



DEPARTMENT OF THE NAVY

ENGINEERING FIELD ACTIVITY, NORTHEAST
NAVAL FACILITIES ENGINEERING COMMAND
10 INDUSTRIAL HIGHWAY
MAIL STOP, #82
LESTER, PA 19113-2090

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8 MAY 2006

Mr. Steve Scharf, P.E.
Project Engineer
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7015

Dear Mr. Scharf:

Subj: Final Design for Construction of a Groundwater Extraction,
Treatment, and Re-injection System at the GM-38 Area; NWIRP
Bethpage, NY and Northrop Grumman Corporation, NY; NYS Registry
#1-30-003 A & B

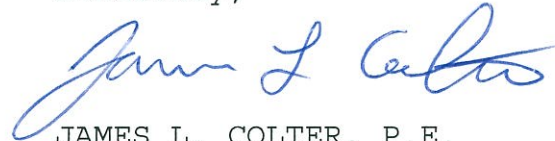
Enclosed, please find a copy of the Final Design for the construction of the GM-38 Area Groundwater Treatment System. This final document was developed by Tetra Tech EC, Inc. in accordance with the Records of Decision for Groundwater approved by the New York State Department of Environmental Conservation (NYSDEC) and United States Department of Navy (Navy).

On November 11, 2005, the Navy forwarded a 90% Draft Final Design which was reviewed by NYSDEC and other parties during a 45-day public comment period which ended on December 30, 2005. The Navy received comments regarding the 90% draft final design from the NYSDEC and a Responsiveness Summary Document was prepared and issued to NYSDEC on March 23, 2006 for consideration. In a letter dated April 10, 2006, NYSDEC stated that the Navy's responses to comments had been reviewed and further directed the Navy to incorporate the responses to comments and finalize the GM-38 Area Remedial Design.

Tetra Tech EC will begin to forward solicitations for work associated with implementation of the final design. Construction mobilization will occur shortly thereafter pending receipt of property access. Letters requesting access were forwarded from the Navy to the Town of Oyster Bay, Long Island Railroad, and New York State Department of Transportation on April 6, 2006 and have gone unanswered to date.

If you have any questions regarding the enclosed final design, please contact me at (610) 595-0567, ext 163 or by email at james.colter@navy.mil.

Sincerely,



JAMES L. COLTER, P.E.
Remedial Project Manager
By direction of the
Commanding Officer

Enclosure: (1) Final Remedial Design for GM-38 Area Groundwater
Remediation System (1 copy of Drawings & Construction
Plans & 5 CD-ROMs)

Distribution: (Drawings & CD-ROM)

Tim Kelly - Nassau County DPW
Matt Russo - Town of Oyster Bay
Eugene Smith - New York State Department of Transportation
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Trevor Wescott - NYSDOH	Ed Resch - RAB Member
Carl Hoffman - NYSDEC (Albany)	Charles Bevilacqua - RAB Member
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Darrol Lopez - Town of Hempstead	
Arnold Palleschi-Hempstead Water Dist	
Andy Musgrave - Bethpage Water Dist	
Frank Flood - Massapequa Water Dist	
Matt Snyder - New York Water Service	
Edoardo Licci - South Farmingdale Water District	

**FINAL DESIGN
FOR
GM-38 AREA GROUNDWATER REMEDIATION
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK**

Issued:

May 8, 2006

Prepared for:

**Engineering Field Activity, Northeast
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop 82
Lester, Pennsylvania 19113-2090**

**Remedial Action Contract No. N62472-99-D-0032
Contract Task Order No. 96**

Prepared by:

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Revision
0

Date
5/8/06

Prepared By
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Approved By
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Pages Affected
All

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1.0 INTRODUCTION

Tetra Tech EC, Inc. (TtEC) has been tasked with developing a groundwater treatment system design to remediate contaminated groundwater at an area referred to as the GM-38 area in Bethpage, New York. The remedial action at the GM-38 area is in response to the off-site groundwater plume that has migrated off the Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage property and Northrop Grumman Site. The GM-38 area is located hydraulically down gradient and approximately 8,500 feet south southeast of the NWIRP Bethpage property.

The selected remedy is based on the New York State Department of Environmental Conservation (NYSDEC) Record of Decision (ROD) for the Northrop Grumman Corporation and NWIRP Site Bethpage Facility Nassau County Site Nos. 1-30-003A & B, dated March 2001, and the Engineering Field Activity, Northeast (EFANE) ROD for the Naval Weapons Industrial Reserve Plant Bethpage New York Operable Unit 2 - Groundwater, Revision 1, dated April 2003. As stated in the ROD, the purpose of the treatment system is to, "Eliminate to the extent practical, site-related contaminants from the affected public water supplies and to prevent, to the extent practical, the future contamination of public water supplies through the implementation of off-site groundwater remediation." The ROD provides a remedial approach that will be protective of human health and the environment.

This design addresses contaminated groundwater located off-site and only one component of a ROD to address Regional contaminated groundwater plumes located beneath properties owned by the Navy as well as properties owned by Northrop Grumman Corporation and Occidental Chemical will be addressed under separate actions.

The system is designed for a 5-10 year operational life. The treatment system is not intended to remediate groundwater in the local aquifer to non-detectable levels. Rather, the intent of the system is to remove mass, reduce elevated VOC levels to levels similar to those in the surrounding aquifer, and in doing so will minimize impacts on water supply wells and currently unaffected portions of the aquifer. The final determination to take the treatment system off-line will be made by the Navy in consultation with the NYSDEC. The specifics of the system shut down criteria will be finalized in the operation, maintenance and monitoring (OM & M) program. An OM & M plan shall be submitted to the NYS DEC that will detail the methodology for determining when the System can be shutdown.

The groundwater treatment system will consist of five components: groundwater extraction; air stripping and off-gas treatment; liquid-phase granular activated carbon polishing; particulate filtration; and treated groundwater re-injection.

The system will meet the discharge requirements of the codes, standards, and specifications as listed in Section 2.0 of this Basis of Design.

2.0 CODES, STANDARDS, AND SPECIFICATIONS

The remedial design for the GM-38 area will follow all federal, state, and local codes, standards, and specifications and requirements and will be in accordance with applicable Navy specifications and procedures. At a minimum, the remedial design will adhere to the following:

- New York State (NYS) Water Quality Regulations
- NYS Drinking Water Standards (10 NYCRR Part 5)
- NYSDEC Groundwater Standards (6 NYCRR Part 700)
- NYS Sanitary Code, Part 5
- NYS Air Quality Requirements (6 NYCRR Part 200)
- Building Officials and Code Administrator (BOCA) Code

- National Fire Prevention Association (NFPA 70, National Electric Code)
- Military Specifications

Technical Specifications and Construction Drawings will be prepared for inclusion in the Scope of Work (SOW) documents for bid requests. Each Technical Specification will list the appropriate codes and standards (ASME, NFPA, AWS, FS, AASTO, etc.). Technical Specifications can be found in Attachment 1 and Contract Drawings can be found in Attachment 2.

SOW bid packages will be prepared and distributed to subcontractors for the following tasks:

- Geophysical Survey to locate underground utilities.
- Installation of extraction, monitoring, and re-injection wells.
- Installation of the pre-engineered steel building, concrete floor and fencing.
- Installation of electrical service for the building and treatment system.
- Installation of the plumbing and other utilities to the building.
- Installation of heating, ventilating and air conditioning (HVAC) system for the steel building.
- Installation of the extraction well pumps, sump pumps, and re-injection well pumps, blowers, re-packing existing air stripper column, bag filters, chemical feed system, and instrumentation and controls.
- Installation and testing of electric power and signal wiring to all equipment and the Programmable Logic Control (PLC).
- Programming and installation of PLC system.

3.0 EXTERNAL LOADS/ENVIRONMENTAL CONSIDERATIONS

The remedial action is to remediate groundwater containing elevated levels of some VOC that is migrating off-site from the NWIRP Bethpage property. The primary groundwater contaminants are chlorinated VOC which were either used and disposed of at the site or are breakdown products of these chemicals. These contaminants include:

- Tetrachloroethene (PCE).
- Trichloroethene (TCE).
- 1,2-Dichloroethene (DCE).
- Vinyl Chloride (VC).
- 1,1-Dichloroethane (1,1-DCA).

In addition, inorganic metals were detected in the groundwater at a few monitoring wells above NYS Groundwater Standards. Removal of these metals from groundwater is not required under this Remedial Action.

The system design is based on the latest available data provided by the Navy. A pump test was to be performed prior to system design but, due to logistical restrictions, will be performed after the system is installed. Therefore, the system and the required number of wells as described in this Basis of Design might need to be modified based on the results of the pump test.

The system is to be designed for a flow rate of up to 1,100 gallons per minute (gpm) from two extraction wells. Re-injection wells will be used to re-introduce the groundwater back to the aquifer hydraulically downgradient of the extraction wells. The number of re-injection wells will be determined after acquiring additional hydrogeological data and performing data on the initial re-injection wells during the pump test.

4.0 HEALTH AND SAFETY CONSIDERATIONS

All activities performed during the remedial action will be conducted with the utmost respect to health and safety. A Site-Specific Health and Safety Plan (SHSP) shall be developed that will create protocols for performing all work in a safe and compliant manner. In addition, all applicable Occupational Safety and Health Administration (OSHA) regulations will be adhered to during the work. TtEC staff and subcontractor personnel will be made aware of and must follow the approved SHSP.

Piping associated with the groundwater treatment system will be tested above the maximum operating pressures (and must pass in accordance with the Technical Specifications) to ensure safe system operation. Additionally, piping, fittings and other equipment will be chemically compatible with the contaminants and other process chemicals.

Equipment will be located inside of a locked building or behind locked gates to protect it from vandalism and to protect the public and property from the equipment's operation. Trenching and excavation associated with the installation of the system piping and installation of the building slab will be performed above the zone of contamination. Exposure to contaminated soil is not anticipated with these activities. TtEC will be on-site during these activities and will provide monitoring per the approved SHSP.

Tasks that could produce unsafe conditions are listed below:

- Well installation.
- Trenching.
- Building construction.
- Operations and Maintenance.
- Sampling.

5.0 EQUIPMENT DATA AND VENDOR INFORMATION

The remedial action at the NWIRP Bethpage site will include equipment that will allow for the removal of the previously described contaminants, as listed in Section 3.0, from the groundwater. The system will be designed using a packed column air stripper to remove VOC contaminants from the extracted groundwater. The groundwater will pass through particulate filtration units and then through liquid-phase granular activated carbon (LGAC), to remove particulate matter and any remaining VOC, respectively, prior to re-injection to groundwater. The vapor stream from the air stripper will pass through vapor-phase granular activated carbon (VGAC) to prevent VOC contaminants from entering the atmosphere. TtEC will prepare an air permit application for the air stripper and submit it to NYSDEC on behalf of the Navy.

Equipment will be sized to prevent the discharge of contaminants to the atmosphere or back to the groundwater in excess of the permitted or regulated value. The contaminants of concern are described in Section 3.0 of this Basis of Design.

6.0 OTHER INFORMATION

In order for the remedial system to be effective, several other action items are required. Should any of the other action items be ceased or conditions changed, the remedial system as described in this Basis of Design may need to be modified. The action items are as follows:

- The On-Site Plume Containment (OSPC), treatment, and discharge to on-site recharge basins via the on-going OSPC system must continue operating at the approximate pumping rate of 3,375 gpm.

- The long term operation and maintenance of VOC removal systems at three off-site Bethpage Public Water Supply well fields must continue to operate for at least 30 years, until the treatment at public supply well(s) is no longer necessary to meet the appropriate performance objectives, or until the Bethpage Water District decides to shut down the given supply well(s).
- A long term operation maintenance and monitoring program that would monitor the effectiveness of the groundwater remedy and determine if wellhead treatment is necessary and to track the transport of site contamination.
- A Vinyl Chloride (VC) Contingency Plan is to be in place to deal with large quantities of VC that may be encountered from an upstream contamination source.
- “Non-Detect” policy for affected public water supplies that should any drinking water wells have detectable quantities of VOC per United States Environmental Protection Agency (USEPA) Method 502.2 above a detection limit of 0.5 µg/L, the Navy, with Northrop Grumman Corporation, will enter into future agreements to implement this policy.
- TtEC will prepare a State Pollutant Discharge Elimination System (SPDES) application and submit it to NYSDEC on behalf of the Navy. Based upon TtEC’s discussions with NYSDEC, an actual permit will not be issued due to the use and purpose of the treatment system. While an actual permit will not be issued, the treatment system must comply with SPDES standards.
- TtEC will check the results of the equipment vendor’s design of the air stripper operation, packing material type, blower sizing, etc. using Airstrip Version 1.0 software. TtEC will use Land Development Desk Top Version 5 (by AutoDesk) to calculate the volumes for cuts and fills for construction of the access road as well as generate the drawings.

ATTACHMENT 1

Technical Specifications

TECHNICAL SPECIFICATIONS

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TECHNICAL SPECIFICATIONS

The following stipulations, specifications, and descriptions of work are defined and described as Technical Specifications and it is understood and agreed that everything herein contained is hereby made part of the contract. Wherever any features of the work is not fully set forth in these Technical Specifications, or amended by Special Requirements, it must be understood that the same shall be governed by the rules of the best prevailing practice for that class of work, as determined by the Contractor who serves as the Government Representative.

These Technical Specifications and any drawings, maps and/or plans forming a part thereof, will cover the furnishing of all labor, technical assistance, equipment, tools and materials necessary to perform the construction work, as required under this contract.

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01010

SUMMARY OF WORK

PART 1. GENERAL

This Section is intended to provide a comprehensive summary of the various elements of work, and describe their relationship to each other. This summary should be read in conjunction with other specifically referenced Sections, and with the Contract Drawings. This Section does not provide the technical detail of the referenced Sections for particular Work activities, but describes the work as a whole, providing an overall perspective of the separate tasks and their interrelationships. This Section shall be used in conjunction with all other Sections to establish the total requirements of the work.

NWIRP Bethpage is located in east central Nassau County, Long Island, New York, approximately 30 miles east of New York City. The Navy's property totaled approximately 109.5 acres and was formerly a Government Owned Contractor-Operated (GOCO) facility that was operated by the Northrop Grumman Corporation (NGC) until September 1998. NWIRP Bethpage is bordered on the north, west, and south by property owned, or formerly owned, by NGC that covered approximately 605 acres, and, on the east, by a residential neighborhood.

The GM-38 Area is approximately 8,500 feet south-southeast and hydraulically downgradient of NWIRP Bethpage. Specifically, the center of the project area is a utility easement that is located east of Broadway Avenue, west of the Seaford – Oyster Bay Expressway, and between the north and south dead ends of Windhorst and Herman Streets.

NWIRP Bethpage was established in 1933. Since inception, the primary mission of the facility has been the research, prototyping, testing, design engineering, fabrication, and primary assembly of military aircraft. Historical operations that resulted in hazardous material generation at the facility included metal finishing processes, maintenance operations, painting of aircraft and components, and other activities that involved aircraft manufacturing. Wastes generated by plant operations were disposed of directly into either drainage sumps, dry wells, and/or on the ground surface, resulting in the disposal of a number of hazardous wastes, including the Volatile Organic Compounds (VOCs) tetrachloroethene (PCE) and trichloroethene (TCE), the semi-volatile organic compounds (SVOCs) polychlorinated biphenyls (PCBs), and the inorganics chromium and cadmium at the site. Some of these contaminants have migrated from the points of disposal to

surrounding areas, including the soils of these sites and the groundwater beneath and downgradient of the NWIRP Bethpage property.

The GM-38 Area refers to a cluster of monitoring wells that were installed in the 1990s by NGC and that first identified an isolated groundwater contaminant plume in this area. Chlorinated VOCs were identified in moderately deep groundwater (220 to 470 feet below ground surface [bgs]) at concentrations greater than 500 micrograms per liter ($\mu\text{g/L}$). The contaminated groundwater in the area represents a relatively large mass of chlorinated VOCs that would remain for extended periods and could adversely affect public water supplies in the area, as well as other downgradient water supplies. Two public water supply systems are present in the general area and extract groundwater at depths ranging from 540 to 740 feet bgs.

The contaminated groundwater plumes emanating from the Navy and NGC sites is estimated to total more than 2,000 acres in area and extend more than 700 feet deep in some locations. Recent groundwater data from the Navy's vertical profile borings indicate that the contaminated groundwater plume has migrated south beyond the Hempstead Turnpike.

To date, the off-site groundwater plume(s) have impacted or threatened three public water supply wellfields operated by the Bethpage Water District (BWD). There are treatment systems in place at each of the three impacted or threatened wellfields. The water that is distributed to the community is tested on a monthly basis to ensure that the drinking water standards promulgated by the New York State Department of Health (NYSDOH) are met. In addition, the BWD has a policy of providing its consumers with drinking water that contains no detectable concentrations of site-related contaminants. Given the proximity of the contaminants to the BWD well fields, nine outpost or sentry wells were installed upgradient of the water supplies. These wells have been sampled on a quarterly basis since March 1995. The purpose of this quarterly sampling is to provide the BWD with the data necessary to ensure that the existing treatment systems are adequate to treat the level of contaminants that may impact their public supply wells. The data are also used to make decisions about the need for groundwater remediation.

Based upon a review of the sentry well data, there is an area surrounding monitoring well cluster GM-38 that contains high concentrations, in excess of 1,000 parts per billion (ppb), of site-related contamination. The outpost wells will continue to be monitored to determine the groundwater concentrations of these site-related contaminants.

The remedial action selected in the ROD addresses on-site contaminated groundwater beneath the Navy's 105-acre parcel, as well as contaminated groundwater that has migrated off-site beyond the boundaries of NWIRP Bethpage.

The Navy's selected remedy for on-site groundwater includes an institutional control consisting of the placement of a restriction in the deed of transfer to the County of Nassau, New York prohibiting extraction of groundwater from within the boundaries of the 105-acre or Plant 20 parcels located at the Navy's former NWIRP Bethpage facility. This remedy is based on the recognition that an existing groundwater extraction and treatment system, known as the On-site Containment (ONCT) System, is containing and remediating VOC-contaminated groundwater emanating from the Navy's property. The system was constructed and is operated by NGC as part of the March 2001 ROD for Regional Groundwater issued by NYSDEC. If the system fails to continue to operate for any reason, the Navy will re-evaluate the remedy for on-site groundwater and implement necessary measures to ensure that the remedy is still protective of human health and the environment.

1.1 WORK INCLUDED IN THIS CONTRACT

Under Contract No. SPP-01-41801-101.1, the Subcontractor shall complete the construction of the groundwater treatment plant and all related facilities at the GM-38 Area Site. The work includes, but is not limited to:

- A. The Subcontractor shall be responsible for contacting the appropriate local officials to obtain any information and requirements concerning work affecting local municipalities including, but not limited to, permits, licenses, certifications, and truck routes. The list of utilities presented on Contract Drawing C-1 is a partial list provided by the referenced surveyor. The Subcontractor shall be responsible for fully identifying all utilities that are present.
- B. The Subcontractor shall prepare, submit for approval, and implement all plans required by the Technical Specifications including a detailed Construction Work Plan (with Construction Schedule), a Site Specific Quality Management Plan, an Erosion and Sedimentation Control Plan, and a Site-Specific Health and Safety Plan. All plans shall be approved by the Contractor prior to initiation of related work. Work should consider the safety of and minimal disturbance to adjacent residences and properties.

C. Mobilization

The Subcontractor shall furnish all necessary labor, materials, and equipment to perform the Work which shall include, but is not limited to, temporary office and storage facilities.

D. Security

All Subcontractors shall provide and maintain his own security system for site access, equipment and support zone facilities for the duration of the construction activities.

E. Maintenance and Protection of Traffic

The Subcontractor shall be responsible for providing all labor, materials, and equipment for the plan preparation and performance of traffic control. In addition, the Subcontractor shall be responsible for obtaining all necessary permits.

F. Site Preparation

The Subcontractor shall be responsible for performing site work according to the approved plans as required to provide for the complete installation of facilities, utilities, improvements, and the construction of extraction and discharge system(s), access road and treatment building construction, and treatment process system activities. This work includes, but is not limited to, the following:

1. Clearing and grubbing of vegetation and site grading as required.
2. Installation and maintenance of access road(s) and construction entrance as required.
3. Installation of impermeable spill containment around any storage tanks, and any other systems as determined in the Construction Work Plan, and required by the Contractor.

4. Construction of all necessary temporary structures or services.
5. Installation and maintenance of site drainage improvements and soil erosion and sediment pollution control measures during implementation of the work.
6. Construction and maintenance of decontamination pad as necessary.

G. Access Road Construction

The Subcontractor shall be responsible for providing all labor, materials, and equipment for the construction of permanent and temporary access roads to the treatment building and drainage facilities/structures as indicated on the Contract Drawings.

H. Treatment Building Construction

The Subcontractor shall be responsible for providing all labor, materials, and equipment for the construction of a pre-fabricated metal building, including all foundations, slabs, equipment pads, doors, vents, internal rooms, and furnishings as specified in the Technical Specifications and on the Contract Drawings. This Works shall include all utility connection work including but not limited; to electrical supply, potable water supply, sanitary sewer connections, and telephone connections; and all building systems including heating/ventilation/air systems, security systems, and fire protection systems.

I. Groundwater/Vapor Extraction System Installation

The Subcontractor shall be responsible for provision of and installation of all groundwater extraction materials and equipment from the 2 recovery wells, installed by the Contractor, and as shown on the Contract Drawings. The groundwater extraction system shall include extraction wellhead manholes and covers; submersible well pumps; instrumentation including level and flow controls; well vault piping, fitting and valves; well vault cable, all electrical conduit and wiring for power and instrumentation; extraction line piping from the well vaults to the treatment building; and vapor piping from the well vaults to the treatment building as specified in the Technical Specifications and shown on the Contract Drawings.

J. Groundwater Treatment System Construction and Startup

The Subcontractor shall be responsible for providing treatment unit systems as shown on the Contract Drawings and in the Technical Specifications. In addition, the Subcontractor shall be responsible for providing all labor, materials, and equipment for the installation of the treatment system process, electrical, and control equipment as specified in the Technical Specifications and as shown the Contract Drawings within the treatment system building as shown on the Contract Drawings. The Subcontractor shall perform all testing and startup activities to ensure that the equipment and system perform as required.

K. Treated Water Discharge System Installation

The Subcontractor shall be responsible for providing all labor, materials and equipment for installation of the treated water discharge system which shall include piping from the treatment system building to groundwater via re-injection wells located approximately 1,000 feet south of the treatment plant building. The treated water discharge system shall include all piping, fittings,

valves, and controls as specified in the Technical Specification and as shown on the Contract Drawings.

- L. The Subcontractor shall be responsible for all excavation, backfilling, and compacting work associated with the treatment system building construction, groundwater extraction system installation, treated water discharge system installation, building utility installation, and access road construction.

- M. Fencing and Landscaping

The Subcontractor shall be responsible for providing all labor, materials and equipment for the installation of site fencing, and landscaping, as specified in the Technical Specifications and as shown on the Contract Drawings.

- N. Site Restoration

The Subcontractor shall be responsible for repairing any areas damaged by construction activities, which shall include re-grading of affected areas, provision and placement of topsoil, seeding, and provision and installation of landscaping materials as directed by the Contractor. In addition, any private or township roads or parking areas disturbed by construction activities shall be restored to original or better conditions at no additional cost to the Contractor.

- O. Operations and Maintenance Services

The Subcontractor shall provide operation and maintenance services (as outlined in the Technical Specifications) for one year of operation following acceptance by the Contractor of the facility construction and startup activities at the direction of the Contractor. Prior to the startup of the one-year period, and before the construction period is considered complete, the Subcontractor shall operate the system for a 30-day proveout period during which a plant availability of 90% shall be provided. Availability shall be defined as time during which the treatment plant is extracting, treating and discharging groundwater in total compliance with all specifications and permit requirements.

If during the 30-day proveout period the Subcontractor is unable to operate the plant for 30 continuous days at 90% availability, the Subcontractor shall make all necessary repairs or changes necessary and continue operations until 30 days of continuous operation are provided at 90% availability at no additional cost to the Contractor.

- P. Off-site Disposal

The Subcontractor shall be responsible for performing characterization sampling, and transportation and disposal of all wastes which include, but are not limited to, asphalt, concrete, construction debris, and excess soils not used in construction of the berm.

- Q. Demobilization

At the end of the project, the Subcontractor shall be responsible for decontaminating and cleaning all materials and equipment prior to removing them from the site. All stockpiles of surplus material shall be removed and disturbed areas graded and seeded. All temporary facilities and utilities shall be removed.

R. Closeout Documents

The Subcontractor shall provide closeout documents, certifications, and as-built drawings to the Contractor.

In instances where conflicts occur between the Contract Drawings and Technical specifications, the Technical Specifications shall govern. In addition, if conflicts occur between the Contract Drawings, Technical Specifications and local, state or federal codes, the local, state or federal code shall govern.

1.2 GENERAL PROCESS DESCRIPTION

A. The treatment system process to be constructed under this project is as follows:

1. VOC impacted groundwater is extracted from 2 recovery wells as shown on the Contract Drawing. Each well will be individually be routed via underground piping to the treatment plant.
2. Within the treatment plant, the influent water will be collected in an equalization tank where pH adjustment will take place to meet the discharge limits.
3. The water is then pumped through a packed column air stripper tower for organic compound removal and then through a particulate filtration step and liquid phase carbon adsorption units. The treated water will then be discharged via re-injection wells, located approximately 1,000 feet south of the treatment plant building.

1.3 COORDINATION OF THE DRAWINGS

Layouts of the equipment, accessories, piping systems, ductwork and conduit runs, etc. are diagrammatic unless specifically dimensioned. The Subcontractor shall coordinate the work with the various components of the project to avoid interference and to secure maximum headroom, clear access to pipes, ducts, valves and equipment. The Subcontractor is responsible for carefully and neatly fitting all equipment into the space provided.

1.4 STANDARD SPECIFICATIONS AND REFERENCES

Any material specified by reference number, symbol or title of a specific standard such as a Federal Specification, American Standard Specification, an ASTM Standard, or a Trade Standard, shall comply with the latest revision thereof and shall include any supplement thereto in effect on the date of the invitation to bid. The standard referred to shall be hereby incorporated into these Specifications by reference except as may be modified herein.

1.5 CONSTRUCTION LOADS ON STRUCTURES

The facilities detailed in this project have been adequately designed to resist the finished load of the equipment and structures. No provisions have been made to resist loads imposed by construction equipment or erection procedures. If the Subcontractor desires to place loads in excess of the design loads on the structures, he shall modify the Drawings at his cost and shall provide the modified Drawings to the Contractor for approval with stress calculations prepared by a New York State registered professional engineer.

PART 2. PRODUCTS

2.1 CONSTRUCTION MATERIALS

- A. Each Subcontractor shall supply, in safe, good working condition all construction equipment, tools, consumable supplies, scaffolding and testing equipment required for the work.
- B. Each Subcontractor shall supply all temporary utilities and other facilities required for the work.
- C. The Subcontractor shall furnish all temporary connectors, supports, spacers, guides, bolts, shims, consumable gasses, connection devices, etc. required for the work.

PART 3. EXECUTION

3.1 GENERAL

- A. The Subcontractor shall complete the entire Work specified in this Contract in accordance with the Terms and Conditions of this Contract.

3.2 CONTRACTOR REQUIREMENTS

- A. The Subcontractor is advised that some Work will be performed at a hazardous waste site. The Subcontractor shall meet all Health and Safety Requirements as listed in Section 01220, "Health and Safety Requirements," of this Specification when working in those areas. The Subcontractor is responsible for preparing a Site Specific Health and Safety Plan (SHSP) for his operations. Section 01220, "Health and Safety Requirements," establishes the minimum requirements for development of the Subcontractor's SHSP. The Subcontractor shall implement this plan taking precautions necessary to protect the public and work force personnel from potential hazards. The Subcontractor shall utilize personnel with approved hazardous waste training in areas designated for hazardous waste work (refer to Section 01220, "Health and Safety Requirements," for training requirements).
- B. The Subcontractor shall use every precaution to protect adjacent properties, utility lines, trees, wells, survey monuments, and other structures from damage. Any damage caused by the Subcontractor while performing activities specified in the contract shall be repaired or replaced at the Subcontractor's expense in a prompt manner as directed by the Contractor.
- C. The Subcontractor shall take all measures required to minimize adverse impacts from execution of the Work on residences adjacent to construction activities, and shall not interfere with their operations.
- D. It shall be the sole responsibility of the Subcontractor to secure any open excavations or trenches by installing fencing (at a minimum), steel road plates, and provide adequate security.

3.3 CONTRACTOR'S USE OF THE PREMISES

- A. The Subcontractor shall confine his activities to the area within the limits of Subcontractor's Working Area (CWA) as shown on the Contract Drawings.

- B. Under this contract the Subcontractor shall assume full responsibility for the protection and safe keeping of products and materials that are stored on-site during the construction and associated activities.
- C. The Subcontractor shall move, without additional compensation, any material or equipment that interferes with the operations of the Contractor or any separate Subcontractor (if any) or Utility Company.
- D. The Subcontractor shall be responsible for costs incurred for the use of additional storage or work areas (off-site) or for use of access routes not provided and approved by the Contractor needed to execute the Work.

3.4 INSTALLATION OF EQUIPMENT

- A. The Subcontractor shall furnish and install his own equipment securely in place, providing all necessary setting materials and accessories. The Subcontractor shall provide all necessary concrete, structural steel, hangers, bolts, anchors and other fastening devices required to properly install the equipment..
- B. All foundations for treatment plant equipment, pipe supports, plumbing, electrical, heating and ventilating equipment shall be furnished and installed by the Subcontractor.

3.5 MATERIAL CONTROL

The Subcontractor shall receive, unload, distribute and warehouse all equipment supplied by him. The Subcontractor is responsible for providing a storage area/facility to adequately protect the equipment.

3.6 SAFETY AND SECURITY

- A. Each Subcontractor shall keep his work area reasonably free of trash and debris during the work.
- B. The Subcontractors shall be responsible for security on the project.

* * * END OF SECTION * * *

SECTION 01220

HEALTH AND SAFETY REQUIREMENTS

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Project Drawings.

The responsibility for development, implementation and enforcement of the Site Specific Health and Safety Plan (SHSP) lies solely with the Subcontractor and his health and safety personnel.

The SHSP developed by the Subcontractor shall include programs for accident prevention, personnel protection, emergency response/contingency planning, air monitoring and handling hazard materials and chemicals on site. The SHSP shall meet all requirements of 29 CFR 1910 (General Industry Occupational Safety and Health Standards) and shall include enough detail to support the Subcontractor's work.

1.1 REFERENCES

The Subcontractor shall comply with federal, state and local regulations and guidelines, including all applicable Occupational Safety and Health Administration (OSHA) Regulations; 29 CFR 1910 (General Industry Standards) and 29 CFR 1926 (Construction Standards). These include, but are not limited to the following:

OSHA Hazardous Waste Operations Standard 29 CFR 1910.120

OSHA Hazard Communication Standard 29 CFR 1926.59

OSHA Construction Standards, Subpart P - Excavations, 29 CFR 1926.650-652

OSHA General Industry Standards, Subpart I - Personal Protective Equipment, 29 CFR 1926.132-137

OSHA Construction Standards, Subpart X - Stairways and Ladders, 29CFR 1926.1050 - 1060

OSHA, Construction Standards for Fall protection, 29 CFR 1926.501 - 502

NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.

U.S. Department of Health and Human Services, (DHHS) "NIOSH Sampling and Analytical Methods," DHHS (NIOSH) Publication 84-100.

ANSI, Practice for Respiratory Protection, Z88.2 (1980).

ANSI, Emergency Eyewash and Shower Equipment, Z41.1 (1983).

ANSI, Protective Footwear, Z358.1 (1981).

ANSI, Physical Qualifications for Respirator Use, Z88.6 (1984).

ANSI, Practice for Occupational and Educational Eye and Face Protection, Z87.1 (1968).

1.2 GENERAL REQUIREMENTS

- A. The Subcontractor, via the Health and Safety Manager, shall be responsible for the development and implementation of the Health and Safety Plan (SHSP) in accordance with the references listed in Section 1.1.
- B. The SHSP shall be submitted for review and acceptance by the Contractor.
- C. Site mobilization will not be permitted until the written acceptance of the SHSP has been issued by the Contractor.
- D. Determination of the appropriate level of worker safety equipment and procedures shall be made by the Subcontractor's Health and Safety Manager. This determination shall be based upon a thorough review of background information, analytical data from previous sampling events, an initial site survey and a continuing safety and health program. As work progresses, the Health and Safety Manager shall specify the worker protection level based on site activity.
- E. Should the Subcontractor seek modification of any portion or provision of the SHSP, such modification shall be requested in writing to the Contractor, and if accepted, be authorized in writing by all who authorized the SHSP. The modification shall be appended to the SHSP. All on-site personnel shall be fully informed of the modifications and required actions.
- F. Specifications and requirements delineated in this section are in addition to or an amplification of all applicable State and Federal regulations pertaining to this kind of work. Any revision or addition to these regulations must be reviewed by the Subcontractor for the applicability to his Site Specific Health and Safety Plan. In such case, the Subcontractor shall revise or add the new requirement to his SHSP and resubmit it to the Contractor for review and acceptance.
- G. Any disregard for the provisions of these health and safety specifications shall be deemed just and sufficient cause for ordering the stopping of all work beyond the support zone until the matter has been rectified to the satisfaction of the Contractor.
- H. Revisions required to produce an acceptable SHSP will be at the Subcontractor's expense. Delays in receiving acceptance of the SHSP shall not be considered justification for a time extension to the Contract.

1.3 SUBMITTALS

- A. Pre-Construction Submittals
 - 1. The SHSP shall include but not be limited to:
 - a) Personnel (Part 3.1)
 - b) Hazard Assessment (Part 3.2)
 - c) Safe Work Practices and Department Safeguards (Part 3.3)
 - d) Training (Part 3.4)
 - e) Medical Surveillance (Part 3.5)

- f) Work zone categories (Part 3.6)
 - g) Personal Safety Equipment and Protective Clothing (Part 3.7)
 - h) Personnel and Equipment Decontamination (Part 3.8)
 - i) Sanitation (Part 3.9)
 - j) Emergency equipment and first aid requirements (Part 3.10)
 - k) Emergency response and contingency planning (Part 3.11)
 - l) Posted regulations (Part 3.12)
 - m) Communications (Part 3.13)
 - n) Environmental and Personnel Monitoring (Part 3.14)
 - o) Record Keeping and Reporting (Part 3.16)
 - p) Inspection/Audit Program (Part 3.17)
 - q) MSDS (Part 3.18)
2. The Subcontractor shall prepare and submit the Site Specific Health and Safety Plan, as specified herein, to the Contractor for review and acceptance. If required, the Subcontractor shall make all necessary amendments required by the Contractor and resubmit the SHSP to the Contractor for acceptance. This procedure shall continue until such time that the Contractor gives its written final acceptance. Mobilization on-site will not be permitted until written acceptance of the SHSP by the Contractor has been received.

B. Construction Submittals

- 1. Daily safety logs, which have been included as Figure 01220-2 and Figure 01220-3 shall be maintained by the Subcontractor and shall be submitted to the Contractor daily. The logs shall include items specified in Section 3.16.
- 2. Weekly Health and Safety Reports, which have been included as Figure 01220-4, shall be maintained by the Subcontractor and submitted to the Contractor weekly. These reports shall include items specified in section 3.16.
- 3. Accident/Incident Reports, which have been included as Figure 01220-5, shall be prepared and submitted by the Subcontractor to the Contractor within 24 hours of occurrence. Reports shall be completed for lost time occupational injury or illness, medical treatment cases, unplanned exposure to toxic materials, and for any significant occurrence resulting in property damage. The Subcontractor shall notify the Contractor immediately of any accidents or incidents.
- 3. Training logs, which have been included as Figure 01220-1, shall be maintained by the Subcontractor and submitted to the Contractor upon request and upon completion of the work.
- 4. Medical authorization documents shall be submitted to the Contractor for each on-site employee, prior to working at the site. Medical authorization documentation shall include the following: the name and signature of the physician, the date of the exam, his/her opinion of the employee's ability to perform work at hazardous waste sites, and his/her opinion of the employee's ability to wear a NIOSH/MSHA approved respiratory device (as specified in ANSI Z88.2).

5. Material Safety Data Sheets shall be submitted for all hazardous chemicals on-site and shall accompany all new shipments of hazardous chemicals.

C. Final Submittals

A Closeout Safety Report shall be submitted by the Subcontractor to the Contractor on completion of the work. This report shall summarize the weekly safety reports and provide an overview of the Subcontractor's performance with regard to the SHSP requirements. This report shall also include certification of final medical examination of on-site employees and equipment decontamination.

PART 2. PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 HEALTH AND SAFETY PERSONNEL

A. Health and Safety Manager/Certified Industrial Hygienist

The Subcontractor's representative Health and Safety Manager shall be a Certified Industrial Hygienist (American Board of Industrial Hygiene) with specialized experience in the chemical hazardous waste industry and with hazards similar to those anticipated on this project. This person shall also have demonstrable expertise in air monitoring techniques and in development of respiratory protection programs for working in potentially toxic atmospheres. The Health and Safety Manager shall have a broad working knowledge of State and Federal occupational safety and health regulations and formal educational training in occupational safety and health. The Site Superintendent cannot serve as the Health and Safety Officer (HSO).

It is not anticipated that this individual will be assigned to this site on a full-time basis. The Health and Safety Manager may delegate the implementation and enforcement of the Health and Safety Plan to the HSO defined below. Regular on-site supervision and continued evaluation of effectiveness of the plans are to be performed by the Health and Safety Manager; at a minimum, these evaluations shall meet the requirements detailed in Section 3.17.

The Health and Safety Manager will be responsible for the preparation, implementation and enforcement of the site Health and Safety Plan. The Safety Manager shall also conduct the initial site specific training (as a minimum) on site and provide regular support.

B. Health and Safety Officer (HSO)

The Subcontractor's representative Health and Safety Officer shall have a minimum of two years of hazardous waste experience and a working knowledge of current Federal and State occupational safety and health regulations and formal training in occupational safety and health. The Site Superintendent cannot serve as the HSO

The Health and Safety Officer shall be assigned to the work site on a full-time basis for the duration of the project with functional responsibility for implementation of the Site Specific Health and Safety Plan and shall report to the Health and Safety Manager.

C. Health and Safety Technician(s) (HST) (as needed)

The Subcontractor shall assign a Health and Safety Technician to each active work area to monitor the health and safety of personnel in that area. The HST(s) shall report to the HSO. The HST(s) shall be proficient in the use of the monitoring equipment described in this specification. The HST(s) shall receive from the Health and Safety Manager, a minimum of eight hours of specialized training in the use and maintenance of the monitoring and sampling equipment and interpretation of the data required to implement the Site Specific Health and Safety Plan. The training shall also include instructions as to when and how to notify the Safety and Health Manager regarding monitoring data of concern. The Health and Safety Manager shall certify that HSTs are proficient in the use of this equipment, by completing and signing training logs which shall identify the equipment demonstrated, outline of topics addressed in the training, date of training, and social security number of attendee(s).

- D. The Subcontractor is required to retain a medical consultant who is either a board certified or board eligible physician in occupational medicine. Certification information can be obtained from the American Board of Preventative Medicine. The Medical Consultant shall have extensive experience in the occupational health area and be familiar with the site hazards and remedial action project. The Subcontractor shall submit a letter with the SHSP which states that the Medical Consultant is aware of site conditions and hazards present at the GM-38 Area, and has been provided with a written copy of the proposed work plan.

3.2 HAZARD ASSESSMENT

A detailed hazard assessment shall be conducted to identify the chemical, physical and biological hazards that may be encountered during the performance of work. An activity hazard analysis is then performed for each task to be completed, which includes assessing the likelihood of exposure to the identified hazards and the risk of exposure. Control measures that will be employed to reduce or minimize hazards completes the hazard assessment. Potentially hazardous operations include, but are not limited to, chemical changeout operations and excavating/trenching at the Gulf Station Site.

- A. The chemical hazards that are anticipated to present an occupational exposure hazard during site operations shall be identified. This identification shall include a thorough review of available analytical data from previous soil and groundwater sampling events at the site. Each chemical hazard that is selected shall be identified as a contaminant of concern. For each contaminant of concern, the following information shall be provided:
1. A brief summary of toxicity
 2. OSHA PEL or ACGIH TLV
 3. Hazardous properties (Flammable, toxic, reactive, etc.)
 4. Source of contaminant (Soil, groundwater, drums, etc.)
 5. Skin designation - does contaminant have the skin designation as defined by OSHA?
- B. Include brief descriptions of all physical hazards that may be encountered during work at the site. Examples of physical hazards include, but are not limited to the following: slips/trips/falls, temperature extremes, noise, splash hazards, manual lifting, heavy equipment, excavations, electrical hazards, hand and power tools, motors and pumps, fire and explosion.

- C. Include a description of all biological hazards that may be encountered during work at the site. Examples of biological hazards include insects (ticks, bees, wasps and spiders), wild animals, and poisonous plants (poison ivy, oak and sumac).
- D. Conduct an activity hazard analysis for each task to be performed. This includes determining the likelihood of exposure to the chemical, physical and biological hazards identified in the previous sections. Consider the routes of exposure, coming into contact with the contaminant or hazard and the procedures that will be utilized to complete the task.

Assign an overall risk to each task, taking into account the likelihood of exposure to all hazards, the anticipated duration of exposure and the potential adverse health effects of that exposure. For example, a potential moderate exposure to a low toxicity chemical may present less risk than a potentially lower exposure to a highly toxic compound.

- E. Describe the control measures that will be utilized to reduce or minimize the overall risks identified in the activities hazard analysis. Control measures include, but are not limited to the following: engineering controls, work practice controls, administrative controls, air monitoring, adherence to decontamination and personal hygiene procedures, and the use of personal protective equipment.

3.3 SAFE WORK PRACTICES AND DEPARTMENTING SAFEGUARDS

The Site Specific Health and Safety Plan shall address the safe work practices and engineering safeguards to be employed for the work covered under this specification. These shall include but not be limited to, the following:

- A. Requirements for protective clothing including eye, head, hands, foot, body, and respiratory protection shall be included in the plan.
- B. The Subcontractor shall define the requirements for entry into confined space (including excavation, treatment facilities and other facilities with limited access) and permitting system in the SHSP. The protocol shall include at a minimum:
 1. Monitoring the air quality (oxygen deficiency, combustible gases or vapors and toxic substances)
 2. Determination of the level of protection, checks of structural integrity
 3. Emergency equipment and other available personnel (buddy system)
 4. Excavation and trenching

The Subcontractor's confined space permits shall be listed and provided to the Contractor for review and acceptance. Entry procedures for these confined spaces shall also be approved by the Contractor.

- C. The SHSP shall describe protocols for loading and operating tank trucks on site (if used). The plan shall include DOT requirements, covering such items as grounding, placarding, driver qualifications and the use of wheel blocks.
- D. The SHSP shall include the Subcontractor's welding/hot work program. This program shall include, at a minimum, the following:
 1. Procedures for cutting, welding, or other flame/spark-producing equipment;

2. Procedures for welding in confined spaces;
3. Procedures for welding on systems that contain or contained flammable liquids;
4. Training requirements;
5. Recordkeeping; and
6. Hot work permit form.

3.4 TRAINING

- A. The Subcontractor shall certify that all Subcontractor personnel performing or supervising work, for health, safety, security or administrative purposes, for maintenance or for any other site-related function, have received site specific health and safety training provided by the Subcontractor via the Safety Officer. Proof of site specific training will be documented and provided to the Contractor.
- B. The Subcontractor shall ensure that all personnel assigned to or entering areas with hazardous materials or who are working with hazardous materials that have not been previously trained, complete a minimum of forty hours of general health and safety training, eight hour refresher and supervisory training (when appropriate) in accordance with 29 CFR 1910.120(e). The training program shall be conducted by a qualified instructor, such as the Health and Safety Manager.
- C. The Subcontractor's Health and Safety Manager, or the health and safety officer shall be responsible for site specific training of visitors in order to inform them of the hazards associated with the site, to explain emergency procedures and instruct them in the use of protective gear required during the visit. No visitors or employees will be permitted in the exclusion and contaminated reduction zones without documented training and medical clearance.
- D. The Subcontractor shall be responsible for, and ensure that personnel not successfully completing the required training and/or not having the required medical clearance shall not be permitted to enter the Exclusion Zone or the Contamination Reduction Zone.
- E. The Subcontractor shall be responsible for providing hazard communication training in accordance with 29 CFR 1910.1200 for employee's working with chemicals brought to the site. This training shall be documented and kept on file at the site by the HSO.

3.5 MEDICAL SURVEILLANCE

- A. Details of the medical surveillance program shall be included in the SHSP and shall include as a minimum the requirements specified below:
 1. The Subcontractor shall utilize the services of a Medical Consultant (see Section 3.1 – Health and Safety Personnel) to oversee and/or provide the medical examinations and surveillance specified herein.
- B. The medical surveillance protocol to be implemented is the occupational physician's responsibility, but shall meet the requirements of OSHA Standard 29 CFR 1910.120 and ANSI Z88.2 (1980). The medical surveillance protocol shall, as a minimum, cover the following:
 1. Medical and Occupational History;
 2. General physical examination (including evaluation of major organ system);
 3. Electrocardiogram;

4. Biological Blood profile (SMAC-21 or equivalent);
5. CBC;
6. Chest X-ray (performed no more frequently than every four years, except when otherwise indicated);
7. Pulmonary Function Testing (FVC and FEV_{1.0});
8. Urinalysis with microscopic examination;
9. Ability to wear respirator;
10. Visual Acuity;
11. Audiometric testing.

Additional clinical tests may be included at the discretion of the Medical Consultant.

- C. The submitted medical surveillance program may be amended as conditions require, subject to the Contractor's acceptance. The Client's acceptance to the program and any amendments to it does not relieve the Subcontractor of his responsibility for its adequacy.
- D. In addition, non-scheduled medical examination may be conducted under the following circumstances after consulting with the Medical Consultant:
 1. After acute exposure to any toxic or hazardous materials;
 2. At the discretion of the Contractor, the Health and Safety Manager or occupational physician;
 3. Upon receipt of a request for a medical examination from an employee with demonstrated symptoms of exposure to hazardous substances.
- E. The ability of on-site employees to wear respiratory protection shall be certified by the occupational physician based on criteria specified in ANSI Z88.2, Appendix A.4, and OSHA 1910.134.
- F. The Subcontractor shall include protocols and requirements for heat and cold stress monitoring and protective measures in the SHSP. These shall include, as a minimum, work/rest schedules (based on ambient conditions and the level of protection being utilized), and physiological monitoring requirements. Procedures to monitor and avoid heat/cold stress shall be followed in accordance with expert advise for heat stress and the guidance of the American Conference of Departmental Industrial Hygienists (ACGIH), in its TLV booklet 1995-1996. Such monitoring shall be performed by the Health and Safety Manager or his designee.
- G. The Subcontractor shall maintain accurate records of medical surveillance in accordance with 29 CFR 1910.20.
- H. Any employee who incurs lost-time due to occupational injury or illness during the period of the contract must be evaluated by the occupational physician. The employee's supervisor shall be provided with a written statement indicating the employee's fitness (ability to return to work), signed by the occupational physician, prior to allowing the employee to re-enter the work site. A copy of this written statement shall be submitted to the Contractor. An accident report in accordance with 29 CFR 1910.20 shall be completed and copies of such reports shall be submitted to the Contractor.

3.6 DIFFERENT WORK ZONE CATEGORIES:

- A. Work and support zones shall be established in order to contain contamination within the smallest areas possible. The Subcontractor shall ensure that each employee has the proper personal protective equipment for the area or zone in which he is to perform work. The Subcontractor shall include the delineated work/support zones as part of the SHSP for approval.
- B. Exclusion zone (contaminated work areas) shall be outlined (as necessary) on drawings provided in the SHSP by the Subcontractor. The Exclusion Zone will require different levels of protective equipment. The required protective equipment for use by personnel working or entering the exclusion areas is specified in Section 3.7 - Personnel Safety Equipment and Protective Clothing. Emergency equipment (such as escape packs, portable eyewashes, fire extinguishers) will be kept in the exclusion zone in a plastic bag to protect them from contamination. The Subcontractor may change the exclusion zone with the written approval of the Contractor.
- C. Contamination Reduction Zone shall be established as a buffer between the Exclusion Zone and the Support Zone. The Contamination Reduction Zone shall be designated on the drawings by the Subcontractor. Other emergency equipment (i.e. - SCBA's, stretchers, emergency shower or eyewash, first aid kits) will be kept in the support zone. The personal protective equipment required for use by personnel working in this area is specified in Section 3.7 - Personnel Safety Equipment and Protective Clothing. Decontamination equipment, supplies and stations shall be established in this area.
- D. Support zone shall include the remaining areas of the job site. Change rooms, lunch and break areas, operational direction and support facilities, including supplies, equipment storage and maintenance areas, shall be located in this area.
- E. Site control shall include a visitor's log, which should include, but is not limited to, the following:
 - 1. Personnel visiting
 - 2. Affiliation
 - 3. Date
 - 4. Arrival Time
 - 5. Departure Time
 - 5. Purpose of Visit

No unauthorized personnel shall be permitted to enter the site. The Subcontractor shall provide the Contractor with a list of all subcontractors and contractor personnel who are authorized to enter the site prior to the start of operations, updating the list as necessary.

3.7 PERSONAL SAFETY EQUIPMENT AND PROTECTIVE CLOTHING:

- A. The Subcontractor shall provide all on-site personnel with appropriate personal safety equipment and protective clothing. The Subcontractor shall also provide personal safety equipment and protective clothing for five visitors. The Subcontractor shall ensure that all safety equipment and protective clothing is properly used, kept clean, and well maintained.
- B. As part of the SHSP, a personal protective equipment hazard assessment shall be performed in accordance with 29 CFR 1910.132(d)(2) and shall include, at a minimum:
 - 1. Potential chemical, physical and biological hazards present;

2. Work operations to be performed;
3. Potential routes of exposure;
4. Concentrations of contaminants present; and
5. Characteristics, capabilities and limitations of PPE, and any hazards that the PPE presents or magnifies such as heat stress.

The hazard assessment shall be included in the SHSP and will contain the identification of the work place evaluated, the person certifying that the evaluation has been performed, and the date(s) of the hazard assessment.

- C. Personal safety and protective clothing shall be compatible with and provide protection against the chemical, physical and biological hazards that may be encountered.
 1. Level D clothing protection shall consist of the following:
 - a) Work clothes (i.e., long pants, long or short-sleeved shirts);
 - b) Steel toe/shank boots that meet or exceed ANSI 24.1.1;
 - c) Work gloves;
 - d) Hearing protection (When necessary);
 - e) Safety glasses or goggles; and
 - f) Hardhat
 2. Level C clothing protection shall consist of the following:
 - a) Work clothes;
 - b) Polycoated Tyvek with hoods and booties attached;
 - c) Surgical inner gloves;
 - d) Chemical resistant outer gloves;
 - e) Chemical resistant steel toe/shank boots that meet or exceed ANSI 24.1.1;
 - f) Booties (optional);
 - g) Hard hat; and
 - h) Face shield attached to hardhat for tasks where a potential splash hazard exists.
 3. Level B clothing protection shall consist of the following:
 - a) Saran-coated Tyvek with hoods and booties attached;
 - b) Items a,b,c,d,e,f of level C protection.
 4. Non-disposable clothing may be substituted for some items required for level B and C protection. These substitutes shall be described in the Subcontractor's SHSP.
- D. Programs for respiratory protection shall be described and documented in the SHSP and shall be in conformance with 29 CFR 1910.134 and ANSI Z88.2. The different levels of respiratory protection are outlined as follows:

1. Level D - No respirator will be worn
 2. Level C - Full face air purifying respirator with appropriate cartridges.
 3. Level B - Full-face positive-pressure SCBA, or full-face supplied air respirator equipped with 5-minute escape capability;
- E. The Subcontractor shall include in the Site Specific Health and Safety Plan a list of tasks and their related initial levels of protection. Levels of protection may be upgraded, downgraded, or modified at any time during site activities based upon air monitoring results and the judgment of the Health and Safety Officer in consultation with the Health and Safety Manager. Requests for downgrade must be submitted to the Contractor for acceptance prior to initiating the change in levels of protection.
- F. On-site personnel unable to pass a qualitative respirator fit test as specified in 29 CFR 1910.134 and ANSI Z88.2 shall not be permitted to enter or work in the Exclusion Zone or Contamination Reduction Zone.
- G. Each respirator shall be individually assigned and not interchanged among employees without cleaning and sanitizing. Cartridges shall be changed in accordance with a respirator cartridge changeout schedule as required by 29 CFR 1910.134.
- H. All prescription eyeglasses brought on-site shall be safety glasses. Prescription lenses for on-site employees requiring vision correction in respirators shall be provided in spectacle kits designed by the manufacturer of the respirator, contact lenses are also permitted for use in full-face respirators.
- I. All personnel protective equipment worn on site shall be decontaminated or properly disposed of at the end of each work day or when leaving the Exclusion Zone. The safety and health specialist shall ensure that all personal protective equipment is decontaminated before being reissued.

3.8 PERSONNEL AND EQUIPMENT DECONTAMINATION:

- A. The Subcontractor shall establish procedures for small equipment (i.e. - respirators, instruments) decontamination and personnel decontamination which shall be included in the SHSP. Boots, gloves, and respirators shall be decontaminated by means of decontamination procedures performed prior to entering support zones. All required breathing devices shall be provided and maintained by the Subcontractor. Eating, chewing gum or tobacco, smoking, drinking and application of cosmetics shall be prohibited except in facilities provided in the Support Zone.

B. Personnel Decontamination

The Subcontractor shall provide a Personnel Decontamination Area, where all contaminated personal protective equipment shall be decontaminated, removed and appropriately disposed of or stored for further use.

1. Layout and Features:

The Subcontractor shall submit a drawing for the Contractor to review and accept, showing the proposed layout of the facilities to be established. The feature of the Personnel Decontamination Area shall include, but not be limited to, the following:

- a) Provisions for employees working in the Exclusion Zone to remove protective outer clothing and to wash hands, face, and other exposed skin prior to eating;
 - b) Provisions for Contamination Reduction Zone employees to remove protective outer clothing and washup before eating; and
 - c) Benches, tables, lockers, and boot racks for clothing, as needed.
2. The personnel decontamination area is the initial area where surface contamination and outer protective clothing are removed. The area shall be partially covered (pavilion) to provide workers protection from the weather. This area shall include provisions for washing contamination and mud from boots and protective clothing and containers for collecting of outer protective clothing. This area shall include provisions for washing contamination and mud from boots, gloves, protective clothing and respirators. Boots and gloves shall be washed with a mixture of water and Alconox or equivalent. Respirators shall be washed with a non-alcohol sanitizer solution, such as MSA brand or equivalent. Containers for collection of contaminated tyveks, gloves, etc. shall be provided. Provisions for drumming the boot and glove washes and rinses shall be made.
 3. Used disposable outerwear shall not be re-used and shall be placed inside designated disposal containers provided by the Subcontractor for that purpose in the Contamination Reduction Zone and disposal by the Subcontractor.

C. Equipment Decontamination

1. The Subcontractor shall provide an equipment decontamination station within the Contamination Reduction Zone for removing soil from all vehicles and equipment leaving the work area. As a minimum, this station shall include a high-pressure water wash area for equipment and vehicles and a steam- cleaning system for use after the mud and/or dirt has been cleaned from the equipment. The Subcontractor shall also provide storage tank(s) to collect the waste water resulting from the decontamination of the equipment. Provisions for collection and storage of liquids generated during equipment decontamination shall be specified in the SHSP.
2. A designated clean area shall be established within the Contamination Reduction Zone for performing equipment maintenance. This area shall be used when personnel are required to come in contact with ground soil, i.e., crawling under a vehicle to change oil. All equipment within the Exclusion or Contamination Reduction Zones shall be decontaminated prior to maintenance work.
3. In general, any item taken into an Exclusion Zone must be assumed to be contaminated and must be carefully inspected and/or decontaminated before the item leaves the site. Vehicles, equipment, and materials brought into the Exclusion Zone shall remain in the Exclusion Zone until no longer necessary to the project. All contaminated vehicles, equipment, and materials shall be cleaned and decontaminated to the satisfaction of the Contractor prior to leaving the site. All construction material shall be handled and brought onto the site in such a way as to minimize the potential for contaminants being carried off site. Separate, clearly-marked parking and delivery areas shall be established in the Support Zone.

3.9 SANITATION

- A. The Subcontractor shall develop a program that addresses sanitation at the project site, which shall include, at a minimum, the following: potable water, toilet facilities, lunch room and washing facilities.
- B. An adequate supply of potable water shall be provided at the site.
- C. Toilet facilities shall be provided in accordance with the requirements of 29 CFR 1910.120 (n)(3).
- D. Washing facilities shall be provided for employees to remove hazardous substances which may be harmful.
 - 1. All personnel exiting the Exclusion or Contamination Reduction Zones shall thoroughly cleanse their hands, faces and other exposed areas before eating, drinking or smoking.
 - 2. The Subcontractor shall ensure that all on-site personnel entering the Exclusion zone or the Contamination Reduction Zone, who are subject to exposure to hazardous chemical vapors, liquids or contaminated solids, shall observe and adhere to the personal hygiene-related provisions in this section. The SHSP shall address the procedures to be utilized for compliance with these provisions.
 - 3. On-site employees found to be disregarding the personal hygiene-related provision of the SHSP shall be barred from the site.

3.10 EMERGENCY EQUIPMENT AND FIRST AID REQUIREMENTS

- A. Each active work area shall be provided with, at a minimum, a portable emergency eye bottle and 2A-10 B:C type dry chemical fire extinguisher. The Contamination Reduction Zone shall be equipped with a 15-minute emergency eyewash that meets or exceeds ANSI Standard 2358.1. Water shall be potable and tempered.
- B. At least one "industrial" first aid kit, approved by the occupational physician, shall be provided and maintained, fully stocked at an easily accessible, uncontaminated, manned location. Should active work areas be isolated or separated as to make one first aid location impractical, then another first aid station shall be established as required in close proximity to the work, but not inside a hazardous work area.
- C. The first aid kit location shall be specially marked and provided with adequate water and other supplies necessary to cleanse and decontaminate burns, wounds, or lesions.
- D. The Subcontractor shall have at least two persons certified in First Aid and CPR on the site at all times. This person may perform other duties, but must be immediately available to tender first aid or CPR when needed. Certification shall be by the American Red Cross or other approved agency.
- E. Dry chemical fire extinguishers, as specified in Section 3.10, Paragraph A shall be provided at the Subcontractor's office, the Contractor's office and at any other site location where flammable or combustible material may present a fire risk.

3.11 EMERGENCY RESPONSE AND CONTINGENCY PLANNING

- A. In addition to the regulation to be posted as specified in general requirements, the Subcontractor shall develop and submit with the SHSP an Emergency Response and Contingency Plan. The Emergency Response and Contingency Plan shall meet the requirements of 29 CFR 1910.120 (I). After approval, this plan shall be posted at all Support Zone offices, and at all entrances to the Exclusion and Contamination Reduction Zones. This plan shall include, but not be limited to:
1. Name, address and telephone number of the occupational physician;
 2. Procedure for prompt notification of local health facilities and fire department for emergency assistance;
 3. Procedure for evacuation of off-site personnel in the event of a significant release;
 4. Specific procedure for handling personnel with any skin or respiratory exposure to chemical or contaminated soil;
 5. Special procedures for fires, explosions, evacuation of on-site personnel, or other unplanned hazardous incidents;
 6. Procedures for treatment of personnel with occupational injuries or illnesses;
 7. Procedure for notifying the Contractor in case of accident or emergency; and
 8. Emergency phone numbers for the local police department, rescue service, hospitals, local fire department, National Response Center, Poison Control Center, USEPA Emergency Response. The Subcontractor shall provide all phone numbers for the above and any additional numbers which he deems necessary for emergency contacts.
- B. The Subcontractor shall arrange for emergency medical care services at a nearby medical facility and establish emergency routes prior to any work on site. The staff at the facility shall be advised of potential medical emergencies including the possibility of contamination of skin and clothing by specific chemicals from the GM-38 Area. The Subcontractors shall establish procedures and facilities for emergency communication with health and emergency services.
- C. Site support vehicles designated for use in transportation of injured or ill personnel shall be provided with a route map to the medical facility(s). All on-site employees shall be thoroughly familiar with the emergency routes to the medical facility(s).
- D. In the event of any emergency associated with construction activities, the Subcontractor shall, without any delay, take diligent action to safeguard the employees, remove or otherwise mitigate the cause of the emergency, alert the Contractor, and institute whatever measures might be necessary to prevent any repetition of the conditions or actions leading to, or resulting in, the emergency.

3.12 POSTED REGULATIONS

- A. The Subcontractor shall develop a series of posted regulations which shall be reviewed and accepted by the Contractor. These regulations shall address the on-site protocol regarding use of personal protective equipment, personal hygiene, and provision for smoking and eating.
- B. These protocols shall be posted on all on-site trailers and shall be reviewed with the Subcontractor's personnel.

3.13 COMMUNICATIONS

- A. The Subcontractor shall provide hardline telephone communication at its site field office.
- B. Emergency numbers, as listed in item 3.11 above, shall be prominently posted near all on-site telephones.
- C. The Subcontractor shall provide two-way radio site communication between the Control Center, each of the site activity areas and the Contractor.
- D. The Subcontractor shall provide air horns for use during emergencies should two-way radios malfunction.
- E. The use of hand signals shall be used during emergencies when necessary.

3.14 ENVIRONMENTAL AND PERSONNEL MONITORING

- A. The Subcontractor shall design, develop and implement an air monitoring program as specified in Section 3.15-Air Monitoring, of this specification as part of the environmental monitoring to assure that site personnel will not be exposed to harmful levels of airborne vapors, particulates, or to explosive atmospheres. As a minimum, the Subcontractor's air monitoring program shall provide multi-stage detection and identification of contaminants.

B. Heat Stress Monitoring

The climate combined with the requirements for personal protective equipment may create heat stress. For monitoring the body's recuperative abilities to excess heat, one or more of the following techniques shall be used. Monitoring of personnel wearing impervious clothing should commence when the ambient temperature is 70 degrees F or above. Monitoring frequency should increase as the ambient temperature exceeds 85 degrees F. Workers shall be monitored for heat stress after every work period. Monitoring shall be performed by a person with a current first aid certificate who is trained to recognize the symptoms of heat stress.

The heat stress monitoring shall include, but not be limited to, the following:

1. Heart Rate (HR)
2. Body temperature
3. Body water loss
4. Visual observation of skin, eyes, etc.

The Health and Safety Manager/Health and Safety Officer shall specify the work cycle period and the rest period based on this heat stress monitoring in accordance with 2001 ACGIH TLV's. The action levels at which the corrective action shall be taken shall be addressed in the Subcontractor's SHSP.

