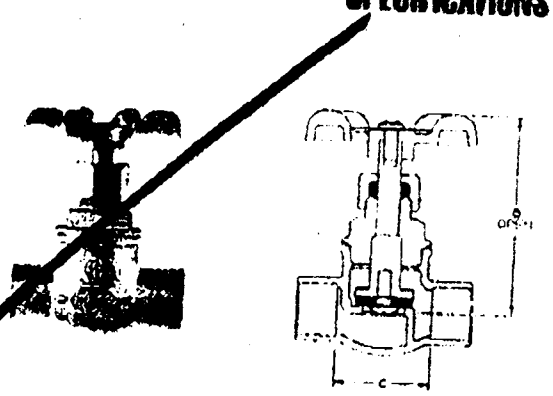
CLASSIC VALVES

SPECIFICATIONS



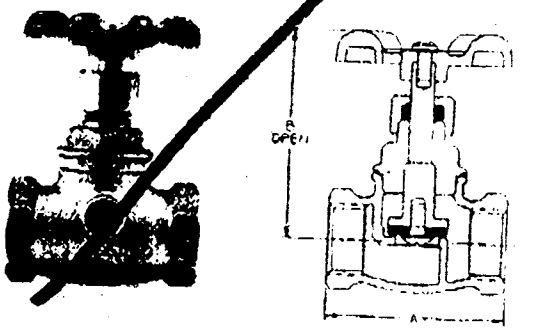
75-CL

DESCRIPTION	NOM. SIZE	DIMENSIONS A	DIMENSIONS B	APPROX. NET WT.
STOP VALVES Threaded	½"	2 3/16"	2 [illegible]	.5 lb
	¾"	2 5/16"	[illegible]/16"	.6 lb



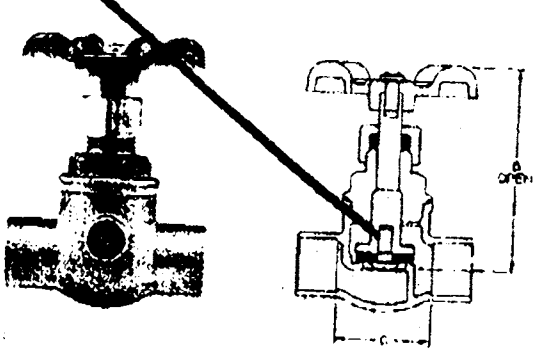
725 CL

DESCRIPTION	NOM. SIZE	DIMENSIONS B	DIMENSIONS C	APPROX. NET WT.
STOP VALVES Copper to Copper	½"	2 5/16"	1 3/16"	.4 lb
	¾"	2 5/16"	1 3/16"	.5 lb



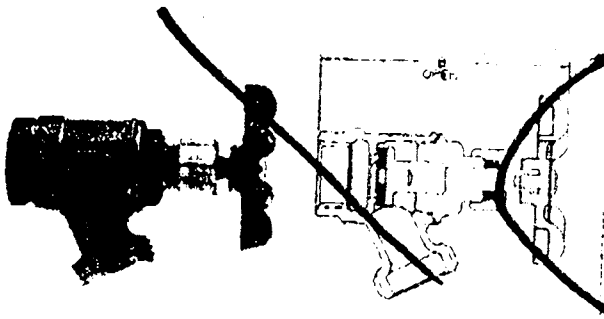
76-CL

DESCRIPTION	NOM. SIZE	DIMENSIONS A	DIMENSIONS B	APPROX. NET WT.
STOP & WASTE VALVES Threaded	½"	2 3/16"	2 5/16"	.6 lb
	¾"	2 5/16"	2 5/16"	.8 lb



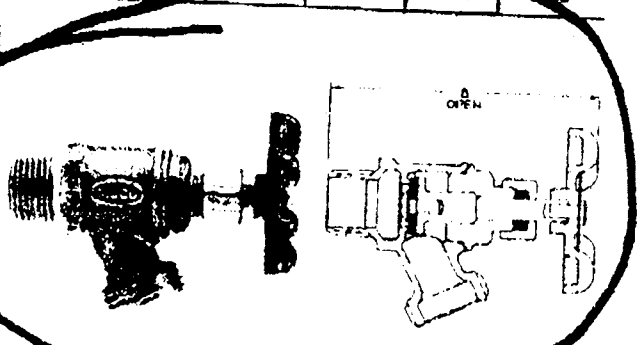
726-CL, 726-LCL

DESCRIPTION	NOM SIZE	DIMENSIONS B	DIMENSIONS C	APPROX. NET WT.
STOP & WASTE VALVES Copper to Copper	½"	2 5/16"	1 3/16"	.4 lb
	[illegible]	2 5/16"	1 5/16"	.6 lb



73-CL

DESCRIPTION	NOM. SIZE	DIMENSION B	APPROX. NET WT.
BOILER DRAINS Threaded to Hose	½"	3 1/4"	.5 lb
	¾"	3 5/16"	.5 lb



74-CL, 74-DC

DESCRIPTION	NOM. SIZE	DIMENSION B	APPROX. NET WT.
BOILER DRAINS Copper or Male Threads to Hose	½"	3 11/16"	.5 lb
	¾"*	3 3/4"	.5 lb

*¾" furnished in male threads only

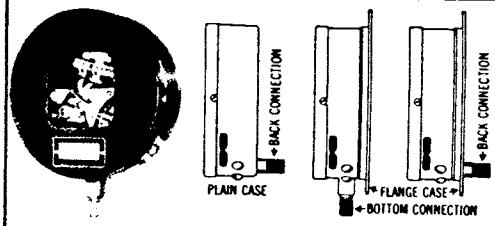
INSTALLATION INSTRUCTIONS

Bulletin No. IN-0118

MERCOID SERIES "D" PRESSURE CONTROLS

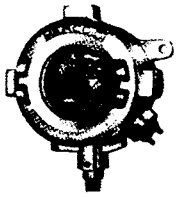
WITH HERMETICALLY SEALED MERCURY SWITCHES & BOURDON TUBE POWER ELEMENTS

(The following instructions apply to Mercoid Pressure Controls prefixed by the letter "D" except Series "DP" Differential Pressure Controls.)



GENERAL PURPOSE Prefixed by DA, DAF, DL, DR, DS, DRF, DSF

WATERTIGHT OR WEATHER-RESISTANT Prefixed by DAW, DRW, DSW, N3-DAW, N3-DRW, N3-DSW



EXPLOSION PROOF Prefixed by DAH, DAHF, DLH, DRH, DSH

EXPLOSION PROOF Prefixed by DAE, DLE, DRE, DSE

CONTROL NUMBERS

Part of the control number identifies the type of control case. The digit 1 of 21, 31, 41, 81, 221, 231, 241, 281, 421, 431, 441, 521, 531, 541, 581, denotes a plain case with bottom connection.

The digit 2 of 22, 32, 222, 232, 242, 422, 432, 522, 532, denotes a plain case with back connection

The digit 3 of 23, 33, 43, 83, 223, 233, 243, 283, 423, 433, 443, 523, 533, 543, 583, denotes a flanged case with bottom connection.

The digit 4 of 24, 34, 224, 234, 524, denotes a flanged case with back connection.

CIRCUIT SUFFIX NUMBERS (SWITCH OPERATION)

Suffix number after control number denotes whether circuit is to open or close on increase or decrease of pressure, etc. Examples: TYPE DA-21-2 -suffix -2 indicates circuit is to open on pressure increase. Type DA-21-3 -suffix -3 indicates circuit is to close on pressure increase. FOR EXPLANATION OF CIRCUIT NUMBERS AND VARIATIONS SEE PAGE 4.

LOCATION AND MOUNTING

Select a location recommended by equipment manufacturer. Note: Vibration causes erratic operation of any instrument and shortens its life. It is important that a location be selected that is reasonably free from vibration caused by reciprocating or rotating machinery. Where excessive vibration occurs, use a remote connection and mount by means of a mounting bracket or separable flange (available on order). Where pulsations, pressure surges or water hammer are present, protect the control with a surge tank or snubber.

MOUNT ALL CONTROLS VERTICALLY AND LEVEL

GENERAL PURPOSE CONTROLS: Prefixed by letters DA, DAF, DRF, DL, DS, DSF. Install control firmly in a LEVEL POSITION. Do not mount control by twisting the case, use wrench on the square part of the ¼" bottom pipe connection. To level, sight across the two cover screws or check the lower end of the glass opening in cover to see that the control is lined up horizontally.

On general purpose controls provided with a flange, mount by means of the three holes in flange - see drawing No. 1000B page 4.

WATERTIGHT OR WEATHER RESISTANT TYPES: Prefixed by letters DAW, DRW, DSW, DLW, N3-DAW, N3-DRW, N3-DSW, N3-DLW: Supplied with flanged case, bottom connection only, for surface mounting. (see drawing No. 1062, page 4) Install firmly in a LEVEL POSITION. Do not mount control by twisting the case, use wrench on the square part of the ¼" bottom pipe connection. Be sure pipe connection is in a vertical position. After cover is properly attached with name plate on bottom of cover, sight across the lower end of the glass opening in cover to see that control is lined up vertically.

EXPLOSION PROOF TYPES: Prefixed by letters DAH, DAHF, DRH, DSH, DAE, DRE, DSE: (see drawings No. 1350 and 1062, page 4) Mount control level by means of mounting lugs attached to control housing. Line up horizontally by sighting across the left and right conduit hubs.

WHEN IN DOUBT AS TO EXCESSIVE VIBRATION USE A REMOTE CONNECTION.

NOTE:
SERIES D-30, D-230, D-430, D-530 (i.e., DA-31-3, etc.) when used for steam with operating ranges 35 psi or higher, must be siphoned to prevent live steam entering the Bourdon tube. On high pressure steam in excess of 100 psi, use a remote connection (see illustration, page 1).
SERIES D-20, D-220, D-420, D-520 (i.e., DA-21-2, etc.) incorporate an orifice as standard in the bottom stem to dampen out surges or pulsations.

ACCESSORIES

Remote Connection No.49-62 (300 psi. No.49-62HP (to 2500 psi.)

MOUNTING BRACKET No.33-25

Pigtail Siphon No. 42-52 (300 psi.) No. 42-58 (2,000 psi.)

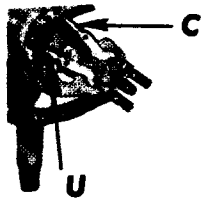
WIRING

Wire in accordance with local electrical codes or equipment manufacturer's instructions.
For general purpose controls use a short piece of BX between the rigid conduit and the control so that it will not be subjected to conduit expansion and contraction. Where control is directly connected into load circuit it should be connected into hot side of line. For electrical rating see nameplate attached to control case.

ADJUSTMENTS HOW TO SET OPERATING POINT

DOUBLE ADJUSTMENT TYPES-FULLY AUTOMATIC:

Prefixed by DA, DAF, DAE, DAW, DAH, DAHF - provided with double adjustments. Adjust the upper pointer "C" to set the HIGH PRESSURE POINT for switch operation. Adjust the lower pointer "U" to set the LOW PRESSURE OPERATING POINT. The difference between the HIGH and LOW pointers is the operating differential between "on-off" switch operation. Minimum differential for each respective range is shown on page 3.



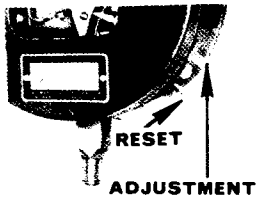
SINGLE ADJUSTMENT TYPES-FULLY AUTOMATIC:

Prefixed by DS, DSE, DSF, DSH - equipped with a single adjustment. The single pointer on the scale sets the pressure where switch operation occurs. Differential is fixed (not adjustable). Example setting: Type DS-21-2 range 0-60 psi. circuit opens on pressure rise. If pointer is set at 40 psi., the control will operate to OPEN circuit at 40 psi and RECLOSE CIRCUIT AT THE FIXED DIFFERENTIAL OF 4 PSI.
For fixed differential of each range see page 3.

Single Adjustment

(Continued on page two)

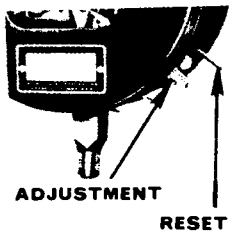
SEMI-AUTOMATIC CONTROL WITH MANUAL RESET



Prefixed by DR, DRF, DRH, DRE, DRW-with suffix -L or -U. Example: DR-21-2U. A single adjustment sets the operating point for automatic operation. A push button reset must be operated manually to restore the circuit to the original position after automatic operation. Example: Type DR-21-2L - circuit will open automatically on a pressure rise to the pressure indicated by the pointer on the scale - no matter how much the pressure drops, the circuit will not reclose until the reset button is operated.

Suffix -L denotes control will operate automatically on an increase. Suffix -U denotes control will operate automatically on a decrease.

MANUAL LOCK TYPE RESET CONTROL



Operates automatically on a decrease of pressure with provision for manual reset when pressure is below set point.
Prefixed by DL, DLW, DLE, DLH: a single adjustment sets the low pressure operating point of control at any value on scale range.
The control will operate automatically at the set point only on a drop of pressure. The lock type feature permits the circuit to be reset and locked in position when pressures are below control setting.

The lock remains in effect until the pressure has risen to a value above the control setting. Lock then releases and the circuit is held in the reset position due to the pressure rise. It will remain in the reset position until it is called on to again operate automatically on a pressure drop to the selected setting.

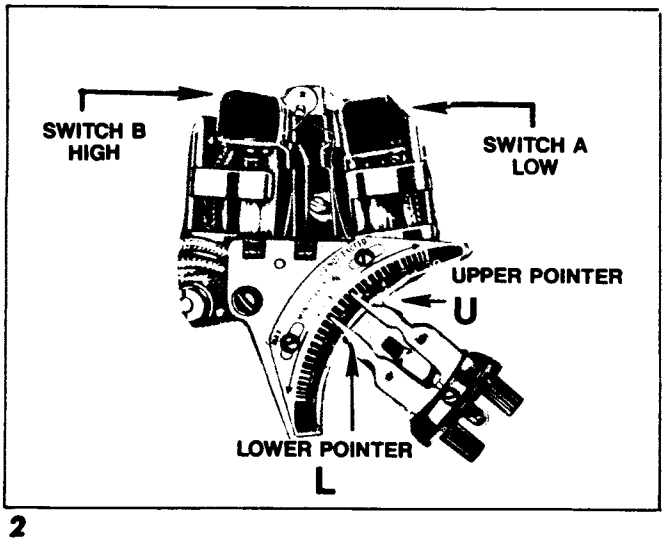
TWO-STAGE PRESSURE CONTROLS
SERIES D-400

Types DA, DAW, DAH, DAE - with suffixes 421, 423, 431, 433, etc. Followed by specification numbers 4122, 4123, 4129, 4132.

This series incorporates two single pole, single throw, magnetic mercury switches, actuated by the same Bourdon tube. The operating point of each switch is adjustable thru an outside adjustment.

The change in pressure which opens and closes each switch at its respective setting is the fixed differential of the switch. The pressure represented by the difference between the two adjustment pointers is the pressure "spread" between operation of the two switches (see illustration).

Upper pointer "U" indicates the operating point of the HIGH pressure circuit. Lower pointer "L" indicates the operating point of the LOW pressure circuit. See switch operating specification chart on this page.



EXAMPLE SETTING: - Type DA-421. Specification No. 4122, range 0-60 psi. With lower pointer "L" set at 25 psi. and upper pointer "U" at 50 psi., both circuits will be closed when the pressure is 25 psi and lower. When pressure rises to 26 psi. mercury switch "A" will open its circuit. When pressure rises to 50 psi. mercury switch "B" will open its circuit; both switches remain open above this setting. The fixed differential (sensitivity) of each switch for this particular range is 1 psi and upon a drop in pressure, mercury switch "B" will close its circuit at 49 psi and mercury switch "A" will close its circuit at 25 psi.

TWO-STAGE PRESSURE CONTROLS
SERIES D-400
RANGES AND DIFFERENTIALS

Range No.	Adj. Working Range	Bourdon Tube Material	Minimum Pressure Spread Between Switch Operation	Fixed Differential Each Switch (Sensitivity)
For Steam and Other Applications: DA-431,-DAW-433, DAH-431				
1	1/8-15 psig	Brass	2½ psig	½ psig
2	0-30" Hg. Vac.	Brass	4" Hg.	1" Hg. Vac.
3	10" Vac 12 psig	Brass	2½ psig	½ psig
3A	1/8-20 psig	Brass	2½ psig	½ psig
4	1-35 psig	Brass	3½ psig	¾ psig
5	2-60 psig	Brass	5 psig	¾ psig
6	5-100 psig	Brass	7 psig	1 psig
7	5-150 psig	Brass	10-5/8 psig	1-1/8 psig
8	5-200 psig	Brass	15 psig	1¼ psig
9	10-300 psig	Brass	25 psig	2 psig
27	25" Vac 50 psig	Brass	7 psig	1 psi
For General Pressure Applications: DA-421, DAW-423, DAH-421				
5S	2-60 psig	Steel	6 psig	1¼ psig
6S	5-100 psig	Steel	8 psig	2 psig
8S	10-200 psig	Steel	10 psig	2 psig
9S	10-300 psig	Steel	20 psig	4 psig
9AS	40-350 psig	Steel	20 psig	4 psig
10S	25-600 psig	Steel	40 psig	7 psig
11S	50-1000 psig	Steel	100 psig	10 psig
12S	100-1500 psig	Steel	150 psig	12 psig
13S	300-2500 psig	Steel	250 psig	20 psig
15S	500-5000 psig	Steel	600 psig	150 psig
25S	30"Hg. Vac 60 psig	Steel	5 psig	1 psig
26S	30" Hg. Vac 75 psig	Steel	10 psig	2 psig
316 S. S. Bourdon Tubes: DA-441, DAW-443, DAH-441				
26E	30" Hg. Vac 75	316 S.S.	12 psig	2 psig
23E	5-75 psig	316 S.S.	12 psig	2 psig
6E	10-100 psig	316 S.S.	12 psig	2 psig
24E	10-150 psig	316 S.S.	13 psig	3 psig
9E	10-300 psig	316 S.S.	35 psig	6 psig
21E	30-400 psig	316 S.S.	40 psig	8 psig
22E	75-800 psig	316 S.S.	85 psig	15 psig
11E	100-1000 psig	316 S.S.	125 psig	22 psig
13E	200-2500 psig	316 S.S.	275 psig	75 psig

ELECTRICAL RATINGS D-400

AC 120V 0.3A, 240V. 0.15A; (24V 0.9A) DC 120V 0.15A, 240V 0.07A For higher electrical capacities use compatible relay. (Not available for 440V service.)

SPECIFICATION NO. 4122. One circuit opens on increase of pressure—second circuit opens on further increase of pressure

SPECIFICATION NO. 4129. One circuit closes on increase of pressure—second circuit closes on further increase of pressure.

SPECIFICATION NO. 4132. Both circuits open at intermediate pressure. One circuit closes on increase of pressure above neutral zone—second circuit closes on decrease in pressure below neutral zone.

SWITCH OPERATING SPECIFICATIONS

In ordering, select operation desired, add suffix number of specification to the type number of control. EXAMPLE: Type DA-431-4122.

Specification No.	Switch Mk.	CONTACT POSITION: Low Pressure Hi-Vac.	Intermediate Pressure	High Pressure Lo Vac.
—4122	"A"	ON	OFF	OFF
	"B"	ON	ON	OFF
—4129	"A"	OFF	ON	ON
	"B"	OFF	OFF	ON
—4132	"A"	ON	OFF	OFF
	"B"	OFF	OFF	ON
—4123	"A"	OFF	ON	ON
	"B"	ON	ON	OFF

SPECIFICATION NO. 4123. Both circuits close at intermediate pressure. One circuit opens on increase of pressure above neutral zone—second circuit opens on decrease in pressure below neutral zone.

PRESSURE CHART FOR SERIES "D" MERCOID PRESSURE CONTROLS

OPERATING RANGES – ADJUSTMENT – DIFFERENTIALS – ELECTRICAL RATINGS

CONTROLS WITH BOURDON TUBE POWER ELEMENTS AND MERCURY SWITCH CONTACTS

CONTROLS WITH MERCURY SWITCHES -2 (SP-ST) OPENS on increase -3 (SP-ST) CLOSES on increase -153 (SP-DT) One opens as other closes			ADJUSTABLE DIFFERENTIAL DOUBLE ADJUSTMENT for setting both 'on' and 'off' operating points Maximum Differential – full scale. Minimum Differential listed below.		FIXED DIFFERENTIAL SINGLE ADJUSTMENT Adjustable operating point. Differential fixed NOT ADJUSTABLE
APPLICATION Bourdon tube material	ADJUSTABLE OPERATING RANGE PSIG	RANGE NO.	SEE CODE A DA-31	SEE CODE B DA-531	SEE CODE C DS-231
FOR GASES, STEAM OR LIQUIDS NOT INJURIOUS TO **BRASS BOURDON TUBES**	0-30 Hg Vac	2	2" Hg.	1" Hg.	0.2" Hg.
	10" Hg Vac 12	3	1 psig	0.5 psig	2 oz.
	1/8-15 psig	1	1 psig	0.5 psig	2 oz.
	1/8-20 psig	3A	1 psig	0.5 psig	2 oz.
	1-35 psig	4	1.75 psig	0.75 psig	4 oz.
	25" Hg Vac 50	27	3.5 psig	2 psig	7 oz.
	2-60 psig	5	3 psig	1 psig	6 oz.
	5-100 psig	6	3.75 psig	2 psig	7 oz.
	5-150 psig	7	6 psig	3 psig	8 oz.
	10-200 psig	8	8 psig	3.5 psig	12 oz.
	10-300 psig	9	12 psig	6 psig	16 oz.
FOR GASES OR LIQUIDS NOT INJURIOUS TO **403 STAINLESS STEEL BOURDON TUBES**			**DA-21**	**DA-521**	**DS-221**
	30" Hg Vac 60	25S	6 psig	3 psig	12 oz.
	30" Hg Vac 75	26S	8 psig	4 psig	12 oz.
	2-60 psig	5S	4 psig	2.5 psig	0.5 psig
	5-100 psig	6S	6 psig	3 psig	0.75 psig
	10-200 psig	8S	8 psig	4 psig	0.75 psig
	10-300 psig	9S	14 psig	7 psig	1 psig
	40-350 psig	9AS	14 psig	7 psig	1 psig
	25-600 psig	10S	25 psig	15 psig	2.5 psig
	50-1000 psig	11S	60 psig	40 psig	10 psig
	100-1500 psig	12S	90 psig	50 psig	12 psig
	300-2500 psig	13S	150 psig	100 psig	45 psig
	500-5000 psig	15S	450 psig	200 psig	150 psig
	800-8000 psig	16S	750 psig	400 psig	200 psig
FOR MEDIUMS NOT INJURIOUS TO **316 STAINLESS STEEL BOURDON TUBES**			**DA-41**	**DA-541**	**DS-241**
	30" Hg Vac 75	26E	7 psig	3.5 psig	14 oz.
	5-75 psig	23E	3 psig	2 psig	0.4 psig
	10-100 psig	6E	7 psig	3.5 psig	14 oz.
	10-150 psig	24E	6 psig	3 psig	0.75 psig
	10-300 psig	9E	18 psig	5 psig	3 psig
	30-400 psig	21E	30 psig	15 psig	5 psig
	75-800 psig	22E	75 psig	35 psig	12 psig
	100-1000 psig	11E	100 psig	45 psig	18 psig
	200-2500 psig	13E	210 psig	110 psig	50 psig

ELECTRICAL RATINGS

CIRCUIT SUFFIX NOS.
-2 SP-ST OPENS ON INCREASE
-3 SP-ST CLOSES ON INCREASE
-153 SP-DT ONE OPENS AS OTHER CLOSES

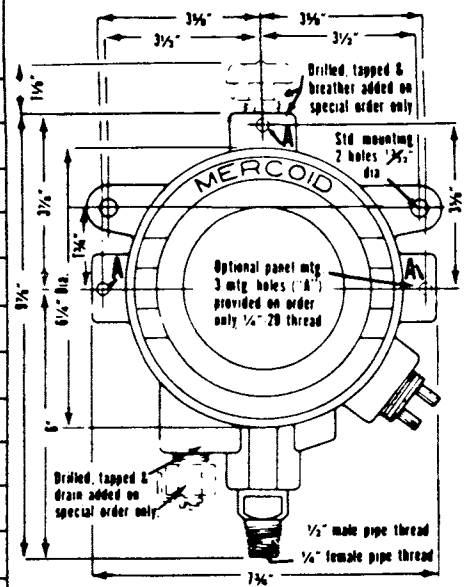
CODE	CIRCUIT SUFFIX	AC CAPACITY 120V.	AC CAPACITY 240V.	AC CAPACITY 440V.	DC CAPACITY 120V.	DC CAPACITY 240V.	HORSEPOWER AC	HORSEPOWER DC
A	-2, -3 -153	10A. 4A.	5A. 2A.	3A. ①	10A. 4A.	5A. 2A.	3/4 1/8	1/3 NA
B	-2, -3	5A.	2A	NA	2½A.	1A.	1/8	1/10
C	-2, -3	0.3A.	0.15A.	NA	0.15A.	0.07A.	NA	NA

NOTE:- Differentials listed above are for SP-ST operation only. When controls incorporate two mercury switches for double throw or two pole operation, the differentials are approximately double those shown for standard single pole, single throw controls.

FOR MULTIPLE CIRCUITS SEE PAGE 4.

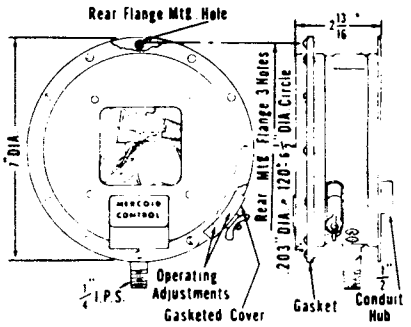
Suffix No.	CIRCUIT	Code	Circuit Response to Pressure Increase
-2	SP-ST	A	Opens
-3	SP-ST	A	Closes
-4	DP-ST	B	Closes
-26	SP-ST	A*	Closes
-36	SP-ST	A*	Opens
-54	DP-ST	B	Opens
-103	DP-ST	A	Closes
-113	DP-ST	A*	Closes
-127	DP-ST	A	Opens
-152	SP-DT	B	One Closes as Other Opens
-153	SP-DT	B	One Closes as Other Opens
-154	2 CIRCUITS 1 CIRCUIT	B	CLOSE OPENS
-155	1 CIRCUIT 2 CIRCUITS	B	CLOSES OPEN
-156	SP-DT	A	One Closes as Other Opens
-705	SP-DT SP-ST	B A	One Opens as Other Closes CLOSES
-729	SP-DT ST-ST	B A	One Closes as Other Opens OPENS
-804	DP-DT	B	TWO CLOSE TWO OPEN
-815		B	4P-ST CLOSE (2)9-67
-816		B	4P-ST OPEN (2)9-67

*17 AMP @ 120/240 VAC NON-INDUCTIVE



Drawing No. 1350

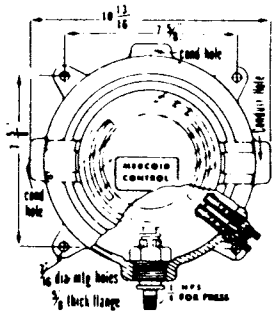
EXPLOSION PROOF PREFIXED BY DAH DAHF DRH DSH DSHF



Drawing No. 1062

Watertight NEMA 2,3,4-

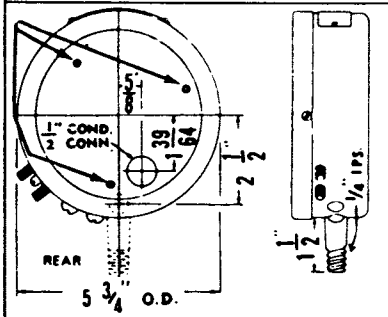
PREFIXED BY DAW, DRW, DSW, DLW



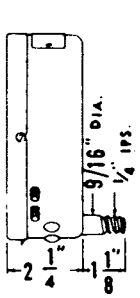
EXPLOSION-PROOF

Drawing No. 98

PREFIXED BY DAE, DLE, DRE, DSE



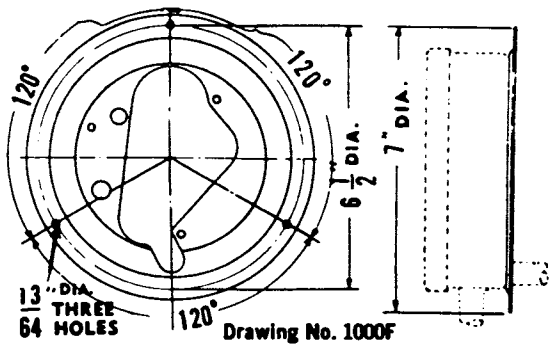
PLAIN CASE — BOTTOM CONNECTION



BACK CONNECTION

Drawing No. 1000B

GENERAL PURPOSE PREFIXED BY DA, DAF DR, DL DS, DSF DRF



Drawing No. 1000F

FLANGE FOR SURFACE MOUNTING

GENERAL PURPOSE CONTROLS—CATALOG No. 17-26

LOCKING DEVICE

When the control has been adjusted to desired range, the locking bar may be inserted between the adjustment screws with slot passing over the projecting lug. By placing a sealing wire between the locking bar and the hole in the lug protruding from adjustment assembly, adjustments cannot be tampered with.

For DAF, DRF, DSF, DAW, DRW, DSW, adjusting knob cover may be sealed in place with sealing wire through cover bolt hole. For DAH, DSH, sealing wire may pass through locking bar and hole in hub above adjusting knobs.

CAUTIONS

Do not exceed maximum adjustment/operating range of control. Remove control if higher pressures are required.

Do not fail to use a siphon on steam where range is 35 lbs. or more. Control movement must not be oiled.

Do not overload — note electrical rating on nameplate and be sure total current passing through switch is within specified rating.

Do not tamper with switch wires. Position of these wires is essential to proper operation. Tampering with these wires will void warranty.

Mercoid®

MERCOID DIVISION
DWYER INSTRUMENTS, INC.
P.O. Box 258
Michigan City, IN 46361

PHONE 219 879-8000
FAX 219 872-9057

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LITHO IN USA 9/96

Pressure and Liquid Level Measurement Users Manual

●

2nd Edition
May 1, 1997

Introduction

KPSI is an ISO-9001 certified U.S. manufacturer of submersible and above ground pressure transducers for environmental, industrial and municipal applications. Our transducers have been specified in hundreds of projects throughout the United States and Canada by geologists, system integrators, national engineering firms and a variety of government agencies. Typical applications include, but are not limited to, pump control, tank level monitoring, sewage lift station operation, reservoirs, weirs, flumes, site remediation, stormwater/well monitoring, pump/pipeline pressures and compressor pressures.

800 Number Support

Twelve hours a day, Monday through Friday, knowledgeable technical assistance is provided by factory personnel (800-328-3665). We work with customers to understand their specific needs and then recommend the pressure measurement device that best fits their application. If no standard is available, we will propose optional modifications to standard products or new product designs to solve the pressure measurement problem.

Product Quality

Each pressure transducer is shipped with its own calibration sheet that describes its exact performance characteristics. This information is NIST traceable! We also keep a duplicate record of each calibration sheet for three years in our record archives in Hampton, VA. Should you misplace your calibration sheet, we can fax or mail a duplicate to you. In emergencies, such information will gladly be provided during a phone discussion.

Fax-On-Demand

When you require information about our products just dial 757-766-0849 from your fax phone 24 hours a day, 7 days a week to reach our Fax-on-Demand service. You will be able to quickly access data sheets, application bulletins, new product releases and a host of other documents that will help you solve your application problems.

Website and E-Mail

Visit our website at www.kpsi.com to look at our latest new product releases, application notes or product specifications then e-mail your questions and comments to kpsi@cts.com.

No Minimum Order

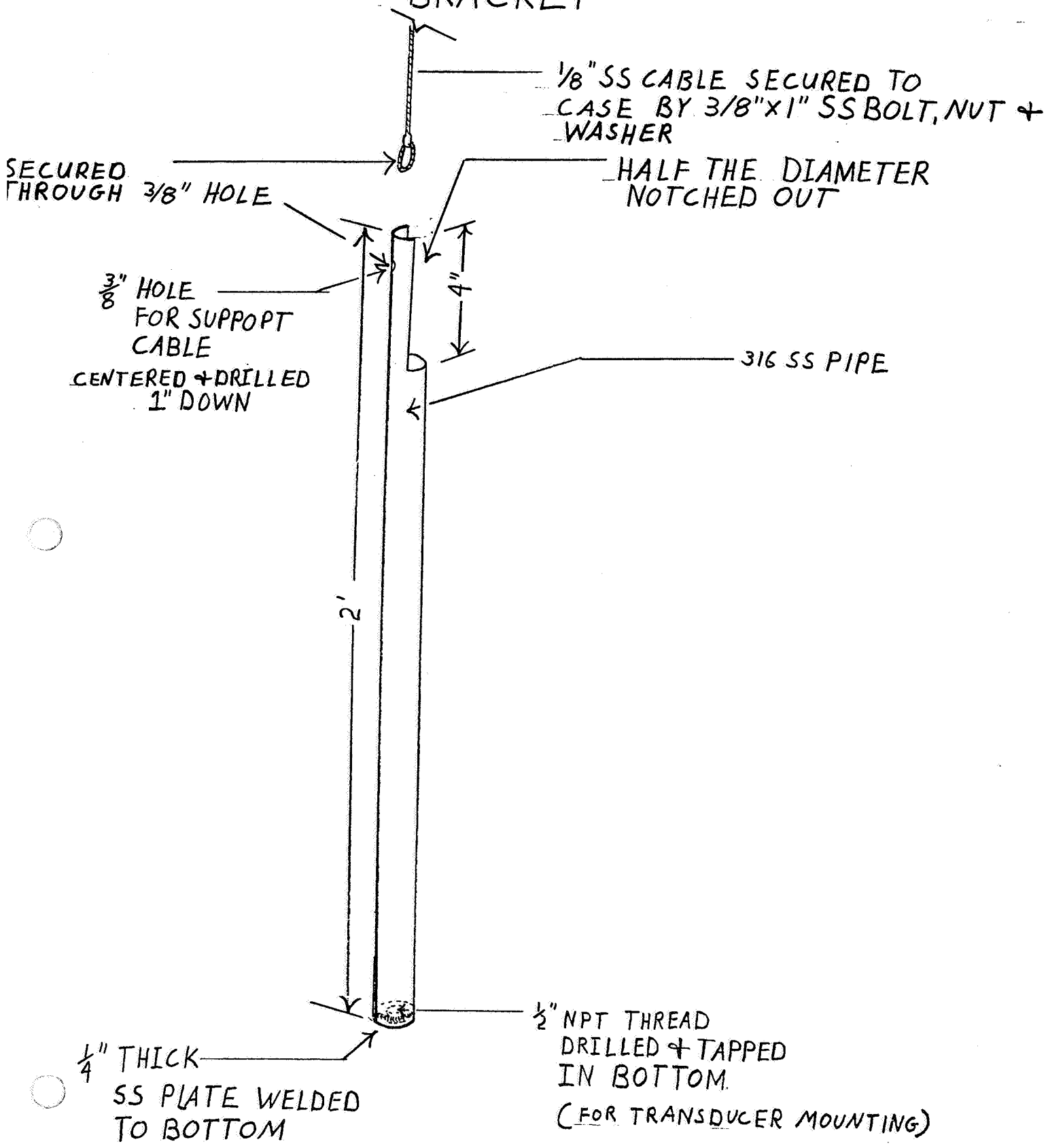
That's correct. Each and every customer is important to us regardless of the dollar value of his/her order.

New Products

Our research branch is bringing out new products monthly.

- The new Series 815 Aneroid Bellows are now available for both new and existing installations of submersible level transmitters. It represents a maintenance-free alternative to the Series 810 Vent Filter/Desiccant dryer.
- We have the only submersible pressure transducer in the market that has 3 intrinsic safety certifications. There are CSA, FM and UL.
- Our new 310S submersible pressure transducer is one of the slimmest (0.625" in diameter) in the world. It boasts a strong self-supporting cable and optional mV, mA and VDC signal outputs.
- The Series 760 submersible level transducers feature SDI-12 serial-digital interface, high static accuracy and is compatible with all data loggers featuring SDI-12 interface.
- The power requirements of our new circuit boards in our submersible and above ground pressure transducers are so low that a simple 9 VDC battery will give months of use when used with dataloggers using pulsed signals

"TRANSDUCER MOUNTING" BRACKET



NATIONAL QUALITY ASSURANCE

Certificate
of Registration

This is to certify that the Quality Management System of

PRESSURE SYSTEMS, INC. / KELLER PSI
34 RESEARCH DRIVE
HAMPTON, VA 23666

applicable to

DESIGN AND MANUFACTURE OF ELECTRONIC PRESSURE SENSING INSTRUMENTATION

has been assessed and registered by
National Quality Assurance Limited against the provisions of

BS EN ISO 9001 : 1994

This registration is subject to the company maintaining a quality management system, to the above standard, which will be monitored by NQA.

The Seal of National Quality Assurance Limited was hereto affixed in the presence of:

Managing Director

Certificate No: 6756

Date: 21 June 1995

Standard Industrial Classification Code 3442

CALIBRATION REPORT

Model No: 710-140-4043.352
Serial No: 980842
Pressure Range: 0 to 100 FT. H20
Excitation: 9-30 VDC
Output: 4-20 mA

Test Temperatures: Room = 25 C
Cold = 0 C
HOT = 50 C
PCU SERIAL# = 0119

Test Pressure FT. H20	BFSL Rm Temp Outputs	------Run #1------ Rm Temp Outputs	Error %FSO	------Run #2------ Rm Temp Outputs	Error %FSO	------Run #3------ Cd Temp Outputs	Error %FSO	------Run #4------ Ht Temp Outputs	Error %FSO
-0.0008	3.979	3.9768	-0.011	3.9769	-0.010	3.9998	0.005	3.9682	-0.003
20.0008	7.180	7.1797	-0.002	7.1801	0.001	7.2137	0.008	7.1814	0.000
39.9977	10.381	10.3825	0.011	10.3831	0.015	10.4260	0.011	10.3953	0.004
59.[illegible]1	13.582	13.5842	0.014	13.5847	0.017	13.6362	0.014	13.6115	0.007
79.[illegible]7	16.783	16.7837	0.007	16.7842	0.010	16.8434	0.015	16.8312	0.012
99.9985	19.984	19.9799	-0.028	19.9802	-0.027	20.0600	0.019	20.0630	0.020
80.0001	16.784	16.7833	-0.001	16.7837	0.001	16.8430	0.015	16.8314	0.012
59.9966	13.582	13.5833	0.010	13.5837	0.012	13.6362	0.014	13.6127	0.008
40.0014	10.381	10.3815	0.001	10.3822	0.006	10.4264	0.011	10.3937	0.003
20.0004	7.180	7.1788	-0.007	7.1792	-0.005	7.2146	0.009	7.1777	-0.001
-0.0049	3.978	3.9765	-0.009	3.9774	-0.003	4.0025	0.006	3.9644	-0.003

Maximum Static Error: -.028 %FSO

Maximum Thermal Error @ Cold: 0.019 %FSO/C

Maximum Non-Repeatability: 0.006 %FSO

Maximum Thermal Error @ Hot: 0.020 %FSO/C

Electrical Termination: Red +Input
Black -Input (Gnd)

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1.0 Order Administration

Order Entry

We accept orders by fax, phone, mail and e-mail. To ensure accuracy, all orders are reviewed by two technical specialists before being submitted for production. Orders are scheduled into production within 12 to 24 hours of order receipt.

Payment

Net 30 terms are available upon approved credit. We accept Visa/MasterCard, corporate checks, money orders and cash. Many orders are shipped C.O.D.

Method of Delivery

All orders are shipped freight on board (FOB) from our factory in Hampton, Virginia USA. We typically ship UPS but will use any shipper you specify.

Delivery Times

Shipment for standard products is typically 4 weeks but we do offer three Expedited Shipment Options for selected products.

Option 1: 10 working days from receipt of order is $30.00 per unit.
Option 2: 5 working days from receipt of order is $60.00 per unit.
Option 3: 2 working days from receipt of order is $100.00 per unit.

Repairable Products

Depending upon the extent of damage, we can repair most of our pressure transducers/ transmitters. All repairs are performed by competent, expertly-trained employees.

Warranty Protection

We warrant all products against defects in material and workmanship for 12 months from date of shipment. Products not subjected to misuse will be repaired or replaced. THE FOREGOING IS IN LIEU OF ANY OTHER EXPRESSED OR IMPLIED WARRANTIES. We reserve the right to make changes to any product herein and assumes no liability arising out of the applications or use of any product or circuit described. Products set out in this manual are not intended for life support applications.

Intrinsic Safety

Several of our products are available with FM, UL and CSA certification for intrinsic safety as well as CE approval for EMC.

2.0 Product Description and Use

General Characteristics

Our submersible pressure transducers use isolated diaphragm sensors that are specifically designed for use with hostile fluids and gases. These sensors utilize a silicon pressure cell that has been fitted into a stainless steel package with an integral, compliant stainless steel barrier diaphragm. This sensor assembly is housed in a rugged 316 stainless steel case which provides for a variety of pressure inputs from 0-1 through 0-300 PSI. Our devices feature internal signal conditioning. Standard outputs are 4 to 20 mA , 0 to 100 mV and 0 to 5 VDC. Other outputs are available upon request.

All units have surge and reverse polarity protection. For ease of use in the field, our transducers are permanently etched with our logo and name, wiring information, part number (P/N), serial number (S/N), date of manufacture (DOM), range, excitation and output. Pressure transducers are offered in diameters of 1.0, .74 and .63 inches.

Care and Handling

Our submersible transducers are designed for rugged use. But, they need protection from overpressure and sharp impact. When lowering them into a liquid, penetrate the surface slowly and only to the depth necessary. Avoid dropping the unit from above the surface. Clean transducers by rinsing them in a mild detergent. Direct probing of the diaphragm or attempts to remove protective screens will damage the sensor.

Calibration

All pressure transducers are shipped with calibration information unique to each transducer. Make sure you keep each calibration report. However, should you misplace your calibration sheet, you can contact our nearest office to have a duplicate faxed or mailed to you.

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3.0 Product Accessories and Options

Nose Caps

There are several different user-installable nose caps for the Series 700, 710, 720, 730 submersible pressure transducers. The closed-faced ported cap (316 SS or Delrin) with #8-32UNC-2B threaded hole is best used where weights are required and for those installations where users may encounter sharp, protruding objects. The open-faced cap which allows maximum contact with the liquid media is ideal for wastewater and "greasy" applications where clogging of the sensor is a concern. The 1/4" male NPT pressure cap is not only useful for calibration purposes but also allows the device to be used as a submersible or above ground pressure transducer. The piezometer cap allows the unit to be buried in the ground without damage to the sensor diaphragm.

Series 810 Vent Filter or Bellows

We supply with each submersible pressure transducer, a protective barrier against moisture collecting in the cable vent tube. This ensures reliable operation and long life as it protects sensitive electronic components from mildew, corrosion, rust and prevents the formation of a liquid column in the vent tube. Any such column directly affects calibration.

Series 820 Sacrificial Anode

The Series 820 Sacrificial Anode provides cathodic protection against galvanic corrosion for our submersible pressure transducers. Galvanic corrosion occurs when dissimilar metals are placed in contact with an electrolyte. This condition causes a potential difference to exist between the two metals, causing electron flow between them. Corrosion of the less corrosion-resistant metal is increased and attack of the more resistant metal is decreased. The Series 820 Sacrificial Anode is clamped to the exterior of the transducer. We also offer a 1" diameter version that attaches to the nose cap of the transducer.

Our sacrificial anodes are made from a special zinc alloy formulated to guarantee continued effectiveness over long periods. Because the anodes are 95% galvanic, they will not corrode unless there is an electrolytic demand. The anode maintains a high driving potential throughout its 12 month life, is self-sluffing and always exposes new zinc for the best possible protection. For those applications where cable buoyancy is a problem, the nominal 21 ounce sacrificial anode can be substituted for hanging weights.

Polyurethane & Tefzel Jacketed Cable

Most installations of our submersible pressure transducers connect our polyurethane or Tefzel cable to a junction box. From this junction box, users run their own cable to the required instrumentation. Polyurethane is used for most applications while Tefzel is recommended for highly corrosive environments. The cable used with the 310S is available with polyurethane jacket only.

050

Specifications for our standard polyurethane and Tefzel jacketed cable are as follows:

Specifications	Standard Submersible Cable	310S Cable Only
Weight	0.05 lbs/ft	0.03 lbs/ft
Min. OD	0.28"	0.2"
Max OD	0.31"	0.21"
Conductors	4 - 22 AWG	4 - 24 AWG
Insulation **Conductors** **Outerjacket**	 PVC Polyurethane or Tefzel	 PVC Polyurethane only
Shield	36 gauge spiral tinned copper wire	36 gauge spiral tinned copper wire
Vent Tube	polyethylene, .060" ID	polyethylene, .024" ID

Chemical Resistance of Polyurethane: Potable Water, Waste Water, Borax, Butane, Animal Fat, Carbonic Acid, Citric Acid, Cod Liver Oil, Corn Oil, Glycerin, Glycol, Mineral Oils, Potassium Nitrate, Potassium Sulfate, Silicone Oils, Stoddard Solvent, Tannic Acid (10), Tartaric Acid, Turbine Oil.

Chemical Resistance of Tefzel: Acetic Acid (Glacial), Acetic Anhydride, Acetone, Aluminum Chloride, Anti-Freeze, Bromine, Calcium Chloride, Calcium Hydroxide, Chlorine, Copper Chloride, Ferrous Chloride, Hydrochloric Acid, Ketones, Lacquer Thinners, Sulfuric Acid.

Lightning Protection

We can provide optional lightning and surge protection for the 0-5 VDC and 4-20 mA output of our 1 inch diameter units. This is achieved through the use of 2 protectors. One is housed in a 4 inch long, 1 inch OD 316 SS tubing attached directly to the non-pressure sensing end of the transducer while the other is the located at the surface and grounded to a DIN-3.

Featuring quick response and low clamping voltages, these devices protect against fast rising voltage transients as well as severe current surges associated with lightning discharges in excess of 10,000 amperes. Following a surge, the protector automatically restores the line to normal operation and awaits the next surge without having to reset a breaker or replace a fuse.

½" Male NPT Conduit Fitting

Submersible pressure transducers can be attached to a rigid conduit and the cable run through the conduit. To achieve this, all of our submersible transducers can be fitted with an optional ½" NPT male conduit fitting where the cable exits the transducer. This fitting can then be mated to a standard rigid conduit.

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Variety of Electrical Outputs

Most applications call for a 0-5 VDC, 4-20 mA or a 0-100 mV output. But where necessary, our transducers offer a broad choice of possibilities including, among others, 0-10 VDC, 0-2.5 VDC, or ratiometric mV/V.

Cable Hanger

We can supply an optional cable hanger to help end users secure the cable. The cable hanger can be positioned anywhere on the cable by pushing the ends together. Once positioned, the cable hanger expands and provides a snug grip on the cable.

When mounting the transducer in a well casing, the cable hanger can be secured to a hook on the well plate or an eyebolt may be attached to the side of the well casing. The cable hanger loop is then secured to the eyebolt by using any number of types of fasteners. A similar technique can be used when working in still wells for surface water level measurement. In this case, the loop-end of the cable hanger can be attached directly to a screw or bolt bored into the still well shelf.

Cable Splicing Kit

Our field-installable cable splice allows you to splice our polyurethane and Tefzel cable. It is most commonly used for well applications where the more expensive Tefzel cable is required for suspension in corrosive media where the liquid level is fairly shallow but the well is hundreds of feet in depth. It also is used in those emergency situations where cable must be spliced together to get an application up and running.

4.0 Installation & Maintenance Tips

General Installation Procedures

Most installations either suspend our submersible transducer in a perforated 1 ½" or 2" PVC instrumentation stilling well or attach the transducer (using our optional conduit fitting) to a rigid conduit.

A minority of applications use our optional bracket to clamp the transducer to a fixed object (i.e., wall, ladder, step) or require the unit to be suspended without any protective still well or attachment device. In all installations, care should be taken to ensure no damage occurs to the cable as cable damage represents one of the most frequent causes of transducer failure.

Cable Lengths

The maximum length of cable to be used with our submersible pressure transducers is largely dependent upon the type of electrical output of the pressure transducer. For a 0-5 VDC output, a maximum cable length of 100 feet is recommended as a voltage output is more susceptible to electrical interference than a 4-20 mA signal.

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A 4-20 mA signal can be transmitted much longer distances depending upon such factors as temperature, wire size, length of wire, power supply and voltage requirements of any devices to be powered. At 25°C the 22 AWG conducting copper wire used in our polyurethane jacketed cable has a resistance of 16.45 ohms per 1000 feet.

Using Ohms Law (E=IR) where E=voltage, I=current and R =resistance, one finds that a 20 mA signal requires .329 volts to drive it along 1000 feet of 22 AWG copper wire (E=16.45 x .020).

To find out how much voltage is required to drive our Series 700 submersible pressure transducer's 4-20 mA signal 10,000 feet, just add the minimum power requirement of the 700 (9 VDC) to the resistance offered by 10,000 feet of our polyurethane jacketed cable (10,000÷1000 x .329=3.29). The resulting power requirement is 12.29 VDC (9 + 3.29).

Reverse Signal

For some applications, it is important to know how far the water is from the top of the tank or the surface of the ground. If specified by the customer, our factory can set the transducer so that zero pressure reads full scale electrical output and maximum pressure reads zero output.

Drying Transducers

If you happen to get water in the vent tube and in the submersible pressure transducer, coil the cable and transducer in a pan and place the pan in an oven at 50°C for 2 hours. This on-site remedy may do the trick. Be careful that the oven temperature does not exceed 50°C. Otherwise, you may damage the transducer and cable.

4-20 mA Wiring

To connect a 2 wire 4-20 mA transducer to a typical power supply and mA meter, connect the + (red) lead of the transducer to the + terminal of the power supply. Connect the - (black) lead of the transducer to the + input terminal of the meter. Connect the - input terminal of the meter to the - terminal of the power supply.

VDC Wiring

To connect a 3 wire VDC output transducer to a typical power supply and the voltmeter, connect the - terminal of the power supply to the - input terminal of the meter. Connect the - excitation (black) lead of the transducer to the - input terminal of the meter. Connect the + input terminal of the meter to the signal lead (white) of the transducer. Connect the + terminal of the power supply to the + lead (red) of the transducer.

Cable Protection

An inexpensive way to protect the cable from damage is to order the submersible pressure transducer with a ½" Male NPT fitting. Connect an inexpensive flexible 5/8" garden hose to the ½" MNPT fitting with an equally inexpensive female PVC ½" NPT x 3/4" NHT swivel fitting.

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Bending of Cable

Our polyurethane and Tefzel jacketed cables are quite flexible. Care needs to be taken to ensure that when bending the cable to suit your installation you do not crimp the vent tube inside the cable. Consequently, do not bend the cable more than a radius of 1 inch.

Cable Compression

Many users require a compression fitting to secure our Tefzel and polyurethane jacketed cable as it enters a junction box. Care needs to be taken that you do not overtighten the fitting so as to damage the cable.

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Appendix A

Frequently Asked Questions

1. I need proof pressure much greater than 1.5 X. How can you help me?

   We can provide 5 X over pressure protection on most ranges if you can accept a thermal error of 0.1% full scale output per degree Centigrade.

2. What installation ideas do you have to help me get rid of electrical noise interfering with the signal?

   An ounce of prevention goes a long way. Either try to eliminate the source of noise or move the transducer as far away from it as possible. We strongly encourage you to secure our cable shield to a good earth ground and that you use a 4-20 mA signal output. Armed with these precautions and the fact that many of our transducers are CE approved for electromagnetic interference, you should have few problems.

3. My cable on the submersible always seems to get cut and damaged. What am I doing wrong?

   This is the most common problem that our users encounter. Make sure that all of your colleagues and staff understand the importance of handling the cable with care. The cable should not be bent around rough or sharp edges. Always use a cable reel during transport. Where possible, suspend the unit in a perforated 2" PVC pipe and thread the cable through protective conduit to the nearest junction box.

4. I have an application where the transducer is frequently damaged by voltage spikes. What can be done to prevent this?

   We can provide a surge protection kit for both our below and above ground transducers and transmitters. These kits will handle typical spikes that might come in through the power lines as well as surges that travel through the ground due to nearby lightning strikes.

5. How much shock can your submersible transducers withstand?

   The lower pressure ranges can be damaged if dropped from several feet onto an unforgiving surface like concrete, so we recommend that the protective shipping foam remain in place until the unit is installed.

6. What is the response time of your transducer?

   From initial power up, the transducer output will stabilize within a fraction of a second. The frequency response is rather low, probably less than 1 kHz, but it really depends on the application, the media, plumbing, etc. Call our factory for application assistance if frequency response is critical in your application.

7. How do I attach your vent filter or aneroid bellows to my cable vent tube?

   The vent filter can be mounted anywhere convenient, preferably out of the weather. It can be mounted in any position and connects to the cable vent tube via the extension tube with metal connector tube provided. The aneroid bellows must be mounted in a way that its movement is not encumbered. It is provided with a mounting base that will install to a standard DIN3 mounting rail common to most control panels. Also provided with the bellow is a 3 inch length of DIN3 rail, just in case one is not already available.

8. What is the best way to mark my cable?

   Use white vinyl marking tape available from your local hardware or electronic stores. These same stores may also sell cable marking kits.

9. Any ideas for preventing marine growth on your submersible transducers?

   You might want to try waterproof grease. Take care when applying the grease not to trap air bubbles against the sensing diaphragm.

10. How many pressure measurements can you make before the diaphragm on the pressure sensor fails?

    In normal operation - millions of cycles. We find that transducer failure is rarely due to diaphragm fatigue.

11. What is the mean time between failure for your submersible pressure transducer?

    Most failures are due to misuse by the end user. However, properly installed units last tens of thousands of hours.

12. What can be repaired on your pressure transducers?

    All parts can be repaired or replaced. Cost of repairs varies depending on the problem. As a rule of thumb, very badly damaged units can be repaired for about 50% of list price.

13. What is the turnaround time on repairs?

Once we get a unit into our shop it takes 1 to 2 weeks to ship it.

14. What is the longest length of cable you have attached to a submersible transducer?

Two thousand feet.

15. Why do you use 316 SS housings and sensors for your standard transducers?

It offers a good combination of corrosion resistance and reasonable cost. We do offer other metals such as Titanium and Hastelloy for very corrosive environments.

16. What wire gauge should I limit myself to when connecting to your 22 AWG wire?

Use 22 AWG or greater.

17. Does it make any difference if I mount the transducer in a vertical or horizontal position?

No. Our units have a minimum amount of position sensitivity. You should mount it in the same position, however, throughout the measurement cycle.

18. What is the longest length of time one of your products has run continuously?

Since 1986, the year we first started manufacturing all-media pressure transducers.

19. What happens when you freeze your transducer in a column of water?

Depending on the pressure range of the unit, over pressure of the unit is possible. However, in harsh environments where debris is common and ice shifts, you might expect damage to both the transducer and cable.

20. What are the most common reasons customers keep buying your products?

No hassle service.
Quick response to problems.
Reliable, long lasting products.
Rapid delivery.
Products are repairable.
We offer guaranteed lightning protection.
Use 800 numbers for order entry and support.
Excellent pre and post sales application support.

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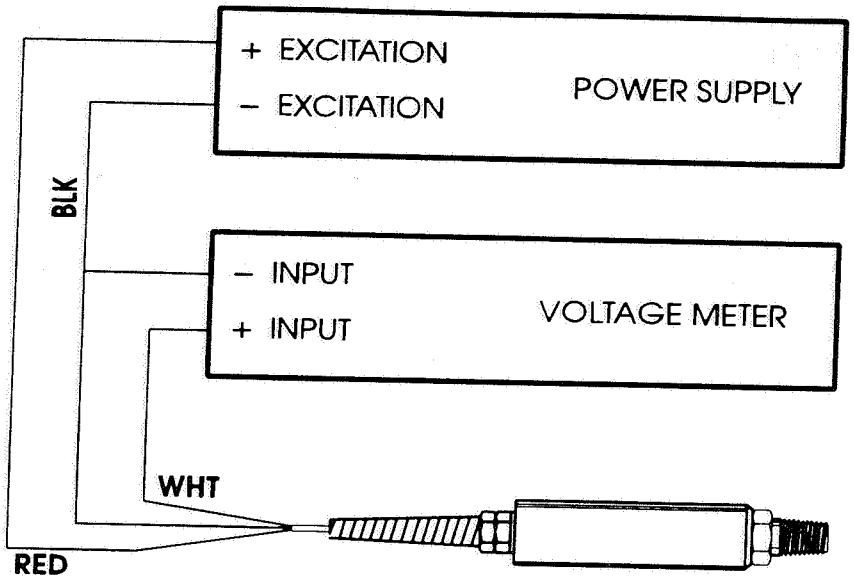
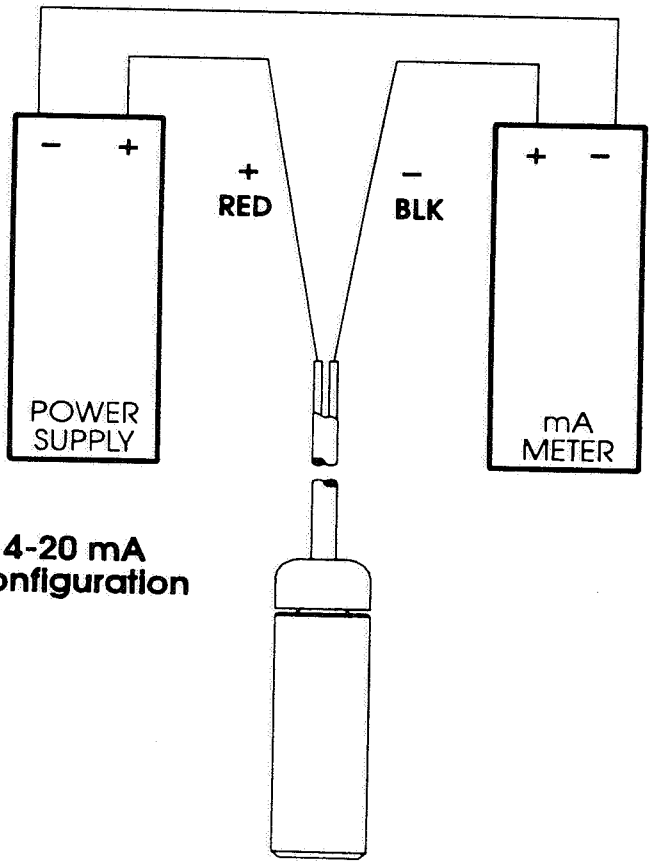
Appendix B

Wiring Diagram VDC and mA B-2
Cable Anchoring Schemes B-3
Reference Connection Schemes B-3
Submersible Cable Termination B-4

0-5 VDC Configuration



Note: These diagrams depict typical installations. Refer to your power supply and instrumentation manufacturer for the specifics of your application.



4-20 mA Configuration

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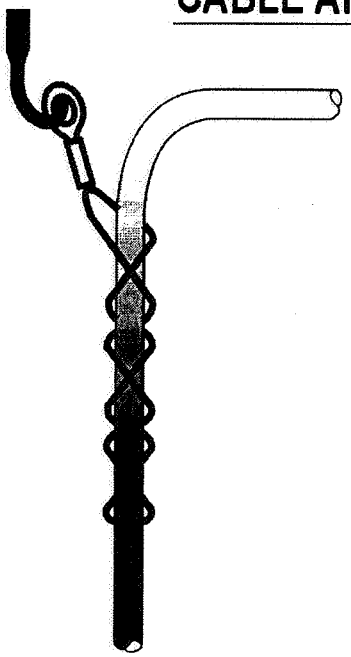
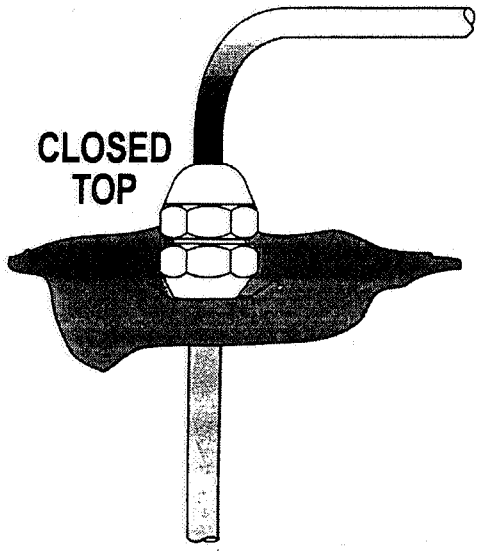
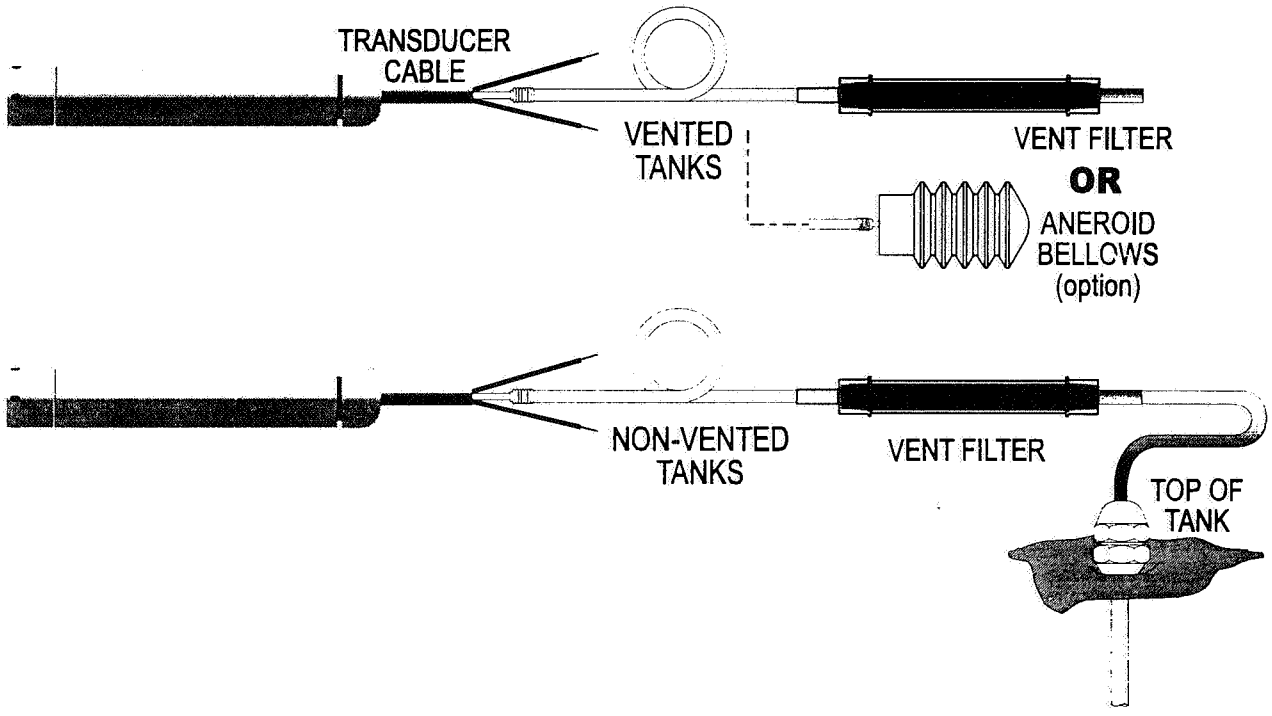
CABLE ANCHORING SCHEMES

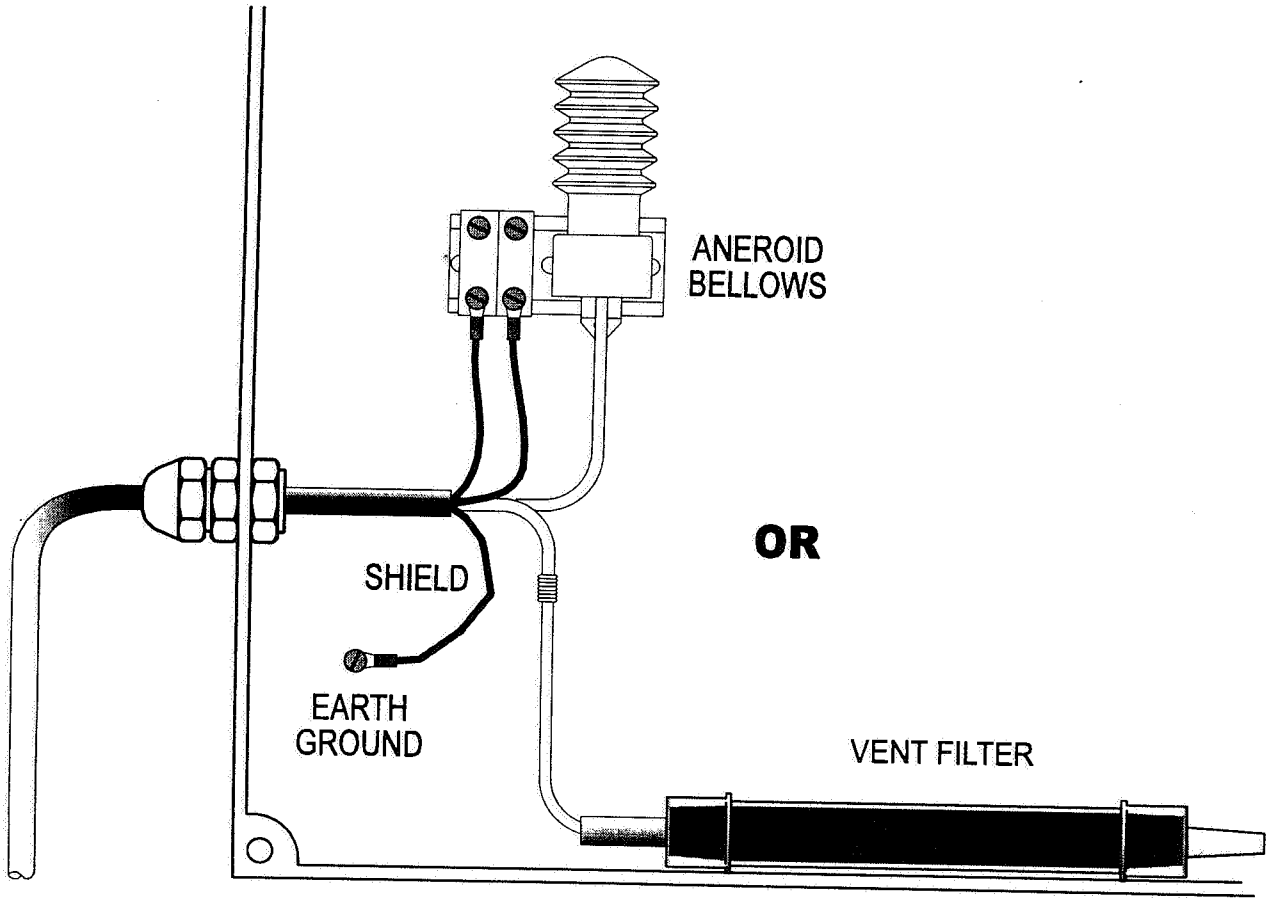




REFERENCE CONNECTION SCHEMES



Submersible Cable Termination



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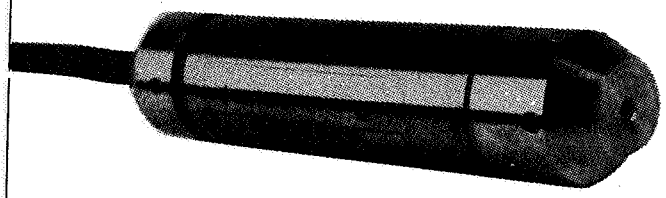
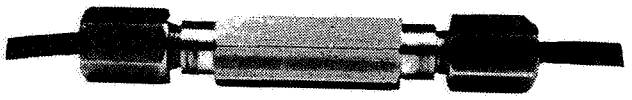
Notes:

Pressure Transducer Accessories

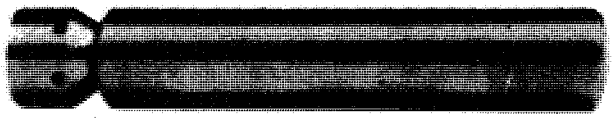
Ported Nose Cap



Cable Splice Kit

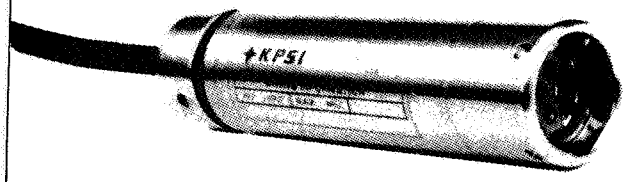


Ported Nose Cap with Inline Sacrificial Anode

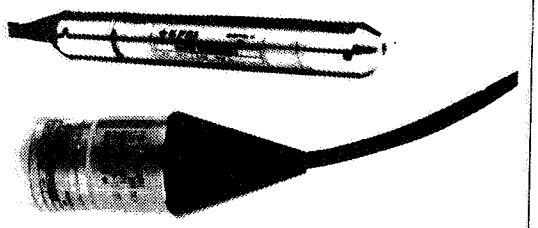


Cable Hanger

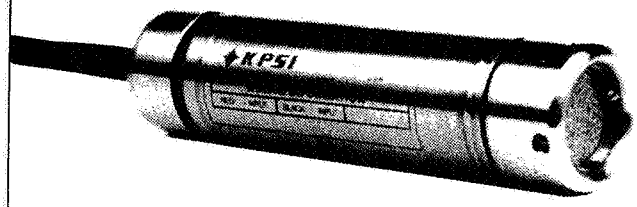
Anti-Fouling Nose Cap with Protective Screen



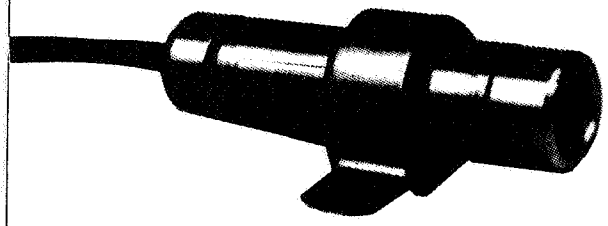
Anti-Snag Cable Cone



Piezometer Nose Cap

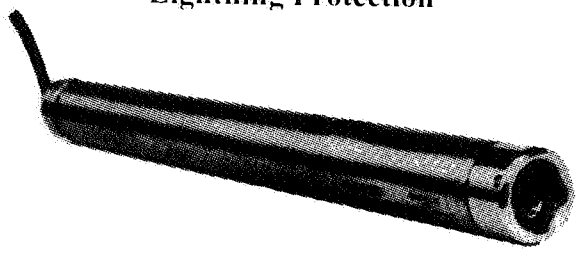


Mounting Bracket

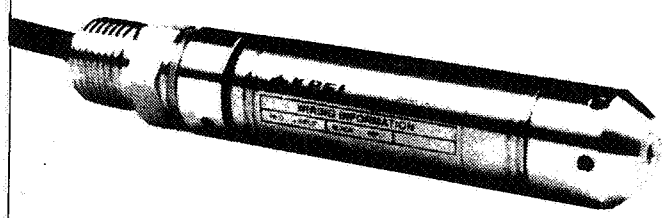


¼" Male NPT Adapter

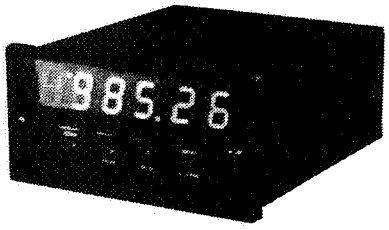
Lightning Protection



½" NPT Male Electrical Conduit Fitting



Micro-P Meter/Controller



California

503 Vista Bella, Suite 11
Oceanside, California 92057
P: 800-328-3665
F: 760-967-0563
E-Mail: kpsi@cts.com
Website: www.kpsi.com

Virginia

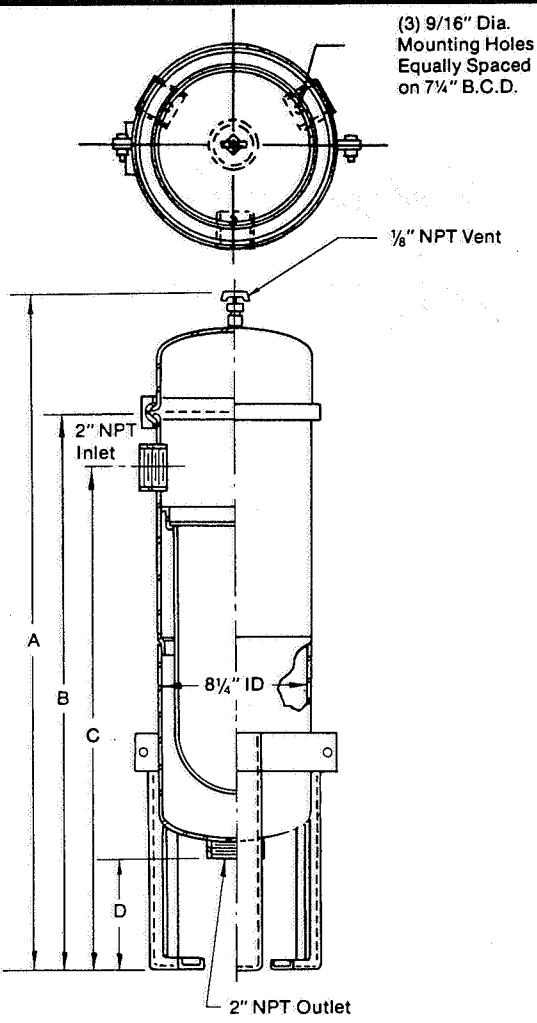
34 Research Drive
Hampton, Virginia 23666
P: 800-678-7226
F: 757-865-8744
E-Mail: kpsi@cts.com
Website: www.kpsi.com

Parker Hannifin Corporation
Commercial Filters Division
P.O. Box 1300
Lebanon, IN 46052
Telephone: 317/482-3900
Telex: 247529

Fulflo® Bag and Strainer Filters (FCB Series)

Product Specifications

The economical FCB series system is ideal for small manufacturers having a need to recycle process liquids or finished products. FCB series filters are also effective in filtering incoming process water and in filtering discharge water. These filters are especially suited for filtering and reclaiming coolants, cutting oils, inks, lubricants, paints, resins, solvents, and other liquids. Flow rates to 100 gpm, pressures to 100 psi.



Features

Stainless basket strainers available in 20, 40, 60, 80 and 100 mesh

Standard bags available in 5, 10, 25, 50 and 100 micrometers

High efficiency/high capacity polypropylene bag media (XLH Series) are also available in ratings of 1, 2.5, 5, 10 and 25 micrometers in single and double length.

2 inch NPT connection

Adjustable legs

Standard air vent

Buna-N-Gasket

Ordering Information

For assistance in finalizing your cartridge selection and to place an order, refer to the Yellow Pages under "Filters-Liquid" for the telephone number of the nearest distributor of Commercial Filters filtration equipment.

Specifications

Model	Material	Maximum Flow (gpm)	Dimensions (inches) A	B	C	D	Estimate Shipping Weight (lbs.)
FCB-11*	Carbon Steel	80	35 9/16	29 9/16	27	5 1/2	35
FCB-12**	Carbon Steel	100***	47 3/16	41 3/16	38 5/8	5 1/2	44
4FCB-11*	304 Stainless Steel	80	35 9/16	29 9/16	27	5 1/2	35
4FCB-12**	304 Stainless Steel	100***	47 3/16	41 3/16	38 5/8	5 1/2	44

*Uses 18" Single Length Bag
**Uses 31" Double Length Bag
***Maximum Recommended flow rate limited by 2" NPT inlet.

Metric Conversion Formulas
mm = inches x 25.4
kg = pounds x .454
kPa = psi x 6.895
°C = 5/9 (°F-32)

The manufacturer reserves the right to change specifications without notice or liability.

Commercial Filters

Form C-1089 Effective 10/87
Supersedes 1/86
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The information, recommendations and opinions set forth herein are offered solely for your consideration, inquiry and verification and are not, in part or total, to be construed as constituting a warranty or representation for which we assume legal responsibility. Nothing contained herein is to be interpreted as authorization to practice a patented invention without a license.

Chattanooga School

786-001

Fulflo® Filtration Products and Systems

Installation and Operating Instructions for Model FH, FHSS, WSSS, WCSS, FCB, FPM, and TFPM Filter Vessels

FCB-11

⚠WARNING

To minimize the risk of serious injury and property damage:

- Do not use with gases—use for liquid filtration only
- Do not use with toxic liquids requiring ASME-approved vessels
- Do not exceed operating pressure of 100 PSIG at 200°F
- Read and follow these instructions and safety information

Contents

I. Shutdown and Cover Removal Procedure (For initial assembly and start-up, refer to Section III)

II. Media Replacement
   A. FH, FHSS, WSSS, and WCSS
   B. FCB Model
   C. FPM Model

III. Cover Replacement and Start-Up

NOTE: ***Store this instruction manual in the plastic bag provided and retain permanently on or adjacent to filter vessel.***

REPLACEMENT FILTERS
FABER
JAMES TRAPODI (914) 739-7889

Process Filtration

FAX (973) 546-9337

$4.01/BAG

COVER

I. Shut Down and Cover Removal Procedure

Note: Inlet, outlet, vent and drain connections are labeled on this vessel.

WARNING: Do not service this vessel while inlet or outlet valves are open or while unit contains pressure. Do not, at any time, remove or loosen clamp before draining. Failure to open drain and vent will result in pressurized liquid being trapped in vessel. Pressured liquid will spray out when clamp is loosened which could cause serious injury or damage.

1. Close inlet valve.
2. Close outlet valve.
3. Before opening vessel, vent pressure by opening vent cock.

WARNING: Protect face and keep hands clear of vent cock while venting pressure.

4. Open drain.*
5. Leave vent cock open to allow vessel to drain properly.
6. Loosen and remove only one of the V-band clamp bolts and then remove the V-clamp.
7. Turn cover counter-clockwise to disengage the internal safety-latch (older models do not have safety latch).
8. Remove cover from vessel.

II. Media Replacement

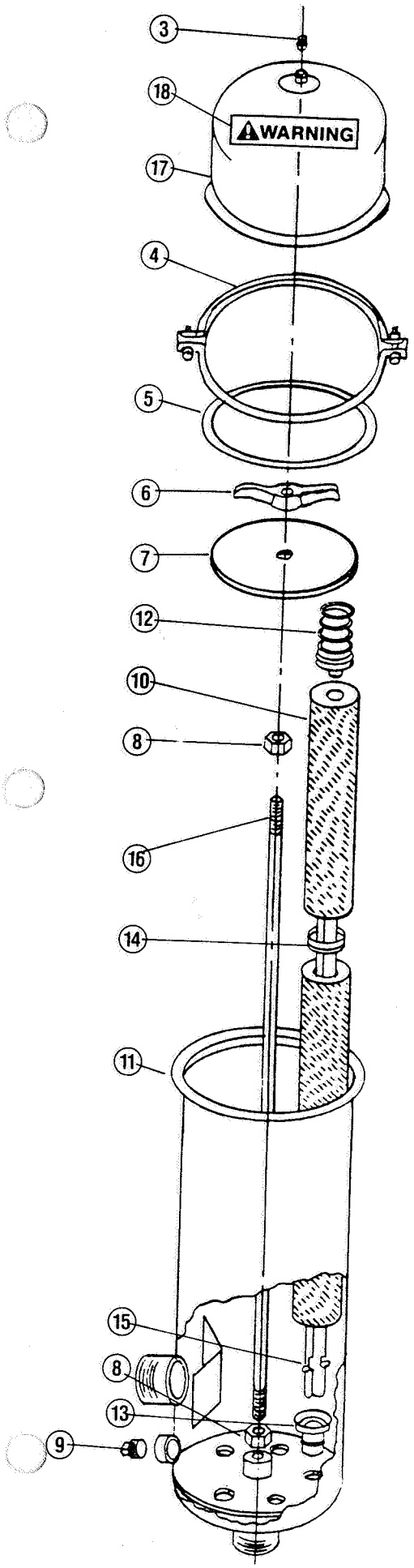
A. FH, FHSS, WSSS, and WCSS Model

1. Follow shut-down procedure.
2. Unscrew wing nut from centerpost.
3. Remove top plate to expose cartridges.
4. Remove top seat assembly from each cartridge.
5. Remove filter cartridges and discard. Retain spacers if cartridges are multi-stacked.
6. Inspect vessel interior and all components for wear, corrosion or damage. Replace if necessary.***
7. Inspect bottom seat plate for damage. Replace if necessary.
8. Remove protective wrapping from new filter cartridges. Slide cartridges onto guides and firmly press onto bottom seat plates. Install spacers between cartridges if 10-inch filters are multi-stacked.
9. Install the top seat assembly on each cartridge. If springs are not level, check for missing spacers or improperly seated cartridges.
10. Reposition top plate onto centerpost and on top of springs and hand-tighten wing nut until the top plate contacts the centerpost jam nut.
11. Follow start-up procedure.

*Model FCB does not have independent drain. Draining must occur through outlet pipe.

**Use only Process Filtration approved Fulflo replacement bolt and V-clamp.

***Replace any worn or damaged parts only with Process Filtration approved Fulflo replacement parts.

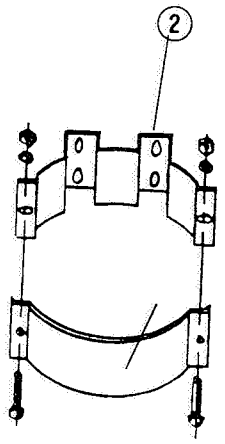


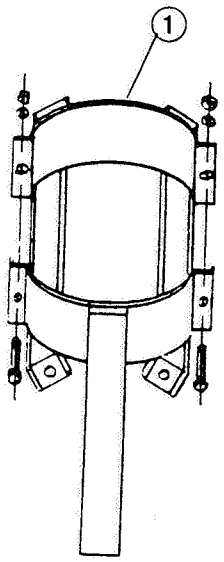
PARTS LIST
MODELS FH, FHSS, WSSS, AND WCSS

ITEM NO.	DESCRIPTION	FH 510 PART NO.	FH 520 PART NO.	FH 530 PART NO.	QTY.
1.	LEG ASSEMBLY		3420-5027		1
2.	BRACKET ASSEMBLY		0820-5094		1
3.	VENT COCK		1510-1-006		1
4.	CLAMP		1390-1-028		1
5.	SHELL O-RING		4150-5310		1
6.	WING NUT		4090-5002		1
7.	TOP PLATE		4480-5234		1
8.	JAM NUT		4090-001-9600		2
9.	DRAIN PLUG		4570-001-9505		1
10.	FULFLO WOUND DEPTH CARTRIDGE		VARIABLE		5,10,15
11.	SHELL ASSEMBLY	5413-5666	5413-5667	5413-5668	1
12.	TOP SEAT ASSEMBLY		5320-5166		5
13.	BOTTOM SEAT PLATE		5320-5003		5
14.	TUBE SPACER	NONE	5710-5020		5,10
15.	TUBE GUIDE	2800-5058	2800-5055	2800-5056	5
16.	CENTER POST	0720-5234	0720-5235	0720-5236	1
17.	HEAD ASSEMBLY		2901-5773		1
18.	DECAL		2010-5072		1

ITEM NO.	DESCRIPTION	FHSS 510 WSSS-5 WCSS-5 PART NO.	FHSS 520 WSSS10 WCSS10 PART NO.	FHSS 530 WSSS15 WCSS15 PART NO.	QTY.
1.	LEG ASSEMBLY		3420-5028		1
2.	BRACKET ASSEMBLY		0820-5095		1
3.	VENT PLUG		4570-154-9500		1
4.	CLAMP		1390-1-028		1
5.	SHELL O-RING		4150-5310		1
6.	WING NUT		4090-5010		1
7.	TOP PLATE		4480-5431		1
8.	JAM NUT		4090-154-9501		2
9.	DRAIN PLUG		4570-157-9510		1
10.	FULFLO WOUND DEPTH CARTRIDGE		VARIABLE		5,10,15
11.	SHELL ASSEMBLY	5413-5672	5413-5673	5413-5674	1
12.	TOP SEAT ASSEMBLY		5320-5166		5
13.	BOTTOM SEAT PLATE		5320-5001		5
14.	TUBE SPACER	NONE	5710-5022		5,10
15.	TUBE GUIDE	2800-5066	2800-5063	2800-5064	5
16.	CENTER POST	0720-5231	0720-5232	0720-5233	1
17.	HEAD ASSEMBLY		2901-5774		1
18.	DECAL		2010-5072		1

NOTES
1 SHELL O-RING (ITEM #5) IS BUNA-N OPTIONAL O-RINGS ARE AS FOLLOWS
VITON-A PT NO 4150-5285
BUTYL PT NO 4150-5312
2 WHERE ONLY ONE PART NUMBER IS SHOWN IT IS COMMON TO ALL (BOTH) MODELS
3 ON UNITS SPECIFIED WITH A (W) SUFFIX (I E FH510W) ONE ITEM 2 IS REQUIRED FOR OPTIONAL WALL MOUNTING



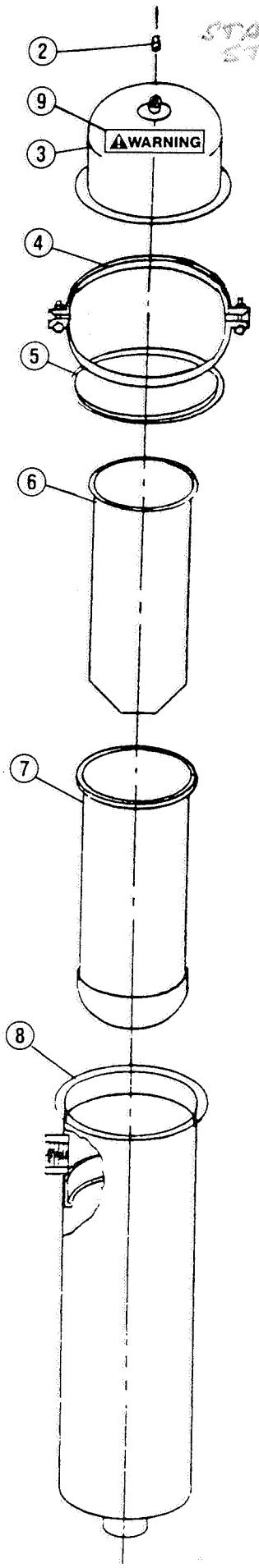


3. FCB Model

Note: Either a filter bag supported by a stainless steel perforated retainer basket or a strainer basket may be used in this vessel.

Filter Bag

1. Follow shutdown procedure.
2. Remove filter bag by grasping loop and pulling toward the center of the bag and upward.
3. Lift the bag out of the support basket and discard.
4. Remove, clean and inspect retainer basket for damage. Replace if necessary.***
5. Inspect the vessel interior. For effective filtration, clean and inspect the basket seating area and bag sealing surface.
6. Insure that retainer basket is firmly seated on the support ring.
7. Install a new filter bag by forming the sewn-in snap ring into a "kidney bean" shape. Allow the ring to snap into place on the bag sealing surface.
8. Follow start-up procedure.



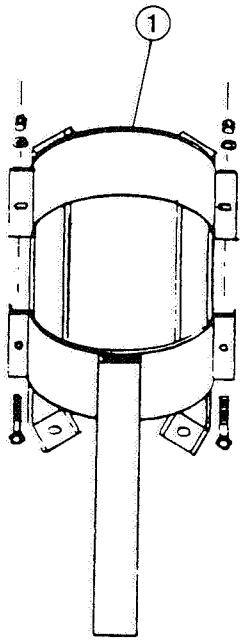
PARTS LIST
MODELS FCB11 AND FCB12
4FCB11 AND 4FCB12
BAG AND STRAINER FILTER VESSELS

ITEM NO.	DESCRIPTION	FCB11 PART NO.	FCB12 PART NO.	
1.	LEG ASSEMBLY	3420-5027		
2.	VENT COCK	1510-1-006		
3.	HEAD ASSEMBLY	2901-5773		
4.	CLAMP	1390-1-028		
5.	SHELL O-RING	4150-5310		
6.	BAG OR STRAINER	VARIABLE		SEE NOTE #1
7.	RETAINER BASKET	0370-5069	0370-5070	
8.	SHELL ASSEMBLY	5413-5658	5413-5659	
9.	DECAL	2010-5072		

ITEM NO.	DESCRIPTION	4FCB11 PART NO.	4FCB12 PART NO.	
1.	LEG ASSEMBLY	3420-5028		
2.	VENT PLUG	4570-154-9500		
3.	HEAD ASSEMBLY	2901-5774		
4.	CLAMP	1390-1-028		
5	SHELL O-RING	4150-5310		
6.	BAG OR STRAINER	VARIABLE		SEE NOTE #1
7.	RETAINER BASKET	0370-5069	0370-5070	
8.	SHELL ASSEMBLY	5413-5662	5413-5663	
9.	DECAL	2010-5072		

NOTES:
1. SHELL O-RING (ITEM #5) IS BUNA N. OPTIONAL O-RINGS ARE AS FOLLOWS:
   VITON-A PT NO 4150-5285
   BUTYL PT NO 4150-5312
2. WHERE ONLY ONE PART NUMBER IS SHOWN, IT IS COMMON TO BOTH MODELS

Strainer

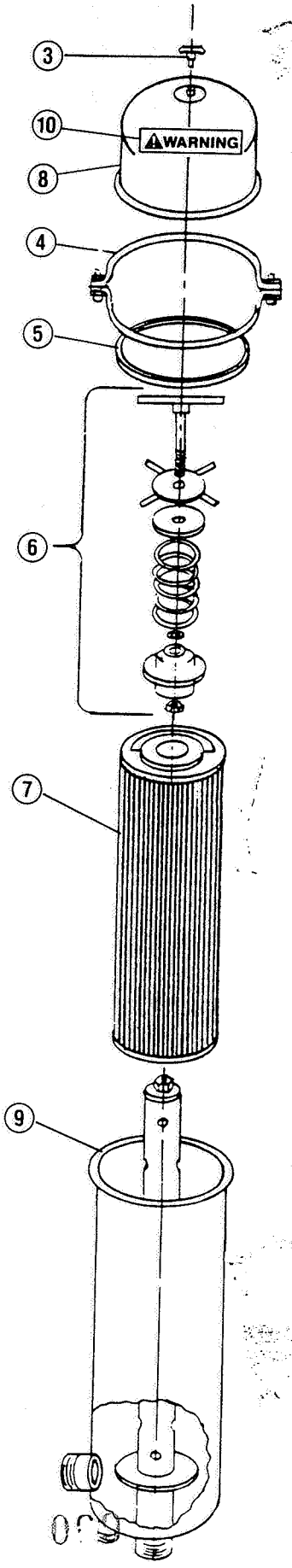


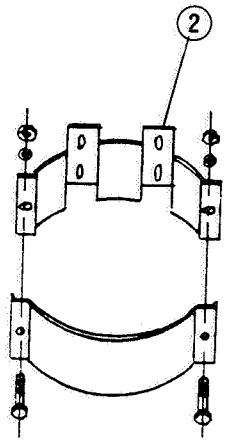
1. Follow shutdown procedure.
2. Remove strainer basket with lifting handle.
3. Clean and inspect the strainer basket for damage. Replace if necessary.***
4. Clean and inspect the strainer and seating surface. Repair if necessary.
5. Install strainer basket. Make sure it is firmly seated on the support ring.
6. Follow start-up procedure.

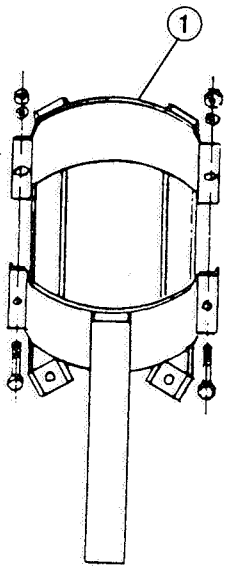
***Replace any worn or damaged parts only with Process Filtration approved Fulflo replacement parts.

C. FPM and TFPM Model

1. Follow shutdown procedure.
2. Turn Tee-handle counter-clockwise and remove Tee-handle assembly.
3. Remove filter cartridge and discard.
4. Clean and inspect filter interior for damage. Also, clean and inspect the bottom cartridge seat area.***
5. Slide new cartridge over standpipe. Spacers are not required when cartridges are multi-stacked.
6. Reposition Tee-handle assembly onto standpipe and hand-tighten Tee-handle clockwise to seal cartridge.
7. Follow start-up procedure.







PARTS LIST
MODELS FPM-1 AND FPM-2
FULFLO FILTERS

ITEM NO.	DESCRIPTION	FPM-1 PART NO.	FPM-2 PART NO.	QTY.	
1.	LEG ASSEMBLY	3420-5027		1	
2.	BRACKET ASSEMBLY	0820-5094		1	
3.	VENT COCK	1510-1-006		1	
4.	CLAMP	1390-1-028		1	
5.	SHELL O-RING	4150-5310		1	SEE NOTE #1
6.	TEE HANDLE ASSEMBLY	2840-5004		1	
7.	FILTER CARTRIDGE	VARIABLE		1,2	SEE NOTE #4
8.	HEAD ASSEMBLY	2901-5773		1	
9.	SHELL ASSEMBLY	5413-5678	5413-5679	1	
10.	DECAL	2010-5072		1	

NOTES:
1. SHELL O-RING (ITEM #5) IS BUNA-N. OPTIONAL O-RINGS ARE AS FOLLOWS
   VITON-A PT.NO. 4150-5285
   BUTYL PT.NO. 4150-5312
2. WHERE ONLY ONE PART NUMBER IS SHOWN, IT IS COMMON TO ALL (BOTH) MODELS
3. ON UNITS SPECIFIED WITH A (W) SUFFIX (I.E. FH510W) ONE ITEM 2 IS REQUIRED FOR OPTIONAL WALL MOUNTING
4. FPM-1 USES (1) FILTER CARTRIDGE, FPM-2 USES (2). OPTIONAL FILTER CARTRIDGES ARE AS FOLLOWS
   9053-5002 (4687)—5 MICRON PLEATED PAPER
   9053-5006 (4659)—10 MICRON PLEATED PAPER
   9053-5009 (4649)—20 MICRON PLEATED PAPER
   9053-5004 (4669)—30 MICRON PLEATED PAPER
   9550-5002 —CRANITE (FULLERS EARTH)
   9551-5000 —RAYON CELLULOSE
   9552-5000 —COTTON WASTE EXCELSIOR

***Replace any worn or damaged parts only with Process Filtration approved Fulflo replacement

III. Cover Replacement and Start-up Procedures (or Initial Assembly and Start-up)

Note: Inlet, outlet, vent and drain connections are labeled on the vessel.