C. Cold Stress Monitoring

To guard against cold injury, the Subcontractor shall provide appropriate clothing, warm shelter for the rest periods and shall monitor worker's condition using one or more of the following techniques:

Workers who are exposed to temperature below -10 degrees F with wind speed of less than five miles per hour shall be medically certified as suitable for such exposure. All workers certified for exposure shall adhere to the work warmup schedule as specified in the 2001 ACGIH TLV's.

3.15 AIR MONITORING

Contaminated soils are not expected to be encountered during the actual construction of the groundwater treatment system. Trenching and excavation associated with the installation of system piping and installation of the building slab will be performed above the zone of contamination. Exposure to contaminated soil is not anticipated with these activities. In the event that impacted soils are discovered, air monitoring shall be performed to detect and quantify volatile organic compounds in the work area and will determine the level of respiratory protection required. This section details air monitoring and sampling protocols in the case that contaminated soil is encountered. Air monitoring and sampling will be performed on an as-needed basis.

A. General Requirements

1. The Subcontractor shall comply with the air monitoring requirements as outlined in this section.
2. The Subcontractor's Health and Safety Manager and/or Health and Safety Officer shall design, develop and implement an Air Monitoring Program to detect and quantify any volatilization of soil contaminants associated with remedial work in the surrounding air. The program shall be submitted as part of SHSP for review and acceptance by the Contractor.
3. Information gathered during air monitoring program shall be used to determine appropriate safety and personnel protective measures to be implemented during the site activities, to document on-site employee's exposures, and to assess off-site migration of contaminants released during remedial activities so that appropriate control measures and/or contingency plans can be implemented.
4. Information gathered during the air monitoring program shall be cataloged and included in the project records and safety and health log.

B. General Responsibilities

1. The Subcontractor's Health and Safety Manager and/or Health and Safety Officer shall be responsible for establishing air monitoring strategies and protocols using real time instrumentation and appropriate industrial hygiene sampling and analytical procedures in order to characterize and qualify the airborne release and transport of contaminants during remediation work. These strategies and protocols shall address appropriate air monitoring for volatile organic compounds and particulate matter in the active work zones of the site and the active site perimeter.
2. The Subcontractor shall be responsible for establishing and documenting baseline (background) air quality conditions prior to commencement of work and for conducting continuous air monitoring during on-site work.
3. All air monitoring equipment required shall be provided by the Subcontractor and shall be maintained and calibrated according to manufacturers' recommendations. Such maintenance and calibration data shall be recorded and included in the project record documents.

4. All air monitoring equipment shall be operated by personnel trained in their specific use (i.e.- Health and Safety Officer or the Health and Safety Technician).
5. The Subcontractor shall be responsible for establishing and documenting the minimum Action Levels to be followed during the implementation of the SHSP. These action levels will determine the minimum level of protection/action to be taken; such as level D, C, or B, adequacy of air monitoring, stop work, or emergency/contingency action. The decision logic for selection of the action levels shall be included in the SHSP.
6. The Subcontractor shall provide the support necessary for the sampling and analysis of all samples collected during the program, for the interpretation of the analytical results and for the recording, presentation and documentation of all results.

C. Real-Time Air Monitoring

1. The Subcontractor shall furnish and maintain real-time air monitoring equipment at each monitoring station to include: an explosimeter, an organic vapor monitor (photoionization detector or flame ionization detector), an airborne dust monitor (GCA mini-RAM or equivalent) and all necessary calibration/audit equipment and supplies as deemed necessary by the Subcontractor's SHSP.
2. The Subcontractor shall perform real-time air monitoring prior to commencement of work in order to establish baseline conditions. Monitoring shall be provided during active site operations both on-site and near each active work zone. This real-time air quality monitoring is required during excavation, staging or loading of potentially contaminated soils and/or handling of contaminated liquids. Real-time air monitoring shall also be performed adjacent to each work zone. This monitoring shall be performed in the area of highest employee exposure risk in the Exclusion Zone.
3. The Subcontractor's trained Health and Safety Manager shall delineate background levels for dust using qualitative visual monitoring at the work area perimeter and adjacent to soil excavation, staging and loading operations.
4. The Subcontractor shall provide continuous real-time air monitoring for volatile organic compounds with a photoionization detector (PID - HNu or equivalent) or a flame ionization detector (FID - Century Organic Vapor Analyzer or equivalent) and an explosimeter.
5. Any departures from general background shall be reported by the Health and Safety Officer to the Health and Safety Manager, shall determine when operation should be shut down and contingency plans activated.
6. The frequency of real-time monitoring for all on-site activities shall be, at a minimum:
 - a) Continuous monitoring for organic vapors adjacent to all exclusion zone work.
 - b) Continuous monitoring for organic vapors, dust, and combustible gas adjacent to all excavation and demolition activities.
 - c) Periodic monitoring in the CRZ and support zone.

The Subcontractor shall establish the frequency of real-time monitoring in the Air Monitoring Plan.

7. Action levels for upgrading of PPE will apply to all site work. Action levels are for unknown contaminants using direct reading instruments in the breathing zone (BZ) for organic vapor and dusts, and at the source for combustible gas.
8. If the real-time air monitoring shows or the Health and Safety Manager feels that an imminent health hazard exists then that work location shall be shut down and personnel evacuated to a predetermined upwind location. The Client shall be notified immediately and work will not resume until:
 - a. Appropriate corrective measures are implemented; and
 - b. Authorization to continue work is given by the Contractor after consultation with the Health and Safety Manager.
9. Should organic vapor levels at the Support Zone exceed the baseline ambient levels or the Action Levels, appropriate action shall be taken as directed by the Health and Safety Officer. During such time that the organic vapor levels exceed the aforementioned limits in the Support Zone, personnel shall be notified and all personnel within this area shall don respiratory protective equipment as described by the Health and Safety Plan.
10. A data sheet shall be developed and implemented by the Health and Safety Manager/Health and Safety Officer upon which to record the following real-time monitoring data information:
 - a) Date and time of monitoring;
 - b) Air monitoring location;
 - c) Instrument, model #, serial #;
 - d) Calibration/background levels;
 - e) Results of monitoring;
 - f) Health and Safety Officer Signature; and
 - g) Interpretation of the data and any further recommendations by the Health and Safety Manager or the Health and Safety Officer in consultation with the Health and Safety Manager.

These results shall be given verbally to the Contractor following each site scan and documented in writing by the end of each work day with three copies provided. Copies of the data sheets shall be included in the daily safety log.

D. Dust and Volatile Organic Emission Control

1. The Subcontractor shall conduct operations and maintain the project site so as to minimize the creation and dispersion of dust and the volatilization of organics. Visible dust is not necessarily the criterion if hazardous wastes are involved.
2. The Subcontractor shall provide foam or water spraying equipment and clean potable water, free from salt, oil, and other deleterious materials for dust and volatile organic emission control (see Section 02040).

3. The Subcontractor shall implement dust control procedures as required to minimize off-site transport of particulates.

- a) Equipment

The contractor shall supply appropriate water spraying equipment capable of accessing all work areas for dust control during project activities.

- b) Execution

The Subcontractor shall apply water to the site when dust control is necessary. For this project, the dust levels shall be kept to below visible levels while working in the exclusion zone and below levels established at the perimeter of the site. Dust shall be controlled by arranging spray bar height, nozzle spacing, and spray pattern to provide complete coverage of ground or excavation area. Water shall be applied without interfering with excavation equipment or site operations and without creating nuisance conditions such as ponding.

3.16 RECORD KEEPING AND REPORTING

- A. The Subcontractor shall maintain logs and reports covering the implementation of the Health and Safety Plan. The format shall be developed by the Subcontractor and shall include Training Logs, Daily Safety Logs, Air Monitoring Logs, Air Monitoring Results Reports, Weekly Safety Reports and a Close-out Safety Report. These logs and reports shall be submitted to the Contractor as specified.

- B. Training logs, which have been included as Figure 01220-1, shall be completed by the Health and Safety Manager and submitted to the Contractor prior to allowing personnel on site. Figure 01220-1 has been provided as examples of these logs and Subcontractor shall generate his own log. These logs shall include:

1. Employee's name, Social Security number, and attendance record;
2. Time allocation in the training session;
3. Topics covered;
4. Materials used;
5. Equipment demonstrated;
6. Equipment practice for each employee;
7. Prohibitions covered;
8. Explanation of the buddy system;
9. Signature of trainer; and
10. Other pertinent information.

- C. Daily Safety Logs, which has been included as Figure 01220-2, shall be completed daily by the Health and Safety Officer and submitted to the Contractor in the daily safety log. Figure 01220-2 has been provided as examples of these logs and Subcontractor shall generate his own log. These logs shall include:

1. Date;

2. Work area(s) checked;
 3. Employees present in work area(s);
 4. Equipment being utilized by employees;
 5. Protective clothing being worn by employees;
 6. Protective devices being used by employees; and
 7. Accidents or breaches of procedure.
- D. Air Monitoring Reports, which have been included as Figure 01220-3, shall be completed by the Health and Safety Officer and submitted to the Contractor in the daily safety log. Figure 01220-3 has been provided as examples of these logs and Subcontractor shall generate his own log. These reports shall include:
1. Date of Report;
 2. Equipment utilized for air monitoring;
 3. Real-Time air monitoring results from each work location;
 4. Time-Weighted-Average of personnel sampling, date of actual sampling, and personnel sampled; and
 5. Calibration methods of equipment and results.
- E. Weekly Safety Reports shall be completed by the Health and Safety Officer and submitted weekly to the Contractor. Figure 01220-4 has been provided as examples of these logs and Subcontractor shall generate his own log. These reports shall include:
1. Non-use or misuse of protective devices in an area where required;
 2. Non-use or misuse of protective clothing;
 3. Disregard of the buddy system;
 4. Violation of eating, smoking, drinking, or chewing prohibition;
 5. Job-related injuries and illness;
 6. Data developed by the meteorological station; and
 7. Summary of air monitoring done that week including results of perimeter monitoring sample analysis completed that week.
- F. Close-Out Safety Report:
- At the completion of the work, the Subcontractor shall submit a close-out safety report. The report shall be signed and dated by the Health and Safety Manager and submitted to the Contractor. The report shall include:
1. Final medical examination of site personnel;
 2. Equipment decontamination certificate; and
 3. Procedures and techniques used to decontaminate equipment, vehicles, toilet and decontamination facilities.

Final acceptance of the work will not be given before the close-out safety report has been received and approved by the Contractor.

3.17 INSPECTION/AUDIT PROGRAM

An Inspection/Audit Program is to be established by the Subcontractor, to identify substandard conditions and employee work practices that could potentially cause or lead to personal injuries or illnesses, and/or equipment damage; and to recognize and reinforce good housekeeping, good work practices, and compliance with regulatory standards.

A. This section sets forth the minimum responsibilities for the Subcontractor's inspection program.

1. The Health and Safety Manager shall be responsible for:

- Ensuring that inspections are conducted at the frequency stated;
- Reviewing the weekly and monthly site inspections for completeness, thoroughness, and trends;
- Performing project inspections; and
- Training site personnel on proper inspection techniques.

2. The Health and Safety Officer shall be responsible for:

- Ensuring that weekly and monthly inspections are conducted;
- Assisting management with the weekly and monthly inspections;
- Reviewing the inspections findings and corrective actions for applicability and thoroughness;
- Providing the Contractor with summary of inspection findings each month; and
- Performing informal daily inspections of the work site.

B. The Subcontractor shall, at a minimum, perform various types of inspections described below.

1. Once each week, the site supervisors shall conduct an inspection of the their area(s) of responsibility. The purpose of this inspection will be to observe and document site conditions and employee work practices.

These weekly inspections shall be documented and kept on file at the site. The inspection report will identify the date, time, site conditions/operations, personnel conducting the inspection, findings, and recommended corrective actions. Figure 01220-5 is a sample project inspection form for the weekly inspections. The Subcontractor shall generate his own log.

2. Once each month, the Subcontractor's Quality Assurance/Quality Control (QA/QC) Engineer shall conduct an inspection of the site accompanied by the HSO. The forms and documentation will be the same as for the weekly inspections. Copies of the inspection report will be sent to the Contractor and the Health and Safety Manager.

3. The Health and Safety Manager shall conduct an inspection at the site for each three months of active field operations at the project site. Figure 01220-6 has been provided as an example of the PHSM project inspection format. The Subcontractor shall generate his own

report. Copies of the inspection report will be sent to the Contractor and the Subcontractor's QA/QC Engineer.

3.18 MATERIAL SAFETY DATA SHEETS (MSDS)

- A. The Subcontractor shall provide all employees with information on the potential hazards of materials brought onto the site in accordance with 29 CFR 1910.120(e) and (i).
- B. A list of hazardous chemicals shall be developed for the site.
- C. A MSDS shall accompany all new shipments of hazardous chemicals.
- D. Each container of hazardous chemicals shall be labeled, marked, or tagged with the following information:
 - 1. Identity of hazardous chemical
 - 2. Appropriate hazard warnings and labeling
- E. Label warning systems shall comply with the National Fire Protection (NFPA) Standards and labels on containers shall reflect:
 - 1. Emergency health hazard
 - 2. Fire hazard
 - 3. Instability or reactivity hazard
- F. Workers shall be trained on the NFPA labeling system.

* * * END OF SECTION * * *

FIGURE 01220-1
TRAINING LOG

FIGURE 01220 - 1

TRAINING LOG

Date: _____

Employees in Attendance (If needed use additional sheets):

Name	S.S. #	Name	S.S. #
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Description of Training Activity/Topics Covered: _____

Equipment Demonstrated: _____

Special Training and Other Comments: _____

Name of Person Conducting Training

Title

Signature

FIGURE 01220-2
DAILY SAFETY LOG

FIGURE 01220 -2
DAILY SAFETY LOG

Date: _____

Work Period Covered: _____

Weather Conditions: _____

Summary of Day's Work Activity _____

Equipment Utilized by Safety Monitors: _____

Protective Clothing and Equipment Being Used by Task: _____

Physical Condition of Workers (any heat or cold stress or other medical problems:

Accidents or Breach of Procedures: _____

Description of Monitoring and Air Samples Taken: _____

Miscellaneous: _____

Name

Title

Signature

FIGURE 01220-3
AIR MONITORING FORM

FIGURE 01220 - 3

AIR MONITORING FORM

Date: _____

Duration of Monitoring: _____

Work Location and Task: _____

Instrument _____ Reading (Time)	Instrument _____ Reading (Time)	Instrument _____ Reading (Time)
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

(Note: If instruments have recorders, just attach tape to report. Also note any action levels when exceeded.)

Instrument Calibration _____

Perimeter Samples Collected: _____

Personnel Samples Collected: _____

Perimeter and Personnel Sample Results From Previous Day
(Provide data when received):

Comments: _____

Name

Title

Signature

FIGURE 01220 - 4
WEEKLY HEALTH AND SAFETY REPORT

**NWIRP BETHPAGE GM-38 AREA SITE
WEEKLY HEALTH AND SAFETY REPORT**

Project Name: _____	
Location: _____	
SITE INFORMATION	INJURIES AND ILLNESSES
Week Ending _____	Yes _____ No _____
Hours Worked: Craft: _____ PS: _____ Subs: _____	Describe: _____
Check Level of Protection For the week: B ___ C ___ D ___	_____
MAJOR ACTIVITIES CONDUCTED THIS WEEK: (drum handling, sampling, excavation, abatement/T&D, etc.)	

SIGNIFICANT EVENTS THIS WEEK: (regulatory visits, equipment malfunctions, process start-up or shutdown):	

FUTURE ISSUES: (schedule, manpower allocation, monitoring equipment, other resources needed)	

SITE AUDIT/INSPECTIONS CONDUCTED Yes _____ No _____ (describe outstanding findings and attach results)	

HIPO ACTIVITIES	
Hot Work	Yes _____ No _____ Dates: _____
Lockout/Tagout	Yes _____ No _____ Dates: _____
Confined Space Entry	Yes _____ No _____ Dates: _____
Soils Analysis Classification	Yes _____ No _____ Dates: _____
Excavation Daily Check List	Yes _____ No _____ Dates: _____
Crane On-Site	Yes _____ No _____ Dates: _____
Critical Lift Plan Performed	Yes _____ No _____ Dates: _____

**NWIRP BETHPAGE GM-38 AREA SITE
WEEKLY HEALTH AND SAFETY REPORT**

REAL TIME AIR MONITORING						
Major Activity	Location(s)	Worker Occupation Monitored	FID/PID Range and Readings	CGI/02 Range and Readings	PDM Range and Readings	Other
PERSONAL AIR MONITORING						
Activity Monitored	Location	Occupation	Type of Sample	Analyte	Result	
SUBCONTRACTORS ON SITE						
Company Name	Task or Function			Return to Site Next Week (Y/N)	Performed Subcontractor Review (Y/N)	
<hr/> Health and Safety Officer - Signature Date						

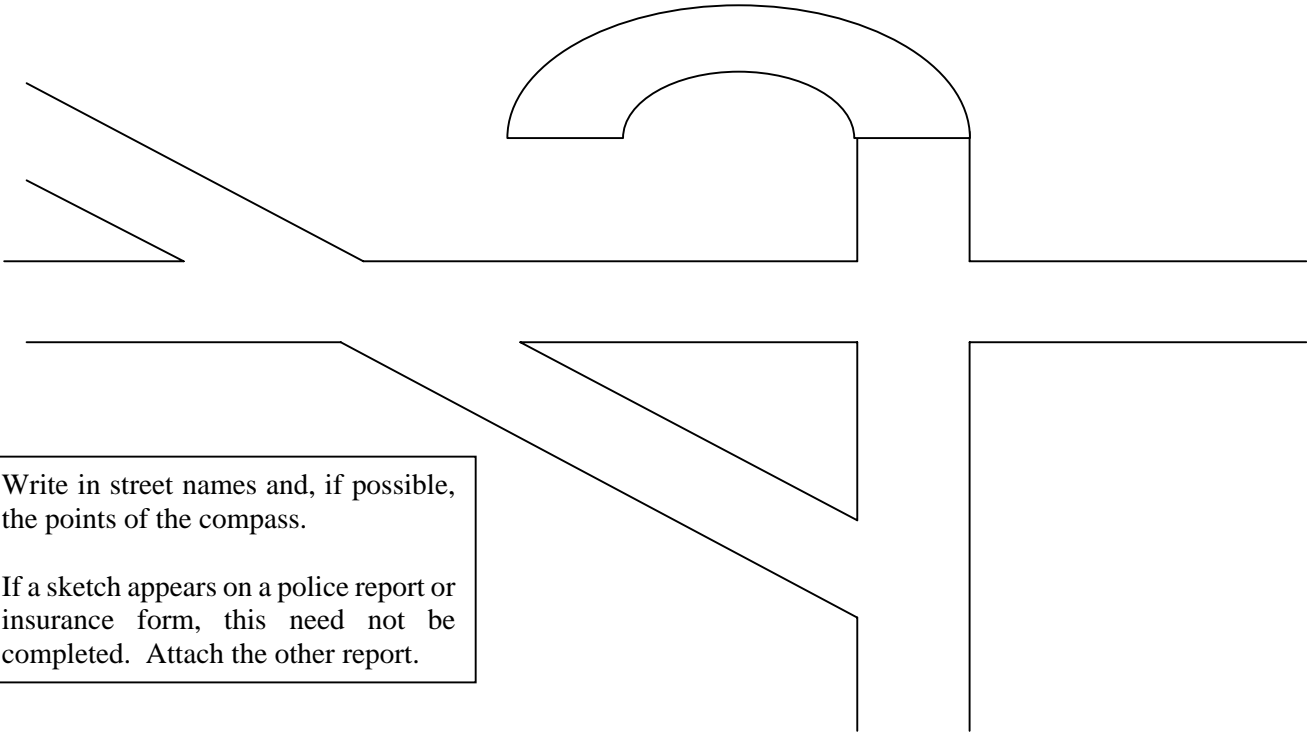
FIGURE 01220-5
INCIDENT REPORT AND INVESTIGATION

INCIDENT/NEAR MISS REPORT AND INVESTIGATION			
TYPE OF INCIDENT - CHECK ALL THAT APPLY			
<input type="checkbox"/> INJURY/ILLNESS	<input type="checkbox"/> VEHICLE DAMAGE	<input type="checkbox"/> PROPERTY DAMAGE	<input type="checkbox"/> FIRE
<input type="checkbox"/> SPILL/RELEASE	<input type="checkbox"/> PERMIT EXCEEDENCE	<input type="checkbox"/> HIGH LOSS POTENTIAL (NEAR MISS)	<input type="checkbox"/> OTHER
GENERAL INFORMATION			
PROJECT/OFFICE:	REPORT #:	DATE OF REPORT:	
DATE OF INCIDENT:	MILITARY TIME: ____	DAY OF WEEK: ____	
FW SUPERVISOR ON DUTY:	AT SCENE OF INCIDENT: <input type="checkbox"/> YES <input type="checkbox"/> NO		
LOCATION OF INCIDENT:			
WEATHER CONDITIONS:	ADEQUATE LIGHTING AT SCENE:	<input type="checkbox"/> YES	<input type="checkbox"/> NO <input type="checkbox"/> N/A
DESCRIBE WHAT HAPPENED (STEP BY STEP - use additional pages if necessary)			
AFFECTED EMPLOYEE INFORMATION			
(Include injured person, driver/operator, or employee whose activities resulted in the incident. Use another page to provide information for additional employees)			
NAME:	FWENC EMPLOYEE: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		
HOME ADDRESS:			
SOCIAL SECURITY #:	HOME PHONE #:		
JOB CLASSIFICATION:	YEARS IN JOB CLASSIFICATION:		
HOURS WORKED ON SHIFT PRIOR TO INCIDENT:	YEARS WITH FWENC:	AGE:	
DID INCIDENT RELATE TO ROUTINE TASK FOR JOB CLASSIFICATION: <input type="checkbox"/> YES <input type="checkbox"/> NO			
INJURY/ILLNESS INFORMATION			
NATURE OF INJURY OR ILLNESS:			
OBJECT/EQUIPMENT/SUBSTANCE CAUSING HARM:			
FIRST AID PROVIDED: <input type="checkbox"/> YES <input type="checkbox"/> NO			
IF YES, WHERE WAS IT GIVEN: <input type="checkbox"/> ON SITE <input type="checkbox"/> OFF SITE			
IF YES, WHO PROVIDED FIRST AID:			
WILL THE INJURY/ILLNESS RESULT IN: <input type="checkbox"/> RESTRICTED DUTY <input type="checkbox"/> LOST TIME <input type="checkbox"/> UNKNOWN			

MEDICAL TREATMENT INFORMATION		
WAS MEDICAL TREATMENT PROVIDED?:	<input type="checkbox"/> YES	<input type="checkbox"/> NO
IF YES, WAS MEDICAL TREATMENT PROVIDED:	<input type="checkbox"/> ON SITE	<input type="checkbox"/> DR.'S OFFICE <input type="checkbox"/> HOSPITAL
NAME OF PERSON(S) PROVIDING TREATMENT:		
ADDRESS WHERE TREATMENT WAS PROVIDED:		
TYPE OF TREATMENT:		
VEHICLE AND PROPERTY DAMAGE INFORMATION		
VEHICLE/PROPERTY DAMAGED:		
DESCRIPTION OF DAMAGE:		
SPILL AND AIR EMISSIONS INFORMATION		
SUBSTANCE SPILLED OR RELEASED:	FROM WHERE:	TO WHERE:
ESTIMATED QUANTITY/DURATION:		
CERCLA HAZARDOUS SUBSTANCE? YES <input type="checkbox"/> NO <input type="checkbox"/> RQ EXCEEDED? YES <input type="checkbox"/> NO <input type="checkbox"/> SPECIFY: _____		
REPORTABLE TO AGENCY? YES <input type="checkbox"/> NO <input type="checkbox"/> SPECIFY: _____		
WRITTEN REPORT? YES <input type="checkbox"/> NO <input type="checkbox"/> TIME FRAME: _____		
RESPONSE ACTION TAKEN		
PERMIT EXCEEDENCE		
TYPE OF PERMIT:	PERMIT #:	
DATE OF EXCEEDENCE:	DATE FIRST KNOWLEDGE OF EXCEEDENCE:	
PERMITTED LEVEL OR CRITERIA (e.g., Water quality):		
EXCEEDENCE LEVEL OR CRITERIA:	EXCEEDENCE DURATION:	
REPORTABLE TO AGENCY? YES <input type="checkbox"/> NO <input type="checkbox"/> SPECIFY: _____		
WRITTEN REPORT? YES <input type="checkbox"/> NO <input type="checkbox"/> TIME FRAME: _____		
RESPONSE ACTION TAKEN:		
NOTIFICATIONS		
NAME(S) OF FWENC PERSONNEL NOTIFIED:	DATE/TIME:	
CLIENT NOTIFIED:	DATE/TIME:	
AGENCY NOTIFIED:	DATE/TIME:	<input type="checkbox"/> NOT REQUIRED
CONTACT NAME:		
PERSONS PREPARING REPORT		
EMPLOYEE'S NAME: (PRINT)	SIGN:	
EMPLOYEE'S NAME (PRINT)	SIGN:	
SUPERVISOR'S NAME: (PRINT)	SIGN:	
NOTE: Supervisor to forward a copy of Incident Report to immediate supervisor, PESM, ESS or ESC, and other personnel as identified in Table 1 of this procedure ASAP, but no later than 24 hours.		

INCIDENT SKETCH
CORPORATE ESQ REPORT # _____

VEHICLE INCIDENTS



INVESTIGATIVE REPORT

DATE OF INCIDENT: _____

DATE OF INVESTIGATION REPORT: _____

INCIDENT COST: ESTIMATED: \$ _____ ACTUAL: \$ _____

OSHA RECORDABLE(S): YES NO # RESTRICTED DAYS _____ # DAYS AWAY FROM WORK _____

CAUSE ANALYSIS

Was the activity addressed in an AHA? YES (Attach a copy) NO

IMMEDIATE CAUSES – WHAT ACTIONS AND CONDITIONS CONTRIBUTED TO THIS EVENT? (USE NEXT PAGE)

BASIC CAUSES - WHAT SPECIFIC PERSONAL OR JOB FACTORS CONTRIBUTED TO THIS EVENT? (USE NEXT PAGE)

ACTION PLAN

REMEDIAL ACTIONS - WHAT HAS AND OR SHOULD BE DONE TO CONTROL EACH OF THE CAUSES LISTED? INCLUDE MANAGEMENT PROGRAMS (SEE ATTACHED LIST) FOR CONTROL OF INCIDENTS IF APPLICABLE.

ACTION	PERSON RESPONSIBLE	TARGET DATE	COMPLETION DATE

PERSONS PERFORMING INVESTIGATION

INVESTIGATOR'S NAME: (PRINT) SIGN: DATE:

INVESTIGATOR'S NAME: (PRINT) SIGN: DATE:

INVESTIGATOR'S NAME: (PRINT) SIGN: DATE:

MANAGEMENT REVIEW

PROJECT/OFFICE MANAGER (PRINT) SIGN:

COMMENTS:

PESM or ESC (PRINT) SIGN:

COMMENTS:

NOTE: Attach additional information as necessary. Supervisor to forward copy of Investigative Report to the PM or OM, PESM or ESC ASAP, but no later than 72 hours after the incident. A copy shall be sent to the Director, Health and Safety Programs within 24 hours of completion of the report.

EXAMPLES OF IMMEDIATE CAUSES

SUBSTANDARD ACTIONS

1. OPERATING EQUIPMENT WITHOUT AUTHORITY
2. FAILURE TO WARN
3. FAILURE TO SECURE
4. OPERATING AT IMPROPER SPEED
5. MAKING SAFETY DEVICES INOPERABLE
6. REMOVING SAFETY DEVICES
7. USING DEFECTIVE EQUIPMENT
8. FAILURE TO USE PPE PROPERLY
9. IMPROPER LOADING
10. IMPROPER PLACEMENT
11. IMPROPER LIFTING
12. IMPROPER POSITION FOR TASK
13. SERVICING EQUIPMENT IN OPERATION
14. UNDER INFLUENCE OF ALCOHOL/DRUGS
15. HORSEPLAY

SUBSTANDARD CONDITIONS

1. GUARDS OR BARRIERS
2. PROTECTIVE EQUIPMENT
3. TOOLS, EQUIPMENT, OR MATERIALS
4. CONGESTION
5. WARNING SYSTEM
6. FIRE AND EXPLOSION HAZARDS
7. POOR HOUSEKEEPING
8. NOISE EXPOSURE
9. EXPOSURE TO HAZARDOUS MATERIALS
10. EXTREME TEMPERATURE EXPOSURE
11. ILLUMINATION
12. VENTILATION
13. VISIBILITY

EXAMPLES OF BASIC CAUSES

PERSONAL FACTORS

1. CAPABILITY
2. KNOWLEDGE
3. SKILL
4. STRESS
5. MOTIVATION

JOB FACTORS

1. SUPERVISION
2. ENGINEERING
3. PURCHASING
4. MAINTENANCE
5. TOOLS/EQUIPMENT
6. WORK STANDARDS
7. WEAR AND TEAR
8. ABUSE OR MISUSE

MANAGEMENT PROGRAMS FOR CONTROL OF INCIDENTS

1. LEADERSHIP AND ADMINISTRATION
2. MANAGEMENT TRAINING
3. PLANNED INSPECTIONS
4. TASK ANALYSIS AND PROCEDURES
5. TASK OBSERVATION
6. EMERGENCY PREPAREDNESS
7. ORGANIZATIONAL RULES
8. ACCIDENT/INCIDENT ANALYSIS
9. PERSONAL PROTECTIVE EQUIPMENT

10. HEALTH CONTROL
11. PROGRAM AUDITS
12. ENGINEERING CONTROLS
13. PERSONAL COMMUNICATIONS
14. GROUP MEETINGS
15. GENERAL PROMOTION
16. HIRING AND PLACEMENT
17. PURCHASING CONTROLS

NOTIFICATION REMINDER

Fatalities or hospitalization (admittance) of three or more individuals requires notification to OSHA within 8 hours. Contact the Director, Health and Safety Programs or Director, ESQ Programs to make the notification. If unavailable, the senior operations person on site should make the notification.

FIGURE 01220-6
PHYSICAL CONDITIONS EVALUATION GUIDE
AND
PROJECT INSPECTION CHECKLIST

EHS WEEKLY/MONTHLY CHECKLIST AND ACTION ITEM REPORT

Project: _____ **Area of Inspection:** _____

Inspection Type: Weekly Monthly

Inspector: _____ **Date:** _____

Signature: _____ **Time:** _____

REQUIREMENTS	OBSERVATIONS (N/A if not applicable)	FINDING YES/NO
WORK CONDITIONS		
1 Walking /Working Surfaces		
2 Aisles and Passageways		
3 Platforms/ Scaffolding		
4 Ladders		
5 Stairs		
6 Exits/Egress		
7 Roadways		
8 Ventilation		
9 Lighting		
10 Noise Exposure		
11 Ergonomics		
Materials		
1 Stacking and Storage		
2 Chemicals and Fuel		
3 Compressed Gases		
Equipment		
1 Hand / Portable Tools		
2 Machine, Tools, Guarding		
3 Mobile/ Heavy Equipment		
4 Lifting Gear Equipment		
5 Materials Handling Equipment		
6 Mechanical Power Systems		
7 Hydraulic Power Systems		

EHS WEEKLY/MONTHLY CHECKLIST AND ACTION ITEM REPORT

REQUIREMENTS	OBSERVATIONS (N/A if not applicable)	FINDING YES/NO
8 Pneumatic Power Systems		
9 Electrical Power Systems		
10 Valves and Controls		
Hazard Controls		
1 Other Heavy Equipment		
2 Lock-Out Systems		
3 Signs and Tags		
4 Color Coding		
5 Materials Labeling		
6 Warning Systems		
Emergency Systems		
1 Emergency Instructions		
2 Fire Protection		
3 Eye Wash and Showers		
4 First Aid Kits/ Stations		
5 Emergency Rescue Equipment		
Protective Equipment		
1 Eye Protection		
2 Ear Protection		
3 Respiratory Protection		
4 Head Protection		
5 Hand Protection		
6 Foot Protection		
7 Body Protection		
8 Fall Protection		
Hazardous Waste Storage Area(s)/Satellite Accumulation Areas^{1 2}		
1 Designated, secured area with "Hazardous Waste" signage. For SAA area is marked "SAA". (SAA)		
2 Containers:		
a. DOT-spec. containers (for wastes to go off-site only)		
b. Intact/in good condition (SAA)		

¹ For sites with multiple storage areas or Satellite Accumulation Areas (SAAs), indicate location where deficiencies are noted.

² For SAAs, evaluate only rows marked with (SAA).

EHS WEEKLY/MONTHLY CHECKLIST AND ACTION ITEM REPORT

REQUIREMENTS	OBSERVATIONS (N/A if not applicable)	FINDING YES/NO
c. Waste compatible with containers (e.g., no evidence of corrosion, softening, bulging) (SAA)		
d. Marked "Hazardous Waste"/ visible Accumulation Date. <i>For SAA, marked "Hazardous Waste" or identify container contents and Accumulation date (SAA)</i>		
e. Securely closed and stored to prevent rupture/leaking, except when add/remove waste. (SAA)		
f. Labeled with EPA Id. No.		
g. For SAA only, Stored "at the point of generation" and meets quantity limits.		
3 Reactive/ignitable wastes stored at least fifty (50) feet from property.		
4 Liquid wastes within secondary containment.		
5 Incompatible wastes separated by a dike, wall, berm or other device.		
6 Stored for less than 90 days. (CERCLA projects may have storage variance). ³		
7 Container tracking log accurately reflects containers stored. (SAA)		
8 Area maintained in an orderly fashion and complies with state/EHS plan requirements. (SAA)		
Hazardous Waste Tank Storage Area (Daily inspection is being conducted and maintained on-site)		
Waste/Stockpiles - State Regulated Non-Hazardous Wastes (Refer to PESM Checklists, if applicable)		
TSCA PCB Wastes – must be inspected at least every 30 days (GMP - weekly) (Refer to PESM TSCA Checklist for inspection items)		

³ If stored on-site 75 or more days, TSDF/transporter has been selected (EHS 1-4), pick-up date scheduled and PM/PESM are aware of 90-day limit.

EHS WEEKLY/MONTHLY CHECKLIST AND ACTION ITEM REPORT

REQUIREMENTS	OBSERVATIONS (N/A if not applicable)	FINDING YES/NO
Point Source Discharges/ Air Emissions		
1 Permit conditions are being met.		
2 Monitoring equipment is fully operational.		
3 Equipment calibrations and maintenance is up-to-date.		
4 Discharge sampling performed at required intervals.		
5 Review monitoring results (<i>Report permit exceedences per EHS 1-7</i>)		
6 DMR and Plant Logs properly completed, signed, and submitted (if required).		
7 Fugitive Dust – Appropriate BMPs are instituted for fugitive dust emissions.		
Stormwater Discharge Activities		
1 SWPPP /Soil Plan reflects current activities.		
2 Monitoring/sampling performed at required intervals.		
3 Review monitoring results (<i>Report permit exceedences per EHS 1-7</i>)		
4 BMPs in SWPPP/Soil Plan implemented.		
5 Visual observations indicate stormwater meets water quality criteria.		
6 Inspections conducted as required and documented. Corrective actions are implemented and documented.		
Other Conditions or Work Practices		
1		
2		
3		
4		

- End of Checklist-

Monthly Inspections must be sent to PESM and Project Manager.

Review previous week's/month's Action Item Report. Carry forward action items that have not been implemented. Note outstanding action items with an (F) in the "Action Item" column on this report. Note an (F) in the "Date Completed" column on previous week's/month's Action Item Report.

Project:

Area of Inspection:

Inspection Type: Weekly Monthly

Date of Inspection:

ACTION ITEM	RESPONSIBLE PARTY	SCHEDULE	DATE COMPLETED
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			

Reviewed by: _____ Date _____
 Site Superintendent/ Site Manager

cc: Project Manager (monthly only)
PESM (monthly only)

SECTION 01510

MOBILIZATION/DEMOBILIZATION

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the project Technical Specifications and Contract Drawings.

The Work shall consist of the Mobilization and Demobilization of the Subcontractor's personnel, materials, and equipment necessary for performing the intended Work of this Contract including the transportation of personnel, equipment, tools, materials, and operating supplies to and from the Site. Mobilization shall include delivery and assembly of all plant and equipment required to complete the Work described herein and comply with the Contract Documents and local, state, and federal laws and regulations. Plant and equipment includes temporary field offices, temporary phone lines, storage areas, building utilities (in compliance with all federal, state and local codes and ordinances), decontamination pad, and other items required to perform all Work incidental to the Work included as part of other bid items.

A temporary decontamination pad shall be installed prior to any equipment or materials entering the contaminated zones of the Site. The temporary decontamination pad shall be used to decontaminate any equipment exiting the contaminated zones and shall also be used for decontamination of personnel, equipment, or waste materials, as required by the approved Construction Work Plan for the duration of the project. The temporary decontamination pad shall not be constructed until the relevant submittals have been approved by the Contractor.

The Subcontractor shall set up contamination reduction zones, as necessary, when working at the remote treatment areas (as directed by the Contractor) to allow for the performance of dry decontamination prior to transporting equipment from the treatment area to the decontamination pad.

The Subcontractor's responsibility for site preparation, in addition to those specified in other Sections, shall include grading work areas as required for the Subcontractor's support facilities and access roads as shown on the Subcontractor's approved Site Layout Plan within the Work Plan. Site preparation shall not include any specific item of Work for which payment is provided elsewhere in the Contract.

Indiscriminate construction of roads and travel by the Subcontractor's vehicles will not be permitted.

The Subcontractor shall be responsible for supplying all materials needed to implement the Health and Safety Plan at the Site.

The Subcontractor shall identify, locate and protect any and all existing utilities. The Subcontractor shall contact the Dig Safely New York One-Call Systems prior to performing any excavations. The Subcontractor shall notify Dig Safely New York One-Call of any construction activities, which could potentially disturb utilities and provide the utility companies with the opportunity to disconnect and reconnect the utility.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 01220	Health and Safety Requirements
Section 01564	Spill Control
Section 02150	Clearing and Grubbing

1.2 SUBMITTALS

The Subcontractor shall submit the following to the Contractor:

A. Site Layout Plan

The Subcontractor shall be responsible for preparing a Site Layout Plan, which will include, but not be limited to, the following:

1. Buildings/Trailers – Floor plans, fixtures, materials of construction and siting locations.
2. Temporary Electricity Supply and Lighting – Source point, layout locations, fixtures and materials.
3. Sketch of the proposed temporary electrical system including metering.
4. Water Supply and Sanitary Facilities – Source point, layout locations, fixtures, material and methods of disposal.
5. Areas designated for health and safety, parking, access roads, stockpiling, loading and unloading, and storage.

B. Construction Sequence

The Subcontractor shall provide a description of the proposed construction sequence for the performance of all major tasks of work, including support zones and access road construction (if necessary). Each major task shall be described in sufficient detail, in the Construction Work Plan in accordance with Section 01200, "Submittals", to demonstrate to the Contractor that the Subcontractor is familiar with the site conditions and is prepared to implement and complete the work in an efficient and safe manner.

C. Construction Permits

The Subcontractor shall submit copies of all issued State, Local, and Municipal construction permits to the Contractor.

D. Construction Schedule

The proposed construction schedule for the overall project shall be presented in both a Gantt bar chart or equivalent format and the Contractor format described in the General Conditions, and shall detail each construction activity's duration in days and interrelationships with the other construction activities. The Gantt bar chart or equivalent shall be prepared utilizing project management software capable of providing a baseline measurement for comparison with updates to the schedule on a monthly basis.

E. Decontamination Pad Details

Decontamination pad design calculations, plans, and specifications that demonstrate that the decontamination pad shall support the intended loadings.

F. Evidence of Final Utility Payment

The Subcontractor shall submit to the Contractor evidence of final payment of all utility services after all temporary utilities are disconnected and removed. In addition, the Subcontractor shall notify Dig-Safely New York of the installation of permanent facilities and removal of temporary utilities.

PART 2. PRODUCTS

The Subcontractor shall fabricate, supply, provide, and maintain all materials, fabrication, installation, and delivery of services as specified in this section for complete and proper site mobilization and demobilization.

PART 3. EXECUTION

3.1 GENERAL

The Subcontractor will exercise the necessary precautions to minimize surface disturbances until the necessary support operations are in place and are operational.

3.2 MOBILIZATION

- A. All work shall be performed by competent, trained personnel, skilled in the field to which they are executing the work.
- B. Mobilization shall include the furnishing, installation, and maintenance of all necessary equipment to perform the Work. Prior to commencement of Work, the Subcontractor's plant and equipment will be inspected and shall be subject to Client approval.
- C. The Subcontractor shall contact all Local, County, and State road authorities and establish haulage routes, which the Subcontractor shall be obligated to follow.
- D. The Subcontractor shall be responsible for constructing and maintaining a stabilized construction entrance and constructing any temporary on-site access roads necessary for his operations. The Subcontractor shall be responsible for obtaining all road permits and shall not construct any access roads without receiving prior approval by the Contractor regarding location and materials of construction. The Subcontractor shall be responsible for maintaining/repairing the access

- roads during execution of the Work. Temporary access roads shall not be constructed until Erosion and Sediment Pollution controls are in place.
- E. Grading in preparation for the installation of facilities, utilities, and improvements shall be performed in accordance with the Subcontractor's approved Site Layout Plan and Erosion and Sediment Pollution Control Plan. Clean soil shall be used for fill and backfill. During the process of grading, the subgrade shall be maintained in such condition that it will be well drained at all times. Temporary drains and drainage shall be installed to intercept or divert surface water runoff as required.
 - F. If, at the time of grading, it is not possible to place soil in its proper section of the construction area, it shall be stockpiled in approved areas as designated and directed by the Contractor for later use.
 - G. No graded soils shall be removed from the site or disposed by the Subcontractor except as directed by the Contractor. Soils shall be neatly piled, at a location specified by the Contractor, so as not to inconvenience the public, adjoining property owners and other site personnel until used otherwise for filling or dressing graded areas.

3.3 DEMOBILIZATION

- A. At the conclusion of the Work, the Subcontractor shall be responsible for restoring the Site to its previous or an improved condition.
- B. The Subcontractor shall dismantle and properly dispose and/or remove from the Site all temporary and supporting facilities, including the decontamination pad, access roads and stabilized construction entrance unless otherwise directed by the Contractor.
- C. All contaminated equipment shall be decontaminated prior to demobilization. Decontaminated vehicles and Subcontractor's equipment shall be inspected and approved by the Contractor prior to removal from the Site. Any soil or sediment attached to the equipment shall be removed. The operations and decontamination pads constructed by the Subcontractor shall be decontaminated prior to removal from the Site.
- D. The Subcontractor shall disconnect and remove all temporary utilities from offices and trailers installed by the Subcontractor. The Subcontractor shall submit to the Contractor evidence of final payment for all utility services.
- E. Any areas of distress in the decontamination pad or operation areas noted by the Contractor during their inspections shall be investigated and repaired by the Subcontractor to the satisfaction of the Contractor. Areas adjacent to the decontamination pad or operation pads which may have become contaminated due to overspray or spillage, along with materials below any apparent areas of cracking, separation, or deterioration in these areas, shall be investigated and sampled by the Subcontractor to the satisfaction of the Contractor at the sole expense of the Subcontractor. Any and all contaminated soils encountered shall be removed and disposed by the Subcontractor, at no additional cost to the Contractor, in accordance with these Specifications.
- F. The Subcontractor shall clean debris from remediated areas, staging areas, support zones, and drainage systems, remove sediment from drainage systems, sweep paved areas and rake clean landscaped areas, and remove waste and surplus materials, rubbish and construction facilities from the Site.
- G. Final grading and dressing of Subcontractor's support areas shall be performed by the Subcontractor to the extent required to assure proper and adequate drainage.

* * * END OF SECTION * * *

SECTION 01564

SPILL CONTROL

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

The Subcontractor shall provide methods, means, and facilities required to prevent contamination of soil, water, atmosphere, uncontaminated structures, equipment, or material by the discharge of wastes from spills due to the Subcontractor's operations.

The Subcontractor shall provide equipment and personnel to perform emergency measures required to contain any spillage and to remove spilled materials and soils or liquids that become contaminated due to spillage. This collected spill material shall be properly disposed of at no additional cost to the Contractor, in accordance with this Specification.

The Subcontractor shall provide equipment and personnel to perform decontamination measures that may be required to remove spillage from previously uncontaminated structures, equipment, or material. Decontamination residues must be properly disposed of at no additional cost to the Contractor, in accordance with this Specification.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 01220	Health and Safety Requirements
Section 01510	Mobilization/Demobilization
Section 01640	Off-Site Transportation and Disposal

1.2 SUBMITTALS

The Subcontractor shall prepare a comprehensive Preparedness, Prevention, and Contingency Plan as part of the Construction Work Plan and submit it to the Contractor. The plan shall include, at a minimum, the following information:

- A. Procedures the Subcontractor shall follow to prevent the occurrence of spills to on-site or off-site media, roadways and/or property.
- B. Procedures the Subcontractor shall follow in response to a spill.
- C. Equipment owned and/or utilized by the Subcontractor in response to a spill.

- D. A listing of emergency contacts and telephone numbers for use in the event of a spill or release.
- E. At the completion of spill or discharge cleanup, the Subcontractor shall document the cleanup with records and certification of decontamination. The record and certification shall consist of the following:
 - 1. Identification of the source of the spill;
 - 2. Estimated or actual date and time of the spill occurrence;
 - 3. The date and time cleanup was completed or terminated (if cleanup was delayed by emergency or adverse weather, the nature and duration of the delay);
 - 4. A brief description of the spill location;
 - 5. Sampling data taken prior to the cleanup and a brief description of the sampling methodology used to establish the spill boundaries;
 - 6. A brief description of the solid surface cleaned and the wash/rinse method used;
 - 7. Approximate depth of soil excavation and the amount of soil removed;
 - 8. A certification statement signed by the Subcontractor stating that the cleanup requirements have been met and that the information contained in the record is true to the best of his knowledge;
 - 9. Copies of the documents and certifications which were submitted to the Contractor for review and acceptance.

PART 2. PRODUCTS

2.1 MATERIALS

The Subcontractor shall provide and maintain any and all materials required for spill control and/or spill cleanup for the duration of construction activities.

PART 3. EXECUTION

3.1 SPILL CONTROL

The details of the Preparedness, Prevention, and Contingency Plan should be implemented and address, at a minimum, the following:

- A. Solid Spills - The Subcontractor shall immediately remove and place contaminated soils into staging piles and cover; identify the pile as contaminated; test the soil for disposal requirements, if appropriate, dispose of at a Client-approved off-site treatment, storage and disposal facility as specified in Section 01640, "Off-Site Transportation and Disposal."
- B. Liquid and/or Sludge Spills - The Subcontractor shall absorb with sand, fill, or other absorbent material and dispose of the absorbent/spill mixture in the manner specified in the previous paragraph, Solid Spills.

C. Reporting Requirements - In addition to the immediate notification of the Contractor and reporting under the applicable requirements of the Clean Water Act, the Subcontractor shall follow the following reporting procedures:

1. Where a spill directly contaminates surface water, sewers, or drinking water supplies, the Subcontractor shall notify the Contractor immediately and shall immediately initiate appropriate cleanup measures.
2. Spills which are not addressed in Part 3.1.C.1. above, must be cleaned in accordance with the approved Construction Work Plan and notification of the Contractor is still required.

D. Determination Of Spill Area In The Absence Of Visible Traces

For spills where there are insufficient visible traces yet there is evidence of a leak or spill, the boundaries of the spill are to be determined by the Subcontractor using a statistically based sampling scheme approved by the Contractor. The Client must approve the final determination of the spill area.

E. Equipment Requirements

The Subcontractor shall provide the appropriate equipment and materials for any unexpected spill or discharges to be kept on site at all times during site work activities.

F. Discharges

If a discharge of material stored in an impoundment, tank, container or from a pipe break or leak occurs, the following actions shall be taken by the Subcontractor to reduce potential migration to adjacent properties:

1. Immediately notify the Contractor and other appropriate authorities(see item 3.1.C above).
2. Take immediate measures to control the discharge within the site boundaries or beyond the site boundaries, if necessary. This will include the following actions:
 - a) Contain and eliminate the discharge, if possible;
 - b) Remove or retrieve any discharged liquids or sludges, if possible;
 - c) Keep unnecessary people away; isolate the hazardous area and deny entry;
 - d) Do not allow anyone to touch the discharged materials;
 - e) Other actions, as needed.

G. Decontamination Procedures

Decontamination procedures may be required after cleanup to eliminate traces of the substance spilled or reduce it to an acceptable level as determined by the Contractor. Complete cleanup may require removal of contaminated soils. Personnel decontamination shall include cleansing or disposing of clothing and equipment. All contaminated materials including solvents, cloth, soil, and wood that cannot be decontaminated must be properly containerized, labeled, and properly disposed as soon as possible.

* * * END OF SECTION * * *

DIVISION 2 – SITE WORK

SECTION 02150

CLEARING AND GRUBBING

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

The Subcontractor shall clear and grub only in those areas necessary to complete the work required. Limits for clearing and grubbing shall be marked in the field by the Subcontractor and approved by the Contractor before the work commences.

The Subcontractor's proposed Operations/Laydown Area as designated in the Subcontractor's Construction Work Plan should be such that the felling, trimming or cutting of trees is not necessary.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 01510 Mobilization/Demobilization

PART 2. PRODUCTS

Not used.

PART 3. EXECUTION

3.1 PROTECTION OF UTILITY LINES

The Subcontractor shall notify the Contractor immediately when they encounter a damage known or an unknown utility line. The Subcontractor shall be responsible for the repairs to existing utility lines. The Subcontractor shall provide ample notification, to the utility companies, for utilities, which require removal or relocation, so that interruption of service shall be at a minimum.

3.2 CLEARING AND GRUBBING

- A. Clearing and grubbing shall consist of the removal and satisfactory disposal of vegetation designated for removal, including trees, stumps, logs, shrubs, snags, and brush occurring within the temporary construction access road area (from Broadway Avenue), permanent plant access road area (off of Sophia Street), treatment building and parking areas, trenching and excavation areas (including utility tie-in locations), two recovery wellhead areas, and four injection wellhead

- areas. The surface of the ground within these areas as required for the installation of facilities, utilities, and improvements shall be cleared as necessary of all brush, stumps, roots, grass, and weeds. Clearing operations shall be conducted in a manner that prevents damage to existing structures and installations and those under construction, and that provides for the safety of employees and others. The Subcontractor shall clear and grub on an as-needed basis as his work progresses.
- B. The Subcontractor shall remove any rubbish, rubble piles, debris, and all other objectionable obstructions resting on or protruding through the surface of the ground that would otherwise adversely impact the construction activities.
 - C. The Subcontractor shall not clear and grub any area beyond the Subcontractor's working area. No stumps, tree limbs, or brush shall be buried in any fills or embankments. Cleared and grubbed material greater than 3 inches in diameter may be placed in areas around the Treatment Plant Building area to create natural wildlife habitat and a visual and noise barrier for the plant as approved by the Contractor. Damage of any nature shall not be inflicted upon adjoining properties by unwarranted entry on such land.
 - D. Subcontractor shall chip for mulch all cleared and grubbed materials that are less than 3 inches in diameter.

3.3 DISPOSAL OF CLEARING AND GRUBBING MATERIAL

If deemed necessary by the Contractor, cleared and grubbed material may be disposed off-site at location approved by the Contractor. All excavated soil that is in excess will be used to build an earthen berm to be located west – northwest of the treatment building.

* * * END OF SECTION * * *

SECTION 02250

EARTHWORK: EXCAVATION AND BACKFILLING FOR
BUILDING CONSTRUCTION

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the design and work specified in this section in accordance with the Technical Specifications and Contract Drawings.

The excavation and backfilling for building construction shall consist of excavating the existing soil within the limits as shown on the Contract Drawings. The depth of excavation shall extend to be as determined by design requirements rendered by the Subcontractor. The suitable excavated material shall be used on-site to the most reasonable extent practicable. The backfilling shall consist of importing structural fill to be placed within the limits as shown on the Contract Drawings and compacted per Technical Specifications.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 02270	Earthwork: Trench Excavation and Backfilling for Extraction, Discharge and Utilities Systems
Section 02300	Crushed Miscellaneous Base Access Road and Parking Areas
Section 03300	Cast-in-Place Structural Concrete

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 422	Sieve Analysis
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2216	(1992) Laboratory Determination of Water (Moisture) Content of Soil, and Rock

ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2850	Triaxial Compression Test for Internal Friction Angle Determination
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 2937	(1994) Density of Soil in Place by the Drive-Cylinder Method
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1995a) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.2 SUBMITTALS

- A. The Subcontractor shall submit geotechnical test results for the structural fill to the Contractor for approval prior to execution. The geotechnical test results shall include:
 - 1. Sieve Analysis
 - 2. Modified Proctor Test
 - 3. Internal Friction Angle for the Structural Fill
- B. The Subcontractor shall also submit a letter certifying that the structural fill is clean and free from any contamination. The Contractor has the right to require the Subcontractor to perform analytical testing on the structural fill material if deemed necessary.
- C. Five copies of each submittal shall be provided.

PART 2. PRODUCTS

2.1 MATERIALS

A. Structural Fill Material

The structural fill material shall consist of a well-graded sand to be classified as SW in accordance with the Unified Soil Classification System. In addition, the structural fill material shall meet a minimum internal friction angle of 34 degrees compacted to a minimum of 95% relative compaction with respect to the maximum dry density as determined by ASTM D-1557 testing method.

B. On-site Suitable Material

- 1. On-site materials for use as fill shall consist of excavated soil from other portions of the site.

2. Excess topsoil may be re-used as fill onsite in strict accordance with the recommendations contained in the geotechnical engineering study.
3. Excavated material containing rock, stone or masonry debris greater than 6 inches in largest dimension is unacceptable as fill within the proposed building area.
4. Rock or stone greater than 6 inches in its largest dimension may be mixed with suitable material and used as fill up to 3 feet below beneath the proposed sub grade elevation at the discretion of the Geotechnical Engineer. The fill must be mixed, placed and compacted such that voids will not exist.
5. Rock and uncontaminated concrete debris may be broken and/or crushed on-site to meet the above size requirements.
6. Prior to placement, on-site fill shall not contain:
 - a. Debris other than crushed concrete and brick meeting the above requirements.
 - b. Timber or Railroad Ties.
 - c. Organic Soils.
 - d. Other deleterious materials such as steel rails, rebar, trash, etc.

PART 3. EXECUTION

3.1 TOPSOIL

Topsoil shall be stripped within the designated excavation areas and deposited in storage piles (on-site), approved by the Contractor, for later use. Subcontractor shall not mix topsoil with subsoil, other fill, contaminated soil or debris. Topsoil shall be free of brush, trash, large stones or other extraneous material and shall be covered until reused. Subcontractor shall dispose of any remaining topsoil as directed by the Contractor.

3.2 EXCAVATION

Excavation for the building shall conform to industry standards and in accordance with Contractor approved concrete foundation drawings to be produced by the concrete structural design engineer. Excavation shall extend a minimum distance of 4 inches from walls and footings to allow for placing and removal of forms. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed by the Contractor and replaced by the Subcontractor with satisfactory material. Unsatisfactory materials include man-made fills, trash, refuse, and backfill from previous construction, roots, and other organic materials. Satisfactory material removed below the depths indicated, without specific direction of the Contractor, shall be replaced at no additional cost with satisfactory materials to the indicated excavation grade. Satisfactory material shall be placed and compacted as specified in Part 3.4, Backfilling. Determination for the excavation of unsatisfactory material below grades shall be by the Contractor.

Satisfactory material shall include, but not be limited to, soil with stone that is less than ¾-inch diameter; be free of debris, trash, and other organic materials; and have acceptable moisture content in accordance with ASTM D2216 and ASTM 4318. Unacceptable material would be soil that has stone that is greater than ¾-inch diameter; contains trash, debris or other organic material; or has high moisture content.

3.3 SUBGRADE PREPARATION

The area for building construction shall be grubbed. The surface shall be scarified to a depth of 6 inches before the fill is started. The material shall be pulverized and compacted to a minimum of 95% relative compaction with respect to the maximum dry density as determined by ASTM D 1557 testing method. Compaction shall be accomplished by sheepsfoot rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used.

3.4 BACKFILLING

Structural fill material shall be placed in loose lifts not to exceed 8 inches. Each lift shall be compacted in accordance with the testing requirements specified in Part 3.6, Compaction Testing. Smooth drum rollers shall be used to compact the structural fill material. If the filled compaction does not meet the specified compaction requirement, the Subcontractor shall adjust the moisture content by soil conditioning. After the moisture content is adjusted, the material shall be placed and compacted in accordance with the requirements of this section.

3.5 DRAINAGE AND DEWATERING

A. Drainage

Surface water shall be directed away from excavation and construction sites to prevent erosion and undermining of foundations. Diversion ditches, dikes, and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the area affecting operations at the site shall be continually and effectively drained.

B. Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift, and heave in the excavation and to eliminate interference with orderly progress of construction. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least 1 foot below the working level. The Subcontractor shall be responsible for the design of temporary support system to support excavation and/or control ground water from entering the excavation.

3.6 COMPACTION TESTING

The structural fill shall be compacted to a minimum of 95% relative compaction with respect to the maximum dry density as determined by ASTM D 1557 testing method. The field compaction shall be performed in accordance with ASTM D 2922 at a testing frequency of four tests per lift. A sand cone test shall be performed in accordance with ASTM D1556 at a testing frequency of one test per lift. The nuclear density gauge shall be calibrated based on the test results obtained from the sand cone test.

Testing shall be the responsibility of the Subcontractor and shall be performed at no additional cost to the Contractor. Testing shall be performed by a Contractor approved testing laboratory or may be performed by

the Subcontractor subject to Contractor approval. Field in-place density shall be determined in accordance with ASTM D 1556, ASTM D 2167, or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted if necessary by the procedure described in ASTM D 2922, paragraph ADJUSTING CALIBRATION CURVE.

The Modified Proctor Test shall be performed for each type of material and from each material source to determine the optimum moisture content and maximum dry density values.

* * * END OF SECTION * * *

SECTION 02270

EARTHWORK: TRENCH EXCAVATION AND BACKFILLING FOR EXTRACTION,
DISCHARGE AND UTILITIES SYSTEMS

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

This section shall consist of excavating, trenching, and backfilling for underground piping, electrical/instrumentation, and utilities systems, which include product transfer lines, and electric lines. The trench depth shall be a minimum of 54 inches. The trench width shall be a minimum of 36 inches and a maximum of 96 inches. The location of the trenches shall be as shown on the Drawings. The suitable excavated material shall be used as partial backfill in the trenches as allowable and directed by the Contractor. After the trench is excavated, product pipes, discharge pipes, SVE pipes and compressed air pipes shall be installed per the Specifications and Drawings. The trench shall be backfilled with the materials specified herein.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 01220 Health and Safety Requirements

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 698	(1991) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb f/ft (600 kN-m/m)
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. Ft. (2,700 kN-m/cu.m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes

(Unified Soil Classification System)

ASTM D 2922 (1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

ASTM D 3017 (1998; R1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

1.2 SUBMITTALS

The Subcontractor shall submit sieve analysis test results for the bedding sand to the Contractor. In addition, the Subcontractor shall submit a letter certifying that the bedding sand is clean and free from any contamination. Five copies of each submittal shall be provided.

PART 2. PRODUCTS

2.1 MATERIALS

A. Bedding Sand

Bedding sand shall consist of a well graded sand material classified as SW in accordance with the Unified Soil Classification System.

B. Warning Tape

Warning tape shall be acid and alkali-resistant polyethylene film, 6 inches wide with a minimum thickness of 0.0035 inches (3.5 mils). Tape shall have a minimum strength of 1,750 psi lengthwise and 1,500 psi crosswise. The tape shall be manufactured with integral wires, foil backing, or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be as specified in Table 02270-1 and shall bear a continuous printed inscription describing the specific utility.

TABLE 02770-1. Tape Color

Red:	Electric
Yellow:	Gas, Oil, and Dangerous Materials
Orange:	Telephone, Telegraph, Television, Police, and Fire Communications
Blue:	Water Systems
Green:	Sewer Systems

PART 3. EXECUTION

3.1 TRENCH EXCAVATION

Trenches shall be excavated to the dimensions shown on the Drawings. Trench walls shall be made vertical. Trench walls which are cut back shall be excavated to at least the angle of repose of the soil. Special attention shall be given to slopes which may be adversely affected by weather or moisture content. All existing and installed utilities will be marked out to prevent any service interruption.

A. Bottom Preparation

The bottoms of trenches shall be accurately graded to provide uniform bearing and support for each pipe.

B. Shoring

Subcontractor shall ensure that all excavations are shored or laid back in accordance with applicable codes and standards, especially OSHA CFR 1926. Subcontractor to prepare the design of shoring by a Professional Engineer.

C. Removal of Unyielding Material

Where overdepth is not indicated and unyielding material is encountered in the bottom of the trench, such material shall be removed below the required grade and replaced with suitable materials. Where unstable material is encountered in the bottom of the trench, such material shall be removed to a depth of 6 to 12 inches, or as directed by the Contractor, and replaced to the proper grade with selected granular material.

D. Drainage and Dewatering

The Subcontractor is responsible for dewatering of the open excavations. Fill shall not be placed in standing water. The Subcontractor shall provide necessary storm water controls to minimize any inflow or infiltration of storm water into open excavations.

E. Stockpiles of Excavated Material

Stockpiles of satisfactory and unsatisfactory materials shall be placed on-site in approved designated areas and graded as directed by the Contractor. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and compacted. Excavated satisfactory and unsatisfactory materials shall be kept separate. Stockpiles of satisfactory materials shall be protected from contamination, which may destroy the quality and fitness of the stockpiled material. The Subcontractor shall ensure that all the appropriate measures are in place in accordance with the Contractor's Soil Erosion and Sedimentation Control Plan.

3.2 BACKFILLING

- A. Backfill material shall consist of bedding sand material and suitable excavated trench material. Backfill shall be placed in 6-inch loose layers and compacted by largest compaction equipment appropriate. Smaller compaction equipment, together with thinner lifts may be required at areas of limited access or maneuverability. Each layer shall be compacted to a minimum of 95% relative compaction with respect to the maximum dry density as determined in accordance with ASTM D 698 testing method. The bedding sand material and excavated trench material shall be placed in the trench to depths as shown on the Drawings.
- B. Bedding sand material shall be placed and compacted with approved tampers to a depth of at least 6 inches below the pipe and 6 inches above any pipe, conduit, or multiple pipes. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe.
- C. Each open section of trench shall be backfilled the same day. Open trenches shall be kept to a minimum as determined in conjunction with the Contractor. The Subcontractor is responsible for safely securing the open trenches during work hours and at the end of the day.
- D. All surface conditions that are damaged, disturbed or removed during the process of excavation for extraction, discharge and utility systems shall be replaced in kind (refer to Section 02910).

3.3 COMPACTION TESTING

- A. Prior to installation of bedding sand material, subgrade shall be compacted to a minimum of 90% compaction per ASTM D 698. If the Subcontractor cannot achieve the required compaction, the Subcontractor is required to remove unsuitable material in order to achieve a minimum of 90% compaction with respect to ASTM D 698.
- B. The bedding sand and the excavated trench material shall be compacted to a minimum of 95% relative compaction with respect to the maximum dry density as determined by ASTM D 698 testing method. The field compaction shall be performed on each lift in accordance with ASTM D 2922 at a testing frequency of one test per 100 linear feet of trench. A sand cone test shall be performed in accordance with ASTM D 1556 at a testing frequency of one test per day only in the upper 2 feet of the trench. The nuclear density gauge shall be calibrated based on the test results obtained from the sand cone test.
- C. Testing shall be the responsibility of the Subcontractor and shall be performed at no additional cost to the Contractor. Testing shall be performed by a Contractor approved testing laboratory or may be performed by Subcontractor subject to Contractor approval. Field in-place density shall be determined in accordance with ASTM D 1556, ASTM D 2167, or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted if necessary by the procedure described in ASTM D 2922, paragraph ADJUSTING CALIBRATION CURVE.

3.4 WARNING TAPE

Warning tapes shall be placed at least 12 inches directly above the pipe or conduit but no more than 12 inches below grade. The installation shall be performed per the manufacturer's recommendations and in accordance with the Drawings.

* * * END OF SECTION * * *

SECTION 02300

CRUSHED MISCELLANEOUS BASE ACCESS ROAD AND PARKING AREAS

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

This work shall consist of performing cut and fill operations and constructing the access road and the building parking areas per the Technical Specifications and Contract Drawings. The location, alignment and width of the access road and the size of the gravel parking areas are shown on the Contract Drawings. The excess suitable excavated material shall be stockpiled on-site in an area to be designated by the Contractor.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 02150	Clearing and Grubbing
Section 02250	Earthwork: Excavation and Backfilling for Building Construction
Section 02910	Site Restoration and Revegetation

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

ASTM D 3017 (1998; R1996e1) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

1.2 SUBMITTALS

The Subcontractor shall submit the following for approval by the Contractor:

- A. Sieve Analysis and Modified Proctor Test results for existing sub-base soil.
- B. Sieve Analysis and Modified Proctor Test results for the Crushed Miscellaneous Base material.
- C. A letter certifying that the imported materials are clean and free from any contamination.

PART 2. PRODUCTS

2.1 CRUSHED MISCELLANEOUS BASE

The crushed miscellaneous base shall conform to the following Gradation requirements.

<u>Sieve Size</u>	<u>% Passing</u>
100 mm	--
75 mm	--
50 mm	100
6.3 mm	25-60
425 mm	5-40
75 mm	0-10

2.2 GEOTEXTILE FABRIC

The geotextile fabric shall be type Trevira Spunbound 1135[®], Mirafi 600X[®], or approved equivalent meeting the following specifications:

Grab Tensile Strength	ASTM D 1682	220 lbs
Grab Elongation	ASTM D 1682	60%
Puncture Strength	ASTM D 751 Modified	125 lbs
Mullen Burst	ASTM D 3786	430 psi

PART 3. EXECUTION

3.1 REMOVAL OF EXISTING SOIL

The existing soil along the limits of the access road and in the parking areas shall be removed to the depths as shown on the Contract Drawings. Topsoil will be stripped and stockpiled for reuse. The suitable subsoil shall be used as a fill material along the limits of the access road in order to meet the final grade elevation. Any excess material shall be stockpiled on-site in areas as designated by the Contractor.

3.2 BACKFILLING

Prior to starting backfilling operations, the Subcontractor shall compact the existing soil to meet the requirements found in Part 3.6 of this section. The backfill material used to meet the required elevations of the access road will be placed in loose lifts of 8 inches. Each lift shall be compacted in accordance with Part 3.6 of this section.

3.3 GEOTEXTILE FABRIC

Geotextile fabric shall be placed in locations as shown on the Contract Drawings.

3.4 MISCELLANEOUS CRUSHED BASE MATERIAL

The material shall be placed in loose lifts not to exceed 8 inches in areas as shown on the Contract Drawings. Each lift shall be compacted in accordance with the testing requirements specified in Part 3.6 of this section.

3.5 DRAINAGE SWALE

Drainage swale along the proposed access road will be placed and installed per the Contract Drawings.

3.6 COMPACTION TESTING

- A. Prior to the installation of geotextile fabric, the soil subgrade shall be scarified to a depth of 6 inches. The scarified material shall be compacted to a minimum of 95% relative compaction with respect to the maximum dry density as determined in accordance with ASTM D 1557 testing method. The compaction shall be performed to a depth of 12 inches at a frequency of one test per 50 linear feet per lift.
- B. The Crushed Miscellaneous Base along the access road shall be placed in two lifts compacted to 6 inches per lift. Each lift shall be compacted to a minimum of 95% relative compaction with respect to the maximum dry density as determined in accordance with ASTM D-1557 testing method. The testing frequency shall be performed at a rate of one test per 50 linear feet per lift.
- C. The Crushed Miscellaneous Base for the parking areas shall be placed in two lifts compacted to 6 inches per lift. Each lift shall be compacted to a minimum of 95% relative compaction with respect to the maximum dry density as determined in accordance with ASTM D 1557 testing method. The testing frequency shall be performed at a rate of one test per 400 square feet per lift.
- D. In areas of the access road where additional fill is required, the Subcontractor shall install the fill in loose lifts not to exceed 6 inches thick. Each lift shall be compacted to a minimum of 95% relative compaction with respect to the maximum dry density as determined in accordance with ASTM D 1557 testing method. The testing frequency shall be performed at a rate of one test per 50 linear feet per lift.

* * * END OF SECTION * * *

SECTION 02500

PRE-ENGINEERED BUILDING

PART 1. GENERAL

The Contractor is the Navy’s representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy’s representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

This work shall include the design of the exterior and interior building systems, erection of the interior and exterior building systems, including fire protection systems, security systems and HVAC systems, and all utility connection work including but not limited; to electrical supply, potable water supply, sanitary sewer connections, and telephone connections. All work must be in accordance with the requirements of the Town of Oyster Bay Code Data Worksheet, which is provided as Attachment 02500-1 of this specification.

The pre-engineered exterior building design shall be reviewed and certified by a licensed New York State Professional Engineer of the Subcontractor or Building Supplier. The layout and locations of the interior buildings (mezzanines) are to be designed and installed as indicated on the Contract Drawings. No wood or other combustible product that is not designated to have an approved fire resistance rating by the manufacturer shall be used in the construction of this building.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 03200	Concrete Reinforcement
Section 03300	Cast-In-Place Structural Concrete

The Subcontractor shall provide a panelized, rigid frame, clear span steel exterior building designed and constructed to be weather tight and easily erected. Internal walls and framing of the exterior building shall be in accordance with the Contract Drawings and IBC-2003. The Subcontractor shall provide and construct the interior buildings in accordance with the Contract Drawings. The design and construction of the interior and exterior buildings shall conform to the following codes and referenced publications to the extent referred. The reference publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7-02	Minimum Design Loads for Buildings and other Structures (Formerly ANSI A58.1)
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AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC FCD – 90	(1990) AISC Quality Certification Program Description
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AISC S302	(1987) Code of Standard Practice for Steel Buildings and Bridges
AISC S329	(1986) Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts.
AISC S335	(1989) Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG-673	(1986; Agenda 1989; Errata November 30, 1990) Cold-Formed Steel Design Manual
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36	(1991) Structural Steel
ASTM A 53	(1990b) Pipe, Steel, Black, and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 185	(1997) Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
ASTM A 252	(1998) Standard Specification for Welded and Seamless Steel Pipe Piles
ASTM A 325	(1991c) Structural Bolts, Steel, Heat Treated, 120-105 ksi Minimum Tensile Strength
ASTM A 446	(1991) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
ASTM A 490	(119a) Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
ASTM A 500	(1990a) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A 501	(1989) Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A 529	(1989) Structural Steel with 42 ksi (290 Mpa) Minimum Yield Point (1/2 in. (13 mm) (Maximum Thickness)
ASTM A 570	(1998) Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality
ASTM A 572	(2004) Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel-AASHTO No.: M223
ASTM A 588	(2004) Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4-in. (100-mm) Thick-AASHTO No.: M 222

ASTM A 606	(2004) Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance
ASTM A 607	(1998) Steel, Sheet and Strip, High-Strength, Low-Allow, Columbium or Vanadium, or Both, Hot-Rolled and Cold-Rolled
ASTM A 618	(1990a) Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing
ASTM A 653	(2002) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 792	(1989) Steel Sheet, Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
ASTM B 117	(2003) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B 221	(2002) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B 241	(2002) Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube
ASTM B 429	(2002) Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube
ASTM C 518	(1991) Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
ASTM D 522	(1988) Mandrel Bend Test of Attached Organic Coatings
ASTM D 523	(1989) Specular Gloss
ASTM D 714	(1987) Evaluating Degree of Blistering Paint
ASTM D 968	(1981; R 1991) Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D 1308	(1987) Effect of Household Chemicals on Clear and Pigmented Organic Finishes
ASTM D 1654	(1979a; R 1984) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D 2244	(1989) Calculation of Color Differences from Instrumentally Measured Color Coordinates
ASTM D 2247	(1987) Testing Water Resistance of Coatings in 100 Percent of Relative Humidity
ASTM D 2794	(1990) Resistance of Organic Coatings to the Effects of Rapid

Deformation (Impact)

- ASTM D 3359 (1990) Measuring Adhesion by Tape Test
- ASTM D 4214 (1989) Evaluating Degree of Chalking of Exterior Paint Films
- ASTM E 84 (1191a) Surface Burning Characteristics of Building Materials
- ASTM E 96 (1192) Water Vapor Transmission of Materials
- ASTM G 23 (1990) Operating Light-Exposure Apparatus (Carbon-arc Type) With and Without Water for Exposure of Nonmetallic Materials

AMERICAN WELDING SOCIETY (AWS)

- AWS D1.1 (1990) Structural Welding Code - Steel

FEDERAL SPECIFICATION

- FS HH-I-558 (Rev B; Am 3) Insulation, Blocks, Boards, Blankets, Felts, Sleeving (Pipe and Tube Covering), and Pipe Fitting Covering, Thermal (Mineral Fiber, Industrial Type)

INTERNATIONAL BUILDING CODE (IBC)

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

- MBMA-01 (1986; Errata; Supple 1990) Low Rise Building Systems Manual

SHEET METAL AND AIR CONDITIONING SUBCONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

- SMACNA-02 (1987) Architectural sheet Metal Manual

UNDERWRITERS LABORATORIES (UL)

- UL 580 (1988; Rev thru Dec 1989) Tests for Uplift Resistance of Roof Assemblies

1.2 SUBMITTALS

- A. The Subcontractor shall submit, in the manner and within the time limit as set forth in the Contract Documents, shop drawings showing outline and overall dimensions, connection details, weights, anchorage details, arrangement of functional parts, and parts list, if applicable, for all equipment and materials furnished.
- B. The Subcontractor's drawings shall be direct reproducibles able to produce clean, sharp, and legible prints. Fabrication of the building and equipment shall not be started until after the Subcontractor has received written drawing review approvals from the Contractor.

- C. Review of the drawings by the Contractor shall not relieve the Subcontractor of the entire responsibility for the engineering, design, workmanship, and material under the Contract Documents.
- D. Submittals Register – The following shall be submitted in accordance with Subcontractor generated submittals and submittals procedures.

- 1. Design Analysis

Design analyses as one package with detail drawings for the exterior building. The design analysis sealed by a Professional Engineer from the Building Supplier or a Subcontractor, licensed to practice in the State of New York, shall include a list of the design loads, and complete calculations for the building, its components, and the foundations. Formulas and references shall be identified. Assumptions and conclusions shall be explained, and cross-referencing shall be clear. The design analysis shall include, but not be limited, to the following wind and seismic information:

- a) Wind forces on various parts of the structure. Both positive and negative pressures shall be calculated with the controlling pressure summarized.
- b) Lateral forces due to seismic loading.

Computer programmed designs shall be accompanied by stress values and a letter of certification, signed by a Professional Engineer, licensed to practice in the State of New York, stating the design criteria and procedures used and attesting to the adequacy and accuracy of the design. A narrative of the computer program delineating the basic methodology shall be included in the submittal. The program output shall be annotated and supplemented with sketches to make it easier for an engineer unfamiliar with the program to verify the input and output. Critical load conditions used in the final sizing of the members shall be emphasized. The design analysis shall include the name and office phone number of the designer and checker who function as a point of contact to answer questions during the detail-drawing review.

- 2. Building System Drawings

Detail drawings for both the interior and exterior buildings consisting of catalog cuts, design and erection drawings containing an isometric view of the roof showing the design wind uplift pressure and dimensions of edge and corner zones; shop painting and finishing specifications, instruction manuals, manufacturer's recommended erection methods and procedures, and other data as necessary to clearly describe design, materials, sizes, layouts, construction details, fasteners, and erection. Manufacturer's recommended erection methods and procedures shall describe the basic sequence of assembly, the temporary metal building including its structural framework and components. A brief list of locations where buildings of similar design have been used (minimum of three) shall be included with the detail drawings and shall include information regarding the date of installation, name and address of owner, and how the structure is used.

- 3. Qualifications

Qualifications of the manufacturer, and qualifications and experience of the building erector.

4. Building Systems Certificates

A certificate from the metal building manufacturer stating that the metal building is constructed of steel produced in the United States, was designed from a complete set of the Contract Drawings and Specifications, and that the building furnished complies with the specified requirements.

Mill certifications for structural bolts, framing steel, joists, decking, wall and roof covering, and wall liner panels.

E. Accessories

One sample of each type of flashing, trim, closure, cap, and similar items. Size shall be sufficient to show construction and configuration.

F. Roof and Wall Covering

One piece of each type and finish (exterior and interior) to be used, 9-inches long, full width. The sample for factory color finished covering shall be accompanied by certified laboratory test results showing that the sheet to be furnished are produced under a continuing quality control program and that a representative sample consisting of not less than five pieces has been tested and has met the quality standards specified for factory color finish.

G. Fasteners

Two samples of each type to be used, with statement regarding intended use. If so requested, random samples of bolts, nuts, and washers as delivered to the site shall be taken in the presence of the Contractor and provided to the Contractor for testing to establish compliance with specified requirements.

H. Insulation

One piece of each type to be used, and descriptive data covering installation. Insulation shall contain recycled material to an amount practical.

I. Gaskets and Insulating Compounds

Two samples of each type to be used, and descriptive data covering installation.

J. Sealant

One sample, approximately 1 pound, and descriptive data.

K. The Subcontractor shall provide a written manufacturer's warranty.

1.3 SHIPPING, DELIVERY, AND STORAGE

A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.

- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.
- C. Components shall be stored off of the ground and shall be protected from weather elements.

1.4 ADDITIONAL DESIGN AND PERFORMANCE REQUIREMENTS

A. Building Configurations

Exterior building shall have vertical walls and gable roof. Exterior building plane dimensions shall be as indicated on the Contract Drawings and as described above. The roof shall have a height of 25'-6" as measured from grade to the roof eave. The roof slope shall be a minimum of 1:12. The exterior building main frame shall be a single-span rigid frame structure (tapered beam or plate girder).

The interior buildings shall be constructed in accordance with the Contract Drawings (and as described above) and all applicable codes and standards. The interior buildings shall be of a structural steel beam and column design with a poured concrete ceiling (6-inches thick). The walls shall be completed using steel wall studs with fire-resistant gypsum wallboard. All wallboard seams shall be taped and spackled. This shall be the overall basic design of the interior buildings or a Contractor approved equivalent.

B. Manufacturer

Metal exterior building shall be the product of a recognized metal building systems manufacturer who has been in the practice of manufacturing buildings for period of no less than 5 years. The manufacturer shall be chiefly engaged in the practice of designing and fabricating metal building systems. The manufacturer shall have an AISC Quality Certification, category MB in accordance with AISC FCD-90.

C. Installer

Erector shall have specialized experience in the erection of the selected metal exterior building system and the interior building design for a period of at least 3 years.

D. Design Loads – Exterior Building

The following loads shall be established by the pre-engineered building manufacturer with input from the Subcontractor, process equipment suppliers, applicable codes, etc. to design the structure. Combinations of these loads shall be considered to produce the maximum stresses in structural members.

Pre-engineered building manufacturer shall supply building reactions to the Subcontractor for final review of the foundation design. Column reactions shall be vertical and horizontal only. No bending moments will be allowed at the column bases.

The Subcontractor shall provide a list of all live and equipment loads used for design. Equipment loads shall be obtained from the various trades and from the process equipment suppliers.

1. Dead Load

The dead load shall consist of the weight of the structural frame and all other materials of the building system.

2. Collateral Loads

Collateral load of a minimum of 15 pounds per square foot shall be applied to the entire structure to account for the weight of additional permanent materials other than the building system, such as sprinklers, mechanical systems, electrical systems, and ceilings. Equipment loads of 50 pounds or more shall be investigated and the structure (frame, purlins, girts) shall be strengthened as required. The Subcontractor is responsible for providing the building manufacturer the magnitude and approximate locations of all concentrated loads greater than 50 pounds.

3. Roof Live Loads

Roof live loads shall be determined and applied in accordance with the referenced code.

4. Roof Snow Loads

Roof snow loads shall be developed using a ground snow load of a minimum of 30 pounds per square foot. Roof snow load shall be calculated by computer and applied in accordance with ASCE 7 and the IBC.

5. Live Loads

Live loads shall consist of all loads (other than dead loads) that must be considered in the design to satisfy the applicable codes and the specific project requirements.

6. Concentrated Loads

Concentrated loads for piping, cable tray, equipment and ceiling construction attached to the building structure, and not included under (2), Collateral Loads, shall be considered.

7. Wind Loads

Reference wind velocity shall be 110 miles per hour (3-second gust) computed and applied in accordance with the current edition of ASCE-7.

8. Seismic Loads

Seismic loads shall be computed in accordance with the current edition of IBC-2003.

E. Design Loads – Interior Buildings

The following loads shall be used to create the details provided in the Contract Drawings. Since the interior buildings are shielded from external forces, no wind or weather loading should be incorporated into the design.

1. Decking Dead Load

The dead load shall assume a weight of 50 pounds per square foot applied to the concrete deck on top of the interior buildings to account for equipment and materials.

2. Decking Live Load

The live load shall assume a weight of 150 pounds per square foot applied to the concrete deck on top of the interior buildings to account for any loads (other than dead loads) that must be considered in the design to satisfy the applicable codes and the specific project requirements.

3. Seismic Loads

Seismic loads shall be computed in accordance with IBC-2003.

4. Suspension Loads

Concentrated loads suspended from the joists are not anticipated to exist on the interior buildings other than standard lighting fixtures, HVAC ductwork, and electrical conduits. Any other concentrated loads proposed by the Subcontractor will need to be incorporated into the design by the Subcontractor before installation to ensure that the joist strength is not compromised.

F. Framing and Structural Members

Structural steel members and their connections shall be designed in accordance with AISC S335. Structural cold-formed steel framing members and their connections shall be designed in accordance with AISI SG-673. Framed openings shall be designed to structurally replace the covering and framing displaced. The allowable live load deflection of roof elements shall not exceed 1/180 of the span. Members with openings in their webs shall be designed with consideration of the additional stresses, which will result due to the openings.

Framing of the interior buildings (rooms) and the wall shall consist of steel studs installed at 16-inches on center (o.c.). Cross bracing and anchoring shall be performed as necessary. Additional framing supports shall be installed around windows and doorways to ensure structural stability.

G. Exterior Covering

Except as otherwise specified, steel covering for the exterior building shall be designed in accordance with AISI SG-673. Section modulus and moment of inertia of steel covering shall be determined for actual cross section dimensions by the conventional methods for actual design stresses and by effective width concept for deflection in accordance with AISI SG-673. Maximum deflection for wall and roof panels under full dead and live and/or wind loads shall not

exceed 1/180 of the span between supports. The design analyses shall establish that the roof when deflected under dead plus live or snow loads will not result in a negative gradient. Maximum deflections shall be based on sheets continuous across two or more supports with sheets unfastened and fully free to deflect. In addition to the loads indicated above, the roof decking shall be designed for a 200-pound concentrated load at mid-span on a 12-inch wide section of deck. The methods for resisting lateral loads shall be cross-bracing, rigid frames, or wind columns.

The exterior covering of the interior buildings shall be in accordance with the Contract Drawings.

H. Gutters and Downspouts

Gutters and downspouts for the exterior building shall be designed according to the requirements of SMACNA-02 for storms, which should be exceeded only once in five years and with adequate provisions for thermal expansion and contraction. Supports for gutters and downspouts shall be designed for the anticipated loads. Downspouts shall be equipped with 2-foot long horizontal extensions at the outlets to direct rainwater away from the building.

I. Louvers and Dampers

Louvers for the exterior building shall be milled aluminum, fixed-blade type designed for a minimum net open area of 50%, shall be rainproof, and shall resist vibration when air is passed at the rate of 700 feet per minute. Milled aluminum barometric dampers (with adjustable weights) shall be fit against the interior face of each louver. Stainless steel insect and bird screens shall be fit onto the interior face of each louver, between each louver and damper.

J. Drift Provision

Lateral deflections of the exterior building, or drift at the roof level of a structure in relation to the floor or slab on grade, caused by deflection of horizontal force resisting elements shall conform to MBMA-01. Masonry walls shall be isolated from the steel framing.

K. Quality Assurance

The Subcontractor shall provide a Site-Specific Quality Management (SSQM) Plan, which will ensure that the equipment, material, and services provided will properly reflect the Contractor's requirements. The SSQM Plan shall cover, as a minimum, the following areas:

1. Design and procurement control
2. Control of purchased material
3. Inspection and status
4. Handling and storage
5. Corrective action

The Subcontractor shall provide inspection personnel and facilities to maintain control of materials, components, and fabrication throughout design and construction.

The Contractor or his representative shall have sufficient access to audit and inspect the Subcontractor's fabrication facilities.

The Subcontractor shall certify to the Contractor, in writing, that the fabrication is in complete compliance with codes, standards, and specifications. Any exceptions to original codes and specifications must be documented with written approvals from the Contractor.

L. Guarantee

The metal exterior building system shall be guaranteed against water leaks arising out of or caused by ordinary wear and tear by the elements for a period of 20 years. Such guarantee shall start upon final acceptance of work. Subcontractor shall provide a copy of this guarantee for inclusion in the System Operation and Maintenance Manual.

PART 2. PRODUCTS

The pre-engineered metal exterior building shall consist of the following:

- A. Rigid frame.
- B. 75 feet by 75 feet in size (approximate).
- C. Three (3) standard steel exterior personnel doors (36-inches by 84-inches) (not insulated and no glazing).
- D. One (1) motorized roll-up (overhead) steel doors (12-foot by 12-foot - not insulated).
- E. Eave height of 25'-6".
- F. Peak height of 28'-8" (minimum).
- G. Double-skinned insulated walls.
- H. 'R' value for insulation shall be 13.
- I. Gutters and downspouts.
- J. Louvers and barometric dampers (with stainless steel insect and bird screens).
- K. Roof ice breaks.

The interior building shall consist of the following:

- A. Steel wall studs.
- B. Fire resistant gypsum wallboard.
- C. Structural steel beams, joists, panels as necessary.
- D. Poured concrete (3,000 psi) deck with 6-inch B-Lok metal pans.

- E. Three (3) standard interior steel personnel doors (36-inch by 80-inch) (not insulated). Two (2) of the doors with no glazing and one (1) of the doors with 10-inch by 10-inch wire reinforced security glazing.
- F. One (1) 4-foot by 4-foot wire reinforced security window.
- G. Galvanized steel safety railing across exposed edge of concrete deck with one (1) galvanized steel access ladder.
- H. Suspended acoustical ceiling tile system at 8-feet above finished floor in Control Room, Closet and Lavatory only.

2.1 BUILDING COMPONENTS

Each piece or part of the assembly shall be clearly and legibly marked to correspond with the detail drawings. All structural steel pieces/parts shall have been produced in the United States and be certified as such.

2.2 FRAMING AND STRUCTURAL MEMBERS

Steel 1/8 inch or more in thickness shall conform to ASTM A 36, ASTM A 529, ASTM A 572, or ASTM A 588. Uncoated steel less than 1/8 inch in thickness shall conform to ASTM A 570, ASTM A 606, or ASTM A 607. Galvanized steel shall conform to ASTM A 446, G 90 coating designation, 0.045-inch minimum thickness. Aluminum zinc-coated steel shall conform to ASTM A 792, AZ 55 coating designation, 0.045-inch minimum thickness. Structural pipe shall conform to ASTM A 53, ASTM A 252, ASTM A 500, ASTM A 501, ASTM A 618, ASTM B 221, ASTM B 241, or ASTM B 429. Holes for bolts shall be made in the shop.

2.3 ROOF AND WALL COVERING

A. Exterior Building

Roof panels shall be steel with an aluminum-zinc coating as specified in paragraph 3 below. Wall panels shall be steel with a factory color finish as specified in paragraph 4 below. Length of sheets shall be sufficient to cover the entire length of any unbroken roof slope or the entire height of any unbroken wall surface. Width of sheets with interlocking ribs shall provide not less than 12 inches of coverage in place. Design provisions shall be made for thermal expansion and contraction consistent with the type of system to be used. All sheets shall be square cut, except gable end wall sheets shall be cut in the shop to correspond to the roof slope without horizontal joint at the eave line.

1. Roof Panels

Roof panels shall be manufacturer's standard factory formed, standing seam roof panel system designed for mechanical attachment of panels to roof purlins using concealed clips and fasteners. Panels shall be 24-gauge minimum. Clips shall be 16-gauge minimum galvanized steel. The ridge cap shall not have exposed fasteners.

2. Wall Panels

Wall panels shall have overlapping ribs for securing adjacent sheets. Wall covering shall be fastened to framework using semi-concealed fasteners (I piece untied molded screws with plastic cap heads and neoprene washers).

3. Steel Covering

Zinc-coated steel (wall panels) conforming to ASTM A 446, G 90 coating designation; aluminum-zinc alloy coated steel (roof panels) conforming to ASTM A 792. Panels shall be 0.024-inch minimum, except that when the mid field of the roof is subject to design wind uplift pressures of 60 psf or greater or the steel covering is used as a diaphragm the entire roof system shall have a minimum thickness of 0.030-inch.

4. Factory Color Finish

Wall panels shall have a factory color finish on the exposed side. The exterior finish shall consist of a polyvinylidene fluoride (PVF) coating. Color shall be selected by the Contractor from manufacturer's color samples provided by the Subcontractor. The dry film thickness of the exterior coating shall not be less than 0.7-0.9 mil, exclusive of the primer. The back side color finish shall consist of a backer coat with a dry film thickness of 0.25-0.35 mil. The exterior color finish shall meet the test requirement specified below. The manufacturer shall have conducted tests on previously manufactured sheets of the same type and finish as proposed for the project. The term "appearance of base metal" refers to the metal coating on steel base metal.

a) Salt Spray Test

A sample of the sheets shall withstand a salt spray test for a minimum of 1,000 hours in accordance with ASTM B 117, including the scribe requirement in the test. Immediately upon removal of the panel from the test, no blistering, as determined by ASTM D 714; edge creek \leq 1/8-inch failure at scribe, as determined by ASTM D 1654.

b) Formability Test

When subjected to a 180-degree bend over a 1/8-inch or 3t, whichever is greater, diameter mandrel in accordance with ASTM D 522, exterior coating film shall show no evidence of fracturing to the naked eye.

c) Accelerated Weathering, Chalking Resistance and Color Change

A sample of the sheets shall withstand a weathering test a minimum of 2,000 hours in accordance with ASTM G 23, using a type EH apparatus, without cracking, peeling, blistering, loss of adhesion of the protective coating, or corrosion of the base metal. Protective coating that can be readily removed from the base metal with tape in accordance with ASTM D 3359, Test Method B, shall be considered as an area indicating loss of adhesion. After the 2,000-hour weatherometer test, exterior coating shall not chalk greater than No. 8 rating in accordance with ASTM D 4214 test procedures. After the 2,000-hour weatherometer test, exterior coating shall not exceed 2 NBS units in accordance with ASTM D 2244.

d) Humidity Test

When subjected to a humidity cabinet in accordance with ASTM D 2247 for 1,000 hours, a scored panel shall show no signs of blistering, cracking, creepage, or corrosion.

e) Impact Resistance

Factory-painted sheet shall withstand direct and reverse impact in accordance with ASTM D 2794 equal to 3 times metal thickness in mils, expressed in inch-pounds, with no loss of adhesions.

f) Abrasion Resistance Test

When subjected to the falling sand test in accordance with ASTM D 968, the coating system shall withstand a minimum of 67 liters of sand before the appearance of the base metal.

g) Pollution Resistance

Coating shall show no visual effects when immersion tested in a 10 percent hydrochloric acid solution for 24 hours in accordance with ASTM D 1308.

5. Accessories

Flashing, trim, metal closure strips and curbs, fascia, caps and similar metal accessories shall not be less than the minimum thickness specified for covering. Accessories shall be compatible with the system furnished. Exposed metal accessories shall be of material, finish, and color to match wall or roof material to which it is adjacent. Molded closure strips shall be bituminous-saturated fiber, closed-cell or solid-cell synthetic rubber or neoprene, or polyvinyl chloride premolded to match configuration of the covering and shall not absorb or retain water.

B. Interior Buildings

The concrete deck shall be sealed with the same material and in the same manner as specified in Specification Section 03300 – “Cast-in-Place Structural Concrete”.

The wall coverings for the interior buildings shall consist of 5/8-inch thick fire-resistant gypsum wallboard on both sides of the wall and on the walls associated with the interior buildings except those in the Lavatory, which shall have ½-inch thick moisture resistant gypsum wallboard installed. All walls within the Control Room, Closet, Lavatory and Mechanical Room shall have gypsum wallboard installed. This is in addition to the interior panels to be installed as part of the exterior building. All interior walls shall be primed, sealed and painted in accordance with Specification Section 09900 – “Painting, General”.

The ceilings of the Control Room, Closet and Lavatory shall receive 2-foot by 2-foot suspended acoustical ceiling tiles. Color of ceiling tiles and all support rails shall be white.

2.4 FASTENERS

A. Exterior Building

Semi-coated fasteners for steel wall and roof panels shall be zinc-coated steel, type and size specified below or as otherwise approved for the applicable requirements. Fasteners for structural connections shall provide both tensile and shear strength of not less than 750 pounds per fastener. Fasteners for accessories shall be the manufacturer's standard but 300 Series stainless steel where exposed to exterior. Exposed roof fasteners shall be gasketed or have gasketed washers on the exterior side of the covering to waterproof the fastener penetration. Washer material shall be compatible with the covering; having a minimum diameter of 3/8 inch for structural connections; and gasketed portion of fasteners or washers shall be neoprene, approximately 1/8-inch thick. Exposed wall fasteners shall be color finished or provided with plastic caps to match the covering.

1. Screws

Screws shall be as recommended by the manufacturer to meet the strength design requirements of the panels.

2. End-Welded Studs

Automatic end-welded studs shall be shouldered type with a shank diameter of not less than 3/16 inch and cap or nut holding covering against the shoulder.

3. Explosive Actuated Fasteners

Fasteners for use with explosive actuated tools shall have a shank diameter of not less than 0.145 inch with a shank length of not less than 1/2 inch for fastening panels to steel and not less than 1 inch for fastening panels to concrete.

4. Blind Rivets

Blind rivets shall be aluminum with 3/16-inch nominal diameter shank or stainless steel with 1/8-inch nominal diameter shank. Rivets shall be threaded stem type if used for other than the fastening of the trim. Rivet with hollow stems shall have closed ends.

5. Bolts

Bolts shall be not less than 1/4 inch diameter, shouldered or plain shank as required, with proper nuts.

B. Interior Buildings

All fasteners for the interior buildings shall be in accordance with wallboard manufacturers' requirements, industry standards and the Contract Drawings.

PART 3. EXECUTION

3.1 ERECTION

A. General

Erection shall be in accordance with the approved erection instructions and drawings and with applicable provision of AISC S335. The completed exterior building shall be free of excessive noise from wind-induced vibrations under the ordinary weather conditions to be encountered at the location where the building is erected, and meet all specified design requirements. Dissimilar materials, which are not compatible when contacting each other, shall be insulated from each other by means of gaskets or insulating compounds. Framing members fabricated or modified on-site shall be saw or abrasive cut; bolt holes shall be drilled. On-site flame cutting of framing members, with the exception of small access holes in structural beam or column webs, will not be permitted. Improper or mislocated drill holes shall be plugged with an oversize screw fastener and gasketed washer; however, sheets with an excess of such holes or with such holes in critical locations shall not be used. Improper or mislocated bolt holes in structural members or other misfits caused by improper fabrication or erection, shall be repaired in accordance with AISC S302. Exposed surfaces shall be kept clean and free from sealant, metal cuttings, excess material from thermal cutting, and other foreign materials. Exposed surfaces, which have been thermally cut, shall be finished smooth within a tolerance of 1/8 inch. Stained, discolored or damaged sheets shall be removed from the site. Welding of steel shall conform to AWS D1.1. High strength bolting shall conform to AISC 329 using ASTM A 325 or ASTM A 490 bolts. Concrete work is specified in Section 03300-"Cast-In-Place Concrete".

B. Framing and Structural Members

Anchor bolts for the exterior building shall be accurately set by template while the concrete is in a plastic state. Uniform bearing under base plates and still members shall be provided using a non-shrinking grout when necessary. Members shall be accurately spaced to assure proper fitting of covering. Separate leveling plates under column base plates shall not be used. As erection progresses, the work shall be securely fastened to resist the dead load and wind and erection stresses.

Anchor bolts for the framing and structural members for the interior buildings shall be installed in accordance with the Contract Drawings.

C. Wall covering and Roof Covering

Wall covering for the exterior building shall be applied with the longitudinal configurations in the vertical position. Roof covering shall be applied with the longitudinal configurations in the direction of the roof slope. Accessories shall be fastened into framing members, except as otherwise approved. Closure strips shall be provided as indicated and where necessary to provide weathertight construction. Provide for use in construction of all roof seaming equipment and accessories required to complete the work.

Wall covering for the interior buildings shall be installed in accordance with the Contract Drawings.

D. Concealed Fastener Wall and Roof Panels

Panels on the exterior building shall be fastened to framing members with concealed fastening clips or other concealed devices standard with the manufacturer. Spacing of fastening clips and fasteners shall be in accordance with the manufacturer's written instructions insofar as the maximum fastener spacings specified are not exceeded and provided such standard practice will result in a structure which will be free from water leaks and meet design requirements. Spacing of fasteners and anchor clips along the panel interlocking ribs shall not exceed 12 inches on center except when otherwise approved. Fasteners shall not puncture covering sheets except when otherwise approved. Fasteners shall not puncture covering sheets except as approved for flashing, closures, and trim; exposed fasteners shall be installed in straight lines. Interlocking ribs shall be sealed according to manufacturer's recommendations. Joints at accessories shall be sealed.

E. Gutters and Downspouts

Gutters and downspouts shall be rigidly attached to the exterior building. Spacing of cleats for gutters shall be 16 inches maximum. Spacing of brackets and spacers for gutters shall be 36 inches maximum. Supports for downspouts shall be spaced according to manufacturer's recommendations.

F. Louvers and Dampers

Louvers shall be rigidly attached to the supporting construction of the exterior building in a manner to assure a rain-tight installation.

G. Insulation

Insulation shall be installed to the exterior building as indicated and in accordance with manufacturer's instruction. Joints shall be tight and sealed as required by the manufacturer. Final appearance of installed insulation shall be free of unsightly sags and wrinkles.

H. Wall Liner

Wall liner shall be securely fastened into place on to the exterior building in accordance with the manufacturer's recommendation and in a manner to present a neat appearance.

3.2 FIELD PAINTING - TOUCH-UP

Immediately upon detection, abraded or corroded spots on shop-painted surfaces shall be wire brushed and touched up with the same material used for the shop coat. If allowed by the Contractor, factory color finished surfaces shall be touched up as necessary with the manufacturer's recommended touch-up paint. Damaged factory color finished surfaces may be ordered to be replaced at the Subcontractor's expense.

* * * END OF SECTION * * *

IN ORDER TO PROCESS YOUR APPLICATION THIS WORKSHEET MUST BE FULLY COMPLETED.

TOWN OF OYSTER BAY
CODE DATA WORKSHEET

DATE: _____

APPLICATION NO.: _____

PROPOSED TENANCY: _____

PRIOR TENANCY: _____

DESIGN PROFESSIONAL (REGISTERED ARCHITECT OR PROFESSIONAL ENGINEER): _____

TELEPHONE: _____

FAX: _____ CELL PHONE: _____

CODES:
BUILDING CODE OF NYS, 2002 [B]
FIRE CODE OF NYS, 2002 [F]
MECHANICAL CODE OF NYS, 2002 [M]
PLUMBING CODE OF NYS, 2002 [PB]
FUEL GAS CODE OF NYS, 2002 [FG]
ENERGY CONSERVATION CODE OF NYS, 2002 [E]
RESIDENTIAL CODE OF NYS, 2002 [R]
PROPERTY MAINTENANCE CODE OF NYS, 2002

TYPE OF WORK:

- NEW CONSTRUCTION REPAIRS (K401) RENOVATIONS (K501)
- ALTERATIONS (K601) RECONSTRUCTION (K701) CHANGE OF OCCUPANCY (K801)
- ADDITIONS (K901) HISTORIC BUILDINGS (K1001) RELOCATED STRUCTURES (K1101)

CODE DATA

LEGEND:

NA - NOT APPLICABLE
NC - NON-CONFORMING

NR - NOT REQUIRED
R - REQUIRED

NS - NOT SHOWN ON DRAWINGS
C - CONFORMS

(* APPLICANT MUST PROVIDE CALCULATIONS IN SPACE PROVIDED ON LINES 3.4, 3.5, 5.1 & 5.2)

NO.	TOPIC	CODE SECTION	REQUIRED/ALLOWED (BY CODE)	ACTUAL (PROPOSED)
1.0	OCCUPANCY CLASSIFICATION PROPOSED/EXISTING	302		
2.0	TYPE OF CONSTRUCTION (INCLUDE SUBTYPE)	602		
2.1	FIRE RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)	TABLE 601		
2.2	FIRE RESISTANCE RATING REQUIREMENTS FOR EXTERNAL WALLS	TABLE 602		
3.0	ALLOWABLE HEIGHT AND BUILDING AREAS	CHAPTER 5	---	---
3.1	HEIGHT (FT.)	TABLE 503		
3.2	NUMBER OF STORIES	TABLE 503		
3.3	FLOOR AREA (SQ. FT. PER FLOOR)	TABLE 503		
3.4	HEIGHT MODIFICATIONS *	504		
3.5	FLOOR AREA MODIFICATIONS *	506		
3.6	OTHER			
4.0	FIRE PROTECTION SYSTEMS	CHAPTER 9	---	---
4.1	AUTOMATIC SPRINKLER SYSTEM	903 [B] [F]		
4.2	PORTABLE FIRE EXTINGUISHERS (MUST SHOW LOCATIONS ON DRAWINGS)	906 [B] [F]		
4.3	FIRE ALARM AND DETECTION SYSTEM	907 [B] [F]		
4.4	OTHER			
4.5	OTHER			
5.0	MEANS OF EGRESS	CHAPTER 10	---	---
5.1	OCCUPANT LOAD *	TABLE 1003.2.2.2		
5.2	EGRESS WIDTH *	TABLE 1003.2.3		
5.3	EXIT SIGN(S)	1003.2.10		
5.4	EGRESS ILLUMINATION (EMERGENCY LIGHTS)	1003.2.11 THRU 1003.2.11.3		
5.5	STAIRWAYS	1003.3.3		
5.6	EXIT ACCESS	1004		
5.7	SPACES WITH ONE MEANS OF EGRESS	TABLE 1004.2.1		
5.7	EXIT ACCESS TRAVEL DISTANCE	TABLE 1004.2.4		
5.8	CORRIDOR WIDTH	1004.3.2.2		
5.9	CORRIDOR FIRE RESISTANCE RATING	TABLE 1004.3.2.1		
5.10	DEAD ENDS	1004.3.2.3		
5.11	CORRIDOR CONTINUITY	1004.3.2.5		
5.12	EXISTING/MINIMUM NUMBER OF EXITS	1005		
5.13	BUILDINGS WITH ONE EXIT	TABLE 1005.2.1 1005.2.2		
5.14	ENCLOSURES	TABLE 1005.2.2 1005.3.2		
5.15	OTHER			
5.16	OTHER			

CODE DATA - PAGE 2

NO.	TOPIC	CODE SECTION	REQUIRED/ ALLOWED (BY CODE)	ACTUAL (PROPOSED)
6.0	ASSEMBLY	SECTION 1008	---	---
6.1	MAIN EXIT	1008.1		
6.2	OTHER EXITS	1008.2		
6.3	INTERIOR BALCONY AND GALLERY MEANS OF EGRESS	1008.4		
6.4	TRAVEL DISTANCE	1008.6		
6.5	COMMON PATH OF TRAVEL	1008.7		
6.6	REQUIRED AISLES	1008.8		
6.7	OTHER			
6.8	OTHER			
7.0	ACCESSIBILITY (ICC/ANSI A-117.1-98) [NOTE: ALL NEW TOILET ROOMS MUST BE ACCESSIBLE.]	CHAPTER 11		
7.1	OTHER			
8.0	ENERGY CONSERVATION CONSTRUCTION CODE - PROVIDE REQUIRED TABLES AND CLIMATE ZONE OR COMCHECKLIST CALCULATIONS** (ATTACH 8 1/2" x 11" SHEETS SEPARATELY - SIGNED AND SEALED REQUIRED) **[DOWNLOAD FREE SOFTWARE AT WWW.ENERGYGUIDES.GOV]			
9.0	REQUIRED LIVE LOADS	TABLE 1607.1		
9.1	SNOW LOADS	FIGURE 1608.2	45 PSF	
10.0	PLUMBING REQUIRED NUMBER OF FIXTURES			
11.0	HEAT PRODUCING EQUIPMENT [NOTE: A STRUCTURAL DIAGRAM/FRAMING PLAN MUST BE PROVIDED TO BE ACCEPTABLE.]		---	---
11.1	NUMBER OF PROPOSED UNITS AND LOCATION			
11.2	NUMBER OF EXISTING UNITS			
11.3	NUMBER OF REPLACEMENT UNITS			
11.4	ELECTRICAL OR GAS POWERED (GAS REQUIRES A PLUMBING APPLICATION)			
12.0	SITE WORK		---	---
12.1	LINEAR FEET OF CURBING			
12.2	SQUARE YARDS OF ASPHALT PAVING			
12.3	CUBIC YARDS OF BASE			
12.4	NUMBER OF DRYWELLS/CATCH BASINS			
13.0	ALL OTHER APPLICABLE CODES(S) THAT APPLY TO THE SCOPE OF WORK BEING PERFORMED i.e. ANY OTHER BUILDING CODES NASSAU COUNTY FIRE MARSHAL NASSAU COUNTY HEALTH DEPT. CURB CUTS (CONTACT APPROPRIATE AGENCY - STATE, COUNTY OR TOWN)			

THE ABOVE IS A SUMMARY OF THE BASIC CODE, WHICH APPLIES TO MANY COMMERCIAL BUILDING APPLICATIONS. IT IS NOT MEANT TO BE A COMPLETE OR COMPREHENSIVE LIST OF APPLICABLE BUILDING CODE REQUIREMENTS, WHICH MAY APPLY TO ANY PARTICULAR OR GIVEN SITUATION.

PLAN EXAMINER COMMENTS:

OFFICE USE ONLY

ORIGINAL INKED SEAL AND SIGNATURE OF
A LICENSED PROFESSIONAL ENGINEER OR
REGISTERED ARCHITECT REQUIRED.

DATE DENIED: _____
DATE APPROVED: _____

PLAN EXAMINER: _____

SECTION 02531

SANITARY SEWERS

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

This section covers requirements for handling and installation of a sanitary sewer line from the groundwater treatment building to connection into Nassau County – Department of Public Works manhole no. 129 located in the utility easement near the dead end of South Herman Avenue.

It is not the intent of this section to specify all details of the installation of the sanitary sewer line. It shall be the responsibility of the Subcontractor to install a sanitary sewer line that is in accordance with the applicable standards of the Nassau County – Department of Public Works and high standards of engineering and workmanship that is suitable for the specified service. A copy of the applicable permit application is provided as Attachment 02531-1 of this specification. A pre-qualified sanitary sewer Subcontractor shall be used to install the 4-inch line poly-vinyl chloride (Schedule 40 PVC) plastic pipe.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C900 (1997) Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution

AWWA M23 (2002) Manual: PVC Pipe – Design and Installation

ASME INTERNATIONAL (ASME)

ASME B1.20.1 (1983; R 2001) Pipe Threads, General Purpose, Inch

ASME B18.2.2 (1987; R 1999) Square and Hex Nuts

ASME B18.5.2.1M (1996; R 2003) Metric Round Head Short Square Neck Bolts

ASME B18.5.2.2M (1982; R 2000) Metric Round Head Square Neck Bolts

ASTM INTERNATIONAL (ASTM)

ASTM A 563	(1984, R 1999e1) Ductile Iron Castings
ASTM A 563M	(2001) Carbon and Alloy Steel Nuts (Metric)
ASTM C 972	(2000) Compression-Recovery of Tape Sealant
ASTM C 990	(2003) Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM D 1784	(2003) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 1785	(1999) Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2241	(2000) Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2321	(2000) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D 2412	(2002) Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
ASTM D 2464	(1999) Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2466	(2002) Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D 2467	(2002) Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2680	(2001) Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping
ASTM D 3034	(2000) Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3139	(1998) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D 3212	(1996a; R 2003) Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D 3350	(2002a) Polyethylene Plastics Pipe and Fittings Materials
ASTM F 477	(2002e1) Elastomeric Seals (Gaskets) for Jointing Plastic Pipe

ASTM F 714	(2003) Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
ASTM F 758	(1995; R 2000) Smooth-Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage
ASTM F 794	(2003) Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
ASTM 894	(1998a) Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
ASTM F 949	(2003) Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
U.S. GENERAL SERVICES ADMINISTRATION (GSA)	
FS-A-A-60005	(Basic) Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole
U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)	
29 CFR 1910.27	Fixed Ladders
UNI-BELL PVC PIPE ASSOCIATION (UBPPA)	
UBPPA UNI-B-3	(1992) Recommended Practice for the Installation of Polyvinyl Chloride (PVC) Pressure Pipe (Nominal Diameters 4-36 Inch)
UBPPA UNI-B-6	(1998) Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe

1.2 SUBMITTALS

The Subcontractor shall submit product data on the pipe material used to construct the sanitary sewer and the manhole connection details. Five copies of PVC pipe manufacturer's standard drawings or catalog cut sheets and manhole connection details shall be submitted for approval by the Contractor.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage

1. Piping

Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store PVC material under cover

out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

PART 2 PRODUCTS

2.1 PIPELINE MATERIALS

Pipe shall conform to the respective specifications and other requirements specified below:

A. PVC Plastic Gravity Pipe and Fittings

ASTM D 3034, SDR 35, or ASTM F 949 with ends suitable for elastomeric gasket joints. ASTM F 794, Series 46, for ribbed sewer pipe with smooth interior, size 200 mm 8 inch through 1200 mm 48 inch diameters.

B. PVC Plastic Gravity Joints and Jointing Material

Joints shall conform to ASTM D 3212. Gaskets shall conform to ASTM F 477.

PART 3. EXECUTION

3.1 INSTALLATION OF PIPELINES AND APPURTENANT CONSTRUCTION

A. General Requirements for Installation of Pipelines

Apply except where specific exception is made in the following paragraphs entitled "Special Requirements."

1. Location

The work covered by this section shall be at locations indicated on the Contract Drawings.

2. Earthwork

Perform earthwork operations in accordance with Section 02270 Earthwork: Trench Excavation and Backfilling for Extraction, Discharge, and Utility Systems.

3. Pipe Laying and Jointing

Inspect each pipe and fitting before and after installation; replace those found defective and remove from site. Provide proper facilities for lowering sections of pipe into trenches. Lay nonpressure pipe with the bell ends in the upgrade direction. Adjust spigots in bells to give a uniform space all around. Blocking or wedging between bells and spigots will not be permitted. Replace by one of the proper dimensions, pipe or fittings that do not allow sufficient space for installation of joint material. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Provide batterboards not more than 25 feet apart in trenches for checking and ensuring that pipe invert elevations are as indicated. Laser beam method may be used in lieu of batterboards for the same purpose.

Branch connections shall be made by use of regular fittings or solvent cemented saddles as approved. Saddles for PVC composite pipe shall conform to Figure 2 of ASTM D 2680 and saddles for PVC pipe shall conform to Table 4 of ASTM D 3034.

B. Special Requirements

1. Installation of PVC Plastic Piping

Install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section and with the requirements of ASTM D 2321 for laying and joining pipe and fittings. Make joints with the gaskets specified for joints with this piping and assemble in accordance with the requirements of ASTM D 2321 for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.

C. Miscellaneous Construction and Installation

1. Connecting to Existing Manholes

Pipe connections to existing manholes shall be made so that finish work will conform as nearly as practicable to the applicable requirements specified for new manholes, including all necessary concrete work, cutting, and shaping. The connection shall be centered on the manhole. Holes for the new pipe shall be of sufficient diameter to allow packing cement mortar around the entire periphery of the pipe but no larger than 1.5 times the diameter of the pipe. Cutting the manhole shall be done in a manner that will cause the least damage to the walls.

D. Installations of Wye Branches

Cutting into piping for connections shall not be done except in special approved cases. When the connecting pipe cannot be adequately supported on undisturbed earth or damped backfill, the pipe shall be encased in concrete backfill or supported on a concrete cradle as directed. Concrete required because of conditions resulting from faulty construction methods or negligence by the Subcontractor shall be installed at no additional cost to the Contractor. The installation of wye branches in an existing sewer shall be made by a method that does not damage the integrity of the existing sewer. One acceptable method consists of removing one pipe section, breaking off the upper half of the bell of the next lower section and half of the running bell of wye section. After placing the new section, it shall be rotated so that the broken half of the bell will be at the bottom. The two joints shall then be made with joint packing and cement mortar.

3.2 FIELD QUALITY CONTROL

A. Field Tests and Inspections

The Contractor shall conduct field inspections and witness field tests specified in this section. The Subcontractor shall perform field tests and provide labor, equipment, and incidentals required for testing and be able to provide evidence, when required that each item of work has been constructed in accordance with the drawings and specifications.

B. Tests for Nonpressure Lines

Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; it shall show a practically full circle of light through the pipeline when viewed from the adjoining end of line. When pressure piping is used in a nonpressure line for nonpressure use, test this piping as specified for nonpressure pipe.

1. Leakage Tests

Test lines for leakage by either infiltration tests or exfiltration tests, or by low-pressure air tests. Prior to testing for leakage, backfill trench up to at least lower half of pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent movement, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

- a) PVC plastic pipelines: Test in accordance with UBPPA UNI-B-6. Allowable pressure drop shall be as given in UBPPA UNI-B-6. Make calculations in accordance with the Appendix to UBPPA UNI-B-6.

- - End of Section - -

COUNTY OF NASSAU, DEPARTMENT OF PUBLIC WORKS

Division of Sanitation and Water Supply, 1550 Franklin Avenue, Mineola, NY 11501

SEWER CONNECTION PERMIT APPLICATION

PLEASE DO NOT WRITE IN HEAVY OUTLINED AREA BELOW.
FOR THIS OFFICE USE ONLY.

PLEASE PRINT OR TYPE ALL INFORMATION

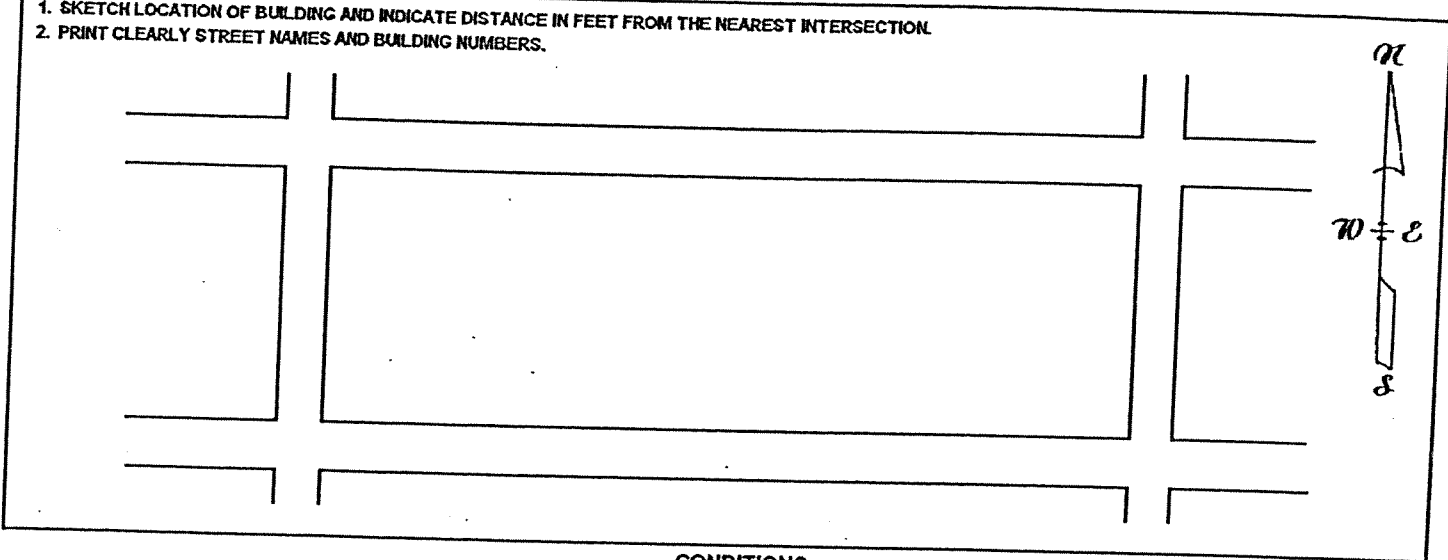
STREET ADDRESS		POST OFFICE		ZIP CODE	Add 1% of Estimated Construction Costs	PERMIT NO.	PERMIT FEE
NAME OF APPLICANT			PLEASE INDICATE WITH AN "X" <input type="checkbox"/> OWNER <input type="checkbox"/> LESSEE				
TYPE OF DWELLING OR BUSINESS		REASON FOR APPLICATION INDICATE WITH AN "X" <input type="checkbox"/> CONNECT <input type="checkbox"/> DISCONNECT		SECTION	BLOCK	LOT	

THE CONTRACTOR INDICATED BELOW HAS BEEN DESIGNATED BY THE APPLICANT TO PERFORM THE NECESSARY WORK

NAME OF CONTRACTOR			
STREET ADDRESS		POST OFFICE	TELEPHONE NO.

DIAGRAM

1. SKETCH LOCATION OF BUILDING AND INDICATE DISTANCE IN FEET FROM THE NEAREST INTERSECTION.
2. PRINT CLEARLY STREET NAMES AND BUILDING NUMBERS.



CONDITIONS

1. This permit shall not relieve the permittee or installer from obtaining any additional permits required by law, ordinance or regulation of Nassau County, Town or Incorporated Village, therein.
2. No tunneling under structures within the highway or sidewalk areas will be permitted.
3. The permittee shall maintain the installation up to the County Sanitary Sewer Lateral or Trunk lines.
4. The installer shall not cover the installation before inspection is made by the proper County, Town or Incorporated Village.
5. The permit must be kept on the premises, available for exhibition at all times during the construction of the work and it shall become void unless connection is made within sixty (60) days from the date of issuance. No refund will be made for permits issued and not used within the time limit given.
6. The permittee shall notify the Commissioner of Public works immediately in the event of any accident, change of conditions or other occurrence that occasions discharge to the County Sewers. Failure to comply with this condition shall void this permit.
7. Cesspools, septic tanks or overflow pools are not allowed to be pumped, drained or discharged into the County Sanitary Sewer Lateral or Trunk Lines.
8. The County makes no warranty of the location of the lateral spur house connection and the location of same shall be the sole responsibility of the permittee.
9. Special permits, "S" number series, are subject to an industrial waste survey. Additional conditions or requirements, which become part of the permit issued, will be determined by this survey. All special requirements must be installed before connection to the County Sanitary Sewer Facility.

The applicant and the Contractor employed to perform the work agree to abide by all the provisions of the Nassau County Sewer Ordinance, the above conditions, and any other conditions deemed necessary as a result of an Industrial Waste Survey.

PLEASE MAKE CHECKS PAYABLE TO "NASSAU COUNTY TREASURER."

_____	_____
AUTHORIZED CONTRACTOR'S SIGNATURE	SIGNATURE OF APPLICANT OR OFFICER
_____	_____
TITLE	TITLE
_____	_____
DATE	DATE

**NCDPW - S&WS
INDUSTRIAL WASTE
CONTROL UNIT
516-571-7319, 20**

SECTION 02650

PRECAST CONCRETE VAULTS AND DOORS

PART 1. GENERAL

The Contractor is the Navy’s representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy’s representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Specifications and Drawings.

The work covered by this section consists of furnishing precast concrete vaults and concrete box pulls with reinforcement complete with frames and doors, vault steps, and appurtenances.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 02270	Earthwork: Trench Excavation and Backfilling for Extraction, Discharge and Utilities Systems
Section 03200	Concrete Reinforcement
Section 03300	Cast-In-Place Structural Concrete

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN CONCRETE INSTITUTE (ACI)

ASTM A123-89a	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A575-89	Steel bars, Carbon, Merchant Quality, M-Grades
ASTM C478-93	Precast Reinforced Concrete Manhole Sections

1.2 SUBMITTALS

- A. Prior to any field construction, the Subcontractor shall submit for review construction/shop drawings and design calculations for vault sections, slabs, steps, frames, and doors, location and size of base section opening and vault step locations.
- B. The submittals shall include such information, which will ensure compliance with the codes, standards, and specifications designated in the following section “PRODUCTS”.

- C. The Subcontractor shall submit manufacturer's technical information regarding sealants, gaskets, and waterproofing.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.
- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.
- C. Components shall be stored off of the ground and shall be protected from weather elements.
- D. All precast vault sections shall be stored and handled with extreme care to avoid structural damage to the units. Damage to the units occurring, as a result of storage or handling shall be cause for rejection.

PART 2. PRODUCTS

2.1 MATERIALS

A. Precast Concrete Vaults

1. Injection Well vaults shall be constructed of precast reinforced concrete with the internal dimensions of 6'W x 6'L x 4'Ht and a 6-inch wall thickness as shown on the Contract Drawings. The vaults shall be manufactured by the AFCO Precast Sales Corporation or a Contractor approved equivalent.
2. Recovery Well vaults shall be constructed of precast reinforced concrete with the internal dimensions of 8'W x 8'L x 4'Ht and a 6-inch wall thickness as shown on the Contract Drawings. The vaults shall be manufactured by the AFCO Precast Sales Corporation or a Contractor approved equivalent.
3. All other vaults (water meter pit, etc.) shall be constructed of precast reinforced concrete with the internal dimensions of 3'W x 5'L x 4'Ht and a 6-inch wall thickness as shown on the Contract Drawings. The vaults shall be manufactured by the AFCO Precast Sales Corporation or a Contractor approved equivalent.
4. Cementitious materials, aggregates, admixtures, and steel reinforcement for manufacturing precast reinforced concrete vaults shall comply with the material requirements of ASTM C478.
5. Each vault shall be provided with a single leaf or double leaf, galvanized steel door rated for a 300-psf live load Type JD-2AL (see Part 2.1.B). Injection well vault door dimensions shall be 4'W x 6'L. Recovery Well vault door dimensions shall be 8'W x 8'L. All other vault doors shall be 3'W x 5'L. The vault doors shall be manufactured by the PA Insert Corp. or a Contractor approved equivalent.
6. The base section of the concrete vault shall be bottomless and shall be installed on a level subgrade of ¾-inch rounded stone as shown on the Contract Drawings to allow for easy

installation of extraction well riser pipes. Concrete shall be installed into each vault to a minimum thickness of 4-inches after all appurtenances are installed and connected.

7. Concrete vault sections shall have a bituminous exterior coating or an equivalent sealant applied prior to installation.
8. Vault steps shall be ASTM A575, Grade M1020 galvanized in accordance with ASTM A123 or a Contractor approved equivalent and shall comply with the dimensional requirements of ASTM C478. Each vault will have steps pre-installed by the manufacturer.

B. Vault Doors

Subcontractor shall install galvanized, standard duty, flush mount lift handle, single leaf cast into concrete slab vault doors by manufacturer PA Insert Corp., or Contractor approved equivalent. Subcontractor shall contact manufacturer for installation information and instructions.

C. Sealants, Caulk and Rubber Gaskets

The material chosen for the sealing of the vault doors to the vault shall be chemically compatible with low concentrations of gasoline and be weather resistant.

D. Mortar

The Subcontractor shall use a mortar mix consisting of 3 parts of sand and 1 part of cement by weight. The water shall be adjusted to the mixture of sand and cement to obtain a workable consistency of the mix.

E. Stone

The stones below the concrete vault shall be 3/4-inch rounded evenly distributed across the base at a thickness of 4 inches.

2.2 QUALITY ASSURANCE

- A. The Subcontractor shall have a quality assurance program, which will ensure that the products, materials, and services provided will properly reflect the Specification requirements.
- B. The Subcontractor shall provide the manufacturer's standard five-year guarantee that the door units shall operate properly and be free of defects in materials and workmanship. A copy of the guarantee shall be provided to the Contractor

PART 3. EXECUTION

3.1 INSTALLATION

- A. Precast vaults shall be installed level on a compacted subgrade and a 4-inch layer of 3/4-inch rounded stone, and be situated with clearance to extraction well as shown on the Contract Drawings.
- B. Joints of precast wall sections and vault doors, where provided, shall be sealed with a rubber gasket or preformed joint sealant.

- C. All joints in the inside of the vault shall be filled with mortar to provide a smooth and continuous surface.
- D. Prior to installation, outer surfaces of precast vaults shall be given two coats of bituminous damp proofing at the rate of 30-60 square feet per gallon in accordance with the manufacturer's instructions.
- E. Vault doors shall be installed as shown on the Contract Drawings and in accordance with the manufacturer's instructions and recommendations.

* * * END OF SECTION * * *

SECTION 02660

POTABLE WATER LINE

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

This section covers requirements for handling and installation of the water supply line to the groundwater treatment building.