1. Before installing cover, inspect vessel and all components for wear, corrosion or other damages.

WARNING: Operating vessel with damaged or worn parts could cause serious injury and damage.

2. Clean and inspect O-ring seating surfaces. Repair if necessary. Re-lubricate O-ring heavily with petroleum jelly.

3. Clean and inspect O-ring for damage. Replace if necessary.***

4. To reposition the cover, first align the outside locating lugs on the cover and body and then turn the cover clockwise engaging the internal safety latch. (Older models do not have safety latch.)

5. Re-install V-band clamp on vessel.**

WARNING: Inspect V-band clamp and bolts for wear or damage. Replace, if necessary. Operating vessel with damaged or worn clamp and bolts could cause serious injury and damage.

6. Re-install bolt and tighten clamp and bolts with a torque wrench.

WARNING: Do not exceed 10½ ft. lb. of torque. Over-tightening can damage clamp which could cause serious injury and damage.

7. Leave vent cock open.

WARNING: Failure to leave vent cock open when starting fluid flow will allow air to become entrapped and compressed in upper portion of vessel. Compressed air might damage clamp and rupture vessel resulting in serious injury and damage.

8. Close drain. (No independent drain on FCB model.)

9. Open inlet valve and allow vessel to fill slowly.

10. Close the vent cock after air is expelled from the vessel and liquid begins to bleed from vent.

11. Open outlet valve.

WARNING: If vessel leaks, do not tighten V-band clamp while filter vessel is pressurized. Doing so could damage clamp and rupture vessel resulting in serious injury and damage.

12. If vessel leaks, repeat shut-down and start-up procedures. Clean O-ring seating surfaces and install a new O-ring.

**Use only Process Filtration approved Fulflo replacement bolt and V-clamp or other parts.

***Replace any worn or damaged parts only with Process Filtration approved Fulflo replacement parts.

Form D-26, Revised, 11/89
Supersedes 3/1/88
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Parker Hannifin Corporation
Process Filtration Division
P.O. Box 1300
Lebanon, Indiana 46052

Telephone: (765) 482-3900
Fax: (765) 482-8410
Telex: 247529

3130–5003

Parker Hannifin Corporation
Process Filtration Division
P.O. Box 1300
Lebanon, Indiana 46052
Toll Free 1-888-C-FULFLO or 1-888-238-5356
Telephone (765) 482-3900
Fax (765) 482-8410
http://www.parker.com

Fulflo® Installation & Operating Instructions for FCB, 4FCB Bag Filter Vessels

Product Instruction Data

Supplemental Section II.B
Media Replacement for Solid Metal and Plastic Ring Type Bags

I. Media Replacement

See Figure 1

1. Follow shutdown procedure.
2. Remove bag hold down ring by grasping handle and lifting upward.
3. Grasp filter bag at top rim and lift upward to remove. Discard bag.
4. Remove, clean and inspect retainer basket for damage. Replace if necessary.*
5. Inspect the vessel interior. For effective filtration, clean and inspect the basket seating area and bag sealing surface.
6. Insure that retainer basket is firmly seated on the support ring.
7. Install new filter bag by dropping bag in strainer, making sure bag is snug with strainer. There should be no gap between bag retainer ring and strainer basket.
8. Replace bag hold down ring making sure ring is firmly seated against top of bag.
9. Follow start-up procedure.

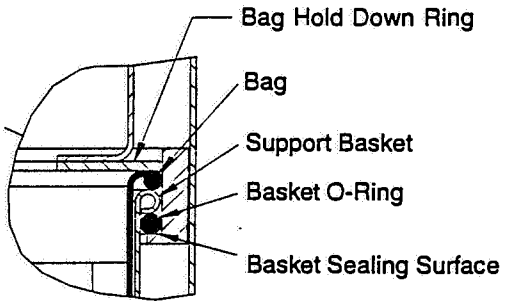

Figure 1
Illustration of a Bag Sealed in a Filter Housing

* Replace any worn or damaged parts only with genuine Parker Process Filtration approved Fulflo replacement parts.

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Process Filtration Division

Supplement Bulletin 3130-5010
Effective 2/98
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The products described herein, including without limitation, product features, specifications, designs, availability and pricing are subject to change by Parker Hannifin Corporation and its

Parker Filtration

CALGON
CALGON CARBON CORPORATION

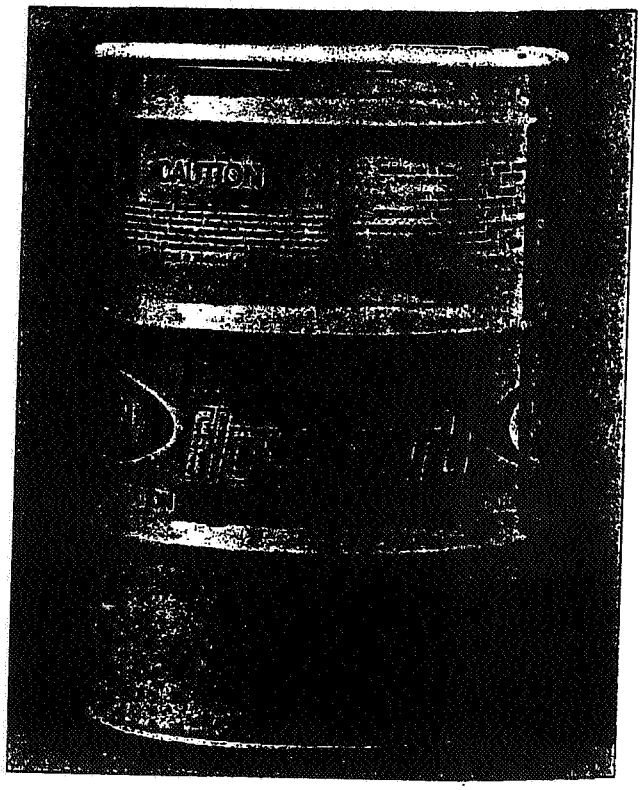
EQUIPMENT BULLETIN

FLOWSORB

GENERAL DESCRIPTION

Designed for low-flow water treatment applications, prefabricated 55-gallon FlowSorb™ canisters contain all the operating elements found in a full-scale adsorption system. These small, economical treatment systems hold 165 pounds of granular activated carbon for applications including:

- Small wastewater streams
- Groundwater remediation
- Underground storage tank leaks
- Well pump tests
- Product purification or decolorization
- Tank cleaning water treatment
- Batch water or product treatment
- Carbon adsorption pilot testing
- Emergency spill treatment
- Monitoring well water treatment



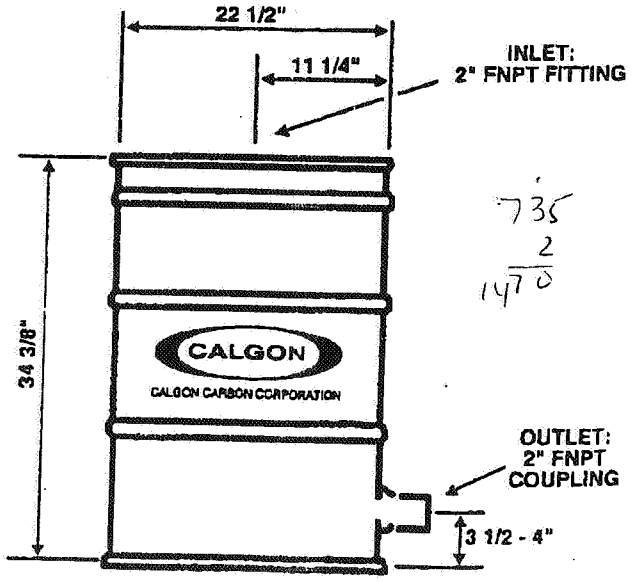
FEATURES

FlowSorb offers several features and benefits to industrial, commercial and municipal users including:

- Sturdy 16 gauge steel construction per DOT specifications
- Continuous treatment at varying flow rates and concentrations
- Simple installation and operation
- Space above carbon bed facilitates flow distribution or backflushing
- Flexibility to be used in series or parallel operation
- Supplied with virgin or reactivated carbon
- May also be supplied with Klensorb, an oil absorbent media
- Practical disposal option, as pre-approved spent carbon canisters may be returned to Calgon Carbon for safe carbon reactivation
- Low Cost per unit makes carbon treatment economical

FLOWSORB SPECIFICATIONS

Vessel:	Open head 16 gauge steel canister
Pressure:	15 psig per DOT 17C
Cover:	Removable steel cover, 12 gauge bolt ring with butyl rubber sponge gasket
Internal Coating:	Heat cured phenolic epoxy
External Coating:	Baked enamel (gray)
Temperature Limit:	150° F (65.6° C) continuous 350°F (176.7°C) intermittent
Inlet:	2" FNPT Nylon fitting
Outlet:	2" FNPT Galvanized steel coupling; 304 stainless steel collector in nylon drum fitting
Carbon:	165 pounds granular activated carbon: Specify Filtrasorb 300 or reactivated grade
Ship Weight:	232 pounds (105 kg)
Identification:	Sequentially numbered for reference



FLOWSORB DIMENSIONS

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TYPICAL FLOWSORB OPERATING PARAMETERS

Flow Rate: ..... 10 gpm (37.8 l/m)
Contact Time: ..... 4.5 minutes
Pressure Drop: ..... < 1 psi (clean water and carbon)
Operating Pressures: ..... Recommend operation at less than 5 psig, but higher pressures, up to 12 psig, possible with tight cover closure

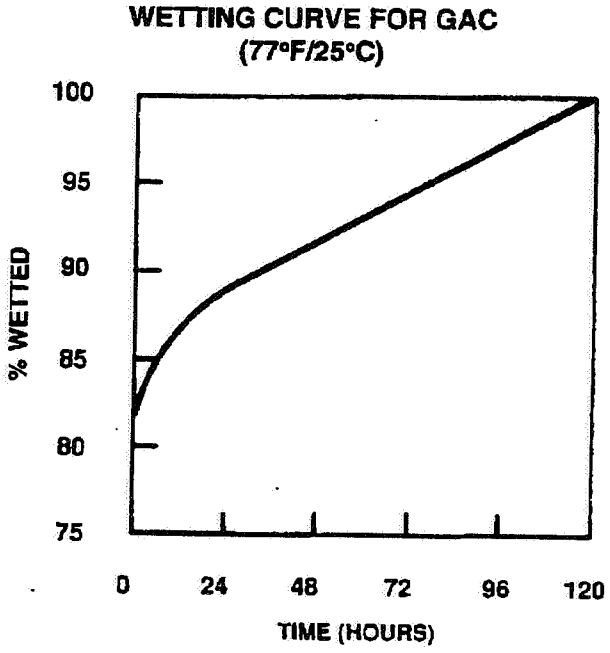
FLOWSORB INSTALLATION

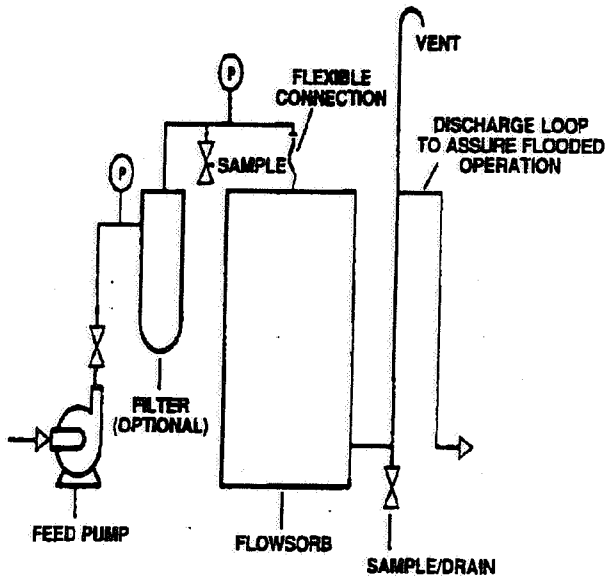
FlowSorb canisters are shipped with dry activated carbon; the carbon must be wetted and deaerated prior to use. This procedure displaces air from the internal structure of the carbon granule, thus assuring that the liquid to be treated is in contact with the carbon surface.

Prior to operation, each canister must be filled with clean water; the water should be introduced into the bottom outlet connection. The unit should set for approximately 48 hours — this allows most of the carbon's internal surface to become wetted, as shown on the wetting curve below.

After wetting, the carbon bed can be deaerated by draining the canister and again filling the canister upflow with clean water. This procedure will eliminate any air pockets which may have formed between the carbon granules. The FlowSorb is now ready for operation.

Canisters should be set on a flat, level surface and piped as recommended in the installation illustration. The influent pipe connection should be attached to the unit by using a flexible connection, as some minor deflection of the lid may occur if pressure builds due to filtration or other flow blockage downstream.





TYPICAL FLOWSORB INSTALLATION

FlowSorb discharge piping should include an elevated piping loop to assure that the canister remains flooded with water at all times. In addition to the piping loop, a drain connection is recommended on the discharge piping; this allows drainage of the unit prior to disconnection or temporary shutdown.

A filter should be installed if the liquid to be treated contains substantial amounts of suspended solids. A simple cartridge or screen filter helps prevent pressure buildup in the carbon bed.

FLOWSORB OPERATION

FlowSorb canisters should be full of clean water before treatment begins. Flow rate to the canister should be determined based on required contact time between the liquid and the carbon media. In groundwater treatment applications, the recommended contact time is typically 8-10 minutes with a resultant flow of approximately 5 gpm. Consult your Calgon Carbon Technical Sales Representative for advice about proper contact time for your application.

FlowSorbs can be manifolded in parallel operation for higher flow rates. For series operation, two FlowSorbs can be piped together sequentially, as normal pressure drop will not exceed the recommended operating pressure.

These canisters have space for bed expansion and can be backflushed by introducing clean water or liquid at approximately 20-25 gpm to the outlet and taking backflush water from the inlet.

If the operating pressure is expected to exceed 5 psig, an application of adhesive caulk at the lid gasket is recommended to prevent leakage. With all surfaces dry, apply the adhesive caulk to the lid recess and lip of the drum per the manufacturer's procedure and set the FlowSorb gasket into the lid recess. After allowing the caulk to set, install the drum lid and tighten the bolt ring.

THEORETICAL FLOWSORB TREATMENT CAPACITY FOR TYPICAL CASES

	Case 1		Case 2		Case 3	
	Conc.	Gallons	Conc.	Gallons	Conc.	Gallons
Benzene	20 ppb	1,600,000	200 ppb	400,000	2 ppm	85,000
Toluene	40 ppb		400 ppb		4 ppm	
Xylene	40 ppb		400 ppb		4 ppm	

	Case 4		Case 5		Case 6	
	Conc.	Gallons	Conc.	Gallons	Conc.	Gallons
TCE	50 ppb	1,900,000	500 ppb	550,000	5 ppm	125,000
PCE	50 ppb		500 ppb		4 ppm	

	Case 7		Case 8		Case 9	
	Conc.	Gallons	Conc.	Gallons	Conc.	Gallons
Phenol	1 ppm	230,000	10 ppm	50,000	100 ppm	10,000
Total SOC	10 ppm		100 ppm		1,000 ppm	

Each case represents a groundwater or wastewater stream that contains the combination of contaminants listed. The treatment capacity indicates the total gallons of that particular water that may be treated before any of the specific contaminants are present in the treated water as noted. Theoretical capacity based on 5 gpm, water at 70°F or less and 165 pounds of Filtrasorb 300. Background TOC is less than 1 ppm except phenol cases as noted. Contaminants reduced to < 5 ppb, except phenol case which is for 95% phenol reduction.

HOW TO ESTIMATE FLOWSORB LIFE

The treatment table on this page lists the volume of water that can be purified by the FlowSorb for typical contamination situations. However, most applications involve a unique mixture of organic chemical contaminants including some chemicals that adsorb at different capacities or strengths. Please consult with your Calgon Carbon Technical Sales Representative for more information about carbon usage rates.

RETURN OF FLOWSORBS

Arrangements should be made at the time of purchase regarding the future return of canisters containing spent carbon. Calgon Carbon will provide instructions on how to sample the spent carbon and arrange for carbon acceptance testing. The spent carbon is reactivated by Calgon Carbon and all of the contaminants are thermally destroyed. The company will not accept FlowSorbs for landfill, incineration or other means of disposal.

FlowSorbs cannot be returned to Calgon Carbon unless the carbon acceptance procedure has been completed, an acceptance number provided, and the return labels (included with the units at the time of purchase) are attached.

FlowSorbs must be drained — and inlet/outlet connections must be plugged – prior to return to Calgon Carbon.

SAFETY CONSIDERATIONS

It is unlikely that a worker would be able to physically enter a FlowSorb canister. However, the following information and precautions apply to a partially closed canister or situations where carbon is to be removed from the canister and stored elsewhere.

Wet or dry activated carbon preferentially removes oxygen from air. In closed or partially closed containers, oxygen depletion may reach hazardous levels. If workers must enter a vessel containing carbon, appropriate sampling and work procedures should be followed for potentially low-oxygen spaces – including all applicable federal and state requirements.

CALGON CARBON LIQUID PURIFICATION SYSTEMS

FlowSorb is a unit specifically designed for a variety of small flow applications. Calgon Carbon Corporation offers a wide range of carbon adsorption systems and services for a greater range of flow rates and carbon usages to meet specific applications.

WARRANTY

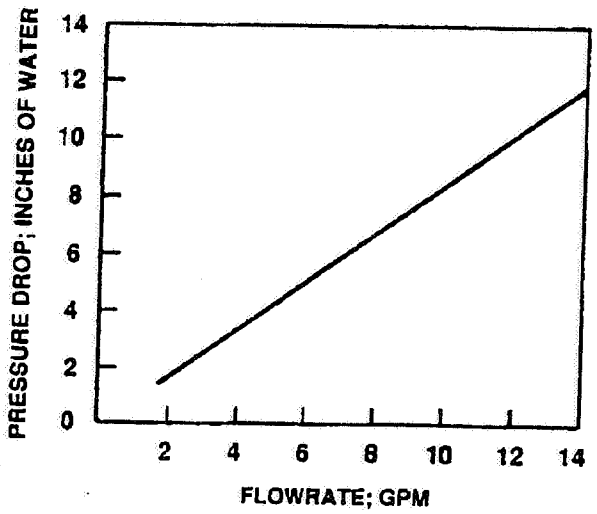
There are no expressed or implied warranties – or any warranty of merchantability or fitness – for a particular purpose associated with the sale of this product.

LIMITATION OF LIABILITY

The Purchaser's exclusive remedy for any cause of action arising out of purchase and use of the FlowSorb, including but not limited to breach of warranty, negligence and/or indemnifications, is expressly limited to a maximum of the purchase price of the FlowSorb unit as sold. All claims of whatsoever nature shall be deemed waived unless made in writing within forty-five (45) days of the occurrence giving rise to the claim. In no event shall Calgon Carbon Corporation for any reason be liable for incidental or consequential damages, in excess of the purchase price of the FlowSorb unit, loss of profits or fines imposed by governmental agencies.

For information regarding incidents involving human and environmental exposure, please call (412) 787-6700 and ask for the Regulatory and Trade Affairs Department.

FLOWSORB PRESSURE DROP



Application information provided in this bulletin is based upon theoretical data. Calgon Carbon Corporation assumes no responsibility for the use of the information in this product bulletin.

If at any time our products or services do not meet your requirements or expectations, or if you would like to suggest any ideas for improvement, please call us at 1-800-548-1999. From outside the U.S. please call +1-412-787-6700.

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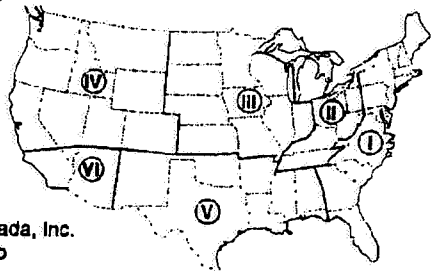

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412-787-6700 or 800-422-7266 FAX: 412-787-6324
Ext 6732

BACKFLUSHING

Backflushing is a procedure involving running clean, contaminant-free water upflow through the adsorber. Backflushing of a carbon bed can be done to remove sediment from the top of the bed.

In a system that is not to be backwashed, an operation termed "BACKFLUSHING" can be used to remove fines from the lower portion of the bed because it does not expand the bed. Expansion of the bed allows the fines at the bottom of the bed to move to the top. However, fines do not always cause high pressure drop, and their removal is not always necessary.

Therefore, if the system is not to be backwashed during operation and is termed "non-backwashable", it may not be necessary to backflush the carbon prior to startup.

The backflushing rate is 1 to 2 gpm/ft² and this is not significant enough to expand the carbon bed; therefore, size segregation of the bed will not occur. The time required for backflushing is 10 to 20 minutes.
Note: Do not exceed operating pressure during backflushing.

Normally when backflushing, a clean external water source is used. The stream should be compatible with the system and free of suspended solids and organic contaminants which might affect adsorption. If necessary, effluent from the adsorber system may be used as the water source. In this case a tank with storage capacity for 20 minutes of backflush water (approximately 200-300 gallons) will be necessary.

When normal downflow operation is started after backflushing, the initial 5 to 15 minutes of effluent flow will be dark due to a small quantity of fines. Under normal operating conditions, this condition will clear up.

➡ Note:
CYCLESORBFP1, CYCLESORBFP2, CYCLESORB STAINLESS STEEL, DISPOSORB, FLOWSORB units are non-backwashable.

Please contact your technical sales representative at the above telephone number if you have any further questions or need any additional assistance!

01/97

Chromalox®

Installation Instructions
and
RENEWAL PARTS IDENTIFICATION
Horizontal Unit Heater

SERVICE REFERENCE	
DIVISION 4	SECTION LUH
SALES REFERENCE (Supersedes PF479)	PF479-1
	161-303474-001
DATE OCTOBER, 1996	

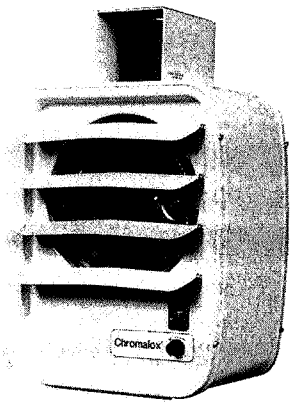

TABLE 1. SPECIFICATIONS

Catalog Number	Electrical Data (60 Hz)					Dimensions (Inches)			Standard Contactor Rating (Qty.)
	Voltage	Wattage	Phase	Amps	BTU	Height	Width	Depth	
LUH-D-02-81	208	2,667	1	12.8	8,850	16	13-1/8	8-7/8	30A (1)
LUH-D-02-21	208/240	2,000/2,667	1	11.1 *					30A (1)
LUH-D-02-71	277	2,667	1	9.6					30A (1)
LUH-D-04-81 †	208	4,000	1	19.2	13,661	16	13-1/8	8-7/8	30A (1)
LUH-D-04-83 †			3	11.2					30A (1)
LUH-D-04-21 †	208/240	3,000/4,000	1	16.7 *					30A (1)
LUH-D-04-23 †			3	9.6 *					30A (1)
LUH-D-04-71	277	4,000	1	14.5					30A (1)
LUH-D-04-43	480	4,000	3	4.8					30A (1)
LUH-D-05-81 †	208	5,000	1	24.0	17,076	16	13-1/8	8-7/8	30A (1)
LUH-D-05-83 †			3	13.8					30A (1)
LUH-D-05-21 †	208/240	3,750/5,000	1	20.8 *					30A (1)
LUH-D-05-23 †			3	12.1 *					30A (1)
LUH-D-05-71	277	5,000	1	18.2					30A (1)
LUH-D-05-43	480	5,000	3	6.0					30A (1)
LUH-D-07-81 †	208	7,500	1	36.1	25,598	20-1/2	17-1/4	11-1/2	50A (1)
LUH-D-07-83			3	20.9					30A (1)
LUH-D-07-21 †	208/240	5,625/7,500	1	31.1 *					30A (1)
LUH-D-07-23			3	18.1 *					30A (1)
LUH-D-07-71	277	7,500	1	27.2					30A (1)
LUH-D-07-43	480	7,500	3	9.0					30A (1)
LUH-D-10-81 †	208	10,000	1	48.0	34,130	20-1/2	17-1/4	11-1/2	50A (1)
LUH-D-10-83			3	27.8					30A (1)
LUH-D-10-21 †	208/240	7,500/10,000	1	41.7 *					30A (1)
LUH-D-10-23			3	24.0 *					30A (1)
LUH-D-10-43	480	10,000	3	12.0					30A (1)
LUH-D-12-83	208	12,500	3	34.8	42,663	20-1/2	17-1/4	11-1/2	50A (1)
LUH-D-12-23	208/240	9,375/12,500	3	30.1 *					50A (1)
LUH-D-12-43	480	12,500	3	15.1					30A (1)
LUH-D-15-83	208	15,000	3	41.8	51,195	20-1/2	17-1/4	11-1/2	50A (1)
LUH-D-15-23	208/240	11,250/15,000	3	36.2 *					50A (1)
LUH-D-15-43	480	15,000	3	18.1					30A (1)
LUH-D-20-23	208/240	15,000/20,000	3	48.0 *	68,460	24	20-1/8	11-1/2	50A (1)
LUH-D-20-43	480	20,000	3	24.0					30A (1)
LUH-D-25-43	480	25,000	3	30.0	85,525	24	20-1/8	11-1/2	50A (1)
LUH-D-30-83	208	30,000	3	83.4	102,390	24	20-1/8	17-1/4	50A (2)
LUH-D-30-23	208/240	22,500/30,000	3	72.2 *					50A (2)
LUH-D-30-43	480	30,000	3	36.1					30A (2)
LUH-D-35-23	208/240	26,250/35,000	3	84.3 *	119,455	24	20-1/8	17-1/4	50A (2)
LUH-D-35-43	480	35,000	3	42.1					30A (2)
LUH-D-40-23	208/240	30,000/40,000	3	96.0 *	136,520	24	20-1/8	17-1/4	50A (2)
LUH-D-40-43	480	40,000	3	48.0					30A (2)
LUH-D-45-43	480	45,000	3	54.1	153,585	24	20-1/8	17-1/4	30A (2)

*NOTE: 208V amperage is 86% of 240V value.

† These models can be field changed from single phase to three phase or three phase to single phase.

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IMPORTANT

Failure to understand and follow these installation instructions and the "WARNING" notes therein may result in serious personal injury from electrical shock, or from the heater failing due to faulty installation.

WARNING: ***This heater is not intended for use in hazardous atmospheres where flammable vapors, gases, liquids, or other combustible atmospheres are present as defined in the National Electric Code. Failure to comply can result in explosion or fire.***

WARNING: *To avoid possible electrical shock, be sure electricity is turned off at main switch first before wiring. All wiring must be in accordance with local electrical codes and the heater must be grounded as a precaution against possible electric shock.*

Do not mount mercury type thermostat directly on unit. Vibration could cause heater to malfunction.

The heater must be mounted at least 7' above the floor to prevent accidental contact with the heating elements or fan blade which could cause injury.

Keep at least 5' clearance in front of the heater. Refer to Table 2 for side, top and back clearance requirements.

The ceiling mounting structure and the anchoring provisions must be of sufficient strength to support the combined weight of the heater and mounting bracket. (Refer to Table 3 for weights of heater and bracket.)

The wall or mounting surface, and the anchoring provisions must be capable of supporting the combined weight of the heater and mounting brackets cantilevered from the mounting surface. (Refer to Table 3 for weights of heater and brackets and for cantilevered force expressed in foot-pounds.)

GENERAL

Heater Location Instructions:

Arrange units so their discharge air streams:

a. are subjected to a minimum of interference from columns, machinery and partitions.

b. wipe exposed walls without blowing directly at them.

c. are directed away from room occupants in comfort heating.

d. are directed along the windward side when installed in a building exposed to a prevailing wind.

Locate thermostat on interior partition walls or posts away from cold drafts, internal heat sources and away from heater discharge air streams.

Small rooms can be heated by one unit heater. Where two walls are exposed, the heater should be mounted as shown in Figure 1.

Large rooms require multi-unit installation. Number and capacity of units will be determined by volume of building and square feet of floor area to be heated. Arrange units to provide perimeter air circulation where each unit supports the air stream from another.

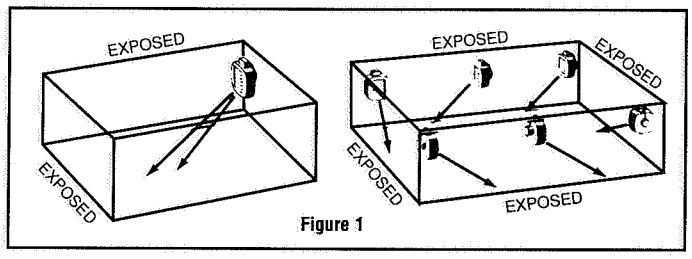

Figure 1

INSTALLATION

WARNING: *When mounting the heater, observe the following precautions:*

1. The heater must be mounted at least 7' above the floor to prevent accidental contact with the heating elements or fan blade which could cause injury.
2. Keep at least 5' clearance in front of heater. Refer to Table 2 for side, top and back clearance requirements.

Table 2. Clearance Requirements

Basic Catalog Number	Mounting Limitations		
	Back to Wall	Side to Wall	Top to Ceiling
LUH-02 through LUH-05	6"	6"	4"
LUH-07 through LUH-15	6"	6"	6"
LUH-20 and LUH-25	6"	6"	6"
LUH-30 through LUH-45	6"	6"	6"

3. The ceiling mounting structure and the anchoring provisions must be sufficient to support the combined weight of the heater and mounting bracket. (Refer to Table 3 for weights of heater and bracket.)

Table 3. Heater & Bracket Weights Combined

Heater Catalog Number	Weight (pounds) Heater and Brackets		
	Ceiling Weight	Wall Weight	Ft.-Lbs.
LUH-02 through LUH-05	33-3/4	38-1/4	48
LUH-07 through LUH-15	55	67-1/4	112
LUH-20 through LUH-25	78	90-1/4	150
LUH-30 through LUH-45	117	141-1/4	400

4. The wall or mounting surface and the anchoring provisions must be capable of supporting the combined weight of the heater and mounting brackets cantilevered from the mounting surface. (Refer to Table 3 for weights of heater and brackets and for cantilevered force expressed in foot-pounds.)

The heater may be mounted either on the ceiling or on the wall as follows:

A. CEILING. The ceiling mounting bracket is fastened to the top of the heater using the four bolts supplied with the mounting bracket. The bracket is then mounted to the ceiling using a 5/8" bolt (by others).

CEILING (Alternate)

1. The heater can be rod mounted to the ceiling by installing four threaded mounting rods in the threaded holes located on the top of the heater as shown in Figure 2. (Refer to Table 4 for mounting rod thread size.)
2. Securely attach the four mounting rods to the ceiling. (Refer to Table 5 for wall and ceiling clearances, and Figure 3 for mounting spacing specifications).

B. WALL. Wall mounting kits include both a ceiling mounting bracket and a wall mounting bracket. First, attach the ceiling mounting bracket to the heater as described in step 4A. Then attach the wall mounting bracket to the wall using four 3/8" bolts (by others). Attach the ceiling mounting bracket on the heater to the wall mounting bracket using the 5/8" bolt provided.

The heater may be rotated to discharge in the desired direction. Open and adjust louvers to desired position. See Figure 4 and 5 for additional mounting details.

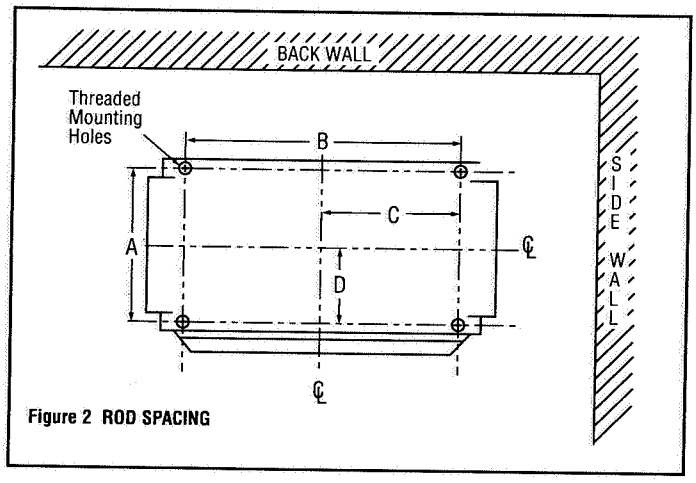

Figure 2 ROD SPACING

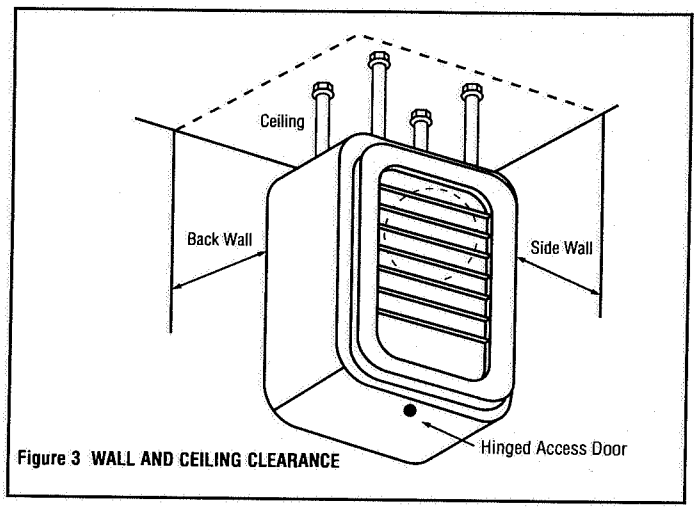

Figure 3 WALL AND CEILING CLEARANCE

Table 4. Rod Thread Type and Spacing Dimensions (inches) for Horizontal Discharge

Unit	Rod Thread Type	Dimensions (Inches)			
		A	B	C	D
2 - 5kW	5/16 - 18	4-1/2	5-1/2	2-3/4	2-1/4
7-1/2 - 15kW	3/8 - 16	6-1/4	8-1/4	4-1/8	3-1/8
20 - 25kW	3/8 - 16	6-1/4	8-1/4	4-1/8	3-1/8
30 - 45kW	3/8 - 16	11-3/4	8-1/4	4-1/8	5-7/8

Table 5. Clearance Requirements

Unit	Ceiling	Side Wall	Back Wall
LUH-02 through LUH-05	4"	6"	6"
LUH-07 through LUH-15	6"	6"	6"
LUH-20 and LUH-25	6"	6"	6"
LUH-30 through LUH-45	4"	6"	6"

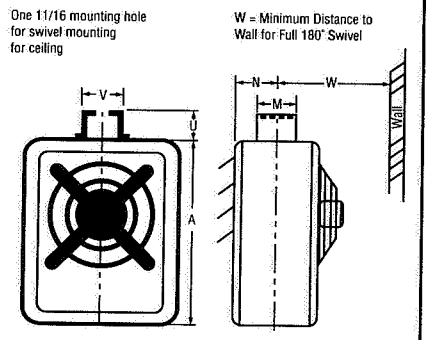

Figure 4
OPTIONAL CEILING SWIVEL MOUNTING BRACKET

Bracket Catalog Number	Dimensions—Inches							Bracket Weight Lbs.	Use with
	A	M	N	O	U	V	W		
LUH-04	16	6	4-7/16	7-13/16	4	4-1/4	10-1/2	1-3/4	LUH-02 04, 05
WUH-05	20-1/2	8	4-3/4	10	6	7-1/4	16	5	LUH-07 10, 12, 15
WUH-05	24	8	6-1/4	11-1/2	6	7-1/4	17-1/2	5	LUH-20, 25
WUH-06	24	13-3/4	9-5/16	15	6	7-1/4	21	11	LUH-C-30 35, 40, 45

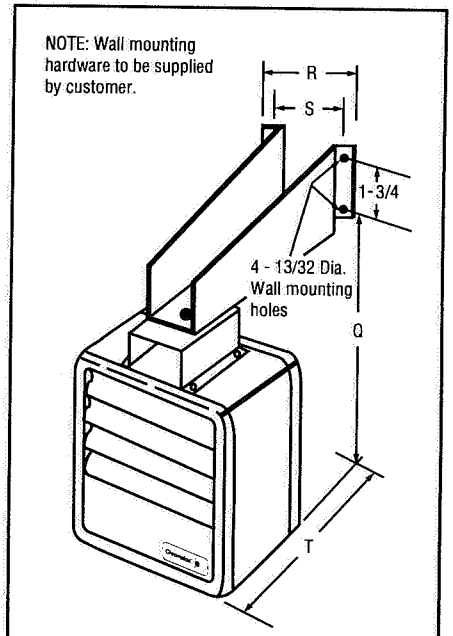

Figure 5
OPTIONAL WALL SWIVEL MOUNTING BRACKET

Bracket Catalog Number	Dimensions—Inches				Bracket Weight Lbs.	Use with
	Q	R	S	T		
WUH-01	24-3/16	6-3/4	5-1/2	14-1/2	4-1/2	LUH-02 04, 05
WUH-02	31-11/16	9-1/2	8-3/8	19-5/8	12-1/4	LUH-07 10, 12, 15
WUH-02	35-3/16	9-1/2	8-3/8	19-5/8	12-1/4	LUn-20, 25
WUH-03	35	5	5-1/2	33-3/16	24-1/4	LUH-C-30, 35, 40, 45

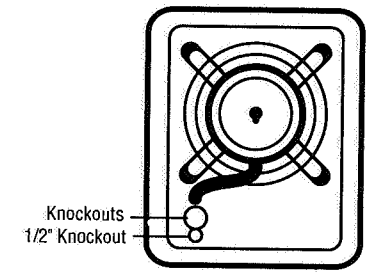

Figure 6
HEATER BACK VIEW

Knockout Sizes	
LUH-02 - LUH-05	3/4" (1)
LUH-07 - LUH-15	1" (1)
LUH-20 - LUH-25	3/4", 1", 1-1/4"(1)
LUH-30 - LUH-45	3/4", 1", 1-1/4"(1)

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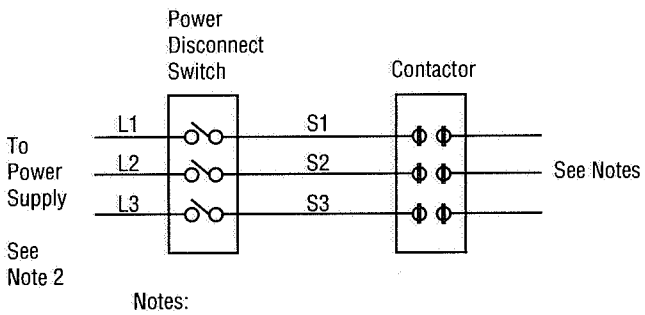
WARNING: ***To avoid possible electric shock, be sure electricity is turned off at main switch first before wiring. The heater must be grounded as a precaution against possible electric shock.***

1. Use heater only on the voltage and frequency specified on the nameplate.
2. All wiring to be done in accordance with local and national electric codes by a qualified person.
3. Two knockouts are provided on the back of the heater for wire entry. See Figure 6 for location of knockouts.
4. Branch circuit wire for connection to heater must be at least 60°C wire.
5. The bottom access door is hinged. There is one screw that must be loosened to gain access (Figure 3). This screw is the captive type; do not try to remove it.
6. A ground terminal is provided near the power terminal board. The ground wire should be connected before other connections are made.
7. Stripped wire leads are supplied to be connected to accept the correct size power supply wire. Copper wire rated at 600V and 60°C is satisfactory for the heater branch circuit.
8. Electrical accessories, either kits or factory-installed options, are shown connected by a dash line on the heater wiring diagram.
9. Wiring connections are to be made on designated wire leads as shown in the wiring diagrams located inside the access door.

POWER DISCONNECT SWITCH (Available as a kit or factory installed option.) This switch (Figure 7) disconnects the power to the power leads when the handle is placed in its full lower position. The power is on when the switch handle is in its full upper position.

1. Use copper conductor supply wire only when connecting to the power line.
2. Connection to the switch pigtails should be made with compression connectors and the joint should be then well insulated.
3. Consult the local wiring code in your area.

SUMMER FAN SWITCH (MOUNTED ON FRONT OF HEATER). When the switch handle is pointing toward the "SUMMER" position, the fan will run continuously. When the switch handle is pointing toward the "WINTER" position, the fan will run only when the heating elements are hot.



Notes:

1. This illustration shows wiring hook up for three phase service. Remove lead wires marked L2 and S2 when using one phase power service.
2. For units without contactors, disconnect switch is to be wired to lead wires on heater power.
3. Use copper supply wire only with this switch.

Figure 7
POWER DISCONNECT SWITCH WIRING DIAGRAM

REMOTE FAN SWITCH (MANUAL SWITCH-LINE VOLTAGE). The wall switch is packed in the wiring compartment.

The remote fan switch is mounted external and remote from the LUH unit heater. The voltage of the remote fan switch is the same as the supply voltage to the LUH heater.

1. Use 14 gage copper, NEC Class 1, 600V rated insulated wire. Wiring must meet all Local and NEC requirements for 480-volt service.
2. Install the remote fan switch in standard wall box in any convenient location that is protected from traffic or other accidental damage.
3. Connect the 14 gage copper field wire to the switch lead wires with suitable connectors.

OPTIONAL THERMOSTAT (LUH-TK)

Heaters can be equipped with an optional thermostat of the Bulb and Capillary type for automatic temperature control (Figure 8). The thermostat controls the heating elements and fan simultaneously to achieve set temperature.

The "Lo" setting of the thermostat is approximately 40°F, and the "Hi" setting is approximately 90°F.

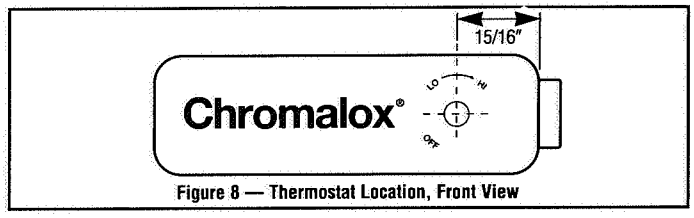


Figure 8 — Thermostat Location, Front View

REMOTE FAN SWITCH (USED WITH 24 or 120-VOLT RELAY) (Available as a kit or factory installed option). The wall switch is packed in the wiring compartment.

1. Use 18 gage (min.) NEC Class 1 600V wiring that meets all Local and NEC requirements.
2. Install the wall switch in a standard wall box in any convenient location that is protected from traffic or other accidental damage.
3. Connect the field wire to the switch lead wires with suitable connectors.

CONTROL VOLTAGE WIRING - EXTERNAL REMOTE THERMOSTATS AND FAN SWITCHES

WARNING: ***Line voltage is present on some of the terminals. Always disconnect the power from the heater before making any connections.***

1. Use 600 volt, NEC Class 1 insulated wiring with a minimum gage of 18 for thermostats and a minimum gage of 14 for line voltage motor switch (remote fan switch without relay).
2. The thermostat should be located in the area to be heated on an inside wall. The thermostat should not be exposed to drafts, sunlight, radiation from hot objects, or in a direct line with the discharge from the unit heater.
3. Install the thermostat approximately 5 feet above the floor line.
4. Install the remote fan switch in any convenient location that is protected from traffic or likely accidental damage.
5. Internal optional controls are shown on the unit heater wiring diagrams by a dash line.

Use wiring diagrams as listed for model number on (A through X), pages 5, 6 and 9.

For installation and optional control kits, refer to instruction sheets listed on page 8.

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WIRING DIAGRAMS

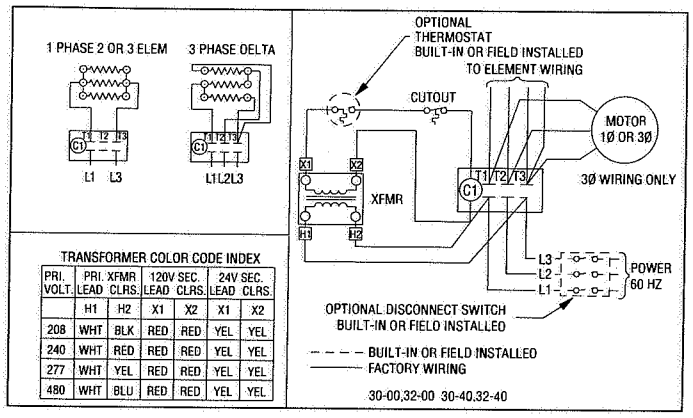


Figure A

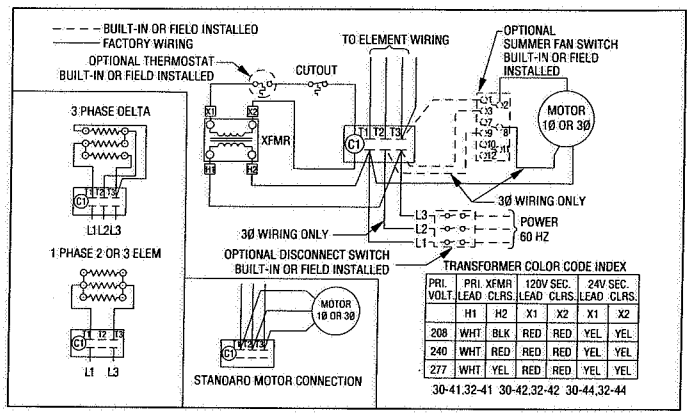


Figure B

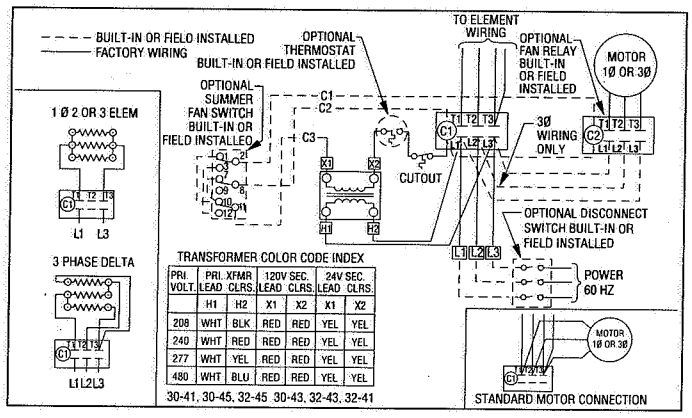


Figure C

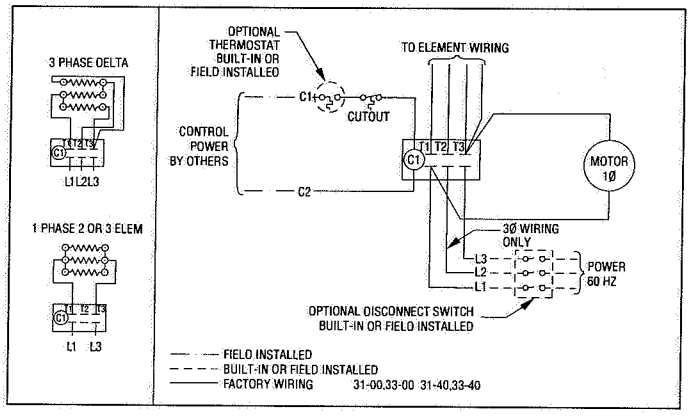


Figure D

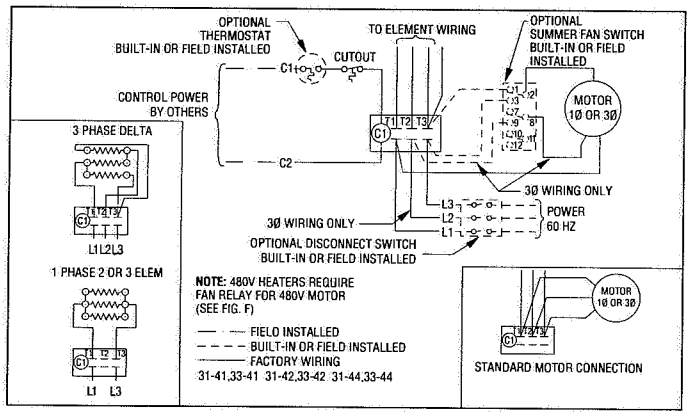


Figure E

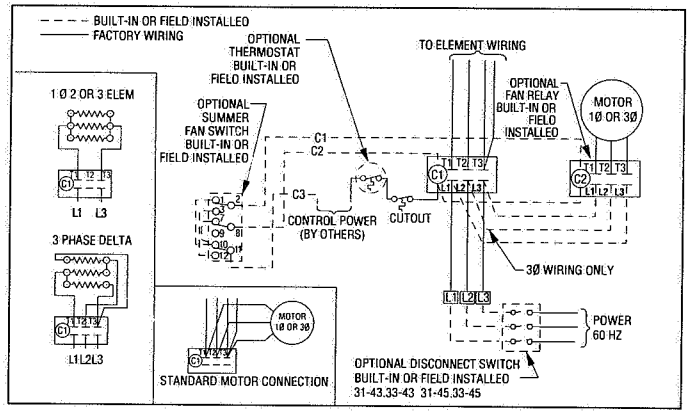


Figure F

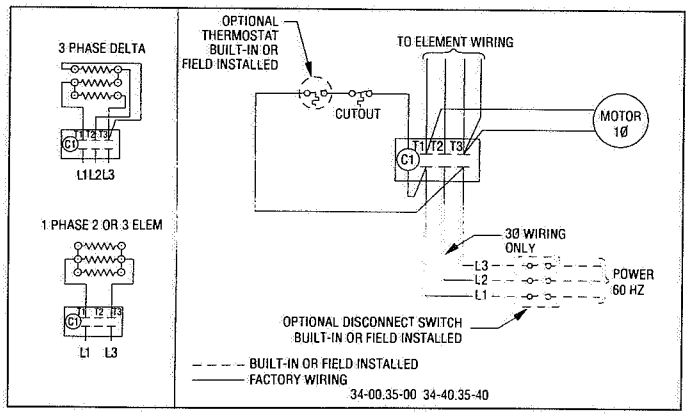


Figure G

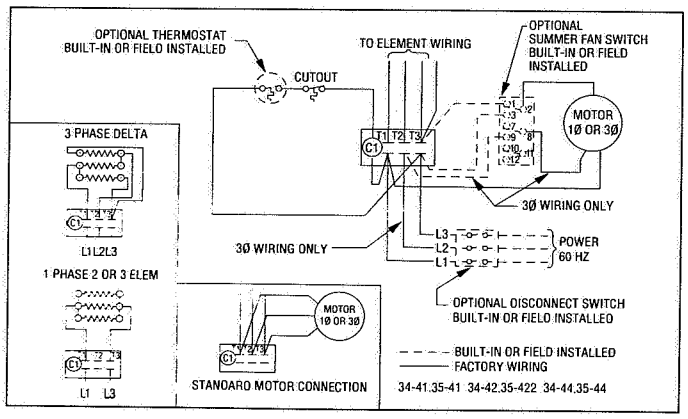


Figure H

WIRING DIAGRAMS

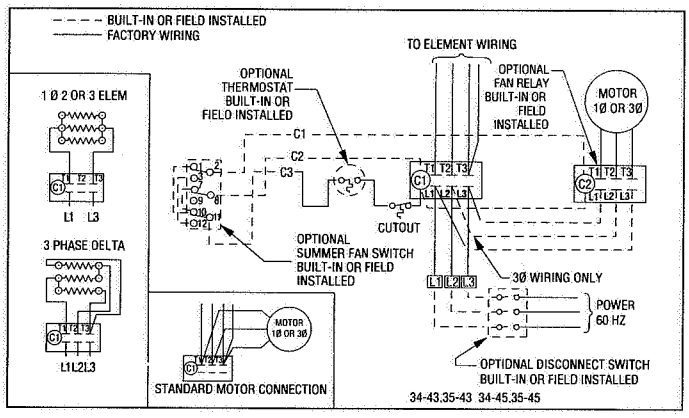
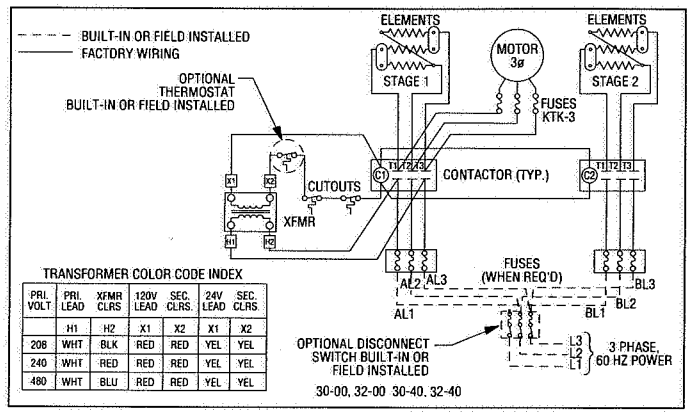
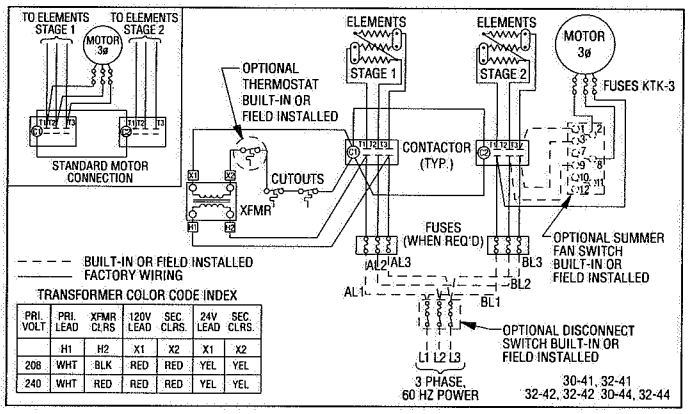


Figure I



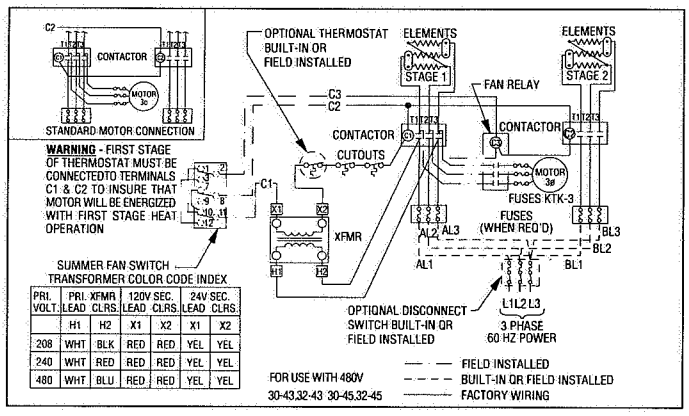
PRI. VOLT	PRI. LEAD	XFMR CLRS	120V LEAD	SEC. CLRS.	24V LEAD	SEC. CLRS.
	H1	H2	X1	X2	X1	X2
208	WHT	BLK	RED	RED	YEL	YEL
240	WHT	RED	RED	RED	YEL	YEL
480	WHT	BLU	RED	RED	YEL	YEL

Figure J



PRI. VOLT	PRI. LEAD	XFMR CLRS	120V LEAD	SEC. CLRS.	24V LEAD	SEC. CLRS.
	H1	H2	X1	X2	X1	X2
208	WHT	BLK	RED	RED	YEL	YEL
240	WHT	RED	RED	RED	YEL	YEL

Figure K



PRI. VOLT.	PRI. LEAD	XFMR CLRS.	120V SEC. LEAD	SEC. CLRS.	24V SEC. LEAD	SEC. CLRS.
	H1	H2	X1	X2	X1	X2
208	WHT	BLK	RED	RED	YEL	YEL
240	WHT	RED	RED	RED	YEL	YEL
480	WHT	BLU	RED	RED	YEL	YEL

Figure L

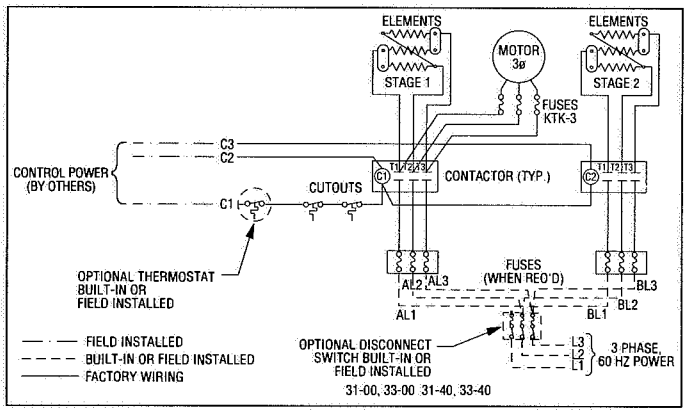


Figure M

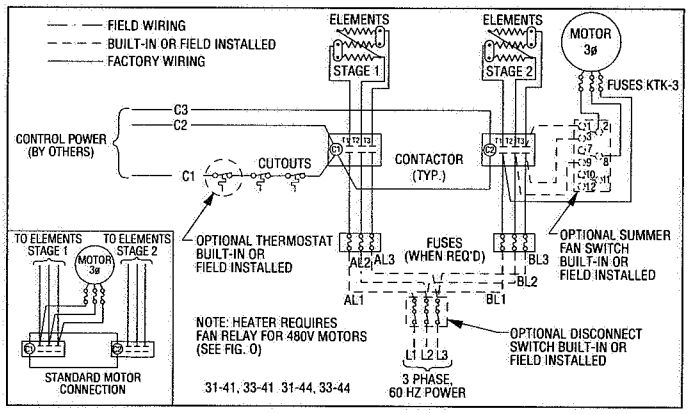


Figure N

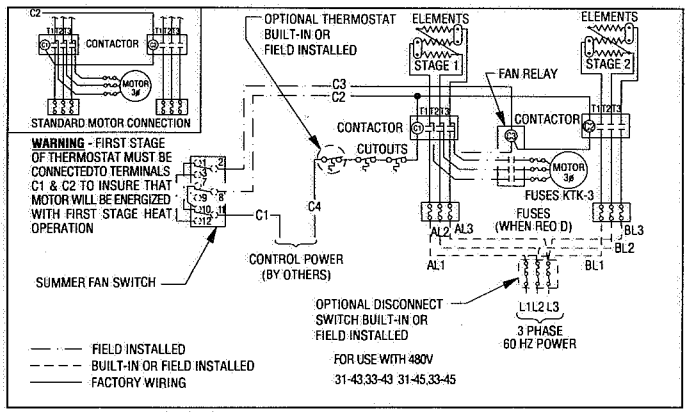


Figure O

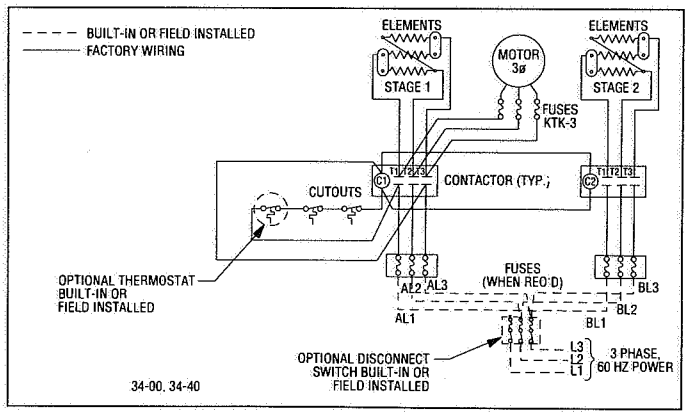


Figure P

082

RENEWAL PARTS

MANUFACTURER PART
FOR MADE TO
(LOCATED ON UI

L U H - D - ☐ ☐ -

Code	kW	Volts	Phase	Element Part No.	Motor Part No.	Fan Part No.
02-81	2.67	208	1	118-303160-001 (2)	193-302912-001	112-302997-001
02-21	2.67	208/240	1	118-303160-002 (2)	193-302912-001	112-302997-001
02-71	2.67	277	1	118-303160-003 (2)	193-302120-001	112-130367-001
04-81	4	208	1	118-303160-001 (3)	193-302912-001	112-302997-001
04-83	4	208	3	118-303160-001 (3)	193-302912-001	112-302997-001
04-21	3/4	208/240	1	118-303160-002 (3)	193-302912-001	112-302997-001
04-23	3/4	208/240	3	118-303160-002 (3)	193-302912-001	112-302997-001
04-71	4	277	1	118-303160-003 (3)	193-302120-001	112-130367-001
04-43	4	480	3	118-303160-004 (3)	193-302912-003	112-302997-001
05-81	5	208	1	118-303160-005 (3)	193-302912-001	112-302997-001
05-83	5	208	3	118-303160-005 (3)	193-302912-001	112-302997-001
05-21	3.75/5	208/240	1	118-303160-006 (3)	193-302912-001	112-302997-001
05-23	3.75/5	208/240	3	118-303160-006 (3)	193-302912-001	112-302997-001
05-71	5	277	1	118-303160-007 (3)	193-302120-001	112-130367-001
05-43	5	480	3	118-303160-008 (3)	193-302912-003	112-302997-001
07-81	7.5	208	1	118-303170-005 (3)	193-302912-004	112-130367-007
07-83	7.5	208	3	118-303170-005 (3)	193-302912-004	112-130367-007
07-21	5.6/7.5	208/240	1	118-303170-001 (3)	193-302912-004	112-130367-007
07-23	5.6/7.5	208/240	3	118-303170-001 (3)	193-302912-004	112-130367-007
07-71	7.5	277	1	118-303170-006 (3)	193-302120-004	112-130367-007
07-43	7.5	480	3	118-303170-004 (3)	193-302912-004	112-130367-007
10-81	10	208	1	118-303169-001 (3)	193-302912-005	112-130367-002
10-83	10	208	3	118-303169-001 (3)	193-302912-004	112-130367-002
10-21	7.5/10	208/240	1	118-303169-002 (3)	193-302912-004	112-130367-002
10-23	7.5/10	208/240	3	118-303169-002 (3)	193-302912-004	112-130367-002
10-43	10	480	3	118-303169-003 (3)	193-302912-005	112-130367-002
12-83	12.5	208	3	118-303169-004 (3)	193-302912-004	112-130367-002
12-23	9.4/12.5	208/240	3	118-303169-005 (3)	193-302912-004	112-130367-002
12-43	12.5	480	3	118-303169-006 (3)	193-302912-005	112-130367-002
15-83	15	208	3	118-303169-007 (3)	193-302912-004	112-130367-002
15-23	11.2/15	208/240	3	118-303169-008 (3)	193-302912-004	112-130367-002
15-43	15	480	3	118-303169-009 (3)	193-302912-005	112-130367-002
20-23	15/20	208/240	3	118-130419-010 (3)	193-302120-005	112-130367-003
20-43	20	480	3	118-130419-011 (3)	193-302120-005	112-130367-003
25-43	25	480	3	118-130419-012 (3)	193-302120-005	112-130367-003
30-83	30	208	3	118-130384-013 (6)	193-302120-005	112-130367-004
30-23	22.5 30	208 240	3	118-130384-014 (6)	193-302120-005	112-130367-004
30-43	30	480	3	118-130384-015 (6)	193-302120-005	112-130367-004
35-23	26.2/35	208 240	3	118-130384-021 (6)	193-302120-005	112-130367-004
35-43	35	480	3	118-130384-016 (6)	193-302120-005	112-130367-004
40-23	30/40	208 240	3	118-130384-022 (6)	193-302120-005	112-130367-004
40-43	40	480	3	118-130384-017 (6)	193-302120-005	112-130367-004
45-43	45	480	3	118-130384-018 (6)	193-302120-005	112-130367-004

Description	Part Number 2-5kW	7.5-15kW	20-25kW	30-45kW
Louver	182-130329-001 (4)	182-130329-002 (5)	182-130329-003 (6)	182-130329-003 (6)
Louver spring	276-130368-001 (4)	276-130368-001 (5)	276-130368-001 (6)	276-130368-001 (6)
Cut-Out	300-049200-001	300-049200-001	300-049200-001	300-049200-001
Case Front	043-130336-014	043-130335-011	043-130334-008	043-130334-008
Case Back	043-130379-028	043-130379-031	043-130379-033	043-130379-033
Case Wrapper W/O Fuse Door	043-130314-005	043-130315-004	043-130316-004	043-130317-004
Case Wrapper With Fuse Door	043-130314-006	043-130315-005	043-130316-005	043-130317-005

Power Fuses (Used when heater exceeds 48 amps)

Code	Description	Part No.
45-53	Fuse Block 600	129-025643-001 (2)
30-83 30-23 35-23 40-23	Fuse Block 250	129-048473-001
30-83 35-23 40-23	Fuse	128-026510-007 (6)
30-23	Fuse	128-026510-006 (6)
45-43	Fuse	128-026510-001 (6)

For Contactor Rating, refer to Specification Table shown on page 1.

Code	Description	Heater Line Volts	Part No.	Wiring Figure
00-40	Thermostat DP	All	300-049197-004	
30-00	Contactor (24 V) 30A	All	072-303180-001	
	Contactor (24 V) 50A	All	072-303180-002	A, J, S
	Transformer	All	315-303571-002	
30-40	Contactor (24 V) 30A	All	072-303180-001	
	Contactor (24 V) 50A	All	072-303180-002	A, J
	Transformer	All	315-303571-002	
	Thermostat SP	All	300-049197-003	
30-41	Contactor (24V) 30A	All	072-303180-001	
	Contactor (24V) 50A	All	072-303180-002	
	Transformer	All	315-303571-002	B, C, K
	Thermostat SP	All	300-049197-003	
	Fan Switch 3PDT	All	292-057673-001	
30-42	Contactor (24V) 30A	All	072-303180-001	
	Contactor(24V) 50A	All	072-303180-002	B, K, T
	Transformer	All	315-303571-002	
	Remote Fan Switch 3PDT	All	292-057673-001	
30-43	Contactor (24V) 30A	All	072-303180-001	
	Contactor (24V) 50A	All	072-303180-002	
	Transformer	All	315-303571-002	C, L
	Fan Relay	2.6-5kW	072-303180-011	
	Fan Relay	7.5-45kW	072-303180-001	
	Remote Fan Switch 3PDT	All	292-057673-001	
30-44	Contactor (24V) 30A	All	072-303180-001	
	Contactor (24V) 50A	All	072-303180-002	
	Transformer	All	315-303571-002	B, K
	Remote Fan Switch 3PDT	All	292-057673-001	
	Thermostat SP	All	300-049197-003	
30-45	Contactor (24V) 30A	All	072-303180-001	
	Contactor (24V) 50A	All	072-303180-002	
	Transformer	All	315-303571-002	C, L
	Remote Fan Switch 3PDT	All	292-057673-001	
	Fan Relay	2.6-5kW	072-303180-011	
	Fan Relay	7.5-45kW	072-303180-001	
	Thermostat SP	All	300-049197-003	
31-00	Contactor (24V) 30A	All	072-303180-001	D, M, U
	Contactor (24V) 50A	All	072-303180-002	
31-40	Contactor (24V) 30A	All	072-303180-001	
	Contactor (24V) 50A	All	072-303180-002	D, M
	Thermostat SP	All	300-049197-003	
31-41	Contactor (24V) 30A	All	072-303180-001	
	Contactor (24V) 50A	All	072-303180-002	E, N
	Thermostat SP	All	300-049197-003	
	Fan Switch 3PDT	All	292-057673-001	
31-42	Contactor (24V) 30A	All	072-303180-001	
	Contactor (24V) 50A	All	072-303180-002	E, N, V
	Remote Fan Switch 3PDT	All	292-057673-001	
31-43	Contactor (24V) 30A	All	072-303180-001	
	Contactor (24V) 50A	All	072-303180-002	F, O, R
	Fan Relay	2.6-5kW	072-303180-011	
	Fan Relay	7.5-45kW	072-303180-001	
	Remote Fan Switch 3PDT	All	292-057673-001	
31-44	Contactor (24V) 30A	All	072-303180-001	
	Contactor (24V) 50A	All	072-303180-002	E, N
	Remote Fan Switch 3PDT	All	292-057673-001	
	Thermostat SP	All	300-049197-003	
31-45	Contactor (24V) 30A	All	072-303180-001	
	Contactor (24V) 50A	All	072-303180-002	
	Fan Relay	All	072-303180-001	F, O, R, W
	Fan Relay	7.5-45kW	072-303180-011	
	Remote Fan Switch 3PDT	All	292-057673-001	
	Thermostat SP	All	300-049197-003	
32-00	Contactor (120) 30A	All	072-303180-007	
	Contactor (120) 50A	All	072-303180-008	A, J, S
	Transformer	All	315-303571-001	
32-40	Contactor (120) 30A	All	072-303180-007	
	Contactor (120) 50A	All	072-303180-008	A, J
	Transformer	All	315-303571-001	
	Thermostat SP	All	300-049197-003	
32-41	Contactor (120) 30A	All	072-303180-007	
	Contactor (120) 50A	All	072-303180-008	
	Transformer	All	315-303571-003	B, C, K
	Thermostat SP	All	300-049197-003	
	Fan Switch 3PDT	All	292-057673-001	
32-42	Contactor (120) 30A	All	072-303180-007	
	Contactor (120) 50A	All	072-303180-008	B, K, T
	Transformer	All	315-303571-001	
	Remote Fan Switch 3PDT	All	292-057673-001	
32-43	Contactor (120) 30A	All	072-303180-007	
	Contactor (120) 50A	All	072-303180-008	
	Transformer	All	315-303571-001	C, L
	Fan Relay	2.6-5kW	072-303180-011	
	Fan Relay	7.5-45kW	072-303180-001	
	Remote Fan Switch 3PDT	All	292-057673-001	
	Contactor (120) 30A	All	072-303180-007	
	Contactor (120) 50A	All	072-303180-008	
	Transformer	All	315-303571-001	B, K
	Remote Fan Switch	All	292-057673-001	

DENTIFICATION

UMBER BREAKDOWN
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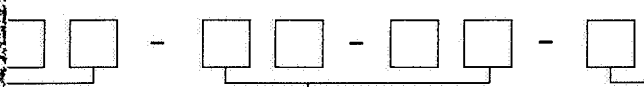


Code	Description	Heater Line Volts	Part No.	Wiring Figure
32-45	Contactor (120) 30A	All	072-303180-007	
	Contactor (120) 50A	All	072-303180-008	
	Transformer	All	315-303571-001	C, L
	Fan Relay	2.6-5kW	072-303180-011	
	Fan Relay	7.5-45kW	072-303180-007	
	Remote Fan Switch 3PDT	All	292-057673-001	
	Thermostat SP	All	300-049197-003	
33-00	Contactor (120) 30A	All	072-303180-007	D, M, U
	Contactor (120) 50A	All	072-303180-008	
33-40	Contactor (120) 30A	All	072-303180-007	
	Contactor (120) 50A	All	072-303180-008	D, M
	Thermostat SP	All	300-049197-003	
33-41	Contactor (120) 30A	All	072-303180-007	
	Contactor (120) 50A	All	072-303180-008	E, N
	Fan Switch 3PDT	All	292-057673-001	
	Thermostat SP	All	300-049197-003	
33-42	Contactor (120) 30A	All	072-303180-007	
	Contactor (120) 50A	All	072-303180-007	E, N, V
	Remote Fan Switch 3PDT	All	292-057673-001	
33-43	Contactor (120) 30A	All	072-303180-007	
	Contactor (120) 50A	All	072-303180-008	F, D, R
	Fan Relay	2.6-5kW	072-303180-011	
	Fan Relay (120V)	7.5-45kW	072-303180-007	
	Remote Fan Switch 3PDT	All	292-057673-001	
33-44	Contactor (120) 30A	All	072-303180-007	
	Contactor (120) 50A	All	072-303180-007	E, N
	Remote Fan Switch 3PDT	All	292-057673-001	
	Thermostat SP	All	300-049197-003	
33-45	Contactor (120) 30A	All	072-303180-007	
	Contactor (120) 50A	All	072-303180-008	
	Fan Relay	2.6-5kW	072-303180-011	
	Fan Relay	7.5-45kW	072-303180-007	F, O, R, W
	Remote Fan Switch 3PDT	All	292-057673-001	
	Thermostat SP	All	300-049197-003	
34-00	Contactor (208/240) 30A	208/240	072-303180-013	G, P
	Contactor (208/240) 50A	208/240	072-303180-014	
34-40	Contactor (208/240) 30A	208/240	072-303180-013	
	Contactor (208/240) 50A	208/240	072-303180-014	G, P
	Thermostat SP	208/240	300-049197-003	
34-41	Contactor (208/240) 30A	208/240	072-303180-013	
	Contactor (208/240) 50A	208/240	072-303180-014	H, Q
	Fan Switch 3PDT	208/240	292-057673-001	
	Thermostat SP	208/240	300-049197-003	
34-42	Contactor (208/240) 30A	208/240	072-303180-013	
	Contactor (208/240) 50A	208/240	072-303180-014	H, Q
	Remote Fan Switch 3PDT	208/240	292-057673-001	
34-43	Contactor (208/240) 30A	208/240	072-303180-013	
	Contactor (208/240) 50A	208/240	072-303180-014	I
	Fan Relay	208/240	072-303180-013	
	Remote Fan Switch 3PDT	208/240	292-057673-001	
34-44	Contactor (208/240) 30A	208/240	072-303180-013	
	Contactor (208/240) 50A	208/240	072-303180-014	H, Q
	Remote Fan Switch 3PDT	208/240	292-057673-001	
	Thermostat SP	208/240	300-049197-003	
34-45	Contactor (208/240) 30A	208/240	072-303180-013	
	Contactor (208/240) 50A	208/240	072-303180-014	
	Fan Relay	208/240	072-303180-013	I
	Remote Fan Switch 3PDT	208/240	292-057673-001	
	Thermostat SP	208/240	300-049197-003	
35-00	Contactor (277) 30A	277	072-303180-019	G
	Contactor (277) 50A	277	072-303180-020	
35-40	Contactor (277) 30A	277	072-303180-019	
	Contactor (277) 50A	277	072-303180-020	G
	Thermostat SP	277	300-049197-003	
35-41	Contactor (277) 30A	277	072-303180-019	
	Contactor (277) 50A	277	072-303180-020	H
	Fan Switch 3PDT	277	292-057673-001	
	Thermostat SP	277	300-049197-003	
35-42	Contactor (277) 30A	277	072-303180-019	
	Contactor (277) 50A	277	072-303180-020	H
	Remote Fan Switch 3PDT	277	292-057673-001	
35-43	Contactor (277) 30A	277	072-303180-019	
	Contactor (277) 50A	277	072-303180-020	I
	Fan Relay	277	072-303180-019	
	Remote Fan Switch 3PDT	277	292-057673-001	
35-44	Contactor (277) 30A	277	072-303180-019	
	Contactor (277) 50A	277	072-303180-020	H
	Remote Fan Switch 3PDT	277	292-057673-001	
	Thermostat SP	277	300-049197-003	
35-45	Contactor (277) 30A	277	072-303180-019	
	Contactor (277) 50A	277	072-303180-020	
	Fan Relay	277	072-303180-019	I
	Remote Fan Switch 3PDT	277	292-057673-001	
	Thermostat SP	277	300-049197-003	

Note: Number in parentheses () in the Part Number Column indicates the quantity of that part required.

Code	Disconnect Rating	Disconnect Part No.
1	40A	292-303472-001
2	80A	292-303472-002
3	100A	292-303472-003

Miscellaneous Parts	
Thermostat Knob	169-049278-001
Mod. Decal Card	170-303678-001

Instruction Sheets	
1. Internal Thermostat	PF-448
2. Internal/External Summer Fan Switch	PF-480
3. Internal/External Summer Fan Switch with Relay	PF-481
4. Disconnect Switch	PF-482

WIRING DIAGRAMS

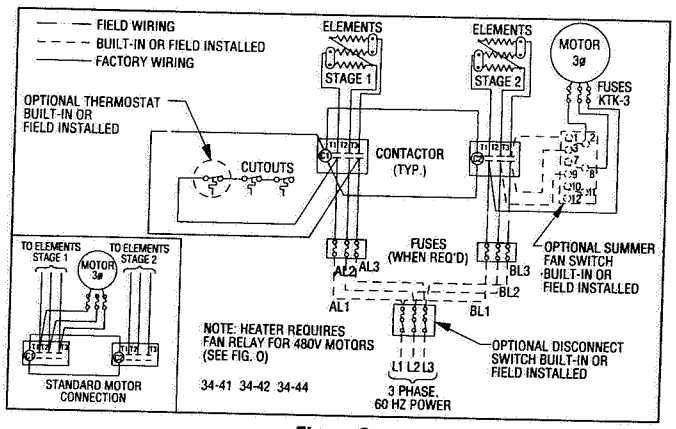


Figure Q

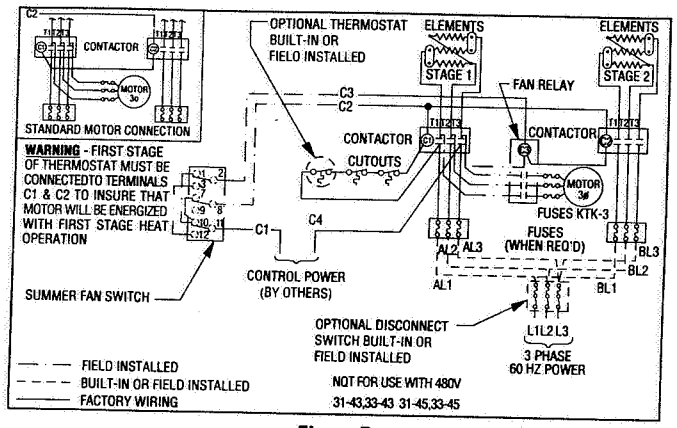
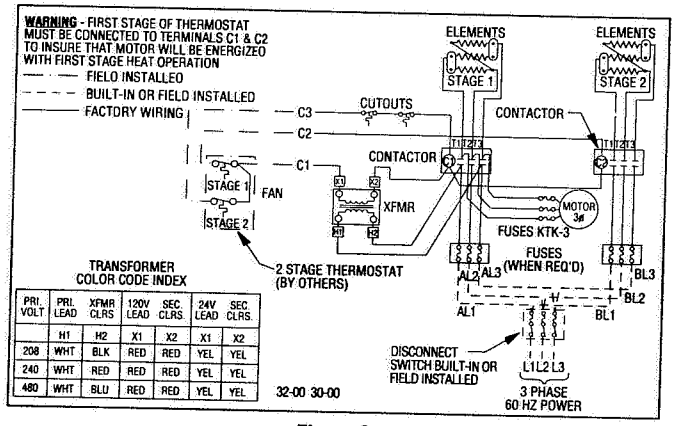
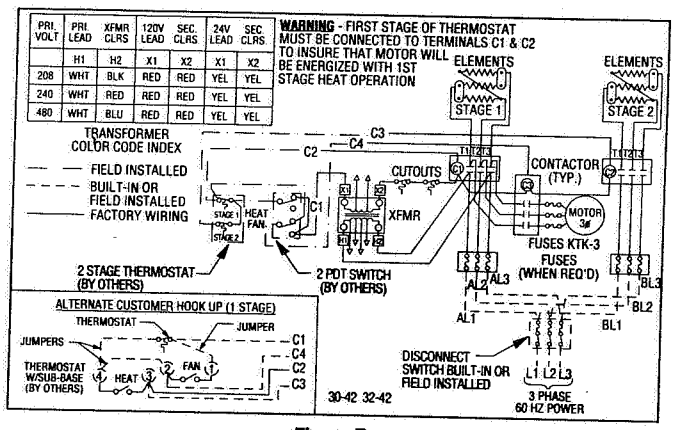


Figure R



PRI. VOLT	PRI. LEAD	XFMR CLRS	120V LEAD	SEC. CLRS.	24V LEAD	SEC CLRS.
	H1	H2	X1	X2	X1	X2
208	WHT	BLK	RED	RED	YEL	YEL
240	WHT	RED	RED	RED	YEL	YEL
480	WHT	BLU	RED	RED	YEL	YEL

Figure S



PRI. VOLT	PRI. LEAD	XFMR CLRS	120V LEAD	SEC. CLRS.	24V LEAD	SEC CLRS.
	H1	H2	X1	X2	X1	X2
208	WHT	BLK	RED	RED	YEL	YEL
240	WHT	RED	RED	RED	YEL	YEL
480	WHT	BLU	RED	RED	YEL	YEL

Figure T

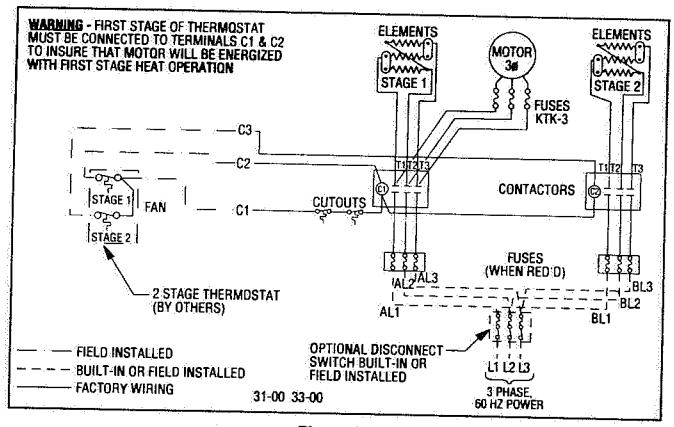


Figure U

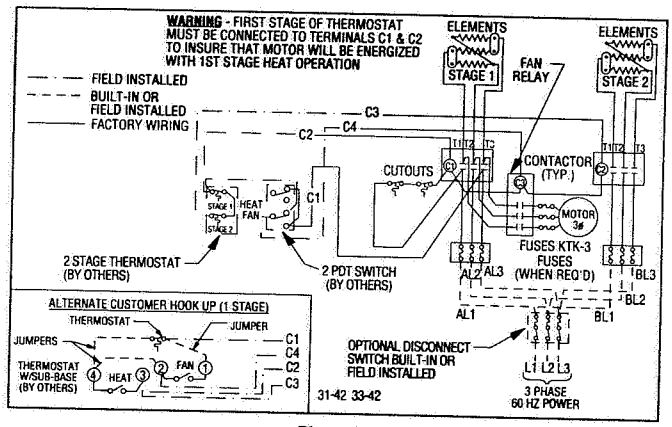


Figure V

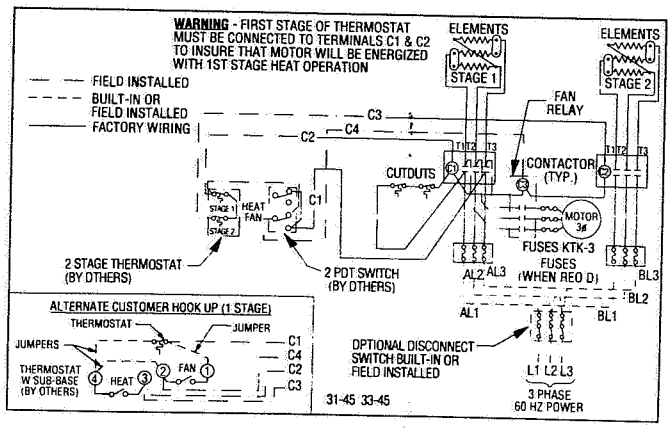
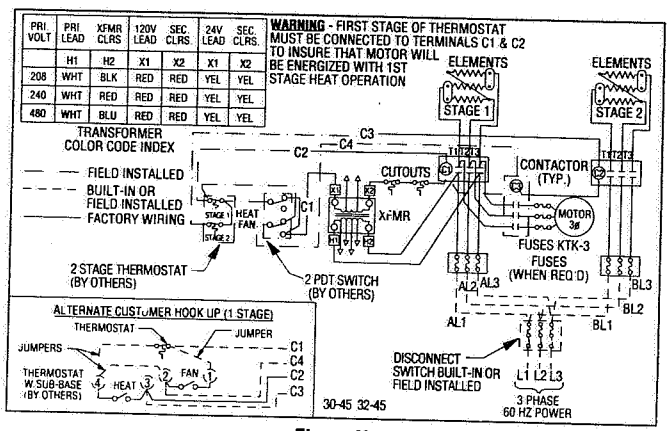


Figure W



PRI. VOLT	PRI. LEAD	XFMR CLRS	120V LEAD	SEC. CLRS.	24V LEAD	SEC. CLRS.
	H1	H2	X1	X2	X1	X2
208	WHT	BLK	RED	RED	YEL	YEL
240	WHT	RED	RED	RED	YEL	YEL
480	WHT	BLU	RED	RED	YEL	YEL

Figure X

055

WARRANTY AND LIMITATION OF REMEDY AND LIABILITY

Chromalox warrants only that the Products and parts manufactured by Chromalox, when shipped, and the work performed by Chromalox when performed, will meet all applicable specification and other specific product and work requirements (including those of performance), if any, and will be free from defects in material and workmanship under normal conditions of use. All claims for defective or nonconforming (both hereinafter called defective) Products, parts or work under this warranty must be made in writing immediately upon discovery, and in any event, within one (1) year from delivery, provided, however all claims for defective Products and parts must be made in writing no later than eighteen (18) months after shipment by Chromalox. Heating elements only are warranted against defects in workmanship and materials for 5 years from date of shipment. Defective and nonconforming items must be held for Chromalox's inspections and returned to the original f.o.b. point upon request. THE FOREGOING IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES WHATSOEVER, EXPRESS, IMPLIED AND STATUTORY, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Notwithstanding the provisions of this WARRANTY AND LIMITATION Clause, it is specifically understood that Products and parts not manufactured and work not performed by Chromalox are warranted only to the extent and in the manner that the same are warranted to Chromalox by Chromalox's vendors, and then only to the extent that Chromalox is reasonably able to enforce such warranty, it being understood Chromalox shall have no obligation to initiate litigation unless Buyer undertakes to pay all cost and expenses therefor, including but not limited to attorney's fees, and indemnifies Chromalox against any liability to Chromalox's vendors arising out of such litigation.

Upon Buyer's submission of a claim as provided above and its substantiation, Chromalox shall at its option either (i) repair or replace its Products, parts or work at the original f.o.b. point of delivery or (ii) refund an equitable portion of the purchase price.

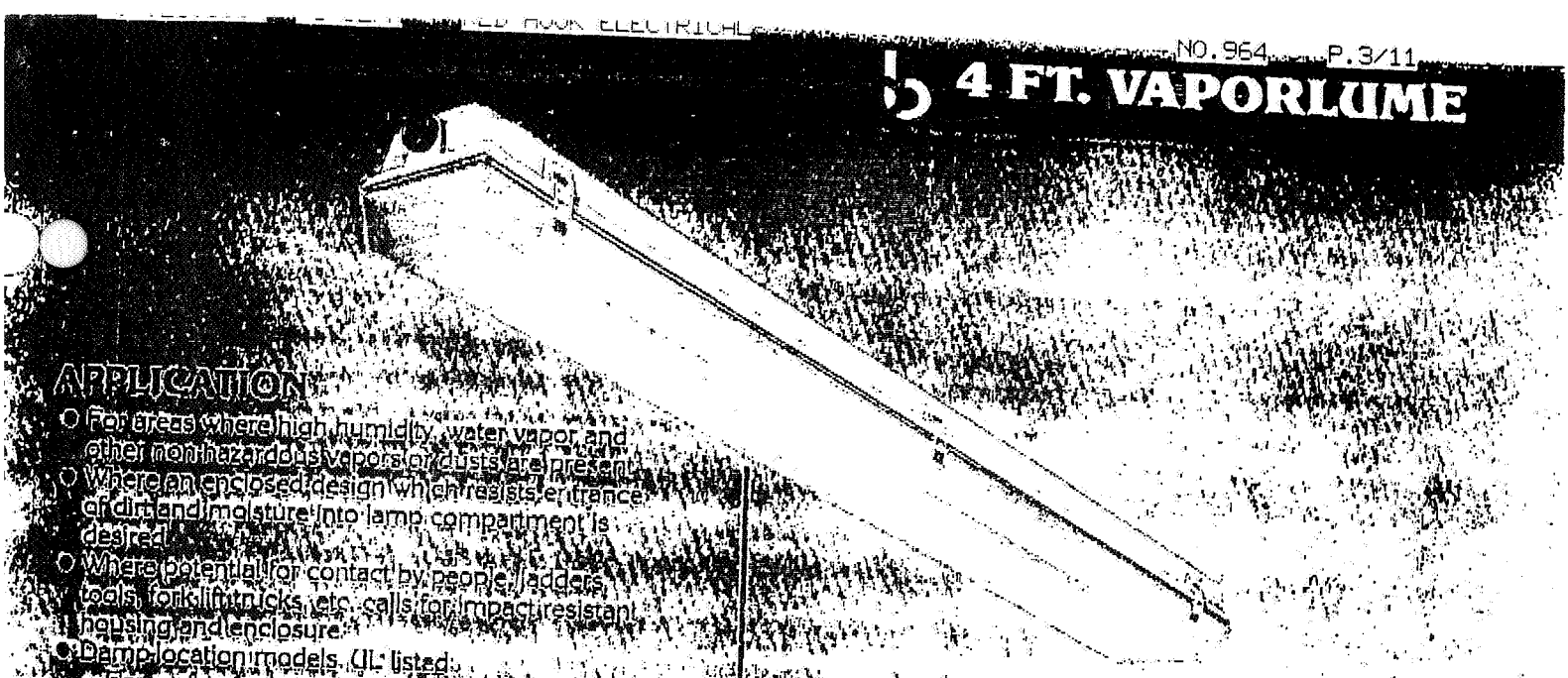
THE FOREGOING IS CHROMALOX'S ONLY OBLIGATION AND BUYER'S EXCLUSIVE REMEDY FOR BREACH OF WARRANTY, AND IS BUYER'S EXCLUSIVE REMEDY AGAINST CHROMALOX FOR ALL CLAIMS ARISING HEREUNDER OR RELATING HERETO WHETHER SUCH CLAIMS ARE BASED ON BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORIES. BUYER'S FAILURE TO SUBMIT A CLAIM AS PROVIDED ABOVE SHALL SPECIFICALLY WAIVE ALL CLAIMS FOR DAMAGES OR OTHER RELIEF, INCLUDING BUT NOT LIMITED TO CLAIMS BASED ON LATENT DEFECTS. IN NO EVENT SHALL BUYER BE ENTITLED TO INCIDENTAL OR CONSEQUENTIAL DAMAGES AND BUYER SHALL HOLD CHROMALOX HARMLESS THEREFROM. ANY ACTION BY BUYER ARISING HEREUNDER OR RELATING HERETO, WHETHER BASED ON BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHER THEORIES, MUST BE COMMENCED WITHIN ONE (1) YEAR AFTER THE DATE OF SHIPMENT OR IT SHALL BE BARRED.

W2008N

Chromalox®
PRODUCT SERVICE
2150 N. RULON WHITE BLVD., OGDEN, UT 84404
Phone: 1-800-368-2493

WIEGAND INDUSTRIAL DIVISION
EMERSON ELECTRIC CO.
EMERSON®

4 FT. VAPORLUME



APPLICATION

- For areas where high humidity, water vapor and other non hazardous vapors or dusts are present
- Where an enclosed design which resists entrance of dirt and moisture into lamp compartment is desired
- Where potential for contact by people, ladders, tools, fork lift trucks, etc. calls for impact resistant housing and enclosure
- Damp location models, UL listed
  - For surface or suspension mounting
  - As individual units or in continuous rows
  - For interior applications protected from weather but subjected to moderate degrees of moisture
  - For partially protected locations, such as under canopies, marquees or roofed open spaces
- Wet location models, UL listed
  - For surface or suspension mounting as individual units
  - For essentially horizontal applications where greater amounts of moisture are present
  - Not intended for unprotected exterior applications

CONSTRUCTION & FINISH

- One piece, injection molded, high impact thermoplastic body. No rusting, no oxidation, no corrosion
- Internal steel wiring compartment
- Electrical components mounted to removable steel wireway cover. Service chains support wireway cover to simplify installation and servicing
- Fixtures are washable, non conductive and non corroding
- Internal steel wiring compartment treated with five stage zinc phosphate metal preparation and finished with baked white polyester powder coating

ELECTRICAL

- Class P, HPF, CBM certified ballasts standard. Energy Saving and low temperature ballasts also available. High temperature ballast available for +130° F. ambients
- Self contained fluorescent Emergency Power Pack (DEB-7) can be incorporated
- Damp location models have removable knock outs top and ends. Gasket washers furnished to seal K.O.'s
- Wet location models have threaded seal fittings at top and ends for electrical feed and for mounting

ENCLOSURE

- Formed from Vangard high impact acrylic sheet of 0.100 inch nominal thickness
- Continuous compressible neoprene gasket provides tight seal between plastic enclosure and fixture body
- Tabs align enclosure for quick and accurate positioning in fixture body
- Enclosure secured to body by six captive hi-w molded plastic latches. Easy to open or close without tools
- Smooth outside surface makes enclosures easy to clean

CATALOG NUMBERS

FIXTURES				DESCRIPTION		
Damp Location	Wet Location	Damp Location	Wet Location	Rows of Lamps	Lamp Type	Nominal Length (Ft.)
100° F. Ambient Model		130° F. Ambient Model				
R41141	WR41141	9-R41141	9-WR41141	1	F40 R.S.	4
R41241	WR41241	9-R41241	9-WR41241	2	F40 R.S.	4

To order above:
With DEB-7 Self-Contained Fluorescent Emergency Power Pack, Prefix Catalog No. with E. Example: ER41141

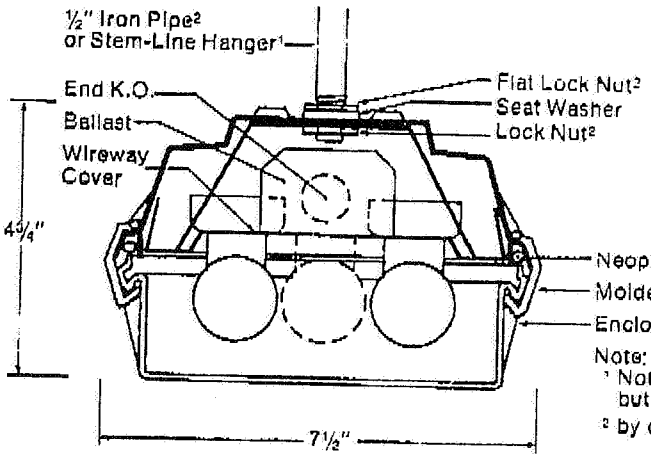
ACCESSORIES: See Catalog Section 55, Page 23 for Vaporlume Mounting Hardware

DAY-BRITE

4 FT. VAPORLUME

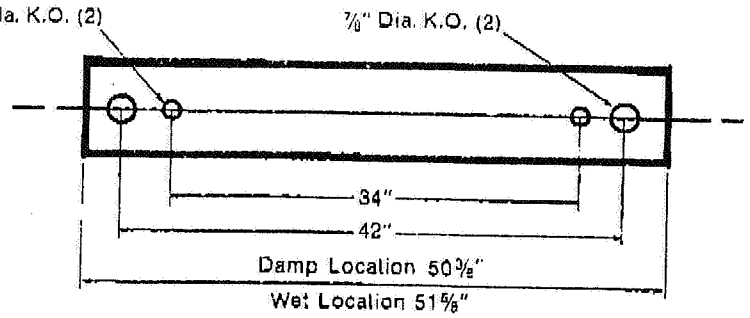
DIMENSIONS

End view with damp location fittings



Note:
¹ Not furnished with fixture, but available from Day-Brite.
² by others

4 FT. VAPORLUME (ALL TYPES)



PHOTOMETRIC DATA

Coefficient of Utilization-Zonal Cavity Method

1-Lamp							2-Lamp						
pfc	20						pfc	20					
pcc	70		50		30		pcc	70		50		10	
pw	30	10	30	10	30	10	pw	30	10	30	10	30	10
RCR							RCR						
0	68	65	63	61	55	54	1	67	64	62	60	55	54
2	56	51	52	48	46	43	2	55	51	52	49	47	44
3	47	42	45	40	39	36	3	47	43	45	41	40	37
4	41	35	38	34	34	31	4	41	36	39	35	35	32
5	35	30	33	28	29	26	5	35	30	33	29	30	27
6	30	26	29	24	26	22	6	31	26	29	25	27	23
7	27	22	25	21	23	19	7	27	23	26	22	24	20
8	24	19	22	18	20	17	8	24	20	23	19	21	18
9	21	17	20	16	18	15	9	21	17	20	16	18	15
10	19	15	18	14	16	13	10	19	15	18	15	16	14

Test #8480-1 S/M-F-1-96 Test #8405-1 S/M-F-1-96

Candlepower Distribution Curve

1-Lamp				2-Lamp		
End	45°	Cross	Angle	End	45°	Cross
560	560	560	5	1200	1200	1200
530	540	555	15	1155	1170	1192
465	500	525	25	1020	1060	1120
395	445	490	35	850	935	1020
325	390	445	45	690	810	930
250	340	410	55	520	680	830
170	285	395	65	345	540	715
100	240	385	75	185	390	585
40	180	320	85	60	290	435
22	130	220	95	50	190	345
20	80	135	105	22	141	275
19	50	80	115	20	90	188
15	35	50	125	16	45	105
0	20	35	135	15	22	52
0	18	20	145	15	15	25
0	10	10	155	12	10	12
0	0	0	165	0	0	0
0	0	0	175	0	0	0

Average Brightness (Footlamberts) with 3100 Lumen Lamps

1-Lamp			2-Lamp	
End	Cross	Angle	End	Cross
656	707	45	1781	1892
614	726	55	1620	1860
551	819	65	1410	1892
499	998	75	1149	1930
464	1154	85	829	1987

Maintained Illumination Table - Square Feet/Fixture

- 50-50-20 reflectances (ceiling-wall-floor)
- LLF = 0.68 3150 lumens/lamp medium dirt
- Room width divided by room height = 3 or more, 2 or 1

Fixture Size & # of Lamps	Room Width / Room Height	Approx. Area (sq. ft.) per Fixture				
		10 ft-c	30 ft-c	50 ft-c	70 ft-c	100 ft-c
7½" x 50⅜" 1-Lamp	5	141	47	29	20	—
	2	94	31	19	—	—
	1	66	22	—	—	—
7½" x 50⅜" 2-Lamp	5	278	93	56	40	28
	2	189	63	38	27	19
	1	133	44	27	19	—

Light Loss Factor Data

LLF = 0.68
LLF = Light Loss Factor
LDD = Luminaire Dirt Depreciation IES Category V Clean Annually
[illegible] = Lamp Lumen Depreciation
Ballast Factor (commercial ballast performance relative to reference ballast)

Light Loss Factor (LLF)
= LDD×LLD×BF
LDD = Clean 0.88 Medium 0.82 Dirty 0.77
LLD = 0.88 @ 40% Rated Lamp Life
BF = 0.94 (Std. Ballasts & Lamps)
Relamp @ 70% Lamp Life

DAY-BRITE
Day-Brite Lighting Division
Emerson Electric Co.
Tupelo, Mississippi 38801
Phone: (601) 842-7212

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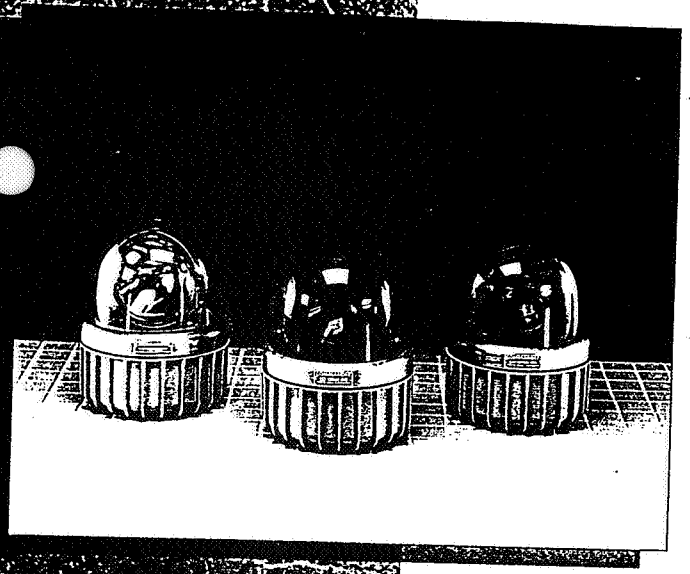


Federal Signal Commander® Rotating Warning Light

Model 371/371L

Heavy duty warning lights

- Available in 125VDC and 120VAC
- Three available dome colors
- 2,000 hour, sealed beam lamp
- Surface mount or 1-inch pipe mount
- 120VAC models are UL-Listed and CSA-Approved
- NEMA Type 3R enclosure; constructed to IP56

Federal Signal's models 371/371L incandescent warning lights have powerful rotating sealed-beam lamps. Their beam angles are adjustable through 90 degrees from horizontal to vertical. The model 371 features a high temperture-resistant glass dome and 200-watt sealed beam. The model 371L features a polycarbonate dome and 100-watt sealed beam.

Models 371/371L have aluminum die-cast housings with 24 cooling fins to dissipate heat quickly. A single screw, stainless steel retaining band permits easy inspection and relamping. Designed for permanent mounting on one-inch pipe or flat surface mounting. An optional shock-mount kit is available for unusually severe operating conditions. A pivotable lamp yoke allows for beam adjustment through 90° from horizontal to vertical. The models 371/371L are available in three dome colors: amber, blue and red.

Recommended for areas where ambient noise is high and ear protective devices reduce the effectiveness of audible signals. Excellent for use on cranes, process-control monitoring or any situation which requires a durable and dependable warning light.

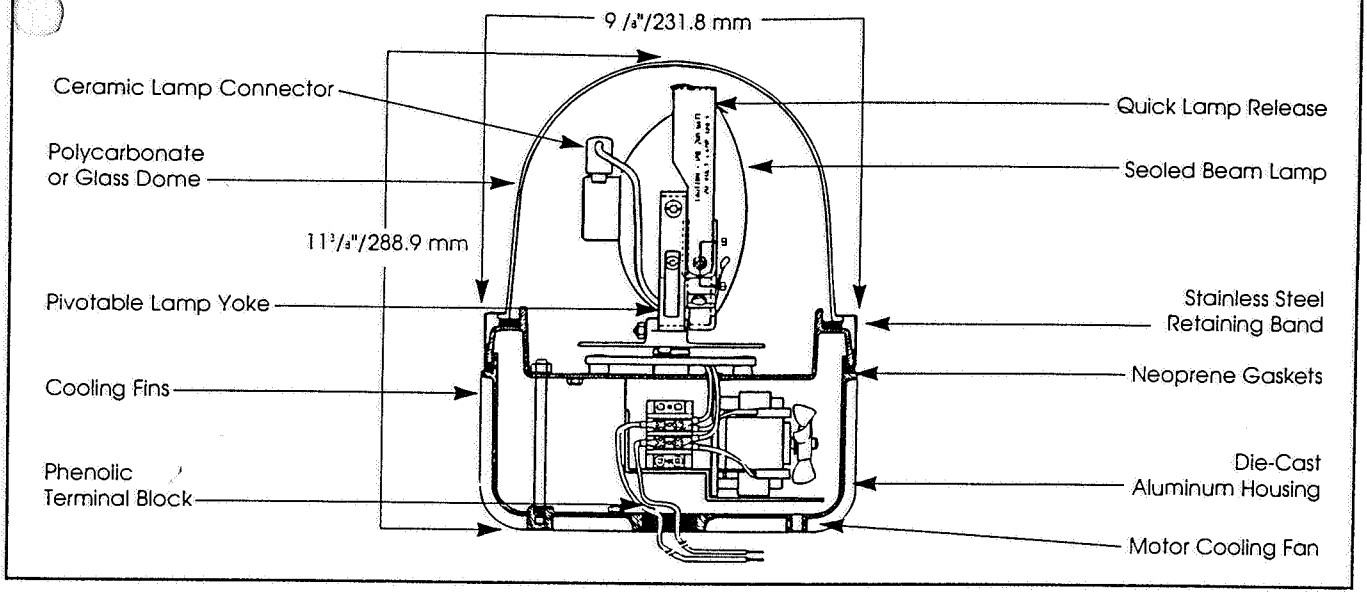
Federal Signal's Commander® Light is one of the most dependable visual signals on the market today. It's high visibility and rugged durability has made it an industry stand-by for years.

Model	Voltage	Operating Current	Flash Rate/ Minute	Candlepower	Mount
371	120VAC 50/60Hz	1.75 amps	60	36 000	1" Pipe or Surface
371	125VDC	1.60 amps	60	36 000	1" Pipe or Surface
371L	120VAC 50/60 Hz	0.80 amps	60	20 000	1" Pipe or Surface
371L	125VDC	1.60 amps	60	20 000	1" Pipe or Surface

089

FEDERAL SIGNAL CORP. 2645 Federal Signal Dr., University Park, IL 60466 (708) 534-4756 • FAX: (708) 534-4852

Commander® Rotating Lights (371 & 371L)



SPECIFICATIONS

Lamp Life*:		2,000 Hours	
Lamp Style:	371	200W Sealed Beam	
	371L-120VAC	100W Sealed Beam	
	371L-125VDC	100W Sealed Beam	
Operating Temperature:		-31°F to 150°F	-35°C to 66°C
Net Weight:	371	13 lbs.	5.9 kg
	371L	10 lbs.	4.5 kg
Ship. Weight:	371	15.2 lbs.	6.89 kg
	371L	11.9 lbs.	5.4 kg
Height:		11³/₈"	288.9 mm
Diameter:		9¹/₈"	231.8 mm

*Optimal hours under ideal conditions.

RATINGS

- 120VAC Model is UL-Listed and CSA-Approved
- NEMA Type 4X
- Constructed to IP 56

HOW TO ORDER

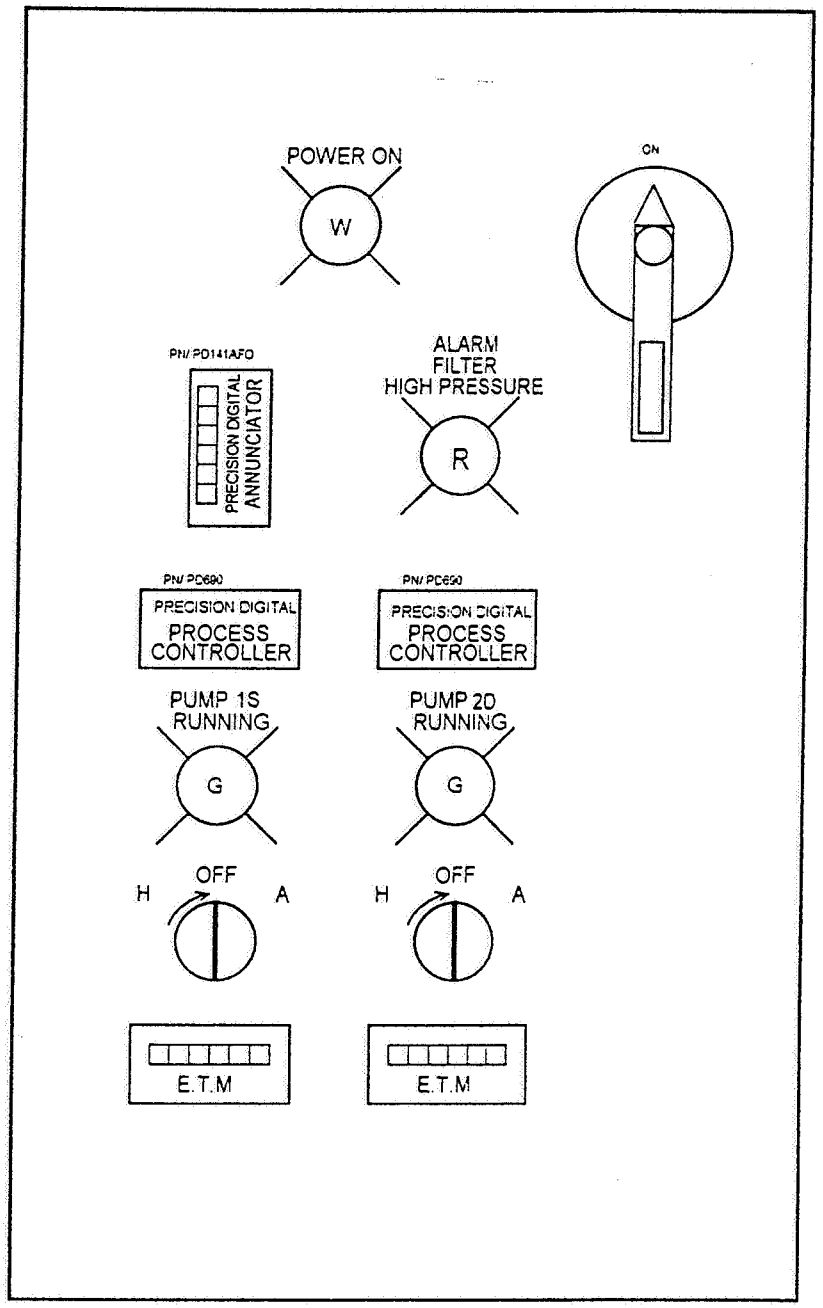
- Specify model, voltage and color
- Specify options:
  Corner Bracket (LCMB2)
  Wall Bracket (LWMB2)
  Shock Mount Kit (8459A076)

REPLACEMENT PARTS

Description	Part Number	Description	Part Number
Exterior Domes			
Amber Glass (371)	K8442C002-01	200W Lamp (371)	K8442A039
Blue Glass (371)	K8442C002-03	100W Lamp (371L)	K8107A130
Red Glass (371)	K8442C002	Shock Mount Kit (371/371L)	K8459A076B
Amber Polycarbonate (371L)	K8449C005-14	Motor Replacement Kit (371/371L)	K8459A113A
Blue Polycarbonate (371L)	K8449C005-12	Worm Gear Assembly (371/371L)	K8459A017
Clear Polycarbonate (371L)	K8449C005-15	Brush and Spring (371/371L)	K8442A028
Green Polycarbonate (371L)	K8449C005-13	Retaining Band & Gasket	K8459A114A
Red Polycarbonate (371L)	K8449C005-11		

090

:DERAL SIGNAL CORP. 2645 Federal Signal Dr., University Park, IL 60466 (708) 534-4756 • FAX: (708) 534-4852



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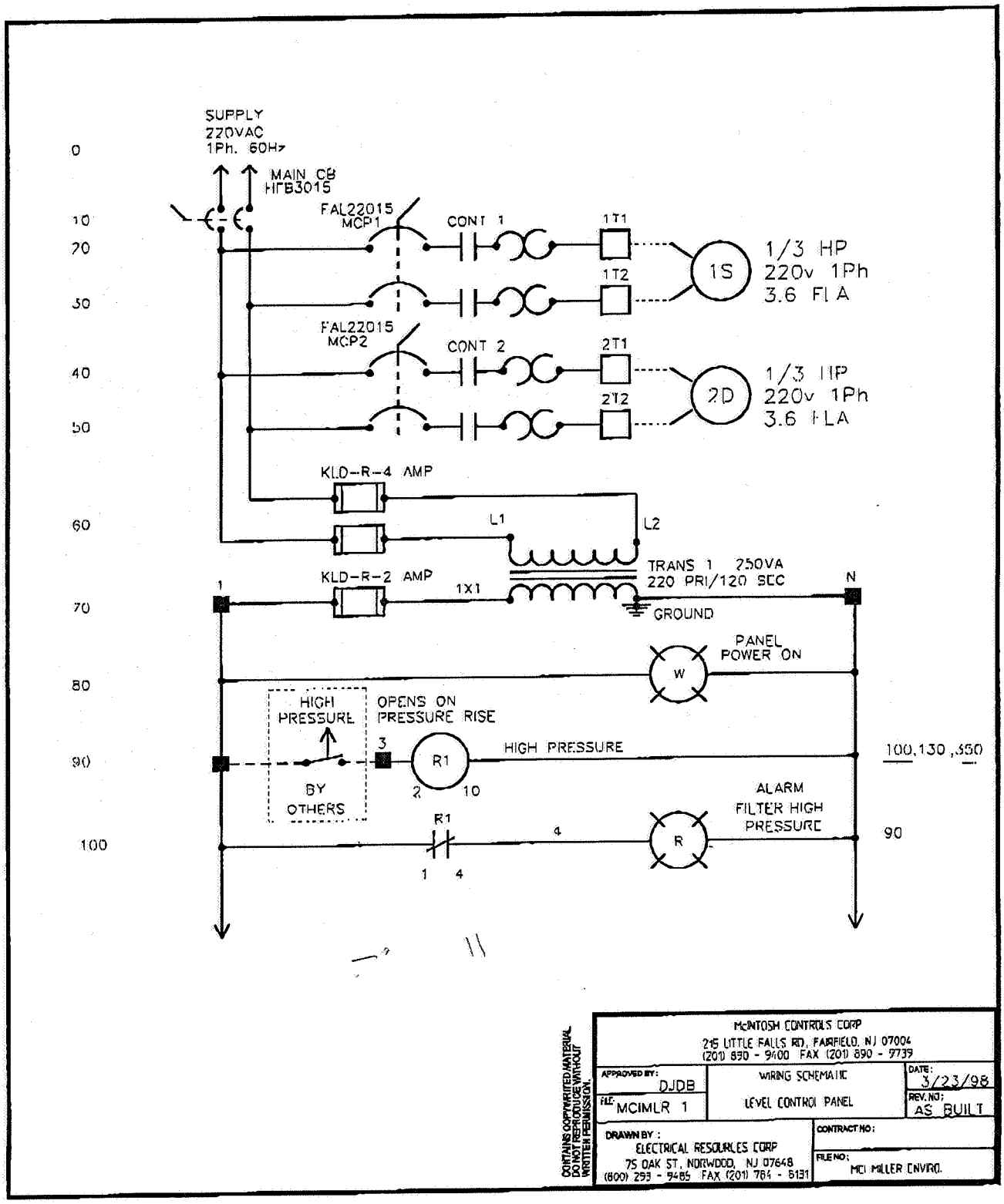
APPROVED BY: MILLER ENVIRO	PROPOSED FRONT PANEL LAYOUT	DATE: 12 10/97
		REV NO: 0
DRAWN BY:	CONTRACT NO: PENDING APPROV.	
	FILE NO: MCIMILR1 - FPL	

KEY	MANUF	PART NUMBER	DESCRIPTION	QUAN	
ENCL	HOF.	A-302010LP	NEMA 12 ENCLOSURE	1	✓
PANL	HOF.	A-30P20	BACK PANEL	1	
DISB	WEST	HFB3015	3P15A BREAKER	1	
DISM	WEST	373D958G22	DISCO MECHNSM	1	
DISS	WEST	373D4447G06	DISCO SHAFT	1	
DISH	WEST	504C323G04	DISCO HANDLE	1	
FU1,2	GOUL	ATMQ8/10AMP	PRIMARY FUSE	2	✓
FU3	GOUL	ATQ1AMP	SECONDARY FUSE	1	✓
T1	SQD	9070TF100	240/120 100VA TRANS	1	✓
CP1,2	SQT	GV2-MO8	CIRCUIT PROTECTOR	2	✓
CONT	SQT	LC1D0910G6	CONTACTOR	2	✓
AUX	SQT	LA1DN10	AUXILLIARY CONTACTS	2	
R1	IDEC	RH2BU120VAC	10A.PLUG IN RELAY	1	✓
R1	IDEC	RH2B05	RELAY SOCKET	1	
SS1,2	SQD	9001SKS63B	3POS S-RETURN SSW.	2	✓
SS1,2	SQD	9001KA1	2 N0 CONTACT BLOCK	2	
TD1,2	SSAC	TDS120L	TIME DELAY RELAY	2	
TD1,2	IDEC	SR2B06	OCTAL SOCKET	2	
S1,2	PD	PDX690-1	SURGE SUPPRESSER	2	
PC	PD	PD690-3-17	PROC.LEV.CONTROLR	2	
ANN	PD	PD141AFO	ANNUNCIATOR	1	
PL1,4	SQD	9001SKT1	PTT. LIGHT MODULES	4	
W	SQD	9001W31	WHITE LENS	1	
G	SQD	9001G31	GREEN LENS	2	
R	SQD	9001R31	RED LENS	1	
ET	SIMP	112ET	RUN TIME METER	2	

AS-BUILT

Rec'V 6-19-98
MEP



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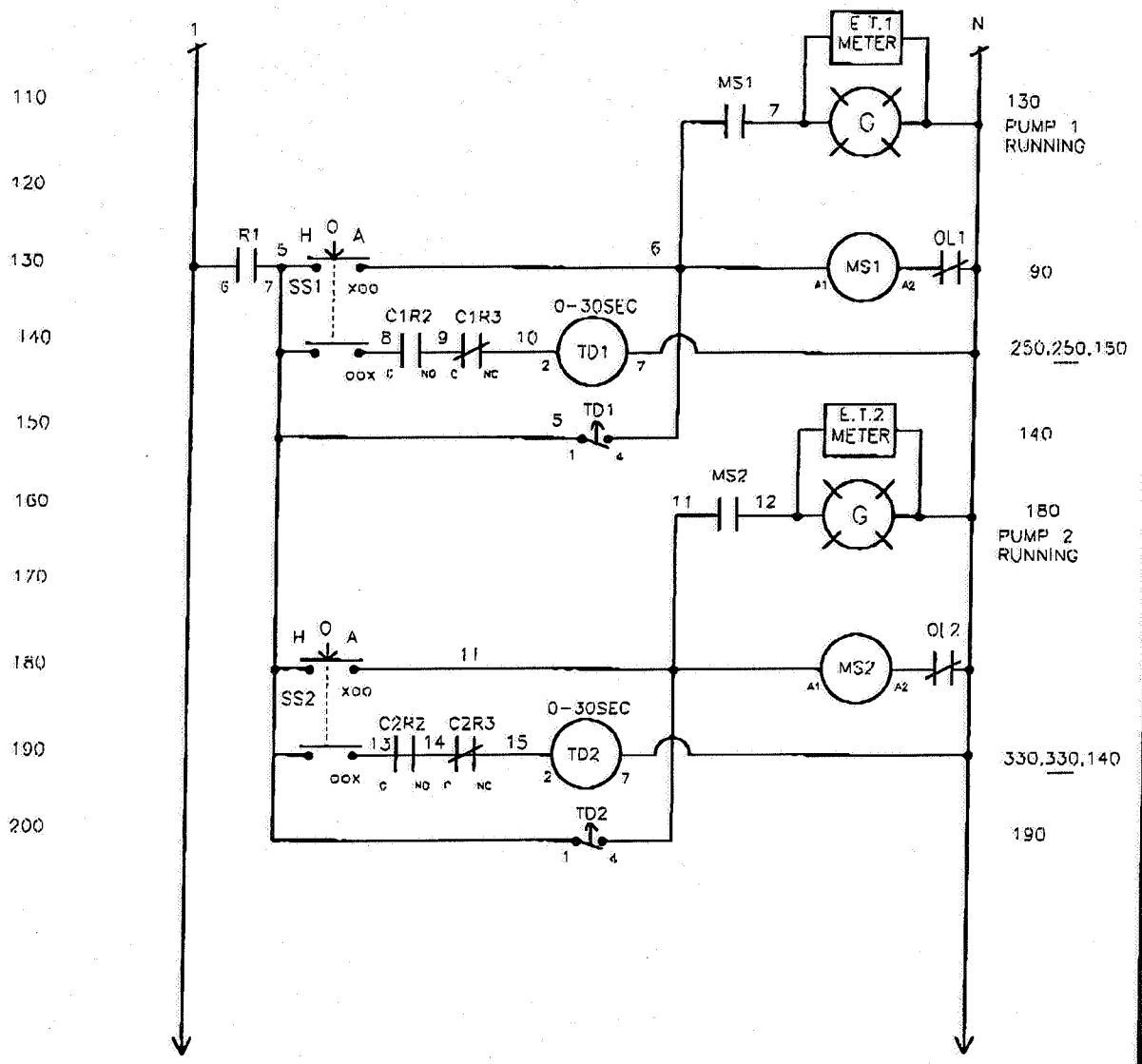
McINTOSH CONTROLS CORP
215 LITTLE FALLS RD, FAIRFIELD, NJ 07004
(201) 890 - 9400 FAX (201) 890 - 9739

APPROVED BY: DJDB	WIRING SCHEMATIC	DATE: 3/23/98
FILE: MCIMLR 1	LEVEL CONTROL PANEL	REV. NO: AS BUILT
DRAWN BY: ELECTRICAL RESOURCES CORP, 75 OAK ST, NORWOOD, NJ 07648, (800) 293 - 9485 FAX (201) 784 - 8131	CONTRACT NO:	
	FILE NO: MCI MILLER ENVIRO.	

094



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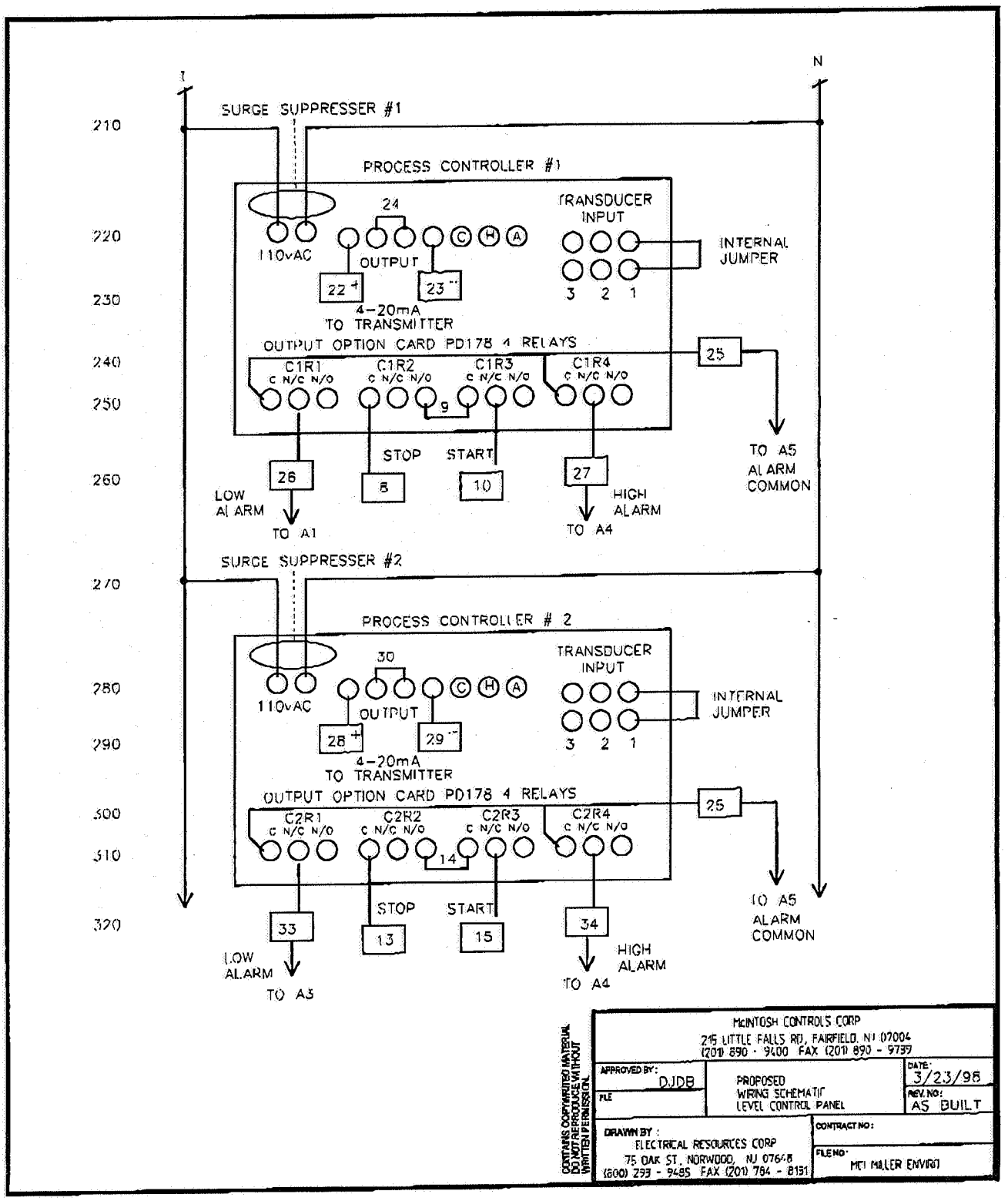
APPROVED BY: DJDB	WIRING SCHEMATIC	DATE: 3/23/98
FILE: MACMILLER 3	LEVEL CONTROL PANEL	REV. NO: AS BUILT
DRAWN BY : ELECTRICAL RESOURCES CORP 75 OAK ST, NORWOOD, NJ 07648 (800) 293 - 9485 FAX (201) 784 - 6131	CONTRACT NO:	
	FILE NO: MCI MILLER ENVRO	

095


L
N
SURGE SUPPRESSER #1
PROCESS CONTROLLER #1
24
TRANSDUCER INPUT
110vAC
OUTPUT
INTERNAL JUMPER
22 +
23 -
3 2 1
4-20mA TO TRANSMITTER
OUTPUT OPTION CARD PD178 4 RELAYS
25
C1R1 C N/C N/O
C1R2 C N/C N/O
C1R3 C N/C N/O
C1R4 C N/C N/O
9
TO A5 ALARM COMMON
STOP
START
26
8
10
27
LOW ALARM
HIGH ALARM
TO A1
TO A4
SURGE SUPPRESSER #2
PROCESS CONTROLLER # 2
30
TRANSDUCER INPUT
110vAC
OUTPUT
INTERNAL JUMPER
28 +
29 -
3 2 1
4-20mA TO TRANSMITTER
OUTPUT OPTION CARD PD178 4 RELAYS
25
C2R1 C N/C N/O
C2R2 C N/C N/O
C2R3 C N/C N/O
C2R4 C N/C N/O
14
TO A5 ALARM COMMON
STOP
START
33
13
15
34
LOW ALARM
HIGH ALARM
TO A3
TO A4
210
220
230
240
250
260
270
280
290
300
310
320
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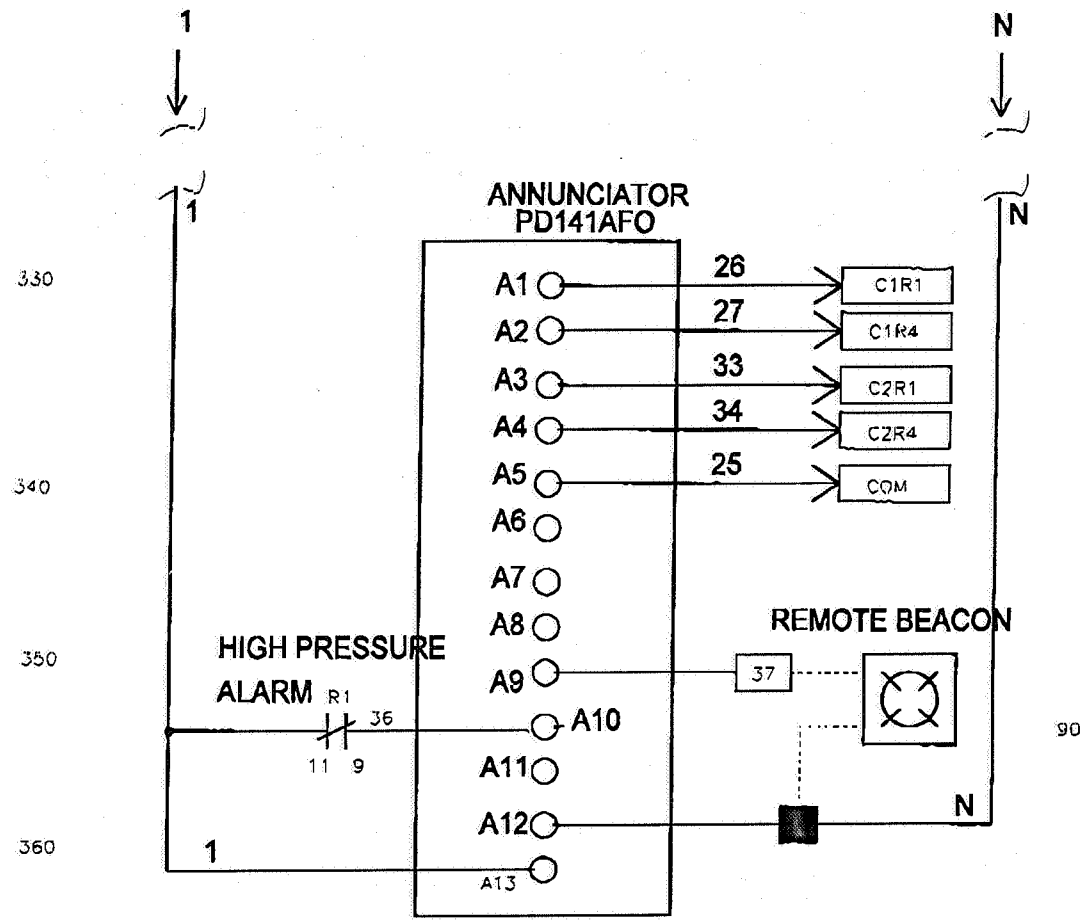
McINTOSH CONTROLS CORP
215 LITTLE FALLS RD, FAIRFIELD, NJ 07004
(201) 890 - 9400 FAX (201) 890 - 9739
APPROVED BY: DJDB
DATE: 3/23/98
PROPOSED WIRING SCHEMATIC LEVEL CONTROL PANEL
REV. NO: AS BUILT
FILE
DRAWN BY :
ELECTRICAL RESOURCES CORP
75 OAK ST. NORWOOD, NJ 07648
(800) 293 - 9485 FAX (201) 784 - 8131
CONTRACT NO:
FILE NO: MCI MILLER ENVIRO



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McINTOSH CONTROLS CORP
216 LITTLE FALLS RD, FAIRFIELD, NJ 07004
(201) 890 - 9400 FAX (201) 890 - 9739

APPROVED BY: DJDB
DATE: 3/23/98
FILE: MCIMLR 4
PROPOSED WIRING SCHEMATIC LEVEL CONTROL PANEL
REV. NO: AS BUILT
DRAWN BY: ELECTRICAL RESOURCES CORP
75 OAK ST, NORWOOD, NJ 07648
(800) 298 - 9485 FAX (201) 784 - 8131
CONTRACT NO:
FILE NO: MCI MILLER ENVIRO

Thermal-Magnetic Molded Case
100 Ampere Frame
Class 650

NEMA FRAME BREAKER

Thermal-magnetic molded case circuit breakers shown on Pages 5-8 thru 5-12 are permanent trip UL Listed, CSA certified, IEC rated, and also meet the requirements of Federal Specification W-C-375B/GEN as indicated on Pages 5-4 thru 5-6. For I-LINE® molded case circuit breakers, see listings on Pages 7-24–7-27.

FAL
1-pole
15-100 Amperes

FAL/FHL
2-pole
15-100 Amperes

FAL/FHL/FCL
3-pole
15-100 Amperes

F Frame – 100A, Thermal-Magnetic (240Vac)

Continuous Current Rating A 40° C	AC Magnetic Trip Settings Hold	Trip	Standard Interrupting Catalog Number	Price	Terminal Wire Range
1-Pole, 120Vac					
15	275	600	FAL12015	$126.	AL50FA #14-#4 AWG Cu or #12-#4 AWG Al
20	275	600	FAL12020	126.	
25	275	600	FAL12025	126.	
30	275	600	FAL12030	126.	
35	400	850	FAL12035	126.	AL100FA #14-#1/0 AWG Cu or #12-#1/0 AWG Al
40	400	850	FAL12040	126.	
45	400	850	FAL12045	126.	
50	400	850	FAL12050	126.	
60	800	1450	FAL12060	126.	
70	800	1450	FAL12070	168.	
80	800	1450	FAL12080	168.	
90	800	1700	FAL12090	168.	
100	900	1700	FAL12100	168.	
2-Pole, 240Vac					
15	275	600	FAL22015	$211.	AL50FA #14-#4 AWG Cu or #12-#4 AWG Al
20	275	600	FAL22020	211.	
25	275	600	FAL22025	211.	
30	275	600	FAL22030	211.	
35	400	850	FAL22035	211.	AL100FA #14-#1/0 AWG Cu or #12-#1/0 AWG Al
40	400	850	FAL22040	211.	
45	400	850	FAL22045	211.	
50	400	850	FAL22050	211.	
60	800	1450	FAL22060	211.	
70	800	1450	FAL22070	345.	
80	800	1450	FAL22080	345.	
90	900	1700	FAL22090	345.	
100	900	1700	FAL22100	345.	
3-Pole, 240Vac					
15	275	600	FAL32015	$318.	AL50FA #14-#4 AWG Cu or #12-#4 AWG Al
20	275	600	FAL32020	314.	
25	275	600	FAL32025	314.	
30	275	600	FAL32030	314.	
35	400	850	FAL32035	314.	
40	400	850	FAL32040	314.	
45	400	850	FAL32045	314.	

APPROVED _____ X
For performance to design concept.
The contractor will be solely responsible for adequacy of the construction.

APPROVAL AS NOTED _____ ☐
RESUBMITTAL REQUIRED ☐ NOT REQUIRED ☐
DISAPPROVED _____ ☐
NOT IN CONFORMANCE WITH DESIGN CONCEPT ☐
SUBSTITUTION NOT EQUIVALENT _____ ☐
INSUFFICIENT INFORMATION _____ ☐

BERNHARD H. SCHWARTZ, P.E.
Date 2/17/98 By MEP

Interrupting Ratings (kA)

	FAL240	FAL480	FCL
240V	10	18 (1P), 25 (2, 3P)	100
480V	...	18	65
600V	...	...	...

Accessories ..... Pages 5-2

102F

SQUARE D
Instruction Bulletin

Bulletin No. 48940-158-03
June 1996
Cedar Rapids, IA, USA
ECN H591

FA, FC, FH, AND SFH CIRCUIT BREAKERS

I-LINE® CIRCUIT BREAKER INSTALLATION

NOTE: Install main circuit breaker adjacent to main lugs.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN OR EXPLOSION

- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

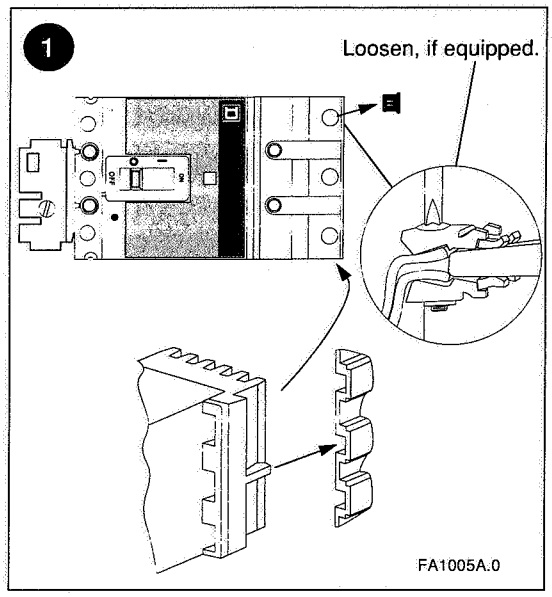
Failure to follow these instructions will result in death or serious injury.

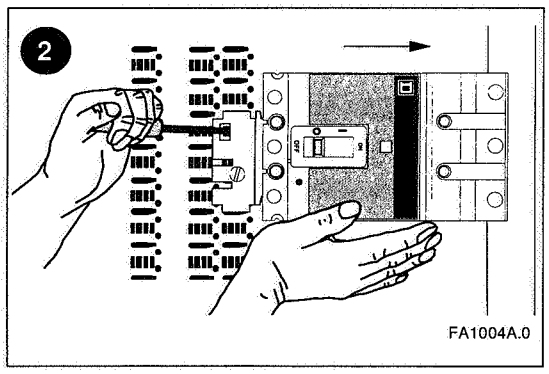
⚠ CAUTION

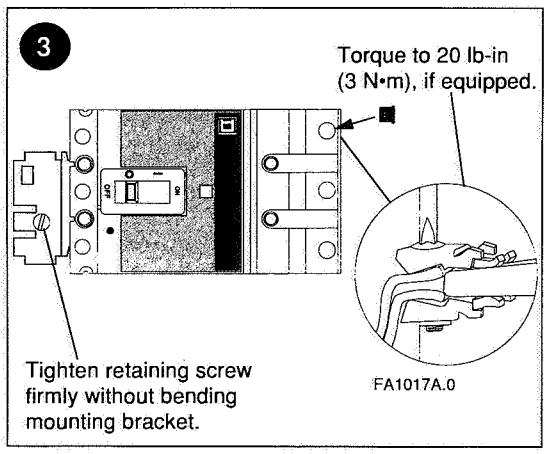
HAZARD OF OVERHEATING.

- Do not adjust plug-on jaws or remove joint compound from them.
- If necessary to replace lubricant, use Square D joint compound PJC7201.

Failure to follow these instructions can result in equipment damage.







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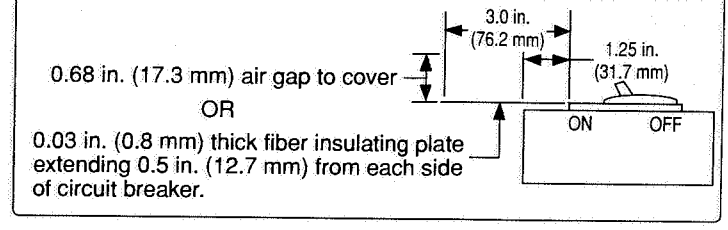
INDIVIDUALLY-MOUNTED CIRCUIT BREAKER INSTALLATION

See last page for mounting dimensions.

⚠ CAUTION

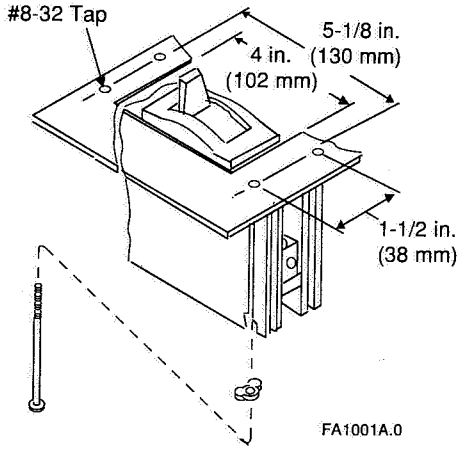
Hazard of equipment damage.
When mounted in metal box, cover must be insulated as shown.



FA1008A.1

One-pole FA and FH Circuit Breakers

Front-mounted Circuit Breakers



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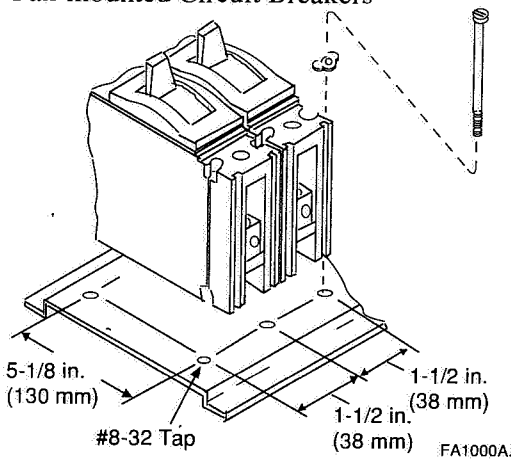
Pan-mounted Circuit Breakers



FA1000A.0

FC, FH and SFH Circuit Breakers

⚠ DANGER

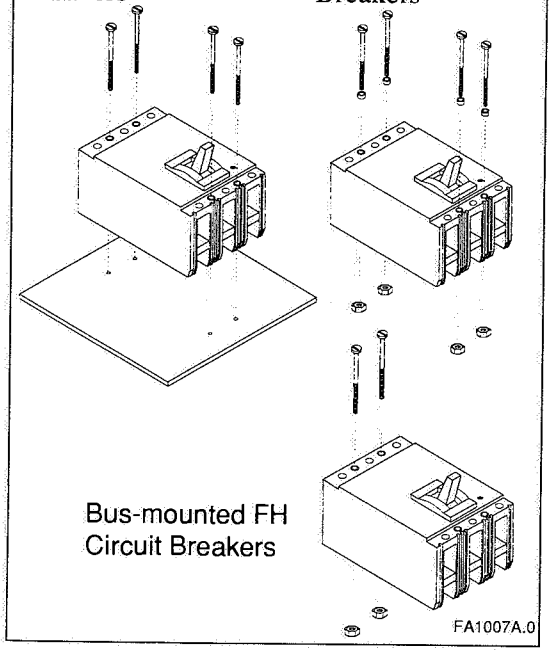
HAZARD OF ELECTRIC SHOCK OR BURN.

Mount circuit breaker as shown in these instructions to prevent cover separation under short-circuit conditions.

Failure to follow these instructions will result in death or serious injury.

Pan-mounted FC, FH and SFH Circuit Breakers

Bus-mounted FC and SFH Circuit Breakers



Bus-mounted FH Circuit Breakers

FA1007A.0

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WIRE INSTALLATION – ALL CIRCUIT BREAKERS

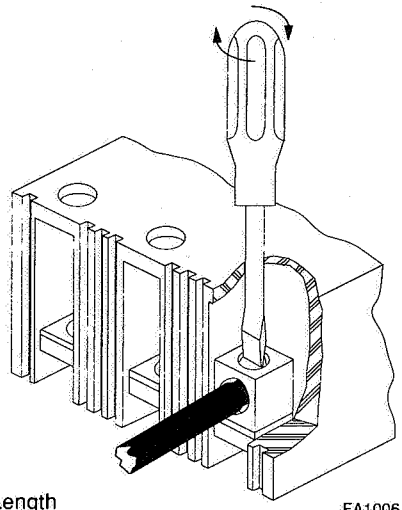
⚠ CAUTION

HAZARD OF FALSE TORQUE INDICATION.

Do not allow wire strands to interfere with threads of wire binding screw.

Failure to follow these instructions can result in equipment damage.

See circuit breaker faceplate label or optional lug instructions for wire size and torque.



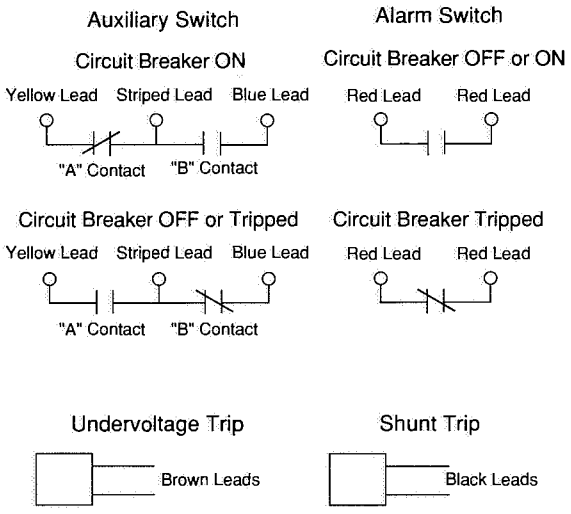
FA1006A.0

Strip Length

5/8 in. (16 mm)
3/4 in. (19 mm) for top feed lugs

FACTORY-INSTALLED ACCESSORIES

If circuit breaker has factory-installed accessories, refer to label on circuit breaker for electrical specifications and lead colors.



MS1172A.3

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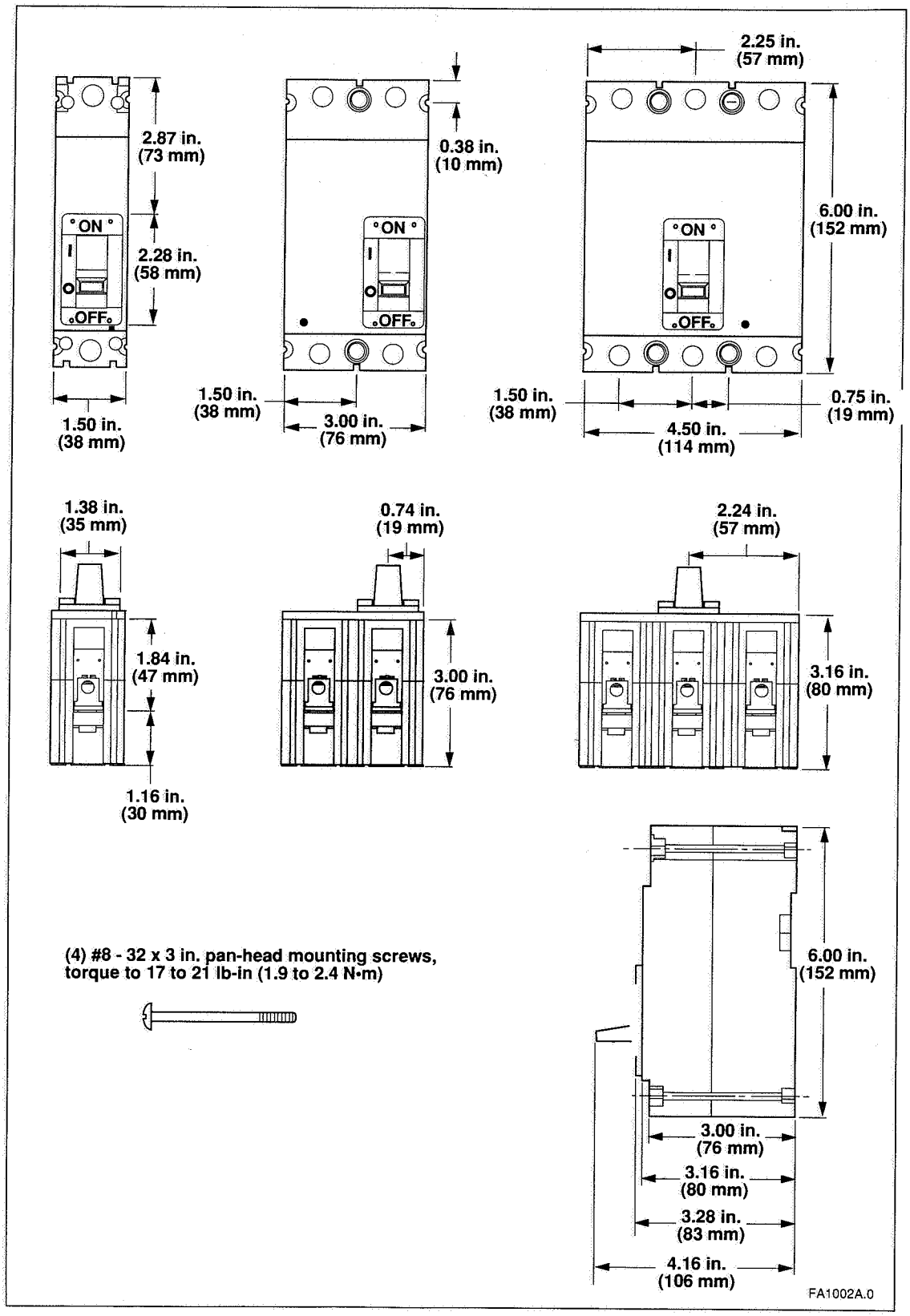
102 I

DIMENSIONS

NOTE: Two-pole FC circuit breakers have the same dimensions as three-pole FC circuit breakers.



Square D Company
PO Box 3069, 3700 Sixth St SW
Cedar Rapids IA 52406-3069 USA
Technical Services: 1-800-634-2003

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Electrical equipment should be serviced only by qualified electrical maintenance personnel. No responsibility is assumed by Square D for any consequences arising out of the use of this material.

PADLOCK ACCESSORY

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN OR EXPLOSION

When circuit breaker handle is padlocked OFF, always use a properly rated voltage sensing device to confirm power is off before working on equipment.

Failure to follow these instructions will result in death or serious injury.

With padlock accessory installed, circuit breaker does not comply with IEC 947 positive contact indication requirement for isolation.

CIRCUIT BREAKER REMOVAL

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN OR EXPLOSION

- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

Remove circuit breaker in reverse order of installation.

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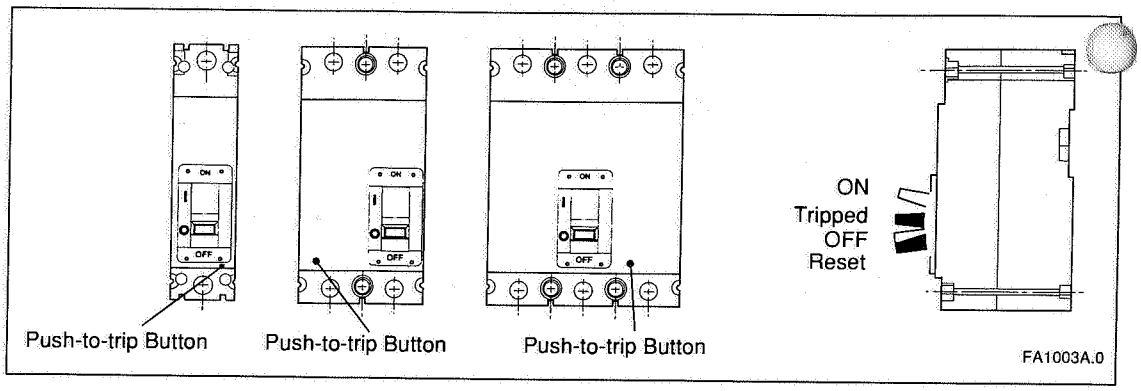
CIRCUIT BREAKER OPERATION

Press push-to-trip button once a year to exercise circuit breaker.



TROUBLE-SHOOTING

If problems occur during installation, refer to the following guide. If trouble persists, contact the local Square D Field Office.

CONDITION	POSSIBLE CAUSES	SOLUTION
Circuit breaker fails to stay closed.	1. Undervoltage trip not energized. 2. Shunt trip energized. 3. Short circuit or overload on system.	1. Energize undervoltage trip. 2. De-energize shunt trip. 3. Check system for short circuit or overload.
Circuit breaker trips, but no short circuit or overload is evident.	1. System voltage below under-voltage trip setting.	1. Check system for low voltage.
Push-to-trip button will not trip circuit breaker.	1. Circuit breaker already tripped or in the OFF position.	1. Move circuit breaker handle to reset then to ON position. Press push-to-trip button.

102 L

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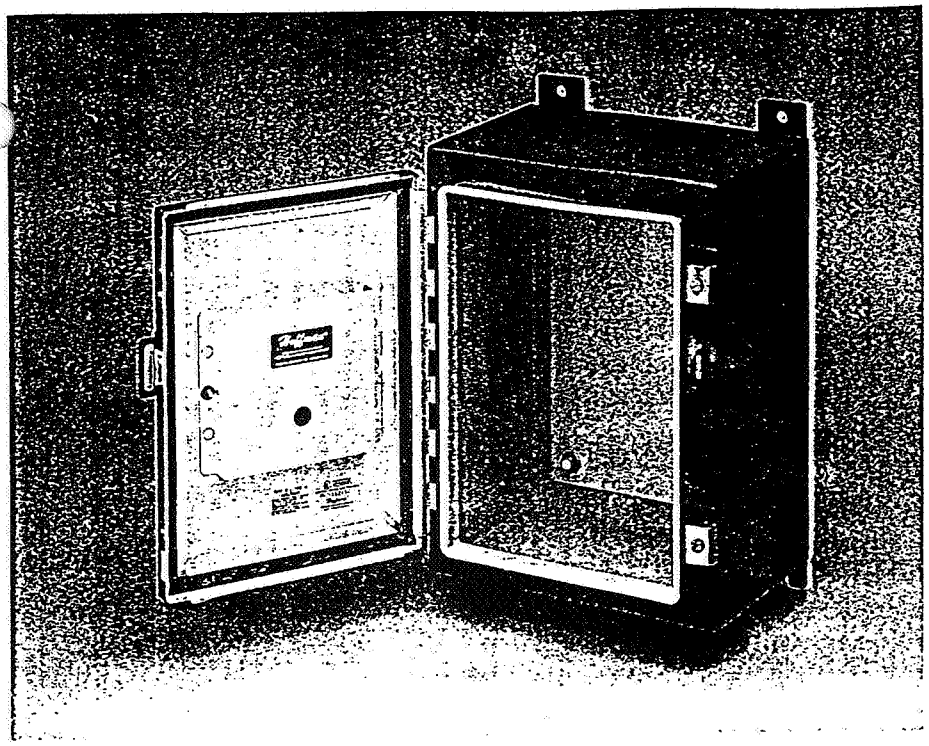

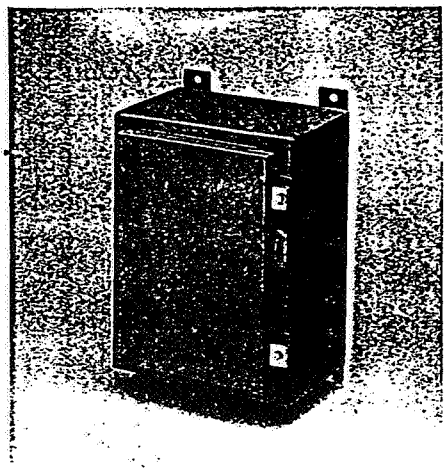

Application

Designed to house electrical and electronic controls, instruments, and components. Provide protection from dust, dirt, oil, and water.

Construction

- 16 gauge steel bodies and 14 gauge doors on all sizes through 24.00 x 24.00; remaining (larger) sizes are 14 gauge
- Seams continuously welded and ground smooth, no holes or knockouts
- Door and body stiffeners in larger enclosures
- Rolled lip around three sides of door and all sides of enclosure opening excludes liquids and contaminants
- Door clamps are quick and easy to operate
- Door removed by pulling heavy gauge continuous hinge pin
- Hasp and staple for padlocking
- Data pocket is high-impact thermoplastic
- Oil-resistant gasket attached with oil-resistant adhesive and held in place with steel retaining strips
- Collar studs provided for mounting optional panels

Finish

White enamel inside with recoatable ANSI 61 gray outside finish over phosphatized surfaces. Optional panels are white enamel.

Industry Standards

NEMA/EEMAC Type 12 and Type 13
UL 508 Type 12 and Type 13
JIC standard EGP-1-1967
CSA Type 12
IEC 529, IP65

Accessories

Page

Air conditioners and heat exchangers for this enclosure can be found in Hoffman's Specifier's Guide for Climate Control Products.

Blower Package 461
Corrosion Inhibitors 469
Door Stop Kit 429
Drip Shield Kit 433
Electric Heater 462
Electrical Interlocks 440
Enclosure Stabilizers 443
Fan Cooling Products 458, 459
Fast Operating Clamp Assembly 435
Floor Stand Kit 442
Folding Shelf 429
Keyboard Kit 429
Latch Kits & Lock Kit 434, 435
Lighting Kit 426-428
Panel Support Kit 448
Panels (See table)
Rack Mounting Angle Kit 473, 474
Swing-Out Panel Kit 448
Terminal Kit Assembly 456
Window Kit 430, 431
Wiring Duct 450

Need More Information?

Page

Chemical Resistance Chart 493
Cross Reference to DesignLine Type 4, 12 and 13 Enclosures 24
Industry Standards 483
Materials and Finishes 487
Price List 7

Modifying Your Enclosure?

We can modify or customize this enclosure to your specs. See page 502 for more information.

Hoffman
A Pentair Company
Phone: 612-421-2240
Fax: 612-421-1556

Standard Sizes (Cont.)

Single-Door Type 12 and 13 Enclosures

Enclosure Catalog Number	Enclosure Size AxBxC	AxBxC	*Panel Catalog Number	Panel Size DxE	DxE	F	Number of Clamps	Stiffener Door / Body
A-161210LP	16.00x12.00x10.00	(406x305x254)	A-16P12	13.00x9.00	(330x229)	1.25 (32)	2	0 0
A-201610LP	20.00x16.00x10.00	(508x406x254)	A-20P16	17.00x13.00	(432x330)	3.00 (76)	2	0 0
A-202010LP	20.00x20.00x10.00	(508x508x254)	A-20P20	17.00x17.00	(432x432)	3.00 (76)	2	0 0
A-241210LP	24.00x12.00x10.00	(610x305x254)	A-12P24	9.00x21.00	(229x533)	1.25 (32)	2	0 0
A-242010LP	24.00x20.00x10.00	(610x508x254)	A-24P20	21.00x17.00	(533x432)	3.00 (76)	2	0 0
A-242410LP	24.00x24.00x10.00	(610x610x254)	A-24P24	21.00x21.00	(533x533)	3.00 (76)	2	0 0
A-302010LP	30.00x20.00x10.00	(762x508x254)	A-30P20	27.00x17.00	(686x432)	3.00 (76)	2	0 0
A-302410LP	30.00x24.00x10.00	(762x610x254)	A-30P24	27.00x21.00	(686x533)	3.00 (76)	2	0 0
A-362410LP	36.00x24.00x10.00	(914x610x254)	A-36P24	33.00x21.00	(838x533)	3.00 (76)	2	0 0
A-363010LP	36.00x30.00x10.00	(914x762x254)	A-36P30	33.00x27.00	(838x686)	3.00 (76)	2	0 1
A-423010LP	42.00x30.00x10.00	(1067x762x254)	A-42P30	39.00x27.00	(991x686)	3.00 (76)	2	1 1
A-423610LP	42.00x36.00x10.00	(1067x914x254)	A-42P36	39.00x33.00	(991x838)	3.00 (76)	2	1 1
A-483010LP	48.00x30.00x10.00	(1219x762x254)	A-48P30	39.00x33.00	(838x686)	3.00 (76)	3	1 1
A-483610LP	48.00x36.00x10.00	(1219x914x254)	A-48P36	45.00x33.00	(1143x838)	3.00 (76)	3	1 1
A-603610LP	60.00x36.00x10.00	(1524x914x254)	A-60P36	57.00x33.00	(1448x838)	3.00 (76)	3	1 1
A-201612LP	20.00x16.00x12.00	(508x406x305)	A-20P16	17.00x13.00	(432x330)	3.00 (76)	2	0 0
A-242012LP	24.00x20.00x12.00	(610x508x305)	A-24P20	21.00x17.00	(533x432)	3.00 (76)	2	0 0
A-242412LP	24.00x24.00x12.00	(610x610x305)	A-24P24	21.00x21.00	(533x533)	3.00 (76)	2	0 0
A-302412LP	30.00x24.00x12.00	(762x610x305)	A-30P24	27.00x21.00	(686x533)	3.00 (76)	2	0 0
A-303012LP	30.00x30.00x12.00	(762x762x305)	A-30P30	27.00x27.00	(686x686)	3.00 (76)	2	0 1
A-362412LP	36.00x24.00x12.00	(914x610x305)	A-36P24	33.00x21.00	(838x533)	3.00 (76)	2	0 0
A-363012LP	36.00x30.00x12.00	(914x762x305)	A-36P30	33.00x27.00	(838x686)	3.00 (76)	2	0 1
A-363612LP	36.00x36.00x12.00	(914x914x305)	A-36P36	33.00x33.00	(838x838)	3.00 (76)	2	1 1
A-423012LP	42.00x30.00x12.00	(1067x762x305)	A-42P30	39.00x27.00	(991x686)	3.00 (76)	2	1 1
A-423612LP	42.00x36.00x12.00	(1067x914x305)	A-42P36	39.00x33.00	(991x838)	3.00 (76)	2	1 1
A-483612LP	48.00x36.00x12.00	(1219x914x305)	A-48P36	45.00x33.00	(1143x838)	3.00 (76)	3	1 1
A-603612LP	60.00x36.00x12.00	(1524x914x305)	A-60P36	57.00x33.00	(1448x838)	3.00 (76)	3	1 1
A-723612LP	72.00x36.00x12.00	(1829x914x305)	A-72P36	69.00x33.00	(1753x838)	3.00 (76)	3	1 0
A-242016LP	24.00x20.00x16.00	(610x508x406)	A-24P20	21.00x17.00	(533x432)	3.00 (76)	2	0 0
A-242416LP	24.00x24.00x16.00	(610x610x406)	A-24P24	21.00x21.00	(533x533)	3.00 (76)	2	0 0
A-302416LP	30.00x24.00x16.00	(762x610x406)	A-30P24	27.00x21.00	(686x533)	3.00 (76)	2	0 0
A-363016LP	36.00x30.00x16.00	(914x762x406)	A-36P30	33.00x27.00	(838x686)	3.00 (76)	2	0 1
A-423616LP	42.00x36.00x16.00	(1067x914x406)	A-42P36	39.00x33.00	(991x838)	3.00 (76)	2	1 1
A-483616LP	48.00x36.00x16.00	(1219x914x406)	A-48P36	45.00x33.00	(1143x838)	3.00 (76)	3	1 1
A-603616LP	60.00x36.00x16.00	(1524x914x406)	A-60P36	57.00x33.00	(1448x838)	3.00 (76)	3	1 1
A-302420LP	30.00x24.00x20.00	(762x610x508)	A-30P24	27.00x21.00	(686x533)	3.00 (76)	2	0 0
A-363020LP	36.00x30.00x20.00	(914x762x508)	A-36P30	33.00x27.00	(838x686)	3.00 (76)	2	0 1
A-483620LP	48.00x36.00x20.00	(1219x914x508)	A-48P36	45.00x33.00	(1143x838)	3.00 (76)	3	1 1
A-603620LP	60.00x36.00x20.00	(1524x914x508)	A-60P36	57.00x33.00	(1448x838)	3.00 (76)	3	1 1
A-302424LP	30.00x24.00x24.00	(762x610x610)	A-30P24	27.00x21.00	(686x533)	3.00 (76)	2	0 0

Millimeter dimensions ( ) are for reference only; do not convert metric dimensions to inch.

* Panels must be ordered separately. Optional aluminum panels are available for most sizes. See Accessories.

Thermal-Magnetic Molded Case
100 Ampere Frame
Class 650

Thermal-magnetic molded case circuit breakers shown on Pages 5-8 thru 5-12 are permanent trip UL Listed, CSA certified, IEC rated, and also meet the requirements of Federal Specification W-C-375B/GEN as indicated on Pages 5-4 thru 5-6. For I-LINE® molded case circuit breakers, see listings on Pages 7-24–7-27.

FAL
1-pole
15-100 Amperes

FAL/FHL
2-pole
15-100 Amperes

FAL/FHL/FCL
3-pole
15-100 Amperes

NEMA FRAME BREAKER

F Frame – 100A, Thermal-Magnetic (240Vac)

Continuous Current Rating A 40° C	AC Magnetic Trip Settings Hold	Trip	Standard Interrupting Catalog Number	Price	Terminal Wire Range
1-Pole, 120Vac					
15	275	600	FAL12015	$126.	AL50FA #14-#4 AWG Cu or #12-#4 AWG Al
20	275	600	FAL12020	126.	
25	275	600	FAL12025	126.	
30	275	600	FAL12030	126.	
35	400	850	FAL12035	126.	AL100FA #14-#1/0 AWG Cu or #12-#1/0 AWG Al
40	400	850	FAL12040	126.	
45	400	850	FAL12045	126.	
50	400	850	FAL12050	126.	
60	800	1450	FAL12060	126.	
70	800	1450	FAL12070	168.	
80	800	1450	FAL12080	168.	
90	800	1700	FAL12090	168.	
100	900	1700	FAL12100	168.	
2-Pole, 240Vac					
15	275	600	FAL22015	$211.	AL50FA #14-#4 AWG Cu or #12-#4 AWG Al
20	275	600	FAL22020	211.	
25	275	600	FAL22025	211.	
30	275	600	FAL22030	211.	
35	400	850	FAL22035	211.	AL100FA #14-#1/0 AWG Cu or #12-#1/0 AWG Al
40	400	850	FAL22040	211.	
45	400	850	FAL22045	211.	
50	400	850	FAL22050	211.	
60	800	1450	FAL22060	211.	
70	800	1450	FAL22070	345.	
80	800	1450	FAL22080	345.	
90	900	1700	FAL22090	345.	
100	900	1700	FAL22100	345.	
3-Pole, 240Vac					
15	275	600	FAL32015	$314.	AL50FA #14-#4 AWG Cu or #12-#4 AWG Al
20	275	600	FAL32020	314.	
25	275	600	FAL32025	314.	
30	275	600	FAL32030	314.	
35	400	850	FAL32035	314.	
40	400	850	FAL32040	314.	
45	400	850	FAL32045	314.	

FAL22015

APPROVED _____
For conformance to design concept.
The contractor will be solely responsible for adequacy of the construction.

APPROVAL AS NOTED _____ ☐
RESUBMITTAL REQUIRED ☐ NOT REQUIRED ☐
DISAPPROVED _____ ☐
NOT IN CONFORMANCE WITH DESIGN CONCEPT ☐
SUBSTITUTION NOT EQUIVALENT _____ ☐
INSUFFICIENT INFORMATION _____ ☐

BERNHARD H. SCHWARTZ, P.E.
Date 2/17/98 By MEP

Interrupting Ratings (kA)

	FAL240	FAL480	FCL
240V	10	18 (1P), 25 (2, 3P)	100
480V	...	18	65
600V	...	...	...

Accessories ..... Pages 5-2

Full Voltage Starters
Class 8536

2-Pole Single Phase – 600 Volts AC Maximum – 50-60 Hz

Note that prices shown do not include thermal units. Devices require 1 thermal unit. Standard trip thermal units are $9.50 each. See page 12-136 for selection information.

NEMA Size	Continuous Current Ratings	Motor Volts	Max. HP	Coil Voltage #	Open Type		NEMA Type 1 General Purpose Enclosure		NEMA Type 4 & 4X Watertight, Dusttight Brushed Stainless Steel Enclosure		NEMA Type 4X Watertight, Dusttight, Corrosion-Resistant Glass-Polyester Enclosure	
					Type	Price	Type	Price	Type	Price	Type	Price
00	9	115 230	⅓ 1	120 240	8AO11V02 8AO11V03	$ 171.	8AG11V02 8AG11V03	$ 186.	Use Size 0		Use Size 0	
0	18	115 230	1 2	120 240	8BO1V02 8BO1V03	183.	8BG1V02 8BG1V03	204.	8BW11V02 8BW11V03	$ 438.	8BW21V02 8BW21V03	$ [illegible]
1	27	115 230	2 3	120 240	8CO1V02 8CO1V03	225.	8CG1V02 8CG1V03	239.	8CW11V02 8CW11V03	457.	8CW21V02 8CW21V03	[illegible]
1P	36	115 230	3 5	120 240	8CO2V02 8CO2V03	294.	8CG2V02 8CG2V03	309.	8CW12V02 8CW12V03	537.	8CW22V02 8CW22V03	[illegible]
2	45	115 230	3 7½	120 240	8DO6V02 8DO6V03	408.	8DG6V02 8DG6V03	474.	8DW18V02 8DW18V03	929.	8DW26V02 8DW26V03	[illegible]

4-Pole, 2-Phase – 600 Volts AC Maximum – 50-60 Hz

Note that prices shown do not include thermal units. Devices require 2 thermal units. Standard trip thermal units are $9.50 each. See page 12-136 for selection information.

NEMA Size	Continuous Current Ratings	Motor Volts	Max. HP	Coil Voltage #	Open Type		NEMA Type 1 General Purpose Enclosure		NEMA Type 4 & 4X Watertight, Dusttight Brushed Stainless Steel Enclosure		NEMA Type 4X Watertight, Dusttight, Corrosion-Resistant Glass-Polyester Enclosure	
					Type	Price	Type	Price	Type	Price	Type	Price
0	18	Separate Control†		120 208 240 480 600	8BO3V02S 8BO3V08 8BO3V03 8BO3V06 8BO3V07	$ 279.	8BG3V02S 8BG3V08 8BG3V03 8BG3V06 8BG3V07	$ 300.	8BW13V02S 8BW13V08 8BW13V03 8BW13V06 8BW13V07	$ 548.	8BW23V02S 8BW23V08 8BW23V03 8BW23V06 8DW23V07	$ [illegible]
		200 230 460 575	3 3 10 10									
1	27	Separate Control†		120 208 240 480 600	8CO4V02S 8CO4V08 8CO4V03 8CO4V06 8CO4V07	317.	8CG4V02S 8CG4V08 8CG4V03 8CG4V06 8CG4V07	338.	8CW14V02S 8CW14V08 8CW14V03 8CW14V06 8CW14V07	578.	8CW24V02S 8CW24V08 8CW24V03 8CW24V06 8CW24V07	578.
		200 230 460 575	7½ 7½ 10 10									
2	45	Separate Control†		120 208 240 480 600	8DO2V02S 8DO2V08 8DO2V03 8DO2V06 8DO2V07	570.	8DG2V02S 8DG2V08 8DG2V03 8DG2V06 8DG2V07	535.	8DW12V02S 8DW12V08 8DW12V03 8DW12V06 8DW12V07	1293.	8DW22V02S 8DW22V08 8DW22V03 8DW22V06 8DW22V07	129 [illegible]
		200 230 460 575	10 15 25 25									
3	90	Separate Control†		120 208 240 480 600	8EO2V02S 8EO2V08 8EO2V03 8EO2V06 8EO2V07	931.	8EG2V02S 8EG2V08 8EG2V03 8EG2V06 8EG2V07	1047.	8EW12V02S 8EW12V08 8EW12V03 8EW12V06 8EW12V07	1869.	Consult Local Square D Field Office	
		200 230 460 575	15 30 50 50									
4	135	Separate Control†		120 208 240 480 600	8FO2V02S 8FO2V08 8FO2V03 8FO2V06 8FO2V07	2268.	8FG2V02S 8FG2V08 8FG2V03 8FG2V06 8FG2V07	2549.	8FW12V02S 8FW12V08 8FW12V03 8FW12V06 8FW12V07	4098.		
		200 230 460 575	40 50 100 100									

† 120 Volt Polyphase starters are wired for separate control.

Coil voltage code must be specified to order this product. Refer to standard coil voltage codes listed in selection table above or additional standard voltage codes below.

Coil Voltage Codes

Voltage 60 Hz	Voltage 50 Hz	Code	Price Adder
24 Δ	...	V01	N.C.
120†	110	V02	N.C.
208	...	V08	N.C.
240	220	V03	N.C.
480	440	V06	N.C.
600	550	V07	N.C.
Specify	Specify	V99	$15.80

Δ 24V coils are not available on Sizes 4-7. On sizes 00-3, where 24V coils are available, Form B (separate control) must be specified.

† 120 Volt Polyphase starters are wired for separate control.

Factory Modifications (Forms) ..... Page 12-118
Dimensions ..... Page 12-22
Separate Enclosures (Class 9081) ..... Page 12-109
Replacement Parts (Class 9998) ..... Page 12-125
Type B Accessories (Class 9999) ..... Page 12-129

APPROVED _____
Approved as noted by engr. dept.
Contractor is responsible for adequacy of connections

APPROVED AS NOTED _____ ☐
RESUBMITTAL REQUIRED ☐ NOT REQUIRED ☐
DISAPPROVED _____ ☐
NOT IN CONFORMANCE WITH DESIGN CONCEPT ☐
SUBSTITUTION NOT EQUIVALENT _____ ☐
INSUFFICIENT INFORMATION _____ ☐

BERNHARD H. SCHWARTZ, P.E.
Date 2/17/98 By MEP

For additional information, reference Catalog # 6502CT9701 or D-FAX™ # 1504.

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SQUARE D
Instruction Bulletin

Reference No. 556AS
Bulletin No. 30072-013-08A
Raleigh, NC, U.S.A., September, 1993
Supersedes 30072-013-08 dated 4/92

2- and 3-Pole AC Magnetic Contactors and Starters Type SA, Series B
Class 8502 and 8536 – Size 00

INTRODUCTION

This instruction bulletin illustrates and describes Class 8502 and 8536 two- and three-pole magnetic contactors and starters. It also contains assembly, modification and parts ordering instructions. To identify parts, refer to Figure 1.

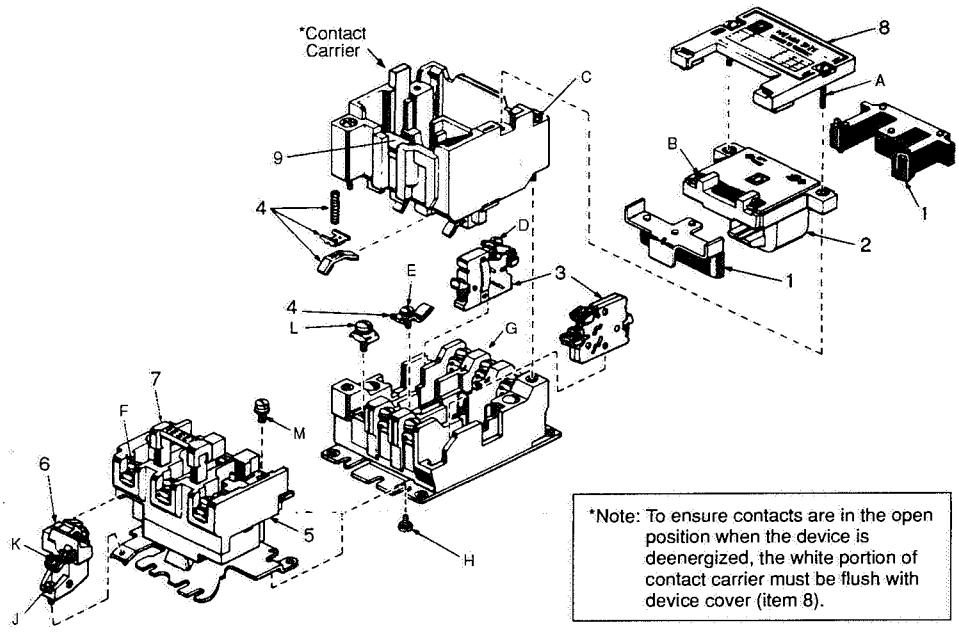

Figure 1 Contactor and Starter Assembly Drawing

⚠ DANGER

HAZARDOUS VOLTAGE.

Disconnect all power before working on equipment.

Electrical shock will cause severe injury or death.

AUXILIARY CONTACTS

All contactors are supplied with a normally-open holding circuit contact as standard. Additional normally-open or normally-closed auxiliary contacts can be installed in the field. Refer to Table 5 on page 4 for class and type. For application information, refer to Bulletin 9999-287 or the Square D Digest.

COVER MOUNTED CONTROL UNITS

NEMA Type 1 general purpose enclosures with slip-on or hinged covers are supplied with knockouts for field addition of the kits listed in Table 1 on page 2.

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ASSEMBLY INSTRUCTIONS

Figure 1 on page 1 shows how contactors and starters are assembled. Factory recommended torques for mechanical, electrical and pressure wire connections are listed in Table 2 and the device instruction sheet. These torques must be followed to ensure proper device operation.

Table 2 Factory Recommended Tightening Torques

Item	Description	Tightening Torque (in-lb)
A	Cover screw (2 per cover)	18-21
B	Coil terminal pressure wire connector (2 per coil)	9-12
C	Power plant screw (2 per device)	18-21
D	Internal auxiliary contact pressure wire connector (2 per contact)	9-12
E	Stationary contact fastener (2 per pole)	6-9
F	Lug screw (2 per pole)	[1]
G	Auxiliary wire binding screw	18-21
H	Overload relay fastening screw (2 per overload block)	18-21
J	Overload switch module fastening screw (1 per module)	9-12
K	Switch module pressure wire connector (2 per module standard; 4 per module w/ alarm circuit contact)	9-12
L	Overload-to-contactor fastener (1 per pole)	18-21 [2]
M	Overload thermal unit fastening screw (2 per pole)	18-21

[1] See instruction sheet.
[2] For contactor, see instruction sheet.

SHORT CIRCUIT PROTECTION

Provide branch-circuit overcurrent protection for starters, referring to instructions supplied with the thermal unit selection table. Provide branch-circuit overcurrent protection for contactors (Class 8502 or 8702) in accordance with the National Electrical Code. Do not exceed the maximum protective device ratings listed in Table 3.

Table 3 Maximum Ampere Ratings

Maximum Voltage (V)	Class K5, RK5 or RK1 Fuse (A)	Class J or T Fuse (A)	Inverse-Time Circuit Breaker (A)
600	10	15	15
250	12	15	15

DISTANT CONTROL

Series impedance and shunt capacitance of the control circuit must be considered to assure proper operation of contactors and starters when controlled from remote operator stations. Depending upon the voltage, wire size and number of control wires used, series impedance or shunt capacitance may limit the maximum distance of the wire run. If distances to start or stop stations are longer than those listed in Table 4, the wire-run configuration and materials must be analyzed. For further information, contact your local Square D field office for Product Data Bulletin M379.

Table 4 Maximum Control Distance

Coil Voltage (60 Hz)	Maximum Control Distance (feet)	
	#14 AWG Copper Wire	#12 AWG Copper Wire
120	1335	1800
240	540	450
480	135	110

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102C

OVERLOAD-RELAY THERMAL UNITS TABLE 13

For continuous-rated motors having service factors of 1.15 to 1.25, select thermal units directly from table using 100% of full-load current shown on motor nameplate. For continuous-rated motors having a service factor of 1.0, select thermal units from table using 80% of full-load current shown on motor nameplate.

Motor Full-Load Current (Amp.)	Thermal Unit No.	Maximum Fuse Rating (Amp.)	Motor Full-Load Current (Amp.)	Thermal Unit No.	Maximum Fuse Rating (Amp.)	
0.26-0.30	B0.44	0.6	4.49-4.93	B7.70	10	
0.31-0.34	B0.51	0.6	4.94-5.27	B8.20	10	
0.35-0.37	B0.57	0.6	5.22-5.84	B9.10	10	
0.38-0.44	B0.63	0.8				
0.45-0.53	B0.71	1			600V Max.	250V Max.
0.54-0.59	B0.81	1.125				
0.60-0.64	B0.92	1.25	5.85-6.67	B10.2	10	12
0.65-0.72	B1.03	1.4	6.68-7.00	B11.5	10	12
0.73-0.80	B1.16	1.6				
0.81-0.90	B1.30	1.8				
0.91-1.03	B1.45	2				
1.04-1.14	B1.67	2.25				
1.15-1.27	B1.88	2.5				
1.28-1.43	B2.10	2.8				
1.44-1.62	B2.40	3.2				
1.63-1.77	B2.65	3.5				
1.78-1.97	B3.00	4				
1.98-2.32	B3.30	4				
2.33-2.51	B3.70	5				
2.52-2.99	B4.15	5.6				
3.00-3.42	B4.85	6.25				
3.43-3.75	B5.50	7				
3.76-3.98	B6.25	8				
3.99-4.48	B6.90	8				

Trip current rating in a 40°C (104°F) ambient temperature is 1.25 times the minimum full-load current shown for the thermal unit selected. Instructions given above assume that the motor and the controller are located in approximately the same ambient temperature. For other conditions consult Square D.

SHORT-CIRCUIT PROTECTION: Branch-circuit protective device rating must comply with applicable electrical codes and the following additional limitations.

FUSES: Do not exceed the maximum fuse rating shown opposite the thermal unit selected. Fuses may need to be of the time delay type to permit motor starting. Class K5 or Class R fuses are recommended. Non-time delay fuses whose rating does not exceed 300 percent of motor full load current may also be used.

THERMAL-MAGNETIC (INVERSE TIME) CIRCUIT BREAKER: Maximum allowable thermal-magnetic (inverse time) circuit breaker rating is 15 amperes.

SQUARE D

NEMA Size 00 Starter
Class 8536, Type S
With Melting Alloy Overload Relay

Suitable For Use On A Circuit Capable of Delivering Not More Than 5000 rms Symmetrical Amperes, 600 Volts Maximum

WARNING:

If burnout of an overload relay thermal unit occurs, the thermal unit must be replaced to provide continued protection against fire and shock hazard.

AVERTISSEMENT:

Si un élément thermique brûle, il doit être remplacé.

CLASS 9999 ACCESSORIES

N.O. Elec. Interlock	Type SX-6
N.C. Elec. Interlock	Type SX-7

Other Class 9999 Accessories may be installed on this product. Consult catalog for applicable Type numbers and description.

Additional information in Service Bulletin 556AS.

CONTROL WIRING

Control circuit conductors must be protected against overcurrent in accordance with applicable electrical codes. This may require installation of protective devices not shown in control circuit diagrams. Fuse-holder Kits Class 9999 Types SF-4 and SFR-4 are available to allow compliance.

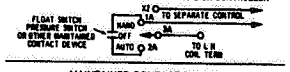
THREE-WIRE CONTROL (MOMENTARY CONTACT)

REMOTE
PUSH-BUTTON STATIONS

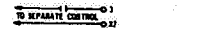
TWO-WIRE CONTROL (MAINTAINED CONTACT)

SELECTOR-SWITCH STATION

LEAD REMOVED FROM TERMINAL 3 TO COIL ON CONTROLLER



MAINTAINED CONTACT DEVICE.
NOT PART OF CONTROLLER

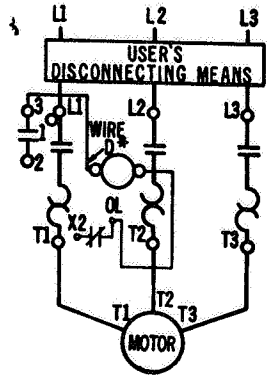


POWER WIRING

Power Lugs Suitable For Copper Conductors Only. Sized for 60°C Wire Ampacity. Rated 60°C Minimum Or Sized for 75°C Wire Ampacity. Rated 75°C Minimum.

Lug Torque Requirements:
Line and Load: 20 lbs.in.

THREE-PHASE, 3-WIRE SYSTEM



★ Wire D Omitted on Form CS.

30072-001-91B

OVERLOAD-RELAY THERMAL UNITS TABLE 15

For continuous-rated motors having service factors of 1.15 to 1.25, select thermal units directly from table using 100% of full-load current shown on motor nameplate. For continuous-rated motors having a service factor of 1.0, select thermal units from table using 90% of full-load current shown on motor nameplate.

Motor Full-Load Current (Amp.)	Thermal Unit No.	Maximum Fuse Rating (Amp.)	Motor Full-Load Current (Amp.)	Thermal Unit No.	Minimum Fuse Rating (Amp.)	
0.29-0.31	B0.44	0.8	4.73-5.21	B7.70	10	
0.32-0.36	B0.51	0.8	5.22-5.51	B8.20	10	
0.37-0.38	B0.57	0.8				
0.39-0.46	B0.63	0.8				
0.47-0.55	B0.71	1			600V Max.	250V Max.
0.56-0.81	B0.81	1.125				
0.82-0.86	B0.92	1.25	5.52-6.17	B9.10	10	12
0.87-0.75	B1.03	1.4	6.18-7.00	B10.2	10	12
0.76-0.83	B1.16	1.6				
0.84-0.93	B1.30	1.8				
0.94-1.06	B1.45	2				
1.07-1.18	B1.67	2.25				
1.19-1.31	B1.88	2.5				
1.32-1.47	B2.10	2.8				
1.48-1.67	B2.40	3.2				
1.68-1.82	B2.65	3.5				
1.84-2.04	B3.00	4				
2.05-2.38	B3.30	4.5				
2.39-2.60	B3.70	5				
2.61-3.13	B4.15	5.6				
3.14-3.59	B4.85	7				
3.60-3.94	B5.50	8				
3.95-4.19	B6.25	8				
4.20-4.72	B6.90	9				

Trip current rating in a 40°C (104°F) ambient temperature is 1.25 times the minimum full-load current shown for the thermal unit selected. Instructions given above assume that the motor and the controller are located in approximately the same ambient temperature. For other conditions consult Square D.

SHORT-CIRCUIT PROTECTION: Branch-circuit protective device rating must comply with applicable electrical codes and the following additional limitations.

FUSES: Do not exceed the maximum fuse rating shown opposite the thermal unit selected. Fuses may need to be of the time delay type to permit motor starting. Class K5 or Class R fuses are recommended. Non-time delay fuses whose rating does not exceed 300 percent of motor full load current may also be used.

THERMAL-MAGNETIC (INVERSE TIME) CIRCUIT BREAKER: Maximum allowable thermal magnetic (inverse time) circuit breaker rating is 15 amperes.

OEM: Discard nonapplicable thermal unit selection table before attaching instruction sheet to your enclosure. Use Table 13 if enclosure volume is less than 478 cubic inches or if additional heat producing equipment is installed with the device. Use Table 15 if enclosure volume is 478 cubic inches or greater.

102E

Amp-trap®

Midget Time Delay Fuses

ATQ

Time Delay
500 Volts AC
10kA I.R.
1/10 to 30 Amperes
UL Listed
CSA Certified
Dimensions: 1½" x 13/32"

APPLICATIONS:
- Small motor circuits
- Small trasformers
- Gas discharge lighting

MOUNTING RECOMMENDATIONS:

Midget Fuse Blocks (303 Series) are shown on page 104.

Panel Mount Fuse Holder (GPM-B) is shown on page 103.

In-Line Fuseholders (GEB-) are shown on pages 107-109.

Accessories for Midget Fuse Blocks are shown on page 105 (DIN Rail Adapter) and page 106 (Safety Puller).

Primary Fuse Sizing* For Small Transformers

TRANSFORMER VOLT-AMPERES	ATQ RATING 480V PRIMARY
50	15/100
75	2/10
100	3/10
150	½
200	5/10
250	8/10
300	1
350	1
500	1 6/10
750	2
1000	3

*Fuse ratings above will withstand inrush currents of 25 times transformer full load for ½ cycle.

SMALL MOTOR FUSE PROTECTION 500 VOLTS AC OR LESS

MOTOR FULL LOAD AMPERES	ATQ RATING	
	NORMAL DUTY**	HEAVY DUTY†
To .8	1 6/10	2 ¼
1.0-1.2	2 ½	3 ½
1.4-1.7	3 ½	6
1.8-2.1	6	8
2.2-2.5	8	9
2.6-3.4	9	12
4.0-4.5	12	15
5-6	15	20
6.5-7.5	20	25
8-9	25	30
10-12	30	-

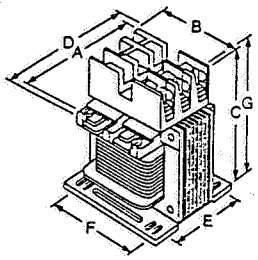
**Normal duty ratings will withstand locked rotor current of 5 times for 10 seconds

†Heavy duty ratings will withstand locked rotor current of 6.6 times for 10 seconds.

Standard Fuse Ampere Ratings, Catalog Numbers

CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER	AMPERE RATING	CATALOG NUMBER	AMPERE RATING
ATQ 1/10	1/10	ATQ 3/10	3/10	ATQ 1 1/8	1 1/8	ATQ 2	2	ATQ 3 3/10	3 3/10	ATQ 6	6	ATQ 12	12
ATQ 1/8	1/8	ATQ 4/10	4/10	ATQ 1 ¼	1 ¼	ATQ 2 1/8	2 1/8	ATQ 3 ½	3 ½	ATQ 6 ¼	6 ¼	ATQ 14	14
ATQ 15/100	15/100	ATQ ½	½	ATQ 1 4/10	1 4/10	ATQ 2 ¼	2 ¼	ATQ 4	4	ATQ 7	7	ATQ 15	15
ATQ 3/16	3/16	ATQ 5/10	5/10	ATQ 1 ½	1 ½	ATQ 2 ½	2 ½	ATQ 4 ½	4 ½	ATQ 8	8	ATQ 20	20
ATQ 2/10	2/10	ATQ 6/10	6/10	ATQ 1 6/10	1 6/10	ATQ 2 6/10	2 6/10	ATQ 5	5	ATQ 9	9	ATQ 25	25
ATQ ¼	¼	ATQ 1	1	ATQ 1 8/10	1 8/10	ATQ 3	3	ATQ 5 6/10	5 6/10	ATQ 10	10	ATQ 30	30

Industrial Control Transformers
Class 9070



Type TF: Factory Installed Primary and Secondary Fusing

Voltage Code D1

UL/CSA VA	CE VA	Type	D1 240 X 480 120	Dimension Accessory KEY
50	50	TF50	$ 50.00	I
75	75	TF75	56.00	I
100	100	TF100	61.00	I
150	150	TF150	65.00	I
200	200	TF200	77.00	I
250	150	TF250	87.00	I
300	200	TF300	95.00	I
350	250	TF350	100.00	I
500	300	TF500	120.00	I
750	500	TF750	161.00	I
1000	750	TF1000	194.00	I
1500	1000	TF1500	269.00	I
2000	1500	TF2000	324.00	I

Voltage Code D23

UL/CSA VA	CE VA	Type	D23 120/240 24	Dimension Accessory KEY
50	50	TF50	$ 56.00	I
75	75	TF75	64.00	I
100	100	TF100	70.00	I
150	150	TF150	84.00	I
200	200	TF200	89.00	I
250	150	TF250	116.00	I
300	200	TF300	129.00	I
350	250	TF350	131.00	I
500	300	TF500	158.00	I

Voltage Code D20

UL/CSA VA	CE VA	Type	D20 208/230/460 115	Dimension Accessory KEY
50	50	T50	$ 82.00	II
100	100	T100	89.00	II
150	150	T150	109.00	II
200	200	T200	134.00	II
300	200	T300	166.00	II
500	300	TF500	185.00	II

Voltage Code D2, D3 and D5

UL/CSA VA	CE VA	Type	D2 240 x 480 24	D3 208 120	D5 600 120	Dimension Accessory KEY
50	50	TF50	$ 56.00	$ 56.00	$ 56.00	I
100	100	TF100	70.00	70.00	70.00	I
150	150	TF150	84.00	84.00	84.00	I
300	200	TF300	129.00	129.00	129.00	I
500	300	TF500	158.00	158.00	158.00	I

Dimensions

VA Key I	VA Key II	VA Key III	Figure	A	B	C	D▲	E	F	G★	SLOT
25 VA	...	...	3	3.09	3.00	4.00	3.84	2.00	2.50	4.20	.20 x .38
...	...	25 VA	3	4.00	3.43	4.00	4.80	2.00	2.50	4.20	.20 X .48
50 VA	25 VA	...	3	3.09	3.00	4.00	3.84	2.00	2.50	4.20	.20 x .38
...	...	50 VA	3	4.19	3.43	4.25	4.99	2.38	2.81	4.45	.20 X .48
75 VA	50 VA	...	3	3.34	3.38	4.25	4.09	2.38	2.81	4.45	.20 X .48
...	75 VA	...	3	3.59	3.75	4.55	4.34	2.88	3.13	4.75	.20 x .38
...	...	75 VA	3	4.88	3.75	4.55	5.68	2.88	3.13	4.75	.20 x .38
100 VA	...	...	3	3.34	3.38	4.25	4.09	2.38	2.81	4.45	.20 X .48
...	...	100 VA	3	4.88	3.75	4.55	5.68	2.88	3.13	4.75	.20 x .38
150 VA	100 VA	...	3	3.59	3.75	4.55	4.34	2.88	3.13	4.75	.20 x .38
200 VA	150 VA	...	3	3.59	3.75	4.55	4.34	2.88	3.13	4.75	.20 x .38
250 VA	...	150 VA	3	5.25	3.75	4.55	6.05	2.88	3.13	4.75	.20 x .38
300 VA	200 VA	200 VA	3	4.70	4.50	5.10	5.50	2.56	3.75	5.30	.20 x .38
350 VA	250 VA	250 VA	3	5.09	4.50	5.10	5.89	3.00	3.75	5.30	.20 x .38
...	300 VA	...	3	5.09	4.50	5.10	5.89	3.00	3.75	5.30	.20 x .38
...	...	300 VA	3	5.46	4.50	5.10	6.26	3.56	3.75	5.30	.20 x .38
500 VA	350 VA	...	3	5.46	4.50	5.10	6.26	3.56	3.75	5.30	.20 x .38
...	...	350 VA	3	5.46	4.50	5.10	6.26	3.56	3.75	5.30	.20 x .38
750 VA	500 VA	500 VA	3	5.66	5.25	5.73	6.46	3.43	4.38	5.93	.28 X .56
1000 VA	750 VA	750 VA	3	6.04	5.25	5.73	6.84	4.31	4.38	5.93	.28 X .56
1500 VA	1000 VA	1000 VA	3	5.81	7.06	7.46	6.61	4.13	5.81	7.66	.28 X .56
2000 VA	1500 VA	1500 VA	3	7.04	7.06	7.46	7.84	4.56	5.81	7.66	.28 X .56

▲ Dimensions with fingersafe covers installed
★ Dimensions with fuse pullers installed.