It is not the intent of this section to specify all details of the installation of the water supply line. It shall be the responsibility of the Subcontractor to provide a water supply system that is in accordance with the applicable standards of the Bethpage Water District provided in Attachment 02660-1 of this specification and the high standards of engineering and workmanship that is suitable for the specified service. A pre-qualified water main subcontractor shall be used to install the 2-inch line

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 02250	Earthwork: Excavation and Backfilling for Building Construction
Section 02270	Earthwork: Trench Excavation and Backfilling for Extraction, Discharge and Utilities Systems
Section 15400	Plumbing, General Purpose

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

- AWWA B300: Hypochlorites (1987)
- AWWA B301: Liquid Chlorine (1987; B301a)

BETHPAGE WATER DISTRICT (BWD)

- General Requirements for Fire and Domestic Services (see Attachment 02660-1 of this specification)

1.2 SUBMITTALS

The Subcontractor shall submit five copies of the following to the Contractor:

- A. Shop drawing showing outline and overall dimensions, connection details, arrangement of functional parts, and parts lists if applicable, for all materials furnished under this section.
- B. The Subcontractor's drawings shall be direct reproducibles to produce clear, sharp, legible prints. The backflow prevention plans (11" x 17" preferred by the BWD) shall be such that they will be approved by the BWD. Once approved, the BWD will forward the plans to the Nassau County Health Department (NCDH) for approval. Approvals must be received from both agencies prior to installation. Plans and applications must be prepared by a New York State licensed architect or engineer.
- C. Review of the drawings by the Contractor shall not relieve the Subcontractor of the entire responsibility for the design, workmanship and material under the Contract Documents.

PART 2. PRODUCTS

2.1 PIPING AND JOINTS

Subcontractor shall evaluate the need for the use of alternative piping materials for the water supply in accordance with the location and routing as shown on Contract Drawings and detailed in Section 15400.

Pipe shall be cement-lined ductile iron pipe – Class 52. Mechanical Joint fittings shall be used on ductile-iron piping. All bends shall be rodded on both ends of the mechanical connection. Compact fittings will not be accepted. All mechanical joints shall use retainer glands. All fittings, bolts, threaded rods, retained glands, etc. shall be new material. No used materials will be allowed. Retainer glands shall be used on all mechanical connections.

2.2 METER PIT

- A. The Subcontractor shall provide a 3' x 5' x 4' deep mid-states meter pit with the following:
 - 1. Ford 20 inch wet meter pit cover
 - 2. No. 2 Ford extension ring
 - 3. Ford VBHC-74-24W-44-44 meter setter

The meter and reduced pressure zone shall either be installed within the public Right-Of-Way or within BWD property.

2.3 POTABLE WATER LINE VALVE BOX

The potable water line valve box shall be constructed according to the standards and specifications approved by the BWD.

2.4 SERVICE BOXES

Service boxes shall be cast iron or concrete and shall meet the approved specifications and standards set by the Bethpage Water District. Service box locations will be as recommended by BWD.

2.5 DISINFECTION

A. Chlorinating materials shall conform to the following:

1. Chlorine, liquid: AWWA B301
2. Hypochlorite, Calcium and Sodium: AWWA B300

2.6 BEDDING MATERIAL

Bedding sand shall consist of a well-graded sand material classified as SW in accordance with the Unified Soil Classification System.

Any section of existing main that becomes undermined shall be removed and replaced following re-excavation of the disturbed supporting soil, then backfilling and compaction of the excavation area in 6-inch lifts up to existing grade. The limits of replacement shall include 8 feet into undisturbed soil on each side of the excavation. Jetting will not be permitted as a means of trench compaction.

PART 3. EXECUTION

3.1 HANDLING

- A. Pipe and accessories shall be handled so as to insure delivery to the trench in sound, undamaged condition. Particular care shall be taken not to damage the pipe coating or lining. If the coating or lining of any pipe or fitting is damaged, the repair shall be made by the Subcontractor at his expense in a satisfactory manner. No other pipe or material of any kind shall be placed inside a pipe or fitting after the coating has been applied.
- B. Pipe shall be carried into position and not dragged. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe.
- C. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method.
- D. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Contractor. Rubber gaskets that are not to be installed immediately shall be stored in a cool and dark place.

3.2 INSTALLATION

A. Cutting of Pipe

Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise recommended by the manufacturer and authorized by the Contractor, cutting shall be done with an approved type mechanical cutter.

B. Placing and Laying

Prior to placing the pipe, bedding material, which is a well graded sand, shall be placed in accordance with Section 02270, Parts 3.2 and 3.3. Water piping shall be installed in undisturbed soil. No other utilities will occupy the water trenches. Horizontal separation distances of 3' 0" shall be maintained between water piping and other utilities or structures, unless otherwise specified.

Pipe and accessories shall be carefully lowered into the trench by means of derrick, tag lines, ropes, belt slings, or other authorized equipment. Under no circumstances shall any of the water-line materials be dropped or dumped into the trench. Care shall be taken to avoid abrasion of the pipe coating. Except where necessary in making connections with other lines or as authorized by the Contractor, pipe shall be laid with the bells facing in the direction of laying. The full length of each section of pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate bells, couplings, and joints. Pipe that has the grade or joint disturbed after laying shall be taken up and re-laid. Pipe shall not be laid in water or when trench conditions are unsuitable for the work. Water shall be kept out of the trench until joints are complete. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no trench water, earth, or other substance will enter the pipes or fittings. Where any part of the coating or lining is damaged, the repair shall be made by the Subcontractor at his expense in a satisfactory manner. Pipe ends left for future connections shall be valved, plugged, or capped, and anchored.

Ductile-iron piping entering the building foundation walls and/or floor slabs shall be wrapped with appropriately sized Arma-Flex at the pipe-concrete interface.

Ductile-iron piping stubs inside the building shall be left flanged at a minimum distance of 24 inches above the floor. The end shall be blind flanged and tapped for purposes of blowing off, testing, and sampling. Rodding shall be provided continuously from the flange, through the slab, to the elbow. Being a vertical bend, the elbow shall be rodded back to the next fitting (or clamp).

C. Connections

The Subcontractor is responsible for preparing for the tapping of the existing water line, however the BWD will perform the actual tap. The tapping shall be coordinated with BWD. Where connections are made between new work and existing mains, the connections shall be made by using specials and fittings to suit the actual conditions. The BWD will be notified prior to the execution. Where made under pressure, these connections shall be installed using standard methods as approved by the Contractor. The BWD shall perform the actual shutdown. The Subcontractor shall not operate any distribution system valves.

Any customers to be out of service during the water line activities during the shut down period must be identified and notified at least 24 hours in advance. The Subcontractor shall coordinate with the BWD.

D. Meter Pit

Meter pit shall be installed by the Subcontractor as per industry standards and as approved by BWD. The meter shall be placed in the grass area adjacent to the entrance of the access road from Sophia Street within a standard meter pit.

E. Setting of Valves and Valve Boxes

1. Valves

Check, pressure reducing, vacuum, and air relief valves shall be installed in valve pits. Valves and valve boxes shall be installed as directed by the Bethpage Water District and shall be set plumb. Valve boxes shall be centered on the valves. Boxes shall be installed over each outside gate valve unless otherwise shown. Where feasible, valves shall be located outside the area of roads and streets. Backfill material shall be placed and compacted per Section 02270, Part 2 3.2 and 3.3. Subcontractor shall take all necessary precautions to protect each valve box or pit to a distance of 4 feet on all sides of the box, or the undisturbed trench face if less than 4 feet.

2. Service Boxes

Where no curbing exists, service boxes shall be installed in accessible locations.

F. Inspections

H2M Group, the BWD Consulting Engineer will provide inspection services during the water main replacement. The Subcontractor shall be billed for these inspection services.

3.3 HYDROSTATIC TESTS

A. Pressure Test

After the pipe is laid, the joints completed, and the trench partially backfilled leaving the joints exposed for examination, the newly laid piping or any valved section of piping shall, unless otherwise specified, be subjected for one hour to a hydrostatic pressure test of one and one-half times the maximum operating pressure within the pipe. Each valve shall be opened and closed several times during the test. Exposed pipe, joints, fittings, and valves shall be carefully examined during the partially open trench test. Joints showing visible leakage shall be replaced or remade as necessary. Cracked or defective pipe, joints, fittings, and valves, discovered in consequence of this pressure test shall be removed and replaced with sound material, and the test shall be repeated until the test results are satisfactory. The water line shall be hydrostatically pressure tested at a pressure of 50 psi for one hour. The pressure shall be maintained during the entire testing period. The newly laid pipe shall be filled in accordance with the local water utility's procedures and/or policies.

Backfill placed prior to the tests shall be placed in accordance with the requirements of Specification 02270-"Trench Excavation and Backfilling for Extraction, Discharge and Utility Systems".

B. Testing of Backflow Preventer Device

The initial test of the device by a certified backflow preventer device tester shall be completed within 45 days of installation.

C. Testing Schedule

Pipeline jointed with rubber gaskets, mechanical or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill. Cement-mortar lined pipe may be filled with water as recommended by the manufacturer before being subjected to the pressure test.

3.4 DISINFECTION

Before acceptance of potable water operation, each unit of completed water line shall be disinfected. After pressure tests have been made, the unit to be disinfected shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. BW D personnel must be present during flushing of the new piping.

Chlorinating material shall be either liquid chlorine, calcium hypochlorite, or sodium hypochlorite, conforming to Part 2.4 of this section. The chlorinating material shall provide a dosage of not less than 200 mg/l (ppm) and shall be introduced into the water lines in an approved manner. Any residual pressure in the chlorinated piping shall be relieved prior to the 24-hour "cook" period. The main shall then be blown off to remove the chlorine solution and then pressure tested to at least 150 psi. The chlorinated solution from the main shall be used when pumping up the main with the testing equipment. No leakage will be permitted during the test.

All water supply piping shall be valved to insure that air products are not present during chlorination. In no case will the agent be introduced into the line in a dry solid state. The treated water shall be retained in the pipe long enough to destroy all non-spore-forming bacteria (a minimum of 24 hours). Except where a shorter period is approved, the retention time shall be at least 24 hours and shall produce not less than 25 ppm of free chlorine residual throughout the line at the end of the retention period.

All valves on the lines being disinfected shall be opened and closed several times during the contact period. The line shall then be flushed with clean water until the residual chlorine is reduced to less than 1.0 ppm. All purged chlorine shall be routed to the closest sanitary sewer. From several points in the unit, the Subcontractor shall take at least three water samples from different points, approved by the Contractor, in proper sterilized containers and perform a bacterial examination in accordance with the BWD requirements in Attachment 02660-1 of this specification

* * * END OF SECTION * * *

BETHPAGE WATER DISTRICT

25 ADAMS AVENUE, BETHPAGE, NY 11714-1304
 (516) 931-0093 FAX (516) 931-0068

COMMISSIONERS

SAL J. GRECO JR., CHAIRMAN
 GERARD F. DONLON SR., TREASURER
 WILLIAM J. ELLINGER, SECRETARY

RONALD J. KRUMHOLZ
 SUPERINTENDENT
 ANTHONY J. SABINO
 COUNSEL TO THE DISTRICT

 GENERAL REQUIREMENTS - FIRE & DOMESTIC SERVICES

10-22-99

The following information shall outline the general requirements of the Bethpage Water District and serve as a guideline for planning the layout, design and construction of the domestic water and fire services and may not be applicable for all situations. Specific approval must be obtained from the Water District for work different than described herein.

1. Bethpage Water District requires any section of existing main that becomes undermined to be removed and replaced following re-excavation of the disturbed supporting soil, then backfilling and compaction of the excavation area in 6-inch lifts up to existing grade. The limits of replacement shall include 8 feet into undisturbed soil on each side of the excavation.
2. Pipe shall be cement-lined ductile iron pipe. Up to 12" - Class 52, 16" - Class 51. Copper tubing shall be type-"K".
3. Mechanical Joint fittings shall be used on ductile-iron piping. All bends shall be rodded on both ends of the mechanical connection. Compact fittings will not be accepted. All mechanical joints shall use retainer glands.
4. The new section of main shall be properly chlorinated to at least 200 ppm (MG/l) for a minimum of 24 hours. Any residual pressure in the chlorinated piping shall be relieved prior to the 24-hour "cook" period. The main shall then be blown off to remove the chlorine solution and then pressure tested to at least 150 psi. The chlorinated solution from the main shall be used when pumping up the main with the testing equipment. No leakage will be permitted during the test.
5. Two consecutive negative bacteriological samples for each run of pipe are required, as per the Nassau county Department of Health. The district requires that the bacteriological samples be tested by H2M Labs, Inc., Melville, New York. A 3 hour wait period after final flushing is required prior to the first sample. Second sample shall be a minimum of 24 hours later.
6. H2M will be providing inspection services during the water main replacement. The owner or its general (prime) contractor will be billed for these services.
7. All fittings, bolts, threaded rods, retained glands, etc. shall be new material. No used materials will be allowed. Retainer glands shall be used on all mechanical connections.

8. The Water District shall perform the actual shutdown. The contractor shall not operate any distribution system valves.
9. The customers to be out of service during the shutdown period must be determined and then notified at least 24 hours in advance. The water main contractor shall coordinate with the Water District on this matter.
10. Water District personnel must be present when flushing the new piping.
11. Jetting will not be permitted as a means of trench compaction.
12. Where rodding is required (between mechanical bends, tees) "L" shaped eye bolts shall be used. "Duc-Lugs" will not be permitted.
13. A pre-qualified water main contractor shall be used for the work (see attached).

Specific requirements for runs of fire line and domestic services to the building shall be as follows:

1. The Bethpage Water District, as authorized under State Sanitary code Subpart 5-1, Section 31, is requiring new RPZ's on both the fire and domestic service lines. As with any backflow prevention submittal, plans (11" x 17" preferred) must be submitted to the Bethpage Water District for review, approval and forwarding to the Nassau County Department of Health (NCDH). The NCDH now requires a fee for each device. All water meters must be purchased from the District.
2. RPZ's and meters shall be installed outside in a vault located along the property fronting the public right-of-way. "Hot boxes" or the like will not be accepted.
3. Water piping shall be installed in undisturbed soil. No other utilities will occupy water trenches. Horizontal separation distances of 3'-0" shall be maintained between water piping and other utilities or structures, unless otherwise specified.
4. Water piping shall be installed in undisturbed soil. Sharing of trenches with other utilities will not be permitted.
5. Copper and ductile-iron piping entering the building foundation walls and/or floor slabs shall be wrapped with appropriately sized Arma-Flex at the pipe-concrete interface.

6. Ductile-iron piping stubs inside the building shall be left flanged at a minimum distance of 24 inches above the floor. The end shall be blind flanged and tapped for purposes of blowing off, testing and sampling. Rodding shall be provided continuously from the flange, through the slab, to the elbow. Being a vertical bend, the elbow shall be rodded back to the next fitting (or clamp).
7. On fire services utilizing a booster pump system, a pump suction control valve must be installed immediately following the fire pump.
8. The copper service shall be stubbed into the building with the full coil left protected outside the structure. The ends of the tubing shall be crimped and folded.
9. Domestic and fire services larger than 2" shall be by 3 valve cut in only. Installation of the runs of fire line and domestic services shall start at the street stubs (installed prior to the site piping) near the property line and continued to the building.
10. A 10-foot horizontal and 18-inch minimum vertical separation from the sanitary facilities must be maintained. In cases where the water piping is above the sanitary piping and a 10-foot horizontal separation is not practical, the 18-inch minimum vertical clearance must be observed and a length of ductile iron water main shall be centered at the point of crossing. In cases where the sanitary piping is above the water piping, the sanitary piping shall be pressure rated, equivalent to the water piping.
11. No services will be tapped off water mains located within easements.

Please understand that the Bethpage Water District is ultimately concerned with providing safe, quality drinking water to thousands of people in the Bethpage area. In these efforts, the district takes interest in seeing that quality water facility construction is maintained from the supply main to the building being served.

NEW SERVICE

Letter of Water Availability

Address a letter to: Board of Commissioners
~~State of New York~~

Requesting a letter regarding Water Availability at given address.

State in letter whether proposed building is for residential,
commercial or industrial use.

Also enclose a copy of a survey for said property with Section,
Block & Lot numbers.

After receiving Bethpage Water Dist. response to Water Availability:

1 copy - DOH 347

4 copies - Plot Plan

1 copy - Installation Plan showing plan notes & comments for
Nassau County.

1 copy - Plumbers Card

1 copy - Road Opening Permit #

Plumber hired must be Licensed in respective Township
and file a one (1) year \$9,000.00 "Performance Bond"
with the Bethpage Water District.

Payment for meter & appurtenance will be made by cash
or certified check. Aforementioned will not be ordered
until payment is received.

Physical Tap cannot be made until Plan has been reviewed
and approved by Nassau County Health Dept.

Meter and appurtenance larger than one inch (1") are
not stocked and waiting time is subject to receipt of same.

Normal Tapping schedule needs 1 week prior notice.

Water District will supply meter & appurtenances on the day of Tap.

The initial test of the device by a certified backflow preventer
device tester completed within 45 days of installation.

List of testers is available at the Water District.

FILE: NEW-SERV 11/92P

SECTION 02831

CHAIN LINK FENCE

PART I. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

Subcontractor shall verify clearances from all underground utilities before initiating any intrusive activities. The chain link fence system cannot be installed above any underground utilities. The proper offset distances must be maintained at all times. Utility identification shall consist of, at a minimum, contacting the Dig Safely NY One Call system, using hand-held magnetic locating devices, and reviewing existing drawings.

1.1 REFERENCES

Subcontractor shall determine submittals, with Contractor concurrence, and submit to the Contractor.

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM A 123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- ASTM A 153 (Reapproved 1987) Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- ASTM A 392 Specification for Zinc-Coated Steel Chain Link Fence Fabric
- ASTM A 500 Standard Specification for Cold-formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- ASTM A 525 Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
- ASTM A 569 Standard Specification for Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip Commercial Quality.
- ASTM A 570 Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.
- ASTM A 641 Specification for Zinc Coated (Galvanized) Carbon Steel Wire.

- ASTM A 824 Specification for Metallic-Coated Steel Marcellled Tension Wire for Use With Chain Link Fence.
- ASTM A 875 Specification Sheet Steel, Zinc-5 percent Aluminum Alloy Metallic-Coated by the Hot Dip Process.
- ASTM C 150 Specification for Portland Cement.
- ASTM F 1083 Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structure.
- ASTM F 567 Standard Practice for Installation of Chain-Link Fence
- ASTM F 626 Specification for Fence Fittings.
- ASTM F 669 Specification for Strength Requirements of metal Posts and Rails for Industrial Chain Link Fence.

NEW YORK STATE DEPARTMENT OF TRANSPORTATION

Section 710 – Fence and Guide Rail

1.2 SUBMITTALS

The Subcontractor shall submit the following to the Contractor:

- A. Product data in the form of manufacturer's technical data, specifications, and installation instructions for fence and gate posts, fabric, gates, and accessories.
- B. As-built drawings showing the installed location of fence, gates, each post, and details of post installation, extension arms, gate swing, hardware, and accessories.
- C. Certification of Grout Materials - The Subcontractor shall provide source name, location, and certification that grout materials used meet the specified requirements.

1.3 QUALITY ASSURANCE

Single-Source Responsibility - Obtain chain link fences and gates as complete units, including necessary erection accessories, fittings, and fastenings from a single source or manufacturer.

PART 2. PRODUCTS

2.1 FABRIC

A. Selvage

Fabric eight (8) feet high with 2-inch mesh shall be knuckled at bottom selvage and twisted at the top.

B. Steel Fabric

Comply with Chain Link fence Manufacturers Institute (CLFMI) Product Manual. Furnish one-piece fabric widths for fencing. Wire size includes zinc coming.

1. Size: 2-inch mesh, 9-gage (0.148-inch diameter) wire.
2. Galvanized steel finish.
3. ASTM A 392, Class 1, with not less than 1.2 ounces of zinc per square foot of uncoated wire surface.

C. Other Materials

The entire chain link fencing system (including all gates) shall be fit with fiberglass screening strips. Strips shall be 2-inches wide and installed vertically. Specifications on screening strips and available colors to be submitted to Contractor for approval prior to procurement and installation.

D. Concrete

The concrete mix design shall provide a minimum compressive strength of 4,000 psi at 28 days.

2.2 FRAMING

A. Strength requirements for posts and rails shall conform to ASTM F 669.

B. Pipe shall be straight, true to section, material, and sizes specified, and shall conform to the following weights per foot:

NPS in Outside Diameter		Type I	Type II
<u>inches</u>	<u>(OD) in inches</u>	<u>Steel</u>	<u>Steel</u>
2	2.375	3.65	3.12

C. Steel Framework, General: Posts, rails, braces, and gate frames.

1. Type I Pipe: Hot-dipped galvanized steel pipe conforming to ASTM F 1083, plain ends, standard weight (schedule 40) with not less than 1.8 ounces of zinc per square foot of surface area coated.
2. Type II Pipe: Manufactured from steel conforming to ASTM A 569 or A 446, grade D, cold formed, electric welded with minimum yield strength of 50,000 psi and triple coated with minimum 0.9 ounces of zinc per square foot after welding, a chromate conversion coating and a clear polymer overcoat. Corrosion protection on inside surfaces shall protect the metal from corrosion when subjected to the salt spray test of ASTM B 117 for 300 hours with the end point of 5 percent Red Rust.
3. C Section: Rolled form steel shapes conforming to ASTM F 669, group II produced from steel conforming to A 446, grade D, or ASTM A 570, grade 45, cold formed, hot-dip

galvanized with minimum 2.0 ounces of zinc per square foot of surface area conforming to ASTM A 123 or ASTM A 525; or 5 percent aluminum-mischmetal coated with minimum 1.0 ounces of coating per square foot of surface area each side conforming, to ASTM A 875.

4. H Section: Hot-rolled steel H shape with minimum yield strength of 45,000 psi conforming to ASTM F 669, group III and hot-dip galvanized with minimum 2.0 ounces of zinc per square foot of surface area conforming to ASTM A 123.
 5. Square Tubing: Fabricated from steel conforming to ASTM A 500, grade B and hot-dip galvanized with minimum 2.0 ounces of zinc per square foot of surface area conforming to ASTM A 123.
- D. End, corner, and pull post:
- 2.375-inch OD Type I or II steel pipe, 2-inch square galvanized steel tubing weighting 2.60 pounds per linear foot or 3.5-inch by 3.5-inch roll-formed sections weighing 4.85 pounds per linear foot.
- E. Line or intermediate posts:
- 1.90-inch OD Type I or II steel pipe, 1.875-inch by 1.625-inch C section weighting 2.28 pounds per linear foot, or 2.25-inch x 1.70-inch galvanized steel H section weighing 3.26 pounds per linear foot.
- F. Gate Posts: Furnish posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:
1. Personnel Access Gates (two gates) (single gate, four (4) feet wide leaf): 2.875-inch OD Type I or II steel pipe, 2.50-inch square galvanized steel tubing weighting 5.10 pounds per linear foot, or 3.5-inch x 3.5-inch roll-formed sections weighing 4.85 pounds per linear foot.
 2. Vehicle Access Gates (2 gates) (double gates at ten (10) feet wide each leaf): 4.00-inch OD Type I or II steel pipe.

2.3 FITTINGS AND ACCESSORIES

- A. All material will comply with ASTM F 626. Mill-finished aluminum or galvanized iron or steel, to suit manufacturer's standards. Unless specified otherwise, galvanize steel fence fittings and accessories in accordance with ASTM A 153, with zinc weights per Table 1.
- B. Tension wire will be made of 0.177-inch-diameter metallic-coated steel marcelled tension wire conforming to ASTM A 824 with finish to match fabric. The tension wire will have Type II Zinc Coated in Class 2, with a minimum coating weight of 1.20 ounces per square foot of uncoated wire surface.
- C. Tie wires will be made of 12-gage (0.106-inch diameter) galvanized steel with a minimum of 0.80 ounces per square foot of zinc coating of surface area in accordance with ASTM A 641, to match fabric core material.
- D. Post brace assembly will be constructed of manufacturer's standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height

of the fabric. Use same material as top rail for brace, and truss to line posts with 3/8-inch-diameter rod and adjustable tightening device. Provide manufacturers standard galvanized steel or cast iron or cast aluminum cap for each end.

- E. Post and line caps. Provide weather tight closure cap for each post. Provide line post caps with loop to receive tension wire or top rail.
- G. Tension or stretcher bars will be constructed of hot-dip galvanized steel with minimum length 2 inches less than full height of fabric, minimum cross section of 3/16-inch by 3/4-inch and minimum 1.2 ounces of zinc coating per square foot of surface area. Provide one bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into post.
- H. Three strands of barbed wire to be provided above top of chain link fence. Barb wire posts are to be vertically plumbed. Main wire diameter to be 12 BWG and barbed wire diameter to be 14 BWG. Barb spacing is to be 3 inches.

2.4 GATES

- A. Fabricate perimeter frames of gates from metal and finish to match fence framework. Assemble gate frames by welding. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories. Space frame members a maximum of eight (8) feet apart unless otherwise indicated.
 1. Provide same fabric as for fence unless otherwise indicated. Install fabric with tension bars and bands at vertical edges and at top and bottom edges.
 2. Install diagonal cross-bracing consisting of 3/8-inch diameter adjustable-length truss rods on gates to ensure frame rigidity without sag or twist.
 3. Keeper: Provide keeper for vehicle gates, which automatically engages gate leaf and holds it in open position until manually released.
 4. Gate Stops: Provide gate stops for double gates, consisting of mushroom-type flush plat with anchors, set in concrete, and designed to engage center drop rod or plunger bar. Include locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with single padlock.
 5. Padlocks: Provide ten (10) padlocks that are keyed alike.

2.5 BOLLARDS

Bollards shall be placed in accordance with the Contract Drawings. Bollards shall consist of 4-inch diameter schedule 40, carbon steel pipe that shall extend from the frost line to a minimum distance of 42-inches above grade. Each bollard shall be set in 12-inch diameter concrete that extends from 6-inches below the bottom of the bollard to 2-inches above the existing grade at the edge and crowned an additional 1-inch higher at the bollard (to shed water). Each bollard shall be completely filled with concrete to form a 1-inch high crown to shed water. Each bollard shall be primed and painted safety yellow in accordance with Specification Section 09900 – “Painting, General”.

2.6 GROUT

Grout shall consist of a mixture of 94 pounds of Type II Portland cement, 3 pounds of powdered bentonite, and a maximum 8 gallons of water. Bentonite shall be Wyoming-type sodium montmorillonite and shall meet the requirements of API Spec 13A, Section 5. Cement shall meet the requirements of ASTM C 150-86.

PART 3. EXECUTION

3.1 GENERAL

Install chain link fencing in locations as shown on the drawings and installed in compliance with ASTM F 567 and in accordance with this specification. No intrusive activities are to begin until all utilities have been identified and the proper clearances will be maintained from all fencing posts. All trenching shall be completed so fence posts are not seated on the trench. Do not begin installation and erection before clearing and grubbing is completed, unless otherwise permitted. Fence alignment shall be as shown on the Drawings and shall be approved by the Contractor prior to installation.

3.2 EXCAVATION

Drill or hand-excavate (using post-hole digger) holes for posts to a minimum of 10-inch diameter and spacing as described in this specification, in firm, undisturbed or compacted soil. Holes are to be advanced to a minimum depth of 42 inches below grade unless directed otherwise by the Contractor.

3.3 EQUIPMENT INSTALLATION

- A. Center and align posts in holes. Space maximum 10 feet on center (o.c.), unless otherwise indicated.
 - 1. Subcontractor shall grout all posts in place.
 - 2. Posts shall be centered in holes approximately 6 inches from the base of the excavation. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
 - 3. Unless otherwise indicated, extend concrete footings 2 inches above grade and trowel to a crown to shed water.
- B. Install braces so posts are plumb when diagonal rod is under proper tension.
- C. Install tension wire within 6 inches of bottom of fabric before stretching fabric and tie to each post with not less than same gage and type of wire. Pull wire taut, without sags. Fasten fabric to tension wire with 11-gage hog rings of same material and finish as fabric wire, spaced maximum 24 inches o.c.
- D. Install tension wire through post cap loops before stretching fabric and tie to each post cap with not less than same gage and type of wire. Pull wire taut, without sags. Fasten fabric to tension wire with 11-gage hog rings of same material and finish as fabric wire, spaced maximum 24 inches o.c.

- E. Leave approximately 2 inches between finish grade and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.
- F. Thread through or clamp to fabric 4 inches o.c., and secure to end, corner, pull, and gate posts with tension bands space not over 15 inches o.c.
- G. Use U-shaped tire wire of proper length to secure fabric firmly to posts and rails with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to person or clothing. Tie fabric to line posts 12 inches o.c. and to rails and braces 24 inches o.c.
- H. Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.
- I. Install gates plumb, level, and secure for fall opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.
- J. Install fiberglass screening strips along entire chain link fencing system (including all gates) in a vertical pattern.
- K. Install bollards in locations as shown on Contract Drawings. Bollards shall be completely filled with concrete and finished with a 1-inch high crown to shed water. Bollards shall be primed and painted safety yellow in accordance with Specification Section 09900 – “Painting, General”.
- L. The Subcontractor shall maintain and replace fencing and gates, as necessary, throughout the course of the project.

* * * END OF SECTION * * *

SECTION 02910

SITE RESTORATION AND REVEGETATION

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

The work covered by this Section consists of scarifying the seed bed, furnishing and placing pulverized agricultural limestone, commercial fertilizer, seed, mulching, and maintaining the seeded areas. The time of seeding may be selected by the Contractor who shall be responsible for securing a satisfactory stand of grass. Seeding shall be performed as soon as possible following the completion and approval of final grading, and the incorporation of soil supplements. If erosion occurs between the time of final grading and time of seeding, the Subcontractor shall replace the soil materials which were eroded away and regrade all eroded areas to reestablish the final grade. The Subcontractor shall also reapply and reincorporate soil supplements in the eroded areas. The Subcontractor may, with the approval of the Contractor, perform temporary seeding operations in order to maintain finished graded areas until optimum time for performing permanent seeding. All surfaces disturbed will be replaced in kind.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 01510	Mobilization/Demobilization
Section 02250	Earthwork: Excavation and Backfilling for Building Construction
Section 02270	Earthwork: Trench Excavation and Backfilling for Extraction, Discharge, and Utilities Systems
Section 02500	Pre-Engineered Building

1.2 SUBMITTALS

The Subcontractor shall submit the following to the Contractor:

- A. The Subcontractor shall submit a certificate of seed purity and germination analysis under the current Rules for Testing Seeds of the Association of Official Seed Analysts by the Commonwealth of Pennsylvania, Department of Agriculture, Bureau of Plant Industry and sample results of topsoil tested for fertilizer and soil nutrients for Contractor review prior to commencement of related Work.
- B. The Subcontractor shall submit information on the fiber mulch to be used with a brief description.

PART 2. PRODUCTS

2.1 GENERAL

The Subcontractor shall furnish all of the materials specified. Unless stated otherwise herein, all sampling and testing of these materials shall be at the direction of the Contractor and at the Subcontractors expense. All materials shall be furnished by suppliers who are approved by the Contractor. The Subcontractor shall replace all damaged grass areas in kind including private property (lawns).

2.2 GRASS SEED

A. Grass seed for the proposed access road/treatment plant berm area shall meet the requirements listed in this section and shall consist of the following mixture or approved equivalent:

Seed Type (Specific Name)	Acceptable Varieties	% Purity	% Total Germination	Seeding Rate (lb/acre as pure live seed)
Tall Fescue (Festuca arundinacea)	XY-31	97.25	92	20
Perennial Ryegrass (Lolium perenne)	Pennefine, Manhattan, Citation, or Regal	97.25	88	5

- B. Subject to the approval of the Contractor, the Subcontractor may add other grass seeds to the mixture to secure a cover crop, but no additional payment shall be made therefor. No seed shall contain any of the following noxious weed seeds: Canada thistle, field bindweed, Johnson grass, perennial peppergrass, perennial sowhistle, quackgrass, horse nettle, bedstraw, corn cockle, Brassica kaber, Brassica nigra, wild onion or wild garlic.
- C. All seed shall conform including the certification of purity and germination analysis to the seed law of New York State.
- D. Seed shall be furnished fully tagged and delivered by separate varieties, separately packaged or bagged. All premixed seed shall have an inspection tag, stamped, dated and signed by the Department of Agriculture Inspector, sewn into the inside top of each bag. No seed shall be utilized which has a mix date older than six months. No seed shall be used unless it has been inspected and sampled as described, or sampled by individual species and mixed on the project under the Contractor’s supervision.
- E. The seed furnished shall not be more than two years old and shall have been tested for germination not more than six months prior to seeding operations. A certificate of test results shall be furnished to the Contractor before approval for use of the seed is given.
- F. Seed which has become wet, moldy or otherwise damaged in transit or storage, shall not be accepted.

- G. All other grass seed shall be replaced in kind and meet the requirements listed in Parts 2.2.B., 2.2.C., 2.2.D., 2.2.E., and 2.2.F., of this section.

2.3 COMMERCIAL FERTILIZER

Commercial fertilizer shall be uniform in composition, free-flowing material suitable for application with approved standard equipment. The commercial fertilizer shall conform to applicable State of New York fertilizer laws and shall be delivered in bags or other convenient containers, each fully labeled and bearing the name, trademark, and warranty of the producer.

2.4 PULVERIZED AGRICULTURAL LIMESTONE

Pulverized agricultural limestone shall be agricultural ground limestone and shall contain not less than 89% carbonate equivalent (CaCO₃ equivalent) and be ground to such fineness that at least 95%, 60% and 50% by weight shall pass standard 20, 60, and 100 mesh sieves, respectively. If moisture content exceeds 5%, the maximum percentage of moisture shall be clearly indicated and the application rates shall be adjusted accordingly to reflect moisture content. Such limestone shall contain a minimum of 3% MgO or a supplemental amount of magnesium (Mg) shall be applied with limestone to achieve a total minimum equivalent application rate of 240 pounds/acre of Mg.

2.5 MULCHING MATERIALS

- A. All mulching materials shall be free from mature seed-bearing stalks or roots of prohibited or noxious weeds as defined in the Pennsylvania Seed Act of 1965, Act No. 187.
- B. Mulches for seeded areas shall be either hay or straw, or a combination of both.
- C. Hay or straw mulching material shall be well cured to less than 20% moisture by weight, and shall contain no stems of tobacco, soybeans, or other coarse or woody material. Asphaltic emulsion may be used if approved by the Contractor.
1. Hay – This shall consist of Timothy hay, mixed clover, or other approved native or forage grasses.
 2. Straw - Straw mulching material shall be either wheat or oat straw reasonably free of viable seed.
 3. Binder Materials:
 - a) Asphaltic Emulsion shall consist of refined petroleum asphalt emulsified in alkaline water without the use of clay, starch, or like deleterious substances and not more than 0.75% of saponified acids. It shall be of a fluid consistency suitable for spray application. It shall contain no petroleum solvents or other diluting acids known to be toxic to plant life.
 - b) Nonasphaltic emulsion consisting of natural vegetable gum blended with gelling and hardening agents (Az-Tac) as manufactured by SPEC International Inc., or approval equivalent.

2.6 WATER

Water shall be fresh and free from injurious amounts of oil, acid, alkali, salts, or other materials harmful to the growth of grass.

2.7 TREES

- A. A total of 100 pinus strobus (white pines) shall be planted at the approximate locations shown on this contract drawing. These eastern white pine trees are selected due to their rapid growth and ability to provide a visual and noise barrier when fully grown. The trees will be 10'-12' in height with 3" minimum average diameter and spaced approximately 10 feet on center. Peat moss and fertilizers consisting of nitrate of soda and holly tone acid will be used during planting. Approximately 2 cubic feet of peat moss, 1.25 lbs. of nitrate of soda, and 2.5 lbs. of Holly Tone acid fertilizer will be used for each tree planted.
- B. Trees will be watered twice a week for 12 weeks after planting. All newly planted trees will be guaranteed for one year. Within the one year guarantee period, the subcontractor shall remove and replace trees where they are in an unhealthy or badly impaired condition in the opinion of the Contractor.

2.8 BLACKTOP (ROADWAYS)

All roadway material that is excavated and/or damaged shall be restored in kind.

2.9 CONCRETE

All curb and sidewalk sections that are excavated and/or damaged shall be restored in kind.

PART 3. EXECUTION

3.1 REPLACEMENT IN KIND

Execution for all replacements of products/services will be in kind.

3.2 PREPARATION OF SEED BED

On all surfaces to be seeded, sticks, rocks, weeds, roots, or other objectionable material appearing on the surface which, in the opinion of the Contractor will be detrimental to obtaining a satisfactory stand of vegetation, shall be removed by the Subcontractor. The finished surface of soil shall be maintained in a true and even condition during the sowing of the seed.

3.3 COMMERCIAL FERTILIZER

- A. Commercial fertilizer shall be applied at the rates indicated by the test results.
- B. No more than 40 pounds of nitrogen, 80 pounds of phosphate and 80 pounds of potash, per acre, shall be placed in the hydroseeder with the seed. Any remaining amount of fertilizer required shall be applied separately. Eighty (80) pounds, per acre, of the nitrogen requirement shall be from a slow-release source such as Ureaform.

3.4 HYDROSEEDING

The seeds, fertilizer and any soil amendments shall be combined together prior to application. The application rate shall be in accordance with the project specifications.

3.5 MULCHING

- A. After seeding has been completed, mulch shall be uniformly applied over the entire surface at an average rate of 2-1/2 tons (dry weight) per acre and spread to a uniform depth. The mulch shall be in a moist condition at the time of placement or shall be sprinkled immediately after placing. While moist, the material shall be anchored in the soil by an approved method to secure the material firmly in the ground to form a soil-binding mulch and prevent loss or bunching by wind. Mulch material cut into lengths less than 6 inches shall not be acceptable.
- B. Approved asphaltic emulsion at the rate of 150 gallons per acre or non-asphaltic emulsion at the manufacturer's recommended rate may be used as an alternative tie down, provided it is applied uniformly over and through the mulch. It shall be non-toxic to plants and seeds. A mechanical blower may be used to apply mulch if it is specifically designed and approved for that purpose.

3.6 MAINTENANCE

- A. The Subcontractor shall maintain the completed area in accordance with the requirements of this section, and be responsible for regrading to final contours until all work under the Contract has been completed and has been accepted by the Contractor. The maintenance shall consist of refilling rain-washed gullies, with same or better type of soils that were eroded, reseeding, reapplying soil supplements and mulch, as directed by the Contractor. Regrading is incidental to revegetation.
- B. Within the one year remedy guarantee period, the Subcontractor shall repair eroded areas, reapply soil supplements, reseed and mulch in accordance with these Specifications any areas where satisfactory growth has not been obtained, in the opinion of the Contractor.

* * * END OF SECTION * * *

SECTION 03200
CONCRETE REINFORCEMENT

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the Contract Document includes, but is not limited to, the following:

Section 03300 Cast-in-Place Structural Concrete

The publications listed below form a part of this specification section to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 318/318R	(2002) Building Code Requirements for Structural Concrete (ACI 318-00) and Commentary (ACI 318R-02)
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 184/A 184M	(2001) Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A 185	(2002) Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A 615/A 615M, Rev. B	(2004) Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement - AASTO No. M31
ASTM A 706/A 706M, Rev. B	(2004) Standard Specification for Low Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4	(1998) Structural Welding Code - Reinforcing Steel
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CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI DA-4

(1990) Manual of Standard Practice, 25th Edition

1.2 SUBMITTALS

Prior to execution of the work, the Subcontractor shall submit certified copies of mill reports attesting that the reinforcing steel furnished has been produced in the United States, contains no less than 25 percent recycled scrap steel, and meets the requirements specified herein. Five copies shall be provided for each submittal.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, the supplier shall carefully pack and brace all material either within shipping containers or on the carrier.
- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.
- C. Reinforcing materials shall be stored off of the ground and shall be protected from weather elements.

PART 2. PRODUCTS

2.1 FABRICATED BAR MATS

Fabricated bar mats shall conform to ASTM A 184/A 184M.

2.2 REINFORCING STEEL

Reinforcing steel shall conform to ASTM A 615/A 615M or ASTM A 706/A 706M, grades and sizes as indicated.

2.3 WELDED WIRE FABRIC

Welded wire fabric shall conform to ASTM A 185.

2.4 WIRE TIES

Wire ties shall be 16 gauge or heavier black annealed steel wire.

PART 3. EXECUTION

3.1 REINFORCEMENT

Reinforcement shall be fabricated to shapes and dimensions shown on the Contract Drawings and shall conform to the requirements of ACI 318/318R. Reinforcement shall be cold bent unless otherwise authorized.

Bending may be accomplished in the field or at the mill. Bars shall not be bent after embedment in concrete. All exposed ends of vertical concrete reinforcement bars that pose a danger to life safety shall be covered/capped by the Subcontractor in accordance with the approved Site-Specific Health and Safety Plan and all applicable codes and standards. Wire tie ends shall face away from the forms.

A. Placement

Reinforcement shall be free from loose rust and scale, dirt, oil, or other deleterious coating that could reduce bond with the concrete. Reinforcement shall be placed in accordance with ACI 381/318R at locations shown plus or minus one bar diameter. Reinforcement shall not be continuous through expansion joints and shall be as indicated through construction or contraction joints. Concrete coverage shall be as indicated or as required by ACI 318/318R.

B. Splicing

Splices of reinforcement shall conform to ACI 318/318R and shall be made only as required or indicated. Splicing shall be performed by lapping or by mechanical or welded butt connection; except that lap splices shall not be used for bars larger than No. 11 unless otherwise indicated. Welding shall conform to AWS D1.4. Welded butt splices shall be full penetration butt welds. Lapped bars shall be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete. Lapped bars shall not be spaced farther apart than one-fifth the required length of lap or 6 inches. Mechanical butt splices shall be in accordance with the recommendation of the manufacturer of the mechanical splicing device. Butt splices shall develop 125 percent of the specified minimum yield tensile strength of the spliced bars or of the smaller bar in transition splices. Bars shall be flame dried before butt splicing. Adequate jigs and clamps or other devices shall be provided to support, align, and hold the longitudinal centerline of the bars to be butt spliced in a straight line.

C. Welded Wire Fabric

The welded wire fabric shall be installed in locations as shown on the Contract Drawings.

3.2 DOWEL INSTALLATION

Dowels shall be installed in slabs on grade at locations indicated and at right angles to joint being doweled. Dowels shall be accurately positioned and aligned parallel to the finished concrete surface before concrete placement. Dowels shall be rigidly supported during concrete placement.

* * * END OF SECTION * * *

SECTION 03300

CAST-IN-PLACE STRUCTURAL CONCRETE

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

The cast-in-place structural concrete for the pre-engineered building concrete foundation, grade beam, and slab shall be placed within the limits as shown on the Contract Drawings and in accordance with ACI 318/318R. These specifications shall also apply to the concrete pads poured for machinery and equipment support, as indicated on Contract Drawing A-1.

The finished floor elevation of the building shall be 87'-00". The finished elevation of the Office/Control Room, located along the western wall, shall be 4-inches higher than the finished floor elevation.

Concrete ramps shall be poured at the doorway that leads to the Control Room.

The perimeter of the building shall have a concrete grade beam 6 inches higher than the finished floor elevation. Piers for the building columns shall be integrally poured concrete with the grade beam. The grade beam shall be cut out at each doorway.

The vapor barrier underneath the floor slab wall shall be constructed so that there are no gaps in materials along the grade beam. All gaps and seams must be sealed with an approved sealant.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 02500	Pre-Engineered Building
Section 02250	Earthwork: Excavation and Backfilling for Building Construction
Section 03200	Concrete Reinforcement

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 318/318R	(1999) Building Code Requirements for Structural Concrete and Commentary
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AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 182 (1991; r 1996) Burlap cloth Made From Jute or Kenaf

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM C 94/C94, Rev. A (2004) Standard Specification for Ready-Mixed Concrete
- ASTM C 143/C143 M (2003) Standard Test Method for Slump of Hydraulic Cement Concrete
- ASTM C 171 (2003) Standard Specification for Sheet Materials for Curing Concrete
- ASTM C 231 (2004) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- ASTM C 309 (2003) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- ASTM C 494/C494 M (2004) Standard Specification for Chemical Admixtures for Concrete
- ASTM C 1017/C1017 M (1998) Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
- ASTM C 1064/C 1064M (1999) Latex Agents for Bonding Fresh to Hardened Concrete
- ASTM D 1751 (2004) Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
- ASTM D 1752, Rev. A (2004) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction

CORPS OF ENGINEERS (COE)

- COE CRD-C 540 (2001) Standard Specification for Nonbituminous Inserts for Contraction Joints in Portland Cement Concrete Airfield Pavements, Sawable Type
- COE CRD-C 572 (1974) Corps of Engineers Specifications for Polyvinylchloride Waterstop

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

- NIST HB 44 (1977) NIST Handbook 44: Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA CPMB 100	(1996) Concrete Plant Standards
NRMCA TMMB 100	(1994) Truck Mixer Agitator and Front Discharge Concrete Carrier Standards
NRMCA QC 3	(1984) Quality Control Manual: Section 3, Plant Certifications Checklist: Certification of Ready Mixed Concrete Production Facilities

1.2 SUBMITTALS

The Subcontractor shall submit the following to the Contractor:

- A. The mix design studies for a 4,000 pounds per square inch (psi) concrete along with a statement giving the maximum nominal coarse aggregate size and the proportions of each ingredient that will be used to make the concrete at least 14 days prior to execution of the work. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from an independent commercial testing laboratory, approved by the Contractor, showing that mixture design studies have been made with materials proposed for the project and that the proportions selected will produce concrete with a minimum compressive strength of 4,000 psi at 28 days.
- B. The Subcontractor shall submit to the Contractor test results for air entrainment.
- C. The Subcontractor shall submit to the Contractor, concrete test results indicating the 7-day and 28-day compressive strengths.

PART 2. PRODUCTS

2.1 CURING MATERIALS

A. Impervious-Sheet

Impervious-sheet materials shall conform to ASTM C 171, type optional, with the exception that polyethylene sheet shall not be used.

B. Membrane-Forming Curing Compound

Membrane-forming curing compound shall conform to ASTM C 309, except that only a styrene acrylate or chlorinated rubber compound meeting Class B requirements shall be used for surfaces, as shown on Contract Drawing A-4, that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, waterproofing, or flooring specified.

C. Concrete Finish

Heavy duty concrete finish shall be Sherwin Williams brand, product name Armorseal Floor-Thane™ Cru Polyester Urethane or a Contractor approved equivalent. A minimum of two coats shall be applied and be performed in accordance with the manufacturer's requirements.

2.2 JOINT MATERIALS

A. Joint Fillers, Sealers, and Waterstops

Expansion joint fillers shall be preformed materials conforming to ASTM D 1751 and ASTM D 1752.

B. Contraction Joints in Slabs

Sawable type contraction joint inserts shall conform to COE CRD-C 540. Nonsawable joint inserts shall have sufficient stiffness to permit placement in plastic concrete without undue deviation from a straight line and shall conform to the physical requirements of COE CRD-C 540. Plastic inserts shall be polyvinyl chloride conforming to the material requirements of COE CRD-C 572.

2.3 CONCRETE

The cast-in-place structural concrete shall conform to the mix design as proposed by the Subcontractor. The concrete mix design shall provide a minimum compressive strength of 4,000 psi at 28 days.

2.4 ADDITIVES

Concrete may contain admixtures other than air entraining agents, such as water reducers, superplasticizers, or set retarding agents to provide special properties to the concrete, if specified or approved.

2.5 VAULT DOORS

Subcontractor shall install aluminum, standard duty, single leaf cast into concrete slab vault doors by manufacturer PA Insert Corp., or Contractor approved equivalent. Subcontractor shall install vault doors that match a Contractor approved equivalent. Subcontractor shall contact manufacturer for installation information and instructions.

PART 3. EXECUTION

3.1 PREPARATION FOR PLACING

- A. Before commencing concrete placement, the following shall be performed. Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water. Forms shall be in place, cleaned, coated, and adequately supported. Reinforcing steel shall be in place, cleaned, tied, and adequately supported, in accordance with Specification Section 03200 - "Concrete Reinforcement." Transporting and conveying equipment shall be in-place, ready for use, clean, and free of hardened concrete and foreign material. Equipment for consolidating concrete shall be at the placing site and in proper working order. Equipment and material for curing and for protecting concrete from weather or mechanical damage shall be at the site, in proper working condition and in sufficient amount for the entire placement.

1. Concrete on Earth Foundations

Earth surfaces upon which concrete is to be placed shall be clean, damp, and free from debris, frost, ice, and standing or running water. Prior to placement of concrete, the foundation shall be well drained and shall be satisfactorily graded and uniformly compacted.

2. Previously Placed Concrete

Concrete surfaces to which additional concrete is to be bonded shall be prepared for receiving the next horizontal lift by washing the entire surface.

3.2 CONCRETE PRODUCTION

Concrete shall be delivered on-site or shall be furnished from a ready-mixed concrete plant. Ready-mixed concrete shall be batched, mixed, and transported in accordance with ASTM C 94, except as otherwise specified. Truck mixers, agitators, and nonagitating transporting units shall comply with NRMCA TMMB 100. Ready-mix plant equipment and facilities shall be certified in accordance with NRMCA QC 3. Approved batch tickets shall be furnished for each load of ready-mixed concrete.

3.3 TRANSPORTING CONCRETE TO PROJECT SITE

Concrete shall be transported to the site in truck mixers.

3.4 PLACING CONCRETE

A. Mixed concrete shall be discharged within 1-1/2 hours or before the mixer drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates. When the concrete temperature exceeds 85 degrees F, the time shall be reduced to 45 minutes. Concrete shall be placed within one minute after it has been discharged from the transporting unit. Concrete shall be handled from mixer or transporting unit to forms in a continuous manner until the approved unit of operation is completed. Adequate scaffolding, ramps and walkways shall be provided so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Subcontractor prevent proper consolidation, finishing and curing. Sufficient placing capacity shall be provided so that concrete can be kept free of cold joints.

B. Depositing Concrete

Concrete shall be deposited as close as possible to its final position in the forms. Concrete shall be deposited continuously in one layer. Fresh concrete shall not be deposited on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within the section.

C. Consolidation

Immediately after placing, each layer of concrete shall be consolidated by internal vibrators. The vibrators shall at all times be adequate in effectiveness and number to properly consolidate the concrete; a spare vibrator shall be kept at the job site during all concrete placing operations. The vibrators shall have a frequency of not less than 10,000 vibrations per minutes, amplitude of at least 0.025 inch, and the head diameter shall be appropriate for the structural member and the concrete mixture being placed. Vibrators shall be inserted vertically at uniform spacing over the area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator so that the are being vibrated will overlap the adjacent just-vibrated area by a reasonable amount. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding layer if there is such. Vibrator shall be held stationary until the concrete is consolidated and then vertically withdrawn slowly while operating. Form vibrators shall not be used unless specifically approved by the Contractor and unless forms are constructed to withstand their use. Vibrators shall not be used to move concrete within the forms.

D. Cold Weather Requirements

Special protection measures shall be used if freezing temperatures are anticipated before the expiration of the specified curing period. The ambient temperature of the air where concrete is to be placed and the temperature of surfaces to receive concrete shall be not less than 40 degrees F. The temperature of the concrete when placed shall be not less than 50 degrees F or more than 75 degrees F. Heating of the mixing water or aggregates will be required to regulate the concrete placing temperature. Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals or other materials shall not be incorporated in the concrete to prevent freezing. Upon written approval, an accelerating admixture conforming to ASTM C 494, Type C or E may be used, provided it contains no calcium chloride. Calcium chloride shall not be used.

E. Hot Weather Requirements

When the ambient temperature during concrete placing is expected to exceed 85 degrees F, the concrete shall be placed and finished with procedures previously submitted and as specified herein. The concrete temperature at time of delivery to the forms shall not exceed the temperature shown in the table below when measured in accordance with ASTM C 1064/C 1064 M. Cooling of the mixing water or aggregates or placing concrete in the cooler part of the day may be required to obtain an adequate placing temperature. A retarder may be used, as approved, to facilitate placing and finishing. Steel forms and reinforcements shall be cooled as approved prior to concrete placement when steel temperatures are greater than 120 degrees F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature.

Maximum Allowable Concrete Placing Temperature

Relative Humidity, Percent, During Time of Concrete Placement	Maximum Allowable Concrete Temperature Degrees
Greater than 60	90 °F
40-60	85 °F
Less than 40	80 °F

F. Contraction Joints in Slabs on Grade

Contraction joints shall be located and detailed as shown on the Contract Drawings S-1 and S-2. Contraction joints shall be produced by forming a weakened plane in the concrete slab by use of snap-out plastic joint forming inserts or sawing a continuous slot with a concrete saw. Regardless of method used to produce the weakened plane, the size of the contraction joints shall be as shown on Contract Drawing S-2. For saw-cut joints, cutting shall be timed properly with the set of the concrete. Cutting shall be started as soon as the concrete has hardened sufficiently to prevent raveling of the edges of the saw cut. Cutting shall be completed before shrinkage stresses become sufficient to produce cracking. Reservoir for joint sealant shall be formed as previously specified.

3.5 FINISHING FORMED SURFACES

After concrete placement is complete, smooth finish shall be applied to the entire concrete slab, except on ramps. A non-slip broom finish shall be applied to all ramps. A mortar mix consisting of one part Portland cement and two parts well-graded sand passing a No. 30 sieve, with water added to give the consistency of thick paint, shall be used. After the surface has been thoroughly wetted and allowed to approach surface dryness, the mortar shall be vigorously applied to the area by clean burlap pads or by cork or wood floating, to completely fill all surface voids. Excess grout shall be scraped off with a trowel. As soon as it can be accomplished without pulling the mortar from the voids, the area shall be rubbed with burlap pads having on their surface the same sand-cement mix specified above but without any mixing water, until all of the visible grout film is removed. The burlap pads used for this operation shall be stretched tightly around a board to prevent dishing the mortar in the voids. The finish of any area shall be completed in the same day, and the limits of a finished area shall be made at natural breaks in the surface. The surface shall be continuously moisture cured for 48 hours commencing immediately after finishing operations in each area.

3.6 CURING AND PROTECTION

- A. Concrete shall be maintained in a moist condition and shall be protected against rapid temperature change, mechanical injury, and injury from rain or flowing water, for a curing period of not less than 10 days. Concrete shall be maintained in a moist condition at temperatures above 50 and below 90 degrees F throughout the specified curing period. Concrete shall be protected from a temperature change greater than 5 degrees F per hour and from rapid drying for the first 24 hours following the removal of temperature protection. Curing activities shall begin as soon as free water has disappeared from the concrete surface after placing and finishing. Curing shall be moist curing accomplished by the following method. Surfaces shall be covered with a double layer of burlap, wetted before placing, and overlapped at least 6 inches. Burlap shall be kept continually wet and in intimate contact with the surface. Burlap shall be kept covered with a polyethylene sheeting at least 0.1 mm, 4 mils thick. All traffic shall be kept from the floor during the curing period and heavy traffic shall be kept off until 28-day age.
- B. The Subcontractor shall install heavy duty concrete finish as defined in Part 2.1 of this section per manufacturer's installation instructions, to all flooring surfaces within the treatment building that will not be covered in vinyl tile.

3.7 REMOVAL OF CONCRETE FORMS

The Subcontractor is responsible for removal and disposal off-site of all concrete forms. The concrete forms shall be removed 48 hours after the concrete was poured.

3.8 TESTING DURING CONCRETE POUR

- A. Each truckload of concrete shall be tested for total air and slump in the presence of the Contractor. The Subcontractor shall test for air entrainment, which must be between 4 and 7 percent total air. Specified air content shall be attained at point of placement into the forms. Air content for normal weight concrete shall be determined in accordance with ASTM C 231. Concrete not passing testing requirements shall be rejected and replaced at no cost to the Client.

- B. Slump of the concrete, as delivered to the point of placement into the forms, shall be within the limits shown in Table 03300-1. Slump shall be determined by the Subcontractor in accordance with ASTM C 143. Concrete not passing testing requirements shall be rejected and replaced at no cost to the Contractor.

TABLE 03300-1: Limits for Slump

<u>Structural Element</u>	<u>Slump</u>	
	<u>Minimum</u>	<u>Maximum</u>
Walls, columns and beams	2 inches	4 inches
Foundation walls, substructure walls, footings, slabs	1 inch	3 inches
Any structural concrete approved for placement by pumping:		
At pump	2 inches	6 inches
At discharge of line	1 inch	4 inches

- C. If a plasticizing admixture conforming to ASTM C 1017 is used, concrete shall have a slump of 2 to 4 inches before the admixture is added and a maximum slump of 8 inches at the point of delivery after the admixture is added.
- D. The temperature of the concrete as delivered shall not exceed 90 degrees Fahrenheit (F). When the ambient temperature during placing is 40 degrees F or less, the temperature of the concrete as delivered shall be between 55 and 75 degrees F.
- E. The Subcontractor shall mold four concrete cylinders for compressive strength testing for every 50 cubic yards of concrete or a minimum of four concrete cylinders per day. The Subcontractor shall provide concrete test results to the Contractor showing the 7-day and 28-day compressive strengths.

* * * END OF SECTION * * *

SECTION 04200

CONCRETE UNIT MASONRY

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Specifications and Drawings.

This work shall consist of installing the concrete unit masonry as shown on the Drawings and as specified in this section.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 03200	Concrete Reinforcement
Section 03300	Cast-In-Place Structural Concrete

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN CONCRETE INSTITUTE/AMERICAN SOCIETY OF CIVIL ENGINEERS (ACI/ASCE)

ACI 530.1-88/ASCE 6-88	Specifications for Masonry Structures
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A82-90a	Specification for Steel Wire, Plain, for Concrete Reinforcement
ASTM A153-82	Specification for Zinc-Coating (Hot Dip) on Iron and Steel Hardware
ASTM A615/615M-93	Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement
ASTM C90-93	Standard Specification for Load-Bearing Concrete Masonry Units
ASTM C270-92a	Standard Specification for Mortar for Unit Masonry
ASTM C476-91	Standard Specification for Grout for Masonry
ASTM D421	Grain Size Analysis

1.2 SUBMITTALS

- A. The Subcontractor shall design and detail the masonry wall shown on the Contract Drawings and submit to Contractor for review and acceptance.
- B. The Subcontractor shall submit five copies of the following documents to the Contractor:
 - 1. Masonry unit certification to ASTM C90
 - 2. Mortar material certification to ASTM C270.
 - 3. Grout material certification to ASTM C476.
 - 4. Masonry reinforcement certification to ASTM A82, A153, and A615.
 - 5. Written statement of proposed cold weather construction procedures.
- C. The Subcontractor shall provide a quality assurance program which will ensure that the materials and services provided will properly reflect the requirements of this contract. Manufacturing, processing, testing and inspection operations affecting the material and installation will be subject to quality assurance surveillance by the Contractor. Testing required to document submittals and certify product compliance with the requirements of this section shall be performed by accepted laboratories under the Subcontractor's responsibility.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. All masonry materials shall be packaged, shipped, delivered, handled and stored to prevent the intrusion of foreign matter and the damage of materials by water, breakage, chipping or staining. Masonry units shall bear the date of manufacture, and trademark of the manufacturer or shall otherwise be readily identified. Cement, lime and other manufactured materials shall be delivered in unbroken containers marked with the manufacturer's name and brand, and shall be stored in their original containers in a manner that will permit identification when ready for use.
- B. Concrete masonry units shall be stacked in piles clear of the earth and shall be protected on top against the weather with an appropriate cover. Blocks which will be stored for a long period of time shall be stacked on their sides and the block courses separated vertically with 1 x 2 inch wood strips.
- C. Sand shall be stored and protected from dirt or foreign matter. Material subject to deterioration, such as cement and lime, shall be stored in weathertight sheds with elevated floors at least 12 inches above grade. All packages showing evidence of water or other damage shall be rejected, removed from the job site and replaced by the Subcontractor.
- D. Anchors, ties, and masonry reinforcement shall be kept free of rust. Steel reinforcing bars or rods shall be free of loose scale and rust.

PART 2. PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. Hollow and solid load-bearing concrete masonry units shall conform to ASTM C90, Type 1, normal weight with a standard size of 8 inches in height, 8 inches in width and 16 inches in length.
- B. The minimum required compressive strength of concrete masonry shall be determined in accordance with the provisions of ACI 530.1/ASCE 6-88.

2.2 MORTAR AND GROUT

- A. Mortar for all concrete masonry units shall comply with the property specifications for Type S mortar of ASTM C270.
- B. Grout for all concrete masonry units shall comply with the material requirements of ASTM C476.
- C. Sand shall consist of clean, hard, sharp durable particles, and shall not contain a total of more than five percent by volume of loam, mica, clay, or other deleterious substances. Sand shall be classified SW as per the Unified Soil Classification System. As part of the mortar material and grout material certifications, grain size analysis of the sand shall be submitted for approval by the Contractor.
- D. Water shall be free from any injurious amounts of acid, alkali, salts, oil, sediment or organic matter.

2.3 MASONRY REINFORCEMENT

- A. Joint reinforcement shall be factory-fabricated from steel wire conforming to ASTM A 82, welded construction. Tack welding will not be acceptable in reinforcement used for wall ties. Wire shall have zinc coating conforming to ASTM A 153, class B-2. All wires shall be a minimum of 9-gauge. Joint reinforcement shall provide a minimum of 5/8 inch cover from either face. Joint reinforcement shall be provided with factory-formed corners and intersections.
- B. Vertical reinforcement shall be grade 60 deformed bars conforming to ASTM A615.
- C. Anchors and ties shall be fabricated without drips or crimps and shall be zinc-coated in accordance with ASTM A 153, Class B-2. Steel wire used for anchors and ties shall be fabricated from steel wire conforming to ASTM A 82. Anchors and ties shall be sized to provide a minimum of 5/8 inch mortar cover from either face.

PART 3. EXECUTION

3.1 INSTALLATION

A. Concrete Masonry Units

Concrete masonry units shall be installed by the Subcontractor in accordance with ACI 530.1/ASCE 6-88 and as specified herein.

1. Masonry units shall be laid plumb, true to line, with level courses accurately spaced. Bond pattern shall be kept plumb throughout. Corners and reveals shall be plumb and true. Vertical joints shall be shoved tight. Each unit shall be adjusted to final position while mortar is still soft and plastic. Any unit that is disturbed after mortar has stiffened shall be removed and re-laid with fresh mortar.
2. All masonry units shall be laid in running bond unless otherwise specified on the Drawings so that vertical joints between units will be located over the center of the units in the next course below and in alignment from bottom to top of wall.
3. Hollow load-bearing concrete masonry units shall be fully bedded in mortar under both face shells and webs under starting courses on slabs, lintels, and beams, and where cores are to be filled with grout, mortar or concrete fill.
4. Small-mesh wire fabric or expanded metal shall be embedded in mortar below cores of hollow concrete masonry units receiving mortar, grout, or concrete fill. Hollow masonry units in walls or partitions supporting plumbing, heating, or other mechanical fixtures, voids at door and window jambs, and other spaces requiring fill shall be filled solid with grout, mortar, or concrete fill.
5. Cores under lintel bearings on each side of openings shall be filled with grout, mortar, or concrete fill for full height of openings. One core of two core units and two cores of three core units shall be filled each side of jambs when lintel bearings are 8 inches.
6. When concrete masonry units are to be laid in extremely hot weather, drying wind conditions, or under daily hot sun exposure appropriate measures must be taken to shelter the work and preserve the necessary moisture of the mortar. If curing in extremely hot weather is required, it shall be done by dampening the concrete masonry surfaces with a light fog spray so that water does not run down the surfaces.
7. When ambient temperature or mean daily air temperature falls below 40 degrees F, a written statement of proposed cold weather construction procedures shall be submitted for approval.
8. Chases and raked-out joints shall be kept free of mortar or other debris. The sizes of any two adjacent units shall be within permitted tolerances so that the difference between the vertical faces of such units shall not exceed 1/8 inch in exposed-to-view or painted walls and partitions. Units in exposed-to-view or painted walls and partitions shall be free of chipped edges or other imperfections detracting from the appearance of the finished work.
9. Anchorage to abutting walls and the columns shall be provided in areas where applicable. Hollow masonry units within vertical planes of the anchors shall be filled with grout for the full height of walls or partitions.