Field Installed Fuse Options

Primary And Secondary Fusing

Catalog	List Price	Accessory Key		
9070FB-3A	$26.40	I: 25-200VA	II: 25-150VA	
9070FB-3B	26.40	I:250-2000VA	II: 200-1500VA	III: 25-1500VA

Primary Fusing

Catalog	List Price	Accessory Key		
9070FB-2A	$22.70	I: 25-200VA	II: 25-150VA	
9070FB-2B	22.70	I:250-2000VA	II: 200-1500VA	III: 25-1500VA

Secondary Fusing

Catalog	List Price	Accessory Key		
9070FB-1A	$15.80	I: 25-200VA	II: 25-150VA	
9070FB-1B	15.80	I:250-2000VA	II: 200-1500VA	III: 25-1500VA
9070SF25A	6.60	I: 25-200VA	II: 25-150VA	
9070SF25B	6.60	I:250-2000VA	II: 200-1500VA	III. 25-1500VA
9070SF41A*	5.40	I: 25-200VA	II: 25-150VA	
9070SF41B*	5.40	I:250-2000VA	II: 200-1500VA	III. 25-1500VA

▲ Only used on single secondary voltage codes

Fuse Pulles (use on TF, and FB accessory)

Catalog	List Price
9070FP-1	$9.90

Factory Installed Secondary Fuse Clips

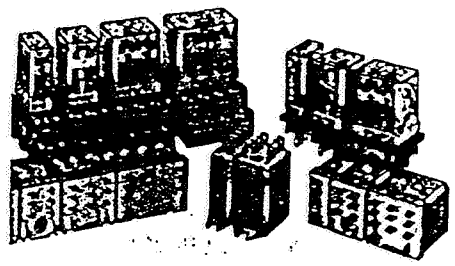
D1:240 x 480-120

UL/CSA VA	CE VA	Catalog Number	List Price
50	50	9070T50D1SF41	$ 40.30
100	100	9070T100D1SF41	52.00
150	150	9070T150D1SF41	55.00
250	150	9070T250D1SF41	79.00
500	300	9070T500D1SF41	113.00
750	500	9070T750D1SF41	154.00

How to Order:

To Order Specify:	Catalog Number		
	Class	Type	Voltage Code
• Class Number • Type Number • Voltage Code	9070	TF500	D1

General Purpose "Midget" Relays
10A Contact Rating
1, 2, 3, & 4 Form C Contact



Features

- Compact "Midget" size package saves space
- Large switching capacity, (10A)
- Choice of blade or PCB style terminals
- Relay options include indicator light, check button, and top mounting bracket
- DIN rail, surface, panel and PCB type sockets available for a wide range of mounting applications
- UL recognized and CSA certified

UL Recognized
Files No. E67770
E59804
E64245

CSA Certified
File No.LR35144

RH Series Part List

Termination	Contact Configuration	Basic Part No.	Basic Part No. w/ Indicator Light	Check Button	Indicator Light & Check Button	Top Bracket
B (Blade)	SPDT	RH1B-U	—	—	—	RH1B-UT
	DPDT	RH2B-U	RH2B-UL	RH2B-UC	RH2B-ULC	RH2B-UT
	3PDT	RH3B-U	RH3B-UL	RH3B-UC	RH3B-ULC	RH3B-UT
	4PDT	RH4B-U	RH4B-UL	RH4B-UC	RH4B-ULC	RH4B-UT
V2 (PCB 0.078" (2mm) wide)	SPDT	RH1V2-U	—	—	—	—
	DPDT	RH2V2-U	RH2V2-UL	RH2V2-UC	RH2V2-ULC	—
	3PDT	RH3V2-U	RH3V2-UL	RH3V2-UC	RH3V2-ULC	—
	4PDT	RH4V2-U	RH4V2-UL	RH4V2-UC	RH4V2-ULC	—

2

Coil Ratings

Rated Voltage		Rated Current ±15% @20°C; 60Hz SPDT	DPDT	3PDT	4PDT	Rated Current ±15% @20°C; 50Hz SPDT	DPDT	3PDT	4PDT	Coil Resistance ±15% @ 20°C SPDT	DPDT	3PDT	4PDT
AC	6V	150mA	200mA	280mA	330mA	170mA	238mA	330mA	387mA	18.8Ω	9.4Ω	6.0Ω	5.4Ω
	12V	75mA	100mA	140mA	165mA	86mA	118mA	165mA	196mA	76.8Ω	39.3Ω	25.3Ω	21.2Ω
	24V	37mA	50mA	70mA	83mA	42mA	59.7mA	81mA	98mA	300Ω	153Ω	103Ω	84.5Ω
	120V	7.5mA	11mA	14.2mA	16.5mA	8.6mA	12.9mA	16.4mA	19.5mA	7680Ω	4170Ω	2770Ω	2220Ω
	*240V	—	5.5mA	7.1mA	8.3mA	—	6.5mA	8.2mA	9.8mA	—	15210Ω	12100Ω	9120Ω
	—	SPDT		DPDT		3PDT		4PDT		SPDT	DPDT	3PDT	4PDT
DC	6V	128mA		150mA		240mA		250mA		47Ω	40Ω	25Ω	24Ω
	12V	64mA		75mA		120mA		125mA		188Ω	160Ω	100Ω	96Ω
	24V	32mA		36.9mA		60mA		62mA		750Ω	650Ω	400Ω	388Ω
	48V	18mA		18.5mA		30mA		31mA		2660Ω	2600Ω	1600Ω	1550Ω
	*110V	—		9.1mA		12.8mA		15mA		—	12100Ω	8600Ω	7340Ω

Operational Characteristics

Maximum continuous applied voltage (AC/DC) @ 20°C	110% of rated voltage
Minimum operating voltage (AC/DC) @ 20°C	80% of rated voltage
Drop-out voltage (AC)	30% or more of the rated voltage
Drop-out voltage (DC)	10% or more of the rated voltage

*Note: Rated voltage marked with asterisk are not available in SPDT.

Note: See page D2-14 for dimensions.

Contact Ratings

UL Ratings		
Motor Load	SPDT, DPDT	3PDT
120V AC	1/6HP	1/6 HP
240V AC	1/3 HP	1/3 HP

Note: Contact ratings continued on following page

Ordering Information

Ordering standard voltages results in quickest delivery. Allow extra delivery time for non-standard voltages.

Basic Part No. Coil Voltage:

RH2B-U — AC120V

Contact Ratings

Voltage	Rating	Resistive				Inductive			
		SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT
28V DC	UL	10A	10A	10A	10A	7.5A	—	—	7.5A
30V DC	UL	10A	10A	10A	—	7A	7A	—	—
	CSA				10A		7.5A		
	Nominal							7.5A	7.5A
120V AC	UL	10A	10A	10A	10A	7.5A	—	—	7.5A
	CSA						7.5A		
	Nominal					7A		7.5A	
240V AC	UL	10A	10A		7.5A	7A	7A		5A
	CSA							7A	
	Nominal	7A	7.5A	7.5A	4.5A	5A	5A	5A	

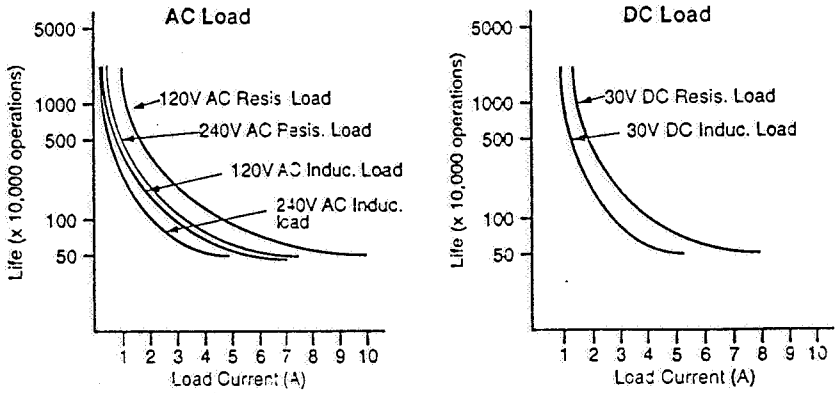
*Note: 6.5A/pole, 20A total.
Note: Inductive load cos ø = 0.3, L/R = 7 msec

Sockets

Relay	Sockets					Spring (Optional)
	DIN Rail Mount		Surface Mount	Panel Mount	PCB Mount	
	Standard	Fingersafe				
RH1B	SH1B-05	SH1B-05C	—	SH1B-51	SH1B-62	SY2S-02F1 SFA-101 SFA-202 SY4S-51F1 SFA-301 SFA-302
RH2B	SH2B-05	SH2B-05C	SH2B-02	SH2B-51	SH2B-62	SY4S-02F1 SFA-101 SFA-202 SY4S-51F1
RH3B	SH3B-05	SH3B-05C	—	SH3B-51	SH3B-62	SH3B-05F1 SFA-101, -202 SY4S-51F1
RH4B	SH4B-05	SH4B-05C		SH4B-51	SH4B-62	SH4B-02F1 SFA-101, -202 SY4S-51F1

Note: See section F for details on sockets. All DIN rail mount sockets shown above can be mounted using DIN Rail BNDN-1000.

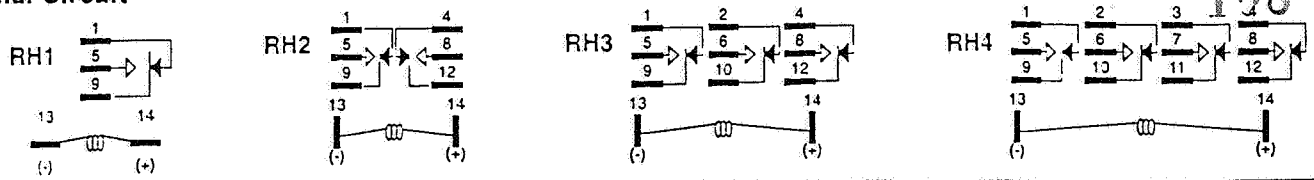
Electrical Life Curves



Specifications

Contact Material	Silver cadmium oxide (AgCdO)
Contact Res.	50mΩ max. (Initial value)
Minimum Applicable Load	24V DC/30mA, 5V DC/100mA (reference value)
Operating Time	SPDT(RH1), DPDT (RH2): 20ms max. 3PDT (RH3), 4PDT (RH4): 25ms max.
Release Time	SPDT(RH1), DPDT (RH2): 20ms max. 3PDT (RH3), 4PDT (RH4): 25ms max.
Power Consumption	SPDT (RH1): DC: 0.8W AC: 1.1VA (50Hz), 1VA (60Hz) DPDT (RH2): DC: 0.9W AC: 1.4VA (50Hz), 1.2VA (60Hz) 3PDT (RH3): DC: 1.5W AC: 2VA (50Hz), 1.7VA (60Hz) 4PDT (RH4): DC: 1.5W AC: 2.5VA (50Hz), 2VA (60Hz)
Insulation Resistance	100MΩ min (measured with a 500V DC megger)
Dielectric Strength	SPDT (RH1) Betw. live and dead parts: 2000V AC, 1 minute; Betw. contact circuit and operating coil: 2000V AC, 1 minute; Between contacts of the same pole: 1000V AC, 1 minute
	DPDT (RH2), 3PDT (RH3), 4PDT (RH4) Betw. live and dead parts: 2000V AC, 1 minute; Betw. contact circuit and operating coil: 2000V AC, 1 minute; Between contact circuits: 2000V AC, 1 minute; Between contacts of the same pole: 1000V AC, 1 minute
Freq. Response	1800 operations/hr
Temperature Rise	Coil: 85°C max. Contact: 65°C max.
Vibration Resistance	0 to 6G (55Hz max.)
Shock Resistance	SPDT/DPDT: 200N (approx. 20G) 3PDT/4PDT: 100N (approx. 10G)
Life Expectancy	Electrical: over 500,000 operations at 120V AC, 10A; (over 200,000 operations at 120V AC, 10A for SPDT (RH1), 3PDT (RH3), 4PDT (RH4). Mechanical: 50,000,000 operations
Operating Temp.	-30° to +70°C
Weight	SPDT: 24g. DPDT: 37g (approx.) 3PDT: 50g. 4PDT: 74g (approx.)

Internal Circuit



Class 9001 – Type SK, 30mm
Corrosion Resistant Selector Switches

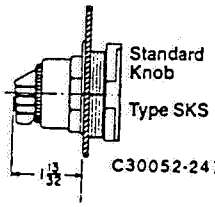
Non-Illuminated and Illuminated 3 Position Selector Switch Operators
UL Types 4, 4X, 13/NEMA Types 4, 4X, 13

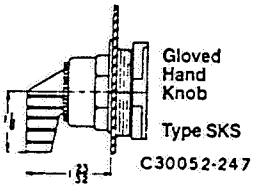
For use in hazardous locations – See Page 15-67.

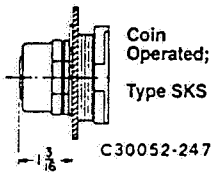
Legend plate and contact block not included unless noted.

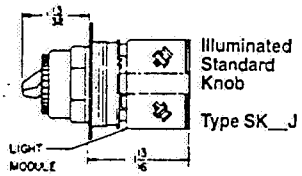
9001 SK ____ ____ ____ ____ ____ ____ ____ ____

Standard Knob Selector Switch 9001SKS



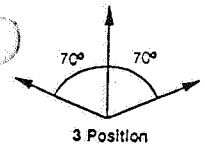






Selector Switch Knobs

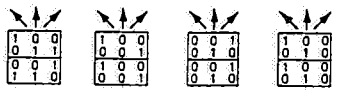
Standard Knob | Gloved Hand Knob | Coin Operated



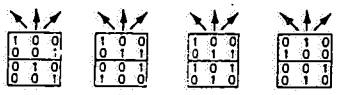
Corrosion Resistant

		Price
Non-illuminated selector switch	S	
Illuminated selector switch	Blank	
Switch Operation		
Manual return	4	$16.10
Spring return left to center	6	28.80
Spring return right to center	7	28.80
Spring return both sides to center	5	28.80

Switch Operation & Cam Codes •
(Choose one based on contact closure sequence)



Codes: 2 3 4 5 — 2.80



Codes: 6 7 9 01 — 2.80

Codes: 02 — 2.80

No Cam		N/C
Illuminated Operator	J	N/C
Non-Illuminated Operator	Blank	N/C
Illuminated Operator: Add Voltage Assembly Code	Blank	N/C
Non-Illuminated Operator	#	
Knob Type		
Standard	Blank	N/C
Gloved Hand	F	N/C
Coin Operated	T	N/C
Knob Color Codes		
◆ Amber	A	4.40
✖ Black	B	4.40
Clear	C	4.40
Green	G	4.40
Blue	L	4.40
Red	R	4.40
◆✖ Orange	S	4.40
◆ White	W	4.40
Yellow	Y	4.40
No Color or Two Color Knob	Blank	N/C
"H" Suffix Numbers for Contact Blocks	@	
No Contact Blocks	Blank	N/C
▲ Two color Selector Switch Knob		
Standard	Y178	19.00
Gloved Hand	Y1781	19.00
Non-Illuminated, Coin Operated or Not Desired	Blank	N/C

• Cam Codes

Code	Cam Type
2	B
3	C
4	D
5	E
6	F
7	G
9	J
01	L
02	M

✖ Not available in illuminated switches.
Choose Voltage Assembly Code from page 15-65. For neon light modules, use **Clear** knob color only. For **LED** light modules, use a knob color that matches the color of the LED (i.e., red LED uses a red knob) or use clear. Price based on light module chosen.
◆ Not available in coin operated knobs.
@ Select from "H" number table on page 15-68. Maximum contact block usage: Maintained switch - 2 blocks mounted in tandem (4 blocks total); Spring return - 2 blocks mounted side-by-side only. Price based on total contact blocks.
▲ Two Color Knobs are used to indicate red in the left position and green in the right position on illuminated operators. Do not add a knob color code when using Form Y178 or Y1781.

Boots ..... Page 15-71
Color Inserts and Mushroom Knobs ..... Page 15-72
Contact Blocks and Ratings ..... Pages 15-66 – 15-67
Hazardous Locations Applications ..... Page 15-67
"H" Contact Block Assembly Codes ..... Page 15-68
Light Modules ..... Page 15-65
Legend Plates ..... Pages 15-69 – 15-70
Lockouts ..... Page 15-71
Replacement Parts ..... Page 15-73
Ring Nuts ..... Page 15-73

For additional information, reference: Catalog Number 9001CT9701 or D-Fax™ #1549.

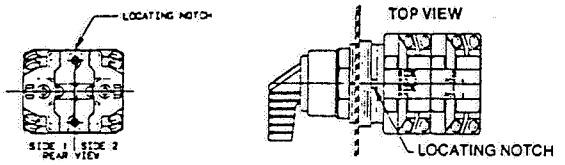
Class 9001 – Type K, SK and KX, 30mm
Contact Block "H" Numbers

Suffix No. (Add to Operator Type No.)	Price	Positions					
		1	2	3	4	5	6
H1	$ 19.	KA1					
H2	38.	KA1	KA1				
H3	57.	KA1	KA1	KA1			
H4	76.	KA1	KA1	KA1	KA1		
H5	9.50	KA2					
H6	9.50	KA3					
H7	19.	KA2	KA2				
H8	19.	KA3	KA3				
H9	38.	KA4	KA1				
H10	28.50	KA4	KA5				
H11	57.	KA1	KA1		KA1		
H12	38.	KA2	KA3	KA2	KA3		
H13	19.		KA1				
H14	9.50		KA3				
H15	28.50	KA2	KA3	KA2			
H16	28.50	KA2	KA3		KA3		
H17	47.50	KA1	KA1	KA2			
H18	47.50	KA3	KA1	KA3		KA3	
H19	95.	KA1	KA1	KA1	KA1	KA1	
H21	19.	KA2	KA3				
H23	114.	KA1	KA1	KA1	KA1	KA1	KA1
H24	28.50	KA1	KA2				
H25	19.	KA5	KA3				
H26	57.	KA1	KA1	KA4			
H27	28.50	KA3	KA3	KA3			
H28	28.50	KA1	KA3				
H29	95.	KA1	KA4	KA1	KA5	KA1	KA3
H31	38.	KA2	KA2	KA1			
H32	38.		KA1		KA1		
H33	38.	KA1	KA3	KA3			
H34	28.50	KA5	KA1				
H36	9.50		KA2				
H37	19.	KA3	KA2				
H38	38.	KA3	KA2	KA3	KA2		
H39	38.	KA5	KA1		KA3		
H40	57.	KA1	KA1		KA4		
H41	28.50	KA3	KA2		KA2		
H42	57.	KA1	KA1	KA2	KA2		
H43	28.50	KA2	KA2	KA2			
H44	28.50	KA3	KA2		KA3		
H45	47.50	KA1	KA2	KA3	KA2		
H46	28.50	KA2	KA2		KA2		
H47	57.	KA5	KA3	KA3	KA5	KA3	KA3
H48	76.	KA1	KA1	KA4	KA4		
H50	39.	KA5	KA3	KA3			
H51	39.	KA5	KA3		KA3		
H52	39.	KA3	KA1	KA3	KA4		
H53	28.50	KA4	KA2				
H54	39.	KA4	KA5	KA2			
H55	57.	KA1	KA2	KA2			
H56	39.	KA2	KA2	KA2			
H57	28.50	KA5	KA4		KA2	KA1	
H58	9.50		KA5				
H59	47.50	KA1	KA2	KA1			
H60	57.	KA1	KA2	KA1			
H61	39.	KA2	KA2	KA5			
H62	39.	KA1	KA2	KA3	KA5	KA3	
H63	28.50	KA1		KA3			
H64	28.50	KA3	KA2	KA2			
H66	57.	KA3	KA1	KA3	KA1		
H71	39.	KA3	KA3	KA3	KA3		
H72	19.	KA3	KA5				
H73	47.50	KA1	KA1	KA3			
H74	47.50	KA1	KA2	KA5	KA5		
H75	57.	KA1	KA3	KA3	KA3	KA3	
H76	57.	KA1	KA2	KA2	KA2	KA2	
H77	39.	KA1		KA1			
H78	39.	KA1	KA2		KA5		
H79	28.50	KA3	KA3		KA5		
H80	57.	KA4	KA4	KA5	KA5		
H81	57.	KA1	KA1	KA2	KA3		
H82	63.	KA12	KA12	KA13	KA13		
H83	31.70	KA35	KA33				
H86	28.50	KA3	KA2	KA3			
H87	47.50	KA3	KA2	KA3	KA2	KA3	
H89	28.50	KA3	KA1				
H90	66.50	KA1	KA1				
H91	57.	KA1	KA2	KA3	KA3	KA3	
H92	57.	KA1	KA2	KA1	KA2		
H93	57.	KA3	KA2	KA3	KA2	KA3	
H94	85.50	KA1	KA1	KA3	KA5	KA5	KA3
H95	28.50	KA2	KA1	KA1	KA3	KA3	KA3
H97	39.	KA1	KA3		KA2		
H98	76.	KA1	KA1	KA1	KA2		KA2
H99	47.50	KA2	KA2	KA2	KA2	KA2	
H100	57.	KA1	KA3	KA1	KA2		
H101	57.	KA2	KA2	KA2	KA2	KA2	KA2
H102	39.	KA1	KA3		KA3		
H103	57.	KA1	KA1	KA3	KA3		
H104	85.50	KA1	KA1	KA1	KA2	KA2	KA2
H105	31.70	KA31					
H106	63.	KA31	KA31				
H107	29.	KA3	KA2	KA5			
H109	29.	KA3	KA3	KA2			
H110	57.	KA3	KA3	KA3	KA3	KA3	KA3
H111	66.50	KA4	KA4	KA4	KA5		
H112	31.70	KA33	KA33				
H113	47.50	KA1	KA1	KA5			
H114	19.	KA21					

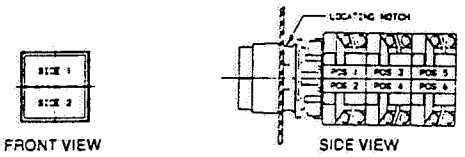
The design of the Class 9001 Type KA contact blocks allows them to be mounted side by side and/or in tandem.

The system illustrated below has been set up to enable an operator and a particular arrangement of contact blocks to be specified by a single type number. Operators and contact blocks will be shipped completely assembled.

EXAMPLE: A Type KR1B push button with 2 Type KA1 contact blocks would be Class 9001 Type KR1BH2.



For Types K and SK



For Type KX

Suffix No. (Add to Operator Type No.)	Price	Positions					
		1	2	3	4	5	6
H115	$ 47.50	KA3	KA1	KA5	KA3		
H116	47.50	KA3	KA1	KA3	KA2		
H117	57.	KA2	KA3	KA1	KA2	KA2	
H118	28.50	KA1	KA5				
H119	57.	KA1	KA1	KA5	KA3		
H120	38.	KA3	KA4	KA3			
H121	38.	KA3	KA3	KA3	KA5		
H122	38.	KA1	KA3		KA5		
H124	19.		KA3		KA3		
H125	28.50.	KA5	KA5	KA3			
H126	19.	KA42					
H127	19.	KA43					
H128	38.	KA41					
H129	19.	KA2		KA2			
H130	28.50	KA2	KA3		KA2		
H131	28.50	KA2		KA3		KA2	
H132	38.	KA2	KA2	KA3	KA3		
H133	19.	KA3		KA2			
H134	38.	KA3	KA3	KA2	KA2		
H135	38.	KA3	KA2	KA2	KA2		
H136	19.	KA3		KA5			
H137	152.	KA45	KA45	KA44	KA44		
H138	28.50	KA3	KA3		KA2		
H139	19.	KA5	KA5				
H140	38.	KA44					
H141	38.	KA43	KA43				
H142	76.	KA1	KA1				
H143	38.	KA3	KA1	KA41			
H144	38.		K85	KA5			
H145	63.	KA51			KA4		
H146	89.	KA53	KA52				
H147	44.50	KA53					
H148	126.	KA51	KA51				
H152	38.	KA1	KA2		KA2		
H153	133.	KA53	KA52	KA53			
H154	28.50	KA4	KA5				
H155	47.50	KA42	KA43	KA2			
H156	95.	KA1	KA1	KA1	KA1	KA2	KA2
H157	47.50	KA1		KA1		KA2	
H158	47.50	KA1	KA2	KA3	KA3		
H159	57.	KA1	KA1	KA3	KA2		
H161	44.50	KA52					
H162	19.	KA2		KA5			
H163	38.	K85		KA4			
H164	76.	K85	K85	KA4	KA4		
H165	63.	KA55					
H166	19.	KA22	KA22				
H167	9.50		KA23				
H168	9.50		KA22				
H170	190.	KA54	KA51		KA51		
H171	108.	KA53	KA51				
H172	19.	KA23	KA23				
H173	126.	KA54	KA51				
H174	57.	KA1	KA3	KA1	KA3		
H175	38.	KA6	KA2	KA5	KA5		
H176	19.	KA4					
H177	28.50	KA3	KA4				
H178	28.50	K85		KA3			
H179	107.50	KA53	KA55				

"H" Numbers not shown in their sequence are no longer used.

For additional information, reference: Catalog Number 9001CT9701 or D-Fax™ #1548.

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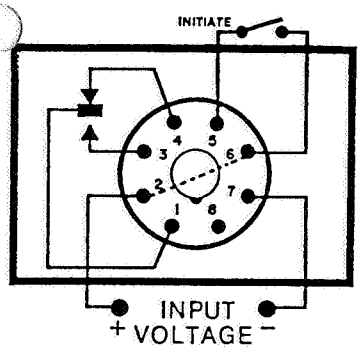
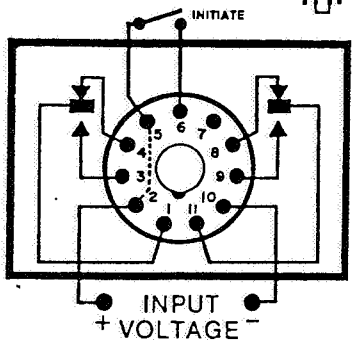
CONNECTION



OCTAL, SPDT



11 PIN, DPDT
SUFFIX D

Note: Relay contacts are isolated from input voltage.
····· Internal Electrical Connection

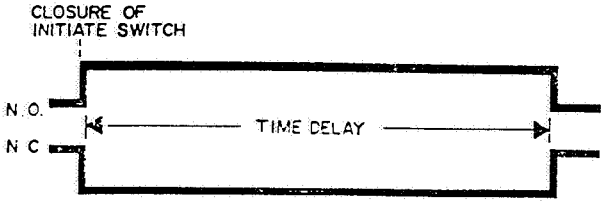
OPERATION

Single Shot: Power must be applied to the input at all times prior to and during timing. Upon closure of the initiate switch (momentary or maintained) the output contacts transfer and the time delay is initiated. At the end of the delay interval, the output contacts revert to their original position.

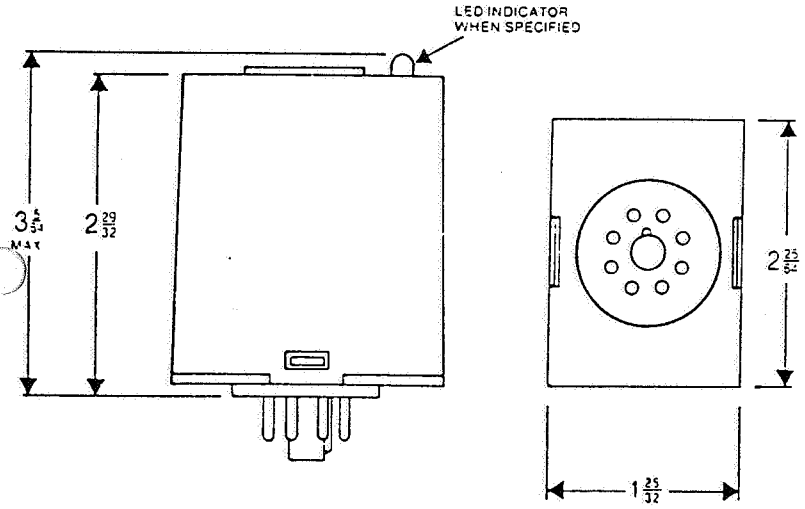
Single Shot

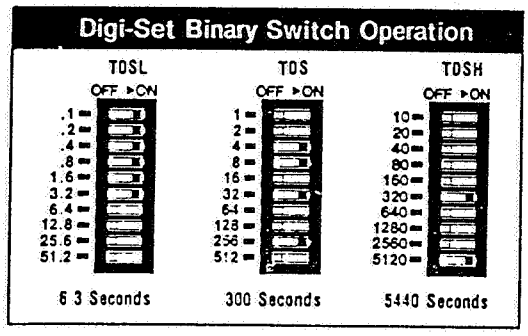
B

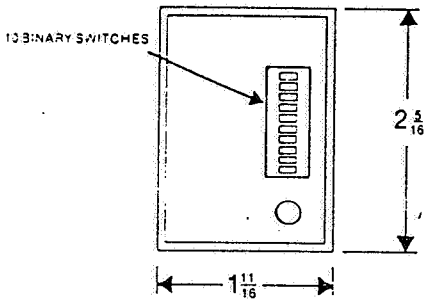
Time Diagram: Output Contacts



MECHANICAL







ORDERING INFORMATION

Series/Time Range	Input Voltage	LED Indication	Type Plug/Output Form
TDSL 0.1 to 102.3 seconds in 0.1 second increments ☆ TDS 1 to 1023 seconds in 1 second increments TDSH 10 to 10,230 seconds in 10 second increments	12VDC 24VDC/28VDC 110VDC 24VAC ☆ 120VAC 230VAC	☆ L Note: LED not available in DC voltages	Suffix D - 11 Pin Plug, Double Pole Double Throw ☆ No Suffix - Octal (8 Pin) Plug, Single Pole Double Throw

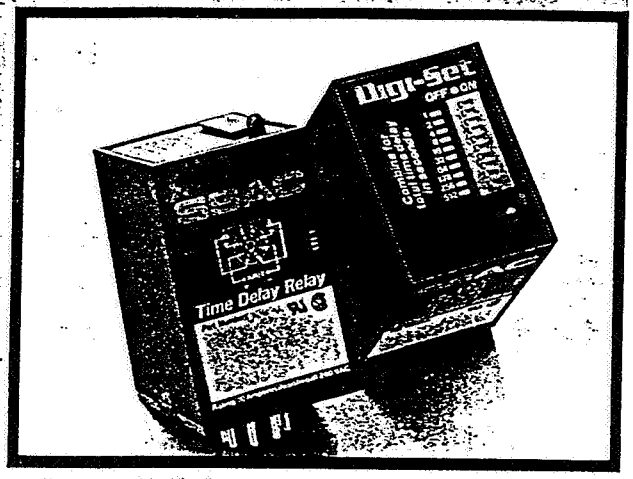
☆ Example Part Number: TDS120AL is a Digi-Set single shot timer, 120 volts AC operation with LED indication, and octal plug-in SPDT output.

PO Box 1000, Baldwinsville, NY 13027 Application Assistance 800-377-SSAC (7722)
Internet Address http://www.ssac.com Phone (315) 638-1300 Fax (315) 638-0333
SSAC INC

Digi-Set TIME DELAY RELAY

TDSL, TDS, TDSH Series
(Single Shot, Interval)

- ☐ Digital Integrated Circuitry
- ☐ Switch Setable Time Delay
- ☐ Three Time Ranges from 100 Milliseconds to Over 2.8 Hours
- ☐ ± 0.1 % Repeat Accuracy
- ☐ ± 2% Setting Accuracy
- ☐ SPDT or DPDT, 10 Amperes Output Contacts
- ☐ LED Indication
- ☐ UL and CSA



DESCRIPTION

Digi-Set timers are a combination of state-of-the-art technology and time proven factors. The result, a control unequalled in performance, features, and reliability.

A. C/MOS digital circuitry that incorporates a stable oscillator and a counting/storage arrangement to provide high repetitive accuracy and stability over a wide range of voltage and temperature. No long first-shot effect or shelf life to consider.

B. Digital selection of time delay by use of ten (10) binary switches. No trial-by-error adjustments or meaningless dials. Set the desired time delay the first time and every time. Three ranges to choose from.

C. Proven electromechanical relay provides isolated output switching. Contacts are 10 ampere silver cadmium oxide that provide millions of reliable operations.

SPECIFICATIONS

1. **Time Delay**
   - 1.1 Type: Digital C/MOS circuitry
   - 1.2 Range: Three ranges (see *Ordering Information*). Selection of the desired time delay is made by means of ten (10) binary switches located at the top end of the unit. To obtain the desired time delay, the time periods for each switch in the ON position are *added* together.
   - 1.3 Repeat Accuracy: ± 0.1 % (no first shot effect)
   - 1.4 Setting Accuracy: ± 2% or 50 milliseconds whichever is greater
   - 1.5 Reset Time: 50 milliseconds maximum
   - 1.6 Recycle Time: 150 milliseconds maximum
   - 1.7 Time Delay vs. Temperature & Voltage: ±5%
   - 1.8 Indicator: LED indicates during timing
   - 1.9 Initiate Time: 60 milliseconds maximum
2. **Input**
   - 2.1 Operating Voltage: 12, 24, 120, and 230 volts
   - 2.2 Tolerance: ± 20% of nominal
   - 2.3 Frequency: 50 or 60 Hertz
   - 2.4 Power Consumption: 3.25 watts maximum
3. **Output**
   - 3.1 Type: Electromechanical relay
   - 3.2 Form: Single pole double throw, Double pole double throw
   - 3.3 Rating: 10 amperes resistive at 240VAC
   - 3.4 Life: Mechanical - 10,000,000 operations
     Full load - 1,000,000 operations
4. **Protection**
   - 4.1 Transient: ± 1500 volts for 150 microseconds
   - 4.2 Dielectric Breakdown: 1500 volts RMS minimum at 60 Hertz between input and output terminals
   - 4.3 DC units are reverse polarity protected
5. **Mechanical**
   - 5.1 Mounting: Plug-in
   - 5.2 Termination: Standard octal plug (8 Pin) or 11 Pin Plug-in
6. **Environmental**
   - 6.1 Operating Temperature: -20°C to + 65°C
   - 6.2 Storage Temperature: -30°C to + 85°C
7. **Panel Mounting Accessory**

BZ1 PANEL MOUNT KIT available for SSAC Plug-in Controls. Also, Octal 8 pin and 11 pin flush mount sockets. See *Accessories*.

PO Box 1000, Baldwinsville, NY 13027 Application Assistance 800 377 SSAC (7722)

Class 9001 – Type SK, 30mm
Corrosion Resistant Pilot Lights

Standard Pilot Light (Plastic Fresnel Color Cap Shown) 9001SKP

Plastic Fresnel 9001_31

Push-To-Test Pilot Light (Plastic Fresnel Color Cap Shown) 9001SKT

Plastic Dome 9001_9

Remote Test Pilot Light (Plastic Fresnel Color Cap Shown) 9001SKTR

Pilot Lights – UL Types 4, 4X, 13/NEMA Types 4, 4X, 13

For use in hazardous locations – See Page 15-67.
Legend plate not included.

Description	Lens Type	Color	Voltage/Light Module Style	Type Number	Price
Standard Pilot	Plastic Dome	Green	110-120VAC, 50-60Hz Transformer	SKP1G9	$ 68.00
Light	Plastic Fresnel	Red	24-28VAC/DC/Full Voltage	SKP35R31	55.00
Push-to-Test	Plastic Dome	Green	110-120VAC/DC/Full Voltage	SKT38G9	74.00
Pilot Light	Plastic Fresnel	Red	Other	SKT#R31	(1)
Remote Test	Plastic Fresnel	Amber	220-240VAC, 50-60Hz Transformer	SKTR7A31	99.00
Pilot Light	Plastic Dome	Clear	24-28VAC/DC/Full Voltage	SKTR35C9	87.00

(1) List price is dependent on light module style used.
Select voltage assembly code from page 15-65.

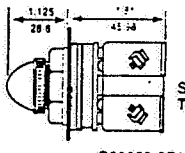
9001 SK ____ ____ ____

Corrosion Resistant

	Pilot Light Types		Price
	Standard Pilot Light	P	$ 12.70
▲	Push-to-Test Pilot Light	T	31.70
▲✱	Remote Test Pilot Light	TR	44.00
	Voltage Assembly Code	#	
	No Light Module (SKP only)	Blank	N/C

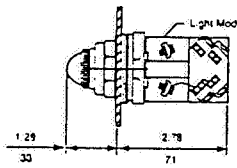
Lens Colors and Types ● (Choose one)	Plastic Fresnel	Price	Plastic Dome	Price
Amber	A31	$ 4.40	A9	$ 4.40
Clear	C31	4.40	C9	4.40
Green	G31	4.40	G9	4.40
Blue	L31	4.40	L9	4.40
Red	R31	4.40	R9	4.40
White	W31	4.40	W9	4.40
Yellow	Y31	4.40	Y9	4.40
No Color	Blank	N/C		

▲ Push-to-Test Pilot Lights are preassembled with one Type KA1 (1N.O./1N.C.) contact block and jumpers and Remote Test pilot Lights are preassembled with one dummy contact block and diodes. No base operators available.
✱ Use only Full Voltage or Resistor light modules (AC only) on Remote Test Pilot Lights. Do not use LED, neon, or transformer.
Choose Voltage Assembly Code from page 15-65. For neon light modules, use a Clear lens only. Price based on light module chosen. Must include when ordering Types SKT and SKTR.
● For LEDs, use Plastic Fresnel lens and match lens color with lamp color (i.e.; green LED uses a green Plastic Fresnel lens) or use a Clear lens.



Standard Type SKP

B30052-271



Push-To-Test Type SKT

C30052-271

Pilot Light For Intrinsically Safe Circuits (NEMA 4X) 9001KP44

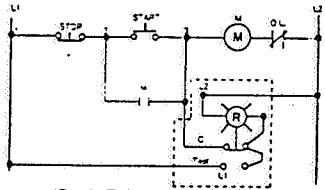
Intrinsically Safe Pilot Lights, NEMA Types 4, 4X, 13

Intrinsically safe equipment must not release electrical or thermal energy capable of igniting certain explosive or combustible hazardous atmospheres, for which the equipment has been tested. These pilot lights are intrinsically safe when used with a suitable approved barrier or barrier relay (e.g.; Class 8501 Type TO or NY2). These pilot lights are Factory Mutual FM# J.I. OH4A2,AX,3610 (FM Approved). Consult your local Square D Sales Office for further details. These pilot lights are fully encapsulated - there are no replaceable parts - except for the Type SK40 ring nut. Use the Type KN100 series plastic legend plates.

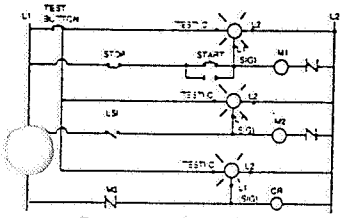
Lens Type ●	Color	Operating Voltage	Nominal Current	Type No.	Price
Plastic Fresnel	Red	20-30VAC/DC	25mA	KP44R	$ 79.00
	Green	(V max. = 32V)	(I max. = 165mA)	KP44G	
	Yellow			KP44Y	

● Only lens style available and not replaceable.

Typical Wiring Diagrams



Push-To-Test Pilot Light



Remote Test Pilot Light

Boots ..... Page 15-71
Color Inserts and Mushroom Knobs ..... Page 15-72
Contact Blocks and Ratings ..... Pages 15-66 – 15-67
Hazardous Locations Application ..... Page 15-67
"H" Contact Block Assembly Codes ..... Page 15-68
Legend Plates ..... Pages 15-69 – 15-70
Light Modules ..... Page 15-65
Replacement Parts ..... Page 15-73
Ring Nuts ..... Page 15-73
Voltage Assembly Codes ..... Page 15-65

For additional information, reference: Catalog Number 9001CT9701 or D-Fax™ #1549.

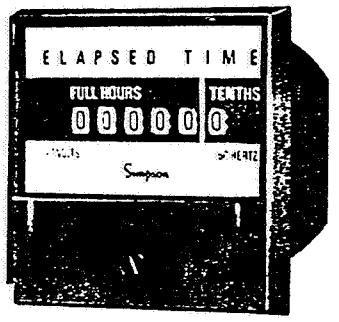
Simpson®

Elapsed Time Meters

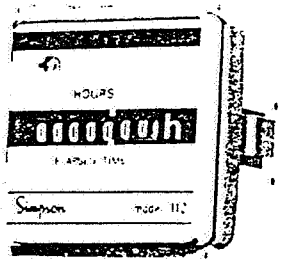
Century, Round, Rectangular, Wide-Vue Style

- *Records the "On" Time of Electrical Equipment AC & DC Operating Voltage Units*
- *Phenolic Cases With Glass Windows*
- *Six Attractive Case Styles*
- *Two Popular Sizes: 1-1/2", 3-1/2"*

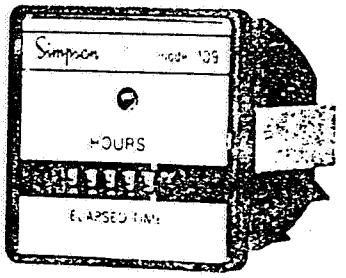
Simpson's series of elapsed time meters feature a six-digit readout with no reset capability, making them virtually tamper proof. Each true time elapsed time meter is ruggedly constructed and records the "on" time of electrical equipment. They are widely used in factory environments where there is a need to accumulate running time and monitor life and performance records on AC and DC powered equipment. All hour meters are connected in parallel with the equipment being monitored. The synchronous motor provides accurate hour indication. Model 109ET has a 10-80 V DC input as a standard feature. An optional plug-in AC converter module can also be ordered with the model 109 ET. Choose from Century, Wide-Vue, Rectangular or Round case styling to match other instruments.



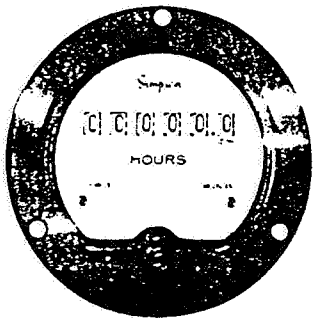
Model 2153ET
Century



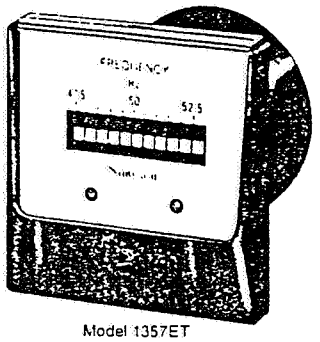
Model 112ET



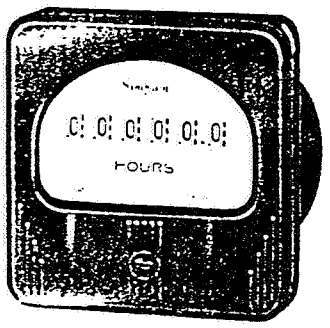
Model 109ET



Model 55ET
Round



Model 1357ET
Wide-Vue



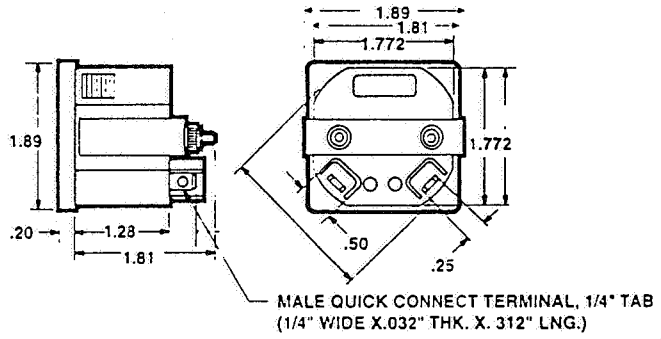
Model 57ET
Rectangular

C 137

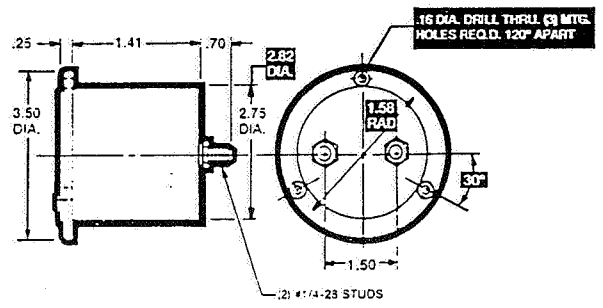
Dimensions

■ = Panel Meter Cut-out Dimensions

1-1/2"- Model 109ET



3-1/2"- Model 55ET

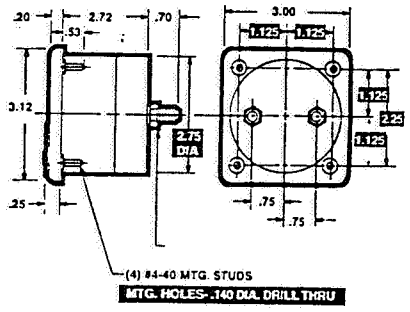


Model Number	Size	Meter Movement
109ET	1-1/2"	Clock Motor
112ET	1-1/2"	
55ET	3-1/2"	
1357ET	3-1/2"	
57ET	3-1/2"	
2153ET	3-1/2"	

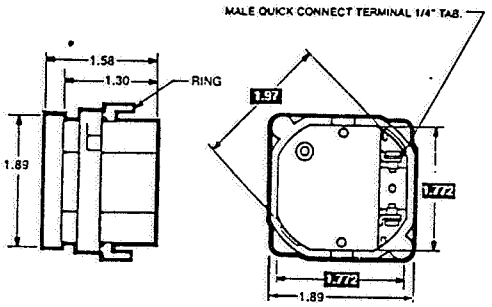
Dimensions

1 = Panel Meter Cut-out Dimensions

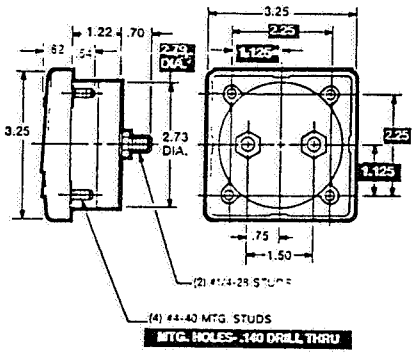
3-1/2"- Model 57ET



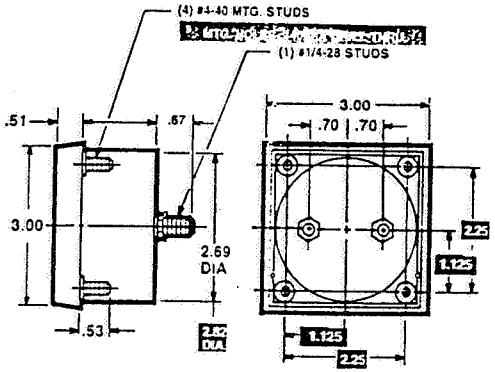
3-1/2"- Model 112ET



3-1/2"- Model 1357ET



3-1/2"-Model 2153ET



Specifications

Accuracy: Model 109ET & 112ET: ≤.01%/24 HRS.* Models 55ET, 1357ET, 57ET, 2153:synchronous with AC Power

Movement: Synchronous Clock Motor

Overload(1 sec): 10 times full scale rating

Maximum Indication: 99,999.9 Hours

Power Consumption: Models 109ET, 112ET: .5 watts
All Other Models: 2.5 watts

Case: Models 55ET, 57ET, 2153ET: High density phenolic.
Models 109ET, 112ET, 1357ET: High density black acrylic.

Operating Temperature: -4°F to +149°F (-20°C to +65°C)

Net Weight: Models 112ET, 109ET: 2.5 oz (0.07kg)
Models 55ET, 57ET: 12.5 oz (0.35kg)
Model 1357ET, 2153ET: 13 oz (0.37kg)

Ordering Information

Elapsed Time

Operating Voltage (± 10)	Maximum Indication (hours)	Power Consumption	Accuracy	Model Size	Model Number	Catalog Number
10-80 VDC*	99,999.9	.5 watt	≤.01%/24 hrs	1-1/2"	109ET	03618
	99,999.9	.5 watt	≤.01%/24 hrs		112ET	03622
120 VAC 60 Hz	99,999.9	2.5 watts	synchronous	3-1/2"	55ET	03580
	99,999.9	2.5 watts	synchronous		1357ET	03595
	99,999.9	2.5 watts	synchronous		57ET	03590
	99,999.9	2.5 watts	synchronous		2153ET	17720
240 VAC 60 Hz	99,999.9	2.5 watts	synchronous	3-1/2"	55ET	03600
	99,999.9	2.5 watts	synchronous		57ET	03610
	99,999.9	2.5 watts	synchronous		1357ET	03615
	99,999.9	2.5 watts	synchronous		2153ET	17721

* Model 109ET has 10-80 VDC input-standard, or 100-265 VAC, 50-1000 Hz with optional plug-in AC converter module, Cat. No. 03619

Function Reference Table

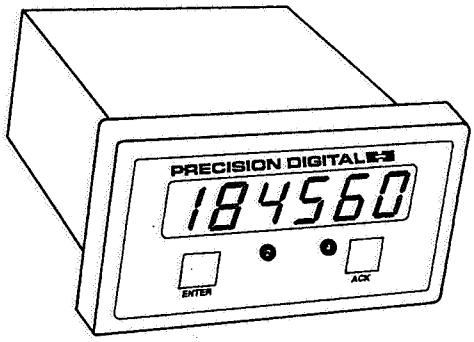
For your convenience, the table below lists Century, Round and Rectangular models for other electrical monitoring functions and page reference.

Function	Style		
	Century	Round	Rectangular
AC Current	C17-18	C19-20	C21-22
AC Voltage	C43-44	C45-46	C47-48
DC Current	C75-76	C77-78	C79-80
DC Voltage	C105-106	C107-108	C109-110
Decibels	C131-132	C133-134	C135-136
Temperature	C144-145		C144-146
Percent Motor Load	C154-155		
RF Current	C161-162	C163-164	C165-166
VU	C171-172		C173-174
Watts	C182-183	C184-185	C185-186
Process	C187-188	C189-190	C189-190

DIGITAL PANEL METERS

Model PD690 Universal Process Meter

Instruction Manual



- Easy Single Button Scaling with Lockout Feature
- 4-20 mA, 0-5 V, or 0-10 V Field Selectable Inputs
- 24 V Transmitter Power Supply Standard
- Stand Alone Scaling
- Steady, Accurate Display to ± 199,990
- 11 Point Linearization
- Square Root Extraction with Low Flow Cutoff
- 4½ Digit + Extra Zero
- NEMA 4X Front Panel
- 2 or 4 Relays + 4-20 mA Output Options
- Green Display Available

PRECISION DIGITAL CORPORATION
15 Mercer Road • Natick MA 01760 USA
Tel 508-655-7300 • Fax 508-655-8990

PRECISION DIGITAL

ORDERING INFORMATION

MODEL:	DESCRIPTION:
115 VAC	
PD690-3-N	No Options
PD690-3-14	2 Relays
PD690-3-15	4-20 mA Output
PD690-3-16	2 Relays + 4-20 mA Output
PD690-3-17	4 Relays
PD690-3-18	4 Relays + 4-20 mA Output
230 VAC	
PD690-4-N	No Options
PD690-4-14	2 Relays
PD690-4-15	4-20 mA Output
PD690-4-16	2 Relays + 4-20 mA Output
PD690-4-17	4 Relays
PD690-4-18	4 Relays + 4-20 mA Output
18-36 VDC	
PD690-2-N	No Options
PD690-2-14	2 Relays
PD690-2-15	4-20 mA Output
PD690-2-16	2 Relays + 4-20 mA Output
PD690-2-17	4 Relays
PD690-2-18	4 Relays + 4-20 mA Output

Notes:
A -G may be added in the part number to call out meters with a green display; ex. PD690-3G-14.

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DEFINITIONS

dEC Pt, DECIMAL POINT: to program decimal point or light up extra "0".
SCALE, I-CAL SCALING: scale unit using internal calibration for desired display.
I-CAL, INTERNAL CALIBRATION: to calibrate without applying an input signal.
E-CAL, EXTERNAL CALIBRATION: Requires calibrated signal to calibrate unit.
CALIb, E-CAL CALIBRATION: To calibrate unit using a calibrated signal source.
Error, ERROR: Calibration not successful.
L, LINEAR INPUT: Programs meter for 2 point linear input signals.
S, SQUARE ROOT EXTRACTION: Programs meter for square root extraction.
no. PtS, NUMBER OF POINTS: Programs meter for 2 to 11 calibration points.
CutoFF, LOW FLOW CUTOFF: unit displays 0 below user programmed point.
ALArS, ALARM and RELAY POINTS: Sets alarm and relay set and reset points.
outPut, 4-20 mA OUTPUT OPTION: Programs optional 4-20 mA output values.
19999, OVERRANGE: Display overrange.

WARNING

Hazardous voltages exist within enclosure. Installation and service should be performed only by trained service personnel.

AVERTISSMENT

Les pièces à l'intérieur du boîtier portent des tensions dangereuses. Seules des personnes qualifiées et bien entrainées devraient entreprondre l'ótalonnage et la maintenance.

Notice

The information contained in this document is subject to change without notice.

WARRANTY

1 year parts & labor.

EXTENDED WARRANTY

Warranty may be extended an additional 12 months by returning the Product Registration Form within 2 months from date of purchase.

SPECIFICATIONS

BASIC METER

INPUTS: Field selectable: 4-20 mA, 0-20 mA, 0-5 V, 1-5 V, 0-10 V.
DISPLAY: Bright, large, 0.56" (14.2mm) high efficiency red or green LED. 4½ digits + extra zero may be switched on to display ± 19,999(0). Leading zeros blanked.
CALIBRATION: May be calibrated using internal calibration (I-CAL) or by applying an external calibration signal (E-CAL).
CALIBRATION RANGE: 4 mA (1V) input may be set anywhere in range of the meter. 20 mA (5V) may be set above or below the 4 mA (1V) input. An *Error* message will appear if input 1 signal and input 2 signal are too close together:

Input Range:	**Minimum Difference Between Input 1 & Input 2:**
0-5 V	0.16 V
0-10 V	0.32 V
4-20 mA	1.60 mA

LOOP POWER: (AC powered units only) Isolated 24 VDC @ 20 mA regulated ±5%. Noise less than 10 mV p-p. Max. loop resistance of 1200 ohms. Available for either signal input or 4-20 mA output option, but not both.
HOLD READING: Connect terminals HLD and COM.
ACCURACY: 0.05% of calibrated span, ± 1 count.
LOCKOUT: Jumper J3 restricts modification of calibration values.
INPUT IMPEDANCE: Voltage ranges, greater than 300 Kohms
Current ranges, 100 ohms.
POWER: AC power: 115 VAC ±10%, 50/60 Hz,10 VA.
230 VAC ±10%, 50/60 Hz,10 VA.
or DC power: 18-36 VDC, 6 watts max.
ISOLATION: AC power: 1500 VAC; DC power: 500 VDC.
COMMON MODE REJECTION: 110 db.
NORMAL MODE REJECTION: 64 db. at 50-60 Hz
ENVIRONMENTAL:
Operating temperature range: 0 to +65°C
Storage temperature range: -40 to +85°C
Relative humidity: 0 to 90% non-condensing
ENCLOSURE: 1/8 DIN, high impact plastic, UL 94V-0.
FRONT PANEL: NEMA 4X, panel gasket provided.
CONNECTIONS: Removable screw terminal block (provided), accepts #22 to #12 AWG.
ALARM POINTS: 4, any combination of high or low alarms.
ALARM STATUS INDICATION: Front panel LED.
ALARM DEADBAND: 0-100% F.S. user selectable.

11 POINT LINEARIZATION:

Input Range:	**Minimum Span Between Inputs:**
4-20 mA	(1.6 / no. of pts-1 mA)
0-5 V	(0.16 / no. of pts-1 V)
0-10 V	(0.32 / no. of pts-1 V)

(Ex. min. span for a 11 point 4-20 mA calibration is .16 mA between inputs)

SQUARE ROOT EXTRACTION:

Accuracy: ±0.1% F.S. ±1 count from 10-100% of flow.

Low Flow Cutoff: 0-100% of full scale, user selectable.

UL FILE NUMBER: E160849; 508 Industrial Control Equipment

(DC powered units are **not** UL listed)

OPTIONS

RELAYS

RATING: 2 or 4 SPDT (form C); rated 2 Amp @ 30 VDC or 2 Amp @ 250 VAC resistive load; 1/14 HP @ 125 / 250 VAC for inductive loads.

RESET: User select.

1. Automatically when the input passes the reset point.
2. Automatically + manually (via user supplied switch or front panel ACK button). Manual reset resets all manually resetable relays, (that have been tripped).

FAILSAFE OPERATION: The relay coils are energized in the non-alarm condition. In the case of a power failure, the relays will go to the alarm state. May be disabled with internal jumper (see page 19).

AUTO INITIALIZATION: When power is applied to the meter, the relays will always reflect the state of the input to the meter.

DEADBAND: 0-100%, User selectable.

ISOLATED 4-20 mA TRANSMITTER OUTPUT

CALIBRATION RANGE: The transmitter output can be calibrated so that a 4 mA output is produced for any number displayed on the meter. The 20 mA output may correspond to any number displayed on the meter that is at least 501 counts greater or smaller than the 4 mA output display. (Ex. 4 mA=0, 20 mA=501) If the span between 4 and 20 mA is less than 501 counts, an error message will appear.

OUTPUT LOOP RESISTANCE:

Power supply:	**minimum:**	**maximum:**
24 VDC	10 ohm	600 ohm
35 VDC (external)	600 ohm	1000 ohm

ACCURACY: ± 0.1% F.S., ± .004 mA.

ISOLATION: 500 VDC or peak AC, input-to-output or input/output-to-power line.

EXTERNAL LOOP POWER SUPPLY: 35 V max.

DESCRIPTION

All PD690s, regardless of configuration, have the same front panel. The front panel consists of a single button for programming and calibrating labeled ENTER and another button for resetting the relays labeled ACK.
In addition, the PD690 front panel includes LEDs that illuminate to assist in 4-20 mA output and alarm programming. LEDs are also provided to indicate alarm condition.

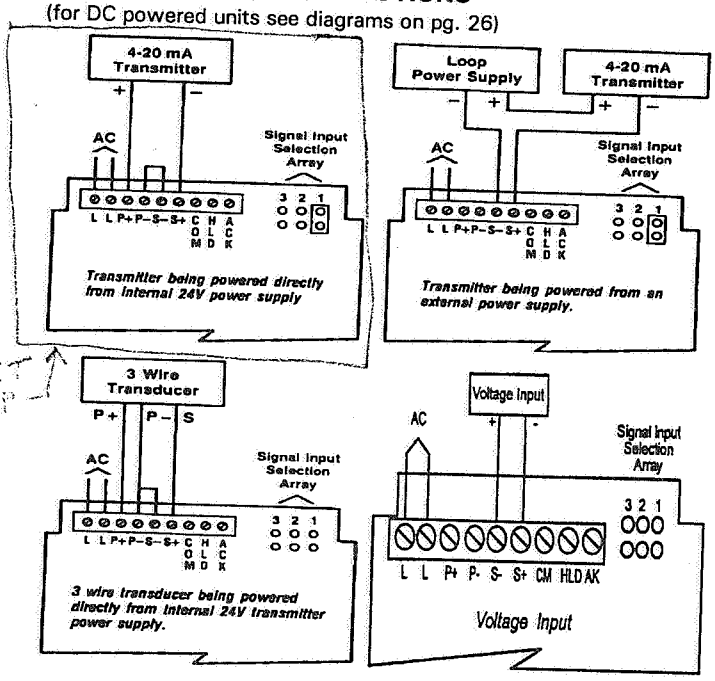
SETUP

Program the Signal Input Selection Array for desired input per chart below. This jumper array is located at the rear of the instrument, next to the screw terminal block. Remove jumper J3 (if installed) to disable Lockout feature.

Input Signal:	**Jumper 1:**	**Jumper 2:**
1-5, 0-5V	OFF	OFF
0-10 V	OFF	ON
4-20, 0-20 mA	ON	OFF

POWER & SIGNAL CONNECTIONS

(for DC powered units see diagrams on pg. 26)

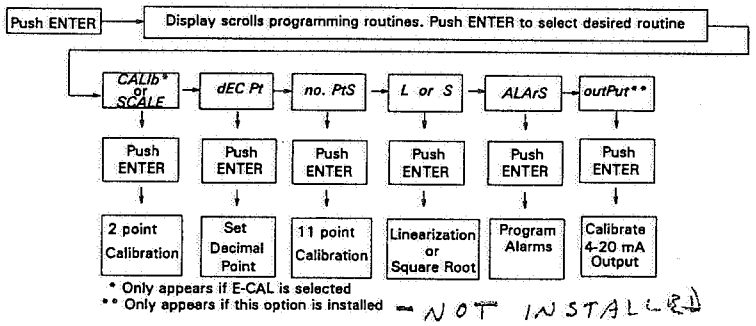


PROGRAMMING

The PD690's ***S***ingle ***B***utton ***S***caling allows it to be programmed using only the ENTER button. The general procedure is to push the ENTER button to accept a flashing display or to wait for the display to scroll and push ENTER when the desired display appears.

For instance the first time the ENTER button is pushed, the meter scrolls through the standard programming routine titles: *SCALE, dEC Pt, no. PtS, L or S, and ALArS*. It will also scroll the programming routine *outPut* if the meter contains an isolated 4-20 mA Output Option. To enter a programming routine, push **ENTER** when the meter displays the desired programming routine title.

The following flow chart overviews the PD690 programming routines.



* Only appears if E-CAL is selected
** Only appears if this option is installed – NOT INSTALLED

WIRING INSTRUCTIONS

1. All field connections to be made with insulated copper wire, either solid or stranded. Tighten all screw terminals to 7 in/lb. (0.8 Nm). Strip length = ¼ in (7 mm). **DO NOT** pre-treat wire with solder.
2. **Terminals L & L:** Use AWG #12-18 wire, 600 volt, 60°c. Connect only one wire to each terminal.
3. **Terminals P+, P-, S-, S+, COM, HLD, & ACK:** Use AWG #12-22 wire, 150 volt, 60°c. If using AWG #20 or smaller wire, up to 2 wires may be connected to each terminal. If using AWG #18 or larger wire, only 1 wire may be connected to each terminal.

CALIBRATION

Calibration is performed from the front panel using the ENTER button. It does not require any tools or disassembly of the meter. A calibrated signal source is required if external calibration *(E-CAL)* is selected.

For best results, allow the meter to warm up for at least 30 minutes.

The calibration input signals must be within the range of the meter and input 2 must be greater than input 1. (However, the display for input 2 does not have to be greater than the desired display for input 1.)

An *Error* message will appear if input 1 signal and input 2 signal are too close together:

Input Range:	**Minimum Difference Between Input 1 & Input 2:**
0-5 V	0.16 V
0-10 V	0.32 V
4-20 mA	1.60 mA

DECIMAL POINT (*dEC Pt*)

To program the decimal point or light up the extra "0", push **ENTER**. The meter displays *SCALE*, then *dEC Pt*. Push **ENTER** when *dEC Pt* appears. The meter then reads 199990 with the decimal point changing locations and the extra "0" illuminating. Push **ENTER** when the decimal point is in the desired position; or if the extra "0" is desired; when the extra "0" is displayed.

SINGLE BUTTON SCALING

The ***S***ingle ***B***utton ***S***caling technique is used to program many of the PD690's functions which include; Scaling, Calibration, Alarm Set and Reset points and the 4 mA and 20 mA output values.

There are 5 basic calibration instructions:

1.If the flashing display is OK, push **ENTER** before it stops flashing to accept it.
2. If the flashing display is not OK, (or if **ENTER** was not pushed in time to accept it), wait for Least Significant Digit (LSD) to flash.
3. If a flashing digit is OK push **ENTER** before it starts to scroll to accept it.
4. If a flashing digit is not OK, (or if **ENTER** was not pushed in time to accept it), wait for the digit to scroll, and push **ENTER** when OK.
5. Digits will scroll until **ENTER** is pushed. When a digit is accepted by pushing **ENTER**, the next digit to the left flashes.

A calibration flow chart appears on page 27.

SCALING and CALIBRATION

The PD690 may be calibrated using an external signal source such as a calibrator or scaled using the internal source with the *I-CAL* feature. With *I-CAL* a 4-20 mA input can be scaled for any display range without applying a signal, (see Selection of Calibration Method below). To scale inputs such as 0-5 V, 1-5 V or 0-10 V without applying a signal it is necessary to first complete an Initial Calibration, (see Initial Calibration on page 14).

SELECTION of CALIBRATION METHOD

1. Apply power with **ACK** button pushed.
2. When display stops flashing, release **ACK** button. Display alternates between *E-CAL* and *I-CAL*.
   To calibrate meter with an external source, such as a calibrator, push **ENTER** when *E-CAL* appears.
   To scale meter with internal source, push **ENTER** when *I-CAL* appears.
3. If *E-CAL* is selected refer to **E-CAL CALIBRATION** for further instructions. (page 13)
4. If *I-CAL* is selected refer to **I-CAL SCALING** below, for further instructions.
5. If *I-CAL* is selected and an input other than 4-20 mA is being used, such as 0-5 V, 1-5 V or 0-10 V it is necessary to first complete an **Initial Calibration.** (page 14)

I-CAL SCALING

If *I-CAL* (Internal Calibration) is selected, it is necessary to scale the meter for the desired display.

1. Push **ENTER**, when *SCALE* appears push **ENTER** again.
2. *InPt 1* flashes. Push **ENTER** then input 1 value (typically 04.000) will flash for 3 seconds.

   If this is desired input value, push **ENTER** before entire display stops flashing,(meter will then flash *dSPy 1*.) Go to step 8 below.

   If this is not the desired input value, (or if ENTER was not pushed in time to accept the display) wait for the first (right most) digit to flash.

Right most digit flashes for 3 seconds before it scrolls.

3. When digit is OK, push **ENTER**, next digit to the left will flash for 3 seconds before it scrolls.
4. When flashing digit is OK, push **ENTER**, next digit to the left will flash for 3 seconds before it scrolls.
5. Repeat step 4 for each remaining digit.
6. When left most digit is OK, press **ENTER**.
7. Entire display will flash for 3 seconds. Press **ENTER** within the 3 seconds if OK to complete input 1 value programming. If not OK, wait for right most digit to flash and go to step 3 above.
8. *dSPy 1* flashes. Push **ENTER** then Display 1 value will flash for 3 seconds.

   If this is desired value, push **ENTER** before entire display stops flashing.

   If this is not the desired value, (or if **ENTER** was not pushed in time to accept the display) wait for the first (right most) digit to flash.

9. GO TO STEP 3 ABOVE.
10. Repeat steps 2 - 8 for *InPt 2* and *dSPy 2* values.

E-CAL CALIBRATION

If *E-CAL* (External Calibration) is selected, it is necessary to calibrate the display.

1. Push **ENTER**, when *CALIb* appears push **ENTER** again.
2. Meter flashes *InPt 1*. Apply input 1 signal THEN push **ENTER**, (e.g. 4mA, 1V, etc.)
3. All digits flash for 3 seconds.

   If this is the desired display for input 1, push **ENTER** before entire display stops flashing,(meter will then flash *InPt 2*). Go to step 9 below.

   If this is not the desired display, (or if **ENTER** was not pushed in time to accept the display) wait for the first (right most) digit to flash.

Right most digit flashes for 3 seconds before it scrolls.

4. When digit is OK, push **ENTER**, next digit to the left will flash for 3 seconds before it scrolls.
5. When flashing digit is OK, push **ENTER**, next digit to the left will flash for 3 seconds before it scrolls.
6. Repeat step 4 for each remaining digits.
7. When left most digit is OK, press **ENTER**.
8. Entire display will flash for 3 seconds. Press **ENTER** within the 3 seconds if OK to complete input 1 calibration. If not OK, wait for right most digit to flash and go to step 3 above.
9. Meter flashes *InPt 2*. Apply input 2 signal THEN push **ENTER**, (e.g. 20 mA, 10 V, etc.)
10. GO TO STEP 3 ABOVE.

CALIBRATION ERROR

A meter display of *Error* during calibration indicates that the calibration process was not successful. The meter should be recalibrated.
The *Error* message will appear if input 1 signal and input 2 signal are too close together, see chart on page 10.
The *Error* message will appear if input 1 signal is inadvertently also applied for input 2 calibration, or **ENTER** is pushed before applying input 2.

PROGRAMMING CONFIRMATION

The values that have been programmed can be quickly checked to make sure they are the desired values. To do this, apply the desired signal for each point and check the display.

INITIAL CALIBRATION

Initial calibration is required only when the *I-CAL* feature is to be used with an input other than the default range of 4-20 mA.

1. Program the Signal Input Selection Array for desired input per chart on pg. 8.
2. Apply power with **ENTER** and **ACK** buttons pushed. Release when display stops flashing
3. The meter scrolls through the choices *20, 5,* and *10* which correspond to input signals of 4-20 mA, 0-5 V or 1-5 V, and 0-10 V. Push **ENTER** when desired value appears.
4. The meter flashes *InPt 1*. Apply low end signal, (4 mA or 0 V)*, push **ENTER**.
5. The meter flashes *InPt 2*. Apply high end signal, (20 mA, 5 V, 10 V), push **ENTER**.

*** For 1-5 V input signals, calibrate meter with input 1 = 0 V, input 2 = 5 V.**

6. This completes the Initial Calibration and initializes the INPUT 1 and INPUT 2 scaling points to 4.000 & 20.000 mA, 0.000 & 5.000 V, **or** 0.000 & 10.000 V).
7. Refer to **I-CAL SCALING** above for further instructions.

LINEARIZATION

The linearization feature has two modes of operation:
The 11 point user calibration (*L*) is for displaying non-linear signals and the square root extraction (*S*) is for displaying the flow rate from a differential pressure transmitter.

11 POINT USER CALIBRATION (*L or S*)

To program the PD690 for 11 point user calibration, push **ENTER**. When *L or S* appears, push **ENTER** again.
The meter will display *L or S* alternately. Press **ENTER** when *L* is flashing. After *L* is selected the meter will switch to indication mode and is ready to be calibrated.

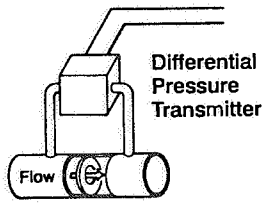
NUMBER OF CALIBRATION POINTS (*no. PtS*)

The user may input up to 11 calibration points and corresponding displays. To program the number of calibration points, push **ENTER**, when *no. PtS* appears, push **ENTER** again.
The meter displays a number from 2 to 11 that represents the number of calibration points. Push **ENTER** when the number equals the desired number of calibration points.
As soon as the number of points is programmed, the meter flashes *InPt 1*.
Refer to I-CAL SCALING or E-CAL CALIBRATION on page 12-13 to calibrate each point.

Round Horizontal Tank Calibration Table

The following tables can be used to calibrate the PD690 for displaying volume in a round horizontal tank.

No. of Points: 10		Max. Error: 0.3% F.S.
Input:	mA:	Display: (% Volume)
1	4.0	0.00
2	4.8	1.80
3	6.0	7.20
4	7.2	14.20
5	9.2	28.10
6	14.8	71.80
7	16.8	85.80
8	18.0	92.80
9	19.2	98.10
10	20.0	100.00



The PD690-3-N can be used to display flow rate.

No. of Points: 8		Max. Error: 0.5% F.S.
Input:	mA:	Display: (% Volume)
1	4.0	0.00
2	4.8	1.90
3	6.4	9.50
4	8.4	22.40
5	15.6	77.70
6	17.6	90.50
7	19.2	98.10
8	20.0	100.00

SQUARE ROOT EXTRACTION

Square root extraction takes the square root of a 4-20 mA or 1-5 V signal from a differential pressure transmitter and displays the rate in engineering units. The square root extraction feature is calibrated using the front panel ENTER button and uses the same ***S***ingle ***B***utton ***S***caling technique that is used for 2 point calibration. Calibration involves setting only 3 points: the zero flow rate (usually zero), the high flow rate and the low flow cutoff point.

Square Root Extraction (*L or S*)

To program the PD690 for square root extraction, push **ENTER**. When *L or S* appears, push **ENTER** again.

The meter will display *L or S* alternately. Press **ENTER** when *S* is flashing. Once *S* is selected the meter will switch to indication mode and is ready to be calibrated.

To calibrate the meter refer to I-CAL SCALING or E-CAL CALIBRATION above.

LOW FLOW CUTOFF (*CutoFF*)*

Low Flow Cutoff allows the PD690 to be programmed so that the often unsteady output from a differential pressure transmitter at low flow rates always displays a zero on the PD690.

Ex. If low flow cutoff is set at 1200, any rate less than 1200 will be displayed as "0".

To program Low Flow Cutoff:

1. Push **ENTER**, when *CutoFF* appears push **ENTER** again.

All digits flash for 3 seconds.

If this is the desired low flow cutoff value push **ENTER** before the entire display stops flashing.

If this is not the desired low flow cutoff value, (or if **ENTER** was not pushed in time to accept the display) wait for the first (right most) digit to flash.

Right most digit flashes for 3 seconds before it scrolls.

2. When digit is OK, push **ENTER**, next digit to the left will flash for 3 seconds before it scrolls.
3. When flashing digit is OK, push **ENTER**, next digit to the left will flash for 3 seconds before it scrolls.
4. Repeat step 3 for each remaining digit.
5. When left most digit is OK, press **ENTER**.
6. Entire display will flash for 3 seconds. Press **ENTER** within the 3 seconds if OK to complete low flow cutoff programming. If NOT OK, wait for right most digit to flash and go to step 2 above.

To disable low flow cutoff, program cutoff value to zero.

*** Only available when using Square Root Extraction.**

Model PD690 Universal Process Meter Instruction Manual

4 ALARM POINTS

The PD690 is equipped with 4 alarm points as a standard feature. Each alarm may be programmed for either a high or low alarm and for 0-100% deadband. Front panel LEDs indicate alarm status.

Options for 2 and 4 relays are available.

To program a high alarm, program the set point above the reset point. To program a low alarm, program the set point below the reset point.
To program the alarm deadband, set the reset point above or below the set point by an amount equal to the desired deadband value.
Example: Alarm 2 is a high alarm that trips at 1500 and has a deadband of 100. Alarm 2 set point is set at 1500 and its reset point at 1400.

Alarm Set & Reset Point Programming: (*ALArS*)

Alarm set & reset point programming is performed in the *ALArS* routine.

1. To enter the *ALArS* routine, push **ENTER** and when *ALArS* appears, push **ENTER** again. This starts a scan of the 4 alarm set & reset points.

The scan sequence begins with a flashing display of alarm #1 set point. The "1" LED and "S" LED are illuminated to indicate the meter is flashing alarm #1 set point value.

2. All digits flash for 3 seconds.

If this is the desired display for this alarm point, push **ENTER**. Pushing ENTER completes this alarm point programming. Proceed to step 8 for next alarm point programming.

If this is not the desired display, wait for the first digit to flash. It will flash for 3 seconds before it starts to scroll.

3. If the first flashing digit is OK, push **ENTER** before it starts to scroll to accept it, the second digit flashes- go to step 6. If not OK, wait for first digit to scroll.

4. When the first digit is OK, push **ENTER** and the second digit flashes for 3 seconds before it starts to scroll.

5. If the second flashing digit is OK, push **ENTER** before it scrolls. If not OK, wait for digit to scroll.

6. When second digit is OK, push **ENTER**. Program remaining digits in same fashion.

7. When the left most digit is OK, push **ENTER**. The entire display flashes for 3 seconds. Push **ENTER** if OK to complete alarm point programming and proceed to step 8. If not OK, wait, first digit flashes. Repeat steps 3-7.

8. When an alarm set and reset point have been programmed the scan moves to the next alarm set and reset point. To program the remaining alarm set and reset points, repeat steps 2-8. JUST [illegible] THESE - NOT USED

Determine which alarm set or reset point is being programmed by noting which LEDs are illuminated. For instance, if the "3" LED and the "R" LED are illuminated, the meter is displaying alarm #3 reset point. When alarm programming is complete the meter will display the process input signal and the front panel LEDs will indicate alarm status.

Programming Confirmation

To verify that the alarm set and reset points have been programmed as desired, push **ENTER**, and push **ENTER** again when *ALArS* appears. Before the display stops flashing #1 set point value, push **ENTER** again to advance the display to #1 reset point. Continue skipping through the remaining alarm set and reset points. To alter an alarm point value, wait for the first digit to flash and follow steps 3-8 above.

Alarm Operation

When the meter detects an alarm, a front panel LED illuminates to indicate which alarm point has been tripped. This LED will stay illuminated until the meter display passes through the reset point.

Alarm Acknowledgment

The ACK button on the front panel resets the optional relays only and has no effect on the alarm status LEDs.

OPTION CARD INSTALLATION

PD690 options may be ordered installed at the factory. If an option is ordered as a separate item, refer to page 28 for installation instructions.

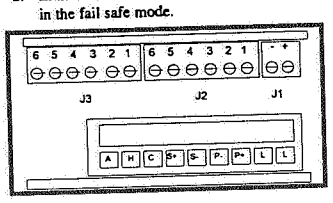
OPTION CARD PIN OUTS

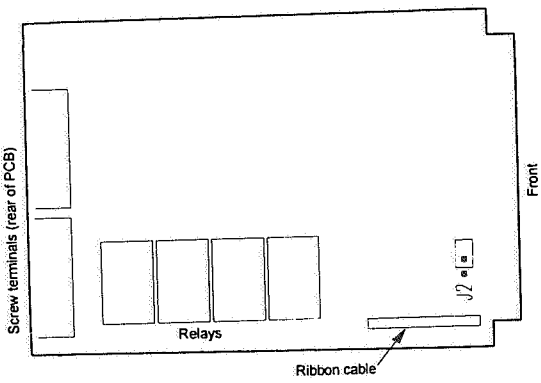
	Pin:	Function:	
J1	1	Transmitter +	PD175
	2	Transmitter –	
J2	1	Relay #1 Common	PD176
	2	Relay #1 NC	
	3	Relay #1 NO	PD174
	4	Relay #2 Common	
	5	Relay #2 NC	
	6	Relay #2 NO	
J3	1	Relay #3 Common	PD177
	2	Relay #3 NC	
	3	Relay #3 NO	
	4	Relay #4 Common	
	5	Relay #4 NC	
	6	Relay #4 NO	

PD178

Notes:

1. Alarm acknowledgement terminals (ACK and COM) are located on the meter main board.
2. In the alarm condition, the NC contact is connected to common in the fail safe mode.





The failsafe operation can be disabled by removing jumper J2 located at the front of the relay option card (see figure to left). Refer to page 28 for option card removal

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RELAYS (optional)

A PD690 is available with 2 and 4 relays. The SPDT relays can be programmed for automatic or automatic + manual reset. The relays can also be programmed for 0-100% deadband.

Set & Reset Point Programming

Refer to page 17 to program the alarm (relay) set and reset points.

Automatic & Manual Reset Programming

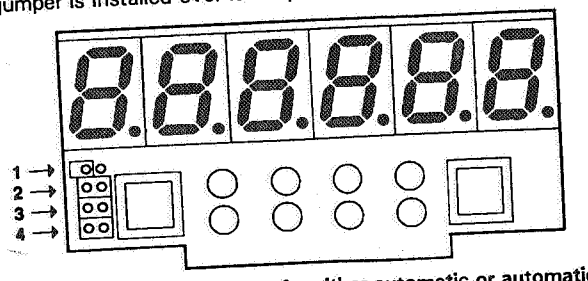
There are two ways to reset the relays:

1. Automatically when the signal passes through the reset point.

2. Automatically + manually via the front panel ACK button, or a user supplied momentary N.O. push-button across terminals ACK and COM at the rear of the instrument. That is, a relay may be manually reset prior to the signal passing through the reset point or it will automatically reset when the signal passes through the reset point.

A manual reset will reset all relays that are programmed for automatic + manual reset.

An array of jumpers located behind the front panel on the Display Board is used to program each relay for either automatic or automatic + manual reset. Refer to page 27 for front panel removal instructions. The top jumper is used for relay 1, the next for relay 2, etc. A relay will automatically reset if no jumper is installed. A relay will automatically reset, plus can be manually reset, if a jumper is installed over its respective pins.



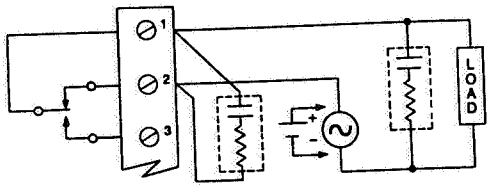
Jumpers to program relays for either automatic or automatic + manual reset.
Relay 1 is programmed for automatic reset;
Relays 2,3, & 4 are programmed for automatic + manual reset.

SWITCHING INDUCTIVE LOADS

(For PD174, PD176, PD177, PD178 Options)

The PD690 has the ability to suppress electrical noise generated by switching inductive loads. However, installing suppressors improves this performance even more and prolongs the life of the PD690's relay contacts. This suppression can be obtained with RC networks assembled by the user or purchased as a complete assembly. Refer to the following circuits for RC network assembly and installation:

AC & DC LOADS



Choose R and C as follows:

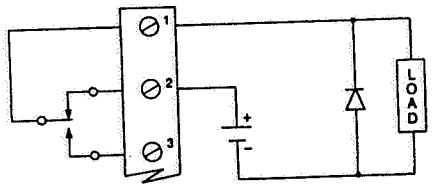
R: 0.5 to 1 ohm for each volt across the contacts

C: 0.5 to 1 microfarad for each 1 A through closed contacts

Notes:

1. Use capacitors rated for 240 VAC.
2. Snubbers may affect load release time of solenoid loads, check to confirm proper operation.
3. Install the RC network right at the PD690's relay screw terminals. A RC network may also be installed across the load.

LOW VOLTAGE DC LOADS



Use a diode with a reverse breakdown voltage two to three times the circuit voltage and forward current at least as large as the load current.

RC NETWORKS

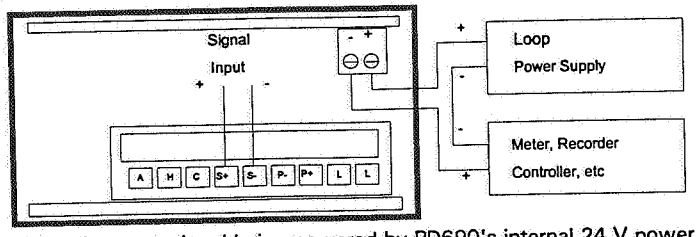
Suppressors are available from Precision Digital and should be applied to each relay that switches an inductive load. Part number PDX-6901.

ISOLATED 4-20 mA OUTPUT OPTION

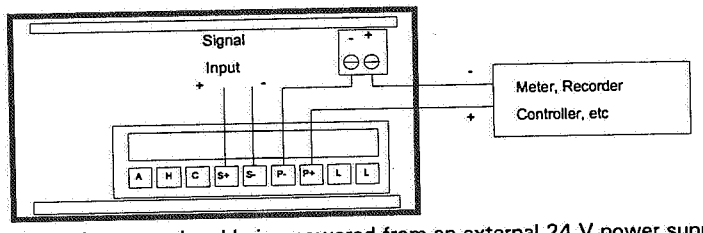
The PD690 can be equipped with an isolated 4-20 mA output signal option that can be programmed to produce a 4-20 mA output for virtually any input.

Connections

The following drawings illustrate the 4-20 mA output signal being powered from the PD690's internal 24 V power supply (AC powered units only) and by an external power supply.



4-20 mA output signal being powered by PD690's internal 24 V power supply (AC powered units only).



4-20 mA output signal being powered from an external 24 V power supply.

Calibration

The isolated 4-20 mA output signal is calibrated using the front panel ENTER button and uses the same ***S***ingle ***B***utton ***S***caling technique that is used to calibrate the signal input and the alarm set and reset points. A multimeter may be connected to the output terminals to verify calibration, but it is not required as part of the calibration process.

4 mA OUTPUT CALIBRATION

1. Push **ENTER**, when *outPut* appears push **ENTER** again.
2. All digits flash for 3 seconds, a green LED labeled "4" illuminates indicating the flashing display is the value at which the meter will produce a 4 mA output.

> If this is the desired display at which the meter will produce a 4 mA output, push **ENTER** before entire display stops flashing. The meter indicates that the 4 mA Output Calibration is now complete by illuminating the green "20" LED. Go to 20 mA Output Calibration below.
>
> If this is not the desired display, (or if ENTER was not pushed in time to accept the display) wait for the first (right most) digit to flash.

Right most digit flashes for 3 seconds before it scrolls.

4. When first digit is OK, push **ENTER**, next digit to the left will flash for 3 seconds before it scrolls.
5. When flashing digit is OK, push **ENTER**, next digit to the left will flash for 3 seconds before it scrolls.
6. Repeat step 5 for each remaining digits.
7. When left most digit is OK, press **ENTER**.
8. Entire display will flash for 3 seconds. Press **ENTER** within the 3 seconds if OK to complete 4 mA Output Calibration. If NOT OK, wait for right most digit to flash and go to step 5 above.

20 mA OUTPUT CALIBRATION

Note: The 20 mA output calibrates in the same fashion as 4 mA output so the 4 mA Calibration Instructions will be referenced for most of the 20 mA Calibration Instructions.

1. When **ENTER** is pushed to complete the calibration for 4 mA output, the green LED labeled "20" illuminates indicating the flashing display is the value at which the meter will produce a 20 mA output.
2. Repeat steps 2-8 in 4 mA Output Calibration above.
3. Upon acceptance of the display corresponding to the 20 mA output, the meter exits the *outPut* routine and returns to indication mode.
4. **An *Error* message will be displayed if the 4-20 mA output span is smaller that 501 counts.**

Programming Confirmation

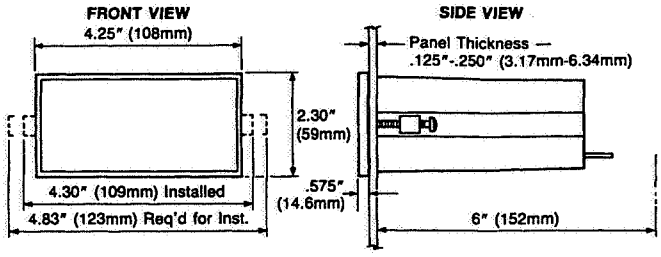
The values that have been programmed to produce the 4 & 20 mA outputs can be quickly checked to make sure they are the desired values. To do this, enter the *outPut* routine by pushing **ENTER** and then pushing **ENTER** again when *outPut* appears.

The green "4" LED illuminates indicating the meter is displaying the value at which it will produce a 4 mA output. Confirm that this is the desired value. Push **ENTER** (within 3 seconds) before the entire display stops flashing and the green "20" LED illuminates indicating the meter is displaying the value at which it will produce a 20 mA output. Confirm that this is the desired value. Push **ENTER** (within 3 seconds) before the entire display stops flashing and the meter returns to indication mode.

LOCKOUT

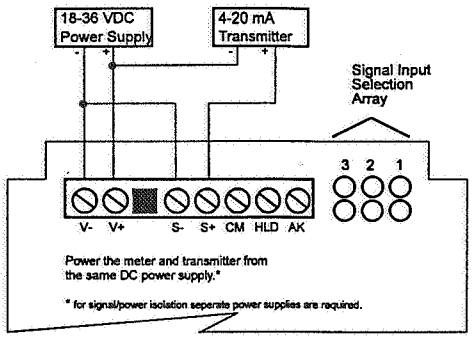
Install jumper 3 at rear of instrument to restrict modification of calibration values. When **ENTER** is pushed with lockout jumper in place, only *ALArS* and *outPut* routines are displayed. These routines may be entered to view their settings, but the settings may not be altered.

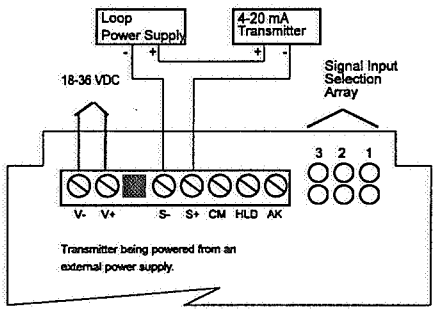
MOUNTING DIMENSIONS



Notes:
1. Panel cutout required: 1.772" X 3.622" (45 mm x 92 mm) 1/8 DIN
2. Panel thickness: 0.125" - 0.250" (3.17 mm - 6.34 mm)
3. Allow 6 inches (152 mm) behind the panel
4. Weight 16 oz. (454 g)

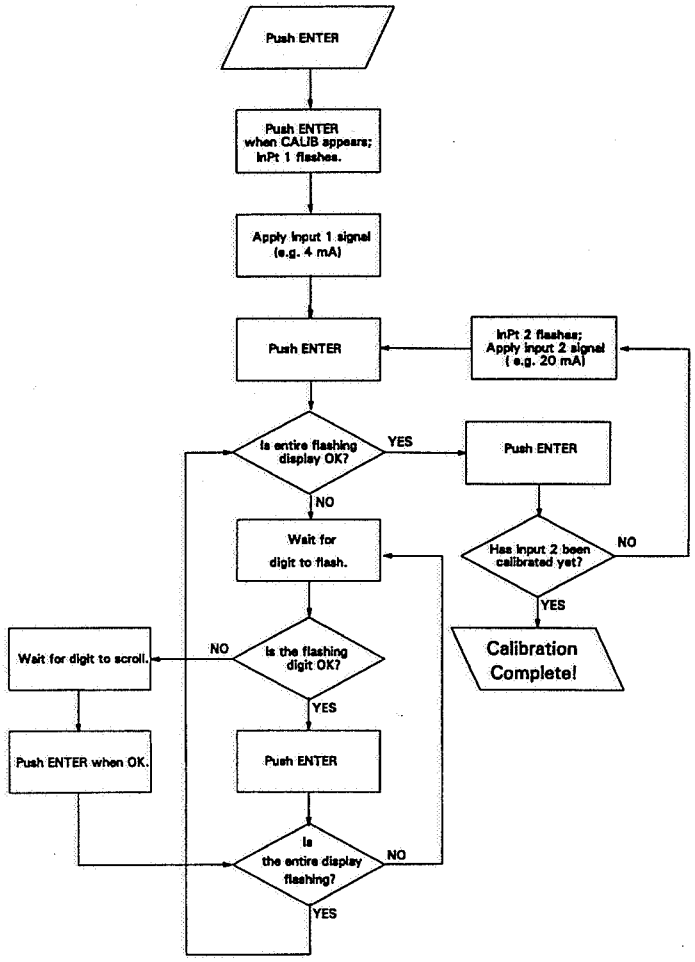
POWER & SIGNAL CONNECTIONS for 18-36 VDC powered units.





2 POINT CALIBRATION FLOW CHART

The following flow chart illustrates a 2 point calibration using ***S***ingle ***B***utton ***S***caling. The same general procedure is used for multi-point calibration, alarm set and reset point programming and 4-20 mA output programming.



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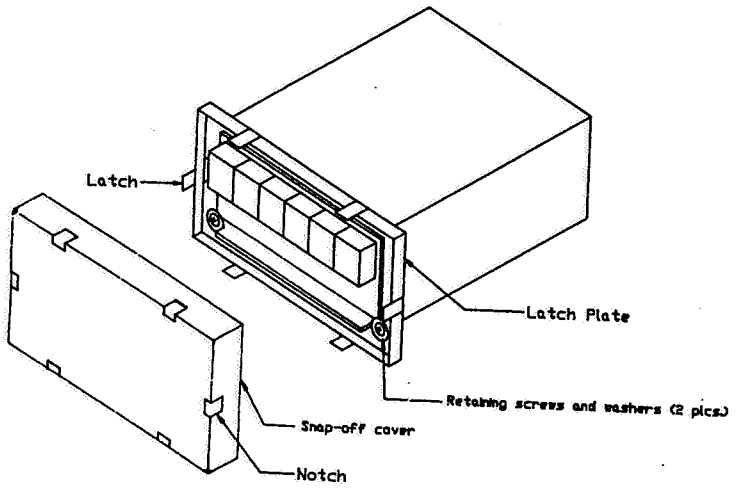
OPTION CARD INSTALLATION

PD690 options may be ordered completely installed at the factory. If an option card is ordered separately, refer to following instructions and illustrations.

WARNING: Disconnect power prior to performing the following operations.

The PD690's snap-off cover is held in place by 6 latches that snap into notches on the snap-off cover. To remove the snap-off cover from the PD690, grasp it firmly on its top and bottom edges and pull it forward. The latch plate remains around the PD690's case.

To remove the circuit board from the case, unscrew the two front panel retaining screws and remove the screw terminal block at the rear of the meter. Push the meter through its case by applying pressure to the circuit board at the rear of the meter. Do not apply pressure to the vertical display board.



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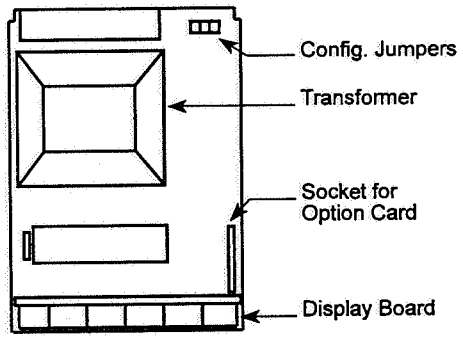
The option card is connected to the PD690 by a flexible cable which is permanently attached to the option card. Place the PD690 and the option card side by side, with the PD690 (display facing you) on the left, and with the option card (with its flexible cable next to the PD690) on the right. Plug the flexible cable from the option card into the socket on the PD690.

To avoid electric shock, re-install the circuit boards in the case prior to applying power. All programming and calibrating can be performed with the circuit boards installed in the case.

To re-install the PD690 in its case, fold the option board over the PD690, grasp both boards so the PD690 is on the bottom and the two PCB's are separated by about an inch. Insert the two boards together into the case. Be sure both the top and bottom boards engage the rails which hold them in place. Do not press on the PD690 Display Board when seating the assembly in the case.

Install washers and retaining screws in 4 corners of meter and install front cover.



Internal view of meter for locating option connector

Your PD690 Programmed Values

☐ 11 Point linearization or ☐ Square root extraction
Low flow cutoff value _____

No. of calibration points _____

Calibration Point Values

input 1 _____	display 1 _____
input 2 _____	display 2 _____
input 3 _____	display 3 _____
input 4 _____	display 4 _____
input 5 _____	display 5 _____
input 6 _____	display 6 _____
input 7 _____	display 7 _____
input 8 _____	display 8 _____
input 9 _____	display 9 _____
input 10 _____	display 10 _____
input 11 _____	display 11 _____

Alarms

relay 1 set point _____	reset point _____
relay 2 set point _____	reset point _____
relay 3 set point _____	reset point _____
relay 4 set point _____	reset point _____

4-20 mA Output Option

4 mA display value _____
20 mA display value _____

Model Number: PD690 -____ - ____

Serial Number: _____

NOTES

Accessories

PDA2407	NEMA 4X enclosure for 1 meter
PDA2411	NEMA 4X enclosure for 2 meters
PDA2412	NEMA 4X enclosure for 3 meters
PDA2444	Explosion-proof enclosure for 1 meter
PDA2446	Explosion-proof enclosure for 2 meters

PD690 Options

PD174	2 Relays
PD175	4-20 mA Output
PD176	2 Relays + 4-20 mA Output
PD177	4 Relays
PD178	4 Relays + 4-20 mA Output

OTHER PRECISION DIGITAL PRODUCTS

PD141AFO 4 Point Annunciator with First-out
Built-in Horn & Relay
PD691 Universal mV Strain Gauge & Load Cell Meter
PD692 Analog Input Flow Totalizer
PD693 Frequency/Pulse Input Flow Totalizer
PD694 0-200 DC Volt Meter
PD695 True RMS AC Volt Meter
PD750 Universal Temperature Meter
Loop-powered Meters
3½, 3½ + Extra Zero, & 4½ Digits
0.4, 0.5, 0.7, & 1 Inch High Digits
Panel Mount, NEMA 4X, & Explosion-proof

PD118 Minimux 8 Point Scanner
Adjustable Scan Rate
Easy PLC Interface
Built-in Horn

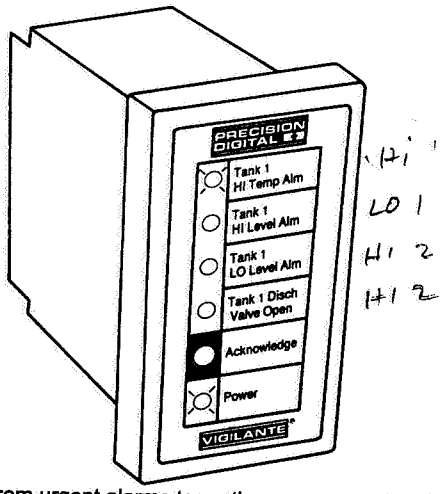
July-97

PRECISION DIGITAL

ANNUNCIATOR INSTRUMENTS

Model PD141AFO

Instruction Manual



From urgent alarms to routine messages, the PD141AFO VIGILANTE® handles all types of operational messages with simplicity and economy. The VIGILANTE® delivers clear, eye catching (and ear catching) information to the plant operators. Alarm outputs from Precision Digital meters, alarm relays, logic levels from 5 to 28 VDC, and switches for parameters such as temperature, pressure, flow, level and proximity can all be fed directly into the VIGILANTE®.

The VIGILANTE® can be field programmed for ISA Sequence A or ISA Sequence F2A, (first-out) operation. ISA Sequence A operation detects both momentary and maintained alarms. ISA Sequence F2A also detects momentary and maintained alarms as well as which alarm occurred first.

Two VIGILANTE®s may be connected together to provide up to 8 points of annunciation. If the system is programmed for ISA Sequence F2A, the VIGILANTE®s will detect which of the 8 inputs was first to alarm.

Alarm message labelling may be performed either in the field with a laser printer, or for no charge at the factory. Front panel is NEMA 4X rated.

PRECISION DIGITAL CORPORATION
15 Mercer Road • Natick MA 01760 USA
Tel 508-655-7300 • Fax 508-655-8990

PRECISION DIGITAL

ORDERING GUIDE

MODEL:	DESCRIPTION:
PD141AFO-2	24-48 VDC Power
PD141AFO-3	115 VAC Power
PD141AFO-4	230 VAC Power

SPECIFICATIONS

NUMBER OF INPUTS: 4 per VIGILANTE®; 8 per system

TYPE OF INPUTS: Momentary or maintained:

NO or NC switches: Each input circuit contains a pull-up resistor, so it is not necessary to provide external excitation to the switch.

Open Collector Transistor: Open circuit voltage is approximately 5 VDC.

Logic Levels: Low = 0 to .8 VDC; High = 4.7 to 28 VDC, input impedance - 100 Kohms.

OPERATION: User field select: ISA Sequence A or ISA Sequence F2A, (first-out).

OUTPUTS: Alarm condition indicated in 3 ways:

1. **Relay**: 1 SPDT relay (2 A @ 240 VAC) per PD141AFO. For failsafe design, the relay is energized in the non-alarm state. In the case of a power failure, the relay will go to the alarm state, (NC contact is connected to common).
2. **Audible:** Built-in horn, 75 dB.
3. **Visual:** Red LED next to the alarm message.

ALARM MESSAGES: Laser-printed, 2 lines at 10 characters per line, per message. Factory or field printable.

POWER INDICATION: Front panel green LED.

POWER: AC power: 115 VAC ±10%, 50/60 Hz, 3 VA.
230 VAC ±10%, 50/60 Hz, 3 VA.

or DC power: 24-48 VDC, 2 W max, 500 VDC isolation.

ENVIRONMENTAL:

Operating temperature range: -10 to +65 °C

Storage temperature range: -40 to +85 °C

Relative humidity: 0 to 90% non-condensing

ENCLOSURE: 1/8 DIN, high impact plastic, UL 94V-0.

FRONT PANEL: NEMA 4X, panel gasket provided.

CONNECTIONS: Removable screw terminal block (provided), accepts #24 to #12 AWG.

WARRANTY: 1 year parts & labor.

EXTENDED WARRANTY: Warranty may be extended an additional 12 months by returning the Product Registration Form within 2 months from date of purchase.

OPERATION

The VIGILANTE® can be field programmed for either ISA Sequence A or ISA Sequence F2A.

ISA Sequence A

MOMENTARY ALARM

CONDITION	LED	HORN
Normal	Off	Off
Alert	Flash	On
Normal	Flash	On
Acknowledge	Off	Off

MAINTAINED ALARM

CONDITION	LED	HORN
Normal	Off	Off
Alert	Flash	On
Acknowledge	Steady	Off
Normal	Off	Off

ISA Sequence F2A (first-out)

MOMENTARY ALARM

CONDITION	LED		HORN
	1st Pt	Next Pt	
Normal	Off	Off	Off
Alert	Flash	Steady	On
Normal	Flash	Steady	On
Acknowledge	Off	Off	Off

MAINTAINED ALARM

CONDITION	LED		HORN
	1st Pt	Next Pt	
Normal	Off	Off	Off
Alert	Flash	Steady	On
Acknowledge	Steady	Steady	Off
Normal	Off	Off	Off

PRECISION DIGITAL

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SETUP

The VIGILANTE® can be set up without removing it from its case. Setup of the VIGILANTE® involves two choices:

1. ISA Sequence A or ISA Sequence F2A

2. Alarm designated by a high (or open) input or by a low (or closed) input.

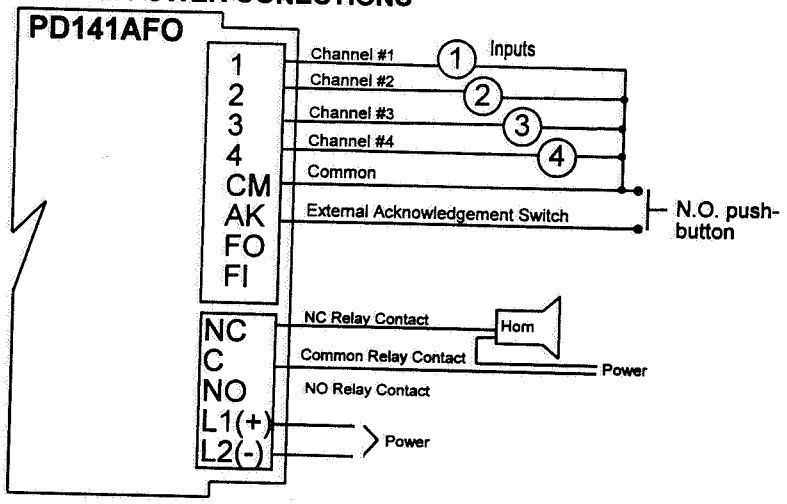
A switch located next to the screw terminals at the rear of the instrument is used to select the sequence under which the VIGILANTE® will operate. Slide this switch toward the front of the instrument (marked A on the PCB) for ISA Sequence A operation. Slide this switch toward the rear of the instrument (marked F2A on the PCB) for ISA Sequence F2A (first-out) operation.

Alarm on a contact opening or closing is determined for each channel by a switch located beside the message LED for that channel.

When a switch is in the forward position, that channel will alarm when the input contact is opened. If a switch is in the rear position, that channel will alarm when the input contact is closed.

Access to these switches is gained by removing the VIGILANTE®'s cover. The VIGILANTE®'s cover is held in place by 6 latches that snap into notches on the snap-off cover. To remove the snap-off cover from the VIGILANTE®, grasp the cover firmly on its short sides and pull it forward. The latch plate remains around the VIGILANTE®'s case.

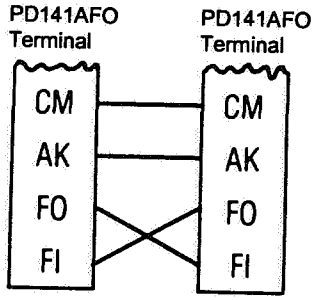
SIGNAL & POWER CONECTIONS



CONNECTING TWO VIGILANTES® TOGETHER

Two VIGILANTE®s may be connected together to form an 8 input system. If the VIGILANTE®s are programmed for ISA Sequence F2A, they will detect which of 8 inputs was first to alarm. The Acknowledgment switches will be wired together, so either one can be used to acknowledge an alarm. However, each VIGILANTE®'s relay will operate independently, so it may be necessary to wire them in parallel to drive a single alarm device. Each VIGILANTE®'s horn also operates independently.

Connections



ALARM MESSAGE LABELS

Alarm message labels for the VIGILANTE® may be factory-printed for no charge, or field-printed using a laser printer with clear self-adhesive labels.

Factory Printing of Alarm Message Labels

Factory-printed alarm message labels may be ordered at any time, at no charge, by completing the following form. (Note: message #1 is the top message & message #4 is at the bottom.)

Make copies of this page for additional alarm message labels that have different messages.

_____ Please include label with my order
_____ I have the PD141, please send ASAP
Quantity _____
Name _____
Company _____
Mailing Address _____
City, St, Zip _____
Phone _____
PO# _____

Message No. 1

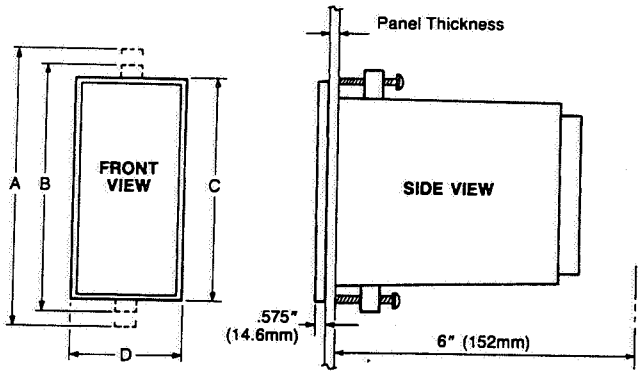
Message No. 2

Message No. 3

Message No. 4

PRECISION DIGITAL

MOUNTING DIMENSIONS



Notes:

1. Dimensions:
   - A: 4.83" (123mm) req'd for installation
   - B: 4.30" (109mm) installed
   - C: 4.25" (108mm)
   - D: 2.30" (59mm)
2. Panel cutout required: 3.62" X 1.77" (92mm X 45mm) 1/8 DIN
3. Panel thickness: .125"-.250" (3.17mm-6.34mm)
4. Weight: 11.4 oz (325g)
5. When mounting two VIGILANTES®, either side-by-side or one on top of another, separate cutouts must be made for each VIGILANTE® to maintain the NEMA 4X rating.

Accessories

PDA2407	NEMA 4X enclosure for 1 meter
PDA2411	NEMA 4X enclosure for 2 meters
PDA2412	NEMA 4X enclosure for 3 meters
PDA2444	Explosion-proof enclosure for 1 meter
PDA2446	Explosion-proof enclosure for 2 meters

OTHER PRECISION DIGITAL PRODUCTS

PD690 Universal Process Meter
PD691 Universal mV Strain Gauge & Load Cell Meter
PD692 Analog Input Flow Totalizer
PD693 Frequency/Pulse Input Flow Totalizer
PD694 0-200 DC Volt Meter
PD695 True RMS AC Volt Meter
PD750 Universal Temperature Meter
Loop-powered Meters
- 3½, 3½ + Extra Zero, & 4½ Digits
- 0.4, 0.5, 0.7, & 1 Inch High Digits
- Panel Mount, NEMA 4X, & Explosion-proof

PD118 Minimux 8 Point Scanner
- Adjustable Scan Rate
- Easy PLC Interface
- Built-in Horn

9/97

PRECISION DIGITAL

SQUARE D
Instruction Bulletin

Reference No. 556AS
Bulletin No. 30072-013-08A
Raleigh, NC, U.S.A., September, 1993
Supersedes 30072-013-08 dated 4/92

2- and 3-Pole AC Magnetic Contactors and Starters Type SA, Series B
Class 8502 and 8536 – Size 00

INTRODUCTION

This instruction bulletin illustrates and describes Class 8502 and 8536 two- and three-pole magnetic contactors and starters. It also contains assembly, modification and parts ordering instructions. To identify parts, refer to Figure 1.

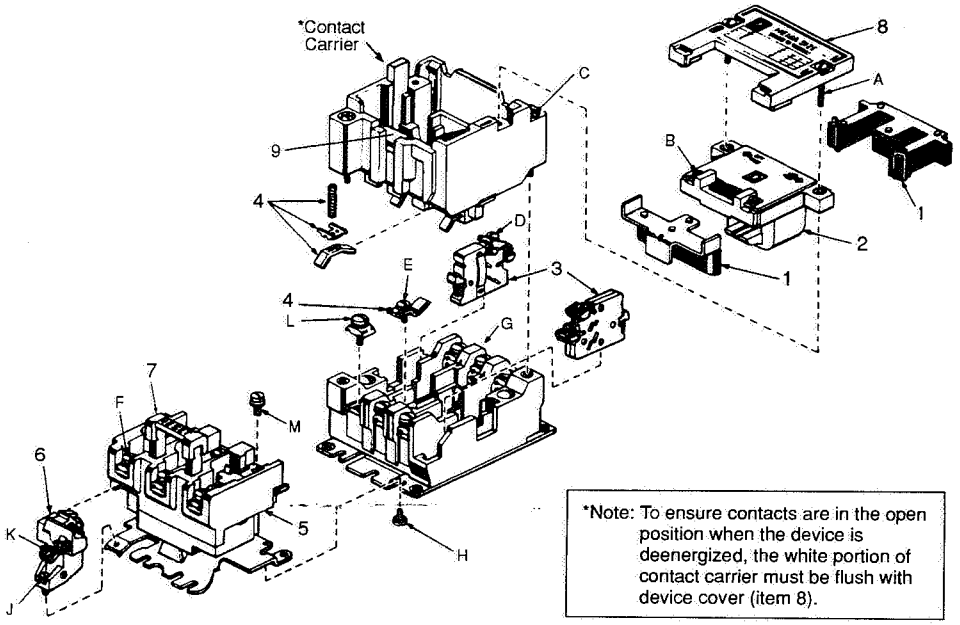


Figure 1 Contactor and Starter Assembly Drawing

⚠ DANGER

HAZARDOUS VOLTAGE.

Disconnect all power before working on equipment.

Electrical shock will cause severe injury or death.

AUXILIARY CONTACTS

All contactors are supplied with a normally-open holding circuit contact as standard. Additional normally-open or normally-closed auxiliary contacts can be installed in the field. Refer to Table 5 on page 4 for class and type. For application information, refer to Bulletin 9999-287 or the Square D Digest.

COVER MOUNTED CONTROL UNITS

NEMA Type 1 general purpose enclosures with slip-on or hinged covers are supplied with knockouts for field addition of the kits listed in Table 1 on page 2.

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ASSEMBLY INSTRUCTIONS

Figure 1 on page 1 shows how contactors and starters are assembled. Factory recommended torques for mechanical, electrical and pressure wire connections are listed in Table 2 and the device instruction sheet. These torques must be followed to ensure proper device operation.

Table 2 Factory Recommended Tightening Torques

Item	Description	Tightening Torque (in-lb)
A	Cover screw (2 per cover)	18-21
B	Coil terminal pressure wire connector (2 per coil)	9-12
C	Power plant screw (2 per device)	18-21
D	Internal auxiliary contact pressure wire connector (2 per contact)	9-12
E	Stationary contact fastener (2 per pole)	6-9
F	Lug screw (2 per pole)	[1]
G	Auxiliary wire binding screw	18-21
H	Overload relay fastening screw (2 per overload block)	18-21
J	Overload switch module fastening screw (1 per module)	9-12
K	Switch module pressure wire connector (2 per module standard; 4 per module w/ alarm circuit contact)	9-12
L	Overload-to-contactor fastener (1 per pole)	18-21 [2]
M	Overload thermal unit fastening screw (2 per pole)	18-21

[1] See instruction sheet.
[2] For contactor, see instruction sheet.

SHORT CIRCUIT PROTECTION

Provide branch-circuit overcurrent protection for starters, referring to instructions supplied with the thermal unit selection table. Provide branch-circuit overcurrent protection for contactors (Class 8502 or 8702) in accordance with the National Electrical Code. Do not exceed the maximum protective device ratings listed in Table 3.

Table 3 Maximum Ampere Ratings

Maximum Voltage (V)	Class K5, RK5 or RK1 Fuse (A)	Class J or T Fuse (A)	Inverse-Time Circuit Breaker (A)
600	10	15	15
250	12	15	15

DISTANT CONTROL

Series impedance and shunt capacitance of the control circuit must be considered to assure proper operation of contactors and starters when controlled from remote operator stations. Depending upon the voltage, wire size and number of control wires used, series impedance or shunt capacitance may limit the maximum distance of the wire run. If distances to start or stop stations are longer than those listed in Table 4, the wire-run configuration and materials must be analyzed. For further information, contact your local Square D field office for Product Data Bulletin M379.

Table 4 Maximum Control Distance

Coil Voltage (60 Hz)	Maximum Control Distance (feet)	
	#14 AWG Copper Wire	#12 AWG Copper Wire
120	1335	1800
240	540	450
480	135	110

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JOSLYN
TECHNICAL DATA

Secondary Surge Arresters/Surge Protectors

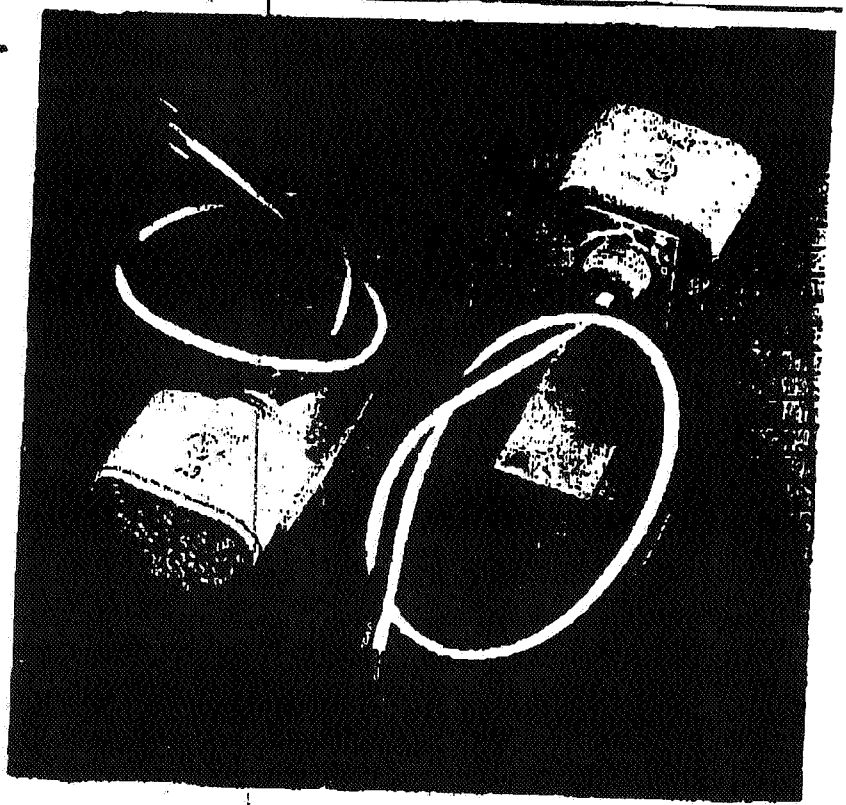
MODEL 1250-32	**110-175 V RMS, 50-60 Hz, 2 WIRE, SINGLE PHASE**
MODEL 1250-32-E	**208-277 V RMS, 50-60 Hz, 2 WIRE, SINGLE PHASE**
MODEL 1250-33	**120/240 V RMS, 50-60 Hz, 3 WIRE, SINGLE PHASE**

Description

Joslyn models 1250-32, 1250-32-E and 1250-33 are MOV (metal oxide varistor) based surge protectors. The purpose of these protectors is to prevent transient overvoltages on power lines from damaging or disrupting vulnerable electronic systems.

Maximum surge capability exceeds the 10kA 8/20 µs surge described by ANSI C62.41 as representative of category C locations. Category C locations include service entrance, and point of building entry for overhead branch circuits feeding detached buildings and underground branch circuits feeding well pumps. Joslyn experience indicates that these protectors are robust enough for all but rural and/or high lightning areas.

Consult Joslyn for information about other AC surge protector products if application requires self-monitoring, remote alarming, or a heavy-duty protector.



Features

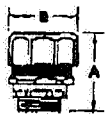
- Quick acting and reliable response in any environment.
- Absolutely no interruption of power nor drop in voltage during or after passage of a surge.
- Extremely long life with dependable protection.
- Low voltage clamping level even with high current surges.
- Reliable and equal performance in either polarity.

Installation

Protectors should be installed between Line and Neutral, and are intended to be located within 20 feet of the neutral grounding point. Protector leads must be kept as short and straight as possible in order to minimize the inductive voltage drop across the protector leads during surge passage. Unneeded lead length should be clipped off, never coiled.

For installations on subpanels, branch circuits or an individual equipment, an additional 1250-32 should be installed between neutral and ground. As an alternative, the 1260-11, 1255-11, 1456-11 or 1458-11 should be considered.

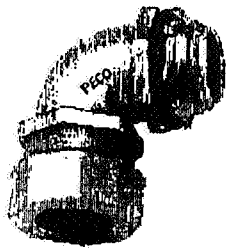
LIQUA-SEAL CONNECTORS

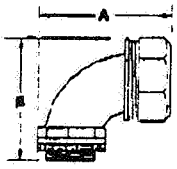


STRAIGHT LIQUA-SEAL CONNECTORS

Zinc Die Cast

Cat. No.	Description	Unit Pkg.	Std. Pkg.	Std. Pkg. Wt.	Dim. A	Dim. B
RT-38	3/8"	26	100	12	1.60	1.12
RT-50	1/2"	25	100	17	1.53	1.22
RT-75	3/4"	10	100	28	1.47	1.50
RT-100	1"	5	50	18	1.77	1.76
RT-125	1-1/4"	5	20	11	1.87	2.41
RT-150	1-1/2"	2	20	12	2.01	2.62
RT-200	2"	2	20	16	2.05	3.16
	WITH INSULATED THROAT					
RT-38A	3/8"	25	100	12	1.59	1.12
RT-50A	1/2"	25	100	17	1.62	1.22
RT-75A	3/4"	10	100	28	1.56	1.50
RT-100A	1"	5	50	18	1.86	1.76
RT-125A	1-1/4"	5	20	11	1.96	2.41
RT-150A	1-1/2"	2	20	12	2.10	2.62
RT-200A	2"	2	20	16	2.14	3.16
RT-250A	2-1/2"	1	1	2	2.91	4.22
RT-300A	3"	1	1	2.5	3.53	4.91
RT-350A	3-1/2"	1	1	3	3.73	5.50
RT-400A	4"	1	1	3.9	3.80	5.92





90° ANGLE LIQUA-SEAL CONNECTORS

Zinc Die Cast

Cat. No.	Description	Unit Pkg.	Std. Pkg.	Std. Pkg. Wt.	Dim. A	Dim. B
RT-90-38	3/8"	10	50	9	2.34	2.06
RT-90-50	1/2"	10	50	10	2.34	2.22
RT-90-75	3/4"	10	100	32	2.60	2.55
RT-90-100	1"	5	50	22	3.30	2.82
RT-90-125	1-1/4"	5	20	15	3.96	3.36
RT-90-150	1-1/2"	2	20	16	4.13	3.45
RT-90-200	2"	2	20	21	4.67	4.04
	WITH INSULATED THROAT					
RT-90-38A	3/8"	10	50	9	2.34	2.15
RT-90-50A	1/2"	10	50	10	2.34	2.31
RT-90-75A	3/4"	10	100	32	2.60	2.64
RT-90-100A	1"	5	50	22	3.30	2.91
RT-90-125A	1-1/4"	5	20	15	3.96	3.45
RT-90-150A	1-1/2"	2	20	16	4.13	3.54
RT-90-200A	2"	2	20	21	4.67	4.13
RT-90-250A	2-1/2"	1	1	3.5	5.37	5.21
RT-90-300A	3"	1	1	4.5	6.50	6.10
RT-90-350A	3-1/2"	1	1	5.5	7.45	6.71
RT-90-400A	4"	1	1	6.6	8.00	6.78

CAST PIPE CLAMPS

All types cast of high copper content bronze alloy which gives maximum strength without sacrificing current carrying capacity except #8080 which is die cast zinc.

Catalog Number	Type	Water Pipe Size	Tap Wire Size Min.	Tap Wire Size Max.	Std. Pkg.	Wt. Per 100
8080	Zinc	½"-¾"-1"	#10 Solid	#2 Str.	100	12
8100	Bronze	½"-¾"-1"	#10 Solid	#2 Str.	100	25
8101	Bronze	1¼"-1½"-2"	#10 Solid	#2 Str.	50	50
8102	Bronze	2½"-3"	#10 Solid	#2 Str.	20	132
		3½"-4"				
8103	Bronze	4½"-6"	#10 Solid	#2 Str.	10	156

For bonding bare copper wire to galvanized or copper water pipe or for use as water meter shunt. Will not loosen or corrode.

Catalog Number	Type	Water Pipe Size	Tap Wire Size Min.	Tap Wire Size Max.	Std. Pkg.	Wt. Per 100
8110	Bronze	½"-¾"-1"	#10 Solid	#6 Solid	50	42
8111	Bronze	1¼"-1½"-2"	#10 Solid	#6 Solid	50	56
8113	Bronze	½"-¾"-1"			50	67

For bonding bare armored or unarmored ground wire or for use with cables or cord. No. 8113 for ½" or ¾" EMT or ½" rig'd.

Catalog Number	Type	Conduit Hub Size	Water Pipe Size	Tap Wire Size Min.	Tap Wire Size Max.	Std. Pkg.	Wt. Per 100
8120	Bronze	½"	½"-¾"-1"	#10 Solid	#4 Str.	50	50
8122	Bronze	¾"	½"-¾"-1"	#10 Solid	#2/C Str.	50	60
8123	Bronze	1"	1¼"-1½"-2"	#10 Solid	#3/C Str.	25	70
8124	Bronze	1"	½"-¾"-1"	#10 Solid	#3/0 Str.	50	65

JUMPER CLAMPS

For use with all combinations of aluminum, steel and copper. No. 8200 for use with aluminum or galvanized steel strand to copper wires. No. 8201 for use with aluminum or galvanized steel strand to similar conductors.

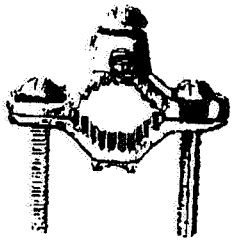
Catalog Number	Type	Grooves	Wire Range	Std. Pkg.	Wt. per 100 pcs.
8200	Cast Bronze—Plated	1—Plated	1/0-6	50	14
8201	Cast Bronze—Plated	1—Plain Plated	1/0-6	50	14

GROUND ROD CLAMPS & FITTINGS

Threaded bronze couplings and steel driving studs for use with sectional type Cop-R-Coat ground rods for deep grounding. Cast bronze clamps U/L listed. Stainless steel clamps.

Catalog Number Bronze	Catalog Number Galvanized	Rod Size	Wire Size Min.	Wire Size Max.	Std. Pkg.	Wt. Per 100
8038	7938	⅜"	14 Sol.	4 Str.	200	9
8012	7912	½"	10 Sol.	2 Str.	100	17
8058	7958	⅝"	8 Sol.	1 Str.	100	18
8034	7934	¾"	8 Sol.	1/0 Str.	100	25
8010		1"	8 Sol.	4/0 Str.	25	40
Stainless	9067	⅜ - ¾	8 Sol.	1/0 Str.	50	30

Fittings				
8534		⅜" Bronze Coupling	10	30
8535		¾" Bronze Coupling	10	46
8538		1" Bronze Coupling	10	100
19534		⅜" Driving Stud	10	23
19535		¾" Driving Stud	10	35
19538		1" Driving Stud	10	75



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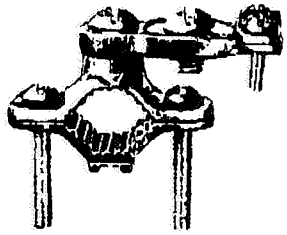

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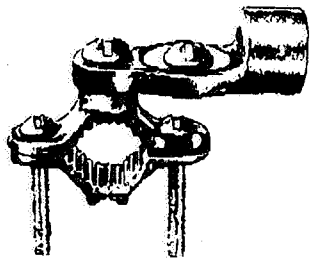

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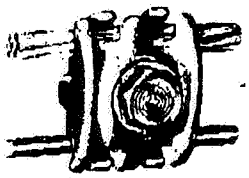

8200

Cast Bronze

Galvanized

Bronze Coupling

Driving Stud

ULTRATITE

LIQUID TIGHT FLEXIBLE STEEL CONDUIT

SPECIFICATIONS

Type UA Liquid-tight

Trade Size	Inside Diameter	Outside Diameter	Approx. Weight per 100 ft.	Minimum Bend Radius	Minimum Bend Diameter

Type UT Liquid-tight

Trade Size	Inside Diameter	Outside Diameter	Approx. Weight per 100 ft.	Minimum Bend Radius	Minimum Bend Diameter

FEATURES

NOTE

ALFLEX CORPORATION

ALLIED'S EMT

QUALITY, EASY-TO-INSTALL ELECTRICAL METALLIC TUBING

MANUFACTURED FOR LONG LIFE

Allied EMT is precision manufactured from the highest grade mild strip steel for exceptional durability and long-lasting life.

Allied EMT is hot galvanized using Allied's patented In-line Flo-Coat® process. This process combines zinc, chromate, and a clear organic polymer top-coat to form a triple layer of protection against corrosion and abrasion.

Allied EMT provides radiation protection and magnetic shielding, while its uniform wall thickness provides resistance to physical damage from impact or crushing.

INSTALLS QUICKLY AND EASILY

Allied EMT's quality steel combines damage resistant strength with ductility to provide easy bending, cutting and joining to prevent waste of time and material. It resists flattening, kinking or splitting, resulting in faster and easier installations.

Allied EMT provides smooth continuous raceways for fast wire-pulling. The interior wall of Allied EMT is protected with a specially formulated corrosion resistant lubricating coating for easier fishing and wire-pulling. No need to worry about damage to the conduit system even when pulling through multiple 90° bends.

FULL CODES AND STANDARDS COMPLIANCE

Allied EMT is U.L. listed and recognized by the National Electrical Code. It meets Underwriters Laboratories' Standards for EMT, U.L. 797. Allied EMT is also manufactured to meet the requirements of ANSI C80.3 and Federal Specifications. Federal Specifications now use U.L. 797 in lieu of WWC 563. Recognized as an equipment grounding conductor (NEC Article 250-91b).

Installation of EMT shall be in accordance with the National Electrical Code and U.L. General Information Card #FJMX.

Master bundles conform to NEMA standard RN2-1987.

SPECIFICATION DATA

To specify Allied EMT, include the following: Electrical Metallic Tubing shall be equal to that manufactured by Allied Tube & Conduit Corporation. EMT shall be hot galvanized steel O.D. with an organic corrosion resistant I.D. coating and shall be produced in accordance with U.L. Safety Standard #797 and ANSI C80.3 and shall be listed by a nationally recognized testing laboratory with follow-up service. Where **Kwik-Fit EMT** is used it shall also meet U.L. Safety Standard #514-B. It is noted that these U.L. standards have been adopted by the federal government and separate military specifications no longer exist.

KWIK-FIT EMT- A NEW INNOVATION FROM THE CONDUIT LEADER

Allied's Kwik-Fit EMT has an integral steel set-screw coupling formed on one end of each length of EMT. Specifying U.L. listed Kwik-Fit EMT ensures an all steel system—both conduit and coupling—for excellent strength and ground return, as well as economy. Contact Allied for detailed specifications on Kwik-Fit EMT. Available in 2½"-4" sizes.

WEIGHTS AND DIMENSIONS FOR ELECTRICAL METALLIC TUBING

Trade Size, Inches	Approx. Wt. per 100 ft. (30.5m)		Nominal Outside Dia.[1]		Nominal Wall Thickness		Length of Finished Conduit[2]		Quantity in Primary Bundle		Quantity in Master Bundle		Approx. Wt. of Master Bundle		Volume of Master Bundle	
	lb.	kg	in.	mm	in.	mm	ft.	m	ft.	m	ft.	m	lb.	kg	cu ft.	cu m
½	29	13.15	0.706	17.9	0.042	1.067	10	3.05	100	30.48	7000	2134	2037	924	28.7	0.81
¾	45	20.41	0.922	23.4	0.049	1.245	10	3.05	100	30.48	5000	1524	2175	987	35.6	1.01
1	65	29.48	1.163	29.5	0.057	1.448	10	3.05	50	15.24	3000	914	1905	864	33.7	0.95
1¼	96	43.55	1.510	38.4	0.065	1.651	10	3.05	50	15.24	2000	610	1894	859	35.0	0.99
1½	111	50.35	1.740	44.2	0.065	1.651	10	3.05	50	15.24	1500	457	1692	767	34.2	0.97
2	141	63.96	2.197	55.8	0.065	1.651	10	3.05	—	—	1200	366	1693	768	46.7	1.32
2½	215	97.52	2.875	73.0	0.072	1.829	10	3.05	—	—	510	186	1412	640	41.5	1.18
3	260	117.94	3.500	88.9	0.072	1.829	10	3.05	—	—	510	155	1429	648	48.9	1.38
3½	325	147.42	4.000	101.6	0.083	2.108	10	3.05	—	—	370	113	1248	566	48.6	1.38
4	390	176.90	4.500	114.3	0.083	2.106	10	3.05	—	—	300	91	1134	514	48.3	1.37

[1] Outside diameter to erances: +/- .005 in. (.13mm) for trade sizes ½" through 2", +/- .010 in. (.25mm) for trade size 2½", +/- .015 in. (.38mm) for trade size 3", +/- .020 in. (.51mm) for trade sizes 3½" and 4"

[2] Length tolerances: +/-.25" (6.35mm).

allied
TUBE & CONDUIT
ELECTRICAL
16100 South Lathrop Avenue
Harvey, Illinois 60426
(708) 339-1610
A Grinnell Company

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ALLIED'S RIGID

QUALITY, LONG-LASTING RIGID STEEL CONDUIT

PROVIDES FULL ELECTRICAL SYSTEM PROTECTION

Allied RIGID conduit is precision manufactured for dependable, long-lasting value and protection for the electrical raceway system.

Manufactured from high-strength strip steel, Allied RIGID combines damage resistant strength with ductility to assure easy bending, cutting and joining. It also provides smooth, continuous raceways for fast wire-pulling. No need to worry about damage to the conduit system even when pulling through multiple 90° bends.

Allied RIGID is hot-dipped zinc galvanized. Then, it is chromated to form an additional protection layer against corrosion and abrasion.

Allied RIGID provides radiation protection and magnetic shielding and resists impact.

The ¾" NPT threads (ANSI B1.20.1) are full cut and hot galvanized after cutting. Color-coded end-cap thread protectors keep the threads clean and sharp and also provide instant trade size recognition. Even-inch sizes are color-coded blue. ½-inch sizes are black, and ¾" sizes are red.

FULL CODES AND STANDARDS COMPLIANCE

Allied's RIGID is U.L. listed and is recognized by the National Electrical Code. It meets Underwriters Laboratories' Standards for RIGID, U.L. 6. Allied's RIGID is also manufactured to meet the requirements of ANSI C80.1 and Federal Specifications. Federal Specifications now use U.L. 6 in lieu of WWC 581. Recognized as an equipment grounding conductor (NEC Article 250-91b).

Installation of Rigid Metal Conduit shall be in accordance with the National Electrical Code and U.L. General Information Card #DYIX.

Master bundles conform to NEMA standard RN2-1987.

SPECIFICATION DATA

Rigid Metal Conduit shall be hot-dip galvanized steel equal to that manufactured by Allied Tube & Conduit Corporation. Threads shall be hot galvanized after cutting. GRC shall be produced in accordance with U.L. Safety Standard #6 and ANSI C80.1 and shall be listed by a nationally recognized testing laboratory with follow-up service. Where **Kwik-Couple** GRC is used it shall also meet U.L. Safety Standard #514-B. It is noted that these U.L. standards have been adopted by the federal government and separate military specifications no longer exist.

KWIK-COUPLE RIGID-A NEW INNOVATION FROM THE CONDUIT LEADER

Allied's patented* Kwik-Couple RIGID has a factory-installed Kwik-Couple coupling threaded onto one end of each conduit length or elbow. The Kwik-Couple performs like a 3-piece coupling, threading securely onto both lengths of conduit at each connection by wrench-tightening the coupling instead of turning the conduit.

Specify U.L. listed Kwik-Couple RIGID ensures RIGID conduit reliability and performance, as well as economy. Contact Allied for detailed specifications on Kwik-Couple Rigid. Available in 2½"-4" sizes.

* U.S. Patent Numbers 4258936, 4547004.

WEIGHTS AND DIMENSIONS FOR GALVANIZED RIGID CONDUIT

Trade Size, Inches	Approx. Wt. per 100 ft. (30.5m)		Nominal Outside Dia.[1]		Nominal Wall Thickness[2]		Length of Finished Conduit[3]		Quantity in Primary Bundle		Quantity in Master Bundle		Approx. Wt. of Master Bundle		Volume of Master Bundle	
	lb.	kg	in.	mm	in.	mm	ft.	m	ft.	m	ft.	m	lb.	kg	cu ft.	cu m
½	80	36.29	0.840	21.3	0.104	2.6	9'11¾"	3.03	100	30.48	2500	762	2000	907	20.8	0.59
¾	109	49.44	1.050	26.7	0.107	2.7	9'11¾"	3.03	50	15.24	2000	610	2180	989	24.3	0.69
1	165	74.84	1.315	33.4	0.126	3.2	9'11"	3.02	50	15.24	1250	381	2063	936	21.7	0.61
1¼	215	97.52	1.660	42.2	0.133	3.4	9'11"	3.02	30	9.14	900	274	1935	878	23.3	0.66
1½	258	117.03	1.900	48.3	0.138	3.5	9'11"	3.02	—	—	800	244	2064	936	27.8	0.79
2	352	159.67	2.375	60.3	0.146	3.7	9'11"	3.02	—	—	600	183	2112	958	33.8	0.96
2½	567	257.19	2.875	73.0	0.193	4.9	9'10½"	3.01	—	—	370	113	2098	952	29.2	0.83
3	714	323.87	3.500	88.9	0.205	5.2	9'10½"	3.01	—	—	300	91	2142	972	31.3	0.89
3½	860	390.10	4.000	101.6	0.215	5.5	9'10½"	3.00	—	—	250	76	2150	975	34.7	0.98
4	1000	453.60	4.500	114.3	0.225	5.7	9'10½"	3.00	—	—	200	61	2000	907	33.7	0.95
5	1320	598.75	5.563	141.3	0.248	6.2	9'10"	3.00	—	—	150	46	1980	898	41.3	1.17
6	1785	809.68	6.625	168.3	0.266	6.8	9'10"	3.00	—	—	100	30	1765	810	38.9	1.10

[1]Outside diameter tolerances: +/- .015 in. (.38mm) for trade sizes ½ in. through 2 in. +/- .025 in. (.64mm) for trade sizes 2½ in. through 4 in. +/- 1% for trade sizes 5 in. and 6 in.
[2]For more information only; not a spec requirement.
[3]Without Coupling Length Tolerances. +/- .25 in (6.35mm)

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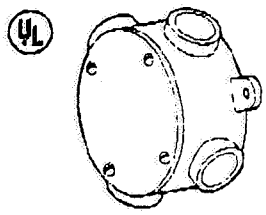
allied
TUBE & CONDUIT
ELECTRICAL
16100 South Lathrop Avenue
Harvey, Illinois 60426
(708) 333-1500

Conduit Bodies and Junction Boxes

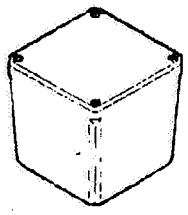
CANTEX

Round Junction Box
with Brass Inserts



PART NO.	SIZE	STD. PKG.	UPC-ITF 3 00 88700	PKG. WT.	PRICE PER 100
5133690	1/2 & 3/4	15	56793 2	9	585.00

Junction Box
with Brass Inserts

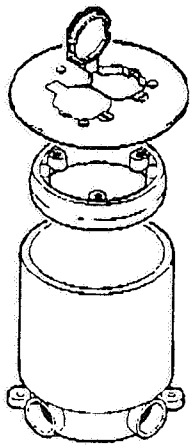


PART NO.	SIZE	STD. PKG.	UPC-ITF 3 00 88700	PKG. WT.	PRICE PER 100
*5133705	4x4x2	10	51790 6	10	979.00
*5133709	4x4x4	10	51794 4	12	1,615.00
5133707	4x4x6	10	51792 0	20	1,655.00
5133706	5x5x2	10	51791 3	10	1,724.00
5133710	6x6x4	10	51795 1	21	1,977.00
5133711	6x6x6	5	51796 8	13	2,307.00
5133712	8x8x4	5	51797 5	16	3,730.00
5133164	8x8x6	4	51799 7	16	4,271.00
5133708	8x8x7	4	51793 7	20	4,953.00
5133714	12x12x4	2	51799 9	14	5,091.00
5133713	12x12x6	2	51798 2	17	5,247.00
5133163	16x14x6	1	51718 0	12	10,934.00
5133165	24x18x8	1	51720 3	22	48,859.00
5133166	24x24x3	1	51721 0	26	66,437.00
5133173	36x24x9	1	54758 3	30	85,121.00

* U.L. Listed

Floor Boxes and Accessories

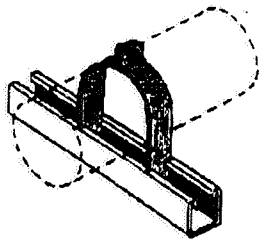
Duplex Boxes and Covers



PART NO.	SIZE	STD. PKG.	UPC-ITF 3 00 88700	PKG. WT.	PRICE PER 100
5133760	Floor Box Base 4-3/4" Hubs 4-3/4" to 1/2" Reducers, Level Ring & Pour Cover, U.L. Listed	9	56927 1	17	1,618.00
5133758	Floor Box Base 2-3/4" Hubs, 2-1" Hubs, 2-3/4" to 1/2" Reducers, 2-1" to 3/4" Reducers, Level Ring and Pour Cover, U.L. Listed	9	56926 4	17	1,618.00
5133679	Duplex Cover-BROWN	10	51769 2	4	3,412.00
5133700	Duplex Cover-BLACK	10	51795 2	4	3,412.00
5133678	Duplex Cover-BRONZE	10	51768 5	4	3,412.00

VERSABAR

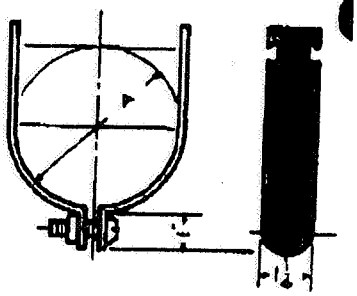
PIPE CLAMPS



STD. FINISH:
ELECTRO-GALVANIZED

ALSO AVAILABLE IN:

- STAINLESS STEEL
- HOT-DIPPED GALVANIZED WITH STAINLESS STEEL FASTENERS
- ALUMINUM WITH ALUMINUM FASTENERS
- ALUMINUM WITH STAINLESS STEEL FASTENERS
- COPPER PLATED



• FOR RIGID STEEL CONDUIT VP-1000 SERIES †

VP-1037	3/8"	1 1/16"	.110	400#
VP-1050	1/2"	1 7/32"	.118	
VP-1075	3/4"	1 1/16"	.130	600#
VP-1100	1"	1 11/32"	.150	
VP-1125	1 1/4"	1 1/4"	.201	
VP-1150	1 1/2"	1 13/32"	.258	800#
VP-1200	2"	2 13/32"	.320	
VP-1250	2 1/2"	2 7/8"	.400	

VP-1300	3"	3 1/2"	.475	800#
VP-1350	3 1/2"	4"	.684	1000#
VP-1400	4"	4 1/2"	.740	
VP-1450	4 1/2"	5"	.791	
VP-1500	5"	5 1/16"	.846	
VP-1600	6"	6 5/8"	1.116	
VP-1800	8"	8 5/8"	1.357	

• FOR THIN WALL CONDUIT (E. M. T.) VPT-1000 SERIES †

VPT-1037	3/8"	1 3/32"	.106	400#
VPT-1050	1/2"	1 5/32"	.112	
VPT-1075	3/4"	1 3/16"	.124	
VPT-1100	1"	1 3/16"	.141	600#

VPT-1125	1 1/4"	1 1/2"	.174	600#
VPT-1150	1 1/2"	1 3/4"	.229	800#
VPT-1200	2"	2 1/32"	.303	

• FOR O. D. TUBING, TRANSITE PIPE, FIBRE DUCT, GLASS, OR CERAMIC TUBES VT-1000 SERIES

VT-1025	1/4" O.D.	1/4"	.091	400#
VT-1037	3/8" O.D.	5/16"	.097	
VT-1050	1/2" O.D.	1/2"	.103	
VT-1062	5/8" O.D.	9/16"	.108	
VT-1075	3/4" O.D.	3/4"	.115	
VT-1087	7/8" O.D.	7/8"	.121	
VT-1100	1" O.D.	1"	.127	600#
VT-1112	1 1/8" O.D.	1 1/16"	.133	
VT-1125	1 1/4" O.D.	1 1/4"	.145	
VT-1137	1 3/8" O.D.	1 3/8"	.158	
VT-1150	1 1/2" O.D.	1 1/2"	.166	
VT-1162	1 5/8" O.D.	1 5/8"	.192	
VT-1175	1 3/4" O.D.	1 1/4"	.229	800#
VT-1187	1 7/8" O.D.	1 7/8"	.251	
VT-1200	2" O.D.	2"	.273	
VT-1212	2 1/8" O.D.	2 1/8"	.288	
VT-1225	2 1/4" O.D.	2 1/4"	.337	
VT-1237	2 3/8" O.D.	2 3/4"	.356	
VT-1250	2 1/2" O.D.	2 1/2"	.364	
VT-1262	2 5/8" O.D.	2 5/8"	.372	
VT-1275	2 3/4" O.D.	2 3/4"	.387	
VT-1287	2 7/8" O.D.	2 7/8"	.404	
VT-1300	3" O.D.	3"	.419	
VT-1312	3 1/8" O.D.	3 1/8"	.434	
VT-1325	3 1/4" O.D.	3 1/4"	.449	
VT-1337	3 3/8" O.D.	3 3/4"	.464	
VT-1350	3 1/2" O.D.	3 1/2"	.479	
VT-1362	3 3/4" O.D.	3 3/8"	.569	1000#
VT-1375	3 3/4" O.D.	3 3/4"	.574	
VT-1387	3 7/8" O.D.	3 7/8"	.580	
VT-1400	4" O.D.	4"	.588	
VT-1412	4 1/8" O.D.	4 1/8"	.595	
VT-1425	4 1/4" O.D.	4 1/4"	.603	
VT-1437	4 3/8" O.D.	4 3/8"	.612	
VT-1450	4 1/2" O.D.	4 1/2"	.619	

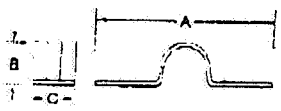
VT-1462	4 5/8" O.D.	4 5/8"	.625	1000#
VT-1475	4 3/4" O.D.	4 3/4"	.635	
VT-1487	4 7/8" O.D.	4 7/8"	.643	
VT-1500	5" O.D.	5"	.651	
VT-1512	5 1/8" O.D.	5 1/8"	.659	
VT-1525	5 1/4" O.D.	5 1/4"	.672	
VT-1537	5 3/8" O.D.	5 3/8"	.675	
VT-1550	5 1/2" O.D.	5 1/2"	.680	
VT-1562	5 5/8" O.D.	5 5/8"	1.290	
VT-1575	5 3/4" O.D.	5 3/4"	1.311	
VT-1587	5 7/8" O.D.	5 7/8"	1.333	
VT-1600	6" O.D.	6"	1.354	
VT-1612	6 1/8" O.D.	6 1/4"	1.376	
VT-1625	6 1/4" O.D.	6 1/4"	1.397	
VT-1637	6 3/8" O.D.	6 3/4"	1.419	
VT-1650	6 1/2" O.D.	6 1/2"	1.441	
VT-1662	6 5/8" O.D.	6 5/8"	1.462	
VT-1675	6 3/4" O.D.	6 3/4"	1.484	
VT-1687	6 7/8" O.D.	6 7/8"	1.499	
VT-1700	7" O.D.	7"	1.517	
VT-1712	7 1/8" O.D.	7 1/8"	1.535	
VT-1725	7 1/4" O.D.	7 1/4"	2.435	
VT-1737	7 3/8" O.D.	7 3/8"	2.464	
VT-1750	7 1/2" O.D.	7 1/2"	2.436	
VT-1762	7 5/8" O.D.	7 5/8"	2.529	
VT-1775	7 3/4" O.D.	7 3/4"	2.551	
VT-1787	7 7/8" O.D.	7 7/8"	2.532	
VT-1800	8" O.D.	8"	2.624	
VT-1812	8 1/8" O.D.	8 1/8"	2.656	
VT-1825	8 1/4" O.D.	8 1/4"	2.699	
VT-1837	8 3/8" O.D.	8 3/8"	2.721	
VT-1850	8 1/2" O.D.	8 1/2"	2.750	
VT-1862	8 5/8" O.D.	8 5/8"	2.736	

* Note: Load Rating is based on Safety Factor of 5.

TWO HOLE STRAPS FOR ARMORED BX CABLE

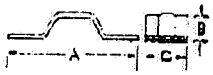
Steel

Cat. No.	Description	Unit Pkg.	Std. Pkg.	Std. Pkg. Wt.	Dim A	Dim. B	Dim. C
TBX-50	1/2"	50	500	7	1.88	.48	.50



PLASTIC UF STRAPS

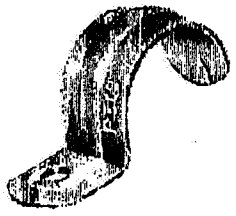
Cat. No.	Description	Unit Pkg.	W. Pkg.	Std. Pkg. Wt.	Dim. A	Dim. B	Dim. C
188AP	14-2, 12-2	1000	1000	26	1.62	.33	.50
188BP	14-3 12-3	1000	1000	31	1.94	.33	.50



ONE HOLE E.M.T. STRAPS

Steel

Cat. No.	Description	Unit Pkg.	Std. Pkg.	Std. Pkg. Wt.	Dim. A	Dim. B	Dim. C
180-S	1/2"	100	1000	22	1.66	.75	.57
181-S	3/4"	100	500	15	1.95	.96	.63
182-S	1"	50	500	18	2.14	1.10	.72
183-S	1-1/4"	20	100	10	3.20	1.40	.88
184-S	1-1/2"	50	50	5	3.50	1.60	1.00
185-S	2"	20	20	4	3.83	2.28	1.13
*168-S	2-1/2"	25	25	14	5.10	3.00	1.25
*169-S	3"	25	25	19	5.87	3.56	1.25
*170-S	3-1/2"	10	10	7	6.25	4.06	1.25
*171-S	4"	10	10	8	6.84	4.55	1.25

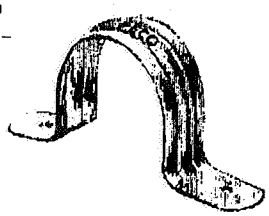


*Also for use on Rigid Conduit and IMC

TWO HOLE E.M.T. STRAPS

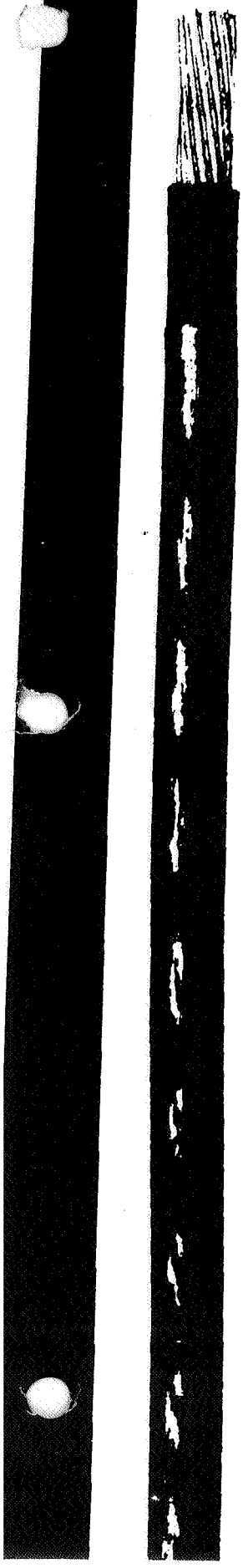
Galvanized Steel

Cat. No.	Description	Unit Pkg.	Std. Pkg.	Std. Pkg. Wt.	Dim. A	Dim. B	Dim. C
TH-180S	1/2"	50	500	10	2.20	.75	.57
TH-181S	3/4"	50	500	13	2.72	.95	.64
TH-182S	1"	50	250	13	3.02	1.15	.69
TH-183S	1-1/4"	50	50	3	3.68	1.50	.76
TH-184S	1-1/2"	25	25	1	4.25	1.71	.88
TH-185S	2"	25	25	3	4.87	2.16	1.00
*TH-168S	2-1/2"	25	25	4	5.86	2.92	1.00
*TH-169S	3"	25	25	5	6.53	3.50	1.00
*TH-170S	3-1/2"	10	10	2	7.46	4.00	1.00
*TH-171S	4"	10	10	2	7.93	4.50	1.00



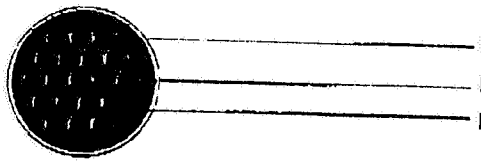
*Also for use on Rigid Conduit and IMC

175



Type THHN-THWN

90°C BUILDING WIRE, U.L. File Number E14656 or E53446



DESCRIPTION: ESSEX® type THHN or THWN building wire is a small diameter, general purpose, 600 volt building wire to be used as power, lighting and control wiring. The thin, high-grade PVC insulation and smooth, tough, nylon jacket permit the easy use of more wires in a given size conduit.

CONSTRUCTION: The copper conductors meet the requirements of ASTM-B-3 if solid, and ASTM-B-3 and B 8 if stranded. Type THHN or THWN complies with Federal Government Specification J-C-30A, and Underwriters Laboratories' standards 83 and 1063 where applicable.

PRINTED: **Essex 2 AWG Type THHN or Type THWN or MTW E53446 (UL) Gasoline & Oil Resistant II 600V VW-1.**

USE: The wide range of listings by Underwriters Laboratories include: THWN-75°C wet or dry, THHN-90°C dry, machine tool wire 90°C, and sizes 14 AWG thru 1,000 MCM, which are gasoline- and oil-resistant 75°C. Sizes 14 AWG to 2 AWG stranded also listed as MTW. Sizes 14, 12, and 10 AWG solid not MTW. Sizes 14 AWG to 350 MCM are rated as VW-1. 1/0 and larger are CT rated.

SIZE AWG**	NUMBER OF STRANDS	THICKNESS (Mils.) INSULATION	THICKNESS (Mils.) JACKET	APPROX. O.D (Inches)	AMPACITY* THHN 90°C	AMPACITY* THWN 75°C	APPROX. WEIGHT (Lbs/M ft.)	STANDARD PACKAGE**
14	1	15	4	.11	15	15	16	500' Spool
12	1	15	4	.12	20	20	25	500' Spool
10	1	20	4	.15	30	30	38	500' Spool
14	19	15	4	.11	15	15	17	500' Spool
12	19	15	4	.13	20	20	25	500' Spool
10	19	20	4	.17	30	30	40	500' Spool
8	19	30	5	.22	55	50	65	500' Spool
8	19	30	5	.26	75	65	97	1,000' Reel
4	19	40	6	.33	95	85	155	1,000' Reel
3	19	40	6	.36	110	100	191	1,000' Reel
2	19	40	6	.39	130	115	236	1,000' Reel
1	19	50	7	.45	150	130	304	1,000' Reel
1/0	19	50	7	.49	170	150	376	1,000' Reel
2/0	19	50	7	.54	195	175	468	1,000' Reel
3/0	19	50	7	.59	225	200	582	1,000' Reel
4/0	19	50	7	.65	260	230	725	1,000' Reel
250 MCM	37	60	8	.70	290	255	863	1,000' Reel
300 MCM	37	60	8	.75	320	285	1,024	1,000' Reel
350 MCM	37	60	8	.80	350	310	1,168	1,000' Reel
400 MCM	37	60	8	.85	380	335	1,350	1,000' Reel
500 MCM	37	60	8	.93	430	380	1,670	1,000' Reel
600 MCM	61	70	9	1.07	475	420	2,013	1,000' Reel
750 MCM	61	70	9	1.14	535	475	2,498	1,000' Reel
1,000 MCM	61	70	9	1.29	615	545	3,300	1,000' Reel

* Ampacity based on not more than three conductors in raceway in free air with an ambient temperature of 30°C (86°F).

14, 12 and 10 AWG also available on 2,500' reels.

6 AWG and larger available on 500' reels and cutting reels

** 14 AWG to 2 AWG use U.L. Style No. 1112-1320-1413-1321. 1 AWG to 1,000 MCM use U.L. Style No. 1408-1409-1410-1411-1016-1317-1318-1319-1452.

SIZE	Black	White	Red	Blue	Green	Yellow	Orange	Brown	Purple	Pink	Gray
14 Solid THHN	X	X	X	X	X	X	X	X	X	X	X
12 Solid THHN	X	X	X	X	X	X	X	X	X	X	X
10 Solid THHN	X	X	X	X	X	X	X	X	X	X	X
14 Strd. THHN	X	X	X	X	X	X	X	X	X	X	X
12 Strd. THHN	X	X	X	X	X	X	X	X	X	X	X
10 Strd. THHN	X	X	X	X	X	X	X	X	X	X	X
8 Strd. THHN	X	X	X	X	X						
6 Strd. THHN	X	X	X	X	X						
4 Strd. THHN	X	X	X	X	X						
3 Strd. THHN	X	X	X	X	X						
2 Strd. THHN	X	X	X	X	X						
1 & Larger THHN	X										

X = STOCK COLORS

Essex Group, Inc.
1710 Wall Street • Fort Wayne, IN 46802

ESSEX

Type 302 Stainless Steel Wire Rope

We offer standard lengths of 10', 50', 100', 200', and 300 ft., as well as any length you may need.

1 x 7 Strand Core is used for dial cable and for guying.

1 x 19 Strand Core is used for guying, rigging, and as standing rigging.

3 x 7 Hollow Core is used on small drums and sheaves, and for controls and signals.

6 x 19 IWRC is excellent for heavy hoisting.

6 x 37 IWRC is used for light to heavy hoisting, and on small drums and sheaves.

6 x 42 Fiber Core is also known as 6 x 6 x 7, and is for rope used for steering cables that aren't subject to crushing loads or abrasion. It is neither lubricated nor preformed.

7 x 3 Hollow Core is used on small drums and sheaves, and for controls and signals.

7 x 7 Strand Core has excellent strength for hoisting and for transmitting mechanical power.

7 x 19 Strand Core is used for light to heavy hoisting, and on small drums and sheaves.

19 x 7 Strand Core helps minimize the natural tendency of cable to rotate and is excellent for single-part hoists.

Key	Specifications
A	Federal Spec. RR-W-410
B	Full Compliance Military Spec. MIL-W-83420
C	Meets Breaking Strength MIL-W-87161
D	Meets Breaking Strength MIL-W-83140
E	Meets Breaking Strength of MIL-W-83420

Dia.	Specs.	Breaking Strength, lbs.		Per Foot 1-99	Per Foot 100-299	Per Foot 300-Up
1 x 7 Strand Core						
.012"	—	25	3458T141	$0.06	$0.04	$0.03
1/64"	—	40	3458T11	.05	.04	.03
.018"	—	55	3458T142	.06	.04	.03
.021"	—	80	3458T143	.06	.04	.03
.024"	—	100	3458T144	.06	.05	.04
.027"	—	125	3458T145	.08	.05	.04
1/32"	C	150	3458T13	.07	.05	.04
.038"	—	250	3458T146	.11	.07	.05
1/16"	C	500	3458T14	.16	.13	.10
3/32"	—	1,200	3458T16	.29	.24	.18
1/8"	—	2,100	3458T17	.48	.39	.32
5/32"	—	3,300	3458T171	.80	.66	.54
3/16"	—	4,700	3458T19	1.02	.84	.68
1 x 19 Strand Core						
1/32"	—	150	3458T21	.10	.07	.06
3/64"	C	375	3458T22	.14	.11	.09
1/16"	C	500	3458T23	.18	.15	.13
5/64"	C	800	3458T24	.24	.21	.17
3/32"	C	1,200	3458T25	.32	.27	.22
1/8"	C	2,100	3458T26	.53	.45	.37
5/32"	C	3,300	3458T27	.75	.67	.55
3/16"	C	4,700	3458T28	1.09	.93	.76
1/4"	C	8,200	3458T91*	1.82	1.56	1.30
5/16"	C	12,500	3458T93*	2.84	2.42	2.03
3/8"	C	17,500	3458T94*	4.05	3.46	2.89
3 x 7 Hollow Core						
1/32"	A,B	110	3458T51	.15	.13	.10
6 x 19 IWRC						
1/2"	A	22,900	3458T122	7.82	6.83	5.83
6 x 37 IWRC						
3/16"	A	3,000	3458T111	2.93	2.43	2.03
1/4"	A	5,400	3458T54	4.08	3.33	2.83
5/16"	A	8,300	3458T55	5.62	4.66	3.90
3/8"	A	11,700	3458T56	7.20	5.97	5.00
6 x 42 Fiber Core						
1/16"	A	700	3458T31	2.15	1.75	1.47
5 x 42 Fiber Core (Cont.)						
3/16"	A	1,600	3458T32	$2.89	$2.35	$1.98
1/4"	A	3,200	3458T33	3.90	3.18	2.68
3/8"	A	6,900	3458T38	6.14	5.09	4.19
7 x 3 Hollow Core						
.018"	—	40	3458T86	.57	.38	.28
.024"	—	60	3458T87	.43	.26	.18
.039"	—	110	3458T89	.37	.22	.16
7 x 7 Strand Core						
1/32"	—	140	3458T425	.48	.29	.20
1/16"	A,B	270	3458T43	.29	.21	.16
3/32"	A,B	450	3458T44	.41	.27	.20
1/8"	—	725	3458T455	.52	.35	.26
5/32"	A,B	900	3458T46	.56	.38	.28
3/16"	—	1,760	3458T47	.85	.61	.49
7/32"	—	2,400	3458T48	.92	.72	.60
1/4"	—	3,700	3458T49	1.15	.97	.75
5/16"	—	6,400	3458T59	1.90	1.58	1.33
3/8"	—	9,000	3458T52	3.30	2.74	2.29
7/16"	—	12,000	3458T53	4.39	3.64	3.05
7 x 19 Strand Core						
3/64"	—	220	3458T74	.68	.65	.46
1/16"	A,B	480	3458T75	1.09	.65	.43
3/32"	A,B	930	3458T76	.96	.64	.48
1/8"	A,B	1,700	3458T77	1.31	.97	.65
5/32"	A,B	2,400	3458T78	1.43	1.03	.82
3/16"	A,B	3,700	3458T79	1.50	1.15	.96
7/32"	A,B	5,000	3458T81	1.80	1.42	1.17
1/4"	A,B	6,400	3458T82	2.12	1.68	1.39
5/16"	A,B	9,000	3458T84	3.19	2.52	2.08
3/8"	A,B	12,000	3458T85	4.48	3.36	2.80
19 x 7 Strand Core						
1/8"	—	1,500	3458T61	1.95	1.67	1.40
5/32"	D	2,160	3458T62	2.15	1.78	1.49
3/16"	D	3,330	3458T63	2.26	1.91	1.52
1/4"	D	5,760	3458T65	4.19	3.47	2.76

* Not lubricated

Type 316 Stainless Steel Wire Rope

Rope is not lubricated. We offer standard lengths of 10', 50', 100', 200', and 300 ft., as well as any length you may need.

1 x 19 Strand Core is often used for guying and rigging, and as standing rigging.

6 x 19 IWRC is excellent for heavy hoisting.

Dia.	Breaking Strength, lbs.		Per Foot 1-99	Per Foot 100-299	Per Foot 300-Up
1 x 19 Strand Core					
1/8"	1,730	8908T12	$0.77	$0.61	$0.50
3/16"	4,000	8908T16	1.56	1.25	1.01
1/4"	6,900	8908T22	2.51	2.01	1.63
5/16"	10,600	8908T24	3.55	2.84	2.31
3/8"	14,800	8908T26	4.80	3.92	3.19
6 x 19 IWRC					
1/2"	19,300	8908T58	9.29	7.83	6.37

7 x 7 Strand Core has excellent strength for hoisting and transmitting mechanical power.

7 x 19 Strand Core is used for light and heavy hoisting, as well as on small drums and sheaves.

Dia.	Breaking Strength, lbs.		Per Foot 1-99	Per Foot 100-299	Per Foot 300-Up
7 x 7 Strand Core					
3/32"	360	8908T32	$0.32	$0.25	$0.21
7/64"	700	8908T54	.42	.34	.27
1/8"	1,300	8908T66	.64	.51	.42
7 x 19 Strand Core					
1/8"	1,300	8908T44	.87	.70	.57
3/16"	2,900	8908T48	1.61	1.29	1.05
1/4"	4,900	8908T52	2.23	1.78	1.45
5/16"	7,600	8908T54	3.51	2.81	2.29
3/8"	11,000	8908T56	4.53	3.62	2.95

Type 305 Stainless Steel Wire Rope

Rope is not lubricated. We offer standard lengths of 10', 50', 100', 200', and 300 ft., as well as any length you may need. Meets the breaking strength requirements for MIL-W-83375.

7 x 7 Strand Core has excellent strength for hoisting and transmitting mechanical power.

7 x 19 Strand Core is used for light and heavy hoisting, as well as on small drums and sheaves.

Dia.	Breaking Strength, lbs.		Per Foot 1-99	Per Foot 100-299	Per Foot 300-Up
7 x 7 Strand Core					
1/16"	360	8909T12	$0.29	$0.24	$0.21
7/64"	700	8909T14	.38	.31	.27
7 x 19 Strand Core					
1/8"	1300	8909T16	.86	.70	.61
3/16"	2900	8909T22	1.38	1.14	.91
1/4"	4900	8909T31	1.96	1.59	1.40

WARNING: NEVER EXCEED WIRE ROPE BREAKING STRENGTH.

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APPENDIX C

HEALTH AND SAFETY PLAN
&
RCRA COMPLIANCE

RCRA Compliance

Generator Status

Because the source of the PCE in the groundwater is a spill of used solvent by a former dry cleaner, the mixture of the spill and groundwater pumped as wastewater to the facility is a listed F002 waste. The used bag filters and spent carbon are residues from the treatment of this wastewater and are also F002 wastes. The time-averaged wastewater flow at the facility is about 2 gpm, which equates to 300,000 kg/month. Therefore this facility is a "generator" of hazardous wastes (generation greater than 1000 kg/month).

Accumulation Area

The used bag filters are accumulated in a plastic-lined drum inside the treatment building. The treatment building is kept locked, except when operator is present. The operator controls the area inside the building. 6 NYCRR 372.2(a)(8)(i)('a') states:

> A generator may accumulate up to 55 gallons of hazardous waste... in containers at or near any point of generation where wastes initially accumulate, which is under the control of the operator of the process generating the waste, without ...complying with subparagraph (ii) of the paragraph [discussed below] provided the generator:
>
> > ('1') complies with section 373-3.0(b)-(d) of this Title; and
> >
> > ('2') marks the containers with the words "Hazardous waste" and with other words that identify the contents of the containers."

Sections 373-3.0(b)-(d) require:

> (b) Condition of containers. If a container holding hazardous waste is not in good condition, or if it begins to leak, the owner or operator must transfer the hazardous waste from this container to a container that is in good condition ...
>
> (c) Compatibility of waste with container. The owner or operator must use a container made of or lined with materials which will not react with, and are otherwise compatible with, the hazardous waste to be stored...
>
> (d) Management of containers
>
> (1) A container holding hazardous waste must always be closed during storage, except when it is necessary to add or remove waste.
>
> (2) A container holding hazardous waste must not be opened, handled, or stored in a manner which may rupture the container or cause it to leak.
>
> (3) Containers holding hazardous waste must be marked with the words "Hazardous Waste" and with other words identifying their contents.

Accordingly, until the drum of used filter bags is full, or until a drum of spent carbon is taken off line [discussed below], the inside of the treatment building is a satellite accumulation area and the drum of bag filters will be managed according to the above standards.

90-Day Storage Area

When a rebed of the activated carbon system is conducted, a 55-gallon drum of spent carbon will be taken off line. At that time (with consideration of the bag filters), the building will contain more than 55 gallons of waste. When the spent drum of carbon is taken off-line, an inside area of the treatment plant will become a 90-day accumulation area. 6 NYCRR 372.2(a)(8)(ii) states:

> ...a generator may accumulate hazardous waste on-site of generation for a period of 90 days or less under the provision subparagraphs 373-1.1(d)(1)(iii), (iv), (xix) and (xx) of this Title. The date upon which each period of accumulation begins must be clearly marked and visible for inspection on all containers, tanks, or storage areas.

Subparagraphs 373-1.1(d)(1)(iii), (iv), (xix) and (xx) require:

> (iii) The storage in containers or tanks of hazardous waste that is generated on-site, for a period not exceeding 90 days...Storage areas that are exempt must comply with the following requirements:
>
> > ('a') For storage of liquid hazardous waste in containers, the total amount of hazardous waste stored in containers in exempt storage areas at one time is 8800 gallons or less...
> >
> > ('b') Reserved.
> >
> > ('c') The following requirements are met:
> >
> > > ('1') the waste is placed: ('i') in containers and the generator complies with section 373-3.9 of this part [discussed below];...and...subdivisions 373-3.7(b) and (e) of this Part.
> > >
> > > [Subdivision 373-3.7(b) is the performance standard and states that closure of the owner or operator must close the facility in a manner that: (1) minimizes the need for further maintenance; (2) controls, minimizes or eliminates...post-closure escape of hazardous waste, hazardous waste constituents...This subdivision also requires compliance to other subdivisions, of which subdivision 373-3.17(e) is applicable, and requires that, when the wastewater treatment process is closed, hazardous waste and residues are to be removed from the process, structures, etc.]
> > >
> > > ('2') the date on which each period of accumulation begins is clearly marked and visible for inspection on each container;
> > >
> > > ('3') a label or sign stating "Hazardous Waste" must identify all areas, tanks, and containers used to accumulate hazardous waste. In addition, tanks and containers must be marked with other words to identify their contents;
> > >
> > > ('4') each container is properly labeled and marked according to sections 372(a)(5) and 372(a)(6) of this Title; and

('5') the generator complies with the requirements for personnel training in section 373-3.2 of this Part, for preparedness and prevention in section 373-3.3 and contingency plans and emergency procedures in section 373-3.4, and with subparagraph 376.1(g)((1)(iv) [Land Disposal Restrictions – these wastes are incinerated.].

(iv) Not applicable to this facility

(xix) ...drip pads...[Not applicable. Applies to drip pads to convey treated wood drippage, precipitation, and/or surface water run-off to an associated collection system.]

(xx) ... containment buildings...[Not applicable. Applies to wastes not stored in containers.]

As noted above, the 90-day storage must meet all the requirements of 6 NYCRR 373-3.9, not just paragraphs (b)-(d), as are required for the filter bag satellite accumulation area. These additional requirements are:

(a) Applicability. [Statement as to the applicability of this section.]

(e) Inspections. At least weekly, the owner or operator must inspect areas where containers are stored, looking for leaking containers and for deterioration of containers and the containment system caused by corrosion or other factors.

(f) Special requirements for ignitable or reactive waste. [The wastes at this facility are not ignitable or reactive.]

(g) Special requirements for incompatible wastes. [All the wastes generated at this facility are compatible.]

(h) Air emission standards. [This requirement is for process vents, equipment that contacts hazardous wastes with an organic concentration of at least 10 percent by weight, tanks, surface impoundments, and containers of at least 264-gallon capacities, none of which is present at this facility.]

Summary – 90-Day Storage

During the time that the spent carbon is taken off line and subsequently removed by a permitted hauling contractor, a space inside the building will be designated as a 90-storage area. After the carbon drum is removed, the 90-day storage area designation will be removed, and the area will revert back to being a satellite accumulation area. Container labels will show when the accumulation starts, drum fill dates, and 90-day storage starts. During the 90-day storage period, the area will be inspected weekly by the operator; the operator will have a mobile telephone. Written records will be retained for these inspections.

An expanded HASP will address the additional requirements for preparedness and prevention in section 373-3.3 and contingency plans and emergency procedures in section 373-3.4. Notification about the facility will be sent to local agencies in conformance with these requirements.

LMS conducts the training required under 373-3.2 and maintains the required records.

Future Considerations

NYSDEC's RCRA regulations may provide an exemption from the definition of hazardous wastes in wastewaters; 6 NYCRR 371.1(d)(1)(ii)('d') states:

> "...However, if the generator can demonstrate that the mixture consists of wastewater and it is a surface water point source or pretreatment facility discharge in compliance with ECL ... [applicable to this facility], then the following mixtures of solid wastes and hazardous wastes listed in section 371.4 are not hazardous wastes...:
>
> > ('1') one or more of the following spent solvents listed in section 371.4(b)-- ...tetrachloroethylene...—provided that the maximum total weekly usage of these solvents (other than the amounts that can be demonstrated not to be discharged to wastewater) divided by the average weekly flow of wastewater into the headworks of the facility's wastewater treatment or pretreatment system does not exceed 1 mg/l."

Influent flows presently have a PCE concentration of 3-4 mg/l, which is greater than the 1 mg/l limit that allows the wastewater to be excluded as a hazardous. When the influent PCE concentration falls below 1 mg/l, the above considerations indicate that the wastewater would not meet the definition as a hazardous waste. However, statements by NYSDEC staff indicate that the exemption would not apply to the site, and that the recovered groundwater will remain RCRA hazardous.

LAWLER, MATUSKY & SKELLY ENGINEERS LLP

SITE-SPECIFIC

HEALTH AND SAFETY PLAN FORM

Site Name: Baldwin Place Mall HASP Preparer: Stuart Bassell

Address: Route 6 City/State: Somers, NY

Job No.: 722-005

APPROVALS

Project Manager: Stuart C. Bassell

Safety Officer: Barry Babcock

PROJECT PERSONNEL:

On-Site Coordinator*: Barry Babcock (system operator)
Lawler, Matusky & Skelly Engineers LLP
Hollowbrook Office Park – 15 Myers Corners Road, Suite 2-J
Wappingers Falls, NY 12590

On-Site Health and
Safety Officer: Barry Babcock

Phone: (914) 297-0666 ext. 14 (Work) (914)534-2734 (Home)

DATE OF PLAN PREPARATION: 3/17/98 (rev.2/3/99)

HAZARDOUS/SUBSTANCES (known or suspected, contaminated media or in storage container, etc.):

perchloroethylene
trichloroethylene
1,2-dichloroethylene

contaminated groundwater and soil

HAZARD ASSESSMENT (toxic effects, including TLVs, IDLHs, reactivity, stability, flammability, and operational hazards with sampling, decontaminating, etc):

See attached tables

*Back-up Stuart Bassell
Lawler, Matusky & Skelly Engineers LLP
One Blue Plaza
Pearl River, NY 10965
(914)735-8300 (Work) (914)358-5176 (Home)
845 845

7/30/04

LAWLER, MATUSKY & SKELLY ENGINEERS LLP

SITE-SPECIFIC

HEALTH AND SAFETY PLAN FORM

Site Name: Baldwin Place Mall HASP Preparer: Stuart Bassell

Address: Route 6 City/State: Somers, NY

Job No.: 722-005

APPROVALS

Project Manager: Stuart C. Bassell

Safety Officer: Karen A Wright

PROJECT PERSONNEL:

On-Site Coordinator: Barry Babcock (system operator)

On-Site Health and Safety Officer: Barry Babcock

Phone: (914) 297-0666 ext. 14

DATE OF PLAN PREPARATION: 3/17/98 (rev.2/3/99)

HAZARDOUS/SUBSTANCES (known or suspected, contaminated media or in storage container, etc.):

perchloroethylene
trichloroethylene
1,2-dichloroethylene

contaminated groundwater and soil

HAZARD ASSESSMENT (toxic effects, including TLVs, IDLHs, reactivity, stability, flammability, and operational hazards with sampling, decontaminating, etc):

See attached tables

SITE WORK ZONES: (designate exclusion zone, contamination reduction zone and support zone)

Chambers – exclusion zone (non-permit required confined space)

treatment building – all other operations

SITE ACCESS: (describe procedures to control site access)

Chambers – manhole lids
Treatment bldg. – locked door

MONITORING PROCEDURES (If required by the Safety Officer)
Monitoring the site for identity and concentration of contamination in all media:

During the first visit to the site, air monitoring with either a PID or FID and CGI will be required. Subsequent visits do not require air monitoring provided that one person is outside the chamber when someone is inside.

Medical monitoring procedures for evidence of personnel exposure i.e., analyses specific to site not covered in general LMS physical:

not applicable

Personnel monitoring procedures:

none

DECONTAMINATION AND DISPOSAL

Decontamination Procedures (contaminated personnel, surfaces, materials, instruments, equipment, etc.):

paper towel

Disposal Procedures (contaminated equipment, supplies, disposables, washwater):

drum solids
pump water into treatment system

EMERGENCY PROCEDURES

In event of personnel exposure (skin contact, inhalation, ingestion, specific procedures for specific chemicals):

dry skin with paper towel

inhalation – remove to fresh air

In the event of personnel injury:

hospital

In event of potential or actual fire or explosion:

fire dept.

In event of potential or actual ionizing radiation exposure:

not applicable

In event of environmental accident (spread of contamination outside sites):

NYSDEC	845 (914)332-1835 ~~ext. 359 (Joseph Marcogliese)~~ Regional Water Engineer
	(518)457-7362 (spill line)
National Response Center	(800) 424-8802

7/30/04

EMERGENCY SERVICES (complete here or have separate list available on-site)

Emergency Medical Facility (include map or written description of route to hospital)

	Location	Telephone 845
Putnam Hospital Center	Stoneleigh Ave Carmel	(914)279-5711

Ambulance Service

911

Fire Department

911

Police Department

911

Poison Control Center

(800)336-6997

PERSONNEL POTENTIALLY EXPOSED TO HAZARDOUS SUBSTANCES (As Applicable)

Personnel Authorized to Enter Site (specific conditions of site would preclude most LMS trained persons from entering site and would allow only certain personnel, list here)

1. _____

2. _____

3. _____

4. _____

ALTERNATIVE WORK PRACTICES

(Describe alternative work practices or instruments not specified in this form. Indicate work practices specified in the chapter for which proposed alternative work practices will serve as substitute).

Chambers are 4' deep with 2' dia. covers. Allow to air out 5 min. after opening

TASK-SPECIFIC LEVEL OF PROTECTION AND ACTION LEVELS

(attach table including specific description of protective gear and action levels to upgrade or downgrade LOP)

Level D – needed only when conducting maintenance, sampling, entering chambers

SITE MAP

(Attach a site map. Map should be properly scaled and keyed to local landmarks).

attached

TRAINING

(Provide description of minimum training, reference OSHA Sections).

initial 40-hr 29 CFR 1910.120(e)(8)
8 hr annual refresher
additional annual training for operator per 6 NYCRR 373-3.2

AFFADAVIT

All personnel who enter site must sign attached affidavit. LMS personnel must also read and comply with LMS' generic HASP.

AFFIDAVIT

I, _____, (name) of _____ (company name) have read the Health and Safety Plan (HASP) for the _____ (site description and project description). I have also read the LMS generic HASP. I agree to conduct all on site work in conformity with the requirements of both HASPs. In addition, I acknowledge that failure to comply with the designated procedures in the Health and Safety Plans may lead to my removal from the site.

Signed _____

Date _____

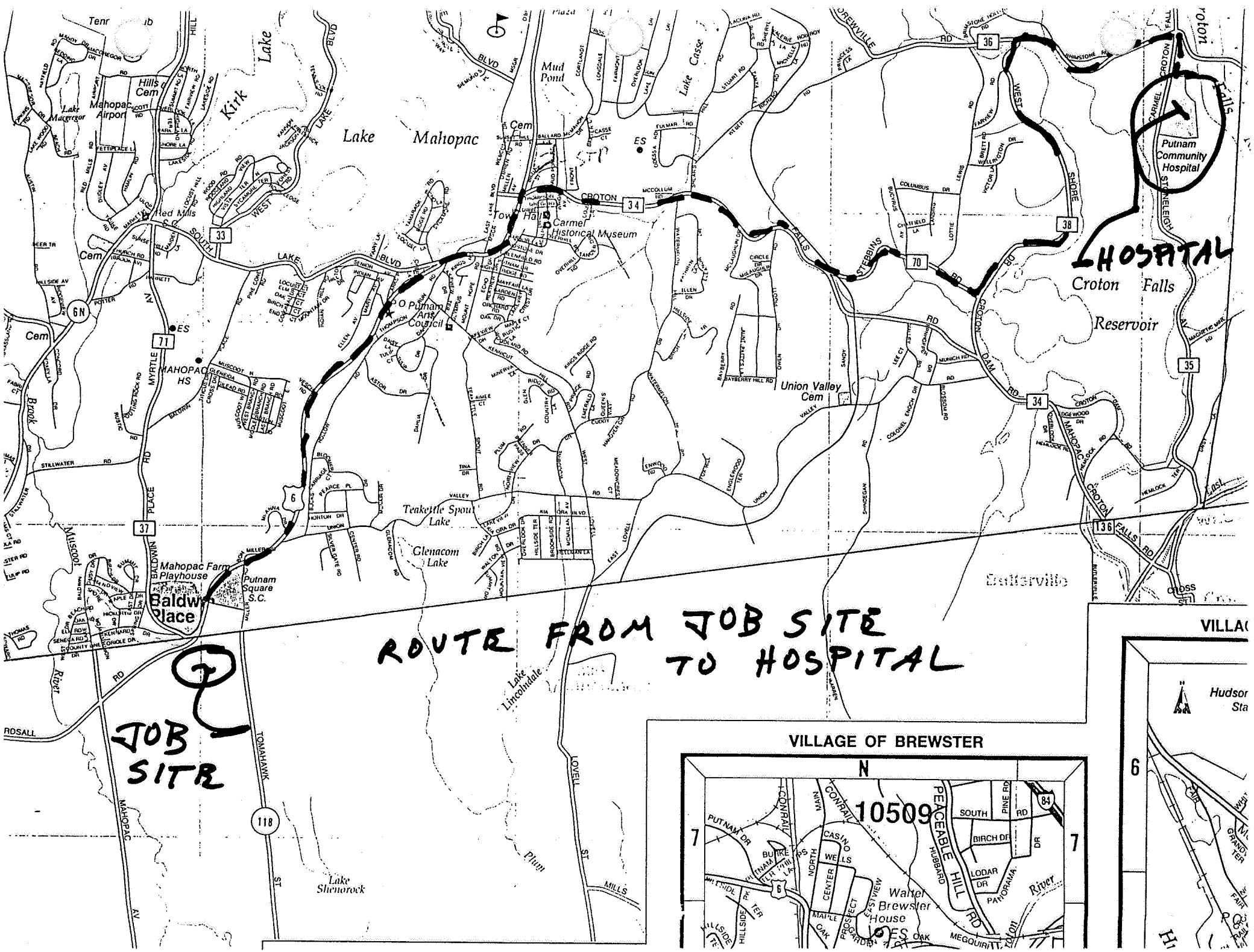
ROUTE FROM JOB SITE TO HOSPITAL
JOB SITE
HOSPITAL
Putnam Community Hospital
Croton Falls Reservoir
Lake Mahopac
Kirk Lake
Mud Pond
Lake Casse
Lake Macgregor
Mahopac Airport
Hills Cem
Red Mills
Town Hall
Carmel Historical Museum
Putnam Arts Council
MAHOPAC HS
Union Valley Cem
Teakettle Spout Lake
Glenacom Lake
Lake Lincolndale
Lake Shenorock
Mahopac Farm Playhouse
Putnam Square S.C.
Baldwin Place
Butterville
Croton Falls
Croton Dam
Croton Falls Rd
Stillwater Rd
Myrtle Place
Baldwin Rd
Muscoot River
Mahopac Ave
Tomahawk St
Lovell St
Mills St
Plum
Croton
Mahopac
Lake
Cem
ES
STP
VILLAGE OF BREWSTER
N
10509
Walter Brewster House
Peaceable Hill Rd
Putnam Dr
Conrail
Casino
Wells
North
Center
Maple
Oak
Prospect
Hubbard
Lodar Dr
Panorama
Birch Dr
South
Pine Rd
Hillside Pk
Hillside Ter
Hillside Pl
Meguiriat
Lotton River
Hudson Sta
VILLA

TABLE 1

BALDWIN PLACE MALL
CHARACTERISTICS OF CHEMICALS FOUND ON THE SITE

COMPOUND	SYNONYMS	ACGIH TLV (ppm)	NIOSH REL (ppm)	OSHA PEL (ppm)	NIOSH IDLH (ppm)	LEL (% at °F)	UEL (%)	FLASH POINT (°F)	AUTOIG. TEMP. (°F)	VP (mm at °F)	VD	IP (eV)	SOLU. (%)	ODOR THRESH. (ppm)	RESP. PROT.	TOXIC EFFECTS
1,2-Dichloroethylene	Acetylene dichloride, cis-Acetylene dichloride, trans-Acetylene dichloride, sym-Dichloroethylene	200	200	200	1000	5.6	12.8	36-39	860	180-265	3.4	9.65	0.4%	0.085-500	yes	Irrit eyes, resp sys; CNS depres
Tetrachloroethylene	Perchlorethylene, Perchloroethylene, Perk, Tetrachloroethene	25 A3	Ca	100	Ca 150	NA	NA	NA	-	14	5.8	9.32	0.02%	4.7-50	yes	Irrit eyes, nose, throat; nau; flush face, neck; vertigo, dizz, inco; head; som; skin eryt; liver damage; [carc]
Trichloroethylene	Ethylene trichloride, TCE, Trichloroethene; Trilene	50 A5	25	100	Ca 1000	8	10.5	?	788	58	4.5	9.45	0.0001 %	21.4-400	yes	Irrit eyes, skin; head, vertigo; vis dist, ftg, gidd; tremor; som, nau, vomit; derm; card arrhy; pares; liver inj; [carc]

Note: Under Respiratory Protection: yes/no indicates whether or not a respirator can be used, even if only for escape.

12/5/97

TABLE 1
EXPLANATION OF ABBREVIATIONS

( )	Notice of intended change
-	Unknown
A1	Confirmed human carcinogen
A2	Suspected human carcinogen
A3	Animal carcinogen
A4	Not classifiable as human carcinogen
A5	not suspected as human carcinogen
Asphy	Asphyxia
BP	Blood pressure
BUN	Blood urea nitrogen
C	Ceiling limit
CNS	Central nervous system
CVS	Cardiovascular system
Ca	Potential carcinogen
FEV	Forced expiratory volume
GI	Gastrointestinal
N.D.	Not yet determined
PNS	Peripheral nervous system
RBC	Red blood cell
ST	Short-term exposure limit
[carc]	Potential occupational carcinogen
abdom	Abdominal
abnor	Abnormal/Abnormalities
album	Albuminuria
anes	Anesthesia
anor	Anorexia
anos	Anosmia (loss of the sense of smell)
appre	Apprehension
arry	Arrythmias
aspir	Aspiration
breath	Breathing
bron	Bronchitis
broncopneu	Bronchopneumonia
bronspas	Bronchospasm
card	Cardiac
chol	Cholinesterase
cirr	Cirrhosis
conc	Concentration
conf	Confusion
conj	Conjunctivitis
constip	Constipation
convuls	Convulsions
corn	Corneal
cyan	Cyanosis
decr	Decreased
depres	Depressant/Depression
derm	Dermatitis
diarr	Diarrhea
dist	Disturbance
dizz	Dizziness
drow	Drowsiness
dysfunc	Dysfunction
dysp	Dyspnea (breathing difficulty)
emphy	Emphysema
eosin	Eosinophilia
epilep	Epileptiform
epis	Epistaxis (nosebleed)
equi	Equilibrium
eryt	Erythema (skin redness)
euph	Euphoria
fail	Failure
fasc	Fasiculation
fib	Fibrosis
fibr	Fibrillation
ftg	Fatigue
func	Function
gidd	Giddiness
halu	Hallucinations
head	Headache
hema	Hematuria (blood in urine)
hemato	Hematopoietic
hemog	Hemoglobinuria
hemorr	Hemorrhage
hyperpig	Hyperpigmentation
hypox	Hypoxemia (reduced oxygen in the blood)
inco	Incoordination
incr	Increase(d)
inebro	Inebriation
inflamm	Inflammation
inj	Injury
insom	insomnia
irreg	Irregular/Irregularities
irrit	Irritation
irrity	Irritability
jaun	Jaundice
kera	Keratitis (inflammation of the cornea)
lac	Lacrimation (discharge of tears)
lass	Lassitude (weakness, exhaustion)
leth	Lethargy (drowsiness or indifference)
leucyt	Leukocytosis (increased blood leukocytes)
leupen	Leukopenia (reduced blood leukocytes)
li-head	Lightheadedness
liq	Liquid
local	Localized
low-wgt	Weight loss
mal	Malaise (vague feeling of discomfort)
malnut	Malnutrition
methemo	Methemoglobinemia
misc	Miscible
mod	Moderate
molt	Molten
monocy	Monocytosis (increased blood monocutes)
mppcf	Million particles per cubic foot
muc memb	Mucous membrane
musc	Muscle
narco	Narcosis
nau	Nausea
nec	Necrosis
neph	Nephritis
ner	Nervousness
numb	Numbness
opac	Opacity
palp	Palpitations
para	Paralysis
pares	Paresthesia
perf	Perforation
peri neur	Peripheal neuropathy
periorb	Periorbital (siutated around the eye)
phar	Pharyngeal
photo	Photophobia (abnormal visual intolerance to light)
pneu	Pneumonia
pneuitis	Pneumonitis
polyneur	Polyneuropathy
prot	Proteinuria
pulm	Pulmonary
repro	Reproductive
resp	Respiratory
restless	Restlessness
retster	Retrosternal (occurig behind the sternum)
rhin	Rhinorrhea (discharge of thin nasal musus)
salv	Salivation
sens	Sensitization
sez	Seizure
short	Shortness
sneez	Sneezing
sol	Solid
soln	Solution
som	Somnolence (sleepiness, unnatural drowsiness)
subs	Substernal (occuring beneath the sternum)
sweat	Sweating
sys	Systen
tacar	Tachycardia
tend	Tenderness
terato	Teratogenic
throb	Throbbing
tight	Tightness
trachbronc	Tracheogronchitis
twitch	Twitching
uncon	Unconsciousness
unk	Unknown
vap	Vapor
venfib	Ventricular fibrillation
verti	Vertigo (an illusion of movement)
vesic	Vesiculation
vis dist	Visual disturbance
vomit	Vomiting
weak	Weakness
wheez	Wheezing

CALGON CARBON -- ACTIVATED CARBON, ATC - CHARCOAL, ACTIVATED
MATERIAL SAFETY DATA SHEET
NSN: 6810011194536
Manufacturer's CAGE: 1DA66
Part No. Indicator: A
Part Number/Trade Name: ACTIVATED CARBON, ATC

General Information

Item Name: CHARCOAL, ACTIVATED
Company's Name: CALGON CARBON CORP
Company's P. O. Box: 717
Company's City: PITTSBURGH
Company's State: PA
Company's Country: US
Company's Zip Code: 15230-0717
Company's Emerg Ph #: 412-787-6700
Company's Info Ph #: 412-787-6700
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 004
Status: SMJ
Date MSDS Prepared: 31AUG94
Safety Data Review Date: 29JUL96
MSDS Preparer's Name: SL LILLER
Preparer's Company: SAME
MSDS Serial Number: CBQRD
Hazard Characteristic Code: N1

Ingredients/Identity Information

Proprietary: NO
Ingredient: CARBON
Ingredient Sequence Number: 01
Percent: 100
NIOSH (RTECS) Number: FF5250100
CAS Number: 7440-44-0
OSHA PEL: 15 MG/M3 TDUST
ACGIH TLV: 2 MG/M3 TDUST

Physical/Chemical Characteristics

Appearance And Odor: BLACK PARTICULATE SOLID, PELLET OR POWDER
Boiling Point: N/A
Melting Point: N/A
Vapor Pressure (MM Hg/70 F): N/A
Vapor Density (Air=1): N/A
Specific Gravity: 2.3
Evaporation Rate And Ref: N/A
Solubility In Water: NEGLIGIBLE

Fire and Explosion Hazard Data

Flash Point: N/A
Flash Point Method: N/A
Lower Explosive Limit: N/A
Upper Explosive Limit: N/A
Extinguishing Media: FLOOD WITH PLENTY OF WATER.
Special Fire Fighting Proc: WEAR NIOSH APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: CONTACT WITH STRONG OXIDIZERS SUCH AS OZONE,

LIQUID OXYGEN, CHLORINE, PERMANGANATE, ETC, MAY RESULT IN FIRE.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): NONE.
Materials To Avoid: STRONG OXIDIZERS SUCH AS OZONE, LIQUID OXYGEN, CHLORINE, PERMANGANATE, ETC.
Hazardous Decomp Products: CARBON MONOXIDE MAY BE GENERATED IN THE EVENT OF A FIRE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT.