B. Cutting and Fitting

1. Cutting and fitting of all concrete masonry units shall be performed by the Subcontractor.
2. Concrete masonry units shall either be dry or wet-cut with power masonry saws. Wet-cut units shall be dried before placing to the same surface-dry appearance as uncut units being laid in the wall.
3. Openings shall be carefully cut, formed or otherwise neatly made for recessed items and for electrical, plumbing, or other mechanical installations so that wall plates and cover plates required by the installation will completely conceal the openings and will have bottoms in alignment with lower edge of masonry joints. Webs of hollow masonry units required shall be cut for the installation.

C. Embedded Items

1. Anchors, ties, wall plugs, accessories, flashings, masonry reinforcement, lintels, control joint materials, pipe sleeves, and other items requiring embedment shall be embedded as the masonry work progresses.
2. Anchors, ties, and masonry reinforcement shall be fully embedded in mortar. Hollow masonry units receiving anchor bolts shall be filled solidly with grout. Control joints shall be kept free of mortar.

D. Unfinished Work and Protection

1. For hollow load-bearing concrete masonry units, unfinished work shall be stepped back for joining with new work. Tothing may be resorted to only when specifically authorized by the Contractor. Loose mortar shall be removed and the exposed joint shall be thoroughly cleaned before laying out new work.
2. Surfaces of concrete masonry units not being worked on shall be properly protected at all times. At the end of each workday, and when rain is imminent, the tops of all exposed concrete masonry units shall be covered with a strong non-staining waterproof membrane, well secured in place in a manner that will prevent moisture from accumulating within the unfinished wall. Adequate provisions shall be made during construction to prevent damage by wind.

E. Mortar and Jointing

1. Mortar for all concrete masonry units shall be thoroughly mixed and only in quantities needed for immediate use.
2. Mortar shall be placed in final position within two hours after mixing. Mortar not used within this time interval shall be discarded. Mortar that has lost workability within the above time interval because of evaporation of moisture from the mortar shall be retempered to restore its workability, but shall not be used beyond the 2 hour limitation. Harsh, non-plastic mortar should not be retempered or used.
3. Only machine-mixing shall be used, except for small jobs when hand mixing is specifically authorized by the Contractor. At least three and a maximum of five minutes of mixing time shall elapse after all of the material has been placed in the mixer before any mortar is

discharged. Water shall be used in the quantity necessary to give proper workability, and in accordance with accepted mix design. Mix design should be included with the mortar material certification to be submitted by the Subcontractor.

4. Joints in exposed-to-view or painted hollow load-bearing concrete masonry unit walls and partitions, except control joints, joints to be pointed or caulked and sealed, shall be tooled slightly concave with the mortar thoroughly compacted and pressed against the edges of the units. Tooling shall be done when the mortar is thumbprint hard. The tooled joints shall be finished to uniformly straight and true lines and surfaces, smooth, and free of tool marks.
5. Horizontal joints between the top of load-bearing concrete masonry walls and the underside of concrete slabs or beams shall be filled with mortar unless otherwise indicated on the drawings. Joint widths in hollow concrete masonry units shall be approximately 3/8 inch. Joints in solid concrete masonry units shall be tight horizontally and vertically.

F. Masonry Reinforcement and Accessories

1. Reinforcement, anchors and ties shall be placed in accordance with this section.
2. Tolerances for placing reinforcement shall comply with ACI 530.1/ASCE 6-88.
3. Horizontal joint reinforcement shall first receive full mortar bedding prior to embedding reinforcement so as to obtain proper bonding, and covered with an additional spread of mortar as necessary to insure full embedment.
4. Vertical masonry reinforcement shall be continuous and rigidly secured at top and bottom and at intervals as necessary to hold in proper position.
5. Splices in vertical bars shall be made only at such points and in such manner as to maintain the structural strength of the member. All splices not shown on the Drawings shall be subject to the Contractor acceptance.

G. Grouting

1. Cores of hollow masonry units containing reinforcement shall be filled with grout and rodded or puddled to ensure complete filling of the hollow masonry core.
2. Grout pour height shall not exceed the height given in ACI 530.1/ASCE 6-88.
3. Grout shall be placed at a rate that will not cause displacement of the masonry due to hydrostatic pressure of the grout. Mortar protruding more than 1/2-inch into the grout space shall be removed before beginning the grouting operation. Grout pours 12 inches or less in height shall be consolidated by mechanical vibration or by puddling. Grout pours over 12 inches in height shall be consolidated by mechanical vibration and reconsolidated by mechanical vibration after initial water loss and settlement has occurred. Vibrators shall not be inserted into lower pours that are in a semi-solidified state.

H. Cleaning

1. Mortar daubs or splashings shall be completely removed from all concrete masonry unit surfaces that will be exposed or painted before setting or hardening. All defects in joints of concrete masonry to be exposed or painted shall be raked out, as necessary, filled with mortar, and tooled to match existing joints.

2. Concrete masonry surfaces shall not be cleaned, other than removing excess surface mortar, until mortar in joints has hardened. Masonry surfaces shall be left clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Metal tools and metal brushes shall not be used for cleaning.

* * * END OF SECTION * * *

SECTION 09650

RESILIENT FLOORING

PART 1. GENERAL

The Contractor is the Navy’s representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy’s representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

Resilient flooring shall consist of vinyl-composition tile, wall base, and necessary adhesives. The unit size, texture, finish, and color shall be as specified herein. Resilient flooring shall be installed in the pre-engineered building and shall cover all floor surfaces in the Control Room, Closet and Lavatory.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the Contract Document includes, but is not limited to, the following:

Section 02500	Pre-Engineered Building
Section 03200	Concrete Reinforcement
Section 03300	Cast-in-Place Structural Concrete

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

FEDERAL SPECIFICATION (FS)

FS SS-T-312	(Rev B; Int Am 1; Notice 1) Tile, Floor: Asphalt, Rubber, Vinyl, and Vinyl Composition
FS SS-W-40	(Rev A; Int Am 1; Notice 1) Wall Base: Rubber, and Vinyl Plastic

1.2 SUBMITTALS

The Subcontractor shall submit five copies of each of the following to the Contractor:

- A. Manufacturer’s descriptive data and installation instructions. Cleaning and maintenance instructions shall be included.
- B. Copies of test reports showing that representative samples of the flooring proposed for use have been tested within the past year and conform to the requirements specified.
- C. Three samples of each color of vinyl-composition tile.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, the supplier shall carefully pack and brace all material either within shipping containers or on the carrier.
- B. The supplier shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The supplier shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The supplier shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.
- C. Components shall be stored off of the ground and shall be protected from weather elements.

PART 2. PRODUCTS

2.1 VINYL-COMPOSITION TILE

Vinyl-composition tile shall conform to FS SS-T-312, Type IV, Composition 1, asbestos-free, and shall be 12 inches square and 1/8 inch thick. Tile shall be of the color and pattern indicated with the color and pattern uniformly distributed throughout the thickness of the tile. Tile in any one continuous area shall be from the same lot and shall have the same shade and pattern. Provide no-wax type tile.

2.2 WALL BASE

Wall base shall conform to FS SS-W-40, coved toe, rubber. Base shall be 4-inches high, minimum 0.080 inch thick, in color as selected. Provide matching, factory formed, outside corners.

2.3 ADHESIVE

Adhesive for flooring and wall base shall be as recommended by the flooring manufacturer.

2.4 CONCRETE FINISHES

- A. For all flooring surfaces within the treatment building that will not be covered in vinyl tile, a heavy-duty concrete finish will be applied. Refer to Section 03300, Part 2.1.C, for product information.
- B. For all cement areas that will be covered in vinyl tile, the Subcontractor shall contact the vinyl tile manufacturer for proper product to cover concrete.

2.5 SPARE PARTS

Spare tiles of each color and pattern shall be furnished. Provide 10 spare tiles packed in tile box. Tiles shall be from the same lot as those installed.

PART 3. EXECUTION

3.1 GENERAL CRITERIA AND REQUIREMENTS

- A. Areas to receive resilient flooring shall be maintained at a temperature above 70 degrees F for 2 days before application, during application and two days after application. A minimum temperature of 55 degrees F shall be maintained thereafter.
- B. Resilient flooring application shall be scheduled after the completion of other work, which would damage the finished surface of the flooring.
- C. Heavy duty concrete finish shall be applied per Section 03300, part 3.6.B.
- D. Concrete that will be finished and then covered in tile will be finished/protected according to the tile manufacturer's installation instructions.

3.2 ENVIRONMENTAL CONDITIONS

- A. Flooring shall be in a true, level plane, except where indicated as sloped. Before any work under this section is begun, all defects such as rough or scaling concrete, low spots, high spots, and uneven surfaces shall have been corrected, and all damaged portions of concrete slabs shall have been repaired as recommended by the flooring manufacturer. Concrete curing compounds, other than the type that does not adversely affect adhesion, shall be entirely removed from the slabs.
- B. After concrete floor surfaces have been cleaned, small patches of adhesive to be used shall be spread in several locations in each room and allowed to dry overnight. If the adhesive can be peeled easily from the floor surfaces, the floor is not sufficiently dry. When tests show that the adhesive adheres tightly to the floor surface, the resilient flooring shall be applied. If concrete floors are in contact with the ground or over unventilated crawl spaces, small patches of primer shall be used in lieu of adhesive to test for moisture.

3.3 INSTALLATION OF VINYL-COMPOSITION TILE

Vinyl-composition tile flooring and wall base shall be installed in the treatment building Control Room, Lavatory and Closet, and shall be set in adhesive in accordance with the approved installation instructions of the manufacturer. Tile lines and joints shall be kept square, symmetrical, tight, and even. Floor shall be in a true, level plane, except where indicated as sloped. Edge tile width shall vary as necessary to maintain full-size tiles in the field, but no edge tile shall be less than one-half the field tile size, except where this is impossible because of irregular shaped rooms. Flooring shall be cut to, and fitted around, all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Edge tile shall be cut, fitted, and scribed to walls and partitions after field flooring has been applied. Base shall be installed at perimeter of all areas requiring tile flooring. Provide formed corners at all outside corners and tightly miter at inside corners. Base shall be installed tight to floors and walls.

3.4 CLEANING

Immediately upon completion of the installation in a room or an area, flooring and adjacent surfaces shall be cleaned with an approved cleaner to remove surplus adhesive. No sooner than 5 days after installation, flooring shall be washed with an approved non-alkaline cleaning solution and rinsed thoroughly with clear cold water. No-wax floors shall then be finished according to manufacturer's recommendations.

3.5 PROTECTION

From the time of laying until acceptance, flooring shall be protected from damage. Flooring which becomes damaged, loose, broken, or curled, shall be removed and replaced at no additional expense to the Contractor.

* * * END OF SECTION * * *

SECTION 09900

PAINTING, GENERAL

PART I. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

General painting shall consist of furnishing and applying coatings of various types to form an effective barrier and/or serve as a form of coding or marking for the various systems, pipes, etc. mentioned here. Interior rooms constructed of drywall including the Control Room, Lavatory, Closet, Mechanical Room and vapor barrier wall (between Blower Room and Utility Room) shall be painted per this specification section.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 02500	Pre-Engineered Building
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The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)

ANSI A 1301	(1981) Scheme For the Identification of Piping Systems
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3273	(1986; R 1991) Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
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ASTM D 3274	(1982; R 1988) Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation
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ASTM D 4214	(1989) Evaluating the Degree of Chalking of Exterior Paint Films
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FEDERAL SPECIFICATIONS (FS)

FS TT-C-535	(Rev B; Am 2) Coating, Epoxy, Two Component, for Interior Use on Metal, Wood, Wallboard, Painted Surfaces, Concrete and Masonry
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FS TT-C-542	(Rev E) Coating, Polyurethane, Oil-Free, Moisture Curing
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FS TT-E-489	(Rev H) Enamel, Alkyd, Gloss, Low VOC Content
FS TT-E-496	(Rev B; Am 3) enamel: Heat-Resisting (400 degrees F), Black
FS TT-F-1098	(Rev D) Filler, Block, Solvent-Thinned, for Porous Surfaces (Concrete Block, Cinder Block, Stucco, Etc.)

FEDERAL STANDARDS (FED-STD)

FED-STD 313	(Rev C) Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Engineer Activities
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STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC Paint 21	(1982) White or Colored Silicone Alkyd Paint
SSPC SP 1	(1982) Solvent Cleaning
SSPC SP 3	(1989) Power Tool Cleaning
SSPC SP 6	(1989) Commercial Blast Cleaning
SSPC SP 7	(1989) Brush-Off Blast Cleaning
SSPC SP 10	(1989) Near-White Blast Cleaning

1.2 SUBMITTALS

The Subcontractor shall submit five copies of each of the following to the Contractor:

- A. The names, quantity represented, and intended use for the proprietary brands of materials proposed to be used for the painting specified.
- B. Manufacturer's current printed product description, material safety data sheets (MSDS) and technical data sheets for each coating system. MSDS submittals shall meet the requirements of FED-STD 313. Detailed mixing, thinning and application instructions, minimum and maximum application temperature, and curing and drying times between coats for epoxy, moisture-curing polyurethane, and liquid glaze coatings. Detailed application instructions for textured coatings shall be provided.
- C. A statement as to the quantity of paint represented and the intended use.
- D. Certificate stating that paints for interior use contain no mercurial mildewcide or insecticide. Certificate stating that paints proposed for use contain not more than 0.06 percent lead. Certificate stating that paints proposed for use meet the volatile organic compound (VOC) regulations of the local Air Pollution Control Districts having jurisdiction over the geographical area in which the project is located.
- E. A complete sample of the moisture-curing polyurethane system applied to a panel of the same material as that on which the coating will be applied in the work and for each color specified. The sample panels will be used for quality control in applying the system.

- F. A complete painting schedule outlining paint type, color and application requirements with the proper equipment/surfaces/materials to be painted.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces.
- B. Paints shall be in sealed containers that legibly show the designated name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name of manufacturer. Pigmented paints shall be furnished in containers not larger than five gallons. Paints and thinner shall be stored in accordance with the manufacturer's written directions and as a minimum stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors and at temperatures between 40 and 95 degrees F.

PART 2. PRODUCTS

2.1 PAINT

- A. The term "paint" as used herein includes emulsions, enamels, paints, stains, varnishes, sealers, cement-emulsion filler, and other coatings, whether used as prime, intermediate, or finish coat. Paint shall conform to the respective specifications listed for use in the painting schedules at the end of this section, except when the required amount of a material of a particular color is 50 gallons or less, an approved first-line proprietary paint material with similar intended usage and color to that specified may be used.
- B. Colors shall be as selected by the Contractor from manufacturer's standard colors as provided by the Subcontractor. Manufacturer's standard color is for identification of color only. Tinting of epoxy, and urethane, paints shall be done by the manufacturer. The color of the undercoats shall vary slightly from the color of the next coat.
- C. Paint specified for all coats applied to fabrics and vapor barrier jackets over insulation shall contain a mildewcide that will not adversely affect the color, texture, or durability of the coating. The mildewcide shall be incorporated into the paint by the manufacturer and shall attain a surface disfigurement rating of 8 or greater when tested in accordance with ASTM D 3273 and evaluated in accordance with ASTM D 3274. Mercurial mildewcide shall not be used in interior paint. Insecticides shall not be used in paint.
- D. Paints containing lead in excess of 0.06 percent by weight of the total nonvolatile content (calculated as lead metal) shall not be used.
- E. Paints containing zinc chromate or strontium chromate pigments shall not be used.
- F. Paints shall comply with applicable state and local laws enacted to insure compliance with Federal Clean Air Standards. Materials shall conform to the restrictions of the local air pollution control authority. When the materials specified in the painting schedule do not

meet the applicable VOC content limitations, the Subcontractor shall notify the Contractor prior to commencing the work.

2.2 MATERIAL CRITERIA AND APPROVAL

- A. Unless otherwise recommended by the paint manufacturer, the ambient temperature shall be between 45 and 95 degrees F when applying coatings other than water-thinned, epoxy, and moisture-curing polyurethane coatings. Water-thinned coatings shall be applied only when ambient temperature is between 50 and 90 degrees F. Epoxy, and moisture-curing polyurethane coatings shall be applied only within the minimum and maximum temperatures recommended by the coating manufacturer. Moisture-curing polyurethane shall not be applied when the relative humidity is below 30 percent.
- B. When samples are tested, approval of materials will be based on tests of the samples; otherwise, materials will be approved based on test reports furnished with them. If materials are approved based on test reports furnished, samples will be retained by the Contractor for testing should the materials appear defective during or after application. In addition to any other remedies under the contract the cost of retesting defective materials will be at the Subcontractor's expense.

2.3 EXTERIOR EQUIPMENT SURFACES

- A. All exterior equipment surfaces shall be prepared with one coat of DuPont CORLAR 825 high build chromate free primer followed by one coat of DuPont IMRON 326 aliphatic polyurethane enamel (Safety Blue) or Contractor approved equal.
- B. Dry mil thickness of the IMRON 326 shall be 2 mils minimum.

PART 3. EXECUTION

3.1 PROTECTION OF AREAS NOT TO BE PAINTED

Items not to be painted which are in contact with or adjacent to painted surfaces shall be removed or protected prior to surface preparation and painting operations. Items removed prior to painting shall be replaced when painting is completed. Following completion of painting, workmen skilled in the trades involved shall reinstall removed items. Surfaces contaminated by coating materials shall be restored to original condition.

3.2 SURFACE PREPARATION

- A. Surfaces to be painted shall be clean and free of foreign matter before application of paint or surface treatments. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. Cleaning solvents shall be of low toxicity with a flashpoint in excess of 100 degrees F. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces. Exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-thinned paints, shall be spot-primed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

- B. Masonry surfaces shall be allowed to dry at least 30 days before painting, except concrete slab on grade, which shall be allowed to cure 90 days before painting. Glaze, efflorescence, laitance, dirt, grease, oil, asphalt, surface deposits of free iron and other foreign matter shall be removed prior to painting. Surfaces to receive epoxy coatings shall be acid-etched or mechanically abraded as specified by the coating manufacturer, rinsed with water, allowed to dry, and treated with the manufacturer's recommended conditioner prior to application of the first coat.
- C. Ferrous surfaces including those that have been shop-coated, shall be solvent-cleaned. Surfaces that contain loose rust, loose mill scale, and other foreign substances shall be cleaned mechanically with power tools according to SSPC SP 3 or by sandblasting according to SSPC SP 7. Shop-coated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.
- D. Galvanized, aluminum and aluminum-alloy, copper, and other nonferrous metal surfaces shall be solvent-cleaned in accordance with SSPC SP 1.
- E. All holes and joints will be filled with putty, spackle, or similar product and then sanded flush to surface before painting.

3.3 MIXING AND THINNING

- A. When thinning is approved as necessary to suit surface, temperature, weather conditions, or application methods, paints may be thinned in accordance with the manufacturer's directions. When thinning is allowed, paints shall be thinned immediately prior to application with not more than 1 pint of suitable thinner per gallon. The use of thinner shall not relieve the Subcontractor from obtaining complete hiding, full film thickness, or required gloss. Thinning shall not cause the paint to exceed local limits on VOCs. Paints of different manufacturers shall not be mixed.
- B. Two-component systems shall be mixed in accordance with manufacturer's instructions. Any thinning of the first coat to ensure proper penetration and sealing shall be as recommended by the manufacturer for each type of substrate.

3.4 APPLICATION

- A. Painting practices shall comply with applicable state and local laws enacted to insure compliance with Federal Clean Air Standards. Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. At the time of application, paint shall show no signs of deterioration. Uniform suspension of pigments shall be maintained during application. Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated. Special attention shall be given to insure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces. Paints, except water-thinned types, shall be applied only to surfaces that are completely free of moisture as determined by sight or touch.

- B. Adequate ventilation shall be provided during paint application. Respirators shall be worn by all persons engaged in spray painting. Adjacent inhabited areas shall be protected by approved precautionary measures.
- C. Surfaces that have been cleaned, pretreated, and otherwise prepared for painting shall be given a coat of the specified first coat as soon as practical after such pretreatment has been completed, but prior to any deterioration of the prepared surface. Sufficient time shall elapse between successive coats to permit proper drying. This period shall be modified as necessary to suit weather conditions. Oil-based or oleoresinous solvent-type paints shall be considered dry for recoating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and the application of another coat of paint does not cause the undercoat to lift or lose adhesion. Manufacturer's instructions for application, curing and drying time between coats of two-component systems shall be followed.
- D. Masonry surface voids shall be filled; however, surface irregularities need not be completely filled. The filler dry film shall be uniform and free of pinholes. Filler shall not be applied over caulking compound.
- E. Solvent-thinned filler, FS TT-F-1098, shall be applied to dry surfaces only and may be applied by brush or roller. Filler shall be allowed to set for three to five minutes or until the filler becomes tacky, and the excess material shall then be removed with a rubber squeegee. Surface voids shall be filled; however, surface irregularities need not be completely filled. Surfaces to which solvent-thinned filler has been applied shall be given the specified topcoat as soon as practical but before the filler material starts to discolor or chalk.
- F. Primer for ferrous-metal shall be applied to ferrous surfaces to receive paint other than asphalt varnish prior to deterioration of the prepared surface. The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat, but shall be overcoated with the specified ferrous-metal primer prior to application of finish coats.

3.5 PIPE COLOR CODE MARKING

Pipes in exposed areas and in accessible pipe spaces shall be provided with color band and titles adjacent to all valves, except those provided at plumbing fixtures, at not more than 40-foot spacing on straight pipe runs, adjacent to change in direction, and on both sides where pipes pass through walls or floors. Color code marking shall be of the color listed in Table 09900-1 and the size listed in Table 09900-2. The arrows shall be installed adjacent to each band to indicate the direction of flow in the pipe per ANSI A1301-1981. The legends shall be printed in upper-case letters as listed in Table 09900-1. Marking shall be painted or applied using colored, pressure-sensitive adhesive markers of standard manufacture or snap-around markers. Paint shall be as specified. The colors for banding in Table 09900-1 are given as a guide. Colors used for body of pipes shall comply with NYS plumbing code and ANSI A13.1-1981 color requirements.

3.6 MISCELLANEOUS PAINTING

Lettering shall be block type and shall be black (or white for contrast) paint as scheduled for particular substrate. Lettering for equipment shall be 3-inches height. Samples shall be approved by the Contractor before application.

3.7 SURFACES TO BE PAINTED

Surfaces listed in the Painting Schedules on Table 09900-3 (Part 3.10), at the end of this section, except for those listed in Part 3.8, SURFACES NOT TO BE PAINTED, shall be painted as scheduled.

3.8 SURFACES NOT TO BE PAINTED

Surfaces in the following areas are not to be painted: Concrete; aluminum, pipe insulation, stainless steel, copper and plastic components (except bands, arrows and legends for pipe or where codes require full pipe painting); metal building wall and roof panels and liners. In addition, surfaces of hardware, fittings, and other factory-finished items shall not be painted.

3.9 CLEANING

Cloths, cotton waste and other debris that might constitute a fire hazard shall be placed in closed metal containers and removed at the end of each day. Upon completion of the work, staging, scaffolding, and containers shall be removed from the site or destroyed in an approved manner. Paint and other deposits on adjacent surfaces shall be removed and the entire job left clean and acceptable.

3.10 PAINTING SCHEDULES

The following painting schedules identify the surfaces to be painted and prescribe the paint to be used and the number of coats to be applied.

TABLE 09900-1. COLOR CODES FOR MARKING PIPE

<u>LEGEND /WORDING</u>	<u>MARKER COLORS*</u>	<u>LEGEND /WORDING</u>	<u>MARKER COLORS*</u>
CHEMICALS	Y	LO PRESSURE AIR +	B
COLD WATER	GW	MEDIUM PRESSURE AIR +	B
COLD WATER SUPPLY	GW	HI-PRESSURE AIR	Y
COMPRESSED AIR	B	NON-POTABLE WATER	Y
DISCHARGE	GW	PLANT AIR	Y
DOMESTIC COLD WATER	GW	PLANT WATER	GW
DOMESTIC HOT WATER	Y	PLUMBING VENT	GW
DRAIN	GW	POTABLE WATER	GW
EXHAUST AIR	B	PROCESS WATER	Y
FIRE PROTECTION WATER	R GW	SANITARY DRAIN	GW
HEATING RETURN	Y	SANITARY SEWER	GW
HEATING SUPPLY	Y	SPRINKLER-FIRE	R
HOT WATER	Y	SPRINKLER-WATER	R
HOT WATER RETURN	Y	TREATED WATER	GW
HOT WATER SUPPLY.	Y	VACUUM +	Y
INSTRUMENT AIR	B	UNSAFE WATER	Y
		VENT	Y
		WASTE	Y
		WASTE WATER	GW
		WELL WATER	GW

* Y = Yellow with Black Letters; GW = Green with White Letters; R = Red with White Letters; B = Blue with White Letters.

+ For air with varying pressures, use AIR (Yellow). For air pressures above 90 lbs., use HI-PRESSURE AIR (Yellow). For air pressures less than 30 lbs., use LO-PRESSURE AIR (Blue). For air pressure of 30-90 lbs., use MEDIUM-PRESSURE AIR (Blue). For air vacuum pressures, use VACUUM (yellow).

TABLE 09900-2. SIZE OF LEGEND LETTERS

<u>Outside Diameter of Pipe or Covering (Inches)</u>	<u>Length of Color Field (Inches)</u>	<u>Size of Letters (Inches)</u>
3/4 to 1-1/4	8	1/2
1-1/2 to 2	8	3/4
2-1/2 to 6	12	1-1/4
8 to 10	24	2-1/2
over 10	32	3-1/2

TABLE 09900-3. PAINTING SCHEDULE

<u>Surface</u>	<u>First Coat</u>	<u>Second Coat</u>	<u>Third Coat</u>
Ferrous: Including galvanized surface	MS MIL-P-2441/GEN Formula 159	MS MIL-C-83286 Formula 150	None
NOTE: Near white blast cleaning, SSPC SP 10 is required.			
Metal: subject to high temperature, up to 400 degrees F	FS TT-E-496, Type II	FS TT-E-496, Type II	None
Concrete masonry units	FS TT-F-1098	FS TT-C-535, Type II	FS TT-C-535, Type II
Ferrous: including galvanized surfaces unless otherwise specified.	FS TT-C-535 Type II	FS TT-C-535 Type II	None
Ferrous: factory-primed mechanical and electrical equipment	FS TT-E-489, Class A ----- or ----- SSPC Paint 21, Type I	FS TT-E-489, Class A SSPC Paint 21, Type I	None None
Facing of vapor barrier jackets of pre-sized or adhesive finished cloth over insulation on exposed ducts, and equipment, as shown on drawings	Exterior grade latex paint to match adjacent areas except where applicable codes dictate the appropriate color	Exterior grade latex paint to match adjacent areas except where applicable codes dictate the appropriate color	None

3.11 EXTRA PAINT

The Subcontractor shall turn over to the Contractor at the completion of the project, two gallons of each type of paint and stain used. Paint shall be furnished in sealed and unopened, marked containers.

* * * END OF SECTION * * *

SECTION 10440

INTERIOR SIGNAGE

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Specifications and Drawings.

Signs shall be complete with lettering, framing and related components for a complete installation. Signs shall be the standard product of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate signs that have been in satisfactory use at least two years at similar facilities.

The Subcontractor shall propose locations and types of interior signage necessary for the treatment building. The proposed sign types and locations must be approved by the Contractor prior to installation. Interior signage shall be provided to meet specified reference requirements and provide a safe and efficient working environment for treatment plant operations.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 02500	Pre-Engineered Building
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The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

ALUMINUM ASSOCIATION (AA)

- | | |
|-----------|---|
| AA DAF-45 | (Sep 1980; 7th Ed) Designation System for Aluminum Finishes |
| AA PK-1 | (Sep 1987) Registration Record of Aluminum Association Alloy Designations and chemical Composition Limits for Aluminum Alloys in the Form of Castings and Ingot |
| AA SAA-46 | (Oct 1978; 5th Ed) Standards for Anodized Architectural Aluminum |

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- | | |
|-------------|--|
| ANSI A117.1 | (1986) Providing Accessibility and Usability for Physically Handicapped People |
|-------------|--|

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|------------|--|
| ASTM B 209 | (1990) Aluminum and Aluminum-Alloy Sheet and Plate |
|------------|--|

ASTM B 221 (1991) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

AMERICANS WITH DISABILITIES ACT (ADA)

FEDERAL SPECIFICATIONS (FS)

FS L-P-387 (Ref A; Am 1; Int Am 2) Plastic Sheet, Laminated, Thermosetting (for Designation Plates)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

1.2 SUBMITTALS

The Subcontractor shall submit five copies of the following to the Contractor:

- A. Manufacturer's descriptive data, catalogs cuts and installation instructions for interior signage.
- B. Details which shall include location and elevations of each type of sign and shall show dimensions, details and methods of mounting or anchoring, shape and thickness of materials, and details of construction. A schedule showing the location of each sign type shall be included.
- C. Samples of each type sign showing typical quality and workmanship. The samples may be installed in the work, provided each sample is identified and location recorded.
- D. Two samples of manufacturer's standard color chips for each material requiring color selection.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.
- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces.

PART 2. PRODUCTS

2.1 ALUMINUM ALLOY PRODUCTS

- A. Aluminum extrusions shall be at least 1/8-inch thick, and aluminum plate or sheet shall be at least 16 gauge, 0.0508-inch thick. Extrusions shall conform to ASTM B 221; plate and sheet shall conform to ASTM B 209.
- B. Where anodic coatings are specified, alloy shall conform to AA KP-1 alloy designation 514.0. Exposed anodized aluminum finishes shall be as shown and shall conform to AA SAA-46.
- C. Anodized finish shall conform to AA DAF-46 as follows:
 - 1. Clear (natural) designation AA-M10-C22-A31, Architectural Class II (0.4 mil or thicker).

2. Integral color anodized designation AA-M10-C22-A32, Architectural Class (0.4 mil to 0.7 mil). Color shall be approved by the Contractor.
3. Electrolytically deposited color-anodized designation AA-M10-C22-A34, Architectural Class II (0.4 mil to 0.7 mil). Color shall be approved by the Contractor.

2.2 SHEETING FOR GRAPHICS

- A. Vinyl sheeting for graphics shall conform to MS MIL-M-43719, minimum 0.003-inch film thickness. Film shall include a pre-coated pressure sensitive adhesive backing (Class 3).
- B. Acrylic sheet for panels and components shall conform to ANSI Z97.1.

2.3 ANCHORS AND FASTENERS

Exposed anchor and fastener materials shall be compatible with metal to which applied and shall have matching color and finish.

2.4 FABRICATION AND MANUFACTURE

- A. Holes for bolts and screws shall be drilled or punched. Drilling and punching shall produce clean, true lines and surfaces. Exposed surfaces of work shall have a smooth finish and exposed riveting shall be flush. Fastenings shall be concealed where practicable.
- B. Where dissimilar metals are in contact, the surfaces will be protected to prevent galvanic or corrosive action.

2.5 GRAPHICS

- A. Signage that provides emergency information, general circulation directions, or identification of rooms and spaces shall be tactile (perceptible to touch) and shall comply with ADA requirements. Characters, symbols, or pictographs on tactile signs shall be recessed or raised 1/32-inch minimum. Tactile letters and numbers shall be sand serif upper case. Tactile characters or symbols shall be at least 5/8-inch high, but no higher than a nominal 2 inches. Characters and symbols shall contrast with their background.
- B. Signage graphics for the various sign types shall conform to the following:
 1. Cast aluminum letters 1/8-inch thick shall be provided and internally fastened to the message panel.
 2. Pressure-sensitive precision-cut vinyl letters shall be provided.
 3. Messages shall be applied to panel using silk screen process. No hand cut screens will be accepted. Edges and corners shall be clean.
 4. Message shall be acrylic letters 1/8-inch thick and chemically welded to 0.125-inch thick acrylic backup sheet.

2.6 TYPE OF SIGNS

<u>Type of Sign</u>	<u>Size (inches)</u>	<u>Location</u>	<u>Thickness (inches)</u>
Emergency Eye Wash Station Keep Area Clear	11 x 6-1/2	Posted above eyewash station	1/8
Emergency Safety Shower Keep Area Clear	11 x 6-1/2	Posted next to safety shower	1/8
Exit	12 x 9	Posted above exits	1/8
Fire Extinguisher	14 x 10	Posted above fire extinguishers	1/8
Caution: Ear Protection Area	14 x 10	Posted in specified areas	1/8
Caution: Eye Protection Area	14 x 10	Posted in specified areas	1/8
Hard Hat Area	14 x 10	Posted in specified areas	1/8
Fire Alarm	14 x 10	Posted above fire alarm	1/8
Hazard Placard Description	14 x 10	Posted on wall next to exit	1/8

PART 3. EXECUTION

3.1 INSTALLATION

- A. Signs shall be installed at locations approved by the Contractor. All signs shall be installed plumb and true at mounting heights indicated, and by method shown or specified. Signs mounted on other surfaces shall not be installed until finishes on such surfaces have been completed.
- B. Anchorage not otherwise specified or indicated shall include slotted inserts, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; lag bolts and screws for wood.
- C. The work shall be protected against damage during construction. Hardware shall be adjusted for proper operation. Glass, frames, and other sign surfaces shall be cleaned.

*** END OF SECTION ***

SECTION 10522

FIRE EXTINGUISHERS AND ACCESSORIES

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Specifications and Drawings.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 02500 Pre-Engineered Building

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

UNDERWRITERS LABORATORIES (UL)

1.2 SUBMITTALS

The Subcontractor shall submit five copies of each of the following to the Contractor:

- A. Shop drawings showing details of extinguishing medium, construction and installation of fire extinguishers and brackets.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.
- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces.

PART 2. PRODUCTS

2.1 MATERIALS

- A. Fire extinguishers shall be as specified.
- B. Units shall be 20 lb capacity carbon dioxide type.

- C. Fire extinguisher brackets, supporting bottom and sides of extinguishers, shall be provided for all fire extinguishers.

PART 3. EXECUTION

3.1 INSTALLATION

- A. Fire extinguishers and brackets shall be furnished and installed at locations required by the Fire Code of NYS, 2002, and as approved by the Bethpage Fire Marshall.
- B. All fire extinguishers shall be inspected and certified within thirty days of start-up.
- C. All fire extinguishers failing certification or being denied approval by Bethpage Fire Marshall shall be replaced at no additional cost to the Contractor and then reinspected/recertified as necessary.

* * * END OF SECTION * * *

SECTION 10800

TOILET ACCESSORIES

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

Each accessory item shall be complete with the necessary mounting plates, anchors, and fasteners. Concealed mounting plates shall be of sturdy construction with corrosion resistant surfaces.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)/AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ASME/ANSI A112.19.1M (Sup 2) Enameled Cast Iron Plumbing Fixture Errata

AMERICANS WITH DISABILITIES ACT (ADA)

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-2380	(Basic) Dispenser, Paper Towel
CID A-A-2398	(Basic) Curtain, Shower and Window Plastic
CID A-A-2668	(Basic) Dispenser, Toilet Paper, Cabinet

FEDERAL SPECIFICATIONS (FS)

FS DD-M-411	(Rev C) Mirrors, Glass
FS WW-P-541/GEN	(Rev E; Am 1) Plumbing Fixtures
FS WW-H-1911	(Rev A) Holder, Toilet Paper (Single Roll)
FS WW-P-541/1	(Rev B; Am 1) Plumbing Fixtures (Water Closets)
FS WW-P-541/4	(Rev B; Am 1) Plumbing Fixtures (Lavatories)
FS WW-P-541/8	(Rev B; Am 1) Plumbing Fixtures (Accessories, Land Use)
FS WW-P-541/9	(Rev B; Am 1) Plumbing Fixtures (Medical Facilities, Land Use)

FS WW-S-1913 Shower Head, Ball Joint (Integral Flow Control)

1.2 SUBMITTALS

The Subcontractor shall submit five copies of each of the shop drawings and/or vendor cuts of the items specified in Paragraphs 2.1 and 2.2 to the Contractor for approval.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.
- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces.

PART 2. PRODUCTS

All Products shall meet applicable requirements stated in the ADA.

2.1 PLUMBING FIXTURES

A. Wheelchair Lavatory

- 1. Toilet – ASME/ANSI A112.19.1M, white vitreous china, contoured front rim, front concealed overflow, height to top of seat shall be 17 to 19 inches above floor.
- 2. Sink – Vitreous china, FS WW-P-541/9, Type III, Class 2, Control A, 20 inches wide by 7 inches deep, with gooseneck spout.
- 3. Drain - Strainer shall be copper alloy or stainless steel.
- 4. Pan, valve, plunger, offset, washout, latrine, frost-proof and other water closets having an invisible seal or unventilated spacer, or having walls which are not thoroughly washed at each flushing, shall be prohibited. Water closets which might permit the contents of the water closet to be siphoned back into the flush tank shall be prohibited.

B. Shower

- 1. Wall Mounted - (Part A. Type III). Showerhead shall conform to FS WW-S-1913, Type I, nonadjustable spray, stainless steel or chromium plated brass with ball joint and a tamperproof flow control device integral with showerhead. The flow control device shall limit the flow to a maximum of 2.75 gpm. Handles shall be chrome-plated die cast zinc alloy. Control valves shall be copper alloy and have metal integral parts of copper alloy, nickel alloy, or stainless steel. Valves shall be pressure balance mechanical mixing, single lever.
- 2. Cabinet Showers - (Part A, Type I, Class 2). 34 inches wide by 34 inches deep, fiberglass reinforced plastic with terrazzo or plastic receptor. Provide with curtain rod, concealed

fittings, trim and tamperproof flow control device integral with showerhead. The flow control device shall limit the flow to a maximum of 2.75 gpm.

2.2 ACCESSORY ITEMS

- A. Accessory items shall conform to the respective specifications and other requirements specified below. All accessory items shall have a smooth finish.
- B. Grab bar shall conform to handicapped code as per the ADA and approved by the Contractor. Exposed mounting flange shall have set screw mounting holes concealed on the lip of the flange. Grab bar shall have peened non-slip surface. Installed bars shall be capable of withstanding a 500 pound vertical load without coming loose from the fastenings and without obvious permanent deformation.
- C. Glass tilt mirror shall be surface mounted and provide full visibility for person in a wheelchair. Size shall be as selected by the Subcontractor and approved by the Contractor.
- D. There shall be a paper towel dispenser, conforming to CID A-A-2380.
- E. Sanitary napkin and tampon disposal container shall be of the disposable liner type and shall conform to FS WW-P-541/GEN and FS WW-P-541/8, Type I, Class 3, Style P (partition mounted). Fifty disposable liners of the type standard with the manufacturer shall be provided.
- F. Sanitary napkin and tampon dispenser shall conform to FS WW-P-541/GEN and FS WW-P-541/8, Type I, Class S, surface mounted. Dispensing mechanism shall be for complimentary use.
- G. There shall be a vertical type liquid soap dispenser with corrosion-resistant surfaces.
- H. There shall be a standard size soap holder, conforming to FS WW-P-541/GEN and FS WW-P-541/8, Type VI, Class 2.
- I. Heavy duty metal shelf shall have hemmed edges, with width and length as shown on approved design drawings. It shall conform to FS WW-P-541/GEN and FS WW-P-541/8, Type VI, Class 2.
- J. Towel pin shall have concealed wall fastenings, pin integral with or permanently fastened to wall flange, maximum 4-inch projection, design consistent with design of other accessory items.
- K. Toilet tissue holder shall be roller mounted on two support brackets with heavy duty vandal resistant spindles. It shall conform to FS WW-H-1911, Type I.
- L. Waste receptacle shall be designed for surface mounting. Reusable liner, of the type standard with the receptacle manufacturer shall be provided. Capacity shall not be less than 12 cubic feet. It shall conform to FS WW-P-541/GEN and FS WW-P-541/8, Type II, Style S.
- M. A bench shall be installed with wooden seat and steel support legs anchored to finish floor. Bench shall be installed as depicted in Contract Drawings.

2.3 ANCHORS AND FASTENERS

Anchors and fasteners shall be capable of developing a restraining force commensurate with the strength of the accessory to be mounted and shall be well suited for use with the supporting construction.

PART 3. EXECUTION

3.1 INSTALLATION

Toilet accessories shall be securely fastened to the supporting construction in accordance with the approved submittals. Accessories shall be protected from damage from the time of installation until acceptance.

* * * END OF SECTION * * *

SECTION 11210

PARTICULATE FILTERS

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, fabrication, drawings, testing and delivery of services as specified in the section and/or on the Contract Drawings for the complete installation of a particulate filtration system as part of the groundwater treatment system.

This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the particulate filter system.

It shall be the responsibility of the Subcontractor to provide material and equipment suitable for the specified service; that has been designed, fabricated and equipped in accordance with the stated standards and high standards of engineering and workmanship.

The work includes the supply, delivery and training (if necessary) for the installation of two particulate filter units. The units shall include all necessary ancillary equipment for a complete, operational system, including two particulate filter housings.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the Contract Document includes, but is not limited to, the following:

Section 13600 Process Control System

Section 15000 Basic Mechanical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

1.2 SUBMITTALS

The Subcontractor shall submit five copies of each of the following to the Contractor:

- A. Shop drawings outlining dimensions, connection details, weights, arrangement of functional parts, foundation or pad requirements (including type and location of loading), and size and material of anchor bolts. The Subcontractor shall submit detailed drawings and installation instructions for any special requirements for handling, storing and final erection of equipment and systems.
- B. The Subcontractor shall provide a complete list of recommended spare parts based on the equipment literature.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.
- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.

1.4 SYSTEM DESCRIPTION

- A. The Subcontractor shall provide two particulate filter units. The filter units shall be suitable for the intended use that includes continuous operation/filtration of contaminated groundwater.
- B. The influent solids loading to the filter system is expected to be approximately one part per million (ppm).
- C. The filtration units will be incorporated in a groundwater treatment system downstream of the air stripper system to prevent the fouling of the liquid phase carbon units.

PART 2. PRODUCTS

2.1 EQUIPMENT

- A. Details of various components are presented below. The general arrangement and design of all working parts shall allow ready access for inspection, replacement, repair and lubrication. Adequate drain, vent and flushing connections shall be provided.
 - 1. Two particulate filtration housings will be piped in parallel to common influent and effluent headers. Each vessel shall be constructed of Carbon Steel. Each filter unit shall be sized for a maximum flow rate of 1,700 gallons per minute (gpm). Each vessel shall be rated for 150 pounds per square inch (psi).
 - 2. The particulate filtration housings shall be multi-bag units that have enough basket strainers with polyethylene filter bags to meet flow requirements. The filtration bags shall each be capable of retaining particles of 25 microns or larger and be approximately 7 inches in diameter by 30 inches high.
 - 3. The influent and effluent piping shall be Carbon Steel with 10-inch, 150 pound flanged connections, both from the same side of each unit.
 - 4. The units shall be a low profile type to minimize distance from the floor to the top of the basket strainers.
 - 5. The filtration housings shall be sealed with Viton o-rings or Contractor approved equal.
 - 6. The filtration housing lids shall be lifted with a standard built-in davit arm mechanism.

7. The particulate filtration units shall be a Model SLP-42-30-10F-4-150-C-V-N-PB-C as manufactured by Rosedale Filters or Contractor approved equal.

2.2 ACCESSORIES

- A. Clips and brackets shall be provided where necessary for pipe supports and shall be constructed of the same material as the housings.
- B. Lifting lugs, supports, rings or other attachments required for installation and erection shall be provided. All piping shall be rigidly supported.

2.3 SPARE PARTS

- A. A spare parts list shall be provided for each different item of material and equipment specified, including all parts recommended by the manufacturer to be replaced after one year of service.
- B. A set of recommended spare parts and supplies for one year of service is to be included as part of the equipment provided under this section. Also to be provided are any unusual tools that are necessary for maintenance and repair of the system.
- C. Enough filter bags shall be supplied assuming a set of bags for each housing needs to be replaced once per week for six months (26 weeks).

2.4 NAMEPLATES

Major equipment items shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment. Each piece of equipment shall bear the approval designation and the markings required for that designation.

PART 3. EXECUTION

3.1 ERECTION/INSTALLATION

- A. The particulate filter units shall be installed in accordance with the manufacturer's instructions and located as shown on the drawings.
- B. All work shall be performed by competent workmen skilled in the field to which they are executing the work.
- C. All equipment shall be installed such that undue stresses are not exerted on equipment and connections or on the Groundwater Treatment Plant (GWTP) floor.
- D. All equipment requiring placement on the GWTP floor prior to the building shell construction shall be appropriately scheduled by the Subcontractor.
- E. Machinery used to place equipment on the GWTP floor shall not cause stress on the floor above the allowable maximum.

3.2 MANUFACTURER'S SERVICE

- A. The following shall be done by a qualified serviceman of the manufacturer of the equipment and accessories and shall be supplied at no additional cost to the Contractor.
1. Supervision - Checking the installation of all components before power is applied.
 2. Check-out - Placing the equipment into operation, field calibration, and adjustments.

3.3 TESTING AND INSPECTIONS

Each system component shall be given requisite factory tests as necessary to determine that the work and materials are free from defects and to establish that the design and construction meet the requirements of the specification and its intended use.

3.4 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction, which shall be for one year after the end of the construction phase. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Subcontractor shall approve of the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. All extended warranties shall be included in the Operations and Maintenance (O&M) Manual.

* * * END OF SECTION * * *

SECTION 11214

CENTRIFUGAL PROCESS PUMPS

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

The work includes the supply, delivery and training (if necessary) for the installation of four horizontal centrifugal process pumps as shown on the Contract Drawings.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 13600 Process Control System.

Section 15000 Basic Mechanical Materials and Methods.

Section 16051 Electric Motors

1.2 SUBMITTALS

The Subcontractor shall submit five copies of the following to the Contractor:

- A. Shop drawings outlining dimensions, connection details, weights and arrangement of function parts. Foundation or pad requirements, including type and location of loading, and size and material of anchor bolts. Detailed drawings and installation instructions for any special requirements for handling, storing and final erection of equipment and systems.
- B. Manufacturer's literature including actual pump curves, electric motor data including rated horsepower, full load amps, motor speed, efficiency and power requirements.
- C. A complete set of recommended spare parts based on the equipment literature.
- D. Required documentation as described under Section 3.2 Testing and Inspections.
- E. Warranty as described in Section 3.3.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.

- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.
- C. Components shall be stored off the ground and shall be protected from weather elements.

PART 2. PRODUCTS

2.1 EQUIPMENT - GENERAL

- A. The equipment specifications are intended to give a general description of what is required, but do not cover all details which may vary in accordance with the exact requirements of the equipment as offered. Any additional equipment which was not specifically mentioned in these sections and/or shown on the Contract Drawings but is necessary for the proper operation of the proposed equipment shall be furnished.
- B. The Subcontractor must meet minimum requirement specified in the contract and does not reserve the right to substitute prior to contractor approval.

2.2 HORIZONTAL CENTRIFUGAL PROCESS PUMPS

- A. The Subcontractor shall provide horizontal centrifugal process pumps close coupled to a matched, high efficiency (85%), totally enclosed fan cooled (TEFC) motor. All pumps shall be manufactured by Goulds with specific model numbers provided in Table 11214-1 or Contractor approved equal.
- B. Pumps shall be horizontally mounted, with a vertical discharge position (90 degrees from suction inlet), and flanged at both suction and discharge connections.
- C. Pumps shall be constructed of 316 type stainless steel wetted parts, including but not limited to the volute/diffuser, shaft, fasteners and brackets. All gaskets and seals shall be constructed of viton or Contractor approved equivalent. Gaskets and seals shall be suitable for an extended life when exposed to the contaminants in the groundwater.
- D. The pump casing shall be concentric volute, diffuser type, back pullout design and shall be constructed of type 316 stainless steel. The pump casing vent/fill and drain shall be provided with stainless steel plugs.
- E. The seal housing shall be self-flushing design, constructed of type 316 stainless steel material and shall hold the stationary seat of the mechanical shaft seal. The seal housing shall be clamped in place over a machined fit on the motor adapter to maintain component alignment and "O-ring" sealed to insure against leakage. The pumps shall not require oil or seal water for lubrication.
- F. Pumps shall be equipped with viton seals, or equal.
- G. The pump(s) shall be rated for efficient operation meeting the performance requirements outlined in Table 11214-1. The pumps shall be capable of intermittent and continuous operation.

- H. The impeller shall be of enclosed design, constructed of type 316 stainless steel material (minimum), threaded shaft connection secured with lock nut.
- I. Pumps and motors shall be mounted on a common base. Base shall be constructed of carbon steel for resistance to wear, corrosion and abrasion. Base shall include anchoring holes for installation as required. The complete pump unit shall be supported by the motor mounting adapter with integral pump foot allowing either front or rear pullout without disturbing the unit mounting.
- J. The pump shall be provided with an easily replaceable suction O-ring, pumpage lubricated and self aligning to maintain maximum pump efficiency without adjustment of impeller clearances.
- K. The motor adapter shall be constructed of type 316 stainless steel and support the pump liquid end and maintain pump to motor alignment. A bottom port shall be provided to allow condensation or seal leakage to drain and not be retained within the adapter.
- L. Subcontractor shall provide sufficient motor and pump supports to ensure pump reactions and other forces are not transferred to the piping system.

2.3 PUMP MOTORS

- A. Motor bearings shall be constructed so as to exclude dirt and water and to prevent lubricant from reaching windings. Thrust bearings shall be of sufficient design to handle the design pressure loads and forces. The motors shall be rated and designed to operate on three phase, 460 volt, 60 Hz, AC power. Variable speed drive motors shall be listed for inverter duty.
- B. Motors shall be so constructed that they will withstand without mechanical injury at least 120 percent of the rated speed in the forward or reverse direction in accordance with NEMA Standard MG-1.
- C. Vibration limits shall not exceed values specified in NEMA Standard MG1-12.05.
- D. Motors shall be TEFC and severe duty type, unless otherwise noted in Table 11214-1.
- E. All motors shall have Class B insulation system minimum.
- F. All motors shall have a suitable means for attaching grounding conductor. Subcontractor's standard grounding means shall be used.
- G. Motor terminal boxes shall be watertight and waterproof with the appropriate NEMA rating.
- H. All motors shall be supplied with their driven pumps. All motors shall be comparable with the driven pump.
- I. The pumps shall be controlled by the treatment system control system which will have the following features:
 - 1. A HAND/OFF/AUTO switch
 - 2. A START/STOP hand switch

2.4 SYSTEM DESCRIPTION

- A. The Subcontractor shall provide four horizontal centrifugal process pumps designed for the intended use that includes start/stop operation and pumping of contaminated groundwater.
- B. The horizontal centrifugal pumps shall be supplied with high efficiency (85% minimum) motors.

2.5 PERFORMANCE REQUIREMENTS

- A. The performance requirements of the individual centrifugal process pumps are specified in Table 11214-1.
- B. All pumps and appurtenances specified under this section shall be products of a single manufacturer regularly engaged in the production of such equipment. The Subcontractor shall have the sole responsibility for the proper functioning of all equipment furnished.

2.6 SPARE PARTS

- A. A spare parts list shall be provided for each different item of material and equipment specified, including all parts recommended by the manufacturer to be replaced after one year of service.
- B. A set of manufacturer recommended spare parts and supplies for one year of service is to be included as part of the equipment provided under this section. Also to be provided are any unusual (non-standard) tools that are necessary for maintenance and repair of the system.

2.7 NAMEPLATES

Major equipment items shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment. Each piece of equipment shall bear the approval designation and markings required for that designation.

PART 3. EXECUTION

3.1 ERECTION/INSTALLATION

- A. The process pumps and accessory equipment shall be installed in accordance with the manufacturer's instructions and located as shown on the drawings or as approved by the Contractor.
- B. All work shall be performed by competent workmen skilled in the field to which they are executing the work.
- C. All equipment shall be installed such that undue stresses are not exerted on equipment and connections or on the GWTP floor.
- D. All equipment requiring placement on the GWTP floor prior to the building shell construction shall be appropriately scheduled by the Subcontractor.
- E. Machinery used to place equipment on the GWTP floor shall not cause stress on the floor above the allowable maximum.

3.2 MANUFACTURER'S SERVICE

- A. The following shall be performed by a qualified serviceman of the manufacturer of the equipment and accessories and shall be supplied at no additional cost to the Contractor.
 - 1. Supervision – Checking the installation of all components before power is applied.
 - 2. Check Out – Placing the equipment into operation, field calibration, and making necessary adjustments.

3.3 TESTING AND INSPECTION

Each system component shall be given requisite factory tests as necessary to determine that the work and materials are free from defects and to establish that the design and construction meet the requirements of the specification and intended use.

3.4 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction, which shall be for one year after the end of the construction phase. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Subcontractor shall approve of the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. All extended warranties shall be included in the operations and maintenance manual.

**TABLE 11214-1
CENTRIFUGAL PROCESS PUMPS**

PUMPS P-3A/B – Close Coupled Centrifugal Pumps

Model	Goulds
Quantity	Two
Location	Air Stripper Feed Pump
Service	Primary Air Stripper Feed
Fluid	Raw Groundwater
Operating Temperature, °F	50-80
Viscosity, Centipoise	1.0
Specific Gravity	1.0
Operating Point GPM @ Ft. HD	1,100 gpm @ 60 ft. TDH
Mounting	Horizontal
Discharge Position	Vertical (90° from suction inlet)
Coupling	Close Coupled
Suction In	Suction Flange
Discharge Out	Discharge Flange
Pump Construction	316 Stainless Steel
Pump Seal	Mechanical
Motor HP – Minimum/Maximum	40 HP (variable speed drive)
Volts/Hz/Phase	460/60/3

PUMPS P-4A/B – Close Coupled Centrifugal Pumps

Model	Goulds
Quantity	Two
Location	Re-Injection Pump
Service	Filter Feed
Fluid	Groundwater
Operating Temperature, °F	50-80
Viscosity, Centipoise	1.0
Specific Gravity	1.0
Operating Point GPM @ Ft. HD	1,100 gpm @ 75 ft. TDH
Mounting	Horizontal
Discharge Position	Vertical (90° from suction inlet)
Coupling	Close Coupled
Suction In	Suction Flange
Discharge Out	Discharge Flange
Pump Construction	316 Stainless Steel
Pump Seal	Mechanical
Motor HP	40 HP (variable speed drive)
Volts/Hz/Phase	460/60/3

*** END OF SECTION ***

SECTION 11215

SUBMERSIBLE WELL PUMPS

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the pumps.

It shall be the responsibility of the Subcontractor to provide material and equipment suitable for the specified service that has been designed, fabricated and equipped in accordance with the stated standards and high standards of engineering and workmanship.

The work includes the supply, delivery and training (if necessary) for the installation of the two submersible well pumps.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

- Section 13600 Process Control System
- Section 15000 Basic Mechanical Materials and Methods
- Section 15050 Extraction System Piping
- Section 16051 Electric Motors

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

1.2 SUBMITTALS

The Subcontractor shall submit five copies of each of the following to the Contractor:

- A. Shop drawings outlining dimensions, connection details, weights and arrangement of functional parts. Detailed drawings and installation instructions for any special requirements for handling, storing and final erection of equipment and systems.
- B. Manufacturer's literature including pump curves, electric motor data including rated horsepower, full load amps, motor speed, efficiency and power consumption.
- C. A complete set of recommended spare parts based on the equipment literature shall be supplied.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.
- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.
- C. Components shall be stored off of the ground and shall be protected from weather elements.

1.4 SYSTEM DESCRIPTION

- A. The Subcontractor shall provide two submersible well pumps designed for the intended use that includes start/stop operation and pumping of contaminated groundwater. The water may contain 6-7 parts per million (ppm) of suspended solids.
- B. The submersible well pumps shall be installed as shown on the Contract Drawings.
- C. The submersible well pumps will be used to extract groundwater from recovery wells and transfer water through a piping manifold to the equalization tank of the groundwater treatment system.

1.5 PERFORMANCE REQUIREMENTS

- A. The performance requirements of the individual submersible well pumps are specified in Table 11215-1.
- B. All submersible pumps and appurtenances specified under this section shall be products of a single manufacturer regularly engaged in the production of such equipment. The Subcontractor shall have the sole responsibility for the proper functioning of all equipment furnished.

PART 2. PRODUCTS

2.1 EQUIPMENT - GENERAL

- A. The equipment specifications are intended to give a general description of what is required, but do not cover all details which may vary in accordance with the exact requirements of the equipment as offered. They are, however, intended to cover the furnishing, delivery, installation, field testing and field calibration of all materials and apparatus as required. Any additional equipment which was not specifically mentioned in these sections and/or shown on the Contract Drawings but is necessary for the proper operation of the proposed equipment shall be furnished.
- B. The Subcontractor must meet the minimum requirement specified in the contract documents and does not reserve the right to substitute prior to client approval.

2.2 SUBMERSIBLE WELL PUMPS (P-1 – P2)

- A. A total of two submersible pumps shall be installed. All submersible pumps shall be as manufactured by Grundfos with specific model numbers provided in Table 11215-1, or Contractor approved equal.
- B. Each submersible pump shall be electrically driven, water lubricated, submersible type. Included with each pump shall be a matched, waterproof, electric motor. The pump shall be sized to fit in a nominal 12-inch well casing and shall require a minimum amount of submergence for proper operation.
- C. All wetted components of the submersible pump, including, but not limited to, the impeller, diffuser vanes, shaft, couplings and self contained check valve shall be constructed of stainless steel for resistance to wear, corrosion and abrasion.
- D. The pump casing shall be one piece construction and of centerline discharge design to minimize clogging or flow interference and include a self contained check valve which shall be self cleaning and non clogging.
- E. Lifting eyebolts shall be cast into the pump and motor housing assembly and shall be adequately designed to lift and support the pump and motor assembly.
- F. Each pump shall be supplied with an intake screen the full diameter of the pump inlet and constructed of stainless steel.
- G. Pumps shall be suitable for installation at depths shown in Table 11215-1.
- H. All pumps shall be equipped with a stainless steel flow shroud to provide adequate cooling to the pump and motor assembly.

2.3 PUMP MOTORS

- A. The submersible pump electric motor shall be completely submersible, self cooling and capable of resisting the surrounding environment including sand and the possible contaminants. Motor bearings shall be constructed so as to exclude dirt and water and to prevent lubricant from reaching windings. Thrust bearings shall be of sufficient design to handle the design pressure loads and forces. The motors shall be rated and designed to operate on three phase, 460 volt, 60 Hertz (Hz), alternating current (AC) power. The motors shall be Grundfos environmental type motors or Contractor approved equal.
- B. AC motors operating with rated terminal voltage and rated frequency shall have torque values in accordance with the requirements determined by the nature of driven equipment, minimum starting voltage and voltage dips while motor is running.
- C. The limiting observable temperature rise of insulated windings of induction motors for continuous ratings, when operated at rated load under rated operating conditions, shall not exceed the values given in the latest NEMA Standard MG-1 for the appropriate enclosure and insulation.

- D. Motors shall be so constructed that they will withstand without mechanical injury at least 120 percent of the rated speed in the forward or reverse direction in accordance with NEMA Standard MG-1.
- E. Vibration limits shall not exceed values specified in NEMA Standard MG1-12.05
- F. All motors shall be supplied with their driven pumps. All motors shall be compatible with the driven pump and rated as inverter duty for operation with a variable speed drive (VSD).
- G. The pumps shall be controlled by the treatment system control system which will have a HAND/OFF/AUTO switch.
- H. Environmental motor leads shall be provided. The motor leads shall be 200 feet in length, have stainless steel connector sleeve, FPM connector plug, epoxy with FPM cap connector polling cable shall be a flat jacketed multi conductor cable with TEFZEL (Santoprene) insulation.

2.4 SPARE PARTS

- A. A spare parts list shall be provided for each different item of material and equipment specified, including all parts recommended by the manufacturer to be replaced after one year of service.
- B. A set of manufacturer recommended spare parts and supplies for one year of service is to be included as part of the equipment provided under this section. Also to be provided are any unusual tools that are necessary for maintenance and repair of the system.

PART 3. EXECUTION

3.1 ERECTION/INSTALLATION

- A. The submersible well pumps and accessory equipment shall be installed in accordance with the manufacturer's instructions and located as shown on the Contract Drawings or as approved by the Contractor.
- B. All work shall be performed by competent workers skilled in the field to which they are executing the work.
- C. All equipment shall be installed such that undue stresses are not exerted on equipment and connections.

3.2 MANUFACTURER'S SERVICE

- A. The following shall be done by a qualified service representative of the manufacturer of the equipment and accessories and shall be supplied at no additional cost to the Contractor.
 - 1. Supervision - Checking the installation of all components before power is applied.
 - 2. Check Out - Placing the equipment into operation, field calibration, and making necessary adjustments.

3.3 TESTING AND INSPECTION

Each system component shall be given requisite factory tests as necessary to determine that the work and materials are free from defects and to establish that the design and construction meet the requirements of the specification and intended use.

3.4 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction, which shall be for one year after the end of the construction phase. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Subcontractor shall approve of the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. All extended warranties shall be included in the Operations and Maintenance (O&M) manual.

**TABLE 11215-1
SUBMERSIBLE WELL PUMPS**

Tag Number	Grundfos Model Number	Nominal Anticipated Flow Rate (GPM)	Installation Depth (ft)	Total Dynamic Head Req. (ft of water)
P-1	1000S600-2-2	800	150	112
P-2	375S150-2	300	150	100

* * * END OF SECTION * * *

SECTION 11225

SUMP PUMPS

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

The work includes the supply, delivery and training (if necessary) for the installation of three submersible sump pumps, two shall be located in the treatment building sump and one shall be located in the air stripper containment sump.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 13600 Process Control System.

Section 15000 Basic Mechanical Materials and Methods.

Section 16000 Basic Electrical Materials and Methods

Section 16051 Electric Motors

1.2 SUBMITTALS

The Subcontractor shall submit five copies of the following to the Contractor:

- A. Shop drawings outlining dimensions, connection details, weights and arrangement of function parts. Detailed drawings and installation instructions for any special requirements for handling, storing and final erection of equipment and systems.
- B. Manufacturer's literature including actual pump curves, electric motor data including rated horsepower, full load amps, motor speed, efficiency and power requirements.
- C. A complete set of recommended spare parts based on the equipment literature.

1.3 SHIPPING, DELIVERY AND STORAGE

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.
- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.
- C. Components shall be stored off of the ground and shall be protected from weather elements.

PART 2. PRODUCTS

2.1 SYSTEM DESCRIPTION

The Subcontractor shall provide four submersible sump process pumps designed for the intended use that includes start/stop operation and pumping of water. The water will possibly contain substantial amounts of solids as large as 1/8 inch in diameter.

2.2 EQUIPMENT - GENERAL

The Contractor must meet minimum requirement specified in the contract and does not reserve the right to substitute prior to client approval.

2.3 SUBMERSIBLE SUMP PUMPS

- A. The sump pumps shall have cast iron housing and volute. The pumps shall have a non-clog semi-open cast iron impeller and viton seals. The pumps shall also have an internal diaphragm level switch to control pump operation. The sump pumps shall be Goulds Model Number WE 0734H or Contractor approved equal.
- B. The sump pumps shall be high efficiency with a thermally protected motor.

2.4 PERFORMANCE REQUIREMENTS

- A. The performance requirements of the individual sump pumps are specified in Table 11225-1.
- B. All sump pumps and appurtenances specified under this section shall be products of a single manufacturer regularly engaged in the production of such equipment. The Subcontractor shall have the sole responsibility for the proper functioning of all equipment furnished.

2.5 SPARE PARTS

- A. A spare parts list shall be provided for each different item of material and equipment specified, including all parts recommended by the manufacturer to be replaced after one year of service.
- B. A set of manufacturer recommended spare parts and supplies for one year of service is to be included as part of the equipment provided under this section. Also to be provided are any unusual tools that are necessary for maintenance and repair of the system.

PART 3. EXECUTION

3.1 ERECTION/INSTALLATION

- A. The sump pumps and accessory equipment shall be installed in accordance with the manufacturer's instructions and located as shown on the drawings or as approved.
- B. All work shall be performed by competent workmen skilled in the field to which they are executing the work.
- C. All equipment shall be installed such that undue stresses are not exerted on equipment and connections.

- D. The Subcontractor shall provide the sump pumps with a lifting chain and guide rails to ease installation and removal.
- E. All equipment requiring placement on the GWTP floor prior to the building shell construction shall be appropriately scheduled by the Subcontractor.
- F. Machinery used to place equipment on the GWTP floor shall not cause stress on the floor above the allowable maximum.

3.2 MANUFACTURER'S SERVICE

- A. The following shall be done by a qualified serviceman of the manufacturer of the equipment and accessories and shall be supplied at no additional cost to the Contractor.
 - 1. Supervision – Checking the installation of all components before power is applied.
 - 2. Check Out – Placing the equipment into operation, field calibration, and making necessary adjustments.

3.3 TESTING AND INSPECTION

Each system component shall be given requisite factory tests as necessary to determine that the work and materials are free from defects and to establish that the design and construction meet the requirements of the specification and intended use.

3.4 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction, which shall be for one year after the end of the construction phase. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Subcontractor shall approve the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. All extended warranties shall be included in the O&M Manual.

**TABLE 11225-1
SUBMERSIBLE SUMP PUMPS**

PUMPS P-5A/B – Submersible Sump Pumps

Model	WE 0734H (Goulds)
Quantity	Two
Location	GWTP Sump
Service	Sump
Fluid	Water
Operating Temperature, °F	50-80
Viscosity, Centipoise	1.0
Specific Gravity	1.0
Operating Point GPM @ Ft. HD	50 gpm @ 35 TDH
Mounting	Slide Rail
Discharge Position	Vertical
Coupling	Close Coupled
Suction In	N/A
Discharge Out	Discharge Flange
Pump Construction	Cast Iron
Pump Seal	Viton
Motor HP – Minimum/Maximum	1/2 HP
Volts/Hz/Phase	460/60/3

PUMP P-7 – Submersible Sump Pump

Model	(Goulds)
Quantity	One
Location	Air Stripper Sump
Service	Sump
Fluid	Water
Operating Temperature, °F	50-80
Viscosity, Centipoise	1.0
Specific Gravity	1.0
Operating Point GPM @ Ft. HD	10 gpm @ 40 TDH
Mounting	Slide Rail
Discharge Position	Vertical
Coupling	Close Coupled
Suction In	N/A
Discharge Out	Discharge Flange
Pump Construction	Cast Iron
Pump Seal	Viton
Motor HP – Minimum/Maximum	1/3 HP
Volts/Hz/Phase	120/60/1

*** END OF SECTION ***

SECTION 11301

PACKED TOWER AIR STRIPPER

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, fabrication, drawings, testing, and delivery of services as specified in the section and/or on the Contract Drawings for the complete installation of a packed column air stripper system as part of the groundwater treatment system. The air stripper shell shall be supplied by the Navy. The Subcontractor shall be responsible for transportation, installation and operation of the air stripper tower as well as all appurtenances such as packing material, external site tube with level switches, blower, centrifugal transfer pump, piping, ductwork, etc.

This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the packed tower air stripper system.

It shall be the responsibility of the Subcontractor to provide material and equipment suitable for the specified service; that has been designed, fabricated and equipped in accordance with the stated standards and high standards of engineering and workmanship.

The work includes the supply, delivery and training (if necessary) for the installation of the packed tower air stripper system. The systems shall include all necessary ancillary equipment for a complete, operational system.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 09900	Painting, General
Section 11214	Centrifugal Process Pumps
Section 13220	Liquid-Phase Carbon Adsorption System
Section 13225	Vapor-Phase Carbon Adsorption System
Section 13650	Instrumentation
Section 15000	Basic Mechanical Materials and Methods
Section 15575	Air Stream Heater
Section 16000	Basic Electrical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B40.1 (1991) Gauges - Pressure Indicating Dial Type - Elastic Element

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA D100 (1996) Welded Steel Tanks for Water Storage

AWWA D102 (1997) Coating Steel Water-Storage Tanks

AWWA D103 (1997) Bolted Steel Tanks for Water Storage

AWWA D120 (1989) Thermosetting Fiberglass Reinforced Plastic Tanks for Water Storage

MANUFACTURERS STANDARDIZATION SOCIETY (MSS) OF THE VALVE AND FITTINGS INDUSTRY

MSS SP-25 (1998) Standard Marking System for Valves, Fittings, Flanges and Unions

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910 Occupational Safety and Health Standards

1.2 SUBMITTALS

The Subcontractor shall submit five copies of each of the following within the time limit as set forth in the Contract documents for all accessories that they shall be providing to the air stripper system:

- A. Product data, including rated flow capacity, dimensions, weights (dry and operating), accessories, and warranty coverage; shop drawings showing outline and overall dimensions, connection details, anchorage details; list of all instrumentation to be provided, with descriptive information for each component, arrangement of functional parts; and spare parts list if applicable, for all equipment and materials furnished under this section.
- B. Results of Hydrostatic and Performance Tests
- C. Results of Influent and Effluent Analyses
- D. Operations and Maintenance Manual

1.3 SHIPPING, DELIVERY, AND STORAGE

Parts shall be pre-assembled to the extent practical, compatible with transportation limitations and equipment protection considerations. Field assembly, if any, shall require merely bolting together of match-marked components. Equipment shall be crated and protected against damage during shipping and delivery. Flange faces shall be protected from damage. Openings shall be covered to prevent entrance of dirt, water and debris. Parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation. Finished iron or steel surfaces shall be properly protected to prevent rust and corrosion. All equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variation, dirt and dust, and other contaminants.

1.4 SYSTEM DESCRIPTION

- A. The Subcontractor shall transport, install and operate the packed column air stripper tower for the removal of volatile organic compounds (VOCs) from the groundwater. The air stripper process must allow influent water to be piped to the air stripper inlet distribution port. The water is then sprayed over a column of polypropylene packing material as it descends to a sump at the bottom of the unit. Air is forced into the air stripper below the base of the packing material and up through the packing material, which creates a large surface area. The packing material is maintained clean to optimize the contaminant removal process. This allows mass transfer of contaminants from the water into the rising air, which is exhausted out the top of the unit. A demister pad prevents the release of water droplets in the exhaust. The exhausted vapor stream is directed downstream for treatment as necessary. Treated groundwater captured in the sump is pumped out of the sump by a centrifugal process pump.

Material	5000 series structural aluminum
Dimensions	10' dia x 47' Ht
Weight (empty)	14,932 lbs empty (88,446 lbs flooded)
Liquid Loading Rate (max)	1,375 gpm (687,500 lbs/hr)
Packing Height	25'
Packing Material	Jaeger Tripack (3.5" diameter)

B. Design Requirements

A total of one packed column air stripper shall be installed as provided by the Navy. The liquid loading rate into the packed column tower will be at a rate of 1,200 gallons per minute (gpm) (1,100 gpm raw groundwater and 100 gpm recirculation water).

The following requirements shall be met by the air stripper:

- Groundwater flow rate: 1,100 gpm
- Groundwater temperature 55 degrees F
- Ambient air temperature: 55 degrees F

C. Influent Organic Chemical Conditions

The anticipated influent organic chemical concentrations in the raw groundwater stream are:

Parameter	Influent Groundwater Concentration (parts per billion [ppb]) ¹
Benzene	4
Toluene	15
Total Xylenes	16
1,2-Dichloroethane	3
Cis 1,2-Dichloroethene	1,100
Vinyl Chloride	300
Tetrachloroethene	900
Trichloroethene	3,400
 Total VOCs	 5,767

¹ Anticipated maximum concentrations based on historical data.

D System Performance Requirements

The air stripper shall be designed to remove a minimum of 99% of the VOCs from the groundwater.

PART 2. PRODUCTS

2.1 AIR STRIPPER SYSTEM COMPONENTS

A. The air stripper shall be a packed column tower unit, capable of operating at a nominal flow rate of 1,200 gpm (maximum flow of 1,500 gpm) and a nominal airflow of 8,000 cubic feet per minute (cfm). The air stripper shall be the Remedial Systems, Inc. unit owned by the Navy. The air stripper is constructed of aluminum with the dimensions of 10-foot diameter by 47-foot overall height. The air stripper shall remove the VOCs from the groundwater at a minimum efficiency of 99% for all VOCs. Removal efficiencies are based on a water temperature of 55 degrees Fahrenheit and an air temperature of 55 degrees Fahrenheit.

B. Sump

The air stripper shall have a sump consisting of an area at the bottom of the unit that receives and stores the treated water. An inspection port and a ½-inch diameter (minimum) drain/sample port with manually operated valve shall be provided at the bottom of the sump to completely drain the air stripper.

C. Packing Material

The air stripper packing material shall be polypropylene with a diameter of 3.5 inches as made by Jaeger Products, Inc or Contractor approved equivalent. The packing material shall fill the entire packing cavity within the air stripper tower, which measures approximately 10-foot diameter by 25-feet high.

D. Assembly

The system shall be as supplied by the Navy with appurtenances as identified on the drawings and as approved by the Contractor.

E. Pipe Connections

Influent pipe connections shall be full line diameter of the connecting pipe. Effluent pipe connections shall be made with standard reducing fittings only if there is adequate vertical run to avoid back-up.

F. Instrumentation and Controls

The air stripper system instrumentation and controls shall consist of the following:

1. All water gauges shall have 4-inch dials, shall be stem mounted, and shall conform to ASME B40.1. Accuracy of gauges shall be Grade A or better. Gauges shall be calibrated in pounds

per square inch (psi) in not more than 2 psi increments from 0 to 100 psi in excess of the normal operating pressure at the tank.

2. Control to shut down the system and activate an alarm if the blower fails (low pressure).
3. Level transmitter to control air stripper discharge pumps. The entire assembly is mounted within an externally mounted site tube (clear) for visible level observation.
4. High-high level switch (normally closed [N.C.] contacts) to shut off feed pumps to air stripper.
5. Pressure indicator with high and low air pressure switches.
6. Direct reading air pressure gauges in the air inlet and outlet throats.

G. Aeration Performance Requirements

1. Air to water ratio

Minimum at maximum flow: 50 volume/volume

H. Mist Eliminator

The air stripper shall have a mist eliminator. The minimum separation efficiency shall be 95%. Materials shall be made of polypropylene.

I. Gaskets

All flange fittings shall have gaskets that prevent air and water leakage in and out of the connections.

N. Nozzle

Nozzles are 25 PSI rating with 150# fitting. Nozzle projections are 8" from inside stripper wall.

2.2 ACCESSORIES

A. Transfer Pumps

The transfer pumps shall be supplied in accordance with Section 11214-"Centrifugal Process Pumps".

B. Blower

The air stripper blower shall be centrifugal type pressure blowers capable of producing a nominal airflow rate of 8,000 cfm of air at 45 inches water column (W.C.) The blower motor (100 horse power [hp]) shall be rated for 3 phase, 460 volt, 60 Hertz (Hz), electrical service. The blower shall be Model 455-29-RA23I as manufactured by the American Fan Company or Contractor approved equal. If a Contractor approved equal blower is to be used, the unit must also comply with the air stripper manufacturer's requirements.

C. Off Gas Control

Off gases from the air strippers are conveyed through an air stream heater for dehumidification as specified in Section 15575-"Air Stream Heater". Off gases from the air heaters shall be conveyed to vapor treatment units as specified in Section 13225-"Vapor-Phase Carbon Adsorption System".

D. Electrical Work

1. Electrical Equipment and Wiring

Electrical motor-driven equipment specified herein shall be provided complete with motor control centers, panels, motor starters, etc. Electrical equipment and wiring, including power and control wires shall conform to the requirements of Section 16000-"Basic Electrical Materials and Methods". Instrumentation and controls shall conform to the requirements of Section 13650-"Instrumentation" with the interlocks and control devices specified herein.

2.3 GENERAL REQUIREMENTS

A. Standard Products

Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall essentially duplicate equipment that has been in satisfactory operation for at least three years.

B. Nameplates

Major equipment items shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment. Each piece of equipment shall bear the approval designation and the markings required for that designation.

C. Safety

Belts, chains, couplings, and other moving parts shall be completely enclosed by guards to prevent accidental personal injury in accordance with 29 CFR 1910, Subpart O, Machinery and Machine Guarding. Guards shall be removable or arranged to allow access to the equipment for maintenance.

2.4 SPARE PARTS

- A. A spare parts list shall be provided for each different item of material and equipment specified, including all parts recommended by the manufacturer to be replaced after one year of service.
- B. A set of manufacturer recommended spare parts and supplies for one year of service is to be included as part of the equipment provided under this section. Also to be provided are any unusual tools that are necessary for maintenance and repair of the system.

PART 3. EXECUTION

3.1 INSTALLATION

Equipment shall be installed as indicated with the written instructions of the manufacturer, under the direct supervision of the manufacturer's representative, and in accordance with the applicable provisions of Section 10 of AWWA D100 or Section 8 of AWWA D103 or Section 7 of AWWA D120.

3.2 TESTS

A. Hydrostatic Tests

Each unit shall be hydrostatically tested by completely filling the shell with potable water up to 6-inches below the blower inlet nozzle and inspect for leaks. Leaks shall be repaired and the column retested. Equipment shall be checked for leaks after it has been filled for at least one hour. Shell inspections and testing shall be in accordance with Section 11 of AWWA D100 or Section 9 of AWWA D103. Precautions shall be taken to avoid water infiltration into the blowers during testing procedures.

B. Pressure Tests

Pressure Tests shall be performed at 125 percent of the rated pressure of the system for 60 minutes. Leakage checking shall be detected by observing a drop in applied pressure on the test gauge during pressure testing and shall be repaired and replaced as necessary and retested. All installation and testing procedures shall be recorded and witnessed to ensure proper QA/QC procedures are achieved.

C. Performance Testing

Each unit shall be operated at the maximum flow specified in the performance requirements for at least one hour prior to sampling.

D. Influent and Effluent Analyses

All equipment shall be inspected and tested under operating conditions after installation. If inspection or test shows defects, such defects shall be corrected, and inspection and test shall be repeated.

3.3 PAINTING FOR CORROSION PREVENTION

A. Welded Tanks

1. Exterior Surfaces

The paint system applied to the outside of the tank air stripper shall be in accordance with Section 09900-"Painting, General". Factory primed surfaces shall be solvent-cleaned before painting. Surfaces that have not been factory primed shall be prepared and primed in accordance with the paint manufacturer's recommendations. Stainless steel or aluminum surfaces shall not be painted.

2. Interior Surfaces

Tank interior surfaces shall be coated in accordance with Sections 3.2, 3.3, 3.4, 3.5, 3.6 or 3.7 of AWWA D102.

B. Touch-up Painting

Factory painted items shall be touched up as needed. These items shall be cleaned of all foreign material and shall be primed and top coated with the manufacturer's standard factory finish.

C. Field Painting

Equipment which did not receive a factory finish shall be painted as specified in Section 09900-"Painting, General".

D. Corrosion Resistant Metals

Painting of corrosion resistant materials such as copper, brass, bronze, copper-nickel, aluminum and stainless steel shall not be performed unless otherwise specified.

3.4 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction, which shall be for one year after the end of the construction phase. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Subcontractor shall approve of the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. All extended warranties shall be included in the Operations and Maintenance (O&M) Manual.

* * * END OF SECTION * * *

SECTION 11330
CHEMICAL FEED SYSTEM

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, fabrication, drawings, testing and delivery of services as specified in the section and/or on the drawings for the complete installation of one chemical feed system skid as part of the groundwater treatment system.

This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the chemical feed system.

It shall be the responsibility of the Subcontractor to provide material and equipment suitable for the specified service; that has been designed, fabricated and equipped in accordance with the stated standards and high standards of engineering and workmanship.

The work includes the supply, delivery and training (if necessary) for the installation of a chemical feed system. The Subcontractor shall provide a chemical feed system, which transfers 50% sodium hydroxide solution into the groundwater treatment process.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 13600 Process Control System

Section 15000 Basic Mechanical Materials and Methods

Electrical Work as specified in Division 16

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

1.2 SUBMITTALS

A. The Subcontractor shall submit five copies of each of the following to the Contractor:

1. Shop drawings outlining dimensions, connection details, weights, arrangement of functional parts, foundation or pad requirements (including type and location of loading), and size and material of anchor bolts. Subcontractor shall submit detailed drawings and installation instructions for any special requirements for handling, storing and final erection of equipment and systems.
2. Manufacturer's literature including pump curves, electric motor data including rated horsepower, full load amps, motor speed, efficiency and power requirements.

3. A complete operation and maintenance (O&M) manual which shall include a complete list of recommended spare parts based on the equipment literature.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material within shipping containers and on the carrier.
- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.
- C. Components shall be stored off of the ground and shall be protected from weather elements.

1.4 SYSTEM DESCRIPTION

- A. The Subcontractor shall provide the chemical feed system as presented below:
 1. Caustic Feed System - The caustic feed system shall include a 55-gallon storage tank (drum) with cover, two chemical metering pumps, pH controller, submersible pH probe, pulsation dampener, and low level float switch.
- B. The chemical feed systems shall be installed as shown on Contract Drawings.

1.5 PERFORMANCE REQUIREMENTS

- A. The chemical feed system pumps shall be supplied by the same manufacturer and rated at the following flows:
 1. Caustic Feed Pump - 0-8.0 gallons per hour (gph) with a maximum pressure output of 60 pounds per square inch gauge (psig). The pump shall have a digital display and operate with remote control input feeds (4-20 milli Amps [mA]).

PART 2. PRODUCTS

2.1 EQUIPMENT - GENERAL

- A. The equipment specifications are intended to give a general description of what is required, but do not cover all details which may vary in accordance with the exact requirements of the equipment as offered. They are, however, intended to cover the furnishing, delivery, installation and field testing and calibration of all materials and apparatus as required. Any additional equipment which was not specifically mentioned in these sections and/or shown on the drawings but is necessary for the proper operation of the proposed equipment shall be furnished.
- B. The Subcontractor must meet minimum requirement specified in the contract and does not reserve the right to substitute prior to contractor approval

2.2 CAUSTIC FEED SYSTEM

- A. The Subcontractor shall provide a caustic feed system to feed the equalization tank (T-1) with sodium hydroxide at feed rates ranging from 0-8.0 gph.
- B. The system shall be provided with a caustic storage tank with a capacity of 55 gallons with at least two top bungs to facilitate a suction tube and a low level probe. A low level, top mounted switch shall be provided, which will send a signal back to the main control panel.
- C. The metering pumps shall be of the electromagnetic diaphragm type with adjustable stroke length and stroke frequency. The pump shall accept a proportional pulse signal from pH controller to adjust the number of strokes. The pumps shall have a range of 0-8.0 gph and a maximum injection pressure of 60 psig. The pumps shall be supplied with suction tubing and foot valve, and discharge tubing with four-function valve (FFV) designated to assist with priming, prevent siphoning, and depressurize the discharge line and pump head.

The metering pump head and wetted parts shall be designed for 50% sodium hydroxide at 70 degrees F.

- D. The system shall be provided with a pulsation dampener to remove 5% of the flow and pressure surges. The pulsation dampener shall be polypropylene shell with viton bladder and shall have a pressure gauge and filling valve on the air fitting.
- E. The pH controller shall be capable of maintaining the pH of the groundwater within a programmable set range. The controller shall accept an external signal from a pH sensor rated for immersion duty. The controller shall have a display which shows the pH and be capable of sending a 4-20 mA signal to the main control panel. The controller shall be manufactured by LMI or Contractor approved equal. Supply sensor with 100 feet of cable (supply pre-amp if required).
- F. The chemical metering pump shall be manufactured by LMI or Contractor approved equal.
- G. A drum heater shall be supplied for heating the 55-gallon drum of caustic solution. The heater shall be a flexible rubber heater with a 1.5 kilowatt (kW) heating element, adjustable thermostat, and a 6-foot power cord. The heater shall use 110 volt, single-phase power. The drum heater shall be Model No. 882440 as manufactured by Hoover Materials Handling Group or Contractor approved equal.

PART 3. EXECUTION

3.1 ERECTION/INSTALLATION

- A. The chemical feed system shall be installed in accordance with the manufacturer's instructions and located as shown on the drawings or as approved by the Contractor.
- B. All work shall be performed by competent workmen skilled in the field to which they are executing the work.
- C. All equipment shall be installed such that undue stresses are not exerted on equipment and connections or on the Groundwater Treatment Plant (GWTP) floor.

- D. All equipment requiring placement on the GWTP floor prior to the building shell construction shall be appropriately scheduled by the Subcontractor.
- E. Machinery used to place equipment on the GWTP floor shall not cause stress on the floor above the allowable maximum.

3.2 MANUFACTURER'S SERVICE

- A. The following shall be done by a qualified serviceman of the manufacturer of the equipment and accessories and shall be supplied at no additional cost.
 - 1. Supervision - Checking the installation of all components before power is applied.
 - 2. Check-out - Placing the equipment into operation, field calibration, and adjustments.

3.3 TESTING AND INSPECTIONS

Each system component shall be given requisite factory tests as necessary to determine that the work and materials are free from defects and to establish that the design and construction meet the requirements of the specification and its intended use.

3.4 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction for a period of one year after installation, minimum. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Subcontractor shall approve of the installation by others. The Subcontractor's warranty to the Contractor shall not be diminished by installation of work by others. All extended warranties shall be included in the O&M manual.

* * * END OF SECTION * * *

SECTION 13200

TANKS

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, fabrication, drawings, testing and delivery of services as specified in the section and/or on the drawings for the complete installation of an equalization tank (T-1).

This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the storage tanks.

It shall be responsibility of the Subcontractor to provide material and equipment suitable for the specified service; that has been designed, fabricated and equipped in accordance with the stated standards and high standards of engineering and workmanship.

The work includes the supply, delivery and training (if necessary) for the installation of an equalization tank (T-1).

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 09900	Painting, General
Section 13600	Process Control System
Section 13650	Instrumentation
Section 15000	Basic Mechanical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

1.2 SUBMITTALS

- A. The Subcontractor shall submit five copies of each of the following to the Contractor:
 - 1. Shop drawings outlining dimensions, connection details, weights, arrangement of functional parts, foundation or pad requirements (including type and location of loading), and size and material of anchor bolts. Subcontractor shall submit detailed drawings and installation instructions for any special requirements for handling, storing and final erection of equipment and systems.
 - 2. The Subcontractor shall submit manufacturer's literature, which shall include a complete list of recommended spare parts based on the equipment literature.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.
- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.
- C. Components shall be stored off of the ground and shall be protected from weather elements.

1.4 SYSTEM DESCRIPTION

The Subcontractor shall provide a 16,900 gallon equalization tank (T-1) as shown on Figure 13200-1. The tank shall be constructed of epoxy coated carbon steel and shall have an air tight cover. The tank dimensions shall be 12 feet in diameter and 20 feet in height. Connections shall be provided as shown on Figure 13200-1 in the sizes and locations/heights shown.

PART 2. PRODUCTS

2.1 EQUIPMENT - GENERAL

- A. Details of various components are presented below. The general arrangement and design of all working parts shall allow ready access for inspection, replacement, repair and lubrication. Adequate drain, vent and flushing connections shall be provided.
- B. The equalization tank shall be of epoxy coated carbon steel construction with cover. The tank shall have a 16,900-gallon capacity. The tank dimensions shall be approximately 12 feet in diameter and 20 feet high.
- C. The tank shall be painted "Safety Blue" as per Section 09900, "Painting, General."

2.2 EQUALIZATION TANK (T-1)

- A. The Subcontractor shall provide one 16,900-gallon epoxy coated carbon steel tank with air tight cover. The tank dimensions shall be approximately 12 feet in diameter and 20 feet high.
- B. The tank shall be provided with connections at locations indicated on Figure 13200-1.
- C. The tank shall have four 12-inch baffles that are the entire height of the tank. The baffles shall be located to promote agitation in the tank.
- D. The equalization tank shall have an agitator to keep solids in suspension. The nozzle for the agitator shall be supported as required due to loads exerted by the agitator.
- E. The agitator shall have a 2-inch diameter shaft that is approximately 132 inches in length. A single high efficiency, axial flow impeller shall be provided and keyed to the shaft to allow for 18 inches of adjustability. All wetted parts are to be fabricated of 316 stainless steel. The agitator

shall be a Model 15-S-3 (3 horsepower [HP], 460 Volt [V], 3 phase motor) top entering, heavy duty, flange mounted agitator as manufactured by Lightning or Contractor approved equal.

- F. The tank shall be provided with a Phenoline 373 epoxy coating as manufactured by Carboline or Contractor approved equal.
- G. The tank shall be provided with a steel ladder at the location indicated on Figure 13200-1. The ladder shall extend from the bottom of the tank to the top. The ladder shall be secured to the tank at a minimum of three locations – top, mid-point, and bottom.
- H. The equalization tank shall be manufactured by TetraSolv Filtration or Contractor approved equal.

PART 3. EXECUTION

3.1 ERECTION/INSTALLATION

- A. The tank shall be installed in accordance with the manufacturer’s instructions and located as shown on the drawings or as approved by the Contractor.
- B. All work shall be performed by competent workmen skilled in the field to which they are executing the work.
- C. All equipment shall be installed such that undue stresses are not exerted on equipment and connections, or on the Groundwater Treatment Plant (GWTP) floor.
- D. All equipment requiring placement on the GWTP floor prior to the building shell construction shall be appropriately scheduled by the Subcontractor.
- E. Machinery used to place equipment on the GWTP floor shall not cause stress on the floor above the allowable maximum.

3.2 MANUFACTURER’S SERVICE

- A. The following shall be done by a qualified serviceman of the manufacturer of the equipment and accessories and shall be supplied at no additional cost.
 - 1. Supervision - Checking the installation of all components before power is applied.
 - 2. Check-out - Placing the equipment into operation, field calibration, and adjustments.

3.3 TESTING AND INSPECTIONS

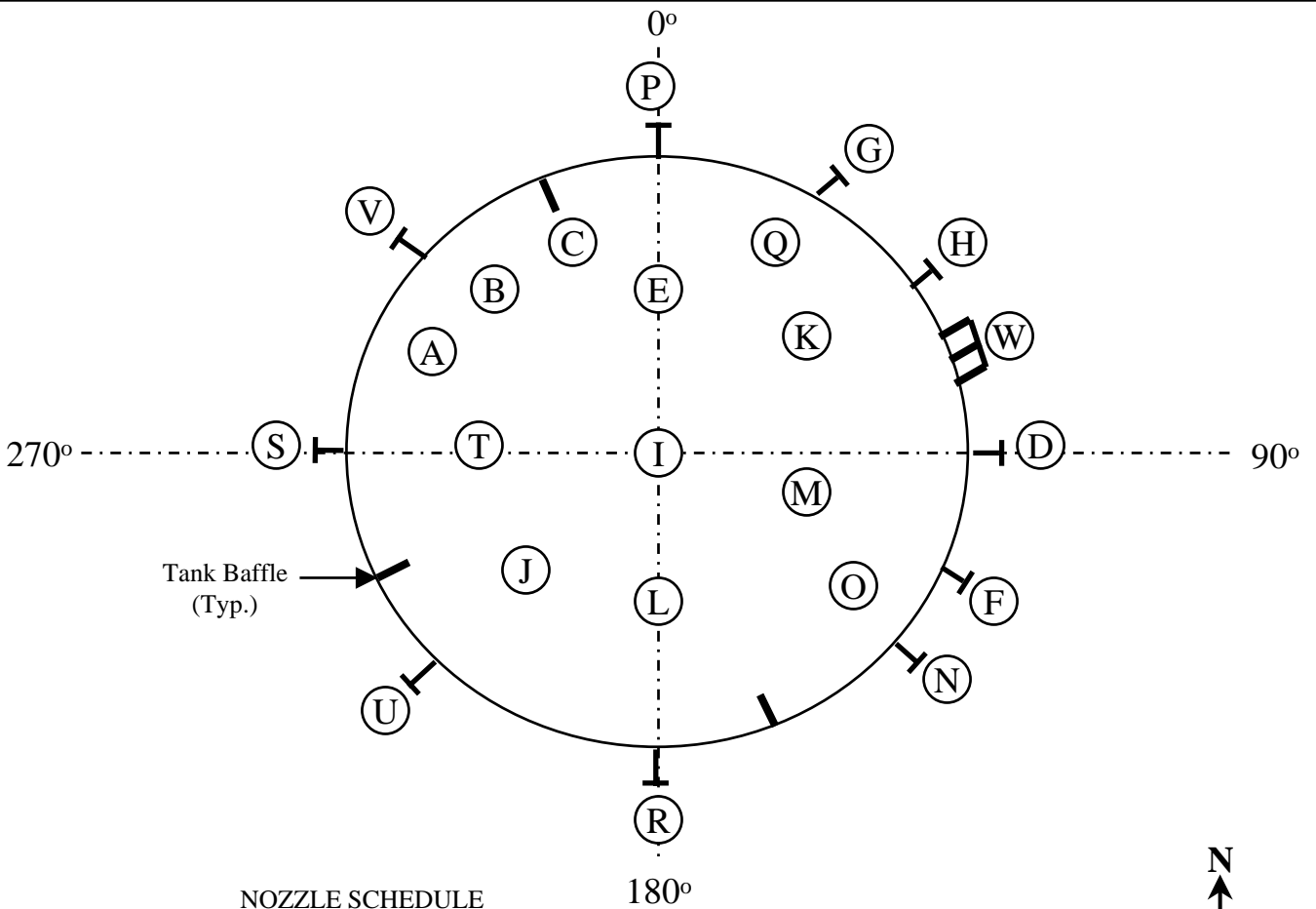
Each system component shall be given requisite factory tests as necessary to determine that the work and materials are free from defects and to establish that the design and construction meet the requirements of the specification and its intended use.

3.4 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction for a period of one year, minimum. The Subcontractor shall warrant the equipment and/or materials of construction for more than one

year when such equipment and/or materials respective warranties extend longer than one year. The Subcontractor shall approve of the installation by others. The Subcontractor's warranty to the Contractor shall not be diminished by installation of work by others. All extended warranties shall be included in the Operation and Maintenance (O&M) manual.

* * * END OF SECTION * * *



NOZZLE SCHEDULE

Nozzle	Angle (Degrees)	Size (inches)	Description	Elevation Above Tank Bottom
A	292.5	8	Influent (RW-1)	Top (5'-0" Off Center)
B	315	8	Influent (RW-2)	Top (5'-0" Off Center)
C	348.75	8	Influent (Spare)	Top (5'-0" Off Center)
D	90	12	Effluent	1'-0"
E	0	2	Spare	Top (3'-0" Off Center)
F	112.5	24	Manway	3'-0"
G	22.5	4	Drain	0'-6"
H	45	8	Overflow	18'-6"
I	--	8	Mixer	Top (In Center)
J	225	2	Level Probe	Top (3'-0" Off Center)
K	45	2	Level Switch	Top (3'-0" Off Center)
L	180	2	PH Probe	Top (3'-0" Off Center)
M	112.5	2	Vent	Top (3'-0" Off Center)
N	135	2	Influent Sump	18'-6"
O	135	6	Influent LGAC	Top (5'-0" Off Center)
P	0	6	Spare	18'-6"
Q	22.5	2	Spare	Top (5'-0" Off Center)
R	180	6	Spare	18'-6"
S	270	8	Spare	18'-6"
T	270	2	Spare	Top (3'-0" Off Center)
U	225	8	Spare	18'-6"
V	315	4	Spare	18'-6"
W	67.5		Ladder	20'-0"

Note: Level Probe (Nozzle J) to be in still well.

TANK DETAILS

- Tank Volume - 16,900 gallons
- Tank Diameter - 12'
- Tank Height - 20'
- Material of Construction: Epoxy Coated Carbon Steel
- Tank shall have four (4) 12" Baffles running entire height of tank.
- Tank shall be provided with a 90 deg. elbow fitting on the inside of drain connection extending to a minimum of 1" off the tank bottom to allow for complete raining of the tank.
- Tank shall have an air tight cover.
- Ladder to extend from tank bottom to top of tank.

Equalization Tank (T-1) Plan View

FIGURE 13200-1

SECTION 13220

LIQUID-PHASE CARBON ADSORPTION SYSTEM

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, fabrication, drawings, testing and delivery of services as specified in this Technical Specification and the Contract Drawings for the complete installation of a liquid-phase carbon adsorption system as part of the groundwater treatment system.

This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the liquid phase carbon adsorption system.

It shall be the responsibility of the Subcontractor to provide material and equipment suitable for the specified service; that has been designed, fabricated and equipped in accordance with the stated standards and high standards of engineering and workmanship.

The work includes the supply, delivery and training (if necessary) for the installation of the liquid-phase carbon adsorption system.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 09900 Painting, General

Section 13650 Instrumentation

Section 15000 Basic Mechanical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A53	(2000) Pipe, Steel, Black and Hot Dipped, Zinc Coated Welded and Seamless
ASTM A 123/A 123M	(1997ae1) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(1998) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 516	Pressure Vessel Plates, Carbon Steel for Moderate to Lower Temperature Services

ASTM D 2652	(1994) Activated Carbon
ASTM D 2854	(1996) Apparent Density of Activated Carbon
ASTM D 2862	(1997) Particle Size Distribution of Granular Activated Carbon
ASTM D 3860	(1998) Determination of Adsorptive Capacity of Activated Carbon by Aqueous Phase Isotherm Technique
ASTM D 4607	(1994) Determination of Iodine Number of Activated Carbon
ASTM F 593	(1998) Stainless Steel Bolts, Hex Cap Screws, and Studs

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B1.1	(1989) Unified Inch Screw Threads (UN and UNR Thread Form)
ASME B40.1	(1991) Gauges - Pressure Indicating Dial Type - Elastic Element
ASME BPV VIII Div 1	(1998) Boiler and Pressure Vessel Code; Section VIII, Pressure Vessels Division 1 - Basic Coverage

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B604	(1996) Granular Activated Carbon
AWWA B605	(1999) Reactivation of Granular Activated Carbon
AWWA C504	(1994) Rubber-Seated Butterfly Valves
AWWA D100	(1996) Welded Steel Tanks for Water Storage
AWWA D102	(1997) Coating Steel Water-Storage Tanks

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1999) National Electrical Code
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SOCIETY OF PROTECTIVE COATINGS (SSPC)

SSPC-SP2	Hand Tool Cleaning
SSPC-SP5	White Metal Blast Cleaning

1.2 SUBMITTALS

Subcontractor shall submit five copies of each of the following to the Contractor:

- A. Specification of granular activated carbon (GAC) to be utilized in the system. Provide a certified analysis on a sample of the GAC media to be supplied to demonstrate that the GAC media is in accordance with the manufacturer's and Contractor's specifications.
- B. Provide a description of the proposed adsorption system including flow, contact time, system design, and operating modes
- C. Provide adsorption vessel specification including shop drawings, design pressure, dimensions and capacity.
- D. Provide GAC flow diagram showing all valving, components, instrumentation and service.
- E. Provide GAC general arrangement showing approximate dimensions, weights, elevations, influent, effluent, backwash, and GAC exchange connection locations.
- F. Provide pressure drop information across adsorption system.
- G. Provide description of adsorption vessel GAC loading and removal procedures for the system.
- H. Operation and maintenance instructions.
- I. List of Spare Parts.

1.3 SHIPPING, STORAGE, AND HANDLING

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material within shipping containers and on the carrier.
- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.
- C. Components shall be stored off of the ground and shall be protected from weather elements.
- D. All equipment requiring placement on the Groundwater Treatment Plant (GWTP) floor prior to the building shell construction shall be appropriately scheduled by the Subcontractor.
- E. Machinery used to place equipment on the GWTP floor shall not cause stress on the floor above the allowable maximum.

1.4 SYSTEM DESCRIPTION

- A. The activated carbon adsorption system shall be a complete unit process for removal of organic contaminants from water. Equipment shall include, but shall not be limited to, vessels containing

GAC, supporting equipment, manifold system, and accessories. Terminology shall be in conformance with ASTM D 2652.

- B. The carbon adsorbers will be used as a polishing treatment used to remove volatile and semi-volatile organic compounds from the groundwater after the air stripper system. The adsorbers will be designed and installed completely skid-mounted with all necessary isolation and diversion valves, controls, face piping and appurtenances. The carbon adsorption system shall consist of two 20,000 pound capacity carbon adsorber vessels. The system piping manifold shall allow for the adsorber vessels to be used in series or parallel, and to switch the primary/secondary operation sequence between adsorbers.
- C. The liquid-phase carbon adsorption system shall be able to reduce the volatile organic compound (VOC) loading out of the air stripper system to below the discharge permit requirements.

PART 2. PRODUCTS

2.1 MEDIA

A. General

Product shall be Calgon Carbon Corporation F-600 type GAC. Twenty thousand (20,000) pounds of GAC shall be provided and installed within each adsorption vessel.

B. GAC Specification

- 1. The GAC shall be a virgin reagglomerated product, manufactured from metallurgical grade bituminous coal and combined with suitable binders by a domestic (United States) manufacturing facility. The GAC must possess superior hardness and abrasion characteristics to withstand repeated pneumatic and hydraulic transfers without significant change in physical size or loss of GAC volume. The GAC shall conform to AWWA B604 standards for GAC.
- 2. Direct activated coal, lignite, peat, wood, coconut based GAC products will not be accepted. All GAC supplied under this contract must be manufactured by the same manufacturing company. The GAC media must be manufactured by a company regularly engaged in manufacturing GAC. The GAC manufacturer must be, and have been in the business of manufacturing GAC for a period of not less than 10 years in the United States as of the date set for receipt of bids.
- 3. The activated carbon shall be Calgon Carbon Corporation Filtrasorb F-600 or Contractor approved equivalent and conform to the following specifications:
 - a. Iodine Number (Maximum) 850
 - b. Moisture, wt % as packed, (Maximum) 2
 - c. Total Ash, % 7
 - d. Abrasion Number (Minimum) 80
 - e. Effective Size, mm 0.8-1.0
 - f. Uniformity Coefficient (Maximum) 2.1
 - g. Total Phosphate, as PO4 (maximum %) 0.10

h. Water Soluble Ash, (maximum %)	0.50
i. <u>U.S. Sieve Series</u>	
Percent on 12 mesh (Maximum)	5
Percent through 40 mesh (Maximum)	4

4. There shall be 20,000 pounds initial fill of Filtrasorb F-600 GAC per vessel (40,000 pounds total for two vessels).

C. GAC Analysis

The delivered GAC must be accompanied by a representative sample of the GAC media being shipped. A Certificate of Analysis certifying compliance with the specifications, and indicating point of manufacture must be submitted at time of delivery.

2.2 GAC ADSORPTION VESSELS

- A. The GAC Adsorber vessel(s) shall be Modular Model 10 GAC Adsorption System Vessels, as supplied by Calgon Carbon Corporation or Contractor approved equal, which meets these specifications.

- B. The GAC Adsorber vessel shall be fabricated of carbon steel, conforming to ASTM A516 grade 70, 10'-0" diameter by 12'-0" straight side height with 2:1 elliptical top and bottom heads. The vessel shall be designed, constructed and stamped in accordance with ASME Section VIII and registered with the National Board for a design pressure rating of 125 pounds per square inch gauge (psig) at 140 degrees F. Each vessel shall be provided with one 20-inch diameter round manway located on the lower straight side portion of the vessel and one 14x18-inch elliptical manway located on the bottom head. The vessels shall be free standing vessels with four structural steel support legs.

C. Underdrain

Each vessel shall be equipped with an internal cone bottom (45 degree angle) underdrain system equipped with polypropylene (ppl) underdrain nozzles to provide a minimum of one nozzle for every nominal square foot of underdrain.

D. Surface Preparation

All surfaces will be degreased prior to sandblasting. The adsorber internal surface that will be lined shall be blasted to a white metal surface (SSPC-SP5) to provide a 3 to 4 mil anchor pattern. The exterior of the adsorber shall be power tool cleaned to the degree specified by SSPC-SP2.

E. Lining

The interior surfaces of each vessel shall be lined with a nominal 35 to 45 mils dry film thickness (dft) Wisconsin Protective Coatings Plasite "4000 series" lining materials. The interior surfaces under the internal cone bottom shall also be lined with 10 to 12 mils dft Wisconsin Protective Coatings Plasite "4000 series" materials.

F. Painting

The exterior surface of the adsorbers shall be "Safety Blue" as per Section 09900, "Painting, General."

2.3 PROCESS AND UTILITY PIPING

A. General

1. The process and utility piping on the GAC adsorption system shall include influent water to the system, treated water and backwash supply and discharge, adsorber vent lines, and GAC supply and discharge piping.
2. The influent and effluent piping network shall allow series (lead/lag) and parallel only flow patterns. Lead/lag flow sequencing allows either; a.) flow from the influent flange, to Adsorber A, to the pipe module, to Adsorber B, to the pipe module then to the effluent flange, or b.) flow from the influent flange, to Adsorber B, to the pipe module, to Adsorber A, to the pipe module to the effluent flange. The change in flow pattern is accomplished with a change of valve positions. The purpose of lead/lag flow sequencing allows an adsorber to act as an on-line backup and/or provides for sufficient contact time to allow adsorption of the contaminants of concern.

B. Process Piping

All process piping (influent/effluent and backwash) shall be 8" diameter constructed of schedule 80 PVC, ASTM 53 Grade B materials with flanged fittings.

C. Vent Piping

Vent piping shall be 3-inch diameter constructed of schedule 80 PVC with flanged fittings.

D. GAC Fill Piping

GAC fill piping shall be 4-inch diameter constructed of schedule 80 PVC with flanged fittings.

E. GAC Discharge Piping

GAC discharge piping shall be 4-inch diameter constructed of schedule 80 PVC materials with flange fittings.

F. Utility Piping

Utility piping shall be threaded schedule 80 PVC materials.

G. Surface Preparation

All piping surfaces shall be power tool cleaned to the degree specified by SSPC-SP2-63.

H. Piping Frame

The piping network shall be provided with a structural steel support frame for support of the piping module.

2.4 PROCESS /UTILITY VALVING

A. General

The process and utility piping; excluding GAC fill and discharge piping shall be equipped with butterfly valves for flow control. A total of ten 8-inch diameter butterfly valves shall be supplied to accommodate the process and backwash control functions. Two valves are needed for backwash control, two valves are needed for influent isolation, two valves for effluent isolation, two for staging of the vessels and two valves for the vent function.

B. Process Valves

The main influent, effluent and backwash control valves shall be a cast iron wafer type body butterfly valve with aluminum-bronze disc, viton seats and stainless steel shaft to mate to a 150 pound ANSI flanges. The valves are rated for 200 psig in closed position at 180 degrees F, and meet or exceed section 5.0 of AWWA specification C-504-87.

C. GAC Fill and Discharge Valves

The GAC fill and discharge valves shall be 4-inch diameter full port ball valves, 316 stainless steel construction with polytetraflouroethylene (PTFE) seats and seals. A total of four valves are supplied. Two for carbon fill and two for GAC discharge.

D. Utility Valves

Valves for the compressed air supply shall be bronze or forge brass or bar stock brass body regular port ball valves.

2.5 INSTRUMENTATION

A. Pressure Relief

A 3-inch rupture disk constructed of impervious graphite and designed to relieve pressure at 75% of the maximum anticipated working pressure (MAWP) shall be provided off each vessel vent line to protect the system against over temperature expansion and extreme system pressure excursions.

B. Differential Pressure Switch

Each vessel will be provided with an indicating differential pressure switch, 4-inch diameter dial scaled for 20-0-20 pounds per square inch (psi). A 10-amp switch shall be provided at 115 volts alternating current (VAC) for remote indication, as manufactured by Orange Research Inc. A total of two will be provided with the system.

C. Pressure Gauges

The process piping shall be equipped with pressure gauges to indicate the pressure of water entering and exiting each adsorber and to provide information on pressure drops across each adsorber and the system. The pressure gauges shall have 4-1/2-inch face diameter with a stainless steel bourdon tube in a glycerin filled housing (0-100 psig range). A total of three pressure gauges will be provided with each system.

2.6 MISCELLANEOUS

A. Transfer Hose Connectors

The GAC piping shall be fitted with hose connectors, such that GAC transfer to and from the adsorbers can be facilitated with GAC transfer hoses. These connectors will be 4-inch Quick Disconnect or Adapters constructed of corrosion resistant materials (Nylon) as manufactured by Dover Corporation as Kamlock Connectors or equal.

B. Flush Connections

Two flush connections will be provided on each GAC fill line, one upstream and one downstream of the valve, and one flush connection downstream of the GAC discharge valve. Connections shall be welded into steel or stainless steel pipe or supplied in solid ppl spacers for lined pipe. Flush connections will consist of a short section of 3/4-inch pipe, and a 3/4-inch full port ball valve and 3/4-inch quick disconnect adapter to match with water hose fittings.

2.7 PIPE AND FITTINGS

Pipe, valves, fitting for liquids, all pipe hangers and supports shall be in accordance with Section 15150, "Pipe, Pipe Fittings, Pipe Supports and Valves." Pipe, valves and fittings for compressed air shall be in accordance with Section 15400, "Plumbing, General Purpose."

2.8 BOLTS, NUTS, AND FASTENERS

Bolts, anchor bolts, nuts, washers, plates, bolt sleeves, and all other types of supports necessary for the installation of the equipment shall be furnished with the equipment and shall be galvanized unless otherwise indicated. Where indicated, specified, or required, anchor bolts shall be provided with square plates at least 4" by 4" by 3/8" or shall have square heads and washers and be set in the concrete forms with suitable sleeves. Expansion bolts shall have malleable-iron and lead composition elements. Unless otherwise specified, stud, tap, and machine bolts shall be of refined bar iron. All threads shall conform to ASME B1.1. Bolts, anchor bolts, nuts, and washers specified to be galvanized, shall be zinc coated, after being threaded, by the hot-dip process in conformity with ASTM A 123/A 123M or ASTM A 153/A 153M. Bolts, anchor bolts, nuts, and washers indicated to be stainless steel shall be Type 316 stainless steel.

2.9 SPECIAL TOOLS

For each type of equipment furnished special tools necessary for adjustment, operation, maintenance, and disassembly shall be provided; a lever type grease gun or other lubricating device for each type of grease required; and one or more steel cases mounted on the wall complete with flat key locks, two keys, and clips or hooks to hold each tool in a convenient location. Tools shall be high-grade, smooth, forged, alloy, tool steel.

2.10 FACTORY TESTS

The adsorption system equipment shall be assembled in the shop, in the configuration outlined in the drawings and specifications, to the maximum practical extent. A factory pressure test shall be made at 125 percent of the rated pressure of the equipment. Test reports shall be furnished with the equipment.

2.11 SPARE PARTS

- A. A spare parts list shall be provided for each different item of material and equipment specified, including all parts recommended by the manufacturer to be replaced after one year of service.
- B. A set of manufacturer recommended spare parts and supplies for one year of service shall be included as part of the equipment provided under this section. Also to be provided are any unusual tools that are necessary for maintenance and repair of the system.

2.12 NAMEPLATES

Major equipment items shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment. Each piece of equipment shall bear the approval designation and markings required for that designation.

PART 3. EXECUTION

3.1 EQUIPMENT INSTALLATION

Each adsorber shell or tank shall be anchored to a pad on the floor slab. Anchor brackets, anchor rods or straps shall be provided to hold the shell to anchors in the footing.

3.2 PIPE, VALVES, FITTINGS AND APPURTENANCES

Installation of piping including cleaning, cutting, threading and jointing, shall be in accordance with Section 15150, "Pipe, Pipe Fittings, Pipe Supports and Valves," or Section 15400, "Plumbing, General Purpose," as appropriate to the application. Differing metals shall be provided with isolation devices.

3.3 PAINTING/CORROSION PREVENTION

All ferrous surfaces shall be coated or painted.

A. Exterior Surfaces

Factory primed surfaces shall be solvent-cleaned before painting. Surfaces that have not been factory primed shall be prepared and primed in accordance with the paint manufacturer's recommendations. The paint system applied to the outside of the tank shall be in accordance with Section 09900, "Painting, General." Color shall be "Safety Blue" or as otherwise approved by the Contractor.

B. Interior Surfaces

Tank interior surfaces shall be coated with the coating conforming to Section 3.2, 3.3, 3.4, 3.5, 3.6, or 3.7 of AWWA D102. System of three coats, 3.9 - 5.9 mils dft per coat, for total of 11.7 - 17.7 mils minimum dft.

C. Touch-Up Painting

Factory painted items shall be touched up as needed. Factory painted items requiring touching up in the field shall be thoroughly cleaned of all foreign material, primed and top-coated with the manufacturer's standard factory finish.

D. Corrosion Resistant Metals

Painting of corrosion resistant materials such as copper, brass, bronze, copper-nickel, and stainless steel is not required unless otherwise specified.

3.4 TESTS

All products shall be carefully inspected for defects in workmanship and material; debris and foreign matter shall be cleaned out of valve openings and seats; all operating mechanisms shall be operated to check their proper functioning; and all nuts and bolts shall be checked for tightness. Valves and other equipment, which do not operate easily or are otherwise defective shall be repaired or replaced.

3.5 MANUFACTURER'S SERVICES

A. A manufacturer's trained specialist, experienced in the installation of the Modular Model 10 GAC Adsorption System (as manufactured by Calgon Carbon Corporation), and with at least five years of field experience shall be present at the site for a maximum of 10 man days for the following services:

1. Inspection of the installed equipment
2. Supervision of GAC loading
3. Startup assistance
4. Trouble shooting
5. Operator training

3.6 QUALITY ASSURANCE

The Contractor reserves the right to reject acceptance of delivery of any or all pieces of equipment found, upon inspection, to be out of compliance with the tolerances specified in ASME Section VIII, Division I - American Society of Mechanical Engineers Boiler and Pressure Vessel Code.

3.7 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction, which shall be for one year after the end of the construction phase. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Subcontractor shall approve of the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. All extended warranties shall be included in the Operations and Maintenance (O&M) manual as provided by the Subcontractor.

* * * END OF SECTION * * *

SECTION 13225

VAPOR-PHASE ACTIVATED CARBON ADSORPTION SYSTEM

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, fabrication, drawings, testing and delivery of services as specified in the section and/or on the drawings for the complete installation of three separate vapor phase carbon adsorption systems as part of the groundwater treatment system.

This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the vapor-phase carbon adsorption system.

It shall be the responsibility of the Subcontractor to provide material and equipment suitable for the specified service; that has been designed, fabricated and equipped in accordance with the stated standards and high standards of engineering and workmanship.

The work includes the supply, delivery and training (if necessary) for the installation of a vapor phase carbon adsorption system.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 09900 Painting, General

Section 15000 Basic Mechanical Materials and Methods

Section 15890 Ductwork and Accessories

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 2652	(1994) Activated Carbon
ASTM D 2854	(1996) Apparent Density of Activated Carbon
ASTM D 2862	(1997) Particle Size Distribution of Granular Activated Carbon
ASTM D 2866	(1994) Total Ash Content of Activated Carbon
ASTM D 2867	(1995) Moisture in Activated Carbon

ASTM D 3802	(1979; R 1994) Ball-Pan Hardness of Activated Carbon
ASTM D 4607	(1994) Determination of Iodine Number of Activated Carbon
ASTM D 5228	(1992) Determination of the Butane Working Capacity of Activated Carbon

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B40.1	(1991) Gauges - Pressure Indicating Dial Type - Elastic Element
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1.2 SUBMITTALS

The Subcontractor shall submit five copies of each of the following to the Contractor:

- A. Shop drawings outlining dimension, connection details, weights, arrangement of functional parts, foundation or pad requirements (including type and location of loading), and size and material of anchor bolts. The Subcontractor shall submit detailed drawings and installation instructions for any special requirements for handling, storing, and final erection of equipment and systems.
- B. Certified analysis on a sample of the granulated activated carbon (GAC) media to be supplied to demonstrate the media is in accordance with the manufacturer's and Contractor's specifications.
- C. Operating instructions outlining the step-by-step procedures required for system startup, operation and shutdown. The manufacturer's name, model number, service manual, parts list, brief description of all equipment and their basic operation features, and operating instructions for each piece of equipment and bulletins, cut sheets and descriptive data are to be included.

1.3 SHIPPING, STORAGE AND HANDLING

Parts shall be preassembled to the largest extent possible, compatible with transportation limitations and equipment protection considerations. Field assembly, if any, shall require merely bolting together of match-marked components. Equipment shall be crated and delivered to protect against damage during shipping. Flange faces shall be protected from damage. All openings shall be covered to prevent entrance of dirt, water and debris. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and until the units and equipment are ready for operation. Finished iron or steel surfaces shall be properly protected to prevent rust and corrosion. All equipment delivered and placed in storage shall be stored with protection from the weather (humidity and temperature), dirt and dust, and other contaminants. All equipment requiring placement on the Groundwater Treatment Plant (GWTP) floor prior to the building shell construction shall be appropriately scheduled by the Subcontractor. Machinery used to place equipment on the GWTP floor shall not cause stress on the floor above the allowable maximum.

1.4 PERFORMANCE REQUIREMENTS

- A. The vapor-phase activated carbon adsorption system shall be a complete once-through forced flow system. The system shall be capable of reducing the levels of the listed organic contaminants. The unit shall be filled with GAC for removal of organic contaminants from an air stripper unit. Equipment shall include, but shall not be limited to, vessels containing activated carbon, supporting equipment and accessories. Terminology is in conformance with ASTM D 2652. The system shall be complete with three carbon vessels, activated carbon, instruments,

valves, piping, and other specified appurtenances. The piping shall be arranged to allow either of the units to serve as the active unit while the other unit(s) is out of service.

- B. This section covers the requirements for the functional design, performance, materials, construction features, testing, quality, and handling of the equipment described herein. It is not the intent of this section to specify all details of design, fabrication and construction. It shall be the responsibility of the Subcontractor to provide equipment that has been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.
- C. Each carbon adsorber will be used to treat a maximum of 15,000 standard cubic foot per minute (scfm) of volatile organic compound (VOC) laden air at a temperature of 50° F and a relative humidity of 70%, containing mixed VOCs at a loading rate of 3.18 pounds per hour (lbs/hr).
- D. The vapor-phase carbon is to remove 95% of the VOCs in a 15,000 scfm air stream. It is anticipated that the volatile organic compound loading rate will be 3.18 lbs/hr.

PART 2. PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Standard Products

Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall essentially duplicate items that have been in satisfactory use for at least two years prior to bid opening.

B. Nameplates

Major equipment items such as adsorption vessels, blowers and motors shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment.

2.2 VAPOR-PHASE ACTIVATED CARBON

A. Material shall conform to the following:

1. Minimum iodine number of virgin carbon of 1,000 shall be as determined by ASTM D 4607.
2. Maximum moisture content of 5 percent by weight shall be as determined by ASTM D 2867.
3. Maximum total ash content of 10 percent by weight shall be as determined by ASTM D 2866.
4. Minimum hardness number of 95 necessary for the required life in vapor phase applications shall be as determined by ASTM D 3802.
5. Activated carbon particle size shall be uniform for consistent pressure drop characteristics. Maximum particle size shall be 0.2 inch diameter as determined by ASTM D 2862.
6. The GAC shall be of the type that can be accepted for offsite regeneration of the spent activated carbon by an approved carbon regeneration facility.

7. Minimum apparent density of 0.45 gram/cubic centimeter (g/cc) shall be as determined by ASTM D 2854.
8. Maximum differential pressure drop shall be 6 inches of water at 8,000 scfm.
9. US sieve size shall be 4x8.
10. Material shall be free from impurities that affect the serviceability and appearance of the finished product.

2.3 VAPOR PHASE ACTIVATED CARBON ADSORPTION UNITS

- A. The GAC Adsorber vessel(s) shall be G-17-FP Vapor High Flow Series, as supplied by Carbtrol Corporation, or Contractor approved equal, which meets these specifications.
- B. The adsorbers shall be constructed of FRP and contain 18,000 pounds of GAC. The adsorbers shall have 36-inch influent and effluent flanges as well as one 24-inch manway flange. The adsorbers shall meet the following criteria:
 1. Maximum adsorber Diameter: 120 inches.
 2. Minimum adsorber Height: 180 inches.
 3. Material of Construction: FRP.
 4. Maximum Allowable Working Pressure: 3 pounds per square inch gauge (psig).
 5. Flow Direction: Up.
 6. Outlet Collector: Integral.
 7. Inlet Distributor: Integral.
 8. The exterior surface of the adsorbers shall be painted "Safety Blue" as per Section 09900, "Painting, General."

C. Sampling Valves

Sampling valves shall be provided at the inlet and outlet of each carbon unit.

D. Piping

Piping shall be in accordance with Section 15890, "Ductwork and Accessories."

2.4 VAPOR-PHASE ACTIVATED CARBON INSTRUMENTATION AND CONTROLS

A. Pressure Gauges

Pressure gauges shall conform to ASME B40.1.

B. Pressure Indicators

Pressure indicators shall be installed on each side of the carbon vessels to alert the operator of excessive pressure drop.

2.5 NAMEPLATES

Major equipment items shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment. Each piece of equipment shall bear the approval designation and markings required for that designation.

PART 3. EXECUTION

3.1 EQUIPMENT INSTALLATION

Equipment shall be installed as indicated with written instructions of the manufacturer. Each vessel shall be anchored as required by the manufacturer.

3.2 PAINTING FOR CORROSION PREVENTION

Equipment which did not receive a factory finish shall be painted, unless specified otherwise. The paint system applied to the outside of the tank shall be in accordance with Section 09900, "Painting, General." Surfaces that have not been factory primed shall be primed and top coated with the manufacturer's standard factory finish. Factory painting shall conform to manufacturer's standard factory finish. All defects in the finish prior to or during installation of the equipment shall be repaired by the Subcontractor as specified in Section 09900-Painting, General. All exposed ferrous surfaces not painted in the factory shall be painted in accordance with Section 09900-Painting, General. Painting of corrosion resistant materials such as copper, brass, bronze, copper-nickel, and stainless steel is not required, unless otherwise specified. All ferrous surfaces shall be coated or painted. Color shall be "Safety Blue" or as otherwise approved.

3.3 FIELD QUALITY CONTROL

A. Equipment Tests

After installation of the carbon adsorption system is complete, operating tests shall be carried out to ensure that the unit installed operates properly. All products shall be carefully inspected for defects in workmanship and material; debris and foreign matter shall be cleaned out of all equipment; all operating mechanisms shall be tested to check their proper functioning; and all nuts and bolts shall be checked for tightness. Valves and other equipment which do not operate easily or are otherwise defective shall be repaired or replaced. Tests shall assure that there is no vibration, or noise from any parts. If deficiencies are revealed during tests, such deficiencies shall be corrected and the tests shall be reconducted at the Subcontractor's expense.

B. Performance Tests

After installation of the activated carbon adsorption system, operating tests shall be carried out to ensure that the system operates properly as specified herein.

C. Noncompliance with Performance Requirements

Removals shall meet or exceed those specified in the performance requirements of this specification. If at any time during the first 12 months of operation the results of the organic analyses of the air emissions are not in compliance with the Request for Determination (included as Appendix B to these Technical Specifications) as provided by the Contractor, except for periods when the carbon is saturated, flow through the unit shall be stopped and the system shall

be said to be inoperable. If at any time the operation of the system does not meet the flow rate requirements, instrumentation or control requirements set forth in this contract, flow through the system shall be stopped. The Subcontractor shall immediately proceed to repair or modify the system for compliance with the contract documents. Repairs or modifications shall be made entirely at the Subcontractor's expense. The Subcontractor shall notify the Contractor one day before the system is to be restarted and retested.

3.4 MANUFACTURER'S SERVICES

- A. A manufacturer's trained specialist, experienced in the installation of the G-17-FP vapor filter-high flow series and with at least five years of field experience, shall be present at the site for a maximum of 10 mandays for the following services:
1. Inspection of the installed equipment
 2. Supervision of GAC loading
 3. Startup assistance
 4. Troubleshooting
 5. Operator training

3.5 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction, which shall be for one year after the end of the construction phase. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Subcontractor shall approve of the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. All extended warranties shall be included in the Operations and Maintenance (O&M) Manual.

** END OF SECTION **

SECTION 13600

PROCESS CONTROL SYSTEM

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Specifications and Drawings.

The work includes but is not limited to the supply, complete installation and testing of the following.

- A. A complete microprocessor based control system (Programmable Logic Controller) to control and monitor the process outlined in the Piping and Instrument Diagrams (P& ID's) Contract Drawings, P-3 through P-7.
- B. All control and data equipment specified in Part 2.1 and as shown in the control system block diagram (see attached Figure 13600-1).
- C. All input/output (I/O) cards subsystem as required in Table 13600-1, I/O List.
- D. The Supplier shall be an approved system integrator who shall assume single source responsibility for providing a complete turnkey monitoring and control system as described in this specification. The system integrator shall be required to demonstrate a minimum of five years recent past experience in the design, programming, manufacturing and commissioning of control systems of the comparable size, type and complexity of the proposed project. The Supplier shall be required to have his own in-house capability to handle complete system engineering, fabrication and testing. This responsibility includes, but is not limited to the following:
 1. System Engineering
 2. System Hardware
 3. System Programming
 4. System Documentation
 5. System Installation Support
 6. Factory Testing
 7. Packing and Shipping to the Job Site
 8. Start-Up Assistance
 9. Loop Checkout
 10. Operating Manual
 11. Recommended Spare Parts
 12. Field Instruments calibration.