Health Hazard Data

LD50-LC50 Mixture: LD50 (ORAL RAT): > 10 G/KG.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: ACUTE: EYES: THE PHYSICAL NATURE OF THE PROD THE EFFECTS OF LONG-TERM, LOW-LEVEL EXPOS TO THIS PROD HAVE NOT BEEN DETERMINED. SAFE HANDLING OF THIS MATL ON LONG-TERM BASIS SHOULD EMPHASIZE AVOIDANCE OF ALL EFTS FROM REPETITIVE ACUTE EXPOSURES.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT.
Signs/Symptoms Of Overexp: SEE HEALTH HAZARDS.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: EYES: FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. SKIN: WASH WITH SOAP AND WATER. INHALATION: REMOVE TO FRESH AIR. SUPPORT BREATHING (GIVE OXYGEN OR ARTIFICIAL RESPIRATION) (FP N) . INGESTION: CALL MD IMMEDIATELY (FP N).

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: SWEEP UP UNUSED CARBON AND DISCARD IN REFUSE CONTAINER OR REPACKAGE.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISPOSE OF IN ACCORDANCE W/LOCAL, STATE & FEDERAL REGULATIONS.
Precautions-Handling/Storing: CAUTION! WET ACTIVATED CARBON REMOVES OXYGEN FROM AIR CAUSING SEV HAZ TO WORKERS INSIDE CARBON VESSELS & ENCLSD/CONFINED SPACES.
Other Precautions: BEFORE ENTERING SUCH AREA, SAMPLING & WORK PROC FOR LOW OXYGEN LEVELS SHOULD BE TAKEN TO ENSURE AMPLE OXYGEN AVAILABILITY, OBSERVING ALL LOCAL, STATE, AND FEDERAL REGS. EXERCISE CAUTION IN STOR & HANDLING OF ALL CHEMICAL SUBSTANCES.

Control Measures

Respiratory Protection: A NIOSH APPROVED PARTICULATE FILTER RESPIRATOR IS RECOMMENDED IF EXCESSIVE DUST IS GENERATED.
Ventilation: LOCAL EXHAUST VENTILATION AND MECHANICAL VENTILATION ARE RECOMMENDED.
Protective Gloves: RUBBER GLOVES RECOMMENDED.
Eye Protection: ANSI APPRVD CHEM WORKERS GOGGS (FP N).
Other Protective Equipment: EMERGENCY EYEWASH & DELUGE SHOWER MEETING ANSI DESIGN CRITERIA (FP N).
Work Hygienic Practices: WASH THOROUGHLY AFTER HANDLING.
Suppl. Safety & Health Data: NONE SPECIFIED BY MANUFACTURER.

Transportation Data

s Data Review Date: 97007
OT PSN Code: ZZZ
DOT Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
IMO PSN Code: ZZZ
IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION
IATA PSN Code: ZZZ
IATA Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
AFI PSN Code: ZZZ
AFI Prop. Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 29JUL96
Label Date: 29JUL96
Label Status: B
Common Name: ACTIVATED CARBON, ATC
Chronic Hazard: NO
Signal Word: CAUTION!
Acute Health Hazard-Slight: X
Contact Hazard-Slight: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: ACUTE: EYES: THE PHYSICAL NATURE OF THE PRODUCT MAY PRODUCE EYE IRRITATION. INHALATION: PRACTICALLY NON-TOXIC THROUGH INHALATION. CHRONIC: THE EFFECTS OF A LONG-TERM, LOW-LEVEL EXPOSURE TO THIS PRODUCT HAVE NOT BEEN DETERMINED. SAFE HANDLING OF THIS MATERIAL ON A LONG-TERM BASIS SHOULD EMPHASIZE THE AVOIDANCE OF ALL EFFECTS FROM REPETITIVE ACUTE EXPOSURES.
Protect Eye: X
Protect Skin: X
Protect Respiratory: X
Label Name: CALGON CARBON CORP
Label P.O. Box: 717
Label City: PITTSBURGH
Label State: PA
Label Zip Code: 15230-0717
Label Country: US
Label Emergency Number: 412-787-6700

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RCRA Contingency Plan (prepared per §373-3.3 and §373-3.4)

As long as the Groundwater Recovery Well Treatment System is a large quantity generator, the regulation require compliance with §373-3.3 and §373-3.4 in order for there to be storage in the 90-day accumulation area. The following is appended to the Health & Safety Plan to meet these regulatory requirments.

§373-3.3 Preparedness and Prevention.

(a) Applicability. The regulations in this section apply to owners and operators of all hazardous waste facilities, except as section 373-3.1(a) of this Subpart provides otherwise.

(b) Maintenance and operation of facility. Facilities must be maintained and operated to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water which could threaten human health or the environment.

[Maintenance and operation requirements are specified in the facilities O&M manual.]

(c) Required equipment. All facilities must be equipped with the following, unless none of the hazards posed by waste handled at the facility could require a particular kind of equipment specified below:

(1) an internal communications or alarm systems capable of providing immediate emergency instruction (voice or signal) to facility personnel;

[The treatment building is a small, one story building 16 ft long by 10 ft 8 in. wide. Therefore, voice communication is appropriate.]

(2) a device, such as a telephone (immediately available at the scene of operations) or a hand-held two-way radio, capable of summoning emergency assistance from local police departments, fire departments, or State or local emergency response teams;

[During such time that the 90-day storage area is needed, the operator will have a cell phone.]

(3) portable fire extinguishers, fire control equipment (including special extinguishing equipment, such as that using foam, inert gas, or dry chemicals, spill control equipment, and decontamination equipment; and

[The drums of wet carbon and bag filters do not pose a fire hazard. However, a portable fire extinguisher is provided. An extra drum for containment is also on site.]

(4) water at adequate volume and pressure to supply water hose streams, foam producing equipment, automatic sprinklers, or water spray systems.

[Not needed.]

(d) Testing and maintenance of equipment. All facility communications or alarm systems, fire protection equipment, spill control equipment, and decontamination equipment, where required, must be tested and maintained as necessary to assure its proper operation in time of emergency.

[Equipment is tested and maintained per manufacturers' instructions.]

(e) Access to communications or alarm system.

(1) Whenever hazardous waste is being poured, mixed, spread, or otherwise handled, all personnel involved in the operation must have immediate access to an internal alarm or emergency device either directly or through visual or voice contact with another employee, unless such a device is not required under subdivision (c) of this section.

[The treatment building is a small, one story building 16 ft long by 10 ft 8 in. wide. Therefore, voice communication is appropriate.]

(2) If there is ever just one employee on the premises while the facility is operating, that employee must have immediate access to a device, such as a telephone (immediately available at the scene of operation) or a hand-held two-way radio, capable of summoning external emergency assistance, unless such a device is not required under subdivision (c) of this section.

[During such time that the 90-day storage area is needed, the operator will have a cell phone.]

(f) Required aisle space. The owner or operator must maintain aisle space to allow the unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment to any area of facility operation in an emergency unless aisle space is not needed for any of these purposes.

[Aisle space is not needed.]

(g) Arrangements with local authorities.

(1) The owner or operator must attempt to make the following arrangements as appropriate for the type of waste handled at the owner or operator's facility and the potential need for the services of these organizations:

(i) arrangements to familiarize police, fire departments, and emergency response teams with the layout of the facility, properties of hazardous waste handled at the facility and associated hazards, places where facility personnel would normally be working, entrances to and roads inside the facility, and possible evacuation routes;

[A copy of this plan will be provided to the police, fire departments and local hospital, along with an invitation to visit the facility with the operator.]

(ii) where more than one police and fire department might respond to an emergency, agreements designating primary emergency authority to a specific police and a specific fire department, and agreements with any others to provide support to the primary emergency authority;

[Not applicable.]

(iii) agreements with State emergency response teams, emergency response contractors, and equipment suppliers; and

[The owner, Big V Supermarkets, Inc., presently contracts with Miller Environmental Group (914/569-1200)for emergency response and hazardous waste removal for the facility.]

(iv) arrangements to familiarize local hospitals with the properties of hazardous waste handled at the facility and the types of injuries or illnesses which could result from fires, explosions, or releases at the facility.

[A copy of this plan will be provided to the local hospital, along with an invitation to visit the facility with the operator.]

(2) Where State or local authorities decline to enter into such arrangements, the owner or operator must document the refusal in the operating record.

[Any such refusals will be documented.]

§373-3.4 Contingency Plan and Emergency Procedures.

(a) Applicability. The regulations in this section apply to owners and operators of all hazardous waste facilities, except as section 373-3.1(a) of this Subpart provides otherwise.

(b) Purpose and implementation of contingency plan.

(1) Each owner or operator must have a contingency plan for the facility. The contingency plan must be designed to minimize hazards to human health or the environment from fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water.

(2) The provisions of the plan must be carried out immediately whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents which could threaten human health or the environment.

(c) Content of contingency plan.

(1) The contingency plan must describe the actions facility personnel must take to comply with subdivisions (b) and (g) of this section in response to fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water at the facility.

[See Health & Safety Plan for procedures.]

(2) If the owner or operator has already prepared a Spill Prevention, Control, and Countermeasure (SPCC) Plan as defined in section 610.2(j) of this Title and 40 CFR Part 300 (see section 370.1(e) of this Title) or some other emergency or contingency plan, that plan need only be amended to incorporate hazardous waste management provisions that are sufficient to comply with the requirements of this Subpart.

[The Health & Safety Plan is amended to incorporate the hazardous waste provisions.]

(3) The plan must describe arrangements agreed to by local police departments, fire departments, hospitals, contractors, and State and local emergency response teams to coordinate emergency services, pursuant to section 373-3.3(g) of this Subpart.

[The police and fire departments respond to calls via 911. A copy of this plan has been provided to these departments. No other special arrangements are needed. A copy of this plan has been provided to the local hospital; the potential for toxic exposure is low; no other

special arrangements are needed. The owner, Big V Supermarkets, Inc., presently contracts with Miller Environmental Group (914/569-1200)for emergency response and hazardous waste removal for the facility.]

(4) The plan must list names, addresses, and phone numbers (office and home) of all persons to act as emergency coordinator (see subdivision (f) of this section), and this list must be kept up-to-date. Where more than one person is listed, one must be named as primary emergency coordinator and others must be listed in the order in which they will assume responsibility as alternates.

[See Health & Safety Plan.]

(5) The plan must include a list of all emergency equipment at the facility (such as fire extinguishing systems, spill control equipment, communications and alarm systems (internal and external), and decontamination equipment), where this equipment is required. This list must be kept up-to-date. In addition, the plan must include the location and a physical description of each item on the list, and a brief outline of its capabilities.

[Fire extinguisher. Suitable for small fires. Kept inside treatment building.

Cell phone. General calling. Kept in operator's vehicle, when 90-day storage is required.

Drum. 55-gal. steel. Kept outside treatment when empty; inside when in use.]

(6) The plan must include an evacuation plan for facility personnel where there is a possibility that evacuation could be necessary. This plan must describe the signal(s) to be used to begin evacuation, evacuation routes, and alternate evacuation routes (in cases where the primary routes could be blocked by releases of hazardous waste or fires).

[See Health & Safety Plan for route to hospital.]

(d) Copies of contingency plan. A copy of the contingency plan and all revisions to the plan must be:

(1) maintained at the facility; and

[A copy is kept inside the treatment building.]

(2) submitted to all local police departments, fire departments, hospitals, and State and local emergency response teams that may be called upon to provide emergency services.

[Copies will be mailed to the police and fire departments, local hospital, and cleanup contractor.]

(e) Amendment of contingency plan. The contingency plan must be reviewed, and immediately amended, if necessary, whenever:

(1) applicable regulations are revised;

(2) the plan fails in an emergency;

(3) the facility changes - in its design, construction, operation, maintenance, or other

circumstances - in a way that materially increases the potential for fires, explosions, or releases of hazardous waste or hazardous waste constituents, or changes the response necessary in an emergency;

(4) the list of emergency coordinations changes; or

(5) the list of emergency equipment changes.

(f) Emergency coordinator. At all times, there must be at least one employee either on the facility premises or on call (i.e., available to respond to an emergency by reaching the facility within a short period of time) with the responsibility for coordinating all emergency response measures. This emergency coordinator must be thoroughly familiar with all aspects of the facility's contingency plan, all operations and activities at the facility the location and characteristics of waste handled, the location of all records within the facility, and the facility layout. In addition, this person must have the authority to commit the resources needed to carry out the contingency plan.

[This employee is the operator; see Health & Safety Plan.]

(g) Emergency procedures.

(1) Whenever there is an imminent or actual emergency situation, the emergency coordinator (or the emergency coordinator's designee when the emergency coordinator is on call) must immediately:

(i) activate internal facility alarms or communication systems, where applicable, to notify all facility personnel; and

(ii) notify appropriate State or local agencies with designated response roles if their help is needed.

(2) Whenever there is a release, fire, or explosion, the emergency coordinator must immediately identify the character, exact source, amount, and areal extent of any released materials. This may be done by observation or review of facility records or manifests, and, if necessary, by chemical analysis.

(3) Concurrently, the emergency coordinator must assess possible hazards to human health or the environment that may result from the release, fire, or explosion. This assessment must consider both direct and indirect effects of the release, fire, or explosion (e.g., the effects of any toxic, irritating, or asphyxiating gases that are generated, or the effects of any hazardous surface water run-off from water or chemical agents used to control fire and heat-induced explosions).

(4) If the emergency coordinator determines that the facility has had a release, fire, or explosion which could threaten human health, or the environment, outside the facility, the emergency coordinator's findings must be reported as follows:

(i) if the assessment indicates that evacuation of local areas may be advisable, appropriate local authorities must be notified immediately. The emergency coordinator must be available to help appropriate officials decide whether local areas should be evacuated; and

(ii) both the Department (using the New York State 24-hour oil and hazardous material spill

notification number 518/457-7362), and either the government official designated as the on-scene coordinator for that geographical area (in the applicable regional contingency plan under 40 CFR Part 300) (see 6 NYCRR 370.1(e)), or the National Response Center (using their 24-hour toll free number 800424-8802) must be notified immediately. The report must include:

("a") name and telephone number of reporter;

("b") name and address of facility;

("c") time and type of incident (e.g., release, fire);

("d") name and quantity of materials(s) involved, to the extent known;

("e") the extent of injuries, if any; and

("f") the possible hazards to human health, or the environment, outside the facility.

(5) During an emergency, the emergency coordinator must take all reasonable measures necessary to ensure that fires, explosions, and releases do not occur, recur, or spread to other hazardous waste at the facility. These measures must include, where applicable, stopping processes and operations, collecting and containing released waste, and removing or isolating containers.

(6) If the facility stops operations in response to a fire, explosion, or release, the emergency coordinator must monitor for leaks, pressure buildup, gas generation or ruptures in valves, pipes, or other equipment, wherever this is appropriate.

(7) Immediately after an emergency, the emergency coordinator must provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility.

> **(Note: Unless the owner or operator can demonstrate, in accordance with 6 NYCRR 371.1(d)(3) or (4), that the recovered materials is not a hazardous waste, the owner or operator becomes a generator of hazardous waste and must manage it in accordance with all applicable requirements of 6 NYCRR Part 372 and Subpart 373-2.)**

(8) The emergency coordinator must ensure that, in the affected area(s) of the facility;

(i) no waste that may be incompatible with the released material is treated, stored, or disposed of until cleanup procedures are completed; and

(ii) all emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed.

(9) The owner or operator must notify the commissioner, and appropriate State and local authorities, that the facility is in compliance with paragraph (8) of this subdivision before operations are resumed in the affected area(s) of the facility.

(10) The owner or operator must note in the operating record the time, date, and details of any incident that requires implementing the contingency plan. Within 15 days after the incident, a

written report on the incident must be submitted to the commissioner. The report must include:

(i) name, address, and telephone number of the owner or operator;

(ii) name, address, and telephone number of the facility;

(iii) date, time, and type of incident (e.g., fire, explosion);

(iv) name and quantity of material(s) involved;

(v) the extent of injuries, if any;

(vi) an assessment of actual or potential hazards to human health or the environment, where this is applicable; and

(vii) estimated quantity and disposition of recovered material that resulted from the incident.

Lawler, Matusky & Skelly Engineers LLP

Environmental Science & Engineering Consultants

JOHN P. LAWLER, P.E.
MICHAEL J. SKELLY, P.E.
KARIM A. ABOOD, P.E.
PATRICK J. LAWLER, P.E.
THOMAS L. ENGLERT, P.E.
PETER M. McGRODDY, P.E.
THOMAS E. PEASE, P.E.
THOMAS B. VANDERBEEK, P.E.

Principal
SUSAN G. METZGER, Ph.D.

ONE BLUE HILL PLAZA
P.O. BOX 1509
PEARL RIVER, NEW YORK 10965
(914) 735-8300
FACSIMILE (914) 735-7466

February 4, 1999
File No. 722-005

Mr. Noel Russ
Miller Environmental Group
501 Temple Hill Road
New Windsor, NY 12553

Re: Baldwin Place Mall Groundwater Remediation System

Dear Mr. Russ:

This letter pertains to the remediation constructed by your company. From time to time, one or two drums of used bag filters and used activated carbon will be stored in the building, pending shipment off-site as hazardous waste. The Resource Conservation and Recovery Act (RCRA) requires the development of a contingency plan for the facility to set out the course of action to be followed in case of fire, explosion, or release of hazardous wastes which could threaten human health or the environment. The regulations require that a copy of the contingency plan and subsequent revisions, be submitted to all local fire departments, police departments, hospitals and state and local emergency response teams that may be called upon to provide emergency services.

The regulations require documentation of arrangements for coordinating an emergency with you. As indicated in the plan, our intention is to rely on your company for that service under the terms of your current authorization from Big V Supermarkets, Inc. Included with this letter is an acknowledgment form documenting your receipt of the plan and agreement to provide emergency services; please sign and return the acknowledgment to me in the enclosed envelope.

Very truly yours,

Stuart E. Bassell, P.E.
Project Manager

Encl.

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Lawler, Matusky & Skelly Engineers LLP

Environmental Science & Engineering Consultants

JOHN P. LAWLER, P.E.
MICHAEL J. SKELLY, P.E.
KARIM A. ABOOD, P.E.
PATRICK J. LAWLER, P.E.
THOMAS L. ENGLERT, P.E.
PETER M. McGRODDY, P.E.
THOMAS E. PEASE, P.E.
THOMAS B. VANDERBEEK, P.E.

Principal
SUSAN G. METZGER, Ph.D.

ONE BLUE HILL PLAZA
P.O. BOX 1509
PEARL RIVER, NEW YORK 10965
(914) 735-8300
FACSIMILE (914) 735-7466

February 4, 1999
File No. 722-005

Somers Police Department
PO Box 342
Somers, NY 10589

Re: Baldwin Place Mall Groundwater Remediation System

As you are probably aware, the perchloroethylene spill from a former dry cleaner at Baldwin Place Mall is presently being remediated. The remediation includes a new groundwater treatment system located on the east side of the property accessed from Route 118. Groundwater is pumped from two wells into a small building and treated in an enclosed system of bag filters and activated carbon. The electrical and control panels are located in the building. From time to time, one or two drums of used bag filters and used activated carbon will be stored in the building, pending shipment off-site as hazardous waste.

The Resource Conservation and Recovery Act (RCRA) requires the development of a contingency plan for the facility to set out the course of action to be followed in case of fire, explosion, or release of hazardous wastes which could threaten human health or the environment. The regulations require that a copy of the contingency plan and subsequent revisions, be submitted to all local fire departments, police departments, hospitals and state and local emergency response teams that may be called upon to provide emergency services.

The regulations require documentation of arrangements for coordinating an emergency with you. As indicated in the plan, our intention is to notify you by calling 911 during an emergency that requires your presence. Included with this letter is an acknowledgment form documenting your receipt of the plan and agreement to provide emergency response services; please sign and return the acknowledgment to me in the enclosed envelope. If you would like a tour of the facility, please contact the operator Mr. Barry Babcock (297-0666 ext. 14) to make arrangements. If you have any questions, please do not hesitate to call Mr. Babcock or myself, at 735-8300.

Very truly yours,

Stuart E. Bassell, P.E.
Project Manager

Encl.

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Lawler, Matusky & Skelly Engineers LLP

Environmental Science & Engineering Consultants

JOHN P. LAWLER, P.E.
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P.O. BOX 1509
PEARL RIVER, NEW YORK 10965
(914) 735-8300
FACSIMILE (914) 735-7466

February 4, 1999
File No. 722-005

Somers Fire District
Primrose St. - Route 139
Lincolndale, NY 10540

Re: Baldwin Place Mall Groundwater Remediation System

As you are probably aware, the perchloroethylene spill from a former dry cleaner at Baldwin Place Mall is presently being remediated. The remediation includes a new groundwater treatment system located on the east side of the property accessed from Route 118. Groundwater is pumped from two wells into a small building and treated in an enclosed system of bag filters and activated carbon. The electrical and control panels are located in the building. From time to time, one or two drums of used bag filters and used activated carbon will be stored in the building, pending shipment off-site as hazardous waste.

The Resource Conservation and Recovery Act (RCRA) requires the development of a contingency plan for the facility to set out the course of action to be followed in case of fire, explosion, or release of hazardous wastes which could threaten human health or the environment. The regulations require that a copy of the contingency plan and subsequent revisions, be submitted to all local fire departments, police departments, hospitals and state and local emergency response teams that may be called upon to provide emergency services.

The regulations require documentation of arrangements for coordinating an emergency with you. As indicated in the plan, our intention is to notify you by calling 911 during an emergency that requires your presence. Included with this letter is an acknowledgment form documenting your receipt of the plan and agreement to provide emergency response services; please sign and return the acknowledgment to me in the enclosed envelope. If you would like a tour of the facility, please contact the operator Mr. Barry Babcock (297-0666 ext. 14) to make arrangements. If you have any questions, please do not hesitate to call Mr. Babcock or myself, at 735-8300.

Very truly yours,

Stuart E. Bassell, P.E.
Project Manager

Encl.

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Environmental Science & Engineering Consultants

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ONE BLUE HILL PLAZA
P.O. BOX 1509
PEARL RIVER, NEW YORK 10965
(914) 735-8300
FACSIMILE (914) 735-7466

February 4, 1999
File No. 722-005

Putnam Hospital Center
Stoneleigh Ave
Carmel, NY 10512

Re: Baldwin Place Mall Groundwater Remediation System

As you are probably aware, the perchloroethylene spill from a former dry cleaner at Baldwin Place Mall is presently being remediated. The remediation includes a new groundwater treatment system located on the east side of the property accessed from Route 118. Groundwater is pumped from two wells into a small building and treated in an enclosed system of bag filters and activated carbon. The electrical and control panels are located in the building. From time to time, one or two drums of used bag filters and used activated carbon will be stored in the building, pending shipment off-site as hazardous waste.

The Resource Conservation and Recovery Act (RCRA) requires the development of a contingency plan for the facility to set out the course of action to be followed in case of fire, explosion, or release of hazardous wastes which could threaten human health or the environment. The regulations require that a copy of the contingency plan and subsequent revisions, be submitted to all local fire departments, police departments, hospitals and state and local emergency response teams that may be called upon to provide emergency services.

The regulations require documentation of arrangements for coordinating an emergency with you. As indicated in the plan, the potential for excess exposure to toxic chemicals is considered slight; there is a greater likelihood of accidents associated with normal activities around the mechanical, electrical, and building systems. In the event of an emergency requiring hospital attention, our intention is to rely on your facility for that service. Included with this letter is an acknowledgment form documenting your receipt of the plan and agreement to provide emergency services; please sign and return the acknowledgment to me in the enclosed envelope. If you would like a tour of the facility, please contact the operator Mr. Barry Babcock (297-0666 ext. 14) to make arrangements. If you have any questions, please do not hesitate to call Mr. Babcock or myself, at 735-8300.

Very truly yours,

Stuart E. Bassell, P.E.
Project Manager

Encl.

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Baldwin Place Mall Groundwater Recovery Treatment System
Route 6
Somers, New York

☐ Please check. Receipt of the Contingency Plan is acknowledged.

☐ Please check. The following agency will provide emergency response services as described in the Contingency Plan:

Agency:_____

By (Name and Title):_____

Signature:_____

Date:_____

BIG V SUPERMARKETS, INC
Florida, New York

BALDWIN PLACE MALL GROUNDWATER RECOVERY SYSTEM
HAZARDOUS WASTE MINIMIZATION PLAN

The Baldwin Place Mall Groundwater Recovery Well Treatment System is designed to pump water containing volatile organic compounds (primarily perchloroethene) from the ground and treat this water by activated carbon adsorption. The site is a 28 acre, vacant shopping center, located in the Town of Somers, Westchester County , New York. The site is accessed from U.S. Route 6.

The Groundwater Recovery System generates primarily two types of hazardous waste. These wastes are spent carbon and used bag filters. Additionally, a small quantity of nitrile gloves and paper towels are generated as a result of maintenance and sampling operations. Spent carbon generation presently averages about 60 kg/month. This amount will drop as the concentration of perchloroethene in the wastewater declines. The system also generates two used filter bags per month. Used filter bag generation will stay about the same for the life of the system.

Hazardous waste minimization is achieved thru the proper operation and maintenance of the system. All phases of operation and maintenance are described in detail in the O&M Manual. In addition, a routine operations report is generated documenting system operations and repairs. The report is useful for tracking system efficiency and thereby eliminating unnecessary component replacements. Between carbon volatile organic compounds samples are collected periodically to assess system loading. Carbon bed replacement is done only when the primary drum is completely spent. This will reduce the amount of carbon waste generated.

Generation of hazardous waste at the Groundwater Recovery System will be minimized by employing good housekeeping procedures, avoiding spills and promptly repairing any leaks or drips. Mixing of hazardous and nonhazardous waste will be avoided. This will reduce hazardous waste generated as a result of the Mixture Rule.

Baldwin Place Mall Groundwater Recovery Treatment System
Route 6
Somers, New York

☒ Please check. Receipt of the Contingency Plan is acknowledged.

☐ Please check. The following agency will provide emergency response services as described in the Contingency Plan:

Agency: SOMERS TOWN POLICE
P.O. BOX 342
SOMERS, NY 10589-0342

By (Name and Title): Sgt. A.J. Stipo

Signature: Sgt A.J. Stipo

Date: 2/2/99

Baldwin Place Mall Groundwater Recovery Treatment System
Route 6
Somers, New York

☑ Please check. Receipt of the Contingency Plan is acknowledged.

☑ Please check. The following agency will provide emergency response services as described in the Contingency Plan:

Agency: Somers Fire & EMS

By (Name and Title): Robert Lux Chief

Signature: [signature]

Date: 2-11-99

Baldwin Place Mall Groundwater Recovery Treatment System
Route 6
Somers, New York

☑ Please check. Receipt of the Contingency Plan is acknowledged.

☑ Please check. The following agency will provide emergency response services as described in the Contingency Plan:

Agency: Miller Environmental Group, Inc.

By (Name and Title): Noel Russ, AEP Project Manager

Signature: Noel R

Date: 2/8/99

UNITED INDUSTRIAL SERVICES
DIVISION OF UNITED OIL RECOVERY INC.

14 WEST MAIN STREET MERIDEN CT 06451
TELEPHONE (203) 238-6745

"An Equal Opportunity Employer"

cc: 722-005
SRB
Barry Babcock
Tony Donadio

RECEIVED
MAR 15 1999
Lawler, Matusky & Skelly Engineers LLP

March 8, 1999

Lawler, Matusky & Skelly Engineers LLP
Attn: Stuart E. Bassell, P.E.
One Blue Hill Plaza
P.O. Box 1508
Pearl River, NY 10885

Dear Mr. Bassell,

I am responding to your request, dated February 19, 1999, regarding Big V Supermarkets, that was forwarded to me by Miller Environmental Group.

I have enclosed approval letters pertaining to the acceptance of the following material:

Approval Code	Material
1914BSH	Waste activated carbon contaminated with tetrachloroethylene
7919ASOFS	Waste ground water from clean up around dry cleaning operation

This waste has been sampled and approved into our facility. I trust that the enclosed approval letters will be sufficient for your inquiries. Should you require any additional information, please do not hesitate to contact me at (888)276-0886.

Sincerely,

Susan Pelloni

Susan Pelloni
Inside Sales Manager

UNITED
INDUSTRIAL
SERVICES
DIVISION OF UNITED OIL RECOVERY INC.

14-16 WEST MAIN STREET MERIDEN CT 06451
TELEPHONE (203) 238-6745

"An Equal Opportunity Employer"

December 10, 1997

Ms Vikki DeVoe
Miller Environmental Group Inc.
501 Temple Hill Road
New Windsor NY

Dear Ms. DeVoe:

The following are approved waste streams at United Oil Recovery, Inc.

Approval Code	**Generator / Material**
7919ASOFS	**Big V Supermarket** Waste ground water from clean up around dry cleaning operation

United Oil Recovery, Inc. has the capacity and the permits to treat these types of waste. If you or your customers would like to witness the capabilities of our facility, please feel free to contact either your sales representative or myself at (203) 238-6754. Thank you for considering our facility for your treatment and recycling needs.

Sincerely,

Darlene M. Corcanges
Environmental Coordinator
United Oil Recovery, Inc.

UNITED
INDUSTRIAL
SERVICES
DIVISION OF UNITED OIL RECOVERY INC.

14 WEST MAIN STREET MERIDEN CT 06451
TELEPHONE (203) 238-6745

"An Equal Opportunity Employer"

December 17, 1998

Mr. Noel Russ
Miller Environmental Group Inc.
538 Edwards Ave.
Calverton NY 11933

Dear Mr. Russ:

The following are approved waste streams at United Oil Recovery, Inc. and Bridgeport United Recycling.

Approval Code	Generator / Material
	Big V Supermarkets
1914BSH	Waste activated carbon contaminated with tetrachloroethylene

United Oil Recovery, Inc. has the capacity and the permits to treat these types of waste. If you or your customers would like to witness the capabilities of our facility, please feel free to contact either your sales representative or myself at (203) 238-6754. Thank you for considering our facility for your treatment and recycling needs

Sincerely,

Darlene M. Corcanges
Environmental Coordinator
United Oil Recovery, Inc.

APPENDIX D

WELL CONSTRUCTION LOGS

NOTE - WELL NOW HAS A CURB BOX

MONITORING WELL RECORD

Well Permit No. ____

OWNER IDENTIFICATION - Owner Baldwin Place Mall
Address ____
City Somers State New York Zip Code ____

Atlas Sheet Coordinates ____

WELL LOCATION - If not the same as owner please give address. Owner's Well No. Piezometer
County ____ Municipality ____ Lot No. ____ Block No. ____
Address ____

TYPE OF WELL (as per Well Permit Categories) ____
Regulatory Program Requiring Well ____

DATE WELL STARTED ____/____/____
DATE WELL COMPETED ____/____/____
Case I.D.# ____

CONSULTING FIRM/FIELD SUPERVISOR (if applicable) Vince Uhl Assoc. Tele. # 215-321-2210

WELL CONSTRUCTION

Total depth drilled 40 ft.
Well finished to 40 ft.

Borehole diameter:
Top 6 in.
Bottom 6 in.

Well was finished: ☐ above grade ☒ flush mounted

If finished above grade, casing height (stick up) above land surface - ft.

Was steel protective casing installed? ☒ Yes ☐ No

Static water level after drilling 4.5 ft.

Water level was measured using M-Scope

Well was developed for 2 hours at 1 gpm

Note: Measure all depths from land surface	Depth to Top (ft.)	Depth to Bottom (ft.)	Diameter (inches)	Material	Wgt./Rating (lbs/sch no.)
Single/Inner Casing	0	20	2	PVC	Sch 40
Middle Casing (for triple cased wells only)	-	-	-	-	-
Outer Casing (largest diameter)	-	-	-	-	-
~~Open Hole~~ Screen (No. Used 1)	20	40	2	PVC .010 slot	Sch 40
Blank Casings (No. Used)	-	-	-	-	-
Tail Piece	-	-	-	-	-
Gravel Pack	15	40	6x2	#00 Gravel	
Grout	0 12	12 15	6x2	Neat Cement Bentonite	188 lbs. 100 lbs.

Grouting Method Pressure Grout with Tremie Line
Drilling Method Air Rotary Dual Tube Drive

Method of development 2" Bailer Bucket

Was permanent pumping equipment installed? ☐ Yes ☒ No

Pump capacity ____ gpm

Pump type: ____

Drilling Fluid Air Type of Rig IRT4

Health and Safety Plan submitted? ☒ Yes ☐ No

Level of Protection used on site (circle one) None (D) C B A

I certify that I have constructed the above referenced well in accordance with all well permit requirements and applicable State rules and regulations.

Drilling Company SAMUEL STOTHOFF CO., INC.

Well Driller (Print) Dennis Wene

Driller's Signature ____

Date ____/____/____

GEOLOGIC LOG

Note each depth where water was encountered in consolidated formations.

0' - 40' Sand & gravel with cobbles

MONITORING WELL RECORD

Well Permit No. ____ - ____

Atlas Sheet Coordinates ____ : ____ : ____

OWNER IDENTIFICATION - Owner Baldwin Place Mall

Address ____

City Somers State New York Zip Code ____

WELL LOCATION - If not the same as owner please give address. Owner's Well No. RW-1S

County ____ Municipality ____ Lot No. ____ Block No. ____

Address ____

DATE WELL STARTED 12 / 17 / 97

TYPE OF WELL (as per Well Permit Categories) RECOVERY WELL DATE WELL COMPETED 12 / 18 / 97

Regulatory Program Requiring Well Case I.D.# ____

CONSULTING FIRM/FIELD SUPERVISOR (if applicable) Vince Uhl Assoc. Tele. # 215-321-2210

WELL CONSTRUCTION

Total depth drilled 49 ft.
Well finished to 49 ft.

Borehole diameter.
Top 10 in
Bottom 10 in.

Well was finished: [X] above grade
[ ] flush mounted

If finished above grade, casing height (stick up) above land surface 1 ft.

Was steel protective casing installed?
[ ] Yes [X] No

Static water level after drilling 4 ft.

Water level was measured using M-Scope

Well was developed for 6 hours at 8 gpm

Note: Measure all depths from land surface	Depth to Top (ft.)	Depth to Bottom (ft.)	Diameter (inches)	Material	Wgt./Rating (lbs/sch no.)
Single/Inner Casing	+1	9'	6	Steel	19/40S
Middle Casing (for triple cased wells only)	-	-	-	-	-
Outer Casing (largest diameter)	-	-	-	-	-
Open Hole or Screen (No. Used 1)	9	49	6	Stainless Steel .010 slot	
Blank Casings (No. Used)	-	-	-	-	-
Tail Piece	-	-	-	-	-
Gravel Pack	4	49	10x6	#00 Gravel	-
Grout	-	-	-	Neat Cement Bentonite	94 lbs. ____ lbs.

Grouting Method Pressure grout with tremie line

Drilling Method Air rotary drill & drive

Method of development Submersible Pump

Was permanent pumping equipment installed? [ ] Yes [X] No

Pump capacity ____ gpm

Pump type: ____

Drilling Fluid Air rotary Type of Rig IRT4

Health and Safety Plan submitted? [X] Yes [ ] No

Level of Protection used on site (circle one) None (D)C B A

I certify that I have constructed the above referenced well in accordance with all well permit requirements and applicable State rules and regulations.

Drilling Company SAMUEL STOTHOFF CO., INC.

Well Driller (Print) Dennis Wenc

Driller's Signature ____

Date ___ / ___ / ___

GEOLOGIC LOG

Note each depth where water was encountered in consolidated formations.

0' - 10' 3/4" Gravel
10' - 49' Sand & Gravel with some cobbles

MONITORING WELL RECORD

Well Permit No. _____

Atlas Sheet Coordinates _____

OWNER IDENTIFICATION - Owner Baldwin Place Mall

Address _____

City Somers State New York Zip Code _____

WELL LOCATION - If not the same as owner please give address. Owner's Well No. RW-2D

County _____ Municipality _____ Lot No. _____ Block No. _____

Address _____

DATE WELL STARTED 12 / 15 / 97

DATE WELL COMPETED 12 / 19 / 97

TYPE OF WELL (as per Well Permit Categories) _____

Regulatory Program Requiring Well _____ Case I.D.# _____

CONSULTING FIRM/FIELD SUPERVISOR (if applicable) Vince Uhl Assoc. Tele. # 215-321-2210

WELL CONSTRUCTION

Total depth drilled 86 ft.

Well finished to 83 ft.

Borehole diameter:

Top 10 in.

Bottom 10 in.

Well was finished: [X] above grade [ ] flush mounted

If finished above grade, casing height (stick up) above land surface 1 ft.

Was steel protective casing installed? [ ] Yes [X] No

Static water level after drilling 8 ft.

Water level was measured using M-Scope

Well was developed for 6 hours at 1.5 gpm

Method of development Submersible

Was permanent pumping equipment installed? [ ] Yes [X] No

Pump capacity _____ gpm

Pump type: _____

Drilling Fluid Air Type of Rig IRT4

Health and Safety Plan submitted? [X] Yes [ ] No

Level of Protection used on site (circle one) None (D) C B A

Note: Measure all depths from land surface	Depth to Top (ft.)	Depth to Bottom (ft.)	Diameter (inches)	Material	Wgt./Rating (lbs/sch no.)
Single/Inner Casing	+1	53	6	Steel	19/40S
Middle Casing (for triple cased wells only)	-	-	-	-	-
Outer Casing (largest diameter)	-	-	-	-	-
Screen (No. Used 1)	53	83	6	Stainless Steel .010 slot	
Blank Casings (No. Used)	-	-	-	-	-
Tail Piece	-	-	-	-	-
Gravel Pack	48	86	10x6	#00 Gravel	
Grout	3	48	10x6	Neat Cement Bentonite	3384 lbs. 180 lbs.

Grouting Method Pressure grout with tremie line

Drilling Method Air rotary, drill & drive

I certify that I have constructed the above referenced well in accordance with all well permit requirements and applicable State rules and regulations.

Drilling Company SAMUEL STOTHOFF CO., INC.

Well Driller (Print) Dennis Wene

Driller's Signature _____

Date __/__/__

GEOLOGIC LOG

Note each depth where water was encountered in consolidated formations.

0'	-	55'	Sand & gravel with boulders
55'	-	82'	Weathered granite
82'	-	86'	Granite

APPENDIX H

HEALTH AND SAFETY PLAN

MACTEC, Inc.

MACTEC Short Form HASP

Site: Baldwin Place – Site No. 360023 Date: January 2016

Street Address: Somers Commons Shopping Center, Somers, Westchester County, New York

Site Description: **(attach map)** The Site is located at the Somers Commons Shopping Center, a 28 acre property located in Somers, Westchester County, New York (Figure 1.1). This shopping center replaced the original Baldwin Place Mall that was located on the Site from 1965 until the early 2000's. The site is surrounded by commercial and residential properties (Figure 1.2). A dry cleaning operations occurred on the mall property until November 1991. The selected remedy for the site includes the existing pump and treat system.

General Scope: This is a General HASP to identify potential hazards at the Site that could be encountered while implementing tasks outlined in the SMP.

Tasks:

Contractors	Others	Task Description
☒	☒	Mobilization/demobilizing
☒	☒	Overall inspection of the site
☒	☐	Water Level Measurements
☒	☐	Well Development
☒	☐	Groundwater Sampling
☒	☐	Process Sampling
☒	☒	Fieldwork Oversight
☒	☐	Groundwater Extraction and Treatment System Operations and Maintenance
☒	☐	Soil Vapor Sampling
☐	☐	
☐	☐	

Dates of Required Training and Medical Surveillance (add additional training topics, as required**):**

Job duties:	**HSO**	**Field Team**	Field Team Lead	Field Team	Field Team
Names:					
	Dates	**Dates**	**Dates**	**Dates**	**Dates**
Medical Surveillance					
40-Hour Initial					
8-Hour Supervisor [1]					
8-Hour Refresher					
First Aid [2]					
CPR [2]					
Hazard Communication					
Site Specific training:					

[1] Required for Field Lead and Site Health and Safety Officer

[2] At least one worker must be trained in First Aid/CPR and should received Bloodborne Pathogen Training

Known or Suspected Contaminants (include PELs/TLVs):

Contaminants of Concern (COC) (Attach Fact Sheets*)	**Maximum Concentrations**		**PEL/TLV**
	Soil (mg/kg)	**Water/Groundwater (µg/l)**	
Tetrachloroethene (PCE)		640	25 ppm 100 ppm - STEL 300 ppm - C

Contaminants of Concern (COC) (Attach Fact Sheets*)	Maximum Concentrations		PEL/TLV
	Soil (mg/kg)	Water/Groundwater (µg/l)	
Trichloroethene (TCE)	Breakdown product	Breakdown product	10 ppm 25ppm - STEL 200ppm - C
Vinyl chloride (VC)	Breakdown product	Breakdown product	1 ppm
Cis-1,2-dichloroethene (cis1,2-DCE)	Breakdown product	Breakdown product	200 ppm

*Workers must be made aware of the signs, symptoms, and first aid for each COC. Information is located on the COC fact sheets.

Air Monitoring Action Levels:

PID/FID Reading[1]	Vinyl Chloride Detector Tube[1]	Dust Meter[1]	LEL[2]/O_2[1]	Action
Any readings above bkg	<0.5 ppm			Monitor with vinyl chloride draeger tube- level D
< 5 ppm	<0.5 ppm	<1.5 mg/M^3		Continue working @level D PPE
≥ 5 ppm	<0.5 ppm	<1.5 mg/M^3		Move up wind, re-evaluate site protocols prior to further action for MACTEC personnel. – Stop Work
≥ 10 ppm	≥0.5 ppm	≥15 mg/M^3	>10% LEL	Stop work. Backoff as level B would be required. This short form HASP is not approved for use with Level B protection.
			<19.5% O_2 or >23.5%	Stop work and evacuate area.

[1] Sustained readings measured in the breathing zone
[2] Readings at measured at the source (borehole, well, etc.)

JHAs: Check and attach all that apply (add applicable JHAs not already listed):

Activity Specific JHAs:

☒	Mobilization/Demobilization and Site Preparation
☒	Field Work - General
☒	Field Work - Oversight
☒	Decontamination
☒	Groundwater Sampling
☒	Soil Sampling
☒	Soil Vapor Sampling
☐	
☐	

Hazard Specific JHAs:

☒	Working with Preservatives (Acids)
☒	Well Development
☒	Static Water Levels
☒	Insects Stings and Bites
☐	
☐	
☐	
☐	
☐	
☐	

HAZARD IDENTIFICATION SUMMARY

Complete the checklist for summarizing the hazards identified in the JHAs

Standard Hazards			
☒ Falling Objects	☒ Slips and trips	☒ Pinch points	☐ Rotating equipment
☒ Falls	☒ Power equipment/tools	☐ Elevated work surfaces	☐ Drill Rig
Eye Hazards			
☒ Particulates	☒ Liquid splashes	☐ Welding Arc	☐ _____

Hearing Hazards			
☒ None	☐ Impact noise	☐ High frequency noise	☐ High ambient noise

Respiratory Hazards						
☐ None	☐ Dust/aerosols/particulates	☒ Organic Vapors	☒ Acid Gases	☐ O_2 deficient	☐ Metals	☐ Asbestos

Chemical Hazards			
☐ None	☒ Organic solvents	☐ Reactive metals	☐ PCBs
☒ Acids / bases	☐ Oxidizers	☒ Volatiles/Semi-volatiles	☐ _____

Environmental Hazards				
☐ None	☒ Cold Stress	☒ Heat Stress	☐ Wet location	☒ Bio hazards (snakes, insects, spiders, poisonous plants, etc.)
☐ Explosive vapors	☐ Confined space	☐ Engulfment Hazard	☐ _____	

Electrical Hazards				
☐ None	☒ Energized equipment or circuits	☐ Overhead utilities	☐ Underground utilities	☐ Wet location

Fire Hazards			
☒ None	☐ Cutting, welding, or grinding generated sparks or heat sources	☐ Flammable materials present	☐ Oxygen enriched location

Ergonomic Hazards					
☒ Lifting	☒ Bending	☒ Twisting	☒ Pulling/tugging	☐ Repetitive motion	☒ Carrying
Computer Use in the: ☐ Office ☐ Field			☐ _____	☐ _____	

Radiological Hazards						
☒ None	☐ Alpha	☐ Beta	☐ Gamma/X-rays	☐ Neutron	☐ Radon	☐ Non-Ionizing

Other Hazards
☒ Other hazards due to the location. Traffic, pedestrians, etc.

PPE and Monitoring Instruments

Initial Level of PPE *			
☒ Level D	☐ Modified Level D	☐ Level C	* Cannot use Short Form HASP for Level B or A work

Standard PPE					
☒ Hard Hat	☒ Safety boots	☒ Safety glasses	☐ Chem. Resistant Boots	☒ High visibility vest	☐ Other:_____

Eye and Face Protection			
☐ Face shield	☐ Vented goggles	☐ Unvented goggles	☐ Indirect vented goggles

Hearing Protection			
☐ Ear plugs (drilling)	☐ Ear Muffs	☐ Ear plugs and muffs	☐ Other _____

Respiratory Protection					
☒ None	☐ Dust mask	☐ Full Face APR	☐ Half Face APR	Cartridge Type: _____	Change Cartridges: _____

Protective Clothing			
☒ Work uniform	☐ White uncoated Tyvek®	☐ Poly-coated Tyvek®	☐ Saranex®

☐ Boot covers	☒ Reflective vest	☐ Chaps or Snake Legs	☐ Other ___

Hand Protection

☐ None	☐ Cotton gloves	☐ Leather gloves	☐ Glove liners	☐ Cut-resistant gloves	☒ Other _See below

☒ Outer Gloves: List Type. The following are best choices for the PCE and also provide protection for TCE: Barrier® PVA™ ChemTek (Viton/Butyl) The following may be used for very short time when in contact with TCE, PCE: Solvex Nitrile (10 to 30 minutes) AlphaTek Nitrile (10 to 30 minutes)	☒ Inner Gloves: List Type___Nitrile_____

Monitoring Instruments Required*

Periodic monitoring shall be conducted when the possibility of an IDLH condition or flammable atmosphere has developed or when there is indication that exposures may have risen over permissible exposure limits or published exposure levels since prior monitoring. Situations where it shall be considered whether the possibility that exposures have risen are as follows:

- When work begins on a different portion of the site.
- When contaminants other than those previously identified are being handled.
- When a different type of operation is initiated (e.g., drum opening as opposed to exploratory well drilling.)
- When employees are handling leaking drums or containers or working in areas with obvious liquid contamination (e.g., a spill or lagoon.)

☐ LEL/O2 Meter	☒ PID: ☒ 10.0-10.6 eV Lamp ☐ 11.7 eV Lamp	☐ FID	☐ Hydrogen Sulfide/Carbon Monoxide

☒ Dräger Pump (or equivalent) List Tubes: vinyl chloride	☒ Dust Meter: ☒ Respirable dust ☐ Total dust	☐ Other _____

*Monitoring instruments will be calibrated daily in accordance with manufacturer's instructions. Results will be recorded in the field logbook.

Chemicals Brought to the Site:
List all chemicals brought to the site (e.g., preservatives, decon solutions, calibration gases, gasoline, etc.).

Chemicals (Note: Name listed must match name on label and MSDS)	**MSDS Attached?**
ISOBTYLENE	☒
HCL	☒
CALIBRATION SOLUTIONS (YSI)-PH 4, PH 7, DO, ORP, 1413 SPECIFIC COND.	☒
LIQUINOX	☒
METHANOL	☒
NITRIC ACID	☒
SULFURIC ACID	☒

Chemicals will be kept in their original containers. If transferred to another container, aside from days use by one individual, the new container will be labeled with the name of the chemical and the hazard warnings.

Work Zones:
The work zones will be defined relative to the location of the work activity. The Exclusion Zone is considered the area within a 10-foot diameter of the sampling location. The Contamination Reduction Zone is considered to be the area with in a 20-foot diameter of the sampling location. The decontamination zone is to be located upwind of the work area. Work zones will be maintained through the use of:

☐ Warning Tape
☒ Cones and Barriers
☐ Visual Observations

Decontamination Procedures and Equipment:
Note: See Decontamination JHA for further information

Level D Decontamination Procedures

Decontamination Solution:	Detergent and Water
Station 1: Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, etc. on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool-down station may be set up within this area.
Station 2: Outer Boots, and Gloves Wash and Rinse (if worn)	Scrub outer boots, and outer gloves decon solution or detergent water. Rinse off using copious amounts of water.
Station 3: Outer Boot and Glove Removal (if worn)	Remove outer boots and gloves. Deposit in plastic bag.
Station 4: Inner glove removal	Remove inner gloves and place in plastic bag.
Station 5: Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

Modified Level D and Level C PPE Decontamination Procedures

Decontamination Solution:	Detergent and Water
Station 1: Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, etc. on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool-down station may be set up within this area.

Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	Scrub outer boots, outer gloves, and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Canister or Mask (Level C only) Change	If worker leaves exclusion zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers are donned, joints are taped, and worker returns to duty.
Station 5:	Boot, Gloves and Outer Garment Removal	Boots, chemical resistant splash suit, and inner gloves are removed and deposited in separate containers lined with plastic.
Station 6:	Face Piece Removal (Level C only)	Facepiece is removed. Avoid touching face with fingers. Facepiece is deposited on plastic sheet.
Station 7:	Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

Site Communication:

- ☒ Verbal
- ☐ Two-way radio
- ☒ Cellular telephone
- ☒ Hand signals
  - Hand gripping throat _____ Out of air, can't breathe
  - Grip partner's wrist or both hands around waist _____ Leave area immediately
  - Hands on top of head _____ Need assistance
  - Thumbs up _____ OK, I am all right, I understand
  - Thumbs down _____ No, negative
- ☐ Horn
- ☐ Siren
- ☐ Other:

EMERGENCY CONTACTS

NAME	TELEPHONE NUMBERS		DATE OF PRE-EMERGENCY NOTIFICATION (if applicable)
Fire Department:	911		
Hospital: Putnam Hospital Center	(845) 279-5711		
Hospital: Pulse-MD Urgent Care	(845) 621-3100		
Police Department:	911		
Site Health And Safety Officer:	Office:	Cell:	
Client Contact: Larry Thomas	Office: 518-402-9813	Cell:	
Project Manager:	Office:	Cell:	
Regional HSE Manager:	Office:	Cell:	

NAME	TELEPHONE NUMBERS		DATE OF PRE-EMERGENCY NOTIFICATION (if applicable)
EPA/DEP (if applicable):			
OTHER: Ambulance	911		

Emergency Equipment:
The following emergency response equipment is required for this project and shall be readily available:

- ☒ Field First Aid Kit (including bloodborne pathogen kit/supplies)
- ☐ Fire Extinguisher (ABC type) (verify that the drilling contractor has appropriate fire extinguisher in vehicle
- ☐ Eyewash (Note: 15 minutes of free-flowing fresh water)
- ☐ Other: _____

EMERGENCY PROCEDURES

- The HSO (or alternate) should be immediately notified via the on-site communication system. The HSO assumes control of the emergency response.
- The HSO notifies the Project Manager and client contact of the emergency.
- If the emergency involves an injury to an MACTEC employee, the HSE Coordinator or Field Lead are to implement the MACTEC Early Injury Case Management program. See procedures and Flow Diagram below:
- If applicable, the HSO shall notify off-site emergency responders (e.g. fire department, hospital, police department, etc.) and shall inform the response team as to the nature and location of the emergency on-site.
- If applicable, the HSO evacuates the site. Site workers should move to the predetermined evacuation point (See Site Map).
- For small fires, flames should be extinguished using the fire extinguisher. Large fires should be handled by the local fire department.
- In an unknown situation or if responding to toxic gas emergencies, appropriate PPE, including SCBAs (if available), should be donned. If appropriate PPE is unavailable, site workers should evacuate and call in emergency personnel.
- For chemical spills, follow the job specific JHA for spill containment
- If chemicals are accidentally spilled or splashed into eyes or on skin, use eyewash and wash affected area. Site worker should shower as soon as possible after incident.
- If the emergency involves toxic gases, workers will back off and reassess. Prior to re-entering the work zone, the area must be determined to be safe. Entry will be using Level B PPE and utilize appropriate monitoring equipment to verify that the site is safe.
- An injured worker shall be decontaminated appropriately.
- Within 24 hours after any emergency response, the Incident Analysis Report (and Vehicle Incident Report if vehicle incident) shall be completed and returned to the Regional HSE Manager. Injuries requiring medical treatment beyond first aid (as well as work-related vehicle incidents) will require the employee to submit a post incident drug test.

FIELD TEAM REVIEW: I acknowledge that I understand the requirements of this HASP, and agree to abide by the procedures and limitations specified herein. I also acknowledge that I have been given an opportunity to have my questions regarding the HASP and its requirements answered prior to performing field activities. Health and safety training and medical surveillance requirements applicable to my field activities at this site are current and will not expire during on-site activities.

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Routes to Emergency Medical Facilities

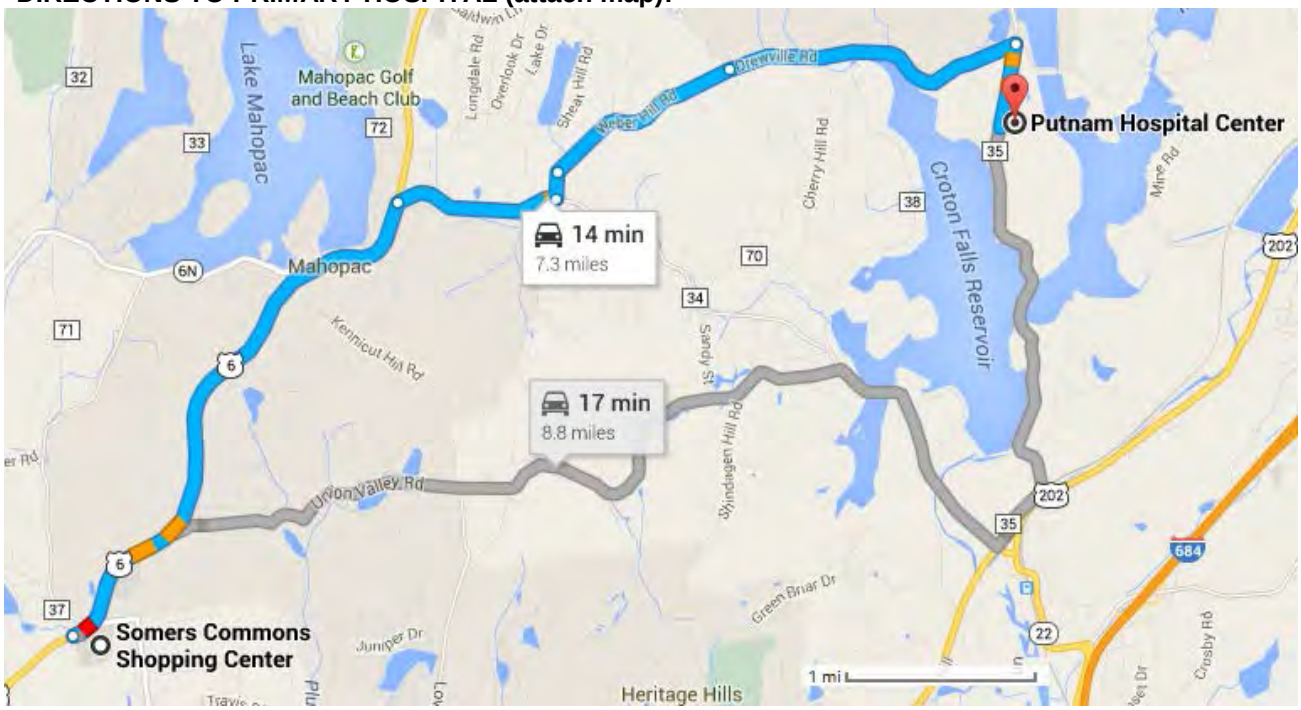
PRIMARY HOSPITAL(for immediate emergency treatment):

Facility Name: Primary: Putnam Hospital Center

Address: 670 Stoneleigh Ave, Carmel, NY 10512

Telephone Number: 845-279-5711

DIRECTIONS TO PRIMARY HOSPITAL (attach map):



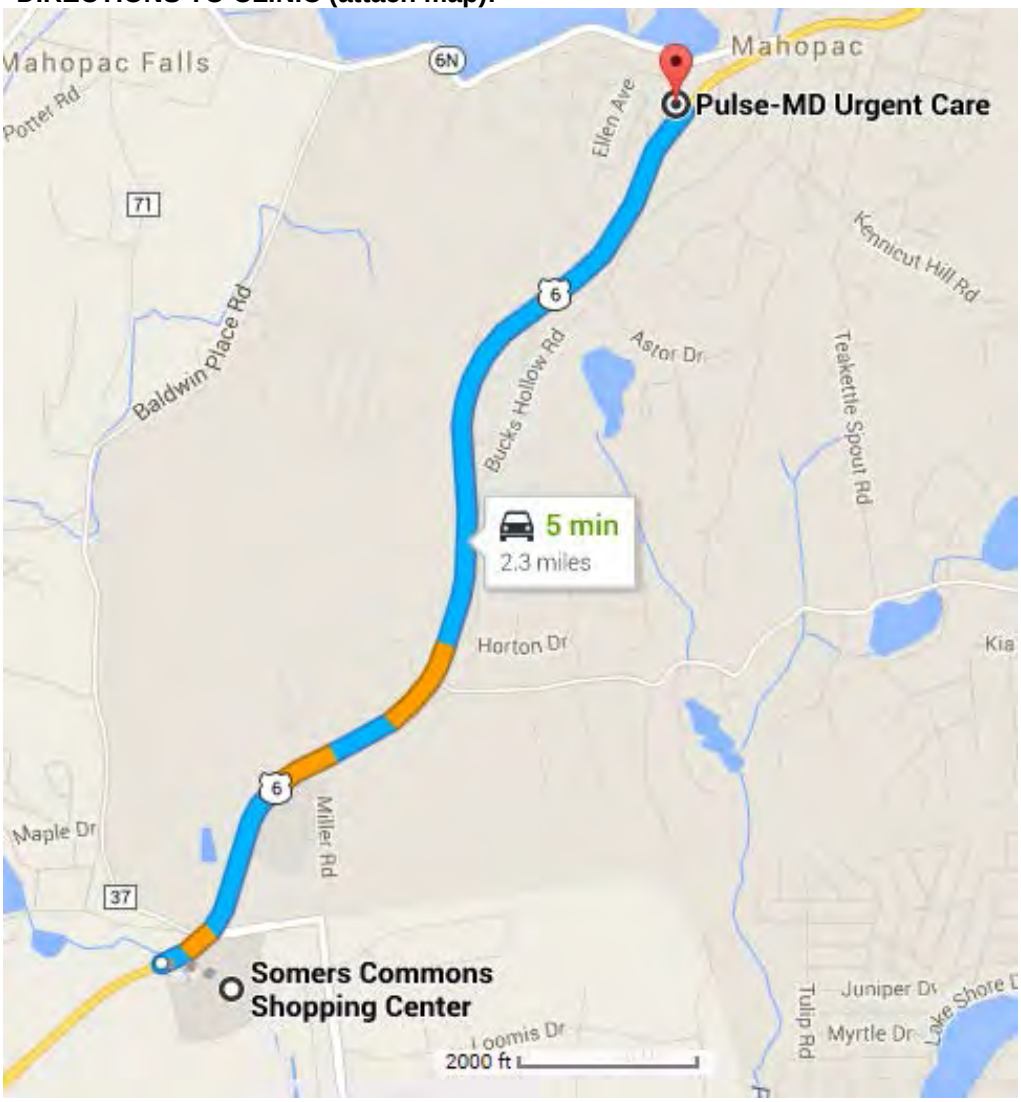
SECONDARY HOSPITAL(for immediate emergency treatment):

Facility Name: Secondary: Pulse-MD Urgent Care

Address: 572 U.S. 6, Mahopac, NY 10541

Telephone Number: (845) 621-3100

DIRECTIONS TO CLINIC (attach map):



DAILY TAILGATE SAFETY MEETING CHECKLIST

Project: _____ Site: _____

Date: Location:

To be reviewed on the first day of site activities and when new workers arrive on site:

Agenda:

During the project, one or more of the agenda items could be selected for the required daily site training.

		Check-off: Date				
		__	__	__	__	__
1.	Planned work for this day (discuss)	☐	☐	☐	☐	☐
2.	Physical hazards and controls (discuss/review)	☐	☐	☐	☐	☐
3.	Chemical hazards and controls (discuss/review)	☐	☐	☐	☐	☐
4.	Biological hazards and controls (discuss/review)	☐	☐	☐	☐	☐
5.	Level of personal protective equipment: _____	☐	☐	☐	☐	☐
6.	Personal protective equipment required per the hazard assessment:	☐	☐	☐	☐	☐

SPECIFY TYPE	
Protective coveralls	
Safety glasses/goggles	ANSI approved
Hard hat	ANSI approved
Foot protection	Safety toe boots
Work gloves	
Chemical gloves	Nitrile outer/nitrile inner
Hearing protection	
Other	

7.	Review inspection and maintenance procedures and the limitations of the PPE to be used.	☐	☐	☐	☐	☐
8.	Decontamination procedure (discuss/review)	☐	☐	☐	☐	☐
9.	Exclusion zone maintained	☐	☐	☐	☐	☐
10.	Site emergency response plan (discuss/review)	☐	☐	☐	☐	☐
11.	Signs and symptoms of overexposure to chemicals anticipated on site	☐	☐	☐	☐	☐
12.	General health and safety rules	☐	☐	☐	☐	☐
13.	Specific health and safety requirements relating to site activities including: (discuss/review)	☐	☐	☐	☐	☐
14.	Drilling/boring	☐	☐	☐	☐	☐
15.	UST	☐	☐	☐	☐	☐
16.	Excavations (including UG utility locations)	☐	☐	☐	☐	☐
17.	Heavy equipment	☐	☐	☐	☐	☐
18.	Slips, trips, and falls	☐	☐	☐	☐	☐
19.	Lockout/tagout	☐	☐	☐	☐	☐
20.	Working in temperature extremes	☐	☐	☐	☐	☐
21.	Rain or other weather advisories	☐	☐	☐	☐	☐
22.	Other health & safety issues (discuss/note)	☐	☐	☐	☐	☐

I have participated in the daily safety meeting discussing the topics indicated and fully understand my responsibility for complying with all health and safety requirements. I have had the opportunity to have my questions on site health and safety issues and procedures answered.

Employee Name	Employee Signature	Date

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PPE Selection Guidelines

When selecting the appropriate PPE for the job, consider the following:

- **Safety glasses** – general eye protection – source of hazard, typically coming from straight on, required at most sites
- **Tinted Safety Glasses** – same as above, but when working in direct sunlight. May need two both tinted and untinted if working in both sunlight and shade/overcast skys.
- **Safety goggles** – needed for splash hazard, more severe eye exposures coming from all directions. Non-vented or indirect venting for chemical splash, non-vented for hazardous gases or very fine dust, vented for larger particulates coming from all directions.
- **Face shield** – needed to protect face from cuts, burns, chemicals (corrosives or chemicals with skin notation), etc.
- **Safety boots** – needed if danger of items being dropped on foot that could injure foot
- **Hard hat** – danger from items falling on head – any overhead work, tools, equipment, etc that is above the head and could fall on head of item fails, or falls off work platform. Typically required at most sites as a general PPE
- **Thin, chemical protective inner gloves** (e.g., thin Nitrile, PVC – do not use latex – many people are allergic to latex) –needed to protect hands from incidental contact with low risk contamination at very low concentrations (ppb or low ppm concentrations in groundwater or soil) or used in combination with outer gloves as a last defense against contamination. Need to specify type
- **Outer gloves** – thicker gloves (e.g., Nitrile, Butyl, Viton, etc.) – used when potential for high concentrations of contaminants (e.g., floating product, percent ranges of contaminant, opening drums, handling pure undiluted chemicals, etc.). Need to specify type.
- **Leather gloves, leather palm, cotton** – good in protecting hands against cuts – no protection from chemicals. May be used in combination with chemical protective gloves.
- **Boot Covers –** when there is contamination in surface soils or waking surface in general. When safety boots need protection from contact with contaminants.
- **White (uncoated) Tyveks** – protect clothing from getting dirty, good for protection against solid, non-volatile chemicals (e.g., asbestos, metals) – no chemical protection.
- **Polycoated Tyveks** – least protective of chemical protective clothing. Used when some risk of contamination getting on skin or clothing. Usually, lower ppm ranges of contaminants.
- **Saranex** – Greater protection against contamination than Polycoated Tyveks. Used to protect against PCBs or higher concentrations of contaminants in the soil or groundwater.
- **Other Chemical protective clothing** – if significant risk of dermal exposure, contact H&S to determine best kind.
- **Long sleeved shirts, long pants** – if working in areas with poison ivy/oak/sumac, poisonous insects, etc. and no chemicals exposure. May want to use uncoated Tyveks for work in areas where poisonous plants are know to be to protect clothing.
- **Cartridge Respirator (Level C PPE)** – Need to calculate change schedule (contact Division EH&S Manager for this) to determine length of use. To be able to use cartridge respirators, need to know contaminants, estimate levels to be encountered in the breathing zone, need to ensure that cartridge will be effective against COCs, and need to be able to monitor for COCs using PID, FID, Dräger tubes, etc.. If can't do any of these, then Level B PPE is probably going to be needed.
- **High Visibility Vest** – needed for any road work (with in 15 feet of a road) or when working on a site with vehicular traffic or working around heavy equipment. Needed if work tasks would take employee concentration away from movement of vehicles and workers would have to rely on the other driver's ability to see the employee in order not to hit them. This includes heavy equipment as well as cars and trucks, on public roads or the jobsite. Not needed if wearing Polycoated Tyveks – as they are already high visibility.
- **Reflective Vest** – see above, but for use at night.
- **Hearing Protection** – needed if working at noise levels above 85 dBA on a time weighted average. If noise measurements are not available, use around noisy equipment, or in general, if you have to raise your voice to be heard when talking to someone standing two feet away.
- **Protective Chaps –** required when using a machete or chain saw or any other cut hazard to legs.

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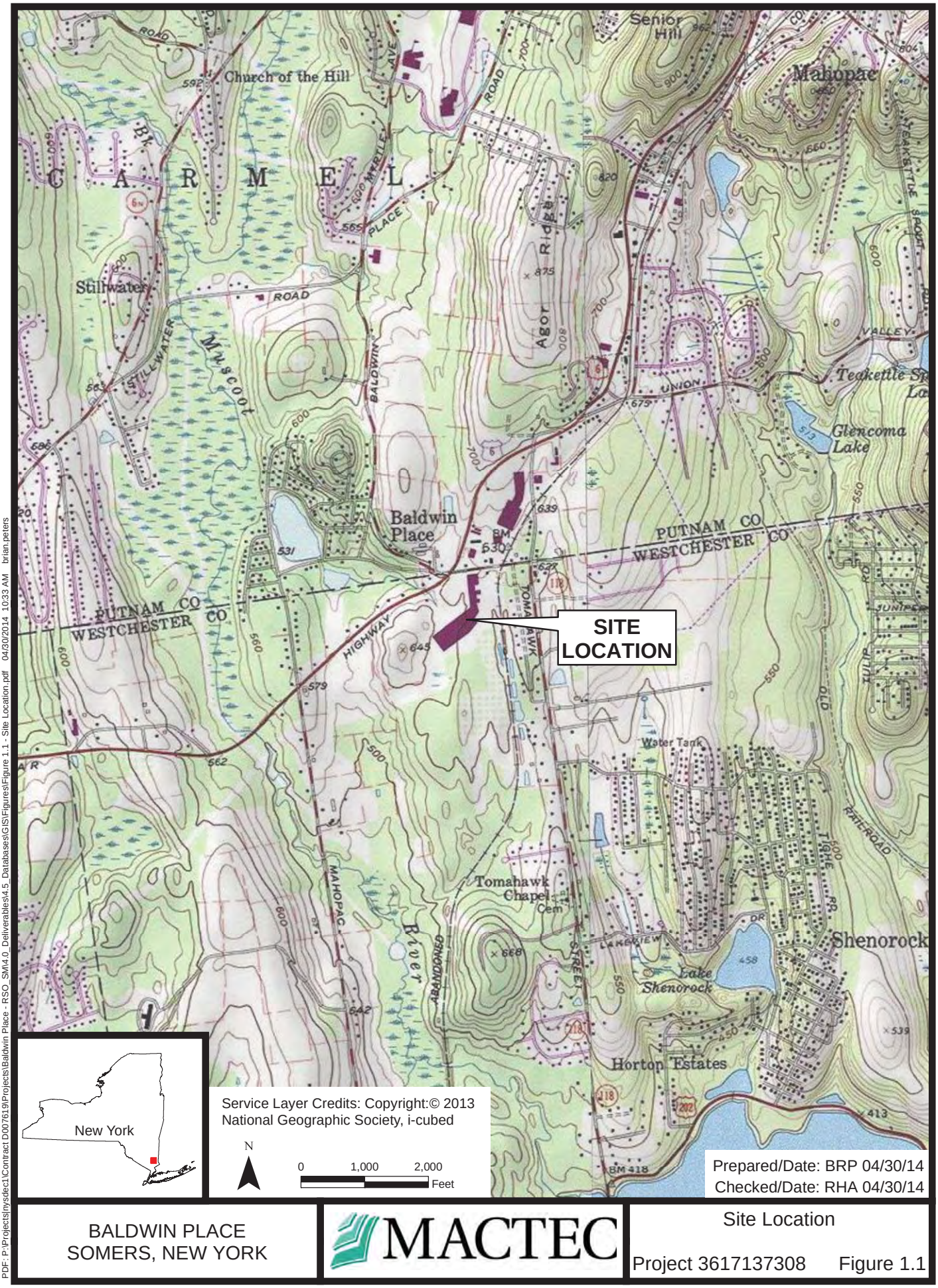

BALDWIN PLACE
SOMERS, NEW YORK

MACTEC

Site Location

Project 3617137308 Figure 1.1

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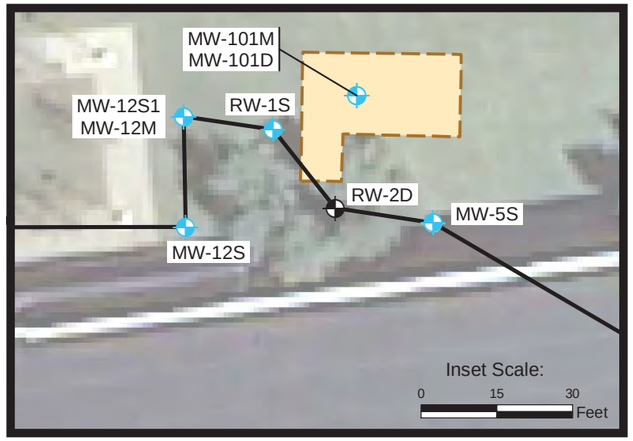
ysdec1\Contract D007619\Projects\Baldwin Place - RSO_SM\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Data_Gap_XC_11x17LS_Inset.mxd PDF: P:\Projects
ysdec1\Contract D007619\Projects\Baldwin Place - RSO_SM\4.0_Deliverables\4.1_Reports\Data_Gap_Investigation_Report\Figures\Figure 1.4b - Plan View of Cross Section.pdf 11/19/2015 2:20 PM brian.peters



MW-8S
MW-4S
MW-4D
RW-1S
MW-101M
MW-101D
MW-12S1
MW-12M
MW-5S
MW-7S
MW-7M1
MW-7M2
MW-12S
RW-2D
MW-3D
MW-3DD
MW-7D
Plant #1
A'
A
MW-9D
MW-9S
MW-10D
PW-1
Plant #2
PW-2
MW-2S
MW-2D

Legend

Overburden Well
Bedrock Well
Cross Section Orientation
Approximate Former Excavation

N
0 75 150 Feet

Putnam County color digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

Prepared/Date: BRP 11/19/15
Checked/Date: CRS 11/19/15

BALDWIN PLACE SHOPPING CENTER
SOMERS, NEW YORK

MACTEC

Site Features

Project 3617137308 Figure 1.2

CONTAMINANT FACT SHEET

Chemical Name:
Tetrachloroethene

CAS Number: 127-18-4

Synonyms:
tetrachloroethylene
Perchloroethylene (Perc)

HEALTH HAZARD DATA

Color: colorless

Physical State: Solid ___ Liquid X Gas ___

Odor: chloroform-like

Odor Threshold: 47 ppm

Vapor Density: 6.8 g/L

Ionization Potential (IP): 9.32 eV

IDLH: 150 ppm

Carcinogen: OSHA ___ IARC ___ NTP X ACGIH X NIOSH X

Skin absorbable: yes ___ no X

Skin corrosive: yes ___ no X

Signs/Symptoms of Acute Exposure:
Irritation of eyes, nose, and throat; nausea; flushing of the face and neck; vertigo; dizziness; incoherence; headache; sleepiness, and skin irritation

Source	TWA (units)	STEL (units)	C (units)
OSHA PEL	100 ppm		200 ppm
ACGIH TLVs	25 ppm	100 ppm	
NIOSH RELs	Lowest Feasible		

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	RAE 10.6 eV	Isobutylene 100 ppm	1.58	9 ppm
PID	HNu 10.2 eV	Isobutylene 100 ppm	0.86	9 ppm
Detecor Tube	Drager 8101 501	2 - 40 ppm		12.5 ppm

Checked by: Cindy Sundquist Date: 3/19/10

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:

Suits: Teflon, Viton, CPF3, Barricade, Responder, Trellchem, Tychem

Gloves: Viton, Teflon, and Polyvinyl Alcohol (do not use in (water)

Boots: Nitrile Rubber

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR=TWA x 10= 90 ppm

MUC Full-Face APR=TWA x 10= 90 ppm

FIRE/REACTIVITY DATA

Flash Point: NA

LEL/UEL: NA / NA

Fire Extinguishing Media:

Dry Chemical	X	Foam	X
Water Spray	X	CO_2	X

Incompatibilities:
Strong oxidizers, chemically-active metals, caustic soda, sodium hydroxide, and potash

2003 by MACTEC Engineering & Consulting, Inc.

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

CONTAMINANT FACT SHEET

Chemical Name: Trichloroethene

CAS Number: 67-64-1

Synonyms: Ethylene trichloride, TCE
Trichloroethylene, Trilene

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid ____
Liquid X
Gas ____

Odor: Chloroform-like

Odor Threshold 82 ppm

Vapor Density: 4.5 g/L

Ionization Potential (IP): 9.69 eV

IDLH: 1000 ppm

Carcinogen: OSHA ____
IARC ____
NTP ____
ACGIH ____
NIOSH X

Skin absorbable: NO

Skin corrosive: NO

Signs/Symptoms of Acute Exposure:

Irritant to eyes and skin, headache, nausea, vomiting, dermatitis, vertigo, visual disturbance, fatigue, giddiness, sleepiness

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	100 ppm		200 ppm
ACGIH TLVs	10 ppm	25 ppm	
NIOSH RELs	25 ppm		

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Resonse or Conversion Factor	Meter Specific Action Level
PID	Micro tip 10.6 eV	Isobutylene 100 ppm	1.82	9.1 ppm
Detector Tube	Drager 6828541	2 – 50 ppm		5 ppm

Checked by: Date:

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:

Suits Viton, PE/EVAL, Tychem, Barricade, Trellchem, Teflon, Responder

Gloves Teflon, Viton, Polyvinyl Alcohol (do not use in water)

Boots Teflon, Viton

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR = TWA x 10 = 91 ppm

MUC Full-Face APR = TWA x *50 = 606 ppm

*If quantitative fit testing is conducted, otherwise, use protection factor of 10

FIRE/REACTIVITY DATA

Flash Point: Unknown

LEL/UEL: 8%/10.5%

Fire Extinguishing Media:

Dry Chemical X Foam X

Water Spray X CO_2 X

Incompatibilities:

Strong caustics and alkalis, chemically-active metals(urch as barium, lithium, sodium, magnesium, titanium, and eryllium)

CONTAMINANT FACT SHEET

Chemical Name:
Vinyl Chloride
CAS Number: 75-01-4
Synonyms:
Chloroethene, chloroethylene, ethylene monochloride, VC, monochloroethene

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid
Liquid X below 7^0 F
Gas X

Odor: pleasant

Odor Threshold: 10-20 ppm

Vapor Density: 2.15 g/L
Vapor Pressure 3.3 atm
Ionization Potential (IP): 9.99 eV

IDLH: Not Determined

Carcinogen: OSHA X
IARC X
NTP X
ACGIH X
NIOSH X

Skin absorbable: yes ___ no X
Skin corrosive: yes ___ no X

Signs/Symptoms of Acute Exposure:
Weakness, abdominal pain, frostbite paleness or blueness of extremeties

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	1.0 ppm		5.0 ppm
ACGIH TLVs	1.0 ppm		
NIOSH RELs	Lowest Feasible		

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	10.6eV	Isobutylene 100 ppm	0.51	0.5 ppm*
PID	HNu 10.2eV	Isobutylene 100 ppm	0.32	0.32 ppm*
PID	HNu 11.7 eV	Isobutylene 100 ppm	0.78	0.78 ppm*
Detector Tube	Drager 6728061	0.5 - 3 ppm		0.5 ppm

Checked by: Cindy Sundquist Date: 4/19/10

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:
Suits Tychem, Teflon
Gloves Teflon, Tychem
Nitrile Rubber
Boots Nitrile Rubber, Teflon

Service Limit Concentration (ppm): N/A

MUC 1/2 Mask APR = TWA x 10 = N/A*
MUC Full-Face APR = TWA x 10 = N/A*

* Upgrade to Level B ppe. No Level C.

FIRE/REACTIVITY DATA

Flash Point: NA

LEL/UEL: 3.6% / 33%

Fire Extinguishing Media:
Dry Chemical X Foam X
Water Spray X CO_2 X

Incompatibilities:
Copper, oxidizers, aluminum, peroxides, iron, steel (polymerizes in air, sunlight, or heat unless stabilized by inhibitors). Attacks iron and steel in presence of moisture.

2003 by MACTEC Engineering & Consulting, Inc.

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminant exists. Professional judgement and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

ATTACHMENT A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name:
Cis -1,2-Dichloroethylene

CAS Number: 540-59-0

Synonyms:
Acetylene dichloride,
cis -Acetylene dichloride,
trans-Acetylene dichloride,

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid ___ Liquid X Gas ___

Odor: Chloroform-like

Odor Threshold: 0.08-17 ppm

Vapor Density: 3.35 g/L

Ionization Potential (IP): 9.65 eV

IDLH: 1000 ppm

Carcinogen: OSHA ___ IARC ___ NTP ___ ACGIH ___ NIOSH ___

Skin absorbable: yes ___ no X

Skin corrosive: yes ___ no X

Signs/Symptoms of Acute Exposure:
Irritant to eyes and respiratory system, CNS, depression

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	200 ppm		
ACGIH TLVs	200 ppm		
NIOSH RELs	200 ppm		

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	Microtip 10.6eV	Isobutylene 100 ppm	1.25	125 ppm

Checked by: Emmet C. Sundquist Date: 6/12/08

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:

Suits: Teflon, Viton, PE/EVAL, Barricade, CPF3, Tychem Responder

Gloves: Viton, Teflon, Polyvinyl Alcohol (do not use in water)

Boots: Teflon, Viton

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR = TWA x 10 = 1000 ppm

MUC Full-Face APR = TWA x 10 = 1000 ppm

FIRE/REACTIVITY DATA

Flash Point: 36-39 ° F

LEL/UEL: 5.6% / 12.8%

Fire Extinguishing Media:

Dry Chemical X Foam X

Water Spray X CO_2 X

Incompatibilities:
Strong oxidizers, strong alkalis, potassium hydroxide, copper

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Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminant exists. Professional judgement and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Mobilization/Demobilization and Site Preparation **Date of Analysis:** 8/15/06

Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for Site Visit	1A) N/A	1A) Prior to leaving for site ▪ Obtain and review HASP prior to site visit, if possible ▪ Determine PPE needs – bring required PPE to the site, if not otherwise being provided at the site (e.g., steel toed boots) ▪ Determine training and medical monitoring needs and ensure all required Health and Safety training and medical monitoring has been received and is current ▪ Ensure all workers are fit for duty (alert, well rested, and mentally and physically fit to perform work assignment) ▪ If respiratory protection is required/potentially required, ensure that training and fit-testing has occurred within the past year. ▪ Familiarize yourself with route to the site
	1B) Vehicle defects	1B) Inspect company owned/leased vehicle for defects such as: ▪ Flat tires ▪ Windshield wipers worn or torn ▪ Oil puddles under vehicle ▪ Headlights, brake lights, turn signals not working
	1C) Insufficient emergency equipment, unsecured loads	1C) Insufficient emergency equipment, unsecured loads ▪ Ensure vehicle has first aid kit and that all medications are current (if first aid kits are not provided at the site) ▪ Ensure vehicle is equpped with warning flashers and/or flares and that the warning flashers work ▪ Cell phones are recommended to call for help in the event of an emergency ▪ Vehicles carrying tools must have a safety cage in place. All tools must be properly secured ▪ Vehicles must be equipped with chocks if the vehicle is to be left running, unattended. ▪ Ensure sufficient gasoline is in the tank
2. Operating vehicles – general	2A) Collisions, unsafe driving conditions	2A) Drive Defensively! ▪ Seat belts must be used at all times when operating any vehicle on company business. ▪ Drive at safe speed for road conditions ▪ Maintain adequate following distance ▪ Pull over and stop if you have to look at a map ▪ Try to park so that you don't have to back up to leave. ▪ If backing in required, walk around vehicle to identify any hazards (especially low level hazards that may be difficult to see when in the vehicle) that might be present. Use a spotter if necessary
3. Driving to the jobsite	3A) Dusty, winding, narrow roads	3A) Dusty, winding, narrow roads ▪ Drive confidently and defensively at all times. ▪ Go slow around corners, occasionally clearing the windshield.
	3B) Rocky or one-lane roads	3B) Rocky or one-lane roads ▪ Stay clear of gullies and trenches, drive slowly over rocks. ▪ Yield right-of-way to oncoming vehicles---find a safe place to pull over.
	3C) Stormy weather, near confused tourists	3C) Stormy weather, near confused tourists ▪ Inquire about conditions before leaving the office. ▪ Be aware of oncoming storms. ▪ Drive to avoid accident situations created by the mistakes of others.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Mobilization/Demobilization and Site Preparation **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3D) When angry or irritated	3D) When angry or irritated ▪ Attitude adjustment; change the subject or work out the problem before driving the vehicle. Let someone else drive.
	3E) Turning around on narrow roads	3E) Turning around on narrow roads ▪ Safely turn out with as much room as possible. ▪ Know what is ahead and behind the vehicle. ▪ Use a backer if available.
	3F) Sick or medicated	3F) Sick or medicated ▪ Let others on the crew know you do not feel well. ▪ Let someone else drive.
	3G) On wet or slimy roads	3G) On wet or slimy roads ▪ Drive slow and safe, wear seatbelts.
	3H) Animals on road	3H) Animals on road ▪ Drive slowly, watch for other animals nearby. ▪ Be alert for animals darting out of wooded areas
4. Gain permission to enter site	4A) Hostile landowner, livestock, pets	4A) Hostile landowner, livestock, pets ▪ Talk to land owner, be courteous and diplomatic ▪ Ensure all animals have been secured away from work area
5. Mobilization/ Demobilization of Equipment and Supplies	5A) Struck by Heavy Equipment/Vehicles	5A) Struck by heavy equipment ▪ Be aware of heavy equipment operations. ▪ Keep out of the swing radius of heavy equipment. ▪ Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times ▪ Employees shall wear a high visibility vest or T-shirt (reflective vest required if working at night). ▪ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation.
	5B) Struck by Equipment/Supplies	5B) Struck by Equipment/Supplies ▪ Workers will maintain proper space around their work area, if someone enters it, stop work. ▪ When entering another worker's work space, give a verbal warning so they know you are there.
	5C) Overexertion Unloading/Loading Supplies	5C) Overexertion Unloading/Loading Supplies ▪ Train workers on proper body mechanics, do not bend or twist at the waist while exerting force or lifting. ▪ Tightly secure all loads to the truck bed to avoid load shifting while in transit.
	5D) Caught in/on/between	5D) Caught in/on/between ▪ Do not place yourself between two vehicles or between a vehicle and a fixed object.
	5E) Slip/Trip/Fall	5E) 1E). Slip/Trip/Fall ▪ Mark all holes and low spots in area with banner tape. Instruct personnel to avoid these areas. ▪ Drivers will maintain 3 point contact when mounting/dismounting vehicles/equipment. ▪ Drivers will check surface before stepping, not jumping down.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Mobilization/Demobilization and Site Preparation **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	5F) Vehicle accident	5F) Vehicle accident ▪ Employees should follow MACTEC vehicle operation policy and be aware of all stationary and mobile vehicles.
6. Site Preparation	6A) Slip/Trip/Fall	6A) Slip/Trip/Fall ▪ Mark all holes and low spots in area with banner tape. Instruct personnel to avoid these areas
7. Installation of soil erosion and sediment controls	7A) Overexertion	7A) Overexertion ▪ Workers will be trained in the proper method of placing erosion controls. ▪ Do not bend and twist at the waist while lifting or exerting force.
	7B) Struck by Equipment/Supplies	7C) Struck by Equipment/Supplies ▪ Workers will maintain proper space around their work area, if someone enters it, stop work. ▪ When entering another worker's work space, give a verbal warning so they know you are there.
8. Driving back from the jobsite	8A) See hazards listed under item #3	8A) See safe work practices under item #3

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Minimum Recommended PPE*: hard hat, steel-toed boots, safety glasses
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Mobilization/ Demobilization and Site Preparation	1A) See Mobilization/Demobilization and Site Preparation JHA	1A) See Mobilization/Demobilization and Site Preparation JHA
2. Communication	2A) Safety, crew unity	2A) Talk to each other. ▪ Log all workers and visitor on and off the site. ▪ Let other crewmembers know when you see a hazard. ▪ Avoid working near known hazards. ▪ Always know the wherabouts of fellow crewmembers. ▪ Carry a radio and spare batteries or cell phone ▪ Review Emergency Evacuation Procedures (see below).
3. Walking and working in the field	3A) Falling down, twisted ankles and knees, poor footing	3A) Always watch your footing. ▪ Horseplay is strictly prohibited ▪ Slow down and use extra caution around logs, rocks, and animal holes. ▪ Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route. ▪ Wear laced boots with a minimum 8" high upper and non-skid Vibram-type soles for ankle support and traction.
	3B) Falling objects	3B) Protect head agains falling objects. ▪ Wear your hardhat for protection from falling limbs and pinecones, and from tools and equipment carried by other crewmembers. ▪ Stay out of the woods during extremely high winds.
	3C) Chemical/Toxicological Hazards	3C) Chemical/Toxicological Hazards ▪ See HASP for appropriate level of PPE ▪ Use monitoring equipment, as outlined in HASP, to monitor breathing zone ▪ Read MSDSs for all chemicals brought to the site ▪ Be familiar with hazards associated with site contaminants. ▪ Ensure that all containers are properly labelled ▪ Decon thoroughly prior to consumption of food, beverage or tobacco.
	3D) Damage to eyes	3D) Protect eyes: ▪ Watch where you walk, ecpecially around trees and brush with limbs sticking out. ▪ Exercise caution when clearing limbs from tree trunks. Advise wearing eye protection. ▪ Ultraviolet light from the sun can be damaging to the eyes; look for sunglasses that specify significant protection from UV-A and UV-B radiation. If safety glasses require, use one's with tinted lenses
	3E) Bee and wasp stings	3E) See JHA for Insect Stings and Bites
	3F) Ticks and infected mosquitos	3F) See JHA for Insect Stings and Bites
	3G) Wild Animals	3G) Wild Animals ▪ Avoid phyisical contact with wild animals ▪ Do not threaten and/or conrner animals ▪ Make noise to get the animal to retreat. ▪ Stay in or return to vehicle/equipment if in danger

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3H) Contact with poisonous plants or the oil from those plants:	3H) Contact with poisonous plants or the oil from those plants: ▪ Look for signs of poisonous plants and avoid. ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with spray paint if working at a fixed location. ▪ Do not allow plant to touch any part of your body/clothing. ▪ Wear PPE as described in the HASP and wear Tyveks, gloves and boot covers if contact with plant is likely ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.
		 POISON IVY (Rhus toxicondendron L.) POISON OAK (Rhus diversiloba) POISON SUMAC (Rhus toxicondendron vernix)
	3I) Back Injuries	3I) Back Injuries ▪ Site personnel will be instructed on proper lifting techniques. ▪ Mechanical devices should be used to reduce manual handling of materials. ▪ Split heavy loads in to smaller loads ▪ Team lifting should be utilized if mechanical devices are not available. ▪ Make sure that path is clear prior to lift.
	3J) Shoveling	3J) Shoveling ▪ Select the proper shovel for the task. A long handled, flat bladed shovel is recommend for loose material ▪ Inspect the handle for splinters and/or cracks ▪ Ensure that the blade is securely attached to the handle ▪ Never be more than 15 inches from the material you are shoveling ▪ Stand with your feet about hip width for balance and keep the shovel close to your body. ▪ Bend from the knees (not the back) and tighten your stomach muscles as you lift. ▪ Avoid twisting movements. If you need to move the snow to one side reposition your feet to face the direction the snow will be going. ▪ Avoid lifting large shoveling too much at once. When lifting heavy material, pick up less to reduce the weight lifted. ▪ Pace yourself to avoid getting out of breath and becoming fatigued too soon. ▪ Be alert for signs of stress such as pain, numbness, burning and tingling. Stop immediately if you feel any of these symptoms.
	3K) Slips/Trips/Falls	3K) Slips/Trips/Falls ▪ Maintain work areas safe and orderly; unloading areas should be on even terrain; mark or repair possible tripping hazards. ▪ Site SHSO inspect the entire work area to identify and mark hazards. ▪ Maintain three points of contact when climbing ladders or onto/off of equipment

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3L) Overhead Hazards	3L) Overhead Hazards ▪ Personnel will be required to wear hard hats that meet ANSI Standard Z89.1. ▪ All ground personnel will stay clear of suspended loads. ▪ All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects. ▪ All overhead hazards will be identified prior to commencing work operations.
	3M) Dropped Objects	3M) Dropped Objects ▪ Steel toe boots meeting ANSI Standard Z41 will be worn.
	3N) Noise	3N) Noise ▪ Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs); all equipment will be equipped with manufacturer's required mufflers. Hearing protection shall be worn by all personnel working in or near heavy equipment.
	3O) Eye Injuries	3O) Eye Injuries ▪ Safety glasses meeting ANSI Standard Z87 will be worn.
	3P) Heavy Equipment (overhead hazards, spills, struck by or against)	3P) Heavy Equipment ▪ All operators will be trained and qualified to operate equipment ▪ Equipment will have seat belts. ▪ Operators will wear seat belts when operating equipment. ▪ Do not operate equipment on grades that exceed manufacturer's recommendations. ▪ Equipment will have guards, canopies or grills to protect from flying objects. ▪ Ground personnel will stay clear of all suspended loads. ▪ Personel are prohibited from riding on the buckets, or elsewhere on the equipment except for designated seats with proper seat belts or lifts specifically designed to carry workers. ▪ Ground personnel will wear high visibility vests ▪ Spill and absorbent materials will be readily available. ▪ Drip pans, polyethylene sheeting or other means will be used for secondary containment. ▪ Ground personnel will stay out of the swing radius of excavators. ▪ Eye contact with operators will be made before approaching equipment. ▪ Operator will acknowledge eye contact by removing his hands from the controls. ▪ Equipment will not be approached on blind sides. ▪ All equipment will be equipped with backup alarms and use spotters when significant physical movement of equipment occurs on-site, (i.e., other than in place excavation or truck loading). ▪ Inspect rigging prior to each use.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3Q) Struck by vehicle/equipment	3Q) Struck by vehicle/equipment ▪ Be aware of heavy equipment operations. ▪ Keep out of the swing radius of heavy equipment. ▪ Ground personnel in the vicinity of vehicles or heavy equipment operations will be within the view of the operator at all times. ▪ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation. ▪ Drivers will keep workers on foot in their vision at all times, if you lose sight of someone, Stop! ▪ Spotters will be used when backing up trucks and heavy equipment and when moving equipment. ▪ High visibility vests will be worn when workers are exposed to vehicular traffic at the site or on public roads.
	3R) Struck/cut by tools	3R) Struck/cut by tools ▪ Cut resistant work gloves will be worn when dealing with sharp objects. ▪ All hand and power tools will be maintained in safe condition. ▪ Do not drop or throw tools. Tools shall be placed on the ground or worksurface or handed to another employee in a safe manner. ▪ Guards will be kept in place while using hand and power tools**.**
	3S) Caught in/on/between	3S) Caught in/on/between ▪ Workers will not position themselves between equipment and a stationary object. ▪ Workers will not wear long hair down (place in pony-tail and tuck into shirt) or jewelry if working with tools/machinery.
	3T) Contact with Electricity/Lightning	3T) Contact with Electricity/Lighting ▪ All electrical tools and equipment will be equipped with GFCI. ▪ Electrical extension cords will be of the “Hard” or “Extra Hard” service type. ▪ All extension cords shall have a three-blade grounding plug. ▪ Personnel shall not use extension cords with damaged outer covers, exposed inner wires, or splices. ▪ Electrical cords shall not be laid across roads where vehicular traffic may damage the cord without appropriate guarding. ▪ All electrical work will be conducted by a licensed electrician. ▪ All equipment will be locked out and tagged out and rendered in a zero energy state prior to commencing any operation that may exposed workers to electrical, mechanical, hydraulic, etc. hazards. ▪ All utilities will be marked prior to excavation activities. ▪ All equipment will stay a minimum of 10 feet from overhead energized electrical lines (50 kV). This distance will increase by 4 inches for each 10 kV above 50 kV. Rule of Thumb: Stay 10 feet away from all overhead powerlines known to be 50 kV or less and 35 feet from all others.) ▪ The SHSO shall halt outdoor site operations whenever lightning is visible, outdoor work will not resume until 30 minutes after the last sighting of lightning.
	3U) Equipment failure	3U) Equipment failure ▪ All equipment will be inspected before use. If any safety problems are noted, the equipment should be tagged and removed from service until repaired or replaced.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3V) Hand & power tool usage.	3V) Hand & power tool usage ▪ Daily inspections will be performed. ▪ Ensure guards are in place and are in good condition. ▪ Remove broken or damaged tools from service. ▪ Use the tool for its intended purpose. ▪ Use in accordance with manufacturers instructions. ▪ No tampering with electrical equipment is allowed (e.g., splicing cords, cutting the grounding prong off plug, etc.) ▪ See JHA for Power Tool Use - Electrical and Power Tool Use - Gasoline
	3W) Fire Protection	3W) Fire Protection ▪ Ensure that adequate number and type of fire extinguishers are present at the site ▪ Inspect fire extinguishers on a monthly basis – document ▪ All employees who are expected to use fire exinguishers will have received training on an annual basis. ▪ Obey no-smoking policy ▪ Open fires are prohibited ▪ Maintain good housekeeping. Keep rubbish and combustibles to a minimum. ▪ Keep flammable liquids in small containers with lids closed or a safety can. ▪ When dispensing flammable liquids, do in well vented area and bond and ground containers.
	3X) Confined Space Entry	3X) Confined Space Entry ▪ See JHA for Confined Space Entry
4. Environmental health considerations	4A) Heat Stress	4A) Take precautions to prevent heat stress ▪ Remain constantly aware of the four basic factors that determine the degree of heat stress (air temperature, humidity, air movement, and heat radiation) relative to the surrounding work environmental heat load. ▪ Know the signs and symptoms of heat exhaustion, heat cramps, and heat stroke. Heat stroke is a true medical emergency requiring immediate emergency response action. NOTE: The severity of the effects of a given environmental heat stress is decreased by reducing the work load, increasing the frequency and/or duration of rest periods, and by introducing measures which will protect employees from hot environments. ▪ Maintain adequate water intake by drinking water periodically in small amounts throughout the day (flavoring water with citrus flavors or extracts enhances palatability). ▪ Allow approximately 2 weeks with progressive degrees of heat exposure and physical exertion for substantial acclimatization. ▪ Acclimatization is necessary regardless of an employee's physical condition (the better one's physical condition, the quicker the acclimatization). Tailor the work schedule to fit the climate, the physical condition of employees, and mission requirements. ▪ A reduction of work load markedly decreases total heat stress. ▪ Lessen work load and/or duration of physical exertion the first days of heat exposure to allow gradual acclimatization. ▪ Alternate work and rest periods. More severe conditions may require longer rest periods and electrolyte fluid replacement.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	4B) Wet Bulb Globe Temperature (WBGT) Index	4B) WBGT ▪ Curtail or suspend physical work when conditions are extremely severe (see attached Heat Stress Index). ▪ Compute a Wet Bulb Globe Temperature Index to determine the level of physical activity (take WBGT index measurements in a location that is similar or closely approximates the environment to which employees will be exposed). WBGT THRESHOLD VALUES FOR INSTITUTING PREVENTIVE MEASURES 80-90 degrees F — Fatigue possible with prolonged exposure and physical activity. 90-105 degrees F — Heat exhaustion and heat stroke possible with prolonged exposure and physical activity. 105-130 degrees F — Heat exhaustion and heat stroke are likely with prolonged heat exposure and physical activity.
	4C) Cold Extremes	4C) Take precautions to prevent cold stress injuries ▪ Cover all exposed skin and be aware of frostbite. While cold air will not freeze the tissues of the lungs, slow down and use a mask or scarf to minimize the effect of cold air on air passages. ▪ Dress in layers with wicking garments (those that carry moisture away from the body – e.g., cotton) and a weatherproof slicker. A wool outer garment is recommended. ▪ Take layers off as you heat up; put them on as you cool down. ▪ Wear head protection that provides adequate insulation and protects the ears. ▪ Maintain your energy level. Avoid exhaustion and over-exertion which causes sweating, dampens clothing, and accelerates loss of body heat and increases the potential for hypothermia. ▪ Acclimate to the cold climate to minimize discomfort. ▪ Maintain adequate water/fluid intake to avoid dehydration.
	4D) Wind	4D) Effects of the wind ▪ Wind chill greatly affects heat loss (see attached Wind Chill Index). ▪ Avoid marking in old, defective timber, especially hardwoods, during periods of high winds due to snag hazards.
	4E) Thunderstorms	4E) Thunderstorms ▪ Monitor weather channels to determine if electrical storms are forcased. ▪ Plan ahead and identify safe locations to be in the event of a storm. (e.g., sturdy building, vehicle, etc.) ▪ Suspend all field work at the first sound of thurnder. You should be in a safe place when the time between the lightning and thunder is less than 30 seconds. ▪ Only return to work 30 minutes after the after the last strike or sound of thunder

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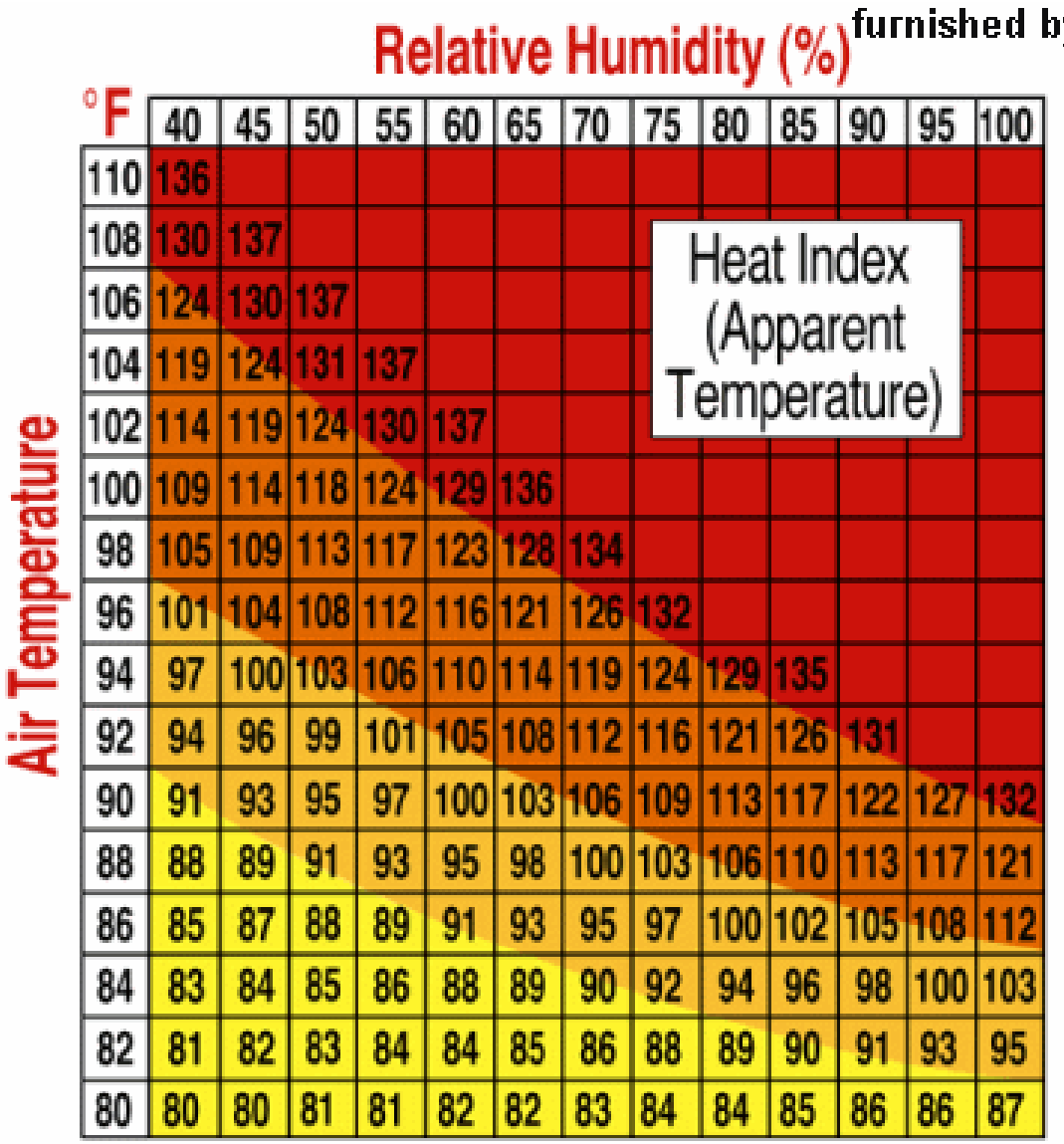

With Prolonged Exposure and/or Physical Activity

Extreme Danger
Heat stroke or sunstroke highly likely
Danger
Sunstroke, muscle cramps, and/or heat exhaustion likely
Extreme Caution
Sunstroke, muscle cramps, and/or heat exhaustion possible
Caution
Fatigue possible

Wind Chill Chart

Wind (mph) \ Temperature (°F)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times — 30 minutes — 10 minutes — 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Job Hazard Analysis Form

Job Title: Field Work - Oversight **Date of Analysis:** 4/13/10
Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for site visit	1A) N/A	▪ Obtain and review HASP prior to site visit, if possible ▪ Determine PPE needs – bring required PPE to the site, if not otherwise being provided at the site (e.g., steel toed boots) ▪ Determine training and medical monitoring needs and ensure all required Health and Safety training and medical monitoring has been received and is current ▪ Complete site specific/ client required training ▪ Ensure all workers are fit for duty (alert, well rested, and mentally and physically fit to perform work assignment) ▪ First aid kits shall be available at the work site and on each transport vehicle. ▪ Familiarize yourself with route to the site ▪ Check weather forecast. Pack appropriate clothing and other items (e.g., sunscreen) for anticipated weather conditions ▪ Verify that subsurface utilities have been identified.
2. Traveling to the site by vehicle	2A) See JHA for Mobilization, Demobilization and Site Preparation	▪ See JHA for Mobilization, Demobilization and Site Preparation
3. Initial Arrival - Assess Site Conditions	3A) Communication with subcontractor and other site personnel	▪ Develop communication methods (agree on hand signals, warning alarms) ▪ Log all workers and visitor on and off the site. ▪ Let other crewmembers know when you see a hazard. ▪ Avoid working near known hazards. ▪ Always know the whereabouts of fellow crewmembers. ▪ Carry a radio and spare batteries or cell phone ▪ Hold and document Safety tailgate meetings ▪ Establish work zones, evacuation routes and rally locations.
	3B) Insect Bites and Stings	▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects. ▪ Inform crew members if allergic to insects and what to do if you need assistance. ▪ Avoid wearing heavy fragrances. ▪ Carry first-aid and sting relief kits. ▪ Carry identification of known allergies and necessary emergency medication. ▪ Spray clothing with insect repellant as a barrier. ▪ Wear light colored clothing that fits tightly at the wrists, ankles, and waist. ▪ Cover trouser legs with high socks or boots. ▪ Tuck in shirt tails.