- E. Review of the drawings shall not relieve the Subcontractor of the entire responsibility for the engineering, design, programming, workmanship and material under the Contract Documents.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 13650	Instrumentation
Section 16000	Basic Electrical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)

ANSI S50.1	Compatibility of Analog Signals for Electronics Industrial Process Instruments.
ANSI C2	National Electrical Safety Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	National Electrical Code (NEC)
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INSTRUMENT SOCIETY OF AMERICA (ISA)

RP 55.1	Hardware testing of Digital Process Computers
RP 12.6	Installation of Intrinsically Safe Instrument System in Classified Location

NATIONAL ELECTRICAL MANUFACTURING ASSOCIATION (NEMA)

ICS 6	Enclosure for Industrial Controls and systems
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FEDERAL COMMUNICATION COMMISSION RULES AND REGULATIONS (FCC)

FCC Part 15	Radio Frequency Devices
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1.2 SUBMITTALS

The Subcontractor shall submit five copies of the following to the Contractor:

- A. The Subcontractor shall submit in the manner and within the time limit as set forth in the contract documents a Statement of Qualifications indicating previous and similar projects.
- B. The Subcontractor shall submit, in the manner and within the time limit as set forth in the contract documents, shop drawings showing outline and overall dimension, connection details, weights, anchorage details, arrangement of functional parts, and parts list if applicable, for all equipment and material furnished.

- C. The shop drawings shall include, but not limited to, the following details:
1. Overall dimensions and details of all equipment, including Main Control Cabinet, Human Machine Interface (HMI), and peripherals. Location of all connections, supports and accessories and bill of materials.
 2. Exact location of all terminal points and control components mounted on Main Control Cabinet shall be shown.
 3. Main Control Panel wiring diagrams, which shall include internal wiring and also field I/O (instruments) wiring showing point-to-point connections between field and panel terminals.
 4. Ladder diagrams and/or strategy building blocks.
 5. Operator screen displays.
- D. Program documentation including complete set of all original manuals received from software supplier, in sufficient detail to enable understanding, trouble shooting and any future system modifications.
- E. Complete filled-in field calibration data sheets for each instrument.
- F. All original system software discs of SCADA and Programmable Logic Controller (PLC) run time and development. One copy of all hard disc files and logic and/or ladder diagrams. One copy of all software manuals and handbooks.

PART 2. PRODUCTS

2.1 EQUIPMENT

- A. The PLC Processor shall have following minimum features:
1. Word Length: 16 bits minimum.
 2. Memory Cycle Time: Not more than 10 ms/used/Kbytes of memory.
 3. Real-Time Clock: Minimum resolution of 50 ms.
 4. Watchdog Circuit: Timer circuit external to the processor to sense processor halt conditions and instruction failures.
 5. Error Detection: Instruction execution checks and error trap. Periodic verification of initialization of I/O structure is required.
 6. Built in data highway and remote I/O link communication interfaces (Data Highway Plus, DH-485 and RS-232).
 7. Processor Memory: 16K program (i.e. ladder logic) memory and data storage (i.e. register) memory of at least 16 bit words. Provide greater memory if required by application.
 8. CMOS Semiconductor type memory module shall be provided with lithium battery protection for protecting data in memory for at least six months in the event of normal power failure.
 9. Ladder programming.

10. Light Emitting Diode (LED) indicator to display status of processor operation, power supply/battery and central processing unit (CPU).
- B. Acceptable PLC Vendors
1. Allen Bradley (SLC 5/04) or Contractor approved equal.
- C. Personal Computer shall be International Business Machines (IBM) or IBM-compatible computer with following minimum hardware configuration shall be provided for interface between PLC and HMI. The computer shall meet FCC Class B requirements (FCC Part 15). Hardware shall be rated, manufactured and advertised as Industrial Grade.
1. Processor board with Intel 2GHz (minimum) Pentium 4 CPU with 512 Megabytes (MB) SDRAM.
 2. Power supply sized for the application with 100 watts reserved for future expansion, 400 watts minimum.
 3. Hard disk, 30 gigabyte (GB) minimum, 18-millisecond access time, configured as a master and as Drive C.
 4. Floppy disk, 3.5-inch - 1.44 MB and 12x speed (minimum).
 5. Compact disc random on-board memory (CD ROM) read-write and digital video disc (RW/DVD) combo drive.
 6. Watch Dog Timer to reboot the processor after processor halt condition is detected. Rebooting shall be warm reboot.
 7. Parallel port (LPT1) for printer and minimum of two serial ports and two USB ports.
 8. Telephone/fax modem 56 K bps.
- D. Acceptable Manufacturers:
1. IBM
 2. Dell
 3. Gateway
 4. Hewlett Packard
- E. HMI Monitor shall be 20-inch screen, color SVGA with 800 x 600 non-interlaced minimum resolution and 0.28 dot pitch matrix. A super VGA card controller, supporting up to 1024 x 768 resolution with 256 colors and minimum 2 MB of on-board memory shall be supplied. All connection and power cables shall be provided.
- F. Keyboard and Mouse: A 101-key AT style keyboard with connection to the computer shall be provided. Mouse shall be 2-button serial type. All connection cables shall be provided.
- G. Printer: Plain paper Color inkjet printer 1200 dots per inch (dpi) resolution and 20 pages per minute (ppm) speed or better with separate black and color ink cartridges shall be provided for alarm and event printing. All connection cables shall be provided.
- H. PLC Programmer: A laptop computer programmer for operation with the PLC shall be provided. Programming shall be done in relay ladder diagram language. A laptop personal computer shall

- have 2.4 GHz Pentium 4 processor, 30 GB hard drive, 256 MB SDRAM, external 3.5-inch floppy disc and 48x speed CD ROM RW built-in, 56 K bps modem, ethernet card, 15-inch SVGA active matrix display and 2 type II PCMCIA slots.
- I. I/O Cabinet: The Main Control (I/O) Cabinet shall be a NEMA 12 floor mounted enclosure (minimum depth 18 inches) with hinged doors and front access panels. This enclosure shall be constructed using commercial available, industry standard HOFFMAN or equal type enclosure. PLC processor and I/O cards shall be mounted inside the enclosure and pre-wired to the terminal blocks together with all other accessories in this cabinet.
1. All external cable entering the I/O cabinet shall enter **from the top** and shall interface with internal component via terminal blocks. These terminal blocks shall be Entelec M4/6 rail mounted or equal. Terminal blocks for digital inputs shall be sized to receive #14 AWG min. wire and for analog input shall be sized to receive #16 wire. Terminal blocks shall be compression type. Provide **6 inch minimum** clearance at the top for field wiring.
 2. Terminal blocks shall be readily accessible and mounted not less than 12 inches above the bottom of cabinet and 6 inches below the top of the cabinet. Minimum distance between rows of terminals shall be 6 inches. No terminals block shall carry more than two wires on either side of any terminal. Terminal blocks and associated cable ties, raceways and wire troughs shall be manufactured from “non-burning” materials defined by ASTM D635.
 3. Each terminal shall be suitably identified in accordance with drawings and wire lists.
 4. Termination cabinet low level terminals and wiring shall be physically separated from 120 volts alternating current (VAC) terminals and wiring by metal barriers or required separation distance.
 5. The shield wires for low level analog signal twisted pair field cable shall be terminated at terminals and grounded at a convenient isolated shield bus bar within the termination cabinet.
 6. Each type of terminal block shall include 20% spare (non-wired) screw terminals for Contractor’s future use.
 7. Miniature knife gate switches similar to Entelec M 4/6.SNB or equal shall be provided on each digital output and input circuit to enable service and maintenance operation.
 8. All 120 VAC and 24 volts direct current (VDC) power to the field instruments shall be individually fused. All analog inputs and outputs shall be fused with 100 milliamp (mA) fuse. Provide LED blown fuse indication.
 9. Main circuit breaker for incoming 120 VAC regular power and 120 VAC uninterruptible power supply (UPS) power shall be provided.
 10. Redundant 24 VDC power supplies shall be provided for I/O and instrument loop power feed. Power supplies shall be monitored for loss of power.
 11. All internal wiring shall be of such cross section, temper and flexibility as to provide ample and safe current carrying capability and physical strength. Insulation shall be fire retardant. All wiring shall be clearly marked and correspondingly designated on system drawings. It shall be the Supplier’s responsibility to make point-by-point checks on all wiring, proper connections and correct designations.
 12. I/O Subsystem: The PLC and its I/O subsystem shall be configured with sufficient capacity for all specified inputs and outputs in the I/O list. The PLC processor performance shall ensure I/O scan and operating cycle execution time are adequate to perform the control,

supervisory and data acquisition goals. Cycle I/O scan of less than 100 milliseconds or better shall be achieved. LED indicators shall be provided to display status of each inputs/outputs. Type of I/O cards shall be as follows:

13. Analog Input (AI) Modules: Resolution shall be 12-bit minimum. Analog inputs from transmitters shall be 4-20 mA isolated, powered by individually fuse protected direct current (DC) power supply source. "Two wire" or "four wire" transmitter power requirements are identified in the I/O list. Precision 250 ohm dropping resistor shall be used to convert current to voltage signal. Input channel shall be differential type.
 14. Analog Output (AO) Modules: Analog outputs shall be 4-20 mA DC individually fused protected.
 15. Digital Input/Output (DI/DO) Modules: Optically isolated inputs and outputs, with on board LED for status monitoring. All digital input circuits shall be powered from the control system 120 VAC power distribution panel. Digital output circuits which controls instruments directly from control panel (i.e. solenoid valve), shall be powered from panel 120 VAC power supply. Digital output shall be via compact, indicating relays with dry contact rating at a minimum 3 amperes (A) at 120 VAC or to match the load (solenoid or starter coil requirements).
 16. A minimum of 15% installed spare I/O for future applications shall be furnished and wired to the terminal blocks.
 17. Provide intrinsically safe barrier for level transmitter input from the wells (ten analog input).
- J. Auto Dialer: For system remote interface an Auto Dialer shall be provided and mounted inside the I/O cabinet. The priority 1 type alarms if not "Acknowledged" by operator after a specified period of time. The trouble alarm will be annunciated and will communicate via telephone line through Auto Dialer to a remote office phone and/or beeper, (telephone and/or beeper number and selected priority 1 alarms to be specified after award of the contract). Auto Dialer shall meet the following requirements:
1. Number of channels = eight, normally open (N.O.) or normally closed (N.C.) contacts.
 2. Solid state component capable of dialing multiple (eight telephone) numbers in succession until it is acknowledged.
 3. Solid state voice recording and playback. No mechanical tape mechanism shall be employed.
 4. Compatible with pager/beeper.
 5. Compatible with rotary, pulse or tone dialing.
 6. Time between alarm phone calls shall be programmable from 0.1 to 99.9 minutes.
 7. Programming: Standard phone jack on front panel for programming phone. Voice menu instruction guide programming.
 8. RJ11 Telephone line jack for connection to public telephone network.
 9. Battery backup: Rechargeable, 8-hours, with built in battery charger.
 10. Surge protection: Solid state protector on phone, power and signal lines.
- K. UPS: An on-line UPS sized (minimum 1 KVA) to enable 30 minutes of continuous operation of control and data acquisition system including personal computer, shall be provided to ensure uninterrupted information processing and safe shutdown in the event of power loss. Provide

alarms on low UPS battery, battery replacement and on AC power output failure. UPS shall have EMI/RFI filtering to prevent electrical noise from affecting computer operation or introducing glitches in the data files. UPS shall also provide surge protection.

2.2 SOFTWARE

A. PLC Software

1. Relay ladder diagram programming to implement specified control strategies.
2. Perform data acquisition and control of associated process equipment. Function as totally independent unit from SCADA software.
3. Relays, timers, counters, math, comparators, data transfer, PID control and other predefined control programming necessary to implement specified control strategies.
4. Software shall allow PLC ladder program to be documented, assign labels to address points in program, display labels on programmer monitor, and annotate on ladder printout.
5. Capability to add, delete or modify any portion of PLC program while system is running or stopped.

B. SCADA Software

A complete package of window based system SCADA software including runtime, development, data acquisition and color graphic systems to interface with PLC shall be provided with the personal computer. The color graphic system shall be computer aided design (CAD) based, preferably compatible with AutoCAD. These systems shall fully support all control, display and data acquisition function for the system outlined on Piping and Instrumentation Diagrams P-3 through P-7. The control and data acquisition software shall be capable of data logging and recording of alarm and operator actions or events. The system should be capable of producing ASCII files for direct import into a spreadsheet program such as Excel (latest version) and replayed on the HMI as one of the multitask functions. The data logging rate, schedule and duration shall be operator configurable. Latest version of Windows-2000 or NT shall be provided.

- C. During first year process control system is in use by the Contractor, provide product upgrade for entire system at no additional cost to the Contractor. Upgrades limited to include software revision updates.

2.3 CONTROL SYSTEM

A. General

The principal means of control of the treatment system is a microprocessor based PLC. The PLC combined with HMI, which includes video display, personal computer, keyboard and printer, will provide the plant operator with complete control of all vital plant operation functions. The system video display graphics indicate a real time and continuously updated set of all parameters, possibly requiring operator intervention. The control system personal computer also serves as a data acquisition system for all system parameters, thereby, allowing plant operator or maintenance personnel a facility for equipment historical record keeping.

B. Plant Alarm System

1. Provide overall plant alarm system. Alarm and events shall be logged to file. Alarms shall fall within one of following categories:
 - a. Priority 1: Alarms enunciated at computer, and logged to alarm printer. These alarms are transmitted to remote location via auto dialer.
 - b. Priority 2: Alarms annunciated at computer, and logged to alarm printer.
2. Provide alarm summary and event summary screens at computer as noted below:
 - a. Alarm Summary Screen
 - Display only current alarms. Acknowledged alarms which are no longer active shall not be displayed.
 - Allow operator to acknowledge alarms using single keystroke at alarm summary screen.
 - Display shall include:
 - Time and date alarm initially occurred.
 - Alarm point identification.
 - Description of alarm.
 - b. Event Summary Screen
 - Events include, but are not limited to:
 - Operator change from manual to automatic operation of equipment.
 - Pump start-stop.
 - Operator entered set-point changes.
 - Acknowledgment of alarms.
 - Display shall include following information.
 - Time and date event occurred.
 - Identification of event.

C. Data Logging

All analog process points shall be logged to the hard disk of the computer. Procedure for data collection and storage for analog data shall be as follows:

1. Computer shall scan process points at regular interval of 1 minute and log average value to the disk.
2. Data shall be stored in Excel file format.
3. Daily log report shall be generated and shall be logged to disk automatically and shall be able to be printed on demand.

D. Trending

Historical and Real Time trending of all analog process points shall be provided. Trend display requirements are as follows:

1. Identification of process point being displayed. Use same nomenclature as used on process graphic display screens.
2. Start and end time of data being displayed.
3. Display shall incorporate movable vertical cursor along time axis. Parameter value at cursor date and time shall be displayed digitally.
4. Initial configuration of display shall display data from present time back to 8 hours prior to present time. Provide capability for operator to enter new start time for data being displayed to view parameter trend more than eight hours old.
5. Trend display shall be accessible via single keystroke from process graphic screen.

E. Graphic Screen

Provide graphic screens as listed below for operator interface. These screens are the minimum required, additional screens may be required during software development based on process requirements, and shall be determined at time of notice to proceed, or any time after.

1. Process main screen: This screen shall appear first whenever system starts. The main screen shall give graphic over-view of the process and give operator the ability to go to any other screen.
2. Process screens: These screens shall provide operator the ability to control the plant operation and view all critical parameters and alarms. Graphic shall be based on Piping and Instrumentation Diagrams P-3 through P-7.
3. Analog input set-point screen: This screen shall provide operator ability to change set points of all analog inputs.
4. Flow totalizer screen: This screen shall show daily and to date total flow.
5. Pump run time totalizer screen: This screen shall show all pumps run time totalized. Provide reset button with date.

F. General programming guidelines

1. All alarm conditions shall be visibly displayed on the cathode ray tube (CRT) screen as well as logged in the hard disc and shall remain active until acknowledged by the operator.
2. Provide adjustable timers for alarm display points to prevent nuisance alarm. Timer values shall be 0-60 seconds. Initial setting, unless otherwise specified, shall be 5 sec.
3. Unless otherwise specified in logic description, following timer values to generate equipment fail alarms:
 - a. Valve fail to open: 60 sec.
 - b. Valve fail to close: 60 sec.
 - c. Equipment fail to start: 60 sec.

4. All digital alarms or interlock signal shall be fail safe, i.e. contact opens for alarm or shutdown, unless otherwise noted.
5. For shutdown or permissive interlock (i.e. High-High level) signal from analog input, provide dead-band in signal to prevent rapid recycling of the pump due to fluctuation of signal. For example, pump will shutdown at 80 inches of water level and will restart automatically at 70 inches of water level, dead-band provided = 10 inches).
6. For shutdown or permissive interlock (i.e. High-High level) signal from digital input, provide time delay after shutdown for automatic restart of the pump to prevent rapid recycling due to signal fluctuation.
7. In 'AUTO' position of the soft 'MAN-AUTO' control station, motor shall start and stop based on the logic description. In 'MAN' position operator will use soft 'START-STOP' push-button, the start signal shall be momentary contact, in 'MAN' position only auto start signal will be by-passed.
8. Switch-over of 'MAN-AUTO' switch from 'MAN' to 'AUTO' or 'AUTO' to 'MAN' shall not stop the motor if interlocks are satisfied.
9. Operational status display of the equipment shall be provided on the personal computer (PC) graphics. Typically running equipment will be displayed green and red if stopped.
10. Electrically actuated ON-OFF valves will be displayed green if it is open and red if it is closed. In addition modulating control valves shall have of percentage of opening as a function of the control signal, i.e. 12 mA control signal is 50% open.
11. Controller shall provide display of process variables, control variable and operator adjustable set-point.
12. All soft switches set-points generated by the analog signal shall be operator adjustable.

G. Password

Provide password protection levels for operation at the computer. Password protection shall consist of two levels.

1. Operator - Password entry required. Parameters, which can be changed at this level, include:
 - Access to all graphic screens.
 - Switch from manual to automatic control.
 - Manual control of equipment.
2. Supervisor - Password entry required. Parameters, which can be changed at this level, include:
 - Alarm and/or interlock set-points generated from analog signals.
 - Process set-points for controller.
 - Exit from run-time operation of Process Control System software.
 - Access to all software programming functions, i.e. strategy building, configuration etc.

H. Automatic Shutdown and Automatic Restart

1. Upon system power-up, the General Purpose Computer and PLC component shall perform necessary start-up diagnostics functions to PC and PLC to begin operation if all components are in good working order. All 'AUTO' 'MAN' switches will come up in 'MAN, mode. Operator will bring the plant to operation.
2. When power failure occurs at the Motor Control Center (MCC) for more than 30 minutes, the PC shall notify the Operator and remote office via an auto-dialer (beeper), record the date and time of the power failure in the alarm log.

During power failure at the MCC, all motors will stop and plant will shutdown. A UPS will provide power to the PC/PLC for 15 minutes. If within 15 minutes power is restored, all motors running in "AUTO" mode before shutdown shall re-start automatically and plant operation will be resumed. In case of power failure of more than 15 minutes, the PC/PLC shall safely stop the application program, which will shutdown the plant and exit to the disc operating system (DOS) prompt. When power is restored, the Operator will restart the application program and bring the plant to operation.

3. Controlled exit from run time software shall not affect the plant operation.

2.4 CONTROL LOGIC DESCRIPTION.

The following section describes the logic sequence of the Water Treatment System.

A. Water Recovery Wells

The water recovery system consists of two wells (RW-1 and RW-2) located along Seaford Oyster Bay expressway. Each well will have a submersible electric pump with variable speed drive (VSD) motor, which will pump water from the well to the equalization tank T1.

Level transmitter will monitor the water level in the well, it will send 4-20 mA (analysis indication, AI) signal to the PLC. Level will be displayed at the HMI. Three operator adjustable soft switches (level switch low [LSL], level switch high [LSH] and level switch low-low [LSLL]) will be generated in HMI. LSLL will display alarm at HMI.

Well pump will have AUTO-MAN switch in HMI

Man position – Soft START-STOP button will control the pump. All soft interlocks are by-passed.

Auto position – Pump will automatically start on high level (LSH) and stop on low level (LSL) in well. Pump will automatically shut down on any of the following conditions:

1. High-High level in Equalization Tank T1, reset on High level.
2. Fire Alarm
3. Effluent High and Low pH (ASH-101, ASL-101)

Well pump VSD will receive start-stop signal (DO) and 4-20 ma signal (AO) for speed control from the PLC and will send run signal (DI) and 4-20 ma signal (AI) to the PLC/HMI for run and speed indication.

Speed indication controller (SIC) will control the speed of well pump to maintain the operator selected speed.. Controller will display process and set variable bar charts and pump speed indication.

A hard wired interlock will be provided to shutdown well pump for High-High level (LSHH-101) in equalization tank.

A magnetic flow meter (FQIT-101 and 102) will monitor total influent water flow from each well to the Equalization tank, it will send 4-20 ma signal (AI) to the PLC, HMI will display, totalized and record the flow rate as system INFLUENT FLOW RATE.

B. Equalization Tank ‘T-1’

Water will flow from recovery wells to the Equalization tank.

Mixer M-1 is used to maintain suspension of groundwater to help avoid settling of solids at the bottom of the tank.

Mixer will have soft ‘AUTO-MAN’ selector switch in HMI.

Man Position – Soft ‘START-STOP’ button will control the mixer. All interlocks will be bypassed.

Auto Position – Mixer will automatically shutdown on any of the following conditions:

1. Equalization tank low-low level.
2. Fire Alarm

Mixer motor starter will receive start-stop signal (DO) from the PLC and will send run signal (DI) to the PLC/HMI for run indication.

Level transmitter LIT-103 will monitor water level in equalization tank and send 4-20 ma signal (AI) to the PLC, level will be displayed at the HMI. Three operator adjustable soft switches (LSL, LSH & LSHH) will be generated in HMI. LSHH-103 will alarm at HMI and it will shutdown the well pumps.

Air stripper feed pump P-3A/B (variable speed drive) will transfer water from the equalization tank to the air stripper. One pump will run and the other pump will be a spare.

HMI will have soft selector switch ‘Pump 3A – Pump 3B’ for selection of the pump. Operator will select the pump manually. Each pump will have soft ‘AUTO-MAN’ selector switch in HMI.

Man Position – Soft ‘START-STOP’ button will control the pump. All interlocks will be bypassed.

Auto Position – Pump will automatic start on High Level (LSH-105) and stop on Low Level (LSL-105). Pump will automatically shutdown on any of the following conditions:

1. Air stripper sump High-High Level (LSHH-105), reset on High Level (LSH-105).
2. Fire Alarm
3. Blower B-1 shutdown
4. Effluent High and Low pH (ASH-101, ASL-101).

Air stripper feed pump VSD will receive start-stop signal (DO) and 4-20 ma speed control signal (AO) from the PLC (FIC-103). VSD will send run signal (DI) and 4-20 ma speed indication signal (AI) to the PLC/HMI for run and speed indication.

Local Ph probe AE/AIT-101 will monitor the influent water Ph in equalization tank. It will send 4-20 ma signal (AI) to the PLC/HMI for indication only.

A magnetic flow meter that is a flow indicator transmitter (FIT-103) will monitor water flow from equalization tank to air stripper, it will send 4-20 ma signal (AI) to the PLC for indication and for flow controller. FIC (PID control) flow indicator controller will control the speed of air stripper feed pump to maintain operator selected flow. Controller will display process and set variable bar charts and pump speed indication. Controller will have soft 'AUTO-MAN' selection switch.

Man Position – Operator will select controller output (0-100 %).

Auto Position – Controller will send 4-20 ma signal (AO) to the variable speed drive of pump P-3A/B to control speed of motor, to maintain operator selected flow rate.

C. Air Stripper AS-1

The water from the equalization tank will be transferred to the air stripper via feed pump P-3A/B, where volatile organic compounds are stripped from the water via induced draft, counter current air flow from blower B-1.

Level transmitter LIT-105 will monitor the water level in air stripper sump and send 4-20 ma signal (AI) to the PLC, level will be displayed at controller LIC-105 in HMI. Four operator adjustable soft switches (LSHH, LSH, LSL & LSL) will be generated in HMI. LSHH will alarm at HMI and it will shutdown all well pumps. LSL will alarm at HMI.

Level controller LIC-105 (PID control) will control the speed of air stripper pump P-4A/B to maintain the operator selected water level in air stripper sump. Controller will display process and set variable bar charts and pump speed indication. Controller will have soft MAN-AUTO selector switch.

Man Position – Operator will select controller output (0-100 %).

Auto Position – Controller will send 4-20 ma signal (AO) to the variable speed drive of pump P-4A/B to control speed of motor, to maintain operator selected water level in air stripper sump.

Liquid carbon feed pump P-4A/B (variable speed drive) will transfer water from air stripper sump to the liquid carbon via particulate filter. One pump will run and the other pump will be a spare.

HMI will have soft selector switch 'Pump 4A – Pump 4B' for selection of the pump. Operator will select the pump manually. Each pump will have soft 'AUTO-MAN' selector switch in HMI.

Man Position – Soft 'START-STOP' button will control the pump. All interlocks will be bypassed.

Auto Position – Pump will automatically start on High Level (LSH) and stop on Low Level (LSL). Pump will automatically shutdown on any of the following conditions.

1. Injection well High-High Level (LSHH-105), reset on High Level (LSH-105).

2. Fire Alarm
3. Blower B-1 shutdown
4. Effluent High and Low pH (ASH-102, ASL-102).

Liquid carbon feed pump VSD will receive start-stop signal (DO) and 4-20 ma speed control signal (AO) from the PLC (FIC). VSD will send run signal (DI) and 4-20 ma speed indication signal (AI) to the PLC/HMI for run and speed indication.

Some water will re-circulate back to equalization tank T-1. Flow transmitter FT-106 will monitor the water backflow. It will send 4-20 ma signal (AI) to the PLC/HMI for indication and totalization.

D. Particulate Bag Filters F-1A & F-1B

Effluent water from air stripper AS-1 will be transferred to particulate bag filters to remove fine particles.

Filtration system will have two filter units working in parallel.

High differential pressure switch PDSH-117 will monitor the differential pressure across the both filter. On high pressure, it will send signal (DI) to the PLC/HMI for alarm.

E. Liquid Phase Granular Activated Carbon Adsorbers LGAC-1 and LGAC-2

Water from particulate filters F-1A/B will pass through carbon adsorbers for removal of organics from the water prior to the discharge in injection well IW-1.

High differential pressure switch PDSH-118 will monitor the carbon vessel inlet/outlet differential pressure. On high pressure (100 psi), it will send a signal (DI) to PLC/HMI for alarm.

F. Chemical Feed System

Sodium Hydroxide feed system will consist of a 55 gallon storage tank T-2 and hydroxide feed pumps P-6A and 6B (one pump will be installed spare)

Low level switch LSL-102 will monitor the caustic level in the tank. On low level, it will send signal (DI) to the PLC/HMI for alarm.

Local controller AIC-102 will monitor the pH level of effluent water before discharge in to the injection wells. Controller will have pH indication and operator adjustable set point for high and low pH (6.2 – 8.2 pH). Based on current pH reading it will send proportional pulse signal to the caustic feed pump P-6A/B to control number of stroke to control amount of caustic injection. Controller will send 4-20 ma signal (AI) to the PLC/HMI for PH indication. Two operator adjustable soft switches (ASH-102 and ASL-102) will be generated in HMI for alarm and **will shutdown the plant**.

G. Injection Wells IW-1, IW-2, IW-3 and IW-4

Effluent water from liquid carbon will be injected in to the recovery wells IW-1, IW-2, IW-3 and IW-4.

A magnetic flow meter (FQIT-109) will monitor total effluent water flow from liquid carbon to the injection wells, it will send 4-20 ma signal (AI) to the PLC, HMI will display, totalized and record the flow rate as system EFFLUENT FLOW RATE to the Injection wells.

A magnetic flow meter (FQIT-108) will monitor total influent water flow from liquid carbon to bypass discharge, it will send 4-20 ma signal (AI) to the PLC, HMI will display, totalized and record the flow rate as system EFFLUENT FLOW RATE to the bypass.

Level transmitter (LT-106, 107, 108, 109) will monitor the water level in each well, it will send 4-20 ma signal to the PLC/HMI for level indication and high-level alarm.

H. Air Stripper Blower B1

Air stripper blower B1, with Variable Speed Drive (VSD) motors, blows air through the air stripper to strip organic compounds via induced draft, via counter current air flow.

Air stripper blower will **start first** followed by the all other pumps in auto position.

Vacuum switch PSL will monitor air pressure at the inlet of the blower, it will send signal (DI) to the PLC/HMI for alarm on low vacuum and it will shutdown the blower. Provide soft reset and activate interlock only when blower is running,

Blower VSD will have Local – Remote selection in operator interface mounted on the door of VSD.

Local Position – Blower start-stop and speed will be controlled from the local operator interface pad.

Remote Position – Blower will be controlled from the PLC/HMI.

Each blower will have soft MAN-AUTO selector switch in the HMI.

Man position – Soft START-STOP button will control the blower, all interlocks are by-passed.

Auto position – Blower will start and it will automatically shutdown on any of the following conditions:

1. Air stripper sump level High-High (LSHH-105), reset on high level (LSH-105).
2. High discharge vapor temperature (TSH-101) provides soft reset.
3. High discharge pressure (PSH-102) provide soft reset
4. High differential pressure across the Air Stripper (DPSH-101).
5. Effluent High and Low pH (ASH-102, ASL-102).

Blower motor VSD will receive start-stop signal (DO) and 4-20 mA speed control signal (AO) from the PLC and will send run signal (DI) and 4-20 mA speed indication (AI) to the PLC/HMI for indication.

High temperature switch (TSH-101) will monitor the discharge air temperature from the blower and send signal (DI) to the PLC/HMI for alarm and shutdown the blower on high temperature. Provide soft reset for interlock.

High pressure switch (PSH-102) will monitor the discharge air pressure from the blower and send signal (DI) to the PLC/HMI for alarm and shutdown the blower on high pressure. Provide soft reset for interlock.

Flow transmitter FIT-105 will monitor air flow from the blower to the air stripper. Transmitter will send 4-20 mA signal (AI) to the PLC/HMI for indication.

High differential pressure transmitter DPTI-101 will monitor the differential pressure across Air Stripper and send 4-20 mA signal (AI) to the PLC/HMI for indication and alarm. High differential pressure (DPSH-101) will shutdown the blower B-1.

I. Air Stream Heater H-1

Air stream heater H-1 will heat the stripped air to bring the temperature at 110 degree F, before entering the vapor phase carbon for removal of moisture in the air.

Heater H-1 will have local control panel. Silicon control rectifier (SCR) will control current through heater element to maintain set temperature of air. Temperature controller and indicator will be mounted on the panel.

Control panel will send and receive the following signals from plant PLC:

1. Remote shutdown signal (DI) from PLC, on blower shutdown and fire alarm.
2. Heater on signal (DO) to the PLC.
3. Heater trouble (DO) to the PLC.
4. Heated air stream 4-20 mA signal (AI) to the PLC for temperature indication and low temperature alarm.

J. Vapor Phase Carbon VGAC-1, VGAC -2 and VGAC-3

Stripped air from air stripper passes through carbon adsorber for removal of organics from the air prior to discharge to the atmosphere via exhaust stack.

2.5 AUTO DIALER ALARMS

A. The following alarms are priority 1 category, and shall be transmitted to remote location via Auto dialer:

1. Well pump RW-1 shutdown.
2. Well pump RW-2 shutdown.
3. Air Stripper blower B-1 shutdown
4. Building sump High-High Level
5. Fire alarm.
6. High ph
7. Low ph
8. Spare.

2.6 FACILITY OPERATION

- A. The vapor treatment facility is intended to operate continuously. Periodic shutdown/startup and temporary operations may be required for routine maintenance and/or automatic equipment shutdown.
- B. The Piping and Instrumentation Diagrams along with the above control system and logic description provide the basis for the treatment facility operation.
- C. All operations of the plant process equipment shall be performed at the HMI except for those operations described as local-manual in nature.

2.7 QUALITY ASSURANCE

- A. The Subcontractor shall have a quality assurance program, which will ensure that the equipment and services provided, will properly reflect the specification requirements. The program shall cover, at a minimum, the following areas:
 - 1. Design and procurement control.
 - 2. Control of purchased material.
 - 3. Inspection and testing.
 - 4. Handling and storage.
 - 5. Corrective action.

PART 3. EXECUTION

3.1 ENVIRONMENTAL CONDITIONS

The Main Control (I/O) Cabinet, HMI, and peripherals will be located in an air-conditioned control room environment. However, the equipment supplied shall be able to operate safely and continuously within the specified accuracy and reliability with the air conditioning/heating system out of service for short duration (8-16 hours) with the approximate extreme conditions indicated below.

	<u>Normal Condition</u>	<u>Extreme Condition</u>
Temperature:	70-78°F	5-100°F
Humidity (non-condensing):	60% RH	5-100% RH

3.2 INPUT/OUTPUT HANDLING

- A. Point Identification - Each system addressable point shall have a unique identification number assigned by the Supplier, which will not exceed twelve alpha/numeric characters. The identification number will be same as the instrument tag number whenever possible and will be used by the operator to address point data. In addition, a twenty-four character (minimum) abbreviated English description of each point shall be part of the database. It shall be possible for the operator to easily modify point identification numbers and descriptions in the future as required.

- B. I/O List - A specific I/O list including range, units, point type etc. will be provided to the Supplier prior to the start of final system engineering. This list is not intended to include the specific requirements of the Supplier. The Supplier is required to compile an I/O assignment list for review. Any I/O required by the vendor to implement the scope of this system such as analog to digital converter check points, system alarms, cold junction compensation, and power supply voltage checks shall be provided in addition to the quantity of inputs and outputs specified by the Contractor. The Contractor will not be responsible for filling out the Supplier's keypunch or similar coding forms. Ranges, functions, and other information will be provided to the Supplier.

3.3 ERECTION/INSTALLATION SUPPORT

- A. Factory supported start-up service personnel is required. This support includes inspection of the equipment installation to insure it is installed in accordance with the manufacturer's recommendations. Check the control system hardware and software configuration, make tuning adjustments necessary to place the system in trouble free operation and instruct the operating personnel in the proper operation and maintenance of the equipment furnished.
- B. The Subcontractor shall allow minimum of 5 days for loop check and start-up service time to perform functions described above to the Contractor's satisfaction. If this service time is completed in less than the schedule service time allotted, then start-up personnel can be released early. The only valid charge for extra service would be if service personnel had completed the start-up service but was requested to remain on site and unit start-up was delayed by circumstances beyond the Supplier's control.

3.4 FIELD CALIBRATION AND LOOP CHECKS

- A. Field Instruments Calibration - Installed instruments shall be calibrated to the ranges specified in the instrument index (see Section 13650, Table 13650-1) and following the manufacturer's recommended practices and with required calibration equipment. Most instruments are supplied factory calibrated with the exception of the level, pH, and certain flow instruments. Factory calibrated instruments shall be checked to make sure their ranges, spans and field adjusted set points are as specified. Adjustments in accordance with the manufacturer's instructions shall be made to meet the required specifications.
- B. Complete (fill in) field calibration data sheets for each instrument shall be submitted for records.
- C. Loop checks shall be performed with the fully operational control system in co-ordination with the Electrical subcontractor and Calibration contractor (if separate than control system Supplier).

3.5 TESTING AND INSPECTIONS

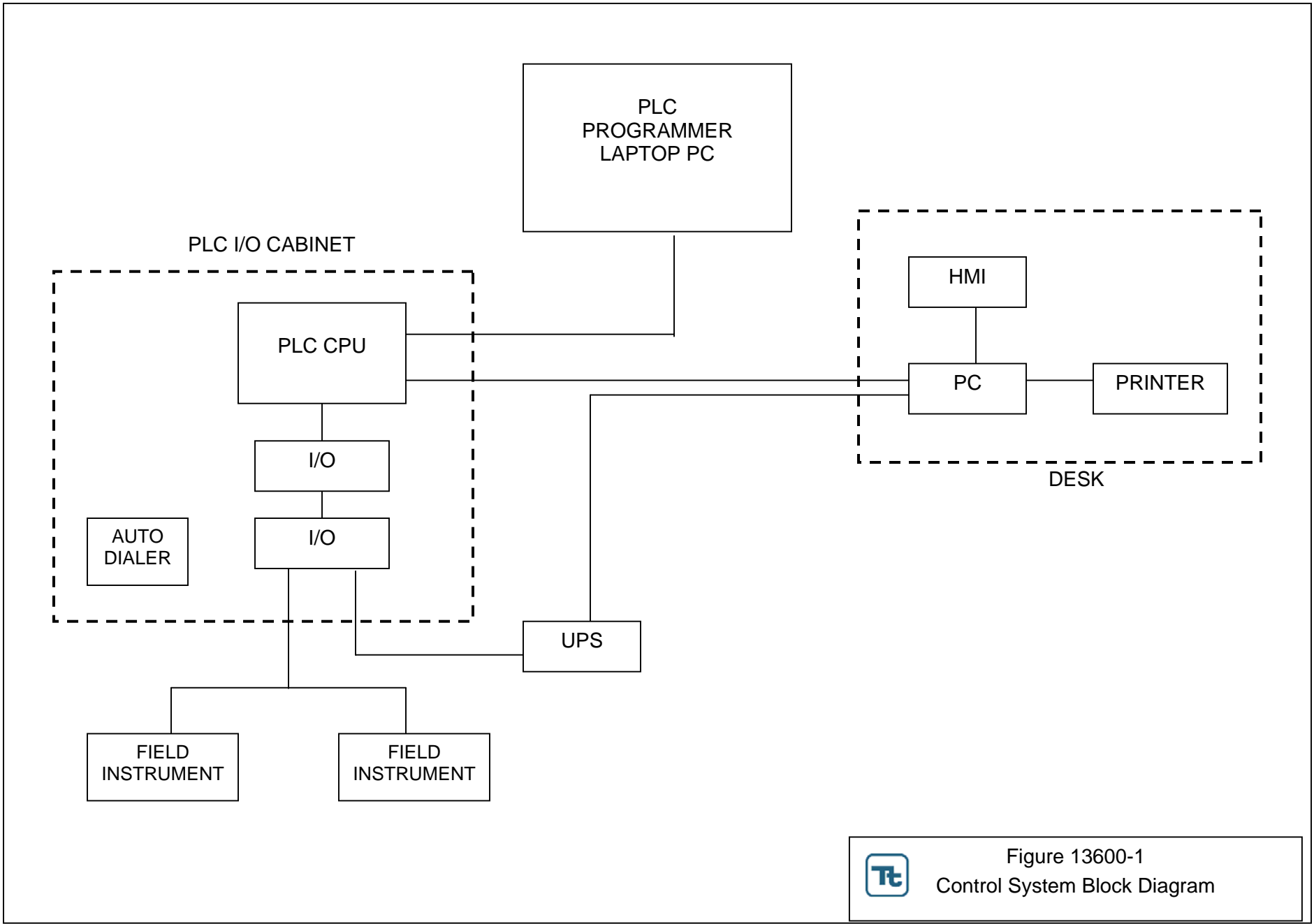
- A. During the course of fabrication, the Supplier shall inspect and test the equipment for materials, connections, assembly, workmanship, completeness, proper operation and strict conformance to this specification and approved design drawings. The Supplier shall have the right to inspect for quality control, including calibration records of test equipment, at any time. In addition to the Supplier ongoing tests and inspections, a demonstration test and a site acceptance test shall be performed.
- B. Prior to shipment of control system equipment to the job site, but upon completion of system fabrication, software implementation and documentation reflecting the current system, the Supplier shall perform a demonstration test to the satisfaction of the Supplier. In the event that


complete test cannot be performed due to shipment of the control panel at the site before software completion, partial test shall be performed at the factory and complete operational test will be performed at the job site. Any deficiency found during test in the field shall be corrected by the Supplier at it's own time and expense.

- C. The various tests performed during the witnessed factory test shall be designed to demonstrate that hardware and software fulfill all the requirements of the specifications. The test conditions shall resemble, as closely as possible, the actual installed conditions. Any additional hardware or software that may be required to successfully verify system operation shall be supplied at no cost to the Contractor.
- D. Some of the test to be performed shall include but not limited to the following:
 - 1. Building and loading the System database.
 - 2. Conduct on-line modifications to the database.
 - 3. Demonstrate operability of the interfaces (hardware and software).
 - 4. Demonstrate operability of the data communication network.
 - 5. Verify the screen displays and interactive capabilities of the operator's console.
 - 6. Simulate selected operating conditions to verify the performance of the monitoring and control functions.
 - 7. Generate reports using test data.
- E. During the test, the Contractor shall have unrestricted access to the system, and all faults identified during this period shall be corrected and re-tested prior to completion of factory test. All test data and procedures followed during testing shall be logged, and certified copies of logs shall be provided to the Contractor.
- F. The Supplier shall notify the Contractor a minimum of 15 days in advance of his proposed starting date of the witnessed factory test. At the time of notification, the Supplier shall submit a detailed test procedure for approval by the Contractor.

3.6 TRAINING

- A. The cost of training programs for two persons shall be included in the Contract price, to be conducted with designated operations personnel, covering programming, operation, and maintenance of the system as specifically set forth hereinafter. The training and instruction, insofar as practicable, shall be directly related to the system being supplied hereunder. The training programs shall include a field-training program consisting of hands-on instruction utilizing the operating system.
- B. The field training program shall be run at the treatment plant and consist of two days of instruction for the operations personnel covering system operation, system debugging, program modification, troubleshooting and maintenance procedures. This training program will be run at a time chosen by the Contractor and will be during start-up service time unless otherwise noted.



 Figure 13600-1
Control System Block Diagram

**TABLE 13600-1
I/O LIST**

TAG NO.	INSTRUMENT DESCRIPTION	I/O TYPE	REMARK
LT-101	Recovery Well 'RW-1' Level Transmitter	AI	
LT-102	Recovery Well 'RW-2' Level Transmitter	AI	
MC-P1	Well 'RW-1' Pump P-1 Control	DO	
MI-P1	Well 'RW-1' Pump P-1 Run Indication	DI	
SC-P1	Well 'RW-1' Pump P-1 Speed Control	AO	
SI-P1	Well 'RW-1' Pump P-1 Speed Indication	AI	
MC-P2	Well 'RW-2' Pump P-2 Control	DO	
MI-P2	Well 'RW-2' Pump P-2 Run Indication	DI	
SC-P2	Well 'RW-2' Pump P-2 Speed Control	AO	
SI-P2	Well 'RW-1' Pump P-2 Speed Indication	AI	
LSL-102	Sodium Hydroxide Tank 'T6' Low Level Switch	DI	
AIT-102	Effluent water pH Transmitter	AI	Signal from Local PH Controller AIC-102
LIT-103	EQ Tank 'T-1' Level Transmitter	AI	
LSHH-101	EQ Tank 'T-1' HI-HI Level Switch	DI	
FQIT-101	Recovery Well RW-1 Flow Transmitter	AI	Magmeter, 4 wire transmitter
FQIT-102	Recovery Well RW-2 Flow Transmitter	AI	Magmeter, 4 wire transmitter
MC-P3A	Air Stripper 'AS-1' Feed Pump P-3A Control	DO	
MI-P3A	Air Stripper AS-1 Feed Pump P-3A Run Indication	DI	
SC-P3A	Air Stripper AS-1 Feed Pump P-3A Speed Control	AO	
SI-P3A	Air Stripper Feed Pump P-3A Speed Indication	AI	
MC-P3B	Air Stripper 'AS-1' Feed Pump P-3B Control	DO	
MI-P3B	Air Stripper AS-1 Feed Pump P-3B Run Indication	DI	
SC-P3B	Air Stripper AS-1 Feed Pump P-3B Speed Control	AO	
SI-P3B	Air Stripper Feed Pump P-3B Speed Indication	AI	
FQIT-103	Air Stripper 'AS-1' Inlet Flow Transmitter	AI	Magmeter, 4 wire transmitter
LT-104	Building Sump Level Transmitter	AI	
MC-P5A	Building Sump Pump P-5A Control	DO	
MI-P5A	Building Sump Pump P-5A Run Indication	DI	
MC-P5B	Building Sump Pump P-5B Control	DO	
MI-P5B	Building Sump Pump P-5B Run Indication	DI	
AIT-101	Influent water pH Transmitter	AI	

**TABLE 13600-1
I/O LIST**

TAG NO.	INSTRUMENT DESCRIPTION	I/O TYPE	REMARK
MC-B1	Air Stripper 'AS-1' Blower B-1 Control	DO	
MI-B1	Air Stripper AS-1 Blower B-1 Run Indication	DI	
SC-B1	Air Stripper AS-1 Blower B-1 Speed Control	AO	
SI-B1	Air Stripper AS-1 Blower B-1 Speed Indication	AI	
PSL-102	Blower B-1 Discharge Low Pressure Switch	DI	
PSH-102	Blower B-1 Discharge High Pressure Switch	DI	
FQIT-105	Blower B-1 Discharge Air Flow Transmitter	AI	
DPIT-101	Air Stripper Differential Pressure Transmitter	AI	
LIT-105	Air Stripper Sump (Inner) Water Level Transmitter	AI	
LSH - 101	Air Stripper Holding Sump	AI	
MC-P4A	Liquid Carbon LGAC Feed Pump P-4A Control	DO	
MI-P4A	Liquid Carbon Feed Pump P-4A Run Indication	DI	
SC-P4A	Liquid Carbon Feed Pump P-4A Speed Control	AO	
SI-P4A	Air Stripper Feed Pump P-4A Speed Indication	AI	
MC-P4B	Liquid Carbon LGAC Feed Pump P-4B Control	DO	
MI-P4B	Liquid Carbon Feed Pump P-4B Run Indication	DI	
SC-P4B	Liquid Carbon Feed Pump P-4B Speed Control	AO	
SI-P4B	Air Stripper Feed Pump P-4B Speed Indication	AI	
FQIT-106	Air Stripper Discharge Water Feedback to EQ Tank	AI	
FQIT-108	Effluent Groundwater Discharge to Bypass Flow Transmitter	AI	
FQIT-109	Effluent Groundwater Discharge to Injection Wells Flow Transmitter	AI	
LT-106	Injection Well 'IW-1' Level Transmitter	AI	
LT-107	Injection Well 'IW-2' Level Transmitter	AI	
LT-108	Injection Well 'IW-3' Level Transmitter	AI	
LT-109	Injection Well 'IW-4' Level Transmitter	AI	
PDSH-117	Particulate Filtration unit diff pressure switch	DI	
PDSH-118	Liquid Phase carbon diff pressure switch	DI	

SECTION 13650

INSTRUMENTATION

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

This specification covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the Instrumentation package.

It is not the intent of this specification to provide all details of design and fabrication. It shall be the responsibility of the Subcontractor to provide equipment that has been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship and that is suitable for the specified service.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Specifications and Drawings.

See Instrumentation Index, Table 13650-1, for list of instruments.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 13600	Process Control System
Section 16000	Basic Electrical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designations only. In case of contradiction, the most stringent code applies.

AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)

ANSI S50.1	Compatibility of Analog Signals for Electronics Industrial Process Instruments.
ANSI C2	National Electrical Safety Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	National Electrical Code (NEC)
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INSTRUMENT SOCIETY OF AMERICA (ISA)

RP 55.1	Hardware testing of Digital Process Computers
RP 12.6	Installation of Intrinsically Safe Instrument System in Classified Location

NATIONAL ELECTRICAL MANUFACTURING ASSOCIATION (NEMA)

ICS 6 Enclosure for Industrial Controls and systems

FEDERAL COMMUNICATION COMMISSION RULES AND REGULATIONS (FCC)

FCC Part 15 Radio Frequency Devices

1.2 SUBMITTALS

The Subcontractor shall submit five copies of the following to the Contractor

- A. Subcontractor shall submit, in the manner and within the time line as set forth in the Contract Documents, the items listed herein for all the equipment and materials furnished under this section.
- B. The Subcontractor's shop drawings shall be direct reading reproducible able to produce clear sharp, and legible prints. Fabrication of the equipment shall not be started until the Subcontractor has received written drawing review approvals from the Contractor in accordance with the submittal register developed for the instrumentation.
- C. Submittals to be provided include:
 - 1. Shop drawings outlining overall dimensions, connection details, weights, and arrangement of functional parts. Installation requirements including type and location of loading, and size and material of anchor bolts. Detailed drawings and installation instructions for any special requirements for handling, storing and final erection of instruments and systems.
 - 2. A complete set of recommended spare parts based on the equipment literature.
 - 3. Instrument Calibration sheets.
 - 4. Operation and Maintenance Manual including equipment manuals, maintenance procedures, testing, lubrication requirements, preventive maintenance matrix, list of spare parts, and trouble shooting instructions and warranties.

1.3 PERFORMANCE REQUIREMENTS

- A. Instrumentation specified herein shall be designed in accordance with high engineering standards and capable of performing the desired tasks. Each instrument shall be supplied with a stainless steel name tag, which shall include the full tag number of the instrument as shown on the Piping and Instrumentation Diagrams and/or Table 13650-1. Each instrument shall be factory calibrated to the maximum extent possible. Calibration sheets, certifications and instructions shall be provided with each instrument.
- B. Instruments shall be rated for general purpose except when located in Class I, Division 2 environments.

PART 2. PRODUCTS

2.1 EQUIPMENT INSTRUMENTATION

- A. Local pressure (and vacuum) gages and indicators shall be direct reading gauges, 4-1/2 inch face diameter with a low internal volume spiral/helical bourden tube type with solid front and rear

- blow. Gauge case shall be PET resin with 316SS tube and socket. Gauges shall conform to ANSI B40.1 (Grade A). Gauges shall be tapped 1/2 inch national pipe thread (NPT) to bottom connection and shall be provided with a 304SS diaphragm type chemical seal tapped 1/2 inch by 1/2 inch. Pressure gauge dial ranges shall be as required for each application. Gauges shall be as manufactured by AMETEK or Contractor approved equal.
- B. Differential pressure transmitters/indicators shall be diaphragm operated with sensing element motion restrained by a calibrated spring affixed with a strain gage transducer. Electrical signal shall be internally conditioned to a two wire standard 4-20 mA isolated control loop output. Transmitter shall have a local pointer indication of sensed pressure with a white dial, black figures and graduations and pointer zero adjustment. The instrument range shall be as shown on the Contract Drawings. Transmitter shall be Dwyer Instruments, Inc. or Contractor approved equal.
 - C. Local airflow meters/transmitters/indicators shall be mass flow meter type calibrated for a flow range as shown in Table 13650-1, Instrument Index. Flow element material shall be stainless steel with operating range of 0-250 degree F and up to 200 psig. Transmitter shall be capable of a standard, isolated 4-20 mA output. Electrical enclosure shall be NEMA 4 housing. Unit shall include local flow indication displayed as either mass flow, velocity or volume flow. Indicator shall be integral with sensor. Unit shall operate on 110 volts alternating current (VAC) power. Flow sensor insertion length shall be as required to operate in a 6 or 12 inch PVC duct line. Connection shall be a compression type fitting 3/4" NPT. Unit shall be manufactured by FCI or Contractor approved equal.
 - D. Temperature indicators/transmitters shall utilize a solid-state sensor and shall be enclosed within a NEMA 4X housing. The unit shall have an integrally mounted sensor and transmitter capable of a 4-20 mA isolated output adjustable to any 20 degree C span up to 0 to 90 degree C. Accuracy shall be within +/- 1 degree C. Unit shall be manufactured by Signet or Contractor approved equal.
 - E. Level switches shall be specific gravity compensating switches with continuous buoyancy control switch activation at the water interface for liquids with a specific gravity between 0.6 and 1.5. Unit shall have a 15 amp 115 VAC single pole, double throw (SPDT) switch action with relays. Housing shall be a NEMA 4 cover with corrosion resistance fiberglass and reinforced plastic cover and body. Unit shall be constructed of a 316 stainless steel float shaft and a Fortron (PPS) body, float and busing. All seals shall be Viton. Unit shall be as manufactured by Gems or Contractor approved equal.
 - F. Solenoid valves shall be designed for their intended use, i.e., water or air service and shall be constructed of stainless steel and, where appropriate, seals and discs shall be Kynar or Viton. Valves shall include standard NEMA 4X general purpose and watertight enclosure. Coil shall be rated for continuous duty, molded Class F. Operating electrical shall be 110 VAC. Units shall be CSA certified and Underwriters Laboratory (UL) listed general-purpose valves. Valve shall be two-way or three-way as shown on the Piping and Instrumentation Diagrams (P&ID's). Valves as manufactured by ASCO or Contractor approved equal.
 - G. Temperature switches shall be designed for their intended use and include a NEMA 4 enclosure suitable for outdoor installation. Units shall include heavy-duty hermetically sealed switch narrow deadband and be suitable for temperatures up to 200°F. The set point temperatures shall be fully adjustable over the entire range. Tubes shall be constructed of inconel and include 3/4-

inch NPT 316 stainless steel thermowell. Units shall be FM approved and operated on 115 VAC. Units as manufactured by Ashcroft Instruments or Contractor approved equal.

- H. Pressure switches shall be designed for their intended use and include a NEMA 4 enclosure suitable for outdoor installation. Unit shall include heavy-duty hermetically sealed switch with narrow band, type C contact, 5A, 120 Volt rated. The set point pressure shall single fully adjustable setpoint over the entire range. Unless otherwise noted switch shall be calibrated to operate on rising pressure. Actuator shall be suitable for temperature up to 200 degree F. Process connection ¼ inch NPT.
- I. Extraction well level transmitters/elements shall be absolute pressure transducer type with a multi-conductor black polyurethane jacketed cable with stretch resistant stringer and sealed air vent tube. Unit shall be capable of field calibration. Transmitter shall be capable of an isolated, standard 4-20 mA signal within 1% accuracy. Casing material shall be 316 stainless steel and Hastelloy C for resistance to corrosion and wear. Unit gage range shall be required based on the depth of wells. Maximum span shall not exceed more than 150% the total monitoring depth of the well. Units shall be as manufactured by KPSI or equal.
- J. Magnetic type flow meters with local indication and integral transmitters shall be rated for a minimum flow of <1 ft/sec, and wafer connections. The transmitters shall be micro processor based, with zirconium electrode material, NEMA 4x classifications, an accuracy of +1% of rate, and 4-20 milliamps direct current (mADC) output. Flow meters and transmitters shall be by Endress Hauser or an approved equal.
- K. Submersion type anti-fouling, pH sensors shall be provided that are highly resistant to iron and metals poisoning and have a measurement range of 0-14 (S.U.) with a 100 psig pressure rating. Materials of construction shall be PES with a ceramic/kynar liquid junction or as specified by the supplier. Sensor cable shall be four conductor; 22 gage with common shield. The pH sensor shall be Rosemount, Signet or approved equal.
- L. Contractor shall provide wall mounted, pH transmitters with 4-20 mADC signal output. The transmitters shall be provided with a NEMA 4X enclosure, an FM/CSA hazardous area classification, a 4-digit liquid crystal display (LCD) read out display, and an 18AWG 2 wire-Beldon 8160 cable. The transmitter shall have a 0-14 pH measurement range, 0.01 pH accuracy, 0.1 stability, oil repeatability and an external zero and span of + 7%. The pH transmitters shall be Rosemount, Signet or approved equal.
- M. Injection well shall be paddlewheel flow sensor type with a sinusoidal frequency capable of driving a self-powered flowmeter. The flow range shall be 1 – 20 ft/sec to allow the sensor to measure liquid flow rates in full pipes and can be used in low-pressure systems. The flowmeter shall be Signet or approved equal.

2.2 ACCESSORIES

Each instrument shall be supplied with a stainless steel tag or equivalent material resistant to wear and abrasion permanently affixed to the instrument such that it is clearly visible but does not interfere with the operation or insulation of the unit. The tag shall include the full instrumentation tag number as shown on the Piping and Instrumentation Diagram.

PART 3. EXECUTION

3.1 INSTALLATION

- A. Perform installation under supervision of competent instrument technicians. Provide components for complete and operational instrumentation system as specified and indicated. Instrument system installation shall provide adequate clearance for instrument maintenance by maintaining access space between piping, equipment, etc. Instrument system installation shall not interfere with clearance requirements for mechanical and electrical system maintenance.
- B. Provide instrument to be installed in piping with required gaskets, flanges, pipe fittings, thermal compound and manual valves for shutoff, equalization and calibration.
- C. Provide sensors in locations to sense the appropriate conditions. Install sensor and transmitter where easily accessible and serviceable without special tools. Install off-line transmitter at grade on 2-inch pipe pedestal (not shown on drawing for purposes of clarity).

3.2 TESTING AND INSPECTIONS

- A. Each instrument component shall be given requisite factory tests and calibrations as necessary to determine that the work and materials are free from defects.
- B. Acceptance tests, after the equipment is completely installed, may be performed to demonstrate performance requirements, as specified herein at the discretion of the Contractor. The field tests will be governed by provisions of applicable industry and institute standards.

3.3 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction as per the Contract Conditions, which shall be for one year after the on-site receipt of all Subcontractor-provided equipment/materials necessary for the installation of all instrumentation. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Subcontractor shall approve of the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. All extended warranties shall be included in the O&M Manual.

TABLE 13650-1
INSTRUMENTATION INDEX

INSTRUMENT TAG	DESCRIPTION	P & ID DWG NO.	MANUFACTURER	MODEL NO.	RANGE	SET POINT	COMMENTS
LT-101	Extraction Well RW-1 Level Transmitter	P-3	KPSI	Series 300S	0 –200 feet		
LT-102	Extraction Well RW-2 Level Transmitter	P-3	KPSI	Series 300S	0-200 feet		
FQIT-101	Extraction Well RW-1 Water Flow Transmitter & Totalizer	P-4	Endress Hauser	Promag 50W	0-1200 GPM		Remote Indicator
FQIT-102	Extraction Well RW-2 Water Flow Transmitter & Totalizer	P-4	Endress Hauser	Promag 50W	0-500 GPM		Remote Indicator
LIT-103	Equalization Tank T-1 Level Transmitter	P-4	DREXELBROOK		0-240 inches		Remote Sensor
LSHH-101	Equalization Tank T-1 High-High Level Switch	P-4	GEM			42 inches from top flange mount	Float Switch, Contact to open on High water Level.
AIT-101	Equalization Tank T-1 PH Transmitter & Indicator	P-4	GF Signet		0-14 S.U.		Submersible Sensor with preamplifier and 50' cable
FQIT-103	Air Stripper Feed Pump Flow Transmitter & Totalizer	P-4	Endress Hauser	Promag 50W	0-1500 GPM		Remote Indicator
PI-101	Extraction Well Pump P-1 Pressure Local Indicator Inside the Bldg.	P-4	Ametek		0-60 PSIG		With Diaphragm Seal
PI-102	Extraction Well Pump P-2 Pressure Local Indicator Inside the Bldg.	P-4	Ametek		0-60 PSIG		With Diaphragm Seal
PI-105A	Air Stripper Feed Pump P-3A Inlet Pressure Indicator	P-4	Ametek		0-30 PSIG		With Diaphragm Seal
PI-105B	Air Stripper Feed Pump P-3A Discharge Pressure Indicator	P-4	Ametek		0-30 PSIG		With Diaphragm Seal
PI-106A	Air Stripper Feed Pump P-3B Inlet Pressure Indicator	P-4	Ametek		0-30 PSIG		With Diaphragm Seal

TABLE 13650-1
INSTRUMENTATION INDEX

INSTRUMENT TAG	DESCRIPTION	P & ID DWG NO.	MANUFACTURER	MODEL NO.	RANGE	SET POINT	COMMENTS
PI-106B	Air Stripper Feed Pump P-3B Discharge Pressure Indicator	P-4	Ametek		0-30 PSIG		With Diaphragm Seal
LT-104	Building Sump Level Transmitter	P-4	DREXELBROOK		0-84 inches		With remote transmitter head
PI-111	Blower B-1 Inlet Pressure Indicator	P-5	Ametek		0-60 i.w. vacuum		
PI-112	Blower B-1 Discharge Pressure Indicator	P-5	Ametek		0-60 i.w.		
PI-113A	Re-Injection Pump P-4A Inlet Pressure Indicator	P-5	Ametek		0-60 PSIG		With Diaphragm Seal
PI-113B	Re-Injection Pump P-4A Discharge Pressure Indicator	P-5	Ametek		0-60 PSIG		With Diaphragm Seal
PI-114A	Re-Injection Pump P-4B Inlet Pressure Indicator	P-5	Ametek		0-60 PSIG		With Diaphragm Seal
PI-114B	Re-Injection Pump P-4B Discharge Pressure Indicator	P-5	Ametek		0-60 PSIG		With Diaphragm Seal
PSL-102	Blower B1 Discharge Pressure Low Switch	P-5	Ashcroft		0-60 i.w.	10 i.w.	
PSH-102	Blower B1 Discharge Pressure High Switch	P-5	Ashcroft		0-100 i.w.	75 i.w.	
FQIT-105	Air Stripper Blower B1 Discharge Air flow Transmitter	P-5	FCI	ST98	0-12,000 CFM		24 inch Al air duct (square)
TI-101	Blower B1 Discharge Air Temperature Indicator	P-5	AMETEK		0-200 F		
DPIT-100	Air Stripper Differential Pressure Transmitter	P-5	Dwyer		0-20 i.w.	12 i.w.	
FQIT-106	Injection Pump P-4 Re-circulation, Water Flow Transmitter & Totalizer	P-5	Endress Hauser	Promag 50W	0-150 GPM		Remote Indicator
LIT-105	Air Stripper Sump Level Transmitter	P-5	Drexelbrook				

TABLE 13650-1
INSTRUMENTATION INDEX

INSTRUMENT TAG	DESCRIPTION	P & ID DWG NO.	MANUFACTURER	MODEL NO.	RANGE	SET POINT	COMMENTS
FQIT-108	Effluent Discharge To Bypass Flow Transmitter & Totalizer	P-6	Endress Hauser	Promag 50W	0-1500 GPM		Remote Indicator
FQIT-109	Effluent Discharge To Injection Well IW-1to4 Flow Transmitter & Totalizer	P-6	Endress Hauser	Promag 50W	0-1500 GPM		Remote Indicator
LT-106	Re-injection well IW-1 Level Transmitter	P-6	KPSI		0-250 feet		
LT-107	Re-injection well IW-2 Level Transmitter	P-6	KPSI		0-250 feet		
LT-108	Re-injection well IW-3 Level Transmitter	P-6	KPSI		0-250 feet		
LT-109	Re-injection well IW-4 Level Transmitter	P-6	KPSI		0-250 feet		
FQI - 110	Re-injection well IW-1 Level Transmitter	P-6	Signet	515 Rotor - X w/ 5090 Flow Monitor	1 - 20 fps		Local Indicator
FQI - 111	Re-injection well IW-2 Level Transmitter	P-6	Signet	515 Rotor - X w/ 5090 Flow Monitor	1 - 20 fps		Local Indicator
FQI - 112	Re-injection well IW-3 Level Transmitter	P-6	Signet	515 Rotor - X w/ 5090 Flow Monitor	1 - 20 fps		Local Indicator
FQI - 113	Re-injection well IW-4 Level Transmitter	P-6	Signet	515 Rotor - X w/ 5090 Flow Monitor	1 - 20 fps		Local Indicator
AIC-102	Effluent Discharge PH Transmitter & Indicator/Controller	P-6	LMI		0-14 pH		
PI-117	Particulate Filter F1, Inlet Pressure Indicator	P-6	Ametek		0-60 PSIG		With Diaphragm Seal
PI-118	Particulate Filter F1, Outlet Pressure Indicator	P-6	Ametek		0-60 PSIG		With Diaphragm Seal
PI-119	Liquid Phase Carbon (LGAC) Inlet Pressure Indicator	P-6	Ametek		0-60 PSIG		With Diaphragm Seal
PI-120	Liquid Phase Carbon (LGAC) Outlet Pressure Indicator	P-6	Ametek		0-60 PSIG		With Diaphragm Seal

TABLE 13650-1
INSTRUMENTATION INDEX

INSTRUMENT TAG	DESCRIPTION	P & ID DWG NO.	MANUFACTURER	MODEL NO.	RANGE	SET POINT	COMMENTS
PDSH 117	Particulate Filtration Unit Diff Pressure Switch	P6	Midwest			30 psig	Pressure indicator with switch
PDSH-118	Liquid Phase Carbon (LGAC) Differential Pressure Switch	P6				15 psig	Supplied By Equipment vendor
LSL-102	Sodium Hydroxide Tank Low Level Switch	P6	GEM			4 inches from bottom	Top Mounted float switch with NO contact
PI-121	Process Air Stream Heater Inlet Pressure Indicator	P-7	Ametek		0-60 i.w.		
PI-122A	Vapor Phase Carbon (VGAC) Inlet Pressure Indicator	P-7	Ametek		0-60 i.w		
PI-122B	Vapor Phase Carbon (VGAC) Inlet Pressure Indicator	P-7	Ametek		0-60 i.w		
PI-122C	Vapor Phase Carbon (VGAC) Inlet Pressure Indicator	P-7	Ametek		0-30 i.w		
PI-123	Exhaust Stack Inlet Pressure Indicator	P-7	Ametek		0-10 i.w		
TI-102	Process Air Stream Heater Inlet Temperature Indicator	P-7			0-200 F		
TIC-104	Process Air Stream Heater Controller	P-7					
TSH-103	Process Air Stream Heater Discharge Air Temp High Switch	P-7	Ashcroft			140 F	

*** END OF SECTION ***

SECTION 15000

BASIC MECHANICAL MATERIALS AND METHODS

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

Basic mechanical materials includes, but are not limited to, such items as interconnecting process duct work, piping, and pipe fittings, pipe supports, anchor bolts and fasteners, insulation, heating, ventilation, and miscellaneous plumbing.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the Contract Document includes, but is not limited to, the following:

- Section 13600 Process Control System
- Section 13650 Instrumentation
- Section 15050 Extraction System Piping
- Section 15150 Pipe, Pipe Fittings, Pipe Supports and Valves
- Section 15400 Plumbing, General Purpose
- Section 16000 Basic Electrical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

THE MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

- MSS SP-58 Pipe Hangers and Supports - Materials, Design and Manufacture
- MSS SP-69 Pipe Hangers and Supports - Selection and Application.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASME Boiler and Pressure Vessel Code.
- ASME B16.3 Malleable Iron Threaded Fittings.
- ASME B16.18 Cast Bronze Solder-Joint Pressure Fittings.