	3C) Poisonous plants	▪ Wear long sleeves, long pants and boots ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with high visibility spray paint if working at a fixed location. ▪ Look for signs of poisonous plants and demark area to aid in avoiding plant. ▪ Do not touch any plant part to any part of your body/clothing. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.
	3D) Vermin, leaches, animal borne disease	▪ Survey the area for dens, nests, etc. ▪ Identify areas where biological hazards may be present. ▪ Wear long sleeve shirt and full length pants ▪ Be aware of your surroundings. ▪ Wear appropriate footwear (snake boots, etc.) ▪ Avoid high grass areas if possible ▪ Do not put hand/arm into/under an area that you cannot see into/under clearly ▪ Perform routine inspections for ticks, leaches, etc. of yourself and co-workers.
	3E) Chemical Hazards	▪ Wear chemical resistant PPE as identified in the HASP ▪ Use monitoring equipment, as outlined in HASP, to monitor breathing zone ▪ Read MSDSs for all chemicals brought to the site ▪ Be familiar with hazards associated with site contaminants. ▪ Ensure that all containers are properly labeled
	3F) Overhead Power Lines	▪ Identify the location of all overhead power lines at the site. ▪ Maintain clearances depending on voltage - All equipment will stay a minimum of 10 feet from overhead energized electrical lines (50 kV or less). This distance will increase by 4 inches for each 10 kV above 50 kV. Rule of Thumb: Stay 10 feet away from all overhead power lines known to be 50 kV or less and 35 feet from all others.) ▪ Re-locate work so it is not close to power lines ▪ Avoid storing materials under overhead power lines
	3G) Underground Utilities	▪ All utilities will be marked prior to excavation activities ▪ For areas where utility locations cannot be verified, workers must hand dig for the first 3 feet ▪ Use lineman's gloves when locating underground power lines ▪ Work at adequate offsets from utility locations ▪ Immediately cease work if unknown utility markings are discovered.

	3H) Cold Stress	▪ Dress in layers with wicking garments (those that carry moisture away from the body – e.g., cotton) and a weatherproof slicker. A wool outer garment is recommended. ▪ Take layers off as you heat up; put them on as you cool down. ▪ Wear head protection that provides adequate insulation and protects the ears. ▪ Maintain your energy level. Avoid exhaustion and over-exertion which causes sweating, dampens clothing, and accelerates loss of body heat and increases the potential for hypothermia. ▪ Acclimate to the cold climate to minimize discomfort. ▪ Maintain adequate water/fluid intake to avoid dehydration. ▪ Be aware of signs of hypothermia, its prevention, detection and treatment. ▪ Have extra protection available, in case of an emergency such as blankets and heating devices. ▪ Don't work under extremely adverse weather conditions ▪ Stay in tune to current weather and extended forecasts.
	3I) Heat Stress	▪ Remain constantly aware of the four basic factors that determine the degree of heat stress (air temperature, humidity, air movement, and heat radiation) relative to the surrounding work environmental heat load. ▪ Know the signs and symptoms of heat exhaustion, heat cramps, and heat stroke. Heat stroke is a true medical emergency requiring immediate emergency response action. ▪ Maintain adequate water intake by drinking water periodically in small amounts throughout the day (flavoring water with citrus flavors or extracts enhances palatability). ▪ Lessen work load and/or duration of physical exertion the first days of heat exposure to allow gradual acclimatization. ▪ Alternate work and rest periods. More severe conditions may require longer rest periods and electrolyte fluid replacement.
	3J) Lightning and Thunder	▪ Monitor weather channels to determine if electrical storms are forecasted. ▪ Plan ahead and identify safe locations to be in the event of a storm. (e.g., sturdy building, vehicle, etc.) ▪ Suspend all field work at the first sound of thunder. You should be in a safe place when the time between the lightning and thunder is less than 30 seconds.
	3K) Severe Weather	▪ Watch for clouds and incoming weather. ▪ Monitor weather forecasts. ▪ Train workers about weather and appropriate precautions. ▪ Identify a shelter and a safe place in event of tornado etc
	3L) Sun	▪ Keep body protected ▪ Wear sunscreen, wide brimmed hat or hardhat. ▪ Schedule work for cool part of day. ▪ Take breaks in the shade.
	3M) High Crime Areas	▪ Do not enter areas where threats are present. ▪ Contract security where applicable. Use the buddy system. ▪ Maintain contact with support such as radio or cell phone ▪ Do not work after dark.

	3N) Operations conducted at an active facility	▪ Stay well clear of operations being conducted at the facility ▪ Keep alert for moving materials, equipment or vehicles ▪ Determine client specific PPE needs prior to arriving at the site ▪ Determine client specific emergency response procedures and follow as appropriate ▪ Participate in client required safety training ▪ Get copies of Clients MSDSs for any client chemicals that workers may be exposed to. ▪ Provide MSDSs to client for all chemicals brought to the site.
	3O) Remote Locations	▪ Carry a two-way radio and know how to use it. ▪ Work in teams. Account for all at the end of the work day. ▪ Make sure someone on crew is certified in first aid. ▪ Carry a first aid kit.
	3P) Set up Decon Station	▪ Refer to MSDS for specific hazards associated with decon solutions ▪ Monitor breathing zone for decon solutions (e.g., methanol, hexane, etc.), if appropriate (see HASP) ▪ Removal of PPE will be performed by the following tasks in the listed order: o Gross boot wash and rinse and removal o Outer glove removal o Suit removal o Respirator removal (if worn). o Inner glove removal ▪ Contaminated PPE is to be placed in the appropriate, provided receptacles. ▪ Employees will wash hands, face, and any other exposed areas with soap and water. ▪ Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials. ▪ Decon solutions will be disposed of according to the work plan.
4. Walk around the Site	4A) Poisonous plants	▪ See section 3C above
	4B) Vermin, leaches, animal borne disease	▪ See Section 3 D above ▪
	4C) Chemical Hazards	▪ See Section 3 E above
	4D) Slips/Trips/Falls	▪ Wear slip resistant footwear preferably laced boots with a minimum 8" high upper and non-skid soles for ankle support and traction. ▪ Pay attention to where you place your feet ▪ Slow down and use extra caution around logs, rocks, and animal holes. ▪ Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route. ▪ Site SHSO will inspect the entire work area to identify and mark hazards. ▪ Clear area of trip hazards; mark or barricade those that cannot be moved; ▪ Use caution when walking around excavated areas ▪ Stay back at least 5 feet from excavated areas ▪ Use caution when walking on or around loose soil. ▪ Be aware of surroundings. Avoid muddy areas if possible.

5. Oversight during drilling, or construction operations	5A) Heavy Equipment/ Vehicles	▪ Spotters will be used when backing up trucks and heavy equipment and when moving equipment. ▪ Ground personnel in the vicinity of vehicles or heavy equipment operations will be within the view of the operator at all times. ▪ Ground personnel will be aware of the swing radius and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation. ▪ Personnel are prohibited from riding on the buckets, or elsewhere on the equipment except for designated seats with proper seat belts or lifts specifically designed to carry workers. Ground personnel will stay clear of all suspended loads. ▪ Ground personnel will wear high visibility vests ▪ Eye contact with operators will be made before approaching equipment.
	5B) Eye Injury	▪ Wear appropriate safety glasses (tinted for sun). ▪ Watch where you walk, especially around trees and brush with protruding limbs.
	5C) Foot Injury	▪ Wear steel toed boots ▪ Wear insulated steel toed boots during winter ▪ Ensure shoes/boots have good traction ▪ Pay attention to where you place your feet, especially when walking on uneven terrain
	5D) Head Injury	▪ Wear hardhat ▪ Do not walk or work under scaffolding or other elevated work unless there are guardrails and toeboards in place ▪ Flag or mark protruding objects at head level
	5E) Chemical Hazards	▪ See Section 3E above ▪ Wash hands and face prior to consumption of food, beverage or tobacco.
	5F) Dust - particulates (respiratory)	▪ Use dust suppression methods ▪ Stand upwind of point of dust generation
	5G) Overhead Power Lines	▪ See Section 3F above.
	5H) Underground Utilities	▪ See Section 3G above
	5I) Standing/Static Posture	▪ Change posture on a frequent basis ▪ Stretch prior to any physical activity
	5J) Slips/`Trips/Falls	▪ See Section 4D above
	5K) Noise	▪ Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs). ▪ All equipment will be equipped with manufacturer's required mufflers. ▪ Hearing protection shall be worn by all personnel working in or near heavy equipment. ▪ Hearing protection will be worn when workers need to shout when standing two feet away from each other. ▪ Segregate noisy equipment from the operators ▪ Use sound dampening around noisy equipment

	5L) Moving Equipment	▪ Clear area of obstructions and communicate with all workers involved that drilling is beginning ▪ Do not exceed manufacturer's recommended speed, force, torque, or other specifications. and penetrate the ground slowly with hands on the controls for at least the first foot of soil to minimize chance of auger kick-out ▪ Stay clear of rotating auger ▪ Use long-handled shovel to clear away cuttings when auger has stopped ▪ Do not wear loose clothing ▪ Wear appropriate PPE including leather gloves and steel-toed boots (See HASP)
6. Sampling Oversight	6A) Chemical Hazards	▪ See Section 3E above ▪ Wash hands and face prior to consumption of food, beverage or tobacco. ▪ Calibrate meters in a clean, well ventilated area ▪ Store calibration gases in well vented area. Ensure chemical labels and warnings are legible.
	6B) Personnel Decontamination	▪ Refer to MSDS for specific hazards associated with decon solutions ▪ Monitor breathing zone for decon solutions (e.g., methanol, hexane, etc.), if appropriate (see HASP) ▪ Removal of PPE will be performed by the following tasks in the listed order: o Gross boot wash and rinse and removal o Outer glove removal o Suit removal o Respirator removal (if worn). o Inner glove removal ▪ Contaminated PPE is to be placed in the appropriate, provided receptacles. ▪ Employees will wash hands, face, and any other exposed areas with soap and water. ▪ Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials. ▪ Decon solutions will be disposed of according to the work plan.
	6C) Lifting	▪ Good lifting techniques (lift with legs not back) ▪ Mechanical devices (e.g., hand truck, cart, forklift, etc.) should be used to reduce manual handling of materials and drums. ▪ Team lifting should be utilized if mechanical devices are not available. (mandatory for items over 50 lbs) ▪ Split heavy loads in to smaller loads ▪ Make sure that path is clear prior to lift. ▪ Redesign work area to avoid low lifts ▪ Stretch prior to lifting ▪ Maintain a healthy life style and level of physical fitness.
	6D) Hand Tools	▪ Cut resistant work gloves will be worn when dealing with sharp objects. ▪ All hand and power tools will be maintained in safe condition. ▪ Do not drop or throw tools. Tools shall be placed on the ground or work surface or handed to another employee in a safe manner. ▪ Guards will be kept in place while using hand and power tools. ▪ Daily inspections will be performed. ▪ Remove broken or damaged tools from service and tag out as defective ▪ No tampering with electrical equipment is allowed (e.g., splicing cords, cutting the grounding prong off plug, etc.) ▪ Do not use excessive force or impact ▪ Do not use tool improperly. Ensure all workers are trained

	6E) Slips/Trips/Falls	▪ See Section 4D above.
	6F) Struck by Vehicle	▪ Ground personnel in the vicinity of vehicles operations will be within the view of the operator at all times. ▪ Ground personnel will not stand directly behind vehicles when it is in operation ▪ Drivers will keep workers on foot in their vision at all times, if you lose sight of someone, Stop! ▪ High visibility vests will be worn when workers are exposed to vehicular traffic at the site or on public roads. ▪ Try to park so that you don't have to back up to leave. ▪ If backing in required, walk around vehicle to identify any hazards (especially low level hazards that may be difficult to see when in the vehicle) that might be present. Use a spotter if necessary ▪ Place cones in the font and rear of the vehicle ▪ Prior to driving off, walk around vehicle to collect cones and identify any hazards - especially low level hazards that may be difficult to see when in the vehicle. ▪ Set up "Workers in the Road" or similar warning signs and cones to alert traffic. ▪ Use emergency flashers and roof top flashing light (recommended) to alert oncoming vehicular traffic. ▪ Remain alert at all times as to the traffic outside the vehicle. Step to the side of the road when distracted by by-standers. Keep unofficial personnel out of the work area. ▪ Exit vehicle with caution. ▪ Wear High Visibility Vest when outside the vehicle. ▪ Utilize vehicle as a shield from oncoming traffic, as practical
7. IDW pickup oversight	7A) Foot Injury	▪ See Section 5C above.
	7B) Chemical Hazards	▪ See Section 3E above.
	7C) Lifting	▪ See Section 6C above.
	7D) Slips/Trips/Falls	▪ See Section 4D above
8. Return to office/home	8A) See Mobilization/ Demobilization and Site Preparation JHA	**See Mobilization/ Demobilization and Site Preparation JHA**

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Job Hazard Analysis - HASP Format

Job Title: Decontamination **Date of Analysis:** 5/30/06

Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Establish Decontamination Station	1A) Materials Handling	1A) Materials Handling ▪ Use proper lifting techniques ▪ Use mechanical aids, if available, to move heavy items.
2. Decontamination / Steam cleaning.	2A) Struck by steam/hot water/pressure washing	2A) Struck by steam/hot water ▪ Workers not directly engaged in steam cleaning operations must stay clear. ▪ Workers using steam cleaning equipment must be trained on operation and safety devices/procedures using the owners/operators manual. ▪ Use face shield **and** safety glasses or goggles, if steam cleaning. ▪ Stay out of the splash/steam radius. ▪ Pressure washer must have dead man switch. ▪ Do not direct steam at anyone. ▪ Do not hold objects with your feet or hands. ▪ Ensure that direction of spray minimizes spread of contaminants of concern. ▪ Use shielding as necessary.
	2B) Exposure to contaminants	2B) Exposure to contaminants ▪ Conduct air monitoring (see HASP). ▪ Wear proper PPE (see HASP). ▪ See MSDSs for hazards associated with the decon solutions used (if other than water alone us used).
	2C) Slips/Trips/Falls	2C) Slips/Trips/Falls ▪ Be cautious as ground/plastic can become slippery ▪ Use boots or boot covers with good traction
3. Vehicle Decontamination	3A) Vehicle traffic in and out of the CRZ	3A) Large Vehicle Traffic ▪ Always wear a hard hat, steel toe boots, and a high visibility vest (unless Tyveks are used and are high visibility). ▪ Vehicle drivers are not to exit the vehicle in the CRZ. ▪ Identify an individual to communicate with vehicle drivers and maintain order ▪ Trucks will be lined with plastic and kept out of direct contact with any contaminated materials during loading. Wear PPE when removing plastic lining from truck beds. ▪ If not in the vehicle, obtain eye contact with the driver, so he is aware of your presence and location in the CRZ. ▪ If you are driving the vehicle, be aware of personnel in the CRZ and maintain communication with the identified personnel.
	3B) Exposure to contaminants	3B) Exposure to contaminants ▪ Use safety glasses or goggles, Polycoated Tyvek (if level of contamination poses dermal hazard or to keep work clothes dry), high visibility vest (if high visibility Tyveks are not used) hard hats, steel toe boots, and gloves while cleaning contaminated materials. ▪ Do not doff PPE until decontamination of the vehicle is complete and a decontamination certificate has been issued by the HSO. ▪ Conduct air monitoring (see HASP). ▪ See MSDSs for hazards associated with the decon solutions (if other than water alone is used).

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Decontamination **Date of Analysis:** 5/30/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3C) Slips/Trips/Falls	3C) Slips/Trips/Falls ▪ Be cautious as ground/plastic can become slippery ▪ Use boots or boot covers with good traction
4. Equipment and Sample Decontamination	4A) Chemical exposure when handling contaminated sample jars and equipment	4A) Chemical exposure ▪ Wear PPE as outlined in the HASP. ▪ Refer to MSDS for specific hazards associated with decon solutions ▪ Monitor breathing zone for contaminants ▪ Monitor breathing zone for decon solutions (e.g., methanol, hexane, etc.) if appropriate (see HASP)
	4B) Materials Handling related injuries	4B) Materials Handling related injuries ▪ Use proper lifting techniques when lifting heavy equipment ▪ Use two person lift for heavy coolers
5. Personal Decontamination	5A) Exposure to contaminants	5A) Exposure to contaminants ▪ Avoid bringing contaminated materials via shoes and clothing into the CRZ by examining such prior to exiting the EZ. ▪ Removal of PPE will be performed by the following tasks in the listed order: ▪ Gross boot wash and rinse and removal ▪ Outer glove removal ▪ Suit removal ▪ Respirator removal (if worn). ▪ Inner glove removal ▪ Contaminated PPE is to be placed in the appropriate, provided receptacles. ▪ Respirators will be removed and decontaminated at a specified location within the CRZ by a designated technician, then placed in storage bag. ▪ Employees will wash hands, face, and any other exposed areas with soap and water. ▪ Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials. ▪ See MSDSs for hazards associated with the decontamination solutions used. ▪ Decon solutions will be disposed of according to the work plan.

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Job Hazard Analysis - HASP Format

Job Title: Groundwater Sampling **Date of Analysis:** 9/21/06

Minimum Recommended PPE*: steel-toed boots, safety glasses, chemical resistant gloves
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Mobilization	1A) See JHA Mobilization/Demobilization/Site Preparation	1A) See JHA Mobilization/Demobilization/Site Preparation
2. General Site Hazards	2A) See JHA Field Work - General	2A) See JHA Field Work - General
	2B) Chemical exposure	2B) Chemical Exposure ▪ Read HASP and determine air monitoring and PPE needs.
3. Calibrate monitoring equipment	3A) Exposure to calibration gases	3A) Exposure to calibration gases ▪ Review equipment manuals ▪ Calibrate in a clean, well ventilated area
4. Opening the well cap, taking water level readings	4A) Contact with poisonous plants or the oil from poisonous plants	4A) Contact with poisonous plants or the oil from those plants: ▪ Look for signs of poisonous plants and avoid. ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with spray paint if working at a fixed location. ▪ Wear PPE as described in the HASP. ▪ Do not touch any part of your body/clothing. ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.
	4B) Contact with biting insects (i.e., spiders, bees, etc.) which may have constructed a nest in the well cap/well.	4B) Contact with stinging/biting insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ If necessary, wear protective netting over your head/face. ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.
	4C) Exposure to hazardous Inhalation and contact with hazardous substances (VOC contaminated groundwater/ soil); liquid splash; flammable atmospheres.	4C) Exposure to hazardous substances ▪ Wear PPE as identified in HASP. ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Immediately monitor breathing zone after opening well to determine exposure and verify that level of PPE is adequate – see Action Levels in HASP ▪ Monitor headspace in well. After the initial headspace reading (if required by the Work Plan), allow the well to vent for several minutes before obtaining water level and before sampling. ▪ When decontaminating equipment wear additional eye/face protection over the safety glasses such as a face shield.
	4D) Back strain due to lifting bailers or pumps and from moving equipment to well locations	4D) Back strain ▪ Use mechanical aids when possible, if mechanical aids are not available, use two person lifts for heavy items. ▪ Use proper lifting techniques

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Job Hazard Analysis - HASP Format

Job Title: Groundwater Sampling **Date of Analysis:** 9/21/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	4E) Foot injuries from dropped equipment	4E) Foot Injuries ▪ Be aware when moving objects, ensure you have a good grip when lifting and carrying objects. ▪ Do not carry more than you can handle safely ▪ Wear Steel toed boots
5. Collecting water samples	5A) Fire/Explosion/Contamination hazard from refueling generators	5A) Fire/Explosion/Contamination hazard from refueling generators ▪ Turn the generator off and let it cool down before refueling ▪ Segregate fuel and other hydrocarbons from samples to minimize contamination potential ▪ Transport fuels in approved safety containers. The use of containers other than those specifically designed to carry fuel is prohibited ▪ See JHA for Gasoline use
	5B) Electrocution	5B) Electrocution ▪ A ground fault circuit interrupter (GFCI) device must protect all AC electrical circuits. ▪ Use only correctly grounded equipment. Never use three-pronged cords which have had the third prong broken off. ▪ Make sure that the electrical cords from generators and power tools are not allowed to be in contact with water ▪ Do not stand in wet areas while operating power equipment ▪ Always make sure all electrically-powered sampling equipment is in good repair. Report any problems so the equipment can be repaired or replaced. ▪ When unplugging a cord, pull on the plug rather than the cord. ▪ Never do repairs on electrical equipment unless you are both authorized and qualified to do so.
	5C) Exposure to contaminants	5C) Exposure to Contaminants ▪ Stand up wind when sampling ▪ Monitor breathing zone with appropriate monitoring equipment (see HASP) ▪ Wear chemical resistant PPE as identified in HASP ▪ See section 4C) under Safe Practices above
	5D) Infectious water born diseases	5D) Infectious water born diseases ▪ Wear chemical resistant gloves and other PPE – as identified in HASP ▪ Prevent water from contacting skin ▪ Wash exposed skin with soap and water ASAP after sampling event ▪ Ensure that all equipment is adequately decontaminated using a 10% bleach solution
	5E) Exposure to water preservatives	5E) Exposure to water preservatives ▪ Work in a well ventilated area, upwind of samples ▪ Wear chemical resistant PPE as identified in HASP ▪ When preserving samples always add acid to water, avoid the opposite. ▪ See JHA Working with Preservatives
	5F) Slips/trips/falls	5F) Slips/trips/falls ▪ Ground can become wet/muddy, created by spilled water ▪ Place all purged water in drums for removal ▪ Wear good slip resistant footwear
	5G) Repetitive Motion and other Ergonomic Issues	5G) Ergonomic Issues ▪ Use mechanical means where possible to raise and lower equipment into well. ▪ Alternate raising and lowering equipment between field sampling team members, and alternate bailing the well. ▪ Use safe lifting techniques.

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Job Hazard Analysis - HASP Format

Job Title: Groundwater Sampling **Date of Analysis:** 9/21/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
6. Sample Processing	6A) Contaminated water	6A) Contaminated water ▪ Wear appropriate PPE as identified in HASP ▪ Decontaminate outside of bottles ▪ Prevent water from contacting skin ▪ Work in well ventilated area – upwind of samples ▪ Waste will be returned to the operation office for storage and disposal
7. Shipping Samples	7A) Freeze burns, back strain, hazardous chemical exposure, sample leakage	7A) Freeze burns, back strain, hazardous chemical exposure, sample leakage ▪ Wear appropriate chemical resistant gloves as identified in HASP. ▪ Wear leather or insulated gloves when handling dry ice. ▪ Follow safe lifting techniques – get help lifting heavy coolers. ▪ Samples that contain hazardous materials under the DOT definition, must be packaged, manifested and shipped by personnel that have the appropriate DOT HAZMAT training.

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Job Hazard Analysis - HASP Format

Job Title: Soil Sampling **Date of Analysis:** 5/1/07

Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for sampling event	1A) Chemical exposure	1A) Chemical Exposure ▪ Read HASP and determine air monitoring and PPE needs.
2. Mobilization	4A) See JHA Mobilization/Demobilization/Site Preparation	2A) See JHA Mobilization/Demobilization/Site Preparation
3. General Site Hazards	3A) See JHA Field Work - General	3A) See JHA Field Work - General
4. Carrying equipment to site location	4B) Back or muscle strain	4A) Back or muscle strain ▪ Use proper lifting techniques when lifting pumps or generators ▪ Use mechanical aids if available ▪ Use 2 person lift for heavy items
5. Calibrate monitoring equipment	5A) Exposure to calibration gases	5A) Exposure to calibration gases ▪ Review equipment manuals ▪ Calibrate in a clean, well ventilated area
6. Preparing sampling location	6A) Contact with poisonous plants or the oil from poisonous plants	6A) Contact with poisonous plants or the oil from those plants: ▪ Look for signs of poisonous plants and avoid. ▪ Wear PPE as described in the HASP. ▪ Do not touch anything part of your body/clothing. ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP.
	6B) Contact with biting insects (i.e., spiders, bees, etc.)	6B) Contact with stinging/biting insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ If necessary, wear protective netting over your head/face. ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.
	6C) Exposure to hazardous Inhalation and contact with hazardous substances (VOC contaminated soil); flammable atmospheres.	6C) Exposure to hazardous substances ▪ Wear PPE as identified in HASP. ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Monitor breathing zone air in accordance with HASP to determine levels of contaminants present. ▪ When decontaminating equipment wear additional eye/face protection over the safety glasses such as a face shield.
	6D) Back strain due to lifting or moving equipment to sampling locations	6D) Back strain ▪ Use mechanical aids when possible, if mechanical aids are not available, use two person lifts for heavy items. ▪ Use proper lifting techniques

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Job Hazard Analysis - HASP Format

Job Title: Soil Sampling **Date of Analysis:** 5/1/07

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	6E) Foot injuries from dropped equipment	6E) Foot Injuries ▪ Be aware when moving objects, ensure you have a good grip when lifting and carrying objects. ▪ Do not carry more than you can handle safely ▪ Wear steel toed boots
7. Collecting soil samples	7A) Working around drill rigs	7A) See JHA - Drilling
	7B) Encountering underground or overhead utilities	7B) Have all utilities located.
	7C) Fire/Explosion/Contamination hazard from refueling generators	7C) Fire/Explosion/Contamination hazard from refueling generators ▪ Turn the generator off and let it cool down before refueling ▪ Segregate fuel and other hydrocarbons from samples to minimize contamination potential ▪ Transport fuels in approved safety containers. The use of containers other than those specifically designed to carry fuel is prohibited ▪ See JHA for Gasoline use
	7D) Electrocution	7D) Electrocution ▪ A ground fault circuit interrupter (GFCI) device must protect all AC electrical circuits. ▪ Use only correctly grounded equipment. Never use three-pronged cords which have had the third prong broken off. ▪ Make sure that the electrical cords from generators and power tools are not allowed to be in contact with water ▪ Do not stand in wet areas while operating power equipment ▪ Always make sure all electrically-powered sampling equipment is in good repair. Report any problems so the equipment can be repaired or replaced. ▪ When unplugging a cord, pull on the plug rather than the cord. ▪ Never do repairs on electrical equipment unless you are both authorized and qualified to do so.
	7E) Exposure to contaminants	7E) Exposure to Contaminants ▪ Stand up wind when sampling ▪ Monitor breathing zone with appropriate monitoring equipment (see HASP) ▪ Wear chemical resistant PPE as identified in HASP ▪ See section 4C) under Safe Practices above
	7F) Exposure to preservatives	7F) Exposure to preservatives ▪ Work in a well ventilated area, upwind of samples ▪ Wear chemical resistant PPE as identified in HASP ▪ Review MSDSs
	7G) Slips/trips/falls	7G) Slips/trips/falls ▪ Ground can become wet/muddy ▪ Wear good slip resistant footwear
	7H) Lifting Injury	7H) Lifting injury ▪ Use proper lifting techniques when carrying quantities of samples ▪ Use proper ergonomics when hand digging for samples
	7I) Eye injury	7I) Eye Injury ▪ Wear eye protection when using picks or similar devices to loosen soil
	7J) Fire	7J) Fire ▪ When using gas powered auger, maintain fire watch whenever fueling or otherwise handling gasoline ▪ See JHA - Gasoline

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Job Hazard Analysis - HASP Format

Job Title: Soil Sampling **Date of Analysis:** 5/1/07

Key Work Steps	Hazards/Potential Hazards	Safe Practices
8. Soil sampling using floor corer	8A) Back injury	8A) Back Injury ▪ Use proper lifting techniques when moving floor corer and generator ▪ Use mechanincal aids if available ▪ Use two person lift for heavy items.
	8B) Electric Shock	8B) Electric Shock ▪ Use electric cords free from defects ▪ Keep cords out of water ▪ Ensure all electrical equipment is properly grounded ▪ Use GFCI
	8C) Hearing	8C) Hearing ▪ Wear hearing protection
	8D) Fire	8D) Fire ▪ When using generator, maintain fire watch whenever refueling or otherwise handling gasoline ▪ See JHA - Gasoline
	8E) Contamination	8E) Contamination ▪ Use appropriate PPE for the contaminants of concern (see HASP). ▪ Minimize sample contact ▪ Label sample in accordance with procedures ▪ Monitor breathing zone levels.

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Job Hazard Analysis - HASP Format

Job Title: Soil Vapor and Sub-Slab-Indoor Air Sampling **Date of Analysis:** 11/1/2007

Minimum Recommended PPE*: steel-toed boots, safety glasses, chemical resistant gloves-nitrile, flashlight/lamp
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Mobilization	1A) See JHA Mobilization/Demobilization/Site Preparation	1A) See JHA Mobilization/Demobilization/Site Preparation
2. General Site Hazards	2A) See JHA Field Work - General	2A) See JHA Field Work - General
	2B) Chemical exposure	2B) Chemical Exposure ▪ Read HASP and determine air monitoring and PPE needs.
3. Calibrate monitoring equipment	3A) Exposure to calibration gases	3A) Exposure to calibration gases ▪ Review equipment manuals ▪ Calibrate in a clean, well ventilated area
4. Access Residence or outdoor location	4A) Tripping hazards	4A) Observe floors/stairs for potential tripping hazards
	4B) Back strain	4B) Watch back when carrying equipment into residence
	4C) Chemical Hazard	4C) Be careful when identifying residential chemicals ▪ Wear PPE as described in the HASP.
5. Drill Hole in basement floor or exterior location	5A) Electrocution	5A) Electrocution ▪ A ground fault circuit interrupter (GFCI) device must protect all AC electrical circuits. ▪ Use only correctly grounded equipment. Never use three-pronged cords which have had the third prong broken off. ▪ Make sure that the electrical cords from generators and power tools are not allowed to be in contact with water ▪ Do not stand in wet areas while operating power equipment ▪ Always make sure all electrically-powered sampling equipment is in good repair. Report any problems so the equipment can be repaired or replaced. ▪ When unplugging a cord, pull on the plug rather than the cord. ▪ Never do repairs on electrical equipment unless you are both authorized and qualified to do so.
	5B) Exposure to hazardous Inhalation and contact with hazardous substances (VOC contaminated Soil Vapor).	5B) Exposure to hazardous substances ▪ Wear PPE as identified in HASP (steel-toed boots, safety glasses, nitrile gloves and a flashlight or lamp). ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Immediately monitor breathing zone using a PID after drilling hole to determine exposure and verify that level of PPE is adequate – see Action Levels in HASP
	5C) Back strain due to lifting and from moving equipment	5C) Back strain ▪ Use mechanical aids when possible, if mechanical aids are not available, use two person lifts for heavy items. ▪ Use proper lifting techniques
	5D) Foot injuries from dropped equipment/drill bit	5D) Foot Injuries ▪ Be aware when moving objects, ensure you have a good grip when lifting and carrying objects. ▪ Do not carry more than you can handle safely ▪ Watch feet when drilling and hold drill firmly ▪ Wear Steel toed boots

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Soil Vapor and Sub-Slab-Indoor Air Sampling **Date of Analysis:** 11/1/2007

Key Work Steps	Hazards/Potential Hazards	Safe Practices
6. Collecting sample	6A) Burn Hazard/fire Hazard	6A) Burn Hazard/ Fire Hazard from Melting Wax ▪ Place hot plate in safe location away from flammable material ▪ Be careful with exposed skin when working around hot plate and hot wax. ▪ Poor wax with spoon and avoid splatter.
	6B) Cutting Hazard	6B) Be careful with sharp knives when cutting tubing
	6C) Exposure to contaminants	6C) Exposure to Contaminants ▪ Monitor breathing zone with appropriate monitoring equipment (see HASP) ▪ Wear chemical resistant PPE as identified in HASP ▪ See section 5B) under Safe Practices above
7. Collecting sample	7A) Pinching Hazard	7A) Pinching Hazard from attaching regulators/tubing ▪ Be careful when using wrenches to attach regulator and or tubing to cans to not pinch fingers

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Working with Preservatives (Acids) **Date of Analysis:** 5/30/06

Minimum Recommended PPE*: Safety glasses/goggles, nitrile gloves,
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Opening the box of ampoules	1A) Cuts or punctures with a knife	1A) Cuts or punctures with a knife ▪ Use appropriate techniques when handling a knife. Always cut away from you.
	1B) Broken ampoules in the box. Cuts from the broken glass.	1B) Broken ampoules in the box. Cuts from the broken glass. ▪ Wear safety goggles and protective gloves. ▪ Dispose of the preservative and broken glass by approved methods.
	1C) Broken ampoules in the box. Breathing fumes.	1C) Broken ampoules in the box. Breathing fumes. ▪ Wear safety goggles and protective gloves. ▪ Always work in a well-ventilated area.
2. Breaking top of glass ampoule	2A) Cuts from the broken glass.	2A) Cuts from the broken glass ▪ Wear safety goggles and protective gloves. ▪ Use a paper towel to wrap ampoule in to snap the top or use an ampoule breaker. ▪ Always point the ampoule away from you when you snap off the top.
	2B) Skin contact chemical burns.	2B) Skin contact chemical burns. ▪ Wear safety goggles and protective gloves. ▪ Fumes may come into contact with the perspiration on your skin and rehydrate to form an acid. ▪ If your skin itches, flush affected area for 15 minutes with water.
	2C) Eye contact	2C) Eye contact ▪ Wear safety goggles. ▪ If acid splashes in the eyes, flush eyes for 15 minutes with water. Seek medical advice.
	2D) Breathing fumes	2D) Breathing fumes ▪ HNO_3 and HCL have high vapor pressure. Always work in a well-ventilated area.
3. Adding acid to sample	3A) Chemical reaction	3A) Chemical reaction ▪ Wear safety goggles and protective gloves. Acid may react with high alkaline sample and fizz (releases CO_2).
	3B) Eye contact	3B) Eye contact ▪ Wear safety goggles. ▪ If acid splashes in the eyes, flush eyes for 15 minutes with water. Seek medical advice.
	3C) Skin contact chemical burns.	3C) Skin contact chemical burns. ▪ Wear safety goggles and protective gloves.
4. Ampoule disposal	4A) Cuts from the broken glass.	4A) Cuts from the broken glass. ▪ Wear safety goggles and protective gloves. ▪ Place used ampoules in an empty, non-reactive container in the field and bring it back to the office. Dispose of the preservative and broken glass by approved methods.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Well Development **Date of Analysis:** 8/11/06

Minimum Recommended PPE*:

*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Going to site, work preparation	1A) Mobilization / Demobilization and Site Preparation	1A) See JHA for Mobilization Demobilization and Site Preparation ▪ See HASP for required PPE and air monitoring equipment needs
2. Working at the site	2A) General Field Work – Walking and working in the field, environmental conditions, communication	2A) See JHA for General Field Work
3. Surge and Bail well	3A) Lifting/Twisting/Tugging	3A) Lifting/Twisting/Tugging ▪ Use proper lifting techniques when lifting equipment ▪ Use mechanical aids if available ▪ Use 2 person lift for heavy items
	3B) Slips/Trips/Falls	3B) Slips/Trips/Falls ▪ Ground can become wet/muddy, created by spilled water ▪ Place all purged water in drums or carboys for removal ▪ Wear good slip resistant footwear
	3C) Entanglement – Mechanical Surge	3C) Entanglement – Mechanical Surge ▪ Be aware of cords/wiring/hose location at all times. ▪ Secure all loose clothing and long hair
	3D) Exposure to Contaminated Groundwater	3D) Exposure to Contaminated Groundwater ▪ After the initial headspace reading (if required by the Work Plan), allow the well to vent for several minutes before bailing well ▪ Wear PPE as identified in HASP. ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Monitor breathing zone air in accordance with HASP to determine levels of contaminants present. ▪ Wear face shield if splash hazard exists.
	3E) Poisonous Plants and Insects	3E) Poisonous Plants and Insects ▪ Look for signs of poisonous plants and avoid. ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with spray paint if working at a fixed location. ▪ Wear PPE as described in the HASP. ▪ Do not touch any part of your body/clothing. ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.
	3F) Contact with biting insects (i.e., spiders, bees, etc.) which may have constructed a nest in the well cap/well.	3F) Contact with biting insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ If necessary, wear protective netting over your head/face. ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.

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Job Hazard Analysis - HASP Format

Job Title: Well Development **Date of Analysis:** 8/11/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
4. Pump well	4A) Lifting/Twisting/Tugging	4A) Lifting/Twisting/Tugging ▪ Use proper lifting techniques when lifting equipment ▪ Use mechanical aids if available ▪ Use 2 person lift for heavy items
	4B) Using Generator/Electrical Equipment	4B) Using Generator/Electrical Equipment ▪ A ground fault circuit interrupter (GFCI) device must protect all AC electrical circuits. ▪ Use only correctly grounded equipment. Never use three-pronged cords which have had the third prong broken off. ▪ Make sure that the electrical cords from generators and power tools are not allowed to be in contact with water ▪ Do not stand in wet areas while operating power equipment ▪ Always make sure all electrically-powered equipment is in good repair. Report any problems so the equipment can be repaired or replaced. ▪ When unplugging a cord, pull on the plug rather than the cord. ▪ Never do repairs on electrical equipment unless you are both authorized and qualified to do so.
	4C) Entanglement	4C) Entanglement ▪ Be aware of cords/wiring/hose location at all times. ▪ Secure all loose clothing and long hair
	4D) Exposure to Contaminated Groundwater	4D) Exposure to Contaminated Groundwater ▪ After the initial headspace reading (if required by the Work Plan), allow the well to vent for several minutes before bailing well ▪ Wear PPE as identified in HASP. ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Monitor breathing zone air in accordance with HASP to determine levels of contaminants present. ▪ Wear face shield if splash hazard exists.
	4E) Cuts to hands	4E) Cuts ▪ Be alert for sharp edges. Wear cut resistant gloves as appropriate
	4F) Poisonous Plants and Insects	4F) Poisonous Plants and Insects ▪ Look for signs of poisonous plants and avoid. ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with spray paint if working at a fixed location. ▪ Wear PPE as described in the HASP. ▪ Do not touch any part of your body/clothing. ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.

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Job Hazard Analysis - HASP Format

Job Title: Well Development **Date of Analysis:** 8/11/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	4G) Contact with biting insects (i.e., spiders, bees, etc.) which may have constructed a nest in the well cap/well.	4G) Contact with biting insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ If necessary, wear protective netting over your head/face. ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.
5. Dispose of developmental water	5A) Lifting, Carrying (5 gal carboys or heavy equipment)	5A) Lifting, Carrying ▪ Use proper lifting techniques when lifting equipment ▪ Use mechanical aids if available ▪ Use 2 person lift for heavy items
	5B) Slips/Trips/Falls	5B) Slips/Trips/Falls ▪ Ground can become wet/muddy, created by spilled water ▪ Place all purged water in drums or carboys for removal ▪ Wear good slip resistant footwear
	5C) Exposure to Contaminated Groundwater	5C) Exposure to Contaminated Groundwater ▪ After the initial headspace reading (if required by the Work Plan), allow the well to vent for several minutes before bailing well ▪ Wear PPE as identified in HASP. ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Monitor breathing zone air in accordance with HASP to determine levels of contaminants present. ▪ Wear face shield if splash hazard exists.
	5D) Walking through woods	5D) Walking through woods ▪ Protect head agains falling objects. ▪ Wear your hardhat for protection from falling limbs and pinecones, and from tools and equipment carried by other crewmembers. ▪ Stay out of the woods during extremely high winds. ▪ Watch your footing as stepping over rocks, roots, uneven terrain, etc.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Static Water Level Readings **Date of Analysis:** 9/14/06

Minimum Recommended PPE*: Safety Glasses, High Visibility Vest, Steel Toed Boots

*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Work Preparation	1A) Chemical Exposures	1A) Chemical Exposures ▪ See HASP for PPE and air monitoring requirements ▪ Calibrate monitoring equipment ▪ Use monitoring equipment, as outlined in HASP, to monitor breathing zone ▪ Read MSDSs for all chemicals brought to the site ▪ Be familiar with hazards associated with site contaminants. ▪ Decon thoroughly prior to consumption of food, beverage or tobacco.
2. Open Well With Hand Tool And Remove Well Cap	2A) Knee Injury Due To Kneeling On Ground	2A) Knee Injury Due To Kneeling ▪ Check the area and remove any rocks or other sharp objects ▪ Kneel on some type of padding or leather glove ▪ Use chemical resistant material to kneel on if surface soil is contaminated.
	2B) Injury Due To Using Hand Tools	2B) Injury Due To Using Hand Tools ▪ Wear leather work gloves, when removing cover from well ▪ Be alert to hand position when using hand tools ▪ All hand tools will be maintained in safe condition. ▪ Do not drop or throw tools. Tools shall be placed on the ground or work surface or handed to another employee in a safe manner.
	2C) Slips/Trips/Falls	2C) Slips/Trips/Falls ▪ Maintain work areas safe and orderly; mark or repair possible tripping hazards. ▪ Always watch your footing. ▪ Horseplay is strictly prohibited ▪ Wear laced boots with a minimum 8" high upper and non-skid Vibram-type soles for ankle support and traction.
	2D) Materials Handling – Sprains/Strains	2D) Materials Handling – Sprains/Strains ▪ Clean out dirt and loosen cap with hammer if lid is difficult to open ▪ Use proper tools to open well cover and cap ▪ Use bucket to carry hand tools and equipment in.
	2E) Contact With Biting Insects (I.E., Spiders, Bees, Etc.) Which May Have Constructed A Nest In The Well Cap/Well.	2E) Contact With Stinging/Biting Insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Static Water Level Readings **Date of Analysis:** 9/14/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	2F) Struck By Vehicle/Equipment	2F) Struck By Vehicle/Equipment ▪ Be aware of heavy equipment operations that may be working nearby. ▪ Keep out of the swing radius of heavy equipment. ▪ Ground personnel in the vicinity of vehicles or heavy equipment operations will be within the view of the operator at all times. ▪ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation. ▪ High visibility vests will be worn when workers are exposed to equipment or vehicular traffic.
3. Insert Probe Into Well and Take Reading	3A) Awkward Postures	3A) Awkward Postures ▪ Use small stool to sit on when sampling if warranted by sampling duration.
	3B) Chemical Exposures	3B) Chemical Exposures ▪ Wear PPE as identified in HASP ▪ Use monitoring equipment, as outlined in HASP, to monitor breathing zone ▪ Calibrate monitoring equipment ▪ Be familiar with hazards associated with site contaminants. ▪ Decon thoroughly prior to consumption of food, beverage or tobacco.
4. Replace Well Cap and Cover.	4A) Slips, Trips, Falls	4A) Slips, Trips, Falls ▪ See Section 2C above
	4B) Injury Due To Using Hand Tools	4B) Injury Due To Using Hand Tools ▪ See Section 2B above

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Job Hazard Analysis - HASP Format

Job Title: Static Water Level Readings **Date of Analysis:** 9/14/06

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Job Hazard Analysis

Job Title: Insect Stings and Bites **Date of Analysis:** 04/23/2012

Minimum Recommended PPE*: Long sleeved shirt and pants, light colored clothing
*See HASP for all required PPE

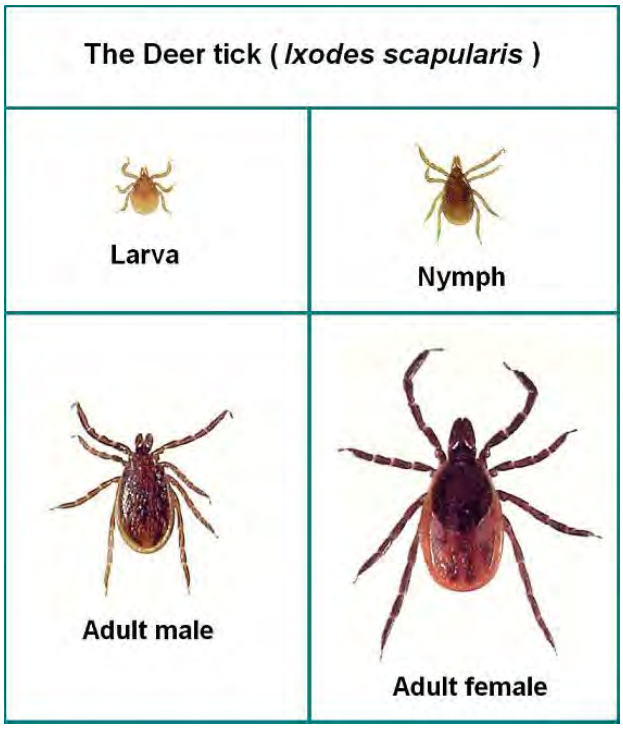
Key Work Steps	Hazards/Potential Hazards	Safe Practices
While adult ticks are the easiest to identify by species, immature stages of ticks may also transmit some pathogens. In addition, male and female ticks of the same species may look different. Of the many different tick species found throughout the world, only a select few bite and transmit disease to humans. Ticks common to the **northeast** are shown below. The maps provide expected distribution of ticks that cause disease.		
American Dog Tick		American dog tick is the most commonly identified species responsible for transmitting *Rickettsia rickettsii*, which causes Rocky Mountain spotted fever in humans. The American dog tick can also transmit tularemia. This tick is widely distributed east of the Rocky Mountains. Larvae and nymphs feed on small rodents. Dogs and medium-sized mammals are the preferred hosts of adult *D. variabilis*, although it feeds readily on other large mammals, including humans. Distribution areas are shown in yellow (Center for Disease Control).
Blacklegged Tick (a/k/a Deer Tick) **See additional pictures of Deer Tick on next page.**		The blacklegged tick (Ixodes scapularis), commonly known as the **"deer tick",** can transmit the organisms responsible for anaplasmosis, babesiosis, and Lyme disease. This tick is widely distributed in the northeastern and upper midwestern United States.Larvae and nymphs feed on small mammals and birds, while adults feed on larger mammals and will bite humans on occasion. It is important to note that the pathogen that causes Lyme disease is maintained by wild rodent and other small mammal reservoirs, and is not transmitted everywhere that the blacklegged tick lives. In some regions, particularly in the southern U.S., the tick has very different feeding habits that make it an unlikely vector in the spread of human disease. Distribution areas are shown in yellow (CDC).

MACTEC

Job Hazard Analysis

Job Title: Insect Stings and Bites **Date of Analysis:** 04/23/2012

Key Work Steps	Hazards/Potential Hazards	Safe Practices



Note: Ticks are shown larger than actual size.

Lone star tick

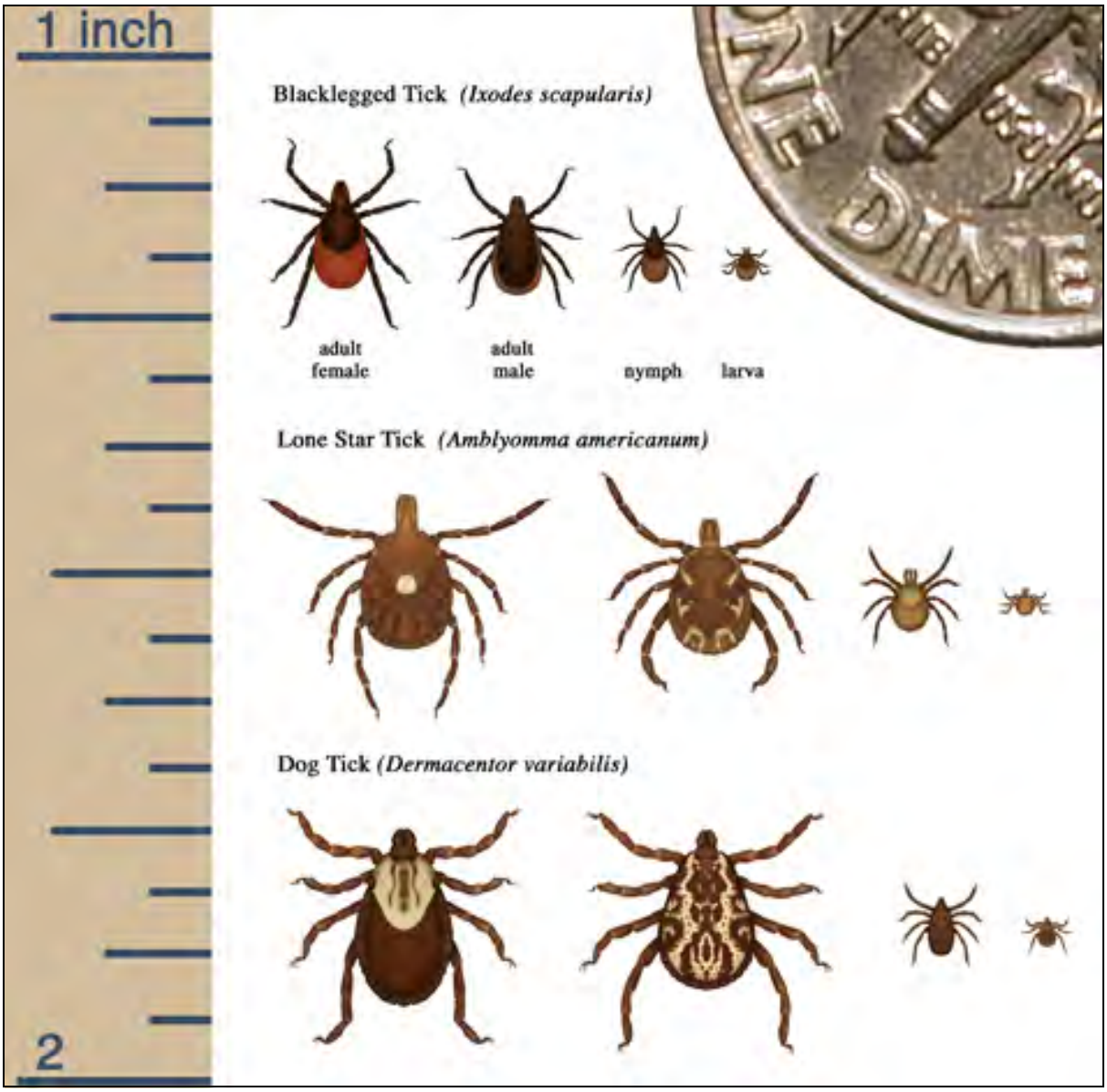
The lone star tick (Amblyomma americanum) transmits Ehrlichia chaffeensis and Ehrlichia ewingii, causing human ehrlichiosis, tularemia, and STARI. The lone star tick is primarily found in the southeastern and eastern United States. White-tailed deer are a major host of lone star ticks and appear to represent one natural reservoir for E. chaffeensis. Larvae and nymphs feed on birds and deer. Both nymphal and adult ticks may be associated with the transmission of pathogens to humans. Distribution areas are shown in yellow (CDC).

MACTEC

Job Hazard Analysis

Job Title: Insect Stings and Bites **Date of Analysis:** 04/23/2012

Key Work Steps	Hazards/Potential Hazards	Safe Practices



Most ticks go through four life stages: egg, six-legged larva, eight-legged nymph, and adult. After hatching from the eggs, ticks must eat blood at every stage to survive. Ticks that require this many hosts can take up to 3 years to complete their full life cycle, and most will die because they don't find a host for their next feeding. The above picture shows the life stages of the Blacklegged Tick (Deer Tick), Lone Star Tick, and the American Dog Tick.

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Job Hazard Analysis

Job Title: Insect Stings and Bites **Date of Analysis:** 04/23/2012

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Traveling/working in areas with potential Tick Bites –Example outdoor wooded areas or fields.	1. Lyme Disease, Rocky Mountain Spotted Fever, etc.	1A) Spray clothing with insect repellant containing DEET or Permethrin as a barrier. Treat outer layer of field clothing by spraying with tick repellent product such as "Tick Stuff" (which contains permethrin) and allowing the treated clothing to dry before wearing it is advisable. **Follow the manufacturer's instructions for the specific tick repellent used.** 1B) Wear light colored clothing that fits tightly at the wrists, ankles, and waist. 1C) Each outer garment should overlap the one above it. 1D) Cover trouser legs with high socks or boots. 1E) Tuck in shirt tails. 1F) Search the body on a regular basis, especially hair and clothing; ticks generally do not attach for the first couple of hours. 1G) Conduct a full-body tick check using a hand-held or full-length mirror to view all parts of your body upon return from the field. 1H) Examine field gear. Ticks can ride into the home on clothing, boots, bags, etc., then attach to a person later. Tumble clothes in a dryer on high heat for an hour to kill remaining ticks. 1I) Bathe or shower as soon as possible after coming indoors (preferably within two hours) to wash off and more easily find ticks that are crawling on you. 1J) If a tick becomes attached, pull it by grasping it as close as possible to the point of attachment and pull straight out with gentle pressure. Wash skin with soap and water then cleanse with rubbing alcohol. Place the tick in an empty container for later identification, if the victim should have a reaction. Record dates of exposure and removal. 1K) Do not try to remove the tick by burning with a match or covering it with chemical agents. 1L) If you can not remove the tick, or the head detaches, seek propmt medical help. 1M) Watch for warning signs of illness: a large red spot on the bite area; fever, chills, headache, joint and muscle ache, significant fatigue, and facial paralysis are reactions that may appear within two weeks of the attack. Symptoms specific to Lyme disease include: confusion, short-term memory loss, and disorientation.

MACTEC

Job Hazard Analysis

Job Title: Insect Stings and Bites **Date of Analysis:** 04/23/2012

Key Work Steps	Hazards/Potential Hazards	Safe Practices
2. Working/traveling in areas with potential bee and wasp stings- Example wooded areas and fields	2. Allergic reactions, painful stings	2A) Be alert to hives in brush or in hollow logs. Watch for insects travelling in and out of one location. 2B) If you or anyone you are working with is known to have allergic reactions to bee stings, tell the rest of the crew and your supervisor. Make sure you carry emergency medication with you at all times. 2C) Wear long sleeve shirts and trousers; tuck in shirt.. Bright colors and metal objects may attract bees. 2D) If you are stung, cold compresses may bring relief. 2E) If a stinger is left behind, scrape it off the skin. Do not use a tweezers as this squeezes the venom sack, worsening the injury. 2F) If the victim develops hives, asthmatic breathing, tissue swelling, or a drop in blood pressure, seek medical help immediately. Give victim antihistime, (Benadryl, chlo-amine tabs).
3. Traveling/working in areas of potential Mosquito Bites- Example- Woods, fields, near bodies of water and etc.	3. Skin irritation, encephalitis	3A) Wear long sleeves and trousers. 3B) Avoid heavy scents. 3C) Use insect repellants. If using DEET, do not apply directly to skin, apply to clothing only. 3D) Carry after-bite medication to reduce skin irritation.

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Job Hazard Analysis

Job Title: Insect Stings and Bites **Date of Analysis:** 04/23/2012

Key Work Steps	Hazards/Potential Hazards	Safe Practices
4. Traveling/Working in areas of potential Spider Bites **Brown Recluse Spider** Found in spaces with secluded, dry, sheltered areas such as underneath structures logs, or in piles of rocks or leaves, or indoors in dark closets, shoes, or attics. **Black Widow** Found in spaces containing undisturbed areas such as woodpiles, under eaves, fences, and other areas where debris has accumulated. They may also be found living in outdoor toilets where flies are plentiful.	4. Itching, rash, pain, blisters, difficulty breathing, nausea and vomiting, high blood pressure, etc. **Brown Recluse:** Cannot bite humans without some form of counter pressure, for example, through unintentional contact that traps the spider against the skin. Bites may cause a stinging sensation with localized pain. A small white blister usually develops at the site of the bite. The venom of a brown recluse can cause a severe lesion by destroying skin tissue. **This skin lesion will require professional medical attention.** **Black Widow:** Pain at the bite area and then spreads to the chest, abdomen, or the entire body.	4A) Inspect or shake out any clothing, shoes, towels, or field equipment/gear before use. 4B) Wear protective clothing such as a long-sleeved shirt and long pants, hat, gloves, and boots when handling stacked or undisturbed piles of materials. 4C) Minimize the empty spaces between stacked materials. 4D) Remove and reduce debris and rubble from around the work areas. 4E) If possible, trim or eliminate tall grasses from around long-term work areas. Avoid these areas whenever possible. 4F) Store clothing/gear and field equipment in tightly closed plastic bags. 4G) Keep your tetanus boosters up-to-date (every 10 years). Spider bites can become infected with tetanus spores.

Completed by: Annette McLean Date 10/14/2011

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PID ANALYZERS

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Instrumentation for Environmental, Process & Industrial Hygiene Monitoring

Isobutylene in Air MSDS

Home

MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS/**ISOBUTYLENE** IN AIR

PRODUCT NAME: 100 PPM ISOBUTYLENE/AIR (**100 PPM ISOBUTYLENE**/AIR) **MSDS**
Version:4 Date: January, 2004

---

1. Chemical Product and Company Identification **PID ANALYZERS, LLC** 25 Walpole Park Drive South Walpole, MA 02081 TELEPHONE NUMBER: (508) 660-5001 **24-HOUR EMERGENCY NUMBER: 1-617-699-4307** FAX NUMBER: (508) 660-5040 E-MAIL: sales@hnu.com

PRODUCT NAME: ISOBUTYLENE (**100 PPM** – 0.9%) IN AIR
CHEMICAL NAME: Isobutylene in air

COMMON NAMES/ SYNONYMS: Calibration Gas

CLASSIFICATION: 2.2 WHIMIS CLASSIFICTATION: A, D2A, D2B

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2. COMPOSITION/ INFORMATION ON INGREDIENTS
INGREDIENT %: **Isobutylene** 0.0001-0.9/Air 99-99.9999
VOLUME:17L
PEL-OSHA: N/A
TLV-ACGIH: N/A
LD50or LC50Route/Species:N/A
FORMULA: C4H8/Air 99.0

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3. HAZARDS IDENTIFICATIONEMERGENCY OVERVIEW Release of this product may produce oxygen-deficient atmospheres (especially in confined spaces or other poorly ventilated environments); individuals in such atmospheres may be asphyxiated. **Isobutylene** may cause drowsiness and other central nervous system effects in high concentrations; however, due to the low concentration of this gas mixture, this is unlikely to occur.

ROUTE OF ENTRY:
Skin: No
Contact Skin: No
Absorption: No
Eye Contact: No
Inhalation: Yes
Ingestion:No

HEALTH EFFECTS:
Exposure Limits: Yes
Irritant: No
Sensitization: No
Reproductive Hazard: No
Mutagen: No
Carcinogenicity: No
NTP: No
IARC: No
OSHA: No

EYE EFFECTS: N/A.
SKIN EFFECTS: N/A.

MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS
PRODUCT NAME: **ISOBUTYLENE** (1 **PPM** – 0.9%) IN AIR
INGESTION EFFECTS: Ingestion unlikely. Gas at room temperature.
INHALATION EFFECTS: Due to the small size of this cylinder, no unusual health effects from over-exposure are anticipated under normal routine use.

NFPA HAZARD CODES HMIS HAZARD CODES RATING SYSTEM
Health: **1**
Flammability: **0**
Flammability: **0**
Reactivity: **0**

***0= No Hazard, 1= Slight Hazard, 2= Moderate Hazard, 3= Serious Hazard, 4= Severe Hazard**

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4. FIRST AID MEASURES EYES: N/A

SKIN: N/A

INGESTION: Not required

INHALATION: PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASED OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED THE SELF-CONTAINED BREATHING APPARATUS. Victims should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. If breathing has stopped administer artificial resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

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5. FIRE-FIGHTING MEASURES These containers hold gas under pressure, with no liquid phase. If involved in a major fire, they should be sprayed with water to avoid pressure increases, otherwise pressures will rise and ultimately they may distort or burst to release the contents. The gases will not add significantly to the fire, but containers or fragments may be

projected considerable distances - thereby hampering fire fighting efforts.

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6. ACCIDENTAL RELEASE MEASURES In terms of weight, these containers hold very little contents, such that any accidental release by puncturing etc. will be of no practical concern.

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7. HANDLING AND STORAGE Suck back of water into the container must be prevented. Do not allow backfeed into the container. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Use only in well-ventilated areas. Do not heat cylinder by any means to increase rate of product from the cylinder. Do not allow the temperature where cylinders are stored to exceed 130oF (54oC).

---

8. EXPOSURE CONTROLS/PERSONAL PROTECTION Use adequate ventilation for extended use of gas.

MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS PRODUCT NAME: ISOBUTYLENE (1 **PPM** – 0.9%) IN AIR

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9. PHYSICAL AND CHEMICAL PROPERTIES PARAMETER: VALUE: Physical state : Gas Evaporation point : N/A pH : N/A Odor and appearance : Colorless, odorless gas

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10. STABILITY AND REACTIVITY Stable under normal conditions. Expected shelf life 24 months.

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11. TOXICOLOGICAL INFORMATION No toxicological damage caused by this product.

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12. ECOLOGICAL INFORMATION No ecological damage caused by this product.

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13. DISPOSAL INFORMATION Do not discharge into any place where its accumulation could be dangerous. Used containers are acceptable for disposal in the normal waste stream as long as the cylinder is empty and valve removed or cylinder wall is punctured.

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14. TRANSPORT INFORMATION
United States DOT/Canada TDG PROPER SHIPPING NAME:
Compressed Gas N.O.S. Compressed Gas N.O.S. (**Isobutylene** in Air)
HAZARD CLASS: 2.2
IDENTIFICATION NUMBER: UN1956
SHIPPING LABEL: NONFLAMMABLE GAS

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15. REGULATORY INFORMATION Isobutylene is listed under the accident prevention provisions of section 112(r) of the Clean Air Act (CAA) with a threshold quantity (TQ) of 10,000 pounds.

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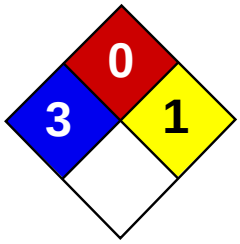
16. OTHER INFORMATION This **MSDS** has been prepared in accordance with the Chemicals

(Hazard Information and Packaging for Supply (Amendment) Regulation 1996. The information is based on the best knowledge of PID Analyzers, LLC , and its advisors and is given in good faith, but we cannot guarantee its accuracy, reliability or completeness and therefore disclaim any liability for loss or damage arising out of use of this data. Since conditions of use are outside the control of the Company and its advisors we disclaim any liability for loss or damage when the product is used for other purposes than it is intended.
MSDS/S010/248/January, 2004

Top



Material Safety Data Sheet
Hydrochloric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrochloric acid

Catalog Codes: SLH1462, SLH3154

CAS#: Mixture.

RTECS: MW4025000

TSCA: TSCA 8(b) inventory: Hydrochloric acid

CI#: Not applicable.

Synonym: Hydrochloric Acid; Muriatic Acid

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Hydrogen chloride	7647-01-0	20-38
Water	7732-18-5	62-80

Toxicological Data on Ingredients: Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth. Repeated or prolonged exposure to the substance can produce target

organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. 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. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Non combustible. Calcium carbide reacts with hydrogen chloride gas with incandescence. Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine. Rubidium acetylene carbides burns with slightly warm hydrochloric acid. Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved. Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammble gas. Cesium acetylene carbide burns hydrogen chloride gas. Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute. Reacts with most metals to produce flammable Hydrodgen gas.

Special Remarks on Explosion Hazards:

Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other violent/vigorous reaction: Acetic anhydride AgClO + CCl4 Alcohols + hydrogen cyanide, Aluminum Aluminum-titanium alloys (with HCl vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca3P2 Chlorine + dinitroanilines (evolves gas), Chlorosulfonic acid Cesium carbide Cesium acetylene carbide, 1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HClO4 Hexalithium disilicide H2SO4 Metal acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate, beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCl), Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U3P4 , Vinyl acetate. Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
CEIL: 5 (ppm) from OSHA (PEL) [United States] CEIL: 7 (mg/m3) from OSHA (PEL) [United States] CEIL: 5 from NIOSH CEIL: 7 (mg/m3) from NIOSH TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)] TWA: 2 STEL: 8 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pungent. Irritating (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point:
108.58 C @ 760 mm Hg (for 20.22% HCl in water) 83 C @ 760 mm Hg (for 31% HCl in water) 50.5 C (for 37% HCl in water)

Melting Point:
-62.25°C (-80°F) (20.69% HCl in water) -46.2 C (31.24% HCl in water) -25.4 C (39.17% HCl in water)

Critical Temperature: Not available.

Specific Gravity:
1.1- 1.19 (Water = 1) 1.10 (20%and 22% HCl solutions) 1.12 (24% HCl solution) 1.15 (29.57% HCl solution) 1.16 (32% HCl solution) 1.19 (37% and 38%HCl solutions)

Vapor Pressure: 16 kPa (@ 20°C) average

Vapor Density: 1.267 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.25 to 10 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility: Soluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, water

Incompatibility with various substances:
Highly reactive with metals. Reactive with oxidizing agents, organic materials, alkalis, water.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Reacts with water especially when water is added to the product. Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent @ 125 deg. C. Sodium reacts very violently with gaseous hydrogen chloride. Calcium phosphide and hydrochloric acid undergo very energetic reaction. It reacts with oxidizers releasing chlorine gas. Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates. Reacts with most metals to produce flammable Hydrogen gas. Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct sunlight, alkalies (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid(increase in temperature and pressure) Hydrogen chloride gas is emitted when this product is in contact with sulfuric acid. Adsorption of Hydrochloric Acid onto silicon dioxide results in exothmeric reaction. Hydrogen chloride causes aldehydes and epoxides to violently polymerize. Hydrogen chloride or Hydrochloric Acid in contact with the folloiwng can cause explosion or ignition on contact or

Special Remarks on Corrosivity:

Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinium, tantalum, silver, and certain alloys are exceptions). It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys. No corrosivity data on zinc, steel. Severe Corrosive effect on brass and bronze

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
Acute oral toxicity (LD50): 900 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse]. Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, . Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Doses (LDL/LCL) LDL [Man] -Route: Oral; 2857 ug/kg LCL [Human] - Route: Inhalation; Dose: 1300 ppm/30M LCL [Rabbit] - Route: Inhalation; Dose: 4413 ppm/30M

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (fetoxicity). May affect genetic material.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Corrosive. Causes severe skin irritation and burns. Eyes: Corrosive. Causes severe eye irritation/conjuntivitis, burns, corneal necrosis. Inhalation: May be fatal if inhaled. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and larryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well has headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure, occur, particularly if exposure is prolonged. May affect the liver. Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomitting (with "coffee ground" emesis), diarrhea, thirst, difficulty swallowing, salivation, chills, fever, uneasiness, shock, strictures and stenosis (esophogeal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneys- renal failure, nephritis). Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel. Chronic Potential Health Effects: dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Hydrochloric acid, solution UNNA: 1789 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Hydrochloric acid Illinois toxic substances disclosure to employee act: Hydrochloric acid Illinois chemical safety act: Hydrochloric acid New York release reporting list: Hydrochloric acid Rhode Island RTK hazardous substances: Hydrochloric acid Pennsylvania RTK: Hydrochloric acid Minnesota: Hydrochloric acid Massachusetts RTK: Hydrochloric acid Massachusetts spill list: Hydrochloric acid New Jersey: Hydrochloric acid New Jersey spill list: Hydrochloric acid Louisiana RTK reporting list: Hydrochloric acid Louisiana spill reporting: Hydrochloric acid California Director's List of Hazardous Substances: Hydrochloric acid TSCA 8(b) inventory: Hydrochloric acid TSCA 4(a) proposed test rules: Hydrochloric acid SARA 302/304/311/312 extremely hazardous substances: Hydrochloric acid SARA 313 toxic chemical notification and release reporting: Hydrochloric acid CERCLA: Hazardous substances.: Hydrochloric acid: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R34- Causes burns. R37- Irritating to respiratory system. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 05:45 PM

Last Updated: 11/01/2010 12:00 PM

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HANNA® instruments

HI 70004
Buffer Solution pH 4.01, ± 0.01 @ 25°C/77°F

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 70004 Buffer Solution pH 4.01
Application: pH Buffer Solution, ± 0.01 @ 25°C/77°F

Additional Product Codes: HI 70004C
HI 70004P
HI 7004P/5

Company Information (USA):
Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information:
1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)
International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)
E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Buffer Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.

After Skin Contact: Wash effected area with water and soap.

After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.

After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.

General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:
Water Spray, Foam, Dry Powder, Carbon Dioxide

Special Risks:
Non-combustible. Development of hazardous combustion gases or vapors possible in the event of fire.

Special Protective Equipment:
Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:
Contain escaping vapors with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless liquid	***Odor:***	Odorless	***Density at 20° C:***	1.0 g/cm³ at 25°C
Melting Point:	NA	***Boiling Point:***	> 100 °C	***Solubility:***	Soluble
pH at 20° C:	4.01 at 25°C	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Heating

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

Quantitative data on the toxicity of this product is not available.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as an ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:	***Sea:***	***Air:***
Not subject to transport regulations	Not subject to transport regulations	Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2006-05-05
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

HANNA® instruments

HI 70007
Buffer Solution pH 7.01, ± 0.01 @ 25°C/77°F

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 70007 Buffer Solution pH 7.01
Application: pH Buffer Solution

Additional Product Codes: HI 70007C
HI 70007P
HI 7007P/5

Company Information (USA):

Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information:

1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information:

1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information:

+1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address:

tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Buffer Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.

After Skin Contact: Wash effected area with water and soap.

After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.

After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.

General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:

Water Spray, Foam, Dry Powder, Carbon Dioxide

Special Risks:

Non-combustible. Development of hazardous combustion gases or vapors possible in the event of fire.

Special Protective Equipment:

Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:

Contain escaping vapors with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless liquid	***Odor:***	Odorless	***Density at 20° C:***	1.0 g/cm³ at 25°C
Melting Point:	NA	***Boiling Point:***	> 100 °C	***Solubility:***	Soluble
pH at 20° C:	7.01 at 25°C	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Heating

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

Quantitative data on the toxicity of this product is not available.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as an ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:
Not subject to transport regulations

Sea:
Not subject to transport regulations

Air:
Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2006-05-05
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

OAKTON® MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Catalog Number(s)

00653-00

Product Identity

ZERO OXYGEN SOLUTION

Manufacturer's Name	Emergency Telephone Number (24 hr)
RICCA CHEMICAL COMPANY	CHEMTREC®: 800-424-9300
Address (Number, Street, City, State, and ZIP Code)	Telephone Number For Information
P.O. Box 13090	817-461-5601
	Date Prepared
Arlington, Texas 76094	4-18-2000

Section 2. Composition / Information on Ingredients

Component	CAS Registry #	Percent Concentration	Exposure Limits ACGIH TLV	Exposure Limits OSHA PEL
Sodium Sulfite	7757-83-7	4.5 – 5.5	N/A	N/A
Cobalt Chloride Hexahydrate	7791-13-1	< 0.01	0.02 mg/m^3 (as Co)	0.1 mg/m^3 (Dust as Co)
Water, Deionized	7732-18-5	Balance	N/A	N/A

Section 3. Hazards Identification

☆☆☆

Section 4. First Aid Measures – In all cases, seek qualified evaluation.

EYE CONTACT: Irrigate immediately with large quantity of water for at least 15 minutes. Call a physician if irritation develops.

INHALATION: Remove to fresh air. Give artificial respiration if necessary.

SKIN CONTACT: Wash areas of contact with soap and water for at least 15 minutes. Call a physician if irritation develops.

INGESTION: Dilute with water or milk. Do not induce vomiting. Call a physician if necessary.

Section 5. Fire Fighting Measures

FLAMMABLE PROPERTIES:

FLASH POINT: N/A METHOD USED: N/A

FLAMMABLE LIMITS

LFL: N/A UFL: N/A

EXTINGUISHING MEDIA: Use any means suitable for extinguishing surrounding fire (water, dry chemical, chemical foam).

FIRE & EXPLOSION HAZARDS: Not considered to be an explosion hazard. May emit irritating and corrosive gases in fire.

FIRE FIGHTING INSTRUCTIONS: Use normal procedures/instructions. Poisonous gases may be produced in fire.

FIRE FIGHTING EQUIPMENT: Use protective clothing and NIOSH-approved self-contained breathing apparatus appropriate for the surrounding fire.

Section 6. Accidental Release Measures

Absorb with suitable material (vermiculite, etc.) and dispose of in accordance with local regulations.

Section 7. Handling and Storage

As with all chemicals, wash hands thoroughly after handling. Avoid contact with eyes and skin. Protect from freezing and physical damage. SAFETY STORAGE CODE: GENERAL

Section 8. Exposure Controls / Personal Protection

ENGINEERING CONTROLS: No specific controls are needed. Normal room ventilation is adequate.

RESPIRATORY PROTECTION: Normal room ventilation is adequate.

SKIN PROTECTION: Chemical resistant gloves, Nitrile Rubber or Neoprene.

EYE PROTECTION: Safety glasses or goggles.

Section 9. Physical and chemical Properties

APPEARANCE:	Clear, colorless liquid	**pH:**	N/A
ODOR:	odorless	**BOILING POINT (^{o}C):**	Approximately 100
SOLUBILITY IN WATER:	infinite	**MELTING POINT (^{o}C):**	Approximately 0
SPECIFIC GRAVITY:	Approximately 1	**VAPOR PRESSURE:**	N/A

Section 10. Stability and Reactivity

CHEMICAL STABILITY: Stable under normal conditions of use and storage. This product absorbs Oxygen from the air.

INCOMPATIBILITY: Strong oxidizing agents, Acids (liberates Sulfur Dioxide), high temperatures.

HAZARDOUS DECOMPOSITION PRODUCTS: Emits toxic and irritating fumes, including Sulfur Oxides, when heated to decomposition.
HAZARDOUS POLYMERIZATION: Will not occur.

Section 11. Toxicological Information

LD50, Oral, Mouse: (Sodium Sulfite) 820 mg/kg, details of toxic effects not reported other than lethal dose value.

Section 12. Ecological Information

ECOTOXICOLOGICAL INFORMATION: No information found.

CHEMICAL FATE INFORMATION: No information found.

Section 13. Disposal Considerations

Whatever cannot be saved for recycling or recovery should be managed in an appropriate and approved waste disposal facility. Always dispose of in accordance with local, state and federal regulations.

Section 14. Transport Information (Not meant to be all inclusive)

D.O.T. SHIPPING NAME:	Not regulated
D.O.T. HAZARD CLASS:	None
U.N. / N.A. NUMBER:	None
PACKING GROUP:	None
D.O.T. LABEL:	None

Section 15. Regulatory Information (Not meant to be all inclusive - selected regulation represented)

OSHA STATUS: This item meets the OSHA Hazard Communication Standard (29 CFR 1910.1200) definition of a hazardous material.

TSCA STATUS: All components of this solution are listed on the TSCA Inventory or are mixtures (hydrates) of items listed on the TSCA Inventory.
CERCLA REPORTABLE QUANTITY: Cobalt Chloride RQ 1 pound
SARA TITLE III:

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES: No
SECTION 311/312 HAZARDOUS CATEGORIES: Acute, Chronic: Yes Fire, Pressure, Reactivity: No
SECTION 313 TOXIC CHEMICALS: No
RCRA STATUS: No

CALIFORNIA PROPOSITION 65: Not listed

Section 16. Other Information

NFPA Ratings:	**Health: 1**	**Flammability: 0**	**Reactivity: 0**	**Special Notice Key: None**
HMIS® Ratings:	**Health: 1**	**Flammability: 0**	**Reactivity: 0**	**Protective Equipment: B (Protective eyewear, gloves)**

Rev 1, 03-25-2003: Reviewed and approved.
Rev 2, 03-20-2006: Reviewed and approved.

When handled properly by qualified personnel, the product described herein does not present a significant health or safety hazard. Alteration of its characteristics by concentration, evaporation, addition of other substances, or other means may present hazards not specifically addressed herein and which must be evaluated by the user. The information furnished herein is believed to be accurate and represents the best data currently available to us. No warranty, expressed or implied, is made and RICCA CHEMICAL COMPANY assumes no legal responsibility or liability whatsoever resulting from its use.

HI 7021
ORP Solution for Platinum and Gold Electrodes

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 7021 ORP Solution

Application: ORP Solution for Platinum and Gold Electrodes.
240 mV @ 25°C/77°F

Additional Product Codes: HI 7021L
HI 7021M
HI 7021/G

Company Information (USA):
Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information:
1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air.

After Skin Contact: Wash effected area with plenty of water.

After Eye Contact: Rinse out with water.

After Swallowing: Wash out mouth thoroughly with water and give plenty of water to drink. In severe cases obtain medical attention.

General Information: Remove contaminated, soaked clothing immediately and dispose of safely.

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:

Water spray, Carbon Dioxide, Dry Chemical Powder, Appropriate Foam.

Special Risks:

Non-combustible.

Special Protective Equipment:

Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:

NA

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

Avoid formation of dusts. Do not inhale dusts. Avoid substance contact.

Environmental Precautions:

Do not discharge into the drains/surface waters/groundwater.

Additional Notes:

Take up dry. Clean up affected area and dispose according to local regulation. Avoid generation of dusts.

SECTION 7: HANDLING AND STORAGE

Handling:

Cannot be stored indefinitely.

Storage:

Tightly closed. Store at room temperature (+15 to +25 °C recommended). Protect from light.

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

Protective clothing should be selected specifically for the working place, depending on concentration and quantity of the hazardous substances handled.

Respiratory Protection:	***Protective Gloves:***	***Eye Protection:***
Required when vapors/aerosols are generated. Work under hood.	Rubber or plastic	Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Yellow liquid	***Odor:***	Odorless	***Density at 20° C:***	~ 1 g/cm³
Melting Point:	NA	***Boiling Point:***	ND	***Solubility:***	Soluble
pH at 20° C:	~ 7	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Strong Heating

Hazardous Decomposition Products:

None

Hazardous Polymerization:

Will not occur.

Substances to be Avoided:

The generally known reaction partners of water

Further Information:

Not available

SECTION 11: TOXICOLOGICAL INFORMATION

No toxic effects are to be expected when the product is handled appropriately.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data:

SECTION 12: ECOLOGICAL INFORMATION

No environmental hazard.

Further Data: Can be safely disposed off as an ordinary refuse.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal:

SECTION 14: TRANSPORTATION INFORMATION

Land:	***Sea:***	***Air:***
Not subject to transport regulations	Not subject to transport regulations	Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2008-01-17
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

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HANNA® instruments

HI 7031

Conductivity Calibration Solution, 1413 µS/cm @ 25°C/77°F

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 7031 Conductivity Calibration Solution

Application: For calibrating electrodes. 1413 µS/cm @ 25°C/77°F

Additional Product Codes: HI 7031/1G HI 7031L HI 7031L/C HI 7031M HI 7031/120ML

Company Information (USA):
Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information:
1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.

After Skin Contact: Wash effected area with water and soap.

After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.

After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.

General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:
Water Spray, Foam, Dry Powder, Carbon Dioxide

Special Risks:
Non-combustible.

Special Protective Equipment:
Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:
Contain escaping vapors with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless liquid	***Odor:***	Odorless	***Density at 20° C:***	~ 1 g/cm³
Melting Point:	NA	***Boiling Point:***	> 100 °C	***Solubility:***	Soluble
pH at 20° C:	~ 7	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Strong Heating (above boiling point). Stable in the recommended storage conditions.

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

Quantitative data on the toxicity of this product is not available.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as an ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:	*Sea:*	*Air:*
Not subject to transport regulations	Not subject to transport regulations	Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2008-01-17
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

LIQUINOX MSDS

Section 1 : MANUFACTURER INFORMATION

Supplier: Same as manufacturer.

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Manufacturer emergency phone number: 800-255-3924.
813-248-0585 (outside of the United States).

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Supplier MSDS date: 2005/02/24

D.O.T. Classification: Not regulated.

Section 2 : HAZARDOUS INGREDIENTS

C.A.S.	CONCENTRATION %	Ingredient Name	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENESULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE

Section 3 : PHYSICAL / CHEMICAL CHARACTERISTICS

Physical state: Liquid.

Appearance & odor: Odourless.
Pale yellow.

Odor threshold (ppm): Not available.

Vapour pressure (mmHg): @ 20°C (68°F).
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Vapour density (air=1): >1

Volatiles (%)

By volume: Not available.

Evaporation rate (butyl acetate = 1): < 1.

Boiling point (°C):	100 (212F)
Freezing point (°C):	Not available.
pH:	8.5
Specific gravity @ 20 °C:	(water = 1). 1.083
Solubility in water (%):	Complete.
Coefficient of water\oil dist.:	Not available.
VOC:	None

Section 4 : FIRE AND EXPLOSION HAZARD DATA

Flammability:	Not flammable.
Conditions of flammability:	Surrounding fire.
Extinguishing media:	Carbon dioxide, dry chemical, foam. Water Water fog.
Special procedures:	Self-contained breathing apparatus required. Firefighters should wear the usual protective gear. Use water spray to cool fire exposed containers.
Auto-ignition temperature:	Not available.
Flash point (°C), method:	None
Lower flammability limit (% vol):	Not applicable.
Upper flammability limit (% vol):	Not applicable.

Not available.

Sensitivity to mechanical impact:	Not available.
Hazardous combustion products:	Oxides of carbon (COx). Hydrocarbons.
Rate of burning:	Not available.
Explosive power:	Containers may rupture if exposed to heat or fire.

Section 5 : REACTIVITY DATA

Chemical stability:	Product is stable under normal handling and storage conditions.
Conditions of instability:	Extreme temperatures.
Hazardous polymerization:	Will not occur.
Incompatible substances:	Strong acids. Strong oxidizing agents.
Hazardous decomposition products:	See hazardous combustion products.

Section 6 : HEALTH HAZARD DATA

Route of entry:	Skin contact, eye contact, inhalation and ingestion.
Effects of Acute Exposure	
Eye contact:	May cause irritation.
Skin contact:	Prolonged and repeated contact may cause irritation.
Inhalation:	May cause headache and nausea.
Ingestion:	May cause vomiting and diarrhea. May cause gastric distress.
Effects of chronic exposure:	See effects of acute exposure.
LD50 of product, species & route:	> 5000 mg/kg rat oral.
LC50 of product, species & route:	Not available.
Exposure limit of material:	Not available.
Sensitization to product:	Not available.
Carcinogenic effects:	Not listed as a carcinogen.
Reproductive effects:	Not available.
Teratogenicity:	Not available.
Mutagenicity:	Not available.
Synergistic materials:	Not available.
Medical conditions aggravated by exposure:	Not available.
First Aid	
Skin contact:	Remove contaminated clothing. Wash thoroughly with soap and water. Seek medical attention if irritation persists.
Eye contact:	Check for and remove contact lenses. Flush eyes with clear, running water for 15 minutes while holding eyelids open: if irritation persists, consult a physician.
Inhalation:	Remove victim to fresh air. If irritation persists, seek medical attention.
Ingestion:	Do not induce vomiting, seek medical attention. Dilute with two glasses of water. Never give anything by mouth to an unconscious person.

Section 7 : PRECAUTIONS FOR SAFE HANDLING AND USE

Leak / Spill:	Contain the spill. Prevent entry into drains, sewers, and other waterways. Wear appropriate protective equipment. Small amounts may be flushed to sewer with water. Soak up with an absorbent material. Place in appropriate container for disposal. Notify the appropriate authorities as required.
Waste disposal:	In accordance with local and federal regulations.
Handling procedures and equipment:	Protect against physical damage. Avoid breathing vapors/mists. Wear personal protective equipment appropriate to task.

Wash thoroughly after handling.
Keep out of reach of children.
Avoid contact with skin, eyes and clothing.
Avoid extreme temperatures.
Launder contaminated clothing prior to reuse.

Storage requirements: Store away from incompatible materials.
Keep containers closed when not in use.

Section 8 : CONTROL MEASURES

Precautionary Measures

Gloves / Type:

Wear appropriate gloves.

Respiratory / Type: None required under normal use.

Eye / Type:

Safety glasses recommended.

Footwear / Type: Safety shoes per local regulations.

Clothing / Type: As required to prevent skin contact.

Other / Type: Eye wash facility should be in close proximity.
Emergency shower should be in close proximity.

Ventilation requirements: Local exhaust at points of emission.

Material Safety Data Sheet
Methanol

ACC# 14280

Section 1 - Chemical Product and Company Identification

MSDS Name: Methanol
Catalog Numbers: AC167830000, AC167830025, AC167835000, AC176840000, AC176840010, AC176840025, AC176840250, AC176845000, AC177150000, AC177150010, AC177150025, AC177150050, AC177150051, AC177150250, AC177150251, AC268280000, AC268280010, AC268280025, AC325740000, AC325740010, AC325740025, AC326630000, AC326630010, AC326630025, AC326950000, AC326950010, AC326951000, AC326952500, AC327900000, AC327900010, AC364390000, AC364390010, AC364391000, AC413770000, AC413770040, AC413775000, AC423950000, AC423950010, AC423950040, AC423950200, AC423955000, AC610090040, AC610200040, AC610400010, AC61040019, AC61040019, AC61040050, AC61040050, AC610401000, AC61040115, AC61040115, AC61040200, AC610981000, AC611070040, AC615130025, S75162, S75163, S75959, S75965, S75965A, S75965HPLC, S93301, S93301A, S93302, S93302A, 19123467, A408-1, A408-4, A408-4LC, A408SK-4, A411-20, A411-4, A412-1, A412-20, A412-200, A412-200LC, A412-4, A412-4LC, A412-500, A412200001, A412CU-1300, A412FB-200, A412FB115, A412FB19, A412FB50, A412J500, A412P-4, A412P-4LC, A412POP19, A412POPB-200, A412RB-200, A412RB-50, A412RB115, A412RS-200, A412RS115, A412RS19, A412RS28, A412RS50, A412SK-4, A412SS-115, A412SS-200, A412SS-50, A413-20, A413-200, A413-4, A413-500, A433F-1GAL, A433P-1GAL, A433P-4, A433P1GAL, A433S-20, A433S-200, A433S-4, A434-20, A450-4, A452-1, A452-212, A452-4, A452-4LC, A452J1, A452N1-19, A452N2-19, A452POP-200, A452POP50, A452RS-115, A452RS-19, A452RS-200, A452RS-28, A452RS-50, A452SK-1, A452SK-4, A452SS-115, A452SS-19, A452SS-200, A452SS-28, A452SS-50, A453-1, A453-1LC, A453-4, A453-500, A453J1, A454-1, A454-4, A454-4LC, A454J1, A454RS-115, A454RS-200, A454RS-28, A454SS-19, A454SS-200, A454SS-28, A454SS-50, A455-1, A455RS19, A456-1, A456-4, A457-4, A4574LC, A935-4, A935RB-200, A935RB200, A947-4, A947-4LC, A947POP-200, A947POP200, A947RS-115, A947RS-200, A947RS-28, A947SS-115, A947SS-200, A947SS-28, A947SS-50, BP1105-1, BP1105-4, BP1105SS19, BP1105SS28, BP2618100, HC400 1GAL, NC9105104, NC9134255, NC9173853, NC9283877, NC9360649, NC9386568, NC9419923, NC9433033, NC9433739, NC9541632, NC9942270, NC9964975, SC95-1, SW2-1, TIA947-4, TIA947P-200, TIA947P-200L
Synonyms: Carbinol; Methyl alcohol; Methyl hydroxide; Monohydroxymethane; Wood alcohol; Wood naptha; Wood spirits; Columbian spirits; Methanol.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
67-56-1	Methanol	> 99	200-659-6

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: APHA: 10 max clear liquid. Flash Point: 12 deg C.
Danger! Poison! May be fatal or cause blindness if swallowed. Vapor harmful. **Flammable liquid and vapor.** Harmful if swallowed, inhaled, or absorbed through the skin. Causes eye, skin, and respiratory tract irritation. May cause central nervous system depression. Cannot be made non-poisonous.
Target Organs: Eyes, nervous system, optic nerve.

Potential Health Effects

Eye: May cause painful sensitization to light. Methanol is a mild to moderate eye irritant. Inhalation, ingestion or skin absorption of methanol can cause significant disturbances in vision, including blindness.
Skin: Causes moderate skin irritation. May be absorbed through the skin in harmful amounts. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis. Methanol can be absorbed through the skin, producing systemic effects that include visual disturbances.
Ingestion: May be fatal or cause blindness if swallowed. Aspiration hazard. Cannot be made non-poisonous. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause systemic toxicity with acidosis. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause cardiopulmonary system effects.
Inhalation: Methanol is toxic and can very readily form extremely high vapor concentrations at room temperature. Inhalation is the most common route of occupational exposure. At first, methanol causes CNS depression with nausea, headache, vomiting, dizziness and incoordination. A time period with no obvious symptoms follows (typically 8-24 hrs). This latent period is followed by metabolic acidosis and severe visual effects which may include reduced reactivity and/or increased sensitivity to light, blurred, doubl and/or snowy vision, and blindness. Depending on the severity of exposure and the promptness of treatment, survivors may recover completely or may have permanent blindness, vision disturbances and/or nervous system effects.
Chronic: Prolonged or repeated skin contact may cause dermatitis. Chronic exposure may cause effects similar to those of acute exposure. Methanol is only very slowly eliminated from the body. Because of this slow elimination, methanol should be regarded as a cumulative poison. Though a single exposure may cause no effect, daily exposures may result in the accumulation of a harmful amount. Methanol has produced fetotoxicity in rats and teratogenicity in mice exposed by inhalation to high concentrations that did not produce significant maternal toxicity.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Effects may be delayed.
Antidote: Ethanol may inhibit methanol metabolism.

Section 5 - Fire Fighting Measures

General Information: Ethanol may inhibit methanol metabolism. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than

water and a fire may be spread by the use of water. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.

Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. Water may be ineffective. For large fires, use water spray, fog or alcohol-resistant foam. Do NOT use straight streams of water.
Flash Point: 12 deg C (53.60 deg F)
Autoignition Temperature: 455 deg C (851.00 deg F)
Explosion Limits, Lower:6.0 vol %
Upper: 31.00 vol %
NFPA Rating: (estimated) Health: 1; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Use water spray to disperse the gas/vapor. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Do not use combustible materials such as sawdust. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Do not ingest or inhale. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid use in confined spaces.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area. Keep containers tightly closed.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Methanol	200 ppm TWA; 250 ppm STEL; Skin - potential significant contribution to overall exposure by the cutaneous r oute	200 ppm TWA; 260 mg/m3 TWA 6000 ppm IDLH	200 ppm TWA; 260 mg/m3 TWA

OSHA Vacated PELs: Methanol: 200 ppm TWA; 260 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Clear liquid
Appearance: clear, colorless - APHA: 10 max
Odor: alcohol-like - weak odor
pH: Not available.
Vapor Pressure: 128 mm Hg @ 20 deg C
Vapor Density: 1.11 (Air=1)
Evaporation Rate:5.2 (Ether=1)
Viscosity: 0.55 cP 20 deg C
Boiling Point: 64.7 deg C @ 760 mmHg
Freezing/Melting Point:-98 deg C
Decomposition Temperature: Not available.
Solubility: miscible
Specific Gravity/Density:.7910 g/cm3 @ 20°C
Molecular Formula:CH4O
Molecular Weight:32.04

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: High temperatures, ignition sources, confined spaces.
Incompatibilities with Other Materials: Oxidizing agents, reducing agents, acids, alkali metals, potassium, sodium, metals as powders (e.g. hafnium, raney nickel), acid anhydrides, acid chlorides, powdered aluminum, powdered magnesium.
Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide, formaldehyde.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 67-56-1: PC1400000
LD50/LC50:
CAS# 67-56-1:
Draize test, rabbit, eye: 40 mg Moderate;
Draize test, rabbit, eye: 100 mg/24H Moderate;
Draize test, rabbit, skin: 20 mg/24H Moderate;
Inhalation, rabbit: LC50 = 81000 mg/m3/14H;
Inhalation, rat: LC50 = 64000 ppm/4H;
Oral, mouse: LD50 = 7300 mg/kg;
Oral, rabbit: LD50 = 14200 mg/kg;
Oral, rat: LD50 = 5600 mg/kg;
Skin, rabbit: LD50 = 15800 mg/kg;
.
Human LDLo Oral: 143 mg/kg; Human LDLo Oral: 428 mg/kg; Human TCLo Inhalation; 300 ppm caused visual field changes & headache; Monkey LDLo Skin: 393 mg/kg. Methanol is significantly less toxic to

most experimental animals than humans, because most animal species metabolize methanol differently. Non-primate species do not ordinarily show symptoms of metabolic acidosis or the visual effects which have been observed in primates and humans.
Carcinogenicity:
CAS# 67-56-1: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: There is no human information available. Methanol is considered to be a potential developmental hazard based on animal data. In animal experiments, methanol has caused fetotoxic or teratogenic effects without maternal toxicity.
Reproductive Effects: See actual entry in RTECS for complete information.
Mutagenicity: See actual entry in RTECS for complete information.
Neurotoxicity: ACGIH cites neuropathy, vision and CNS under TLV basis.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: 29.4 g/L; 96 Hr; LC50 (unspecified)Fish: Goldfish: 250 ppm; 11 Hr; resulted in deathFish: Rainbow trout: 8000 mg/L; 48 Hr; LC50 (unspecified)Fish: Rainbow trout: LC50 = 13-68 mg/L; 96 Hr.; 12 degrees CFish: Fathead Minnow: LC50 = 29400 mg/L; 96 Hr.; 25 degrees C, pH 7.63Fish: Rainbow trout: LC50 = 8000 mg/L; 48 Hr.; UnspecifiedBacteria: Phytobacterium phosphoreum: EC50 = 51,000-320,000 mg/L; 30 minutes; Microtox test No data available.
Environmental: Dangerous to aquatic life in high concentrations. Aquatic toxicity rating: TLm 96>1000 ppm. May be dangerous if it enters water intakes. Methyl alcohol is expected to biodegrade in soil and water very rapidly. This product will show high soil mobility and will be degraded from the ambient atmosphere by the reaction with photochemically produced hyroxyl radicals with an estimated half-life of 17.8 days. Bioconcentration factor for fish (golden ide) < 10. Based on a log Kow of -0.77, the BCF value for methanol can be estimated to be 0.2.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 67-56-1: waste number U154 (Ignitable waste).

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	METHANOL	METHANOL
Hazard Class:	3	3
UN Number:	UN1230	UN1230
Packing Group:	II	II
Additional Info:		FLASHPOINT 11 C

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 67-56-1 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 67-56-1: 5000 lb final RQ; 2270 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 67-56-1: immediate, fire.
Section 313
This material contains Methanol (CAS# 67-56-1, > 99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 67-56-1 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 67-56-1 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
T F
Risk Phrases:
R 11 Highly flammable.
R 23/24/25 Toxic by inhalation, in contact with skin and if swallowed.
R 39/23/24/25 Toxic : danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.

Safety Phrases:
S 16 Keep away from sources of ignition - No smoking.
S 36/37 Wear suitable protective clothing and gloves.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 7 Keep container tightly closed.

WGK (Water Danger/Protection)

CAS# 67-56-1: 1

Canada - DSL/NDSL

CAS# 67-56-1 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B2, D1B, D2B.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 67-56-1 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 7/21/1999
Revision #14 Date: 9/05/2006

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

MSDS Number: N3660 * * * * * *Effective Date: 11/18/09* * * * * *Supercedes: 11/07/08*

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, 50-70%

1. Product Identification

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 50%; Nitric Acid 65%; nitric acid 69-70%
CAS No.: 7697-37-2
Molecular Weight: 63.01
Chemical Formula: HNO3
Product Codes:
J.T. Baker: 5371, 5796, 5801, 5826, 5856, 5876, 5896, 9597, 9598, 9600, 9601, 9602, 9603, 9604, 9606, 9607, 9608, 9610, 9616, 9617, 9670, 9761
Mallinckrodt: 1409, 2704, 2705, 2706, 2707, 2716, 6623, H862, H988, H993, H998, V077, V650

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	50 - 70%	Yes
Water	7732-18-5	30 - 50%	No

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.
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 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 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.

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.

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, 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.

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, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. 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.

9. Physical and Chemical Properties

Appearance:
Colorless to yellowish liquid.
Odor:
Suffocating, acrid.
Solubility:
Infinitely soluble.
Specific Gravity:
1.41
pH:
1.0 (0.1M solution)
% Volatiles by volume @ 21C (70F):
100 (as water and acid)
Boiling Point:
122C (252F)
Melting Point:
-42C (-44F)
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, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Light and heat.

11. Toxicological Information

Nitric acid: Inhalation rat LC50: 244 ppm (NO2)/30M; Investigated as a mutagen, reproductive effector. Oral (human) LDLo: 430 mg/kg.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Nitric Acid (7697-37-2)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

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.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8, 5.1
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 6.5GL

International (Water, I.M.O.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8, 5.1
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 6.5GL

International (Air, I.C.A.O.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8, 5.1
UN/NA: UN2031
Packing Group: II

Information reported for product/size:

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Nitric Acid (7697-37-2)	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.
Nitric Acid (7697-37-2)	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)
Nitric Acid (7697-37-2)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

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.

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0** 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 get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 14.
Disclaimer:
****
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.

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.

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.

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.

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.

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.

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\---------------------------------
                                                      --Canada--
Ingredient                                    Korea  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\----------------
                                          -SARA 302-    ------SARA 313------
Ingredient                                RQ    TPQ     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\----------------
                                                 -RCRA-    -TSCA-
Ingredient                                CERCLA     261.33     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.

---

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.)

APPENDIX I

QUALITY ASSURANCE PROJECT PLAN/FIELD ACTIVITIES PLAN

APPENDIX I

SITE-SPECIFIC FIELD ACTIVITIES PLAN
&
QUALITY ASSURANCE PROJECT PLAN

for the

BALDWIN PLACE SHOPPING CENTER (NOW SOMERS COMMONS)

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3.1 Sample Container, Preservation, and Hold Time Requirements

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ASP	Analytical Services Protocol
cc	cubic centimeter
COC	chain of custody
DO	dissolved oxygen
DQOs	Data Quality Objectives
EDD	electronic data deliverable
EDS	Electronic Document Standards
ELAP	Environmental Laboratory Approval Program
FAP	Field Activities Plan
FDR	Field Data Record
ft	foot/feet
HASP	Health and Safety Plan
Hg	mercury
ID	identification
K	hydraulic conductivity
L	liter
LCS	laboratory control samples
LTM	long term monitoring
mg	milligram(s)
MS	matrix spike

GLOSSARY OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

MSD	matrix spike duplicate
NAPL	non-aqueous phase liquid
NTU	nephelometric turbidity unit
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O.D.	outside diameter
PID	photoionization detector
QA	quality assurance
QAPjP	Quality Assurance Project Plan
QC	quality control
RPD	relative percent difference
Site	Baldwin Place Shopping Center site
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

1.0 PROJECT OBJECTIVES AND DESCRIPTION

1.1 PURPOSE

The purpose of this site-specific Field Activities Plan (FAP) / Quality Assurance Project Plan (QAPjP) is to provide the quality assurance/quality control (QA/QC) objectives for data measurement, describe sampling and analysis procedures to meet the objectives, and summarize reporting requirements for sampling activities undertaken at the Baldwin Place Shopping Center (Site).

The FAP/QAPjP provides guidance and specifications for the following:

- samples are obtained under controlled conditions using appropriate and documented procedures;
- samples are identified uniquely and controlled through sample tracking systems and chain-of-custody (COC) protocols;
- field determinations and laboratory analytical results are of known quality and are valid and consistent through using approved methods, preventive maintenance, calibrations, analytical protocols, QC measurements, reviews, audits, and correcting out-of-control situations;
- calculations and evaluations are accurate, appropriate, and consistent throughout the project;
- data are validated and their use in calculations is documented; and
- records are retained as documentary evidence of the quality of samples, applied processes, equipment, and results.

1.2 SCOPE

This Plan has been prepared in support of remedial sampling conducted at the Site. The requirements of this FAP/QAPjP apply to Site Owner and the New York State Department of Environmental Conservation (NYSDEC) (or their designee). The content and format of the FAP/QAPjP is based on:

- DER-10: Technical Guidance for Site Investigation and Remediation - Issued 05/03/2010, and
- *Guidance for Quality Assurance Project Plans - EPA QA/G-5 (EPA/240/R-02/009)* prepared by the United States Environmental Protection Agency (USEPA) (USEPA, 2002).

2.0 QUALITY ASSURANCE / QUALITY CONTROL OBJECTIVES FOR DATA MEASUREMENT

Data quality levels for the Site are described below:

Level I - Field Screening. This level is characterized by the use of portable instrumentation that can provide real time data to assist in the optimization of sampling point locations and for health and safety monitoring. Data can be generated indicating the presence or absence of certain contaminants, especially volatiles, at sampling locations. These measurements may include hand held photoionization detector (PID) for volatile organic compounds (VOC) monitoring, and instruments used for measuring temperature, pH, specific conductance, dissolved oxygen (DO), and turbidity during water sampling. Calibration and data recording procedures for the field testing instruments are described in Section 6.

Level III - Laboratory Analysis. Subcontract laboratory-generated data will be obtained using USEPA or NYSDEC-approved procedures. Analyses will be completed by a laboratory with New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certification. Laboratory services will be completed in accordance with the NYSDEC Analytical Services Protocol (ASP) with the following Data Quality Objectives (DQOs):

- Remedial system performance - Category A
- Long Term Monitoring (LTM) - Category B

2.1 PRECISION, ACCURACY, REPRESENTATIVENESS, COMPLETENESS, COMPARABILITY

Analytical data will be evaluated for data quality, the degree of uncertainty with respect to precision, accuracy, representativeness, completeness, and comparability. Specific objectives for each of these

characteristics are established to develop sampling protocols, and to identify applicable documentation, sample handling procedures and measurement system procedures.

2.1.1 Precision

Precision is defined as the agreement among individual measurements of the same chemical constituent in a sample, obtained under similar conditions. Field precision will be expressed as relative percent difference (RPD) of field duplicates:

$$\frac{(X_1 - X_2)}{X_1 + X_2/2} \times 100 = RPD$$

where,

RPD	=	relative percent difference between duplicate results
X1 and X2	=	results of duplicate analyses
$\lvert X1 - X2 \rvert$	=	absolute difference between duplicates X1 and X2

Field duplicates take into account the level of error introduced by field sampling techniques, field conditions, and analytical variability.

2.1.2 Accuracy

Accuracy is defined as the degree to which the analytical measurement reflects the true concentration level present. Accuracy will be measured as percent recovery for spiked analyses including laboratory control samples (LCS), surrogates spikes, and matrix spikes. A spike is a sample to which predetermined quantities of standard solutions of certain target analytes are added prior to sample extraction/digestion and analysis. These compounds are spiked into all blanks, standards, and samples prior to analysis. Percent recoveries of the LCS, surrogate, and matrix spikes will be reported by the laboratory. Variations from 100 percent recovery may be due to method extraction and analysis efficiency, matrix interferences, laboratory spike handling procedures, or sample heterogeneities between replicates.

The percent recovery of the spikes can be calculated from the following equation:

$$\frac{X - B}{T} \times 100 = REC$$

where,

X	=	measured amount in sample after spiking
B	=	background amount in sample
T	=	amount of spike added

2.1.3 Representativeness

Representativeness expresses the degree to which sample data depict existing site conditions. Measurements will be made so that analytical results are representative of the media (e.g., soil, water, and sediments) and conditions being measured, to the extent possible. Representative data are collected by establishing standardized procedures for identification (ID) of sample locations and sampling techniques, and the collection of a sufficient number of samples. Sampling protocols are designed to collect representative samples of the media. Sample handling protocols (e.g., storage, transportation, holding time, sample preservation) are selected to protect the representativeness of the collected sample during shipment to the laboratory. Proper documentation will establish that protocols have been followed and sample ID and integrity are assured.

QC blanks including laboratory method blanks and field QC blanks are also collected to evaluate potential for samples to be cross- contaminated during sample collection or lab analysis.

2.1.4 Completeness

The characteristic of completeness is a measure of the amount of valid data obtained compared to the amount that was expected. The completeness of data generated during each sampling task will be evaluated by the project team when data review is completed and sample data are considered final.

2.1.5 Comparability

The characteristic of comparability reflects: (1) the internal consistency of measurements made at the site, (2) the expression of results in units consistent with other organizations reporting similar data, and (3) the confidence with which one data set can be compared to other similar measurements. Comparability will be established through the use of NYSDOH ELAP certified laboratory(s) and USEPA and other standard analytical methods used by the environmental testing industry to provide chemical data that meet the project DQOs.

3.0 SAMPLING PROCEDURES

The following sampling procedures will be used while collecting samples for the site for site management (SM) purposes.

3.1 SAMPLE LABELS AND RECORDS

Each sample may require several labels for the different containers, depending on the analysis to be performed. ID of samples collected during the remedial system performance or LTM sample will adhere to the following conventions:

RW-1S[2] (Influent)	MW-7M1
RW-2D[2] (Influent)	MW-7M2
MW-4S	MW-10D
MW-4D	MW-12S1
MW-5S	MW-12M
MW-7S	MW-101D
MW-7D	13 Meadow Park Road
MW-8S	6 Meadow Park Road
MW-9S	12 Meadow Park Road
MW-9D	21 Meadow Park Road
MW-12S	SS-03
MW-101M	IA-03
MW-2S	SS-04
MW-2D	IA-04
MW-3D	OA-1
MW-3DD	

Notes:
MW = monitoring well RW = recovery (extraction) well
SS = sub-slab vapor IA = indoor air OA = outdoor ambient air
[2] = RW-1S and RW-2D are collected from the sample port within Plant 1

At the time the sample is obtained a field data record (FDR) sheet will be completed (see Appendix A). The sample record documentation will include:

- Sample ID
- Description of the sample
- Physical descriptors of the sample, as appropriate (e.g., depth to groundwater, etc.)
- Sampling parameters, as appropriate
- Sketch and/or list of photograph(s) taken
- Notable observations

3.2 SAMPLE CONTAINER, PRESERVATION REQUIREMENTS, AND ANALYTICAL HOLDING TIMES

Sample containers, preservation methods, and analytical holding times are summarized in Table 3.1. Pre-preserved sample containers will be provided by the laboratory.

3.3 DECONTAMINATION PROCEDURES

Equipment to be decontaminated during the sampling tasks may include monitoring equipment, sample collection equipment, and sample containers. Decontamination will be done by personnel in protective gear appropriate for the level of decontamination as determined in the Health and Safety Plan (HASP).

Direct or obvious contamination on equipment or sample containers will be brushed or wiped with a clean paper towel. The equipment will then be wiped off with damp disposable wipes and dried, if necessary. Sample handling areas will be cleaned/wiped down daily using clean paper towels.

3.4 SAMPLING TECHNIQUES AND PROCEDURES

At the time samples are obtained, the following will be recorded by the sampler in the field logbook and/or on sample data sheets:

- sample id;
- sample type;
- date and time of sampling;
- sampler initials,
- analysis requested.

3.4.1 Groundwater Monitoring Well Water Level Gauging

Collecting a round of water level measurement will be performed prior to low flow groundwater sampling. Gauging and sampling will proceed from the upgradient or background wells to the downgradient or potentially contaminated wells, as best as can be determined, as follows:

1. Check the well for proper ID and location.
2. Measure and record the height of the protective casing above ground surface.
3. After unlocking the well and removing any well caps, measure and record the ambient and well-mouth organic vapor levels using a PID.
4. Measure and record the distance between the top of the well and the top of the protective casing.
5. Using the electronic water level meter, measure and record the static water level in the well and the depth to the well bottom to the nearest 0.01 ft. Measurements will be referenced from the top of the well riser as opposed to the protective casing, when feasible. Record the depth to water in the logbook and/or Groundwater Sample Data Record. Rinse or wipe the water level meter once removed from the well.
6. Calculate the volume of water in the well. Volume in gallons for a well equals 0.041 times the square of the inside diameter of the well riser, in inches, times the depth of water, in ft. Volume calculations are detailed on the Groundwater Sample Data Record.

3.4.2 Low Flow Groundwater Sampling

Procedure below is based on the low-flow purging and sampling procedure presented in the "USEPA Region 1 - New England Low Stress (low-flow) Purging and Sampling Procedures for the Collection of Ground Water Samples from Monitoring Wells", Revision 3, January 19, 2010 (USEPA, 2010a).

Sample collection information will be recorded on the Low Flow Groundwater Sampling Record (Appendix A).

Sampling will be conducted using the following procedure:

1. Determine target depth for location of the pump intake. Target depth should be the portion of the screened interval that intersects the zone of highest hydraulic conductivity (K). If the zone of highest K is unknown, or if the screen is placed within homogenous material, then the target depth shall be the midpoint of the saturated screen length. Primary flow zones should be identified in wells with screen lengths longer than 10 ft.
2. Measure and record the depth to water. Care should be taken to minimize disturbance of the water column within the well during pre-sample measurements.
3. Decontaminate pump prior to use (if pumps are dedicated then this applies to the initial effort only). Attach appropriate length of dedicated high density polyethylene tubing or mark the tubing at the appropriate point so that when the pump and tubing are lowered into the well, and the mark is at the top of the well riser, the pump shall be located at the target depth within the screened interval.
4. Carefully lower the pump to the predetermined target depth. Start the pump at a purge rate low enough to achieve 0.3 ft of drawdown or less based on historical data. If sampling the well for the first time, start the pump at the lowest possible setting (or approximately 100-milliliters per minute) and slowly increase the speed until discharge occurs. Check water level. Adjust pump speed until there is little or no drawdown (less than 0.3 ft) if possible. If stabilized drawdown cannot be achieved, use the no-purge method described later in this section.
5. Monitor and record pumping rate and water levels every 3 to 5 minutes (or as appropriate) during purging. Record any adjustments to pumping rates.
6. During purging, monitor field parameters using a flow through cell (the flow through cell cannot be used for turbidity measurements and the sample for turbidity measurement must be collected prior to entering the flow through cell). Purging is considered complete and sampling may begin when the field parameters have stabilized. Stabilization is considered to be achieved when three consecutive readings, taken at 3 to 5 minute intervals, are within the following limits:
    - Turbidity (+/- 10% for values >10 nephelometric turbidity units (NTUs) if turbidity is greater than 10 and well is not stable, continue purging well for up to two hours, collect sample and document on field data record and in log book (collection of a filtered sample for metals analysis may be necessary if turbidity is greater than 50 NTUs).)
    - DO (+/- 10% for values greater than 0.5 milligram per liter (mg/L). If three dissolved oxygen values are < 0.5 mg/L, consider the values stabilized)
    - Specific conductivity (+/- 3%)

- Temperature (+/- 3%)
- pH (± 0.1 unit)
- oxidation reduction potential (± 10 millivolts)

7. The final purge volume must be greater than the stabilized drawdown volume plus the tubing extraction volume.
8. During purging and sampling the tubing should remain filled with water.
9. Disconnect the tubing from the flow through cell to collect the analytical samples. Water samples for laboratory analyses must not be collected after water has passed through the flow through assembly. Fill sample containers directly from the tubing without alterations to the pumping rate.
10. The VOC fraction shall be collected first. The VOC sample container shall be completely filled without air space within the container. The remaining samples shall be collected for polynuclear aromatic hydrocarbons, polychlorinated biphenyls, metals, and other fraction specified.
11. For subsequent sampling efforts, duplicate the pump intake depth and final purge rate from the initial sampling event (use final pump dial setting information).
12. If using non-dedicated equipment, remove the pump and decontaminate by flushing with the decontamination fluid. Obtain and record a depth to bottom of well measurement before closing the well.
13. Complete the Low flow Groundwater Sampling Record as each well is sampled. Include any observations made during sampling such as color, odor, etc., in the field logbook and field sample data record.
14. Secure the well cap and lock.

3.4.3 Groundwater Sampling Using Aqueous Diffusion Samplers

This procedure is designed to permit the collection of representative groundwater samples for analysis of VOCs. Groundwater sampling using aqueous diffusion samplers will be conducted using the procedures described below and in accordance with the User's Guide for Polyethylene-Based Passive Diffusion Bag Samplers to Obtain Volatile Organic Compound Concentrations in Wells (Vroblesky, 2001).

Aqueous diffusion samplers are constructed by sealing de-ionized water in polyethylene tubing (1-millimeter thickness is typical). Tubing sizes vary, but can be up to 2-feet long. Samplers can be

acquired pre-filled with laboratory de-ionized water, or assembled by the sampler. If assembled by the sampler, on option is to seal the de-ionized water in the polytubing by using a heat seal device.

One end of the polytube is rolled over onto itself several times then heat is applied to seal this end. The polytube is then filled with de-ionized water. The top end (unsealed end) of the tube is then rolled over onto itself until there is no headspace in the polytube; heat is then applied to seal this end. Care is taken to ensure that no headspace or air bubbles are present in the tube prior to sealing the top end. The samplers are weighted with stainless steel weights, and a stainless steel line is attached to the top of the sampler for placement and retrieval.

Should this technique be used, sampling will be conducted using the following procedures:

1. Enter the following information in the field logbook and FDR, as appropriate, prior to installation of the diffusion sampler: date and time of sampler installation, depth of sampler, and total depth of well.
2. Attaching weight to the base of the sampler and stainless steel line to the top of the sampler.
3. Install the sampler at the predetermined depth, attaching the top of the line to a secure location at the ground surface and the well cap should be replaced to ensure surface water does not enter the well. The depth of the sampler will be determined prior to installation, based on previous sampling data or previously collected aqueous diffusion samplers.
4. Allow the sampler to equilibrate for approximately 14 days. Return after no less than 14 days to retrieve the sampler. Samplers can remain in the well for longer than 14 days, if necessary.
5. Enter the following information in the field logbook and FDR, as appropriate, during retrieval of diffusion sampler: date and time of sampler retrieval, analytical method, and quality assurance/quality control data as necessary.
6. Retrieve the diffusion sampler from the well and note any observations on the FDR (possible tears, iron build up, etc.).
7. After retrieving sampler, install an in-well water quality parameter meter such as a YSI 556 or equivalent. Remove the line and weight, and make a diagonal cut toward the top of the sampler. The diagonal cut allows easier filling of the sample containers. A dealer supplied discharge device may also be used.

8. Begin filling the volatile organic compound sample containers from the diagonal cut or discharge device by allowing the water to flow gently down the inside of the container with as little agitation or minimal aeration as possible.
9. Label each sample container upon filling. Placed sample containers into a cooler with ice.
10. After sample collection is complete, record water quality parameter readings and then remove the water quality meter from the well. Cap and lock the well.
11. Complete remaining portions of the Groundwater Grab FDR (Appendix A) after each well is sampled, including sample date and time (time of retrieval from the well), well sampling sequence, types of sample bottles used, sample ID numbers, preservatives used, parameters requested for analysis, and field observations of the sampling event.

3.4.4 Domestic Private Well Sampling

Domestic private wells will be sampled using the same procedures described for groundwater monitoring wells, with the exception of using in-place plumbing equipment. Prior to sampling, the well owner will be contacted to arrange for a mutually agreeable time for sample collection. Sample collection will be performed as close to the pump as practical. When possible, samples will be taken up-line from aerators, softeners, or filtering systems. If there is no outlet available up-line from the water treatment system, attempts will be made to by-pass the system, if possible.

When the necessary information is available, the purge volume will be calculated to ensure purging of one storage volume, based on pressure tank volume, before sampling. If such information is unavailable, the tap will be opened and the water will be allowed to run for a minimum of fifteen minutes and until the pH and temperature stabilize. Sample containers will be filled directly from the tap or faucet. Groundwater data will be recorded on a Groundwater Grab Sampling Record (FDR in Appendix A)

3.4.5 Air Sampling Methodology

Substructure soil vapor, soil vapor, and/or ambient air sampling will be performed in accordance with DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, 2010a), DER-13 Strategy for Evaluating Soil Vapor Intrusion at Remedial Sites in New York (NYSDEC,

2006a), and the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, 2006). Field data from the collection of air samples will be recorded on an Indoor Air Quality Questionnaire and Building Inventory form and on a field data form (see Appendix A).

3.4.5.1 8-Hour Substructure Soil Vapor Sampling

Substructure soil vapor samples will be collected from beneath the Home Goods (Unit 6) commercial building at locations specified in the SM Plan (SMP) using SUMMA® type air canisters equipped with metering flow controllers for the purpose of collecting a "time-averaged" soil vapor sample. This technique is intended for 8-hour sample collection and will be collected in conjunction with indoor air samples. Substructure soil vapor samples will be collected from historical sampling locations specified in the SMP.

Subslab soil vapor sample obtained via permanently installed sampling point.

1. **Prepare the sample collection point.**
    - Conduct interview with occupant/owner. Complete Indoor Air Quality Questionnaire and Building Inventory Form (Appendix A).
    - Observe the condition of the building floor slab for apparent penetrations such as concrete floor cracks, floor drains, or sump holes.
    - Note the floor conditions on the sampling form.
    - Using the PID, screen indoor air in the area of floor penetrations such as concrete floor cracks, floor drains, or sump holes. Record the indoor air PID readings on the sampling form.

2. **Preparation of 24-hour SUMMA®-type canister and collection of sample**
    - Connect a two foot section of ¼-inch outside diameter (O.D.) Teflon® tubing to the permanent sampling port. Purge the probe point and tubing using a polyethylene 60 cubic centimeter (cc) syringe. Close the syringe valve, remove and cap the syringe. The air/soil vapor syringe will be discharge out of doors.
    - Remove brass plug from canister fitting.

- Install pressure gauge/metering valve on canister valve fitting and tighten. If pressure gauge has additional (2nd) fitting, install brass plug from canister fitting into gauge fitting and tighten.
- Connect subsurface probe to end of in-line particular filter via ¼-inch O.D. Teflon® tubing and "swagelok®-type" fittings. For duplicate sample locations connect a second canister by installing a 1/4-inch stainless steel "tee" fitting between the probe point and the first canister.
- Record SUMMA®-type canister serial number on sampling summary form and COC.
- Record sample ID on canister ID tag, and record on sampling summary form and COC.
- Open canister valve and in-line stainless steel valve to initiate sample collection.
- Record gauge pressure on sample summary form and COC. Gauge pressure must read >25 inches mercury (Hg). Replace SUMMA®-type canister if gauge pressure reads <25 inches Hg.
- Record date and local time (24-hour basis) of valve opening on sampling summary form and COC.
- Take digital photograph of SUMMA®-type canister and surrounding area.

4. Termination of 24-hour sample collection

- Revisit SUMMA®-type canister approximately at end of sample collection period (e.g., 8 hours after initiation of sample collection) and record gauge pressure on sampling form and COC.
- Record date and local time (24-hour basis) of valve closing on sampling form and COC.
- Close canister valve.
- Disconnect Teflon® tubing and remove pressure gauge / flow valve from canister.
- Reinstall brass plug on canister fitting and tighten.
- Remove SUMMA®-type canister from sample collection area.
- Clean sampling area to pre sampling conditions.

5. Preparation and shipment of sample to analytical laboratory

- Pack SUMMA®-type canister in shipping container, note presence of brass plug installed in tank fitting.
- Complete COC and place requisite copies in shipping container.
- Close shipping container and affix custody seal to container closure.

Subslab soil vapor sample obtained via temporary installed sampling port through apparent vapor barrier (i.e. concrete floor slab) IF PERMANENT POINT NOT USABLE. Follow the subslab procedures as above, with the exception of installing the temporary sample port as follows:

- Observe the condition of the building floor slab for apparent penetrations such as concrete floor cracks, floor drains, or sump holes.
- Note the floor conditions on the sampling form and select a potential location or locations for a temporary subsurface probe.
- The location or locations should be central to the building away from foundation walls and apparent penetrations.
- Review the proposed location or locations with the occupant/owner describing how the sampling port or ports will be installed.
- After receiving' permission from the occupant/owner, mark the proposed location(s) and describe the location(s) on the sampling form.
- Drill a 3/8 or 1/2-inch diameter hole through the concrete slab using an electric hammer drill. Extend the hole about three inches into the subslab material. Sweep hole to remove excess dust.
- Insert a three foot section of ¼-inch O.D. Teflon® tubing to the bottom of the floor slab. Seal the annular space between the hole and 1/4-inch tubing using a seal approved by the NYSDEC, such as Plastalina non-hardening modeling clay.
- Purge the tubing using a polyethylene 60 cc syringe as described above and connect to SUMMA®-type canister.
- Upon completion of sampling, fill the hole with a quick drying hydraulic cement. Finish flush with floor surface.

3.4.5.2 Indoor Air Sampling

Indoor air samples will be collected from the Home Goods (Unit 6) commercial building from the locations specified in the SMP. This technique is intended to be a general directive for the collection of indoor air samples using SUMMA®-type air canisters equipped with metering flow controllers for the purpose of collecting a "time-averaged" indoor air sample. This procedure is intended for 24-hour sample collection and will be collected in conjunction with 24 hour substructure soil vapor sampling. Indoor air data will be recorded on a field data form (Appendix A).

1. Selection and Preparation of indoor air sample collection area

- Conduct interview with occupant/owner. Complete Indoor Air Quality Questionnaire and Building Inventory Form (Appendix A).
- Observe the area for the apparent presence of items or materials that may potentially produce or emit VOCs and interfere with analytical laboratory analysis of the collected sample. Record relevant information on Building Inventory Form and document with digital photographs.
- Using the PID, screen indoor air in the location intended for sampling and in the vicinity of potential VOC sources (i.e. paints, glues, household cleaners, dry cleaned clothes, etc.) to assess the potential gross presence of VOCs. Record PID readings on the sampling form. Items or materials exhibiting PID readings shall be considered probable sources of VOCs and, given approval of the owner or occupant, will be removed prior to sampling. If practical, sampling will be rescheduled for 24-hours later.

2. Preparation of SUMMA®-type canister and collection of indoor air sample

- Place SUMMA®-type canister at breathing zone height (approximately 3 to 5 ft above floor). Canister can be placed on a stable surface, such as a table or bookshelf, or affixing to a wall or ceiling support with nylon rope. Avoid placing canisters near windows or other potential sources of drafts and air supply vents.
- Record SUMMA®-type canister serial number on sampling summary form and COC.
- Record sample ID on canister ID tag, and record on sampling summary form and COC.

- Remove brass plug from canister fitting.
- Install pressure gauge / metering valve on canister valve fitting and tighten. If pressure gauge has additional (2nd) fitting, install brass plug from canister fitting into gauge fitting and tighten.
- Open and close canister valve.
- Record gauge pressure on sample summary form and COC. Gauge pressure must read >25 inches Hg. Replace SUMMA®-type canister if gauge pressure reads <25 inches Hg.
- Remove brass plug from gauge fitting and store for later use.
- Open canister valve to initiate sample collection.
- Record date and local time (24-hour basis) of valve opening on sampling summary form and COC.
- Take digital photograph of SUMMA®-type canister and surrounding area.

3. Termination of indoor air sample collection

- Revisit SUMMA®-type canister approximately at end of sample collection period (e.g., 24 hours after initiation of sample collection) and record gauge pressure on sampling form and COC.
- Record date and local time (24-hour basis) of valve closing on sampling form and COC.
- Close canister valve.
- Remove pressure gauge / flow valve from canister.
- Reinstall brass plug on canister fitting and tighten.
- Remove SUMMA®-type canister from sample collection area.

4. Preparation and shipment of sample to analytical laboratory

- Pack SUMMA®-type canister in shipping container, note presence of brass plug installed in tank fitting.
- Complete COC and place requisite copies in shipping container.
- Close shipping container and affix custody seal to container closure.

3.4.5.3 Ambient Air Sampling

Ambient (outdoor) air samples will be collected in the vicinity of the Home Goods (Unit 6) building. This technique is intended to be a general directive for the collection of ambient air samples using SUMMA®-type air canisters equipped with metering flow controllers for the purpose of collecting a "time-averaged" ambient air sample. This procedure is intended for 24-hour sample collection. Ambient air sampling information will be recorded on the FDR (Appendix A).

Procedure for Ambient (outdoor) Air Sample Collection

The following section provides a general guidance on the collection of ambient air samples; the sequence can be modified as needed based on site specific conditions at the time of sample collection.

1. **Selection and Preparation of ambient sample collection area**
    - Conduct interview with occupant/owner. Complete Indoor Air Quality Questionnaire and Building Inventory Form. (Appendix A).
    - Choose an area for sample collection that is upwind of the property (properties) being assessed, if possible. Collect sample away from wind breaks, if possible.
    - Observe the area for the apparent presence of items or materials that may potentially produce or emit VOCs and interfere with analytical laboratory analysis of the collected sample (i.e. fuel tanks, gasoline, paint storage, etc.). Record relevant information on Building Inventory Form and document with digital photographs.
    - Using the PID, screen ambient air in the location intended for sampling to assess the potential gross presence of VOCs. Record PID readings on the sampling form.

2. Preparation of SUMMA® canister and collection of ambient sample

- Place SUMMA®-type canister approximately 5 ft above ground (or equivalent to the mid-point of the ground story of the building(s). Canister can be placed on a stable surface, or suspended from structure with nylon rope.
- Record SUMMA®-type canister serial number on sampling summary form and COC.
- Record sample ID on canister ID tag, and record on sampling summary form and COC.
- Remove brass plug from canister fitting.
- Install pressure gauge/metering valve on canister valve fitting and tighten. If pressure gauge has additional (2nd) fitting, install brass plug from canister fitting into gauge fitting and tighten.
- Open and close canister valve.
- Record gauge pressure on sample summary form and COC. Gauge pressure must read >25 inches Hg. Replace SUMMA®-type canister if gauge pressure reads <25 inches Hg.
- Remove brass plug from gauge fitting and store for later use.
- Open canister valve to initiate sample collection.
- Record date and local time (24-hour basis) of valve opening on sampling summary form and COC.
- Take digital photograph of SUMMA®-type canister and surrounding area.

3. Termination of ambient sample collection

- Revisit SUMMA®-type canister approximately at end of sample collection period (e.g., 24 hours after initiation of sample collection) and record gauge pressure on sampling form and COC.
- Record date and local time (24-hour basis) of valve closing on sampling form and COC.
- Close canister valve.
- Remove pressure gauge / flow valve from canister.
- Reinstall brass plug on canister fitting and tighten.
- Remove SUMMA®-type canister from sample collection area.

4. Preparation and shipment of sample to analytical laboratory

- Pack SUMMA®-type canister in shipping container, note presence of brass plug installed in tank fitting.
- Complete COC and place requisite copies in shipping container.
- Close shipping container and affix custody seal to container closure.

3.5 WATER LEVEL MEASUREMENTS

Water level measurements are designed to characterize groundwater flow patterns. Groundwater level measurements can be made in monitoring wells, private or public drinking water wells, piezometers, or open boreholes. Water level measurements in monitoring wells should be made before purging and evacuation for groundwater sampling.

The procedures for water level measurements are:

1. Check the well for proper ID and location.
2. Measure and record the height of protective casing from ground surface to check for settlement or heave.
3. After unlocking the well and removing any well caps, measure and record the ambient and well-mouth organic vapor levels using a PID. This level will be recorded in the field notebook and the appropriate health and safety actions taken, in accordance with the project-specific HASP.
4. Measure and record the distance between the top of the well riser and the top of the protective casing to check for heave or settling.
5. Using an electronic water level meter (or similar measuring device), measure and record the static water level in the well and the depth to the well bottom to the nearest 0.01 ft. Measurements will be referenced from the top of the well riser, as opposed to the protective casing, when feasible. An interface probe will be used in areas where light non-aqueous phase liquids (NAPLs) are anticipated. (The water level meter should be decontaminated after use according to the procedures specified in Subsection 4.3).

All well measurements will be recorded, along with the date and time of measurement, in the field notebook. Every well will have a clearly established reference point of known elevation, normally a painted mark on the upper edge of the riser pipe.

3.6 MANAGEMENT OF INVESTIGATION-DERIVED WASTES

Investigation generated water/fluid (i.e. well development and purge water) will be recharged to unpaved ground adjacent to the monitoring well in a manner that does not result in surface water runoff., unless 1) visual evidence of contamination such as color, sheen, or free product/NAPL is present, 2) olfactory evidence of contamination, or 3) concentrations of contaminants above groundwater standards at levels of concern are known to be present in the monitoring wells based on historic sampling. If water cannot be discharged to the ground for the above mentioned reasons, it will be properly containerized and labeled and brought to the on-site groundwater extraction treatment system for treatment prior to discharge.

3.7 CHAIN OF CUSTODY & ANALYTICAL SAMPLE SHIPPING

3.7.1 Chain of Custody

The COC record will be used to document sample-handling information (i.e., sample location, sample ID, and number of containers corresponding to each sample number). The following information is recorded on the COC record:

- project reference;
- the site location code, sample ID number, date of collection, time of collection, sample bottle number, preservation, and sample type, number of containers, sample matrix;
- the names of the sampler(s) and the person shipping the samples;
- serial number of custody seals and shipping cases;
- the date and time that the samples were delivered for shipping;
- analyses required; and

- the names of those responsible for receiving the samples at the laboratory.

The COC is completed in triplicate. Two copies accompany the analytical samples to the laboratory; another is kept by the sample crew leader and maintained in the project file. The third copy is sent back with the analytical data package. In the case of computer generated COCs, the original COC is shipped with the samples to the laboratory. When this shipment is received by the laboratory, the COC is signed by the laboratory and returned with the test results as part of the data package submittal.

3.7.2 Sample Packing

Sample containers will be packed in metal or hard plastic, insulated coolers for shipment. Bottles are packed tightly to minimize motion. Styrofoam, vermiculite, and "bubble pack" are suitable packing material for most instances. Ice is placed in double Ziploc® bags and added to the cooler along with all paperwork which is sealed in a separate Ziploc® bag. The cooler top is then taped shut. The samples are shipped to the laboratory together with the COC record.

3.7.3 Sample Shipping

The standard procedure for shipping environmental samples to the analytical laboratory is as follows:

1. All shipping of environmental samples collected must be done through FedEx, or equivalent overnight delivery service. Receipts are retained as part of the COC documentation. Samples will be shipped to the laboratory within 24 to 48 hours of sampling unless other arrangements are made with the laboratory.
2. If prompt shipping and laboratory receipt of the samples cannot be guaranteed, (e.g., Sunday arrival), the samplers will be responsible for proper storage and custody of the samples until adequate shipping arrangements can be made.

4.0 ANALYTICAL PROGRAM

Laboratory analyses will be performed by a laboratory certified by the NYSDOH ELAP and scheduled based on historical information regarding potentially hazardous material disposal, previous site information, the determination of data objectives, and NYSDEC criteria. The analytical parameters listed below represent methods used as part of this SMP.

Groundwater

- VOCs by Method 8260

Soil Vapor and Ambient Air

- VOCs by USEPA Method TO-15

Drinking Water

- VOCs by Method 524.2

The quantitation limits will be sufficiently below the DQOs to evaluate concentrations in comparison to the SCGs specified in the SMP.

Laboratory results will be reported with Category A and B deliverable requirements for each sampling task is defined in the SMP.

The laboratory will submit analytical results in an EQuIS-based electronic data deliverable (EDD) format for uploading into the engineer's database, or the NYSDEC database.

5.0 DATA REDUCTION, VALIDATION AND REPORTING

Data reduction is the process of converting measurement system outputs to an expression of the parameter which is consistent with the comparability objective. Calculations made during data reduction are described in the referenced analytical methods and in the participating laboratory QA Program.

Upon receipt, analytical data packages will be reduced to standard data tabulations. During the data review process the electronic data are checked against the hardcopy data package to verify that no systematic error occurred during the production of the electronic deliverable.

For analytical data collected under this program, a data review will be completed in accordance with NYSDEC Division of Environmental Remediation guidance DER-10, Appendix 2B for Data Usability Summary Reports (NYSDEC, 2010a). During the review the results are reviewed using the laboratory hardcopy deliverables to verify that results were reported and qualified correctly by the laboratory, and to evaluate QC measurements to determine the usability of results. The data review will include the following information:

- Data Quality Observations
- Data Qualification Summary
- Table of Final Results and Qualifiers

All final documents are to be submitted in an electronic format that complies with the most recent DER's electronic document standards (EDS). Until such time as the Department establishes an EDS final documents are to be submitted as an Adobe© PDF document. All final data sets shall be provided in a NYSDEC EQuIS EDD format that complies with the most recent guidance at the NYSDEC EDD Submission Website (http://www.dec.ny.gov/chemical/62440.html).

6.0 QUALITY CONTROL

Field QC samples to be collected and submitted to the laboratory include:

- trip blanks
- equipment blanks
- field duplicates
- matrix spikes

Trip Blanks. Trip blanks are required for assessing the potential for contaminating aqueous VOC samples during sample shipment. The trip blank consists of a VOC sample container filled by the laboratory with reagent water and is shipped to the site with other VOC sample containers. A trip blank is included with each shipment of water samples scheduled for VOC analysis and will be analyzed with the other VOC samples.

Field Duplicates. Field duplicates of soil and water samples will be submitted for analysis of all project-specific parameters at a rate of 5 percent of the samples collected. These duplicates are intended to assess the homogeneity of the sampled media and the precision of the sampling protocol.

Equipment Blanks. Equipment blanks (i.e., rinsate blanks) for the bailer, sampling pump, and/or tubing assembly are scheduled during monitoring well sampling at a rate of 5 percent of the samples collected. VOCs present within the bailer, pump apparatus, or discharge tubing are assessed by collecting a sample of reagent water passed through the sampling apparatus after washing with the decontamination solution followed by at least one rinse with reagent water. If dedicated equipment is used at a site, the need for equipment blanks may be omitted from the sampling program.

Matrix Spike/Matrix Spike Duplicates (MS/MSD). The NYSDEC ASP requires the laboratory to analyze MS/MSDs for organic analyses at a frequency of 5 percent. If the laboratory selects a site sample for MS/MSD analysis, QC results will be included in the laboratory report of analysis.

7.0 SUSTAINABILTY AND GREEN REMEDIATION

Green remediation seeks to minimize ancillary environmental impacts such as greenhouse gas emissions through minimizing energy consumption, maximizing the reuse of land, and the recycling of materials.

During the implementation of field activities emphasis will be placed on using green strategies and approaches. These strategies will include efforts to reduce direct and indirect emissions of carbon dioxide and other greenhouse gasses, conserve natural resources, reduce waste, and maximize habitat value as presented in DER-31 (NYSDEC, 2010b).

8.0 REFERENCES

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TABLE

TABLE 3.1
SAMPLE CONTAINER, PRESERVATION AND HOLD TIME REQUIREMENTS

NYSDEC QUALITY ASSURANCE PROGRAM PLAN

PARAMETER	MEDIUM	CONTAINER	VOLUME REQUIREMENTS	PRESERVATION	HOLDING TIMES[1]
Volatile Organics					
TCL VOCs	Low Soil/Sediment	VOA Vial*	Fill - no headspace*	Cool, 4°C*	7 days
	Low Soil/Sediment	VOA Vial - field preserved	5 g	Freeze within 48 hours	14 days
	Low Soil/Sediment	VOA Vial - field preserved	5 g	Cool, 4°C with sodium bisulfate	14 days
	High Soil/Sediment	VOA Vial - field preserved	10 g	Cool, 4°C with methanol	14 days
	Groundwater/Liquid	glass, Teflon® lined septa	(2) 40 mL	Cool, 4°C HCL to pH <2	14 days
Extractable Organics					
TCL SVOCs, TCL Pesticides/PCBs	Soil/Sediment	Glass, Teflon® lined lid	100 g	Cool, 4°C	14 days extract/40 days analyze
	Groundwater/Liquid	Glass, Teflon® lined cap	(2) l-L	Cool, 4°C	7 days extract/40 days analyze
Inorganics					
TAL Inorganics	Soil/Sediment	Glass	2g	Cool, 4°C	6 months
Mercury		Glass	1g	Cool, 4°C	28 days
Cyanide		Glass	10g	Cool, 4°C	14 days
Hexavalent Chromium		Glass	2g	Cool, 4°C	24 hrs.
TAL Inorganics	Groundwater/Liquid	Glass or Polyethylene	450 mL	HNO_3 to pH<2, 4°C	6 months
Mercury		Glass or Polyethylene	200 mL	HNO_3 to pH<2, 4°C	28 days
Cyanide		Glass or Polyethylene	1 L	NaOH to pH>12, 4°C	14 days
Hexavalent Chromium		Glass or Polyethylene	500 mL	Cool, 4°C	24 hrs.
TCLP					
VOCs	Soil/Sediment	Glass, Teflon® lined lid	3x100g	Cool, 4°C	7 days extraction/7 days analyze
SVOCs	Soil/Sediment	Glass, Teflon® lined lid	200g	Cool, 4°C	7 days extraction/7 days extraction/40 days analyze
Mercury	Soil/Sediment	Glass, Teflon® lined lid	200g	Cool, 4°C	7 days extraction/28 days analyze
Inorganics	Soil/Sediment	Glass, Teflon® lined lid	200g	Cool, 4°C	180 days extraction/180 days analyze
Pesticides	Soil/Sediment	Glass, Teflon® lined lid	200g	Cool, 4°C	7 days extraction/40 days analyze
Herbicides	Soil/Sediment	Glass, Teflon® lined lid	200g	Cool, 4°C	7 days extraction/40 days analyze

continued

TABLE 3.1
SAMPLE CONTAINER, PRESERVATION AND HOLD TIME REQUIREMENTS

NYSDEC QUALITY ASSURANCE PROGRAM PLAN

PARAMETER	MEDIUM	CONTAINER	VOLUME REQUIREMENTS	PRESERVATION	HOLDING TIMES[1]
Ignitability	Soil/Sediment	Glass, Teflon® lined lid	25g	Cool, 4°C	28 days
Reactivity	Soil/Sediment	Glass, Teflon® lined lid	40g	Cool, 4°C	28 days
Corrosivity	Soil/Sediment	Glass, Teflon® lined lid	30g	Cool, 4°C	28 days

Notes:* Only if directed by NYSDEC PM

[1] All holding times are from date of sample collection.

°C = Celsius
g = gram
Hg = mercury
HNO_3 = nitric acid
L = liter
mL = milliliter
NaOH = sodium hydroxide
PCB = polychlorinated biphenyls
SVOC = semivolatile organic compound
TAL = Target Analyte List
TCL = Target Compound List
VOC = volatile organic compound

APPENDIX A

INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY FORM (FROM NYSDOH FINAL VAPOR INTRUSION GUIDANCE – OCTOBER 2006)

NEW YORK STATE DEPARTMENT OF HEALTH
INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY
CENTER FOR ENVIRONMENTAL HEALTH

This form must be completed for each residence involved in indoor air testing.

Preparer's Name _____ Date/Time Prepared _____

Preparer's Affiliation _____ Phone No._____

Purpose of Investigation_____

1. OCCUPANT:

Interviewed: Y / N

Last Name: _____ First Name: _____

Address: _____

County: _____

Home Phone: _____ Office Phone: _____

Number of Occupants/persons at this location _____ Age of Occupants _____

2. OWNER OR LANDLORD: (Check if same as occupant ___)

Interviewed: Y / N

Last Name: _____ First Name: _____

Address: _____

County: _____

Home Phone: _____ Office Phone: _____

3. BUILDING CHARACTERISTICS

Type of Building: (Circle appropriate response)

Residential	School	Commercial/Multi-use
Industrial	Church	Other: _____

If the property is residential, type? (Circle appropriate response)

Ranch	2-Family	3-Family
Raised Ranch	Split Level	Colonial
Cape Cod	Contemporary	Mobile Home
Duplex	Apartment House	Townhouses/Condos
Modular	Log Home	Other:_____

If multiple units, how many? _____

If the property is commercial, type?

Business Type(s) _____

Does it include residences (i.e., multi-use)? Y / N If yes, how many? _____

Other characteristics:

Number of floors_____ Building age_____

Is the building insulated? Y / N How air tight? Tight / Average / Not Tight

4. AIRFLOW

Use air current tubes or tracer smoke to evaluate airflow patterns and qualitatively describe:

Airflow between floors

_____

_____

_____

Airflow near source

_____

_____

_____

Outdoor air infiltration

_____

_____

_____

Infiltration into air ducts

_____

_____

_____

5. BASEMENT AND CONSTRUCTION CHARACTERISTICS (Circle all that apply)

a. Above grade construction:	wood frame	concrete	stone	brick
b. Basement type:	full	crawlspace	slab	other _____
c. Basement floor:	concrete	dirt	stone	other _____
d. Basement floor:	uncovered	covered	covered with _____	
e. Concrete floor:	unsealed	sealed	sealed with _____	
f. Foundation walls:	poured	block	stone	other _____
g. Foundation walls:	unsealed	sealed	sealed with _____	
h. The basement is:	wet	damp	dry	moldy
i. The basement is:	finished	unfinished	partially finished	
j. Sump present?	Y / N			
k. Water in sump?	Y / N / not applicable			

Basement/Lowest level depth below grade: _____(feet)

Identify potential soil vapor entry points and approximate size (e.g., cracks, utility ports, drains)

_____

_____

6. HEATING, VENTING and AIR CONDITIONING (Circle all that apply)

Type of heating system(s) used in this building: (circle all that apply – note primary)

Hot air circulation	Heat pump	Hot water baseboard	
Space Heaters	Stream radiation	Radiant floor	
Electric baseboard	Wood stove	Outdoor wood boiler	Other _____

The primary type of fuel used is:

Natural Gas	Fuel Oil	Kerosene
Electric	Propane	Solar
Wood	Coal	

Domestic hot water tank fueled by: _____

Boiler/furnace located in:	Basement	Outdoors	Main Floor	Other_____
Air conditioning:	Central Air	Window units	Open Windows	None

Are there air distribution ducts present? Y / N

Describe the supply and cold air return ductwork, and its condition where visible, including whether there is a cold air return and the tightness of duct joints. Indicate the locations on the floor plan diagram.

_____

_____

_____

_____

7. OCCUPANCY

Is basement/lowest level occupied? Full-time Occasionally Seldom Almost Never

Level	**General Use of Each Floor (e.g., familyroom, bedroom, laundry, workshop, storage)**
Basement	_____
1st Floor	_____
2nd Floor	_____
3rd Floor	_____
4th Floor	_____

8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY

a. Is there an attached garage? Y / N

b. Does the garage have a separate heating unit? Y / N / NA

c. Are petroleum-powered machines or vehicles stored in the garage (e.g., lawnmower, atv, car) Y / N / NA Please specify_____

d. Has the building ever had a fire? Y / N When?_____

e. Is a kerosene or unvented gas space heater present? Y / N Where? _____

f. Is there a workshop or hobby/craft area? Y / N Where & Type? _____

g. Is there smoking in the building? Y / N How frequently? _____

h. Have cleaning products been used recently? Y / N When & Type? _____

i. Have cosmetic products been used recently? Y / N When & Type? _____

j. Has painting/staining been done in the last 6 months? Y / N Where & When? _____

k. Is there new carpet, drapes or other textiles? Y / N Where & When? _____

l. Have air fresheners been used recently? Y / N When & Type? _____

m. Is there a kitchen exhaust fan? Y / N If yes, where vented?_____

n. Is there a bathroom exhaust fan? Y / N If yes, where vented?_____

o. Is there a clothes dryer? Y / N If yes, is it vented outside? Y / N

p. Has there been a pesticide application? Y / N When & Type?_____

Are there odors in the building? Y / N
If yes, please describe: _____

Do any of the building occupants use solvents at work? Y / N
(e.g., chemical manufacturing or laboratory, auto mechanic or auto body shop, painting, fuel oil delivery, boiler mechanic, pesticide application, cosmetologist

If yes, what types of solvents are used? _____

If yes, are their clothes washed at work? Y / N

Do any of the building occupants regularly use or work at a dry-cleaning service? (Circle appropriate response)

Yes, use dry-cleaning regularly (weekly) No
Yes, use dry-cleaning infrequently (monthly or less) Unknown
Yes, work at a dry-cleaning service

Is there a radon mitigation system for the building/structure? Y / N Date of Installation: _____
Is the system active or passive? Active/Passive

9. WATER AND SEWAGE

Water Supply:	Public Water	Drilled Well	Driven Well	Dug Well	Other: _____
Sewage Disposal:	Public Sewer	Septic Tank	Leach Field	Dry Well	Other: _____

10. RELOCATION INFORMATION (for oil spill residential emergency)

a. Provide reasons why relocation is recommended: _____

b. Residents choose to: remain in home relocate to friends/family relocate to hotel/motel

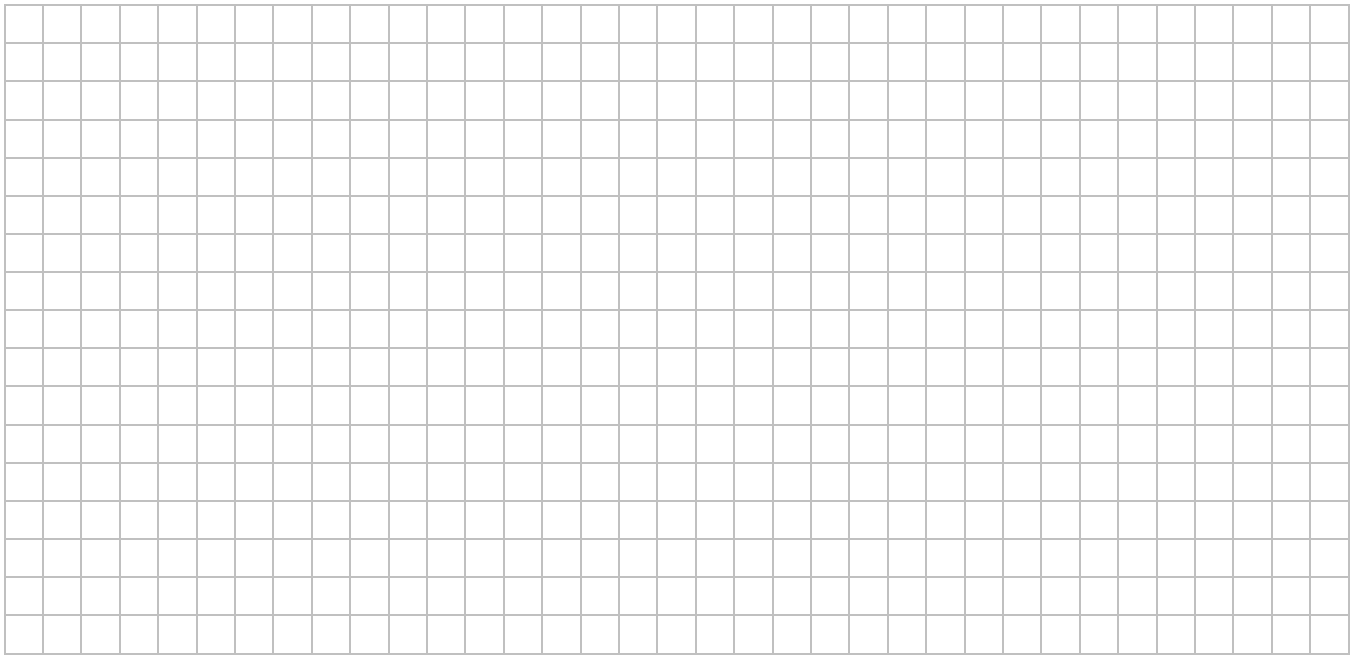
c. Responsibility for costs associated with reimbursement explained? Y / N

d. Relocation package provided and explained to residents? Y / N

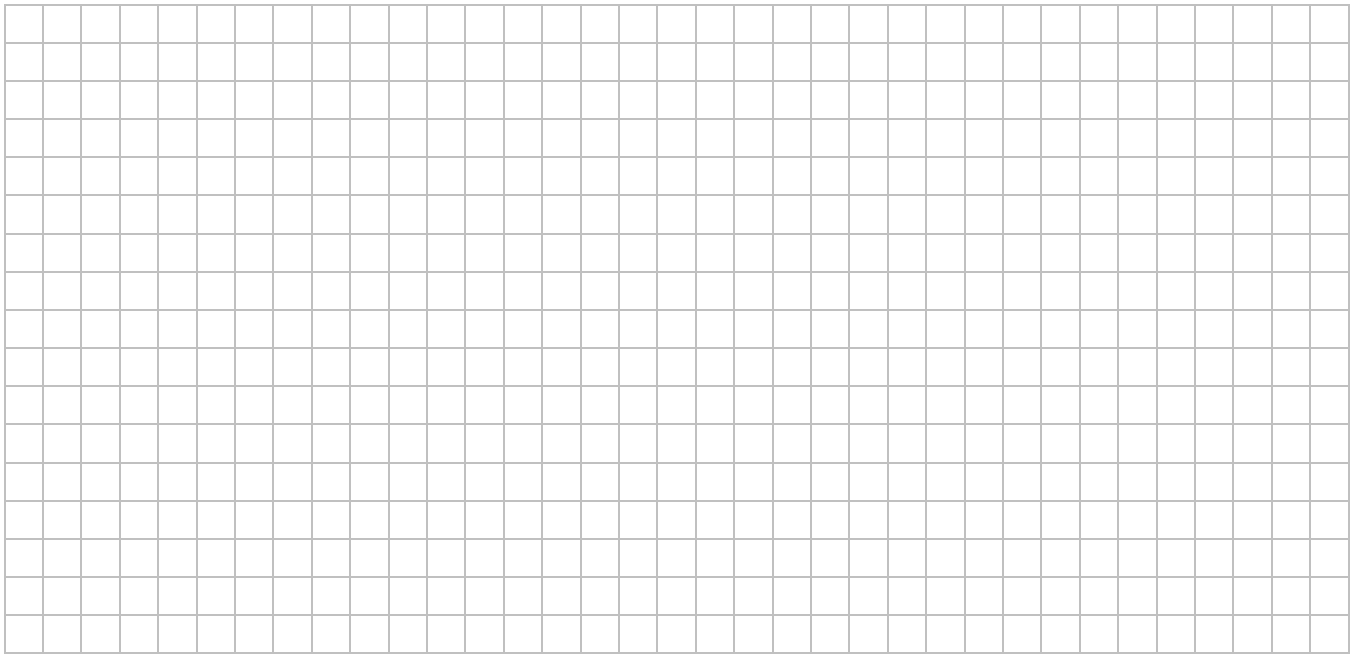
11. FLOOR PLANS

Draw a plan view sketch of the basement and first floor of the building. Indicate air sampling locations, possible indoor air pollution sources and PID meter readings. If the building does not have a basement, please note.

Basement:



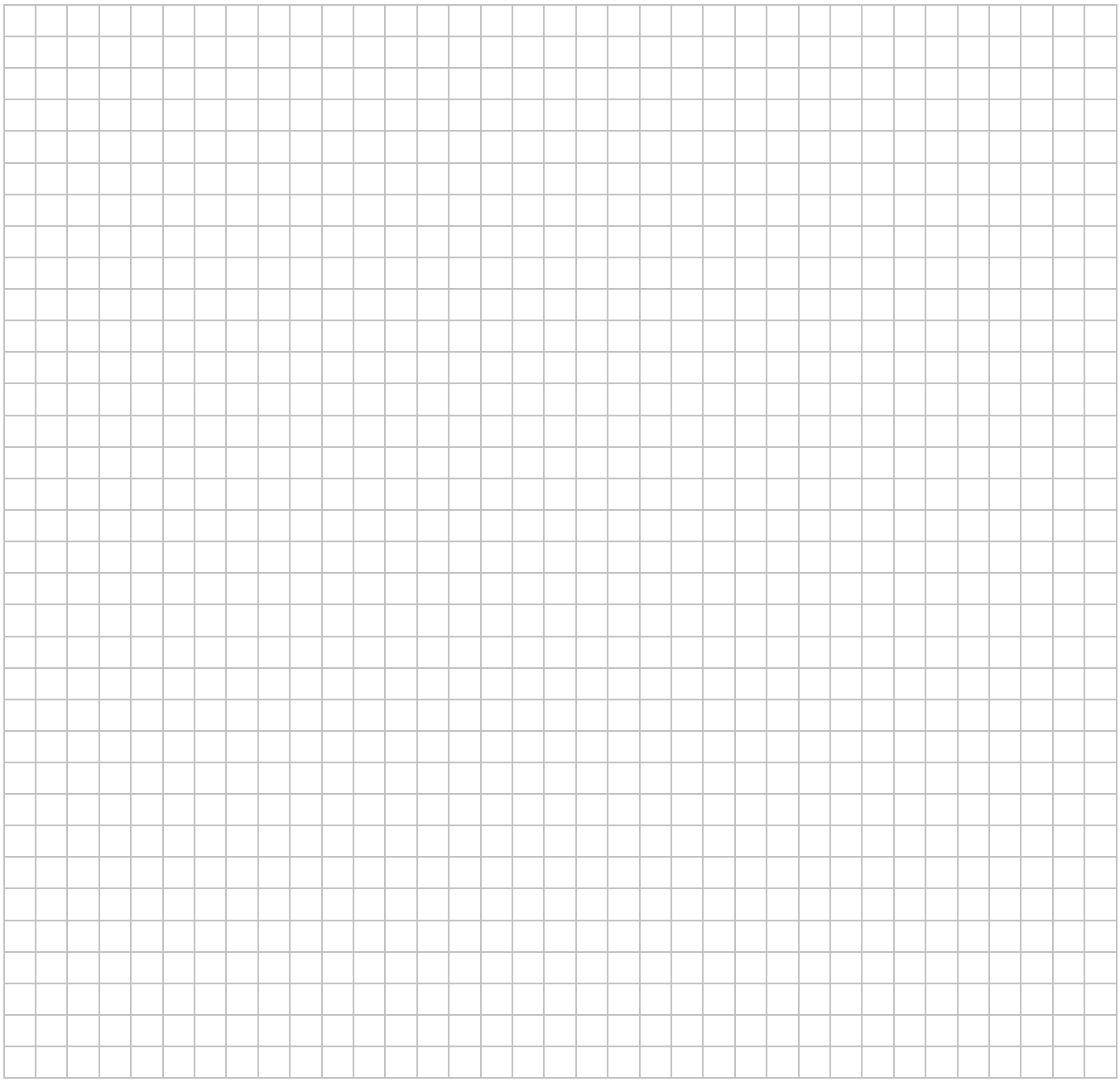
First Floor:



12. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s) and PID meter readings.

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system, if applicable, and a qualifying statement to help locate the site on a topographic map.



13. PRODUCT INVENTORY FORM

Make & Model of field instrument used: _____

List specific products found in the residence that have the potential to affect indoor air quality.

Location	Product Description	Size (units)	Condition*	Chemical Ingredients	Field Instrument Reading (units)	Photo ** Y / N

* Describe the condition of the product containers as **Unopened (UO), Used (U),** or **Deteriorated (D)**
** Photographs of the **front and back** of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.

INDOOR AIR SAMPLING RECORD

PROJECT NAME: _____ LOCATION ID: _____ DATE: _____

PROJECT NO./TASK NO.: _____ CLIENT: _____

PROJECT LOCATION: _____ SAMPLER NAME: _____

WEATHER CONDITIONS (AM): _____ SAMPLER SIGNATURE: _____

WEATHER CONDITIONS (PM): _____ CHECKED BY: _____ DATE: _____

SUMMA Canister Record Information

SUB-SLAB SOIL VAPOR SAMPLE		INDOOR AIR SAMPLE		INDOOR AIR SAMPLE-2		AMBIENT AIR SAMPLE	
Flow Regulator Number:		Flow Regulator Number:		Flow Regulator Number:		Flow Regulator Number:	
Flow Rate (mL/min):		Flow Rate (mL/min):		Flow Rate (mL/min):		Flow Rate (mL/min):	
Canister Serial Number:		Canister Serial Number:		Canister Serial Number:		Canister Serial Number:	
Start Date/Time		Start Date/Time		Start Date/Time		Start Date/Time	
Start Pressure ("Hg):		Start Pressure ("Hg):		Start Pressure ("Hg):		Start Pressure ("Hg):	
Stop Date/Time		Stop Date/Time		Stop Date/Time		Stop Date/Time	
Stop Pressure ("Hg):		Stop Pressure ("Hg):		Stop Pressure ("Hg):		Stop Pressure ("Hg):	
Sample ID:		Sample ID:		Sample ID:		Sample ID:	

Other Sampling Information:

Finished Basement, Crawl Space, Unfinished Basement		Story/Level:		Story/Level:		Direction from Building	
Floor Slab Thickness:		Room:		Room:		Distance from Building:	
Potential Vapor Entry Points:		Potential Vapor Entry Points:		Potential Vapor Entry Points:		Distance from Roadway:	
Floor Surface:		Floor Surface:		Floor Surface:		Ground Surface:	
Noticable Odor:		Noticable Odor:		Noticable Odor:		Noticable Odor:	
PID Reading (ppb):		PID Reading (ppb):		PID Reading (ppb):		PID Reading (ppb):	
Intake Depth/Height:		Intake Height:		Intake Height:		Intake Height above Ground Surface:	
Helium Test Conducted? Breakthrough %:		Indoor Air Temp		Indoor Air Temp		Intake tubing?	

Comments/Location Sketch:

INDOOR AIR SAMPLING RECORD

LOW FLOW GROUNDWATER SAMPLING RECORD

PROJECT NAME		LOCATION ID	DATE
PROJECT NUMBER		START TIME	END TIME
SAMPLE ID	SAMPLE TIME	SITE NAME/NUMBER	PAGE OF

WELL DIAMETER (INCHES) ☐ 1 ☐ 2 ☐ 4 ☐ 6 ☐ 8 ☐ OTHER _____

TUBING ID (INCHES) ☐ 1/8 ☐ 1/4 ☐ 3/8 ☐ 1/2 ☐ 5/8 ☐ OTHER _____

MEASUREMENT POINT (MP) ☐ TOP OF RISER (TOR) ☐ TOP OF CASING (TOC) ☐ OTHER _____

WELL INTEGRITY

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

INITIAL DTW (BMP)	FT	**FINAL DTW (BMP)**	FT	**PROT. CASING STICKUP (AGS)**	FT	**TOC/TOR DIFFERENCE**	FT
WELL DEPTH (BMP)	FT	**SCREEN LENGTH**	FT	**PID AMBIENT AIR**	PPM	**REFILL TIMER SETTING**	SEC
WATER COLUMN	FT	**DRAWDOWN VOLUME** (initial DTW- final DTW X well diam. squared X 0.041)	GAL	**PID WELL MOUTH**	PPM	**DISCHARGE TIMER SETTING**	SEC
CALCULATED GAL/VOL (column X well diameter squared X 0.041)	GAL	**TOTAL VOL. PURGED** (mL per minute X total minutes X 0.00026 gal/mL)	GAL	**DRAWDOWN/ TOTAL PURGED**		**PRESSURE TO PUMP**	PSI

FIELD PARAMETERS WITH PROGRAM STABILIZATION CRITERIA (AS LISTED IN THE QAPP)

TIME 3-5 Minutes	DTW (FT) 0.0-0.33 ft Drawdown	PURGE RATE (mL/min)	TEMP. (°C) (+/- 3 degrees)	SP. CONDUCTANCE (mS/cm) (+/- 3%)	pH (units) (+/- 0.1 units)	DISS. O_2 (mg/L) (+/- 10%)	TURBIDITY (ntu) (+/- 10% <10 ntu)	REDOX (mv) (+/- 10 mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
	BEGIN PURGING									

FINAL STABILIZED FIELD PARAMETERS (to appropriate significant figures[SF])

TEMP.: nearest degree (ex. 10.1 = 10)
COND.: 3 SF max (ex. 3333 = 3330, 0.696 = 0.696)
pH: nearest tenth (ex. 5.53 = 5.5)
DO: nearest tenth (ex. 3.51 = 3.5)
TURB: 3 SF max, nearest tenth (6.19 = 6.2, 101 = 101)
ORP: 2 SF (44.1 = 44, 191 = 190)

EQUIPMENT DOCUMENTATION

TYPE OF PUMP
- ☐ PERISTALTIC
- ☐ SUBMERSIBLE
- ☐ BLADDER
- ☐ _____
- ☐ WATTERA
- ☐ OTHER _____
- ☐ OTHER _____

DECON FLUIDS USED
- ☐ LIQUINOX
- ☐ DEIONIZED WATER
- ☐ POTABLE WATER
- ☐ NITRIC ACID
- ☐ HEXANE
- ☐ METHANOL
- ☐ OTHER _____

TUBING/PUMP/BLADDER MATERIALS
- ☐ SILICON TUBING
- ☐ TEFLON TUBING
- ☐ TEFLON LINED TUBING
- ☐ HDPE TUBING
- ☐ LDPE TUBING
- ☐ OTHER _____
- ☐ OTHER _____

- ☐ S. STEEL PUMP MATERIAL
- ☐ PVC PUMP MATERIAL
- ☐ GEOPROBE SCREEN
- ☐ TEFLON BLADDER
- ☐ OTHER _____
- ☐ OTHER _____
- ☐ OTHER _____

EQUIPMENT USED
- ☐ WL METER _____
- ☐ PID _____
- ☐ WQ METER _____
- ☐ TURB. METER _____
- ☐ PUMP _____
- ☐ OTHER _____
- ☐ FILTERS NO. ___ TYPE _____

ANALYTICAL PARAMETERS

	PARAMETER	METHOD NUMBER	FIELD FILTERED	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED	QC COLLECTED	SAMPLE BOTTLE ID NUMBERS
☐								
☐								
☐								
☐								
☐								
☐								
☐								

PURGE OBSERVATIONS

	YES	NO
PURGE WATER CONTAINERIZED	☐	☐
NO-PURGE METHOD UTILIZED	☐	☐

NUMBER OF GALLONS GENERATED _____

If yes, purged approximately 1 standing volume prior to sampling or _____mL for this sample location.

SKETCH/NOTES

Sampler Signature: Print Name:

Checked By: Date:

GROUNDWATER GRAB SAMPLING RECORD

PROJECT NAME		SAMPLE LOCATION	DATE
PROJECT NUMBER		START TIME	END TIME
SAMPLE ID	SAMPLE TIME	SITE NAME/NUMBER	PAGE OF

SAMPLE TYPE ☐ GRAB ☐ WELL/PIEZOMETER ☐ GEOPROBE ☐ RESIDENTIAL ☐ OUTFALL ☐ OTHER _____

WELL DIAMETER (INCHES) ☐ 1 ☐ 2 ☐ 4 ☐ 6 ☐ 8 ☐ OTHER _____

TUBING ID (INCHES) ☐ 1/8 ☐ 1/4 ☐ 3/8 ☐ 1/2 ☐ 5/8 ☐ OTHER _____

MEASUREMENT POINT (MP) ☐ TOP OF RISER (TOR) ☐ TOP OF CASING (TOC) ☐ OTHER _____

WELL INTEGRITY

	YES	NO	N/A
CAP			
CASING			
LOCKED			
COLLAR			

INITIAL DTW (BMP)	FT	**FINAL DTW (BMP)**	FT	**PROT. CASING STICKUP (AGS)**	FT	**TOC/TOR DIFFERENCE**	FT
WELL DEPTH (BMP)	FT	**SCREEN LENGTH**	FT	**PID AMBIENT AIR**	PPM	**REFILL TIMER SETTING**	SEC
WATER COLUMN	FT	**DRAWDOWN VOLUME** (initial DTW- final DTW X well diam. squared X 0.041)	GAL	**PID WELL MOUTH**	PPM	**DISCHARGE TIMER SETTING**	SEC
CALCULATED GAL/VOL (column X well diameter squared X 0.041)	GAL	**TOTAL VOL. PURGED** (mL per minute X total minutes X 0.00026 gal/mL)	GAL	**DRAWDOWN/ TOTAL PURGED**		**PRESSURE TO PUMP**	PSI

FIELD PARAMETERS

TIME	DTW (FT)	PURGE RATE (mL/min)	TEMP. (°C)	SP. CONDUCTANCE (mS/cm)	pH (units)	DISS. O_2 (mg/L)	TURBIDITY (ntu)	REDOX (mv)	PUMP INTAKE DEPTH (ft)	COMMENTS
	BEGIN PURGING									

SAMPLE OBSERVATIONS: CLEAR _____ COLORED _____ CLOUDY _____ TURBID _____ ODOR _____ OTHER (see notes) _____

EQUIPMENT DOCUMENTATION

TYPE OF PUMP	DECON FLUIDS USED	TUBING/PUMP/BLADDER MATERIALS		EQUIPMENT USED
☐ PERISTALTIC	☐ LIQUINOX	☐ SILICON TUBING	☐ S. STEEL PUMP MATERIAL	☐ WATER LEVEL METER
☐ SUBMERSIBLE	☐ DEIONIZED WATER	☐ TEFLON TUBING	☐ PVC PUMP MATERIAL	☐ PID _____
☐ BLADDER _____	☐ POTABLE WATER	☐ TEFLON LINED TUBING	☐ GEOPROBE SCREEN	☐ WQ METER _____
☐ WATTERA	☐ NITRIC ACID	☐ HDPE TUBING	☐ TEFLON BLADDER	☐ TURB. METER _____
☐ OTHER _____	☐ HEXANE	☐ LDPE TUBING	☐ OTHER _____	☐ PUMP _____
☐ OTHER _____	☐ METHANOL	☐ OTHER _____	☐ OTHER _____	☐ OTHER _____
	☐ OTHER _____	☐ OTHER _____	☐ OTHER _____	☐ FILTERS NO. ____ TYPE _____

ANALYTICAL PARAMETERS

	PARAMETER	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED	QC COLLECTED	SAMPLE BOTTLE ID NUMBERS
☐							
☐							
☐							
☐							
☐							
☐							
☐							
☐							

NOTES

SKETCH

PURGE OBSERVATIONS

	YES	NO	
PURGE WATER CONTAINERIZED	☐	☐	NUMBER OF GALLONS GENERATED _____
NO-PURGE METHOD UTILIZED	☐	☐	If yes, purged approximately 1 standing volume prior to sampling or _____mL for this sample location.

Sampler Signature: Print Name:

Checked By: Date:

GROUNDWATER GRAB SAMPLING RECORD

Field Instrument Calibration Table

Instrument	Activity	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA
pH Probe	Calibrate probe with up to three temperature-equilibrated standards to bracket expected pH values on site.	Daily-before use Calibration check - at end of day, or if instrument gives erratic results	Stable readings $\pm$ 0.1 pH units within 3 minutes	If probe reading fails to stabilize, do not use. Check/replace membrane and recalibrate or service as necessary. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Task Leader and Field Samplers
DO Probe	Calibrate with 2 standards – saturated DO standard and 0.0 mg/L DO standard	Daily-before use Calibration check - at end of day, or if instrument gives erratic results	$\pm$ 0.2 mg/L before use. $\pm$ 0.5 mg/L for end of day calibration check.	If DO reading exceeds criterion, recalibrate or service as necessary. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Task Leader and Field Samplers
Specific Conductance Electrode	Calibrate electrode with a standard solution close to expected sample values.	Daily-before use Calibration check - at end of day, or if instrument gives erratic results	$\pm$ 5% of standard or $\pm$ 10 mS/cm of standard (whichever is greater)	If sp. conductance electrode reading exceeds criterion, then clean probe or service as necessary and recalibrate. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Task Leader and Field Samplers
Thermistor-Temperature Sensor	Calibrate against NIST-certified thermometer annually.	Calibration check –prior to onset of program	$\pm$ 0.2 ^{o}C of NIST certified thermometer.	If temperature sensor reading exceeds criterion, then clean probe, or service as necessary and recalibrate. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Task Leader and Field Samplers

Field Instrument Calibration Table

Instrument	Activity	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA
Turbidimeter	Hach-calibrate with <0.1, 20, 100, and 800 NTU standards.	Daily-before use Calibration check-at end of day, or if instrument gives erratic results	± 5% per scale.	If turbidity reading exceeds criterion, then calibrate or service as necessary. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Task Leader and Field Samplers
ORP/ Eh Probe	Calibrate against a Hanna solution.	Daily-before use Calibration check -at end of day, or if instrument gives erratic results	± 10 mV of standard	If ORP/Eh reading exceeds criterion, then have manufacture recalibrate. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Task Leader and Field Samplers
PID	Calibrate with 100 ppmV isobutylene standard. Blank: zero air check	Daily-before use Calibration check – at end of day, or if instrument gives erratic results	± 10% of true value	Recalibrate or service; rerun affected sample.	Task Leader and Field Samplers

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT NAME: _____ TASK NO: _____ DATE: _____
PROJECT NUMBER: _____ MACTEC CREW: _____
PROJECT LOCATION: _____ SAMPLER NAME: _____
WEATHER CONDITIONS (AM): _____ SAMPLER SIGNATURE: _____
WEATHER CONDITIONS (PM): _____ CHECKED BY: _____ DATE: _____

MULTI-PARAMETER WATER QUALITY METER

METER TYPE _____
MODEL NO. _____
UNIT ID NO. _____

AM CALIBRATION Start Time _____/End Time_____

POST CALIBRATION CHECK Start Time _____/End Time_____

	Units	Standard Value	Meter Value	*Acceptance Criteria (AM)	Standard Value	Meter Value	*Acceptance Criteria (PM)
pH (4)	SU	4.0		+/- 0.1 pH Units			
pH (7)	SU	7.0		+/- 0.1 pH Units	7.0		+/- 0.3 pH Units
pH (10)	SU	10.0		+/- 0.1 pH Units			
Redox	+/- mV	240		+/- 10 mV	240		+/- 10 mV
Conductivity	mS/cm	1.413		+/- 0.5 % of standard	1.413		+/- 5% of standard
DO (saturated)	%	100		+/- 2% of standard			
DO (saturated)	mg/L[1] (see Chart 1)			+/- 0.2 mg/L			+/- 0.5 mg/L of standard
DO (<0.1)	mg/L	<0.1		< 0.5 mg/L			
Temperature	°C						
Baro. Press.	mmHg						

TURBIDITY METER

METER TYPE _____
MODEL NO. _____
UNIT ID NO. _____

	Units	Standard Value	Meter Value	Standard Value	Meter Value	*Acceptance Criteria (PM)
<0.1 Standard	NTU	<0.1		<0.1		+/- 0.3 NTU of stan.
20 Standard	NTU	20		20		+/- 5% of standard
100 Standard	NTU	100		100		+/- 5% of standard
800 Standard	NTU	800		800		+/- 5% of standard

PHOTOIONIZATION DETECTOR

METER TYPE _____
MODEL NO. _____
UNIT ID NO. _____

Background	ppmv	<0.1		<0.1		within 5 ppmv of BG
Span Gas	ppmv	100		100		+/- 10% of standard

O_2-LEL 4 GAS METER

METER TYPE _____
MODEL NO. _____
UNIT ID NO. _____

Methane	%	50		50		+/- 10% of standard
O_2	%	20.9		20.9		+/- 10% of standard
H_2S	ppmv	25		25		+/- 10% of standard
CO	ppmv	50		50		+/- 10% of standard

OTHER METER

METER TYPE _____
MODEL NO. _____
UNIT ID NO. _____

See Notes Below for Additional Information

☐ Equipment calibrated within the Acceptance Criteria specified for each of the parameters listed above.
☐ Equipment (not) calibrated within the Acceptance Criteria specified for each of the parameters listed above**.

MATERIALS RECORD

Deionized Water Source: Portland FOS
Lot#/Date Produced: _____
Trip Blank Source: _____
Sample Preservatives Source: _____
Disposable Filter Type: 0.45µm cellulose
Calibration Fluids / Standard Source:
- DO Calibration Fluid (<0.1 mg/L) Portland FOS
- Other _____
- Other _____
- Other _____

	Cal. Standard Lot Number	Exp. Date
pH (4)		
pH (7)		
pH (10)		
ORP		
Conductivity		
<0.1 Turb. Stan.		
20 Turb. Stan.		
100 Turb. Stan.		
800 Turb. Stan.		
PID Span Gas		
O_2-LEL Span Gas		
Other		

NOTES:

* = Unless otherwise noted, calibration procedures and acceptance criteria are in general accordance with USEPA Region 1 SOPs for Field Instrument Calibration (EQASOP-FieldCalibrat) and Low Stress Purging and Sampling (EQASOP-GW001), each dated 1/19/2010. Additonal acceptance criteria obtained from instrument specific manufacturer recommendations.
** = If meter reading is not within acceptance criteria, clean/replace probe and re-calibrate, or use calibrated back-up meter if available. If project requirements necessitate use of the instrument, clearly document any deviations from acceptance criteria on all data sheets and log book entries.
1 = DO Saturated standard value is calculated based on Oxygen Solubility at Indicated Pressure Chart from the USEPA Region 1 SOP for Field Instrument Calibration (EQASOP-FieldCalibrat), dated 1/19/2010.

MACTEC
511 Congress Street, Portland Maine 04101

FIGURE 6.1
FIELD INSTRUMENT CALIBRATION RECORD
NYSDEC QUALITY ASSURANCE PROJECT PLAN

APPENDIX J

SITE MANAGEMENT FORMS

Baldwin Place Shopping Center - Routine O&M Site Visit Log

Date: _____

Time Onsite: _____

Time Offsite: _____

Name of Technician: _____

Groundwater Extraction and Treatment System		
Process Component	**Reading**	**Unit**
Influent Bag Filter Pressure		PSI
Effluent Bag Filter Pressure		PSI
Transducer Water Level Reading		FT
Bag Filter Pressure Differential		PSI
Carbon Vessel #1 Pressure		PSI
Carbon Vessel #2 Pressure		PSI
Carbon Effluent Pressure		PSI
Bag Filter Replaced?	Y N	
Recovery Well (RW-1S)		
Flow Totalizer Previous Recording		GAL
Flow Totalizer Current Month		GAL
Total Flow		GAL
Pump Run Time Previous Recording		HRS
Pump Run Time Current Month		HRS
Pump Total Run Time		HRS
Elapsed Time		DAYS
Elapsed Time		MIN
Average Flow-Elapsed		GPM
Recovery Well (RW-2D)		
Flow Totalizer Previous Recording		GAL
Flow Totalizer Current Month		GAL
Total Flow		GAL
Pump Run Time Previous Recording		HRS
Pump Run Time Current Month		HRS
Pump Total Run Time		HRS
Elapsed Time		DAYS
Elapsed Time		MIN
Average Flow-Elapsed		GPM

Additional Notes:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BALDWIN PLACE SHOPPING CENTER (NOW SOMERS COMMONS)

SITE WIDE INSPECTION LOG

Inspected By:	Date:

INSPECTION ITEM	COMMENTS
1. Fencing and Site Access	
A. Security Fence	
B. Road Gates	
C. Access Roads/ Roads	
2. Groundwater Extraction & Treatment System	
A. Building Structure	
B. Security (locks, systems, etc)	
C. Operational Status	

NOTE: Refer to the SMP Appendix G for remedial component specific operation, maintenance, and inspection details and Appendix I for Routine Inspection Forms.

Summary of Green Remediation Metrics for Site Management

Site Name: _____ Site Code: _____
Address: _____ City: _____
State: _____ Zip Code: _____ County: _____

Initial Report Period (Start Date of period covered by the Initial Report submittal)
Start Date: _____

Current Reporting Period
Reporting Period From: _____ To: _____

Contact Information
Preparer's Name: _____ Phone No.: _____
Preparer's Affiliation: _____

I. Energy Usage: Quantify the amount of energy used directly on-site and the portion of that derived from renewable energy sources.

	Current Reporting Period	**Total to Date**
Fuel Type 1 (e.g. natural gas (cf))		
Fuel Type 2 (e.g. fuel oil, propane (gals))		
Electricity (kWh)		
Of that Electric usage, provide quantity:		
Derived from renewable sources (e.g. solar, wind)		
Other energy sources (e.g. geothermal, solar thermal (Btu))		

Provide a description of all energy usage reduction programs for the site in the space provided on Page 3.

II. Solid Waste Generation: Quantify the management of solid waste generated on-site.

	Current Reporting Period (tons)	**Total to Date (tons)**
Total waste generated on-site		
OM&M generated waste		
Of that total amount, provide quantity:		
Transported off-site to landfills		
Transported off-site to other disposal facilities		
Transported off-site for recycling/reuse		
Reused on-site		

Provide a description of any implemented waste reduction programs for the site in the space provided on Page 3.

III. Transportation/Shipping: Quantify the distances travelled for delivery of supplies, shipping of laboratory samples, and the removal of waste.

	Current Reporting Period (miles)	**Total to Date (miles)**
Standby Engineer/Contractor		
Laboratory Courier/Delivery Service		
Waste Removal/Hauling		

Provide a description of all mileage reduction programs for the site in the space provided on Page 3. Include specifically any local vendor/services utilized that are within 50 miles of the site.

IV. Water Usage: Quantify the volume of water used on-site from various sources.

	Current Reporting Period (gallons)	**Total to Date (gallons)**
Total quantity of water used on-site		
Of that total amount, provide quantity:		
Public potable water supply usage		
Surface water usage		
On-site groundwater usage		
Collected or diverted storm water usage		

Provide a description of any implemented water consumption reduction programs for the site in the space provided on Page 3.

V. Land Use and Ecosystems: Quantify the amount of land and/or ecosystems disturbed and the area of land and/or ecosystems restored to a pre-development condition (i.e. Green Infrastructure).

	Current Reporting Period (acres)	**Total to Date (acres)**
Land disturbed		
Land restored		

Provide a description of any implemented land restoration/green infrastructure programs for the site in the space provided on Page 3.

Description of green remediation programs reported above (Attach additional sheets if needed)
Energy Usage:
Waste Generation:
Transportation/Shipping:
Water usage:
Land Use and Ecosystems:
Other:

CERTIFICATION BY CONTRACTOR

I, _____ (**Name**) do hereby certify that I am _____ (**Title**) of the Company/Corporation herein referenced and contractor for the work described in the foregoing application for payment. According to my knowledge and belief, all items and amounts shown on the face of this application for payment are correct, all work has been performed and/or materials supplied, the foregoing is a true and correct statement of the contract account up to and including that last day of the period covered by this application.

_____

Date **Contractor**

APPENDIX K

REMEDIAL SYSTEM OPTIMIZATION TABLE OF CONTENTS

REMEDIAL SYSTEM OPTIMIZATION TABLE OF CONTENTS

REMEDIAL SYSTEM OPTIMIZATION FOR [Site Name]

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