ASME B16.22	Wrought Copper and Bronze Solder-Joint Pressure Fittings.
ASME B16.26	Cast Bronze Fittings for Flared Copper Tubes.
ASME B31.1	Power Piping.
ASME B31.9	Building Services Piping.
ASTM A234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
ASTM B32	Solder Metal.
ASTM B88	Seamless Copper Water Tube.
ASTM D2513	Thermoplastic Gas Pressure Pipe, Tubing and Fittings.
ASTM D2683	Socket-Type Polyethylene Fillings for Outside Diameter-Controlled Polyethylene Pipe.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A13.1-B1	Identification of Pipe Systems.
ANSI B1.20.1-83	Pipe Threads - General Purpose.
ANSI B16.1-89	Cast Iron Pipe Flanges and Flanged Fittings
ANSI B16.5-88	Pipe Flanges and Fittings.
ANSI B16.34-88	Valves-Flanged, Threaded and Welded End
ANSI B36.1DM-85	Stainless Steel Pipe
ANSI B36.19M-85	Stainless Steel Pipe

BUILDING OFFICIALS AND CODES ADMINISTRATORS INTERNATIONAL, INC., NATIONAL MECHANICAL CODE/1993

BUILDING OFFICIALS AND CODES ADMINISTRATORS INTERNATIONAL, INC. NATIONAL ENERGY CONSERVATION CODE/1993

AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR CONDITIONING ENGINEERS (ASHRAE)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

SHEET METAL AND AIR CONDITIONING FIELD OR SUBCONTRACTORS NATIONAL ASSOCIATES (SMACNA)

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

UNDERWRITERS LABORATORIES (UL)

1.2 SUBMITTALS

The Subcontractor shall submit five copies of each of the following to the Contractor:

- A. Manufacturer's detailed technical data for all materials, fabrication and installation, including catalog cuts of all piping, fittings, valves, ductwork, supports and insulation.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.
- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.
- C. Components shall be stored off of the ground and shall be protected from weather elements.

PART 2. PRODUCTS

2.1 MATERIALS

- A. Materials of construction for all piping and piping support systems and accessories are as presented on the Drawings. This includes, but is not limited to, vapor pipes, compressed air pipes, ductwork, and general purpose pipes. Basis of selection has been made on the materials compatibility with the intended service. Attention has been paid to corrosion resistance, chemical compatibility and the mechanical requirements of the particular service. Materials other than those selected must be reviewed and approved by the Contractor.
- B. Miscellaneous gaskets required for flange connections shall be constructed of viton or Contractor approved equal.
- C. Equipment supply Subcontractor shall appropriately size and provide vibration isolation dampers for all equipment. These shall be shipped with or before the equipment and shall be installed on-

site by others. The corresponding anchor bolt requirements for the vibration isolation dampers shall be provided to the Contractor to ensure proper installation into the concrete floor.

PART 3. EXECUTION

3.1 CONSTRUCTION METHODS

A. General

1. The equipment and materials shall be fabricated and/or erected in accordance with the requirements of the Contract Documents and the manufacturer's instructions and recommendations.
2. All work shall be performed by competent, trained, workmen, skilled in the field to which they are executing the work.
3. All equipment shall be properly and securely installed such that undue stresses are not exerted on equipment and connections. All pipes and fittings shall be installed true to alignment, rigidly supported and fitted accurately.
4. Flange covers should not be removed until flanges are ready to be bolted into position or sealing faces may become damaged or distorted. If covers are removed for inspection purposes, they should be replaced immediately.
5. All outdoor piping between the building and the wells and discharge points shall be installed below the frost line as shown on the Contract Drawings to prevent freezing and cracking of the pipes.

B. Workmanship

1. The installation shall be completed as to present a neat and orderly appearance.
2. The inside of pipes and fittings shall be kept free from dirt and debris.
3. Exposed pipe and duct shall show no tool marks.
4. After cutting, pipes shall be reamed out to full bore.
5. Pipes shall be cut accurately and installed without springing or forcing.
6. All work shall be coordinated so that any necessary excavations may be closed promptly. The Subcontractor shall not cover work until it has been inspected and accepted in writing via daily reports.

C. Piping Layout and Installation

1. Run parallel with or at right angles to walls except as otherwise noted. Use fittings for changes in direction.
2. Install so as to provide for proper alignment, slope and expansion.
3. Run exposed piping and duct as close as possible to walls and ceiling.
4. All piping shall be pitched to drain in order to prevent accumulation.

5. Size and location of piping should be as indicated on the Drawings.
6. Pipe insulation shall be installed as required by the Drawings. Installation shall be as per the manufacturer's requirements. Insulation shall be installed over heat trace as specified in Specification 15050, "Extraction System Piping."

D. Installation of Fittings

1. Install flanges adjacent to all equipment.
2. Do not install joints or fittings over any motor, switchbox or other electrical equipment.
3. Provide swing joints at mains and connections to risers, and provide swing joints, expansion loops, and fittings as required for flexible piping system.
4. Where changes in pipe sizes occur, use only reducing fittings; box unions and reducing bushings are not acceptable.

E. Installation of Hangers and Supports

1. The design, engineering, and installation of all hangers and supports shall be in accordance to standards contained in ANSI B31.1 Code for Pressure/Power Piping and all other applicable codes and regulations. Rigidly support all piping and ducts from structures by Code approved hangers, inserts or supports with adequate provisions for expansion and contraction. Support shall be provided at changes in direction and elsewhere at a spacing of no greater than 10 feet.
2. Where piping is installed on structural steel supports, provide blocking of pipe rolls to arrest lateral pipe movement.
3. Support all vertical piping, at intervals as required by Code approved pipe collars, clamps, brackets or wall rests, and at all points necessary to ensure rigid construction.
4. All hangers and supports shall be installed so that they cannot become disengaged by movements of the supported pipe.
5. Support piping from steel frame construction by beam clamps and supplementary steel angles.
6. Supports for piping adjacent to pumps shall be provided and installed that are tested to withstand pump vibrations.
7. Supports and hangers shall be installed in such a way to minimize unnecessary stress on valves, meters and any other pieces of equipment.

F. Joints

1. Ferrous Pipe Screwed Joints
 - a) Right hand threads, pipe standard, clean-cut, full depth, and tapered (ANSI Standard B2.1).
 - b) Joints made tight without use of lead or paint.
 - c) Use no lubricant.

- d) Make up joints with "Teflon" tape or an approved equal. Tape shall be applied to the threads of the pipe and not in the fittings.
 - 2. Copper Pipe Joints
 - a) Make pipe and fitting mechanically clean, bright and fluxed.
 - b) Apply flux and solder as recommended by manufacturer of solder-type fittings.
 - 3. Polyvinyl Chloride (PVC) Pipe Joints
 - a) Clean dirt and moisture from pipe and fittings for solvent welding.
 - b) Apply solvent cement of proper grade as recommended by PVC pipe manufacturer.
 - 4. High Density Polyethylene (HDPE) Pipe Joints
 - a) Clean dirt and moisture from pipe and fittings.
 - b) Fuse pipe/fittings using methods and equipment recommended by pipe manufacturer.
 - 5. Installation of Joints
 - a) Flanged joints shall be made with bolts, bolt studs with a nut on each end of studs if the flange is tapped. The number and size of bolts shall conform to the ANSI standards as the flanges. Bolts and nuts shall be Grade 5 conforming to the ASTM Specification for Carbon Steel Externally and Internally Threaded Standard Fasteners, Designation A307-74. Bolts and studs shall be of the same quality as machine bolts.
 - b) For flanged joints, gaskets shall be full-face flat ring gaskets of approved composition suitable for the required service. Gaskets 12 inches in diameter and smaller shall be 1/16 inch thick; those larger than 12 inches in diameter shall be 3/32 inch thick.
 - 6. Stainless Steel Tubing Joints
 - a) Joints for stainless steel tubing with non-threaded ends shall be made using Swagelok type fitting connectors or approved equal.
 - b) Install fitting connection as recommended by manufacturer.
 - c) Threaded joints shall have right hand threads, pipe standard, clean cut and full depth. Joints shall be made up with "Teflon" tape, joint cement such as "Permatex" or approved equal, and applied to male threads only.
 - d) Joints between ferrous and copper pipe shall be made using dielectric fittings or gaskets of proper insulating material.
- G. Installation of Sleeves and Escutcheons
- 1. Provide sleeves cut flush with surface for each pipe passing through walls, floors, partitions or ceilings.
 - 2. Install sleeves one pipe size larger than pipe encased, but allow for insulation.
 - 3. Install sleeves one inch above finished floor in areas where water is present.
 - 4. Caulk and seal between sleeves and pipes, caulk floor sleeves with graphite packing and plastic waterproofing compound.
 - 5. Provide escutcheon plate in finished areas around pipes passing through walls, floors, and partitions.

H. Cutting and Patching

1. The Subcontractor shall install all hangers, supports, and pipe sleeves in floors, walls, partitions, ceilings, and roof slabs as construction progresses to permit their work to be built into place and to eliminate unnecessary cutting of construction work.
2. All cutting of concrete, or other material for the passage of piping and ductwork through floors, walls, partitions, and ceiling shall be done by the Subcontractor, where necessary, to install his work. The Subcontractor will close all such openings around piping, ductwork, and conduits with material equivalent to that removed. All exposed surfaces shall be left in suitable condition for refinishing without further work.
3. No structural member shall be altered or cut without special permission.

3.2 TESTING, ADJUSTING, AND BALANCING

- A. Test, adjust, and balance mechanical air and liquid distribution systems and their associated equipment.
- B. Testing, adjusting, and balancing work for heating, ventilating and air conditioning ductwork shall follow recommended procedures for examination, preparation, and performance of testing, adjusting, and balancing, as outlined in the NEBB standard.
- C. Recorded data shall represent actually measured observed conditions.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical boxes and panels, and restoring thermostats to specified settings.
- E. For testing of treatment process piping to be used in water or vapor service, see Specification Section 15150, "Pipe, Pipe Fittings, Pipe supports and Valves."
- F. Execution articles above shall supplement the referenced standard.

3.3 EXAMINATION

- A. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned, and is operable.
- B. Report any defects or deficiencies noted during examination. Any defects or deficiencies shall be repaired or replaced.
- C. Promptly report abnormal conditions in mechanical systems or conditions, which prevent system balance.

3.4 INSTALLATION TOLERANCES

- A. Adjust air handling systems to plus or minus 5 percent for supply systems and plus or minus 10 percent for return and exhaust systems from indicated quantities.

B. Patching

1. Patch holes drilled in ductwork and equipment housings for test purposes using plastic plugs with retainers.
2. Patch non-circular and larger holes using galvanized sheet metal. Secure patch to duct or housing using aluminum or stainless steel pop rivets. Seal patch using silicone rubber caulking. Degrease, prepare, and prime paint patch.
3. Holes in ductwork and/or piping insulation will be repaired by the Subcontractor. The Subcontractor shall coordinate locations of damaged or cut insulation. The Subcontractor shall ensure complete repair.

3.5 OPERATION AND MAINTENANCE

- A. All spare parts and supplies are to be boxed and shipped in separate containers from other equipment and shall be prominently marked.
- B. A separate set of special tools shall be provided in a durable case, which shall contain any non-standard size and not normally available wrenches, screw or nut drivers, etc., which are necessary for performing maintenance.

3.6 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction, which shall be for one year after the end of the construction phase. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Subcontractor shall approve of the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. All extended warranties shall be included in the Operations and Maintenance (O&M) manual.

* * * END OF SECTION * * *

SECTION 15050

EXTRACTION SYSTEM PIPING

PART 1. GENERAL

The Contractor is the Navy’s representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy’s representative or agent.

The Product extraction system transfer piping shall be a secondary containment piping system and factory manufactured. No slip lining of the containment system will be allowed. All straight sections, fittings and other accessories shall be factory manufactured to allow the placement of a leak detection cable in the secondary containment (if necessary in future). The containment shall be drainable, dryable, and air pressure testable.

All secondary containment piping shall be a system supplied by the manufacturer of the secondary containment piping system. The system supplier shall have at least five years experience in the manufacturing of secondary contained pipe systems having an integrated sensor cable leak detection/location alarm system. The manufacturer of the secondary containment piping system must provide stamped engineering stress calculations on the secondary contained piping system.

Factory trained field representatives of the piping supplier shall provide technical field training and support during all periods of piping installation including final check-out of the access port system, and end-user training.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

- Section 15000 Basic Mechanical Materials and Methods
- Section 15150 Pipe, Pipe Fittings, Pipe Supports and Valves

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|----------------|--|
| ASME B 31.4 | Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids |
| ASTM B 209 | Standard Specification for Aluminum and Aluminum –Alloy Sheet and Plate |
| ASTM C 552 | Standard Specification for Cellular Glass Thermal Insulation |
| ASTM D 3350-93 | Standard Specifications for Polyethylene Plastic Pipe and Fittings Materials |

1.2 SUBMITTALS

The Subcontractor shall submit five copies of the following to the Contractor:

- A. Shop Drawings showing outline and overall dimensions, connection details, weights, anchorage details, arrangement of functional parts, and parts list, if applicable, for all equipment and materials furnished.
- B. Literature and drawings describing the equipment in sufficient detail, including parts list and materials of construction.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, Supplier shall carefully pack and brace all components either within shipping containers or on carrier.
- B. All equipment shall be sealed to prevent entry of water, dirt or other foreign material. Seals used on nozzles shall not affect, but shall protect the weld preparation or flange faces of the nozzles. Solid steel plugs shall be used to close all threaded connections. All equipment, especially all small, loose pieces, including bolting, tools, gaskets, etc. shall be adequately crated or boxed for protection during shipment.
- C. Where required to protect against condensation and humidity, a desiccant shall be provided and its presence with the need of periodic removal and dry-out shall be so marked.
- D. Equipment which is hydrostatically tested by Manufacturer, shall be completely drained and thoroughly dried prior to shipment to prevent damage from corrosion or freezing and drain plugs replaced.
- E. Boxes or other shipping units shall be clearly marked to indicate any special instructions, e.g., Fragile, Desiccant Inside, This Side Up, etc. Large and heavy shipping units shall have suitable skids for moving or provisions for lifting with slings. If location of slings is critical, these locations shall be marked accordingly.
- F. Flanged connections shall be protected by a ½-inch or thicker plywood disc, or suitable alternate, bolted to the face of the flange.
- G. Threaded or socket weld connections shall be protected with screwed or snap-in (snap-on) type, securely held, plastic protectors. Cast iron plugs are not acceptable for protection unless part of the permanent assembly.
- H. Butt weld connections shall be protected by wooden disks that cover the entire weld end area, and are secured by metal straps and fasteners.

PART 2. PRODUCTS

2.1 CARRIER PIPE

- A. Carrier pipe shall be high-density polyethylene (HDPE) PE3408 in accordance with ASTM D3350. Carrier pipe shall be manufactured to a standard dimension ratio (SDR) rating so that the pressure rating of the pipe will be consistent for all pipe sizes. No socket fusion or electrofusion joints will be allowed. The carrier pipe shall be SDR 11 with a pressure rating of 160 pounds per square inch, gauge (psig) at 80 degrees F.
- B. All fittings shall be factory manufactured. All secondary contained fittings shall be of unitized construction with the carrier and containment integrally anchored together to prevent the moment of the carrier relative to the containment within the fitting. Anchors shall be of sufficient thickness to withstand the maximum possible end loads that will be generated by the carrier pipe during the life of the system. Engineering end load calculation must be furnished by the manufacturer. Elbows must be anchored on both ends. Tees and laterals must be anchored on both the run and the branch. (Anchoring of the change in direction less than 45 degrees does not require concrete thrust blocks.)

2.2 CONTAINMENT PIPE

Containment pipe shall be HDPE PE3408 in accordance with ASTM D3350. Containment pipe shall be manufactured to an SDR rating so that the pressure rating of the containment pipe will be consistent for all pipe sizes. No socket fusion or electrofusion joints will be allowed. The containment pipe shall be SDR 17 with a pressure rating of 100 psig at 80 degrees F.

2.3 PIPE SUPPORTS

Supports shall be designed and factory installed by the secondary containment manufacturer. No field-assembled supports will be allowed. The manufacturer shall design and fabricate the system taking into account pressure and temperature requirements when placing the pipe supports. Double supports will be required throughout the system to minimize stresses due to point loading. All pipe supports shall be circular and welded to the carrier pipe. The supports at both ends of every straight section shall be factory welded to both the carrier and containment pipes in order to facilitate the simultaneous welding of all secondary contained pipe and fittings. Support clips will not be allowed.

2.4 SUBASSEMBLIES

End seals and other subassemblies shall be designed and factory prefabricated to prevent the ingress of moisture into the system. All subassemblies shall be designed to allow for complete draining of the secondary containment. Cable access ports shall be installed in accordance with the leak detection manufacturer's written installation instructions.

2.5 PIPING INSULATION

- A. All outdoor and vault piping shall be insulated with cellular glass pipe insulation that conforms with ASTM C552. The insulation is to have a minimum thickness of 2 inches.
- B. Insulation is to be covered with an aluminum jacketing that shall be ASTM B 209, temper H14 with a minimum thickness of 0.016 inch.

PART 3. EXECUTION

3.1 PIPE LAYOUT

Installation shall present a neat, orderly appearance. Openings or passageways shall not be blocked.

3.2 INSTALLATION

A. Plastic piping shall be installed in accordance with the manufacturer's installation instructions.

1. Horizontal Piping, Underground

- a. Piping shall be laid on a firm bed of sand for the entire trench length, except where otherwise supported.
- b. Partial backfilling and cradling shall be employed to secure piping during backfilling operations.

2. Cutting

Cuts shall be made square with pipe, and burrs shall be removed by smoothing edges.

3. Joints

- a. Joints shall be made via the method of thermal butt fusion as directed by the manufacturer.
- b. The welded area must be protected against unfavorable weather conditions, such as moisture, wind, exposure to the sun's radiation and temperatures below 32 degrees F. Suitable measures such as preheating, covering with a tent, and heating should be taken to ensure that a uniform pipe wall temperature can be maintained. If these measures are taken, it is possible to perform the installation work at any external temperature. When there is radiation by the sun, unequally heated pipes must be brought to equilibrium by covering the weld area until the pipe temperatures match.
- c. The connecting faces of the parts to be welded must be free from contamination. Cleaning must take place immediately before welding. The same applies with respect to the heating mirror, which should be cleaned with methylated spirit and lint free cloth. The metal surface should be Teflon coated to prevent adhesion of the pipe to the heating element and to make it easier to detach the pipe. In order to prevent excessive cooling by the wind during the operation, the pipe ends opposite to the joint should be closed off.

4. Insulation

Insulation shall be installed in accordance with the manufacturer's recommendations.

3.3 TESTING

The carrier and secondary containment piping shall be air tested at 10 psig. Additionally, the carrier pipe shall be hydrostatically tested at a pressure of 1.5 times the maximum operating pressure or 100 psig, whichever is greater. All testing pressures shall be held for not less than two hours and no change in applied

pressure shall be observed during the entire two-hour test period. Pipes that fail the pressure test shall be repaired/replaced at the Subcontractor 's expense (no expense incurred by the Contractor) and retested. All installation and testing procedures shall be performed in accordance with ASME B31.4 and shall be recorded and witnessed to ensure proper Quality Assurance/Quality Control (QA/QC) procedures are being achieved.

3.4 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction, which shall be for one year after the end of the construction phase. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Subcontractor shall approve of the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. All extended warranties shall be included in the Operations and Maintenance (O&M) manual.

* * * END OF SECTION * * *

SECTION 15150

PIPE, PIPE FITTINGS, PIPE SUPPORTS AND VALVES

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

The work shall include the supply of all materials, fabrication drawings, erection design, installation, testing and delivery of services as specified in this section and/or on the drawings for completion and proper operation of all system piping and valving as included in the Contract Documents. See Valve Index, Table 15150-1, for list of valves.

It is not the intent of this section and associated drawings to specify all details of design, fabrication and construction. It shall be the responsibility of the Subcontractor to provide equipment that has been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

The work includes supply, erection, complete installation and testing of the piping, fittings, valves and related accessories.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 15000	Basic Mechanical Materials and Methods
Section 15050	Extraction System Piping

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AMERICAN SOCIETY OF TESTING MATERIALS (ASTM)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

THE MANUFACTURER'S STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58 Pipe Hangers and Supports - Materials, Design and Manufacture

MSS SP-69 Pipe Hangers and Supports - Selection and Application

1.2 SUBMITTALS

A. The Subcontractor shall submit the following to the Contractor:

1. Shop drawings showing outline and overall dimensions, connection details, weights, anchorage details, arrangement of functional parts, and parts lists if applicable, for all equipment and materials furnished.
2. Literature and drawings describing the equipment in sufficient detail, including parts list and materials of construction.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, Supplier shall carefully pack and brace all components either within shipping containers or on carrier.
- B. All equipment shall be sealed to prevent entry of water, dirt or other foreign material. Seals used on nozzles shall not affect, but shall protect the weld preparation or flange faces of the nozzles. Solid steel plugs shall be used to close all threaded connections. All equipment, especially all small, loose pieces, including bolting, tools, gaskets, etc. shall be adequately crated or boxed for protection during shipment.
- C. Where required to protect against condensation and humidity, a desiccant shall be provided and its presence with the need of periodic removal and dry-out shall be so marked.
- D. Equipment which is hydrostatically tested by Manufacturer, shall be completely drained and thoroughly dried prior to shipment to prevent damage from corrosion or freezing and drain plugs replaced.
- E. Boxes or other shipping units shall be clearly marked to indicate any special instructions, e.g., Fragile, Desiccant Inside, This Side Up, etc. Large and heavy shipping units shall have suitable skids for moving or provisions for lifting with slings. If location of slings is critical, these locations shall be marked accordingly.
- F. Flanged connections shall be protected by a ½-inch or thicker plywood disc, or suitable alternate, bolted to the face of the flange.
- G. Threaded or socket weld connections shall be protected with screwed or snap-in (snap-on) type, securely held, plastic protectors. Cast iron plugs are not acceptable for protection unless part of the permanent assembly.
- H. Butt weld connections shall be protected by wooden disks that cover the entire weld end area, and are secured by metal straps and fasteners.

- I. All electrical and electronic equipment or accessories installed prior to shipment shall be wrapped and sealed in plastic for rain and weather protection during shipment and storage prior to installation.

1.4 DESIGN CRITERIA - PIPE SUPPORTS

- A. Design criteria for the fabrication of the pipe hangers and supports shall conform to the following criteria.
 1. Accurate weight balance calculations shall be made to determine the required supporting force at each hanger location and the pipe weight load at each equipment concentration.
 2. Pipe hangers shall be capable of supporting the pipe in all conditions of operations. They shall allow free expansion and contraction of the piping and prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment.
 3. Hangers shall be designed and installed so that they cannot become disengaged by movement of the supported pipe.
 4. The hangers and supports shall meet with the following requirements:
 - a) Standard and fabricated hangers and supports shall be furnished complete with necessary inserts, bolts, nuts, rods, washers and other accessories.
 - b) Run piping in groups and parallel to building walls where practicable. Provide minimum clearance of 1-in between pipe and other work.
 - c) Install hangers or supports at all locations where piping changes direction.
 - d) All hangers and supports shall be capable of adjustment after placement of piping.
 - e) Each type of hanger or support shall be the product of one manufacturer. Types of hangers or support shall be kept to a minimum.
 - f) All suspended or supported pipe shall have a hanger or support adjacent to each hub.
 - g) Vertical piping shall be supported at each floor and between floors by stays or braces designed to prevent rattling and vibration.
 - h) Hanger rods shall be straight and vertical. Chain, wire, strap or perforated bar hangers shall not be used. Hangers shall not be suspended from piping.
 - i) Prevent contact between dissimilar metal by use of copper plated, rubber or vinyl coated, or stainless steel hangers or supports.
 - j) Thin walled stainless steel piping shall be isolated from carbon steel by use of plastic coated hangers or supports.
 - k) Hangers and supports shall provide for expansion throughout the full operating temperature range.
 - l) Provide lateral support, anchors and guides for all pipelines in which expansion joints are installed. Anchors and guides shall be in accordance with the recommendations of the manufacturer of the expansion joints.

- m) Minimum size single hanger rods shall be in accordance with the schedule below unless otherwise shown or specified. Double rods used for pipe 8-inch and greater may be 1/4-inch less in diameter than indicated.

<u>Pipe Size (inches)</u>	<u>Rod Diameter (inches)</u>
Less than 2	3/8
2-1/2 through 3	1/2
4 through 6	3/4
8 through 12	7/8
14 through 20	1
Larger than 20	1-1/4

- n) The Subcontractor shall verify all spans meet state and local codes and adjust them as necessary prior to fabrication and installation. The Subcontractor shall be responsible for obtaining the proper span.

PART 2. PRODUCTS

2.1 MATERIALS - PIPE AND PIPE FITTINGS

- A. Filler rings shall be used where necessary and shall conform to the 125-pound ANSI standard. Conventional practices shall be incorporated to ensure correct assembly of the adjoining piping.
- B. Stainless steel piping shall be schedule 80 304 SS conforming to ASTM A-778 or A-312 and furnished in 20 foot or 10 foot sections without circumferential welds. Pipe shall be cold worked - annealed and passivated, hydrostatically tested and milled certified. All stainless steel pipe fittings shall conform to ASTM A-774 or A403CR. All pipes, fittings and fabrications will be properly marked with type, gauge and heat number.
- C. Stainless steel tubing for instrumentation connection as shown on the drawings, shall be Type 316 3/8 inch OD, tube wall thickness of 0.035 inch conforming to ASTM A213. All tubing and fittings shall be in accordance with ANSI 31.1 Code for Power Piping.
- D. Soldered fittings shall conform to ANSI B16.18 and compression fittings shall be flared, conforming to ANSI B16.26, or flareless such as Parker-Hannifin, Swagelok, or approved equal.
- E. All PVC process piping and ductwork shall conform to ASTM D1785, ASTM D2466 and ASTM 12454-B. All PVC piping and ductwork shall be Schedule 80 unless otherwise noted. Dimensions and tolerances of sockets shall conform to ASTM D2466 and ASTM D2467 where applicable. Maximum height of pipe stop on all fittings except for reducer bushings shall be not greater than the wall thickness of the corresponding size and schedule of the pipe, nor less than the wall thickness of SDR 11 pipe.

- F. The groundwater extraction system piping shall be double contained HDPE as noted on the Contract Drawings. The secondary containment shall be of HDPE and shall be installed with spacers, seals, and other appurtenances in accordance with manufacturer's recommendations and instructions.
- G. Copper pipe and fittings for potable water or compressed air systems shall be Type L hard drawn conforming to ASTM B88, ASME B16.18 and ASME B16.22 with grade 95TA welded joints.
- H. High density, high molecular weight polyethylene pipe (HDPE) shall meet the requirements of Type III, Class C Category 5 Grade P34 IPS pipe as defined in ASTM D-1248-84. The pipe SDR ratio is 11. All HDPE pipe fittings supplied by the Contractor shall conform to ASTM D-3350 and have a SDR ratio of 11.

2.2 MATERIALS – VALVES

See Valve Index, Table 15150-1, for list of valves.

- A. Ball valves shall be PVC schedule 80 construction with socket end connections. Seals to be Viton with Teflon seats. Valves to be full port design for low pressure loss and have a fine pitched threaded seal retainer for precise seat adjustments. Valve seats to be reversible and self-lubricating for bubble tight seal. All valves to be Sure Block design and rated to 225 psig.
- B. Ball check valves shall be PVC schedule 80 construction with true union socket end connections. Seals and seats shall be Viton. Valves 1/2 inch to 4 inches shall be true union design. Seat O-ring to be square cut for positive sealing with minimal back pressure. 1/2 inch to 4 inch valves to be of full port design.
- C. Globe valves shall be PVC schedule 80 construction or approved equal per ASTM B16.34 inside screw rising stem construction and shall have integral seal swivel disc and screwed bonnet as manufactured by ASAHI or equal. Globe valves to be used for instrumentation root valves shall be stainless steel 600 class minimum and have ends that are compatible with the instrument tubings.
- D. Pressure relief valves shall be bronze or carbon steel construction and Viton seals with 1" threaded connections and non-sticking design utilizing a Teflon shaft passing through three vented U-cup seals. They shall be an angle type design. The valves shall have no external metal fasteners and have one corrosion resistant coated internal spring to cover the valves entire set pressure range. All pressure relief valves to be hand adjustable, without tools to relieve pressures between 5 and 100 psig.
- E. Butterfly valves shall be rubber seated and conform to requirements specified in AWWA C504, latest revision, and ANSI B16.1. They shall be short body style of cast iron construction with eccentric disk. Valves shall be designed to allow seat refurbishment in the line, and packing replacement without removing the manual actuator. Flanged ends shall be drilled in accordance with ANSI B16.1. Valve position shall have an infinite span over the entire range of actuation.
- F. Potable water gate valves (1 inch or less) shall be Class 125, bronze body, N.R.S. solder ends, inside screw, solid wedge disc.

- G. Hose bib vacuum breakers shall be as manufactured by Watts Regulator Company or Contractor approved equal.

2.3 PIPE SUPPORTS

- A. Any reference to a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired and is not to be considered proprietary. In all cases, any comparable source or device is acceptable upon approval by the Contractor.
- B. Equipment described under this section shall be furnished by manufacturers who are experienced, reputable and qualified in the manufacture of pipe supports. The manufacturer shall be fully responsible for the proper operation and performance of the system as a whole.
- C. Except where otherwise specified shop painting and coatings shall conform to manufacturers best standard finish.
- D. Unistrut pipe supports, unless noted, shall be punch-press made from hot-rolled, pickled and oiled steel plates, strip or coil, and conform to ASTM specifications A575, A576, A635, or A36. The fitting steel shall also meet the physical requirements of ASTM A570 GR 33. The pickling of the steel produces a smooth surface free from scale. Unistrut channels shall be accurately and carefully cold formed to size from low-carbon strip steel. Spot-welded combination members shall be welded 3" (maximum) on center.
- E. Unistrut fittings, unless otherwise noted, shall be made from hot-rolled, pickled and oiled steel plates, strip or coil, and conform to ASTM specifications A575, A576, A635, or A36. The fitting steel shall also meet the physical requirements of ASTM A570 GR 33. The pickling of the steel produces a smooth surface free from scale. Fittings, unless otherwise noted, shall be made from hot-rolled, pickled and oiled steel plates, strip or coil, and conform to ASTM specifications A575, A576, A635, or A36. The fitting steel shall also meet the physical requirements of ASTM A570 GR 3. The pickling of the steel produces a smooth surface free from scale.
- F. Unistrut channel nuts shall be manufactured from mild steel bars, and after machining operations are completed, they are case hardened, assuring positive biting action into the in-turned edge of the Unistrut channel. The standard channel nut shall conform to ASTM A576 GR 1015. Screws shall conform to SAE J429 GR 2 (also meet and exceeds ASTM A307). All beam and column load data pertains to carbon steel and stainless steel unistrut channels. Load tables and charts shall be constructed to be in accordance with the specification for the design of cold-formed steel structural members August 19, 1986 Edition with December 11, 1989 Addendum published by the American Iron and Steel Institute.

PART 3. EXECUTION

3.1 ERECTION/INSTALLATION

- A. The equipment shall be installed and/or erected in accordance with the requirements of the Contract Documents and the manufacturer's instructions and recommendations.
- B. All work shall be performed by competent, trained, workmen, skilled in the field to which they are executing work.

- C. All equipment shall be properly and securely installed such that undue stresses are not exerted on equipment and connections. All pipes and fittings shall be installed true to alignment, rigidly supported and fitted accurately.
- D. Flange covers should not be removed until flanges are ready to be bolted into position or sealing faces may become damaged or distorted. If covers are removed for inspection purposes, they should be replaced immediately.
- E. Wall pipe castings of proper size shall be installed for all pipes passing through masonry walls or floors, unless otherwise shown on the drawings, and concrete inserts for hangers and supports as soon as forms are erected and before concrete is poured. Before setting these items, the Subcontractor shall check all drawings and figures, which have a direct bearing on the pipe location and be responsible for the proper location of these pipes during the construction of structures.
- F. Flanged joints shall be made up tight, and measures taken to prevent undue strain upon adjacent pieces such as pumps, valves and other piping. Before the pieces are assembled, the Subcontractor shall remove rust preventive coatings from machined surfaces, thoroughly clean pipe ends and gaskets and carefully smooth all burrs and other defects. The flanged bolt holes on each end of flanged pipe and fittings shall accurately straddle the same horizontal and vertical centerlines, unless special drilling is required.
- G. Bolts should be tightened using proper bolt torque ratings as recommended by the manufacturer. Threads must be clean and well lubricated and washers should be used to ensure correct torque. Bolts should be tightened alternatively and evenly.
- H. Mechanical joint pipes and fittings shall be joined in accordance with Section 9b of the AWWA Standard C600, latest edition, and also in accordance with the "Notes on Method of Installation" included at the end of ANSI Specification A21.11, 1972.
- I. PVC pipe shall be joined by a solvent welding method conforming to ASTM D-2564. The solvent shall be designed for its intended use as recommended by the manufacturer. The PVC pipe may be adapted to fittings or other systems by means of a flange assembly made to class 150 ANSI B16.5 dimensional standards.
- J. Welding techniques for stainless steel pipe should be TIG and conform to ASME/ANSI B31.3. Inert gas can be argon or argon/helium mixture, electrodes should be 1 to 2% thoriated tungsten and cups should be ceramic. MIG technique should not be used for fabricating piping systems. Copper contacts on wire feed can melt and drop into the weld which produces an unsatisfactory and unsafe situation. Pipe and fittings should be beveled for butt welding. Never overlap material and weld gas pockets and inclusions should be kept to a minimum.
- K. Copper pipe and fittings shall have sweated joints in accordance with ASTM B321 grade 95TA.
- L. Wherever possible the polyethylene pipe should be jointed by the method of thermal butt-fusion or socket fusion, as outlined in ASTM D-2657, Heat Joint Polyolefin Pipe and Fittings. Butt-fusion/socket fusion jointing of pipe and fittings shall be performed in accordance with the procedures recommended by the manufacturer. In all cases pipe manufacturer should be consulted regarding joining temperatures and pressures. The polyethylene pipe may be adapted to fittings or the systems by means of an assembly consisting of a polyethylene stub-end, butt-

fused/socket fused to the pipe, a back-up flange of ductile iron, made to Class 150, ANSI B 16.5 dimensional standards with exceptions, bolts of compatible material and a gasket of suitable red rubber cut to fit the joint. In all cases, the bolts shall be drawn up evenly and in line. The pipe supplier shall be consulted to obtain machinery and expertise for the joining by butt-fusion/socket fusion of polyethylene pipe and fittings. No pipe or fittings shall be joined by fusion by any contractor unless he is adequately trained and qualified in the techniques involved. Polyethylene pipe can not be solvent cemented.

- M. Machinery used to place equipment/materials on the GWTP floor shall not cause stress on the floor above the allowable maximum.

3.2 TESTING AND INSPECTIONS

- A. Each system component will be given requisite factory tests as necessary to determine that the work and materials are free from defects and to establish that the design and construction meet the requirements of the contract documents.
- B. Acceptance tests, after the equipment is completely installed, may be performed to demonstrate performance requirements as specified herein. The field tests will be governed by provisions of applicable industry and institute standards.
- C. All piping embedded in concrete or underground and designed for pressure of more than 1 psig above atmospheric shall be tested for leaks immediately prior to concreting/backfilling. The test pressure shall be 1.5 times the operating pressure, to which the pipes will be subjected, with a minimum test pressure of 100 psig. The pressure test shall be held for two hours with no drop in pressure except that which may be caused by air temperature variations. The entire piping system shall be visually inspected for leakage. In case of leakage, leaks shall be repaired and testing repeated.
- D. Pipe Testing
 - 1. Check and plug all relevant open ends, adequately block all bends, tees, and other fittings, and do whatever else is necessary so that pipelines will safely withstand the pressures developed under the tests and so that no damage or injury will occur to the pipeline, people, or property.
 - 2. All tests shall be conducted at the pressure specified in this section.
 - 3. The Subcontractor is cautioned that trapped air may cause a false indication of the rate of leakage. Points of concern include ends of lines, stubs, and high points in pipelines. No credit will be made for this condition and no adjustment will be made to the allowable leakage. Where trapped air is suspected of causing a test failure, the Subcontractor shall do whatever is necessary to evacuate the air and repeat the tests until the actual leakage is equal to or less than the allowable rate of leakage.
 - 4. Every length of pipe installed under this contract shall be tested, unless otherwise specified or approved by the Contractor.
 - 5. All regulators, gages, traps, and other apparatus or equipment, which may be damaged by test pressures shall be isolated or removed before tests are made.

6. All leakage in pipelines and appurtenances shall be located and eliminated. Repairs shall be to the satisfaction of the Contractor, and all work found to possess leaks may be ordered to be re-excavated, removed, and replaced, with no additional compensation. In all cases, repair or replacement shall be with the prior concurrence and to the satisfaction of the Contractor. The testing procedure(s) shall then be repeated.
 7. Should any test disclose leakage, or pressure drop greater than that specified, the Subcontractor shall at his own expense locate and repair the defective joints until the specified allowance is met.
 8. All pressure pipes shall be leakage and pressure tested in accordance with AWWA C600 and ASME.
 9. The pressure test pressure shall be 200 psig based on the lowest point in the line corrected to the elevation of the test gage.
 10. The leakage test pressure shall be 120 psig based on the lowest point in the line corrected to the elevation of the test gage.
 11. Allowable leakage shall be equal to or less than that given in AWWA C600 Table 3.
 12. All pipes shall be tested prior to applying insulation and before they are concealed or furred-in. Restrain and brace all piping adequately prior to testing. Leave all restraining devices in place after testing.
 13. With clean water, hydrostatically test all piping, which will convey water or aqueous solutions. Maintain a test pressure of 200 psig or 170 percent of the pump shutoff head, whichever is greater.
 14. Provide concentrated liquid soap or a commercial leak detection apparatus to be used for locating leaks and where directed by the Contractor.
 15. These tests shall be considered satisfactorily passed only when there is no evidence of leakage and no other defects are disclosed.
- E. The Subcontractor shall ensure pipe and pipe fittings, solvents and joints are compatible with the operating chemicals and surrounding environment.

* * * END OF SECTION * * *

TABLE 15150 – 1
VALVE INDEX

MASTER VALVE LIST			
Drawing No.	Part	Description	Location
BALL VALVE PIPING DATA			
P4	BV-101	Ball Valve, 1/2" Sched 80 PVC	PI-101
P4	BV-102	Ball Valve, 1/2" Sched 80 PVC	PI-102
P4	BV-103	Ball Valve, 1" Sched 80 PVC	RW-1 to T-1 Sample
P4	BV-104	Ball Valve, 1" Sched 80 PVC	RW-2 to T-1 Sample
P4	BV-105	Ball Valve, 1/2" Sched 80 PVC	PI-105A
P4	BV-106	Ball Valve, 1/2" Sched 80 PVC	PI-106A
P4	BV-107	Ball Valve, 1/2" Sched 80 PVC	PI-105B
P4	BV-108	Ball Valve, 1/2" Sched 80 PVC	PI-106B
P4	BV-109	Ball Valve, 2" Sched 80 PVC	P-5A Outlet
P4	BV-110	Ball Valve, 2" Sched 80 PVC	P-5B Outlet
P5	BV-111	Ball Valve, 1/2" Sched 80 PVC	PI-113A
P5	BV-112	Ball Valve, 1/2" Sched 80 PVC	PI-114A
P5	BV-113	Ball Valve, 1/2" Sched 80 PVC	PI-113B
P5	BV-114	Ball Valve, 1/2" Sched 80 PVC	PI-114B
P5	BV-115	Ball Valve, 1" Sched 80 PVC	F-1A/B Inlet Sample
P5	BV-116	Ball Valve, 1/2" Sched 80 PVC	PI-111
P5	BV-117	Ball Valve, 1/2" Sched 80 PVC	PI-112
P6	BV-118	Ball Valve, 1/2" Sched 80 PVC	PI-117
P6	BV-119	Ball Valve, 1" Stainless	F-1A Vent
P6	BV-120	Ball Valve, 1" Stainless	F-1B Vent
P6	BV-121	Ball Valve, 1" Stainless	F-1A Drain
P6	BV-122	Ball Valve, 1" Stainless	F-1B Drain
P6	BV-123	Ball Valve, 1/2" Sched 80 PVC	PI-118
P6	BV-124	Ball Valve, 1" Sched 80 PVC	F-1A/B Outet Sample
P6	BV-125	Ball Valve, 1/2" Sched 80 PVC	PI-119
P6	BV-126	Ball Valve, 1/2" Sched 80 PVC	PI-120
P6	BV-127	Ball Valve, 1" Sched 80 PVC	Effluent Sample Port
P7	BV-128	Ball Valve, 1/2" Stainless	PI-121
P7	BV-129	Ball Valve, 1/2" Stainless	TI-102
P7	BV-130	Ball Valve, 1/2" Stainless	TE-104
P7	BV-131	Ball Valve, 1/2" Stainless	TSH-103
P7	BV-132	Ball Valve, 1/2" Stainless	VGAC Influent Sample Port
P7	BV-133	Ball Valve, 1/2" Stainless	PI-122A
P7	BV-134	Ball Valve, 1/2" Stainless	Post VGAC-1 Sample Port
P7	BV-135	Ball Valve, 1/2" Stainless	PI-122B
P7	BV-136	Ball Valve, 1/2" Stainless	Post VGAC-2 Sample Port
P7	BV-137	Ball Valve, 1/2" Stainless	PI-122C
P7	BV-138	Ball Valve, 1/2" Stainless	PI-123
P7	BV-139	Ball Valve, 1/2" Stainless	VGAC Effluent Sample Port

TABLE 15150 – 1
VALVE INDEX

Drawing No.	Part	Description	Location
CHECK VALVE PIPING DATA			
P4	CV-101	Check Valve, 10" Sched 80 PVC	P-3A outlet
P4	CV-102	Check Valve, 10" Sched 80 PVC	P-3B outlet
P4	CV-103	Check Valve, 2" Sched 80 PVC	P-5A outlet
P4	CV-104	Check Valve, 2" Sched 80 PVC	P-5B outlet
P5	CV-105	Check Valve, 10" Sched 80 PVC	P-4A outlet
P5	CV-106	Check Valve, 10" Sched 80 PVC	P-4B outlet
P5	CV-107	Check Valve, 3" Sched 80 PVC	Recirc. to T-1
P6	CV-108	Check Valve, 6" Sched 80 PVC	Recirc. to T-1
P6	CV-109	Check Valve, 4" Sched 80 PVC	IW-1 Inlet
P6	CV-110	Check Valve, 4" Sched 80 PVC	IW-2 Inlet
P6	CV-111	Check Valve, 4" Sched 80 PVC	IW-3 Inlet
P6	CV-112	Check Valve, 4" Sched 80 PVC	IW-4 Inlet
GATE VALVE PIPING DATA			
P4	GV-101	Gate Valve, 8" Sched 80 PVC	RW-1 to T-1
P4	GV-102	Gate Valve, 6" Sched 80 PVC	RW-2 to T-1
P4	GV-103	Gate Valve, 12" Sched 80 PVC	T-1 Outlet
P4	GV-104	Gate Valve, 4" Sched 80 PVC	T-1 Drain
P4	GV-105	Gate Valve, 12" Sched 80 PVC	P-3A Inlet
P4	GV-106	Gate Valve, 12" Sched 80 PVC	P-3B Inlet
P4	GV-107	Gate Valve, 10" Sched 80 PVC	P-3A Outlet
P4	GV-108	Gate Valve, 10" Sched 80 PVC	P-3B Outlet
P4	GV-109	Gate Valve, 12" Sched 80 PVC	P-4A Inlet
P4	GV-110	Gate Valve, 12" Sched 80 PVC	P-4B Inlet
P5	GV-111	Gate Valve, 10" Sched 80 PVC	P-4A Outlet
P5	GV-112	Gate Valve, 10" Sched 80 PVC	P-4B Outlet
P5	GV-113	Gate Valve, 3" Sched 80 PVC	Recirc. to T-1
P5	GV-114	Gate Valve, 3" Sched 80 PVC	Recirc. to T-1
P4	GV-115	Gate Valve, 10" Sched 80 PVC	LGAC Inlet
P4	GV-116	Gate Valve, 10" Sched 80 PVC	In-Line Static Mixer
P6	GV-117	Gate Valve, 10" Sched 80 PVC	To Injection Wells
P6	GV-118	Gate Valve, 10" Sched 80 PVC	To Bypass Discharge
P6	GV-119	Gate Valve, 6" Sched 80 PVC	Recirc. to T-1
P6	GV-120	Gate Valve, 4" Sched 80 PVC	IW-1
P6	GV-121	Gate Valve, 4" Sched 80 PVC	IW-2
P6	GV-122	Gate Valve, 4" Sched 80 PVC	IW-3
P6	GV-123	Gate Valve, 4" Sched 80 PVC	IW-4

TABLE 15150 – 1
VALVE INDEX

Drawing No.	Part	Description	Location
BUTTERFLY VALVE PIPING DATA			
P5	BFV-101	Butterfly Valve, 2" Sched 80 PVC	From EQ Tank to B-1
P5	BFV-102	Butterfly Valve, 24" Galvanized	B-1 Outlet
P6	BFV-103	Butterfly Valve, 10" Sched 80 PVC	F-1A Inlet
P6	BFV-104	Butterfly Valve, 10" Sched 80 PVC	F-1B Inlet
P6	BFV-105	Butterfly Valve, 10" Sched 80 PVC	F-1A Outlet
P6	BFV-106	Butterfly Valve, 10" Sched 80 PVC	F-1B Outlet

SECTION 15400

PLUMBING, GENERAL PURPOSE

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall supply and provide all materials, fabrication, drawings, erection, design, installation, testing and delivery of services as specified in this section and/or in the Technical Specifications and Contract Drawings for completion and proper operation of the plumbing system, as included in the Contract Documents.

This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the equipment described herein.

It is not the intent of this section and associated drawings to specify all details of design, fabrication and construction. It shall be the responsibility of the Subcontractor to provide equipment that has been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

Lavatory fixtures shall meet Americans with Disabilities Act (ADA) requirements including a toilet, sink, wall-mounted mirror, shower stall, shower curtain with rod, bench, wall-mounted clothing hooks, roller mount toilet tissue dispenser, wall-mounted liquid soap dispenser, wall-mounted paper towel dispenser and waste receptacle.

1.1 REFERENCES

Subcontractor shall determine submittals, with Contractor concurrence, and submit to the Contractor.

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction between the specifications and the codes, the code will prevail. In addition, the most stringent code applies.

Plumbing Code Section 900 BOCA National Plumbing Code

ANSI A117.1	(1986) Providing Accessibility and Usability for Physically Handicapped People
ASTM B 32	(1991) Solder Metal
ASTM B 88	(1992) Seamless Copper Water Tube
ASTM C 564	(1988) Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASME A112.1.2	(1991) Air Gaps in Plumbing Systems
ASME A112.6.1M	(1988) Supports for Off-the-Floor Plumbing Fixtures for Public Use
ASME A112.21.1M	(1991) Floor Drains

ASME A112.36.2M	(1991) Cleanouts
ASME B1.20.1	(1983) Pipe Threads, General Purpose (Inch)
ASME B16.3	(1985) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.4	(1985) Cast Iron Threaded Fittings Class 125 and 250
ASME B16.12	(1991) Cast Iron Threaded Drainage Fittings
ASME B16.18	(1984) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.39	(1986) Malleable Iron threaded Pipe Unions (Classes 150, 250, and 300)
ASME B40.1	(1991) Gauges - Pressure Indicating Dial Type - Elastic Element
ASSE 1001	(1988) Pipe Applied Atmospheric Type Vacuum Breakers
ASSE 1003	(1981) Water Pressure Reducing Valves for Domestic Water Supply Systems
ASSE 1011	(1981) Hose Connection Vacuum Breakers
ASSE 1013	1988) Reduced Pressure Principle Backflow Preventers
ASSE 1018	(1986) Trap Seal Primer Valves Water Supply Fed
CISPI Std 301	(1990) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
CISPI Std HSN	(1985) Neoprene Rubber Gaskets for Hub and Spigot Cast Iron Soil Pipe and Fittings
CID A-A-238	(Rev B) Seat, Water Closet
CDA 1.0	(1990) Standard Test Method 1.0 for Liquid and Paste Fluxes for Soldering Applications of Cooper and Cooper Alloy Tube
FS QQ-L-201	(Ref F; AM 2) Lead Sheet
FS TT-P-1536	(Rev A) Plumbing Fixture Setting Compound
FS TT-S-00230	(Rev C) Sealing Compound, Elastomeric Type, Single Component for Caulking, Sealing, and Glazing (for Buildings and Other Structures)
FS TT-S-001543	(Rev A) Sealing Compound: Silicone Rubber Base (for Caulking, Sealing, and Glazing in Buildings and Other Structures)
FS WW-C-440	(Rev B; Am 2) Clamps; Hose, (Low-Pressure)
FS WW-P-541/GEN	(Rev E; Am 1) Plumbing Fixtures
FS WW-P-541/1	(Rev B; Am 1) Plumbing Fixtures (Water Closets)

FS WW-P-541/4	(Rev B; Am 1) Plumbing Fixtures (Lavatories)
FS WW-P-541/5	(Rev B; Am 1) Plumbing Fixtures (Sinks, Sample and Service)
FS WW-P-541/7	(Rev C; Am 1) Plumbing Fixtures (Shower Bath and Emergency Eye and Face Wash Outfits)
FS WW-S-1913	(Rev A) Shower Head, Ball Joint (Integral Flow Control)
FS WW-U-516	(Rev B; Notice 1) Unions, Brass or Bronze, Threaded Pipe Connections and Solder-Joint Tube Connections
FS WW-V-35	(Rev C) Valve, Ball
FCCHR-01	(Jun 1988) Manual of Cross-Connection Control
MSS SP-25	(1978; R 1988) Standard Marking System for Valves, Fittings, Flanges and Unions
MSS SP-58	(1988) Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-69	(1991) Pipe Hangers and Supports - Selection and Application
MSS SP-80	(1987) Bronze Gate, Globe, Angle and Check Valves
MSS SP-83	(1987) Steel Pipe Unions Socket-Weldings and Threaded
NEMA 250	(1991) Enclosures for Electrical Equipment (1000 Volts Maximum)
PDI WH 201	(1977) Water Hammer Arresters

1.2 SUBMITTALS

The Subcontractor shall submit five copies of the following to the Contractor:

- A. Shop drawings showing outline and overall dimensions, connection details, weights, anchorage details, arrangement of functional parts, and parts lists if applicable, for all equipment and materials furnished.
- B. Manufacturer's detailed technical data for materials, fabrication and installation. Include catalog cuts of all equipment, hardware, anchors, fastenings and accessories.

1.3 DESIGN CRITERIA

- A. Plumbing systems shall be designed, constructed and maintained so as to guard against fouling, clogging and depositing of solids.
- B. Plumbing systems shall be installed in such manner as not to weaken structural members nor cause damage or deterioration to any part of the building through fixture usage.
- C. Where practical, drain pipes shall be run to piping connections in the nearest wall rather than through the floor.

- D. The minimum pressure available at all times at water outlets shall be 8 psig, except at direct supply flush valves at which the minimum shall be 15 psig, and except at other equipment requiring higher pressure at which the minimum shall be that required for satisfactory performance.
- E. If the building sanitary sewer line is installed in the same trench as the water service the building sewer pipe shall conform to one of the standards for ABS plastic pipe, cast iron pipe or PVC plastic pipe listed in Table P-404.3 of the BOCA National Plumbing code, or approved equal as required to meet site specific water service pipe and the conditions building sewer shall be separated by undisturbed earth or compacted earth. The bottom of the water service pipe at all points shall be a minimum of 12 inches above the top of the highest point of the sewer. The water service pipe shall be on a slid shelf excavated at one side of the common trench.
- F. Subcontractor shall assess the need and acceptability of alternative water service and sewer pipe materials under the current site conditions and line routing shown on the Drawings. Subcontractor shall have all alternative materials approved by the Contractor and the applicable state or local agency prior to installation.
- G. Sanitary drainage fixture units shall conform to BOCA Building Code 1996 edition.

PART 2. PRODUCTS

2.1 MATERIALS

- A. Pipe fittings shall be compatible with the applicable pipe materials. Pipe threads (except dry seal) shall conform to ASME B1.20.1. Grooved pipe couplings and fittings shall be of the same manufacturer. Material or equipment containing lead shall not be used in any potable water system. Pipe materials shall be in accordance with applicable Building Codes of New York State.
- B. Hubless cast-iron soil pipe shall not be installed under concrete floor slabs or in crawl spaces.
- C. Joints and gaskets materials shall conform to the following:
 1. Coupling for Cast-Iron Pipe: ASTM A 74, AWWA C606.
 2. Coupling for Steel Pipe: AWWA C606.
 3. Neoprene Gaskets for Hub and Cast-Iron Pipe and fittings: CISPI Std HSN.
 4. PTFE Tape, for use with Threaded Metal or Plastic Pipe: MS MIL-T-27730.
 5. Rubber Gaskets for Cast-Iron Soil-Pipe and Fittings: ASTM C 564.
- D. Miscellaneous materials shall conform to the following:
 1. Water hammer Arrester: PDI WH 201.
 2. Lead, Sheet: FS QQ-L-201, Grade B.
 3. Asphalt Roof Cement: ASTM D 2822.
 4. Hose Clamps: FS WW-C-440.
 5. Supports for Off-the-Floor Plumbing Fixtures: ASME A112.6.1M.
 6. Metallic Cleanouts: ASME A112.36.2M.

- 7. Plumbing Fixture Setting Compound: FS TT-P-1536, Type II.
 - 8. Gauges - Pressure and Vacuum Indicating Dial Type - Elastic Element: ASME B40.1.
 - 9. Thermometers: SAMA Z236.1.
- E. Pipe hangers, insets, and supports shall conform to MSS SP-58.
- F. Valves shall be provided on supplies to equipment and fixtures. Valves 2-1/2 inches and smaller shall be bronze with threaded bodies for pipe and solder-type connections for tubing. Valves 3 inches and larger shall have flanged iron bodies and bronze trim. Pressure ratings shall be based upon the application. Valves used for water service shall have the zinc content limited to no more than 6 percent for the stem, body, bonnet, wedge, or disk in contact with the fluid. Grooved end valves may be provided if the manufacturer certifies that the valves meet the performance requirements of applicable MSS standard.

Description	Standard
Cast-Iron Gate Valves, Flanged and Threaded Ends	MSS SP-70
Cast-Iron Swing Check Valves, Flanged and Threaded Ends	MSS SP-71
Ball Valves with Flanged and Butt-Welding Ends for General Service	MSS SP-72
Ball Valves	FS WW-V-35
Bronze Gate, Globe, Angle, and Check Valves	MSS SP-80
Cast-Iron Globe and Angle Valves, Flanged and Threaded Ends	MSS SP-85
Backwater Valves	ASME A112.14.1
Water Pressure Reducing Valves	ASSE 1003
Trap Seal Primer Valves	ASSE 1018

- G. Reduced pressure principle assemblies, double check valve assemblies, atmospheric (nonpressure) type vacuum breakers, and pressure the vacuum breakers shall be tested, approved, and listed in accordance with FCCHR-01. Backflow preventers with intermediate atmospheric vent shall be in accordance with ASSE 1012. Reduced pressure principle backflow preventers shall be in accordance with ASSE 1011. Pipe applied atmospheric type vacuum breakers shall be in accordance with ASSE 1001. Air gaps in plumbing systems shall be in accordance with ASME A112.1.2.
- H. Floor drains in the lavatory shall consist of a galvanized body, integral seepage pan, and adjustable perforated or slotted chromium-plated bronze, nickel-bronze, or nickel-brass strainer, consisting of grate and threaded collar. Floor drains shall be cast iron except where metallic waterproofing membrane is installed. Drains shall be of soluble drainage pattern for embedding in the floor construction. The seepage pan shall have seep holes or channels for drainage to the drainpipe. The strainer shall be adjustable to floor thickness. A clamping device for attaching flashing or waterproofing membrane shall be provided when required. Drains shall be provided with threaded or caulked connection.
- I. Unless otherwise specified herein, traps shall be copper-alloy adjustable tube type with slip joint inlet and swivel. Traps shall be without a cleanout. Tubes shall be not less than 20-gauge copper alloy with walls 0.032-inch thick within commercial tolerances, except on the outside of bends where the thickness may be reduced slightly in manufacture by usual commercial methods. Inlets shall have rubber washer and copper alloy nuts for slip joints above the discharge level.

Seivel joints shall be below the discharge level and shall be of metal-to-metal or metal-to-plastic type as required for the application. Nuts shall have flats for wrench grip. Outlets shall be internal pipe thread, except that when required for the application, the outlets shall have sockets for solder-joint connections. The depth of the water seal shall be not less than 2 inches. The interior diameter shall be not more than 1/8 inch over or under the nominal size, and interior surfaces shall be reasonably smooth throughout. A copper alloy "P" trap assembly consisting of an adjustable "P" trap and threaded trap wall nipple with cast brass wall flange shall be provided for lavatories. The assembly shall be a standard manufactured unit and may have a rubber-gasketed swivel joint.

- J. In cast-iron bell and spigot pipe, cleanouts shall consist of a cast-iron ferrule and extra-heavy brass tapered screw cleanout plug with square or hexagonal nuts.
- K. In screw pipe, cleanout shall consist of standard iron pipe size (I.P.S.) brass plugs screwed into drainage fittings. In copper tubing they shall consist of copper-to-copper to I.P.S. with I.P.S. brass plugs screwed into female threaded portion of the tee.
- L. Flush floor cleanout (F.C.O.) for areas with concrete floor finish locations in general shall be Zurn Industries Z-1420-25 or Contractor approved equal.
- M. Hot water heater shall be a minimum of 30 gallons in capacity, 240 Volt, 1-phase, and 4.5 KW.
- N. Point of Use Thermostatic Mixing Valves for Single Drench Emergency Showers and Eye Washes: positive hot water shut-off; integral cold water bypass; gpm range sufficient for combination drench shower and eyewash; one thermometer measuring temperature of outlet flow; installed inline to emergency eyewash/shower assembly; easily tested and repaired; complying with ANSI Z358.1

PART 3. EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. All piping located in air plenums shall conform to NEPA 90A requirements. The plumbing system shall be installed complete with necessary fixtures, fittings, traps, valves, and accessories. Drainage piping shall be extended 40 feet outside the building, unless otherwise indicated. A gate valve or full port ball valve and drain on the water service line shall be installed inside the building approximately 6 inches above the floor from point of entry. Piping shall be connected to the exterior service lines or capped or plugged, if the exterior service is not in place. Sewer and water pipes shall be laid in separate trenches, except when otherwise shown. All exterior underground utilities shall be at least 12 inches below the average local frost depth as indicated on the drawings. If trenches are closed or the pipes are otherwise covered before being connected to the service lines, the location of the end of each plumbing utility shall be marked with a stake or other acceptable means. Valves shall be installed horizontal or above.
- B. Metallic pipe shall be used through the roof from at least 6 inches below the roof to the required point of termination above the roof. An appropriate rubber boot shall be installed to completely seal the opening between pipe and roof.
- C. Metallic pipe shall be used through the firewall to a point at least 6 inches on both sides of the wall.

- D. The piping shall be extended to fixtures, outlets, and equipment. The water piping system shall be arranged and installed to permit faucets, flush valves, or other control valves which are supplied with integral stops, shall be equipped with a shut-off valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures. Supply piping to fixtures faucets, and flush valves shall be anchored to prevent movement.
- E. The work shall be carefully laid out in advance, and unnecessary cutting of construction shall be avoided. Damage to building, piping, wiring, or equipment as a result of cutting shall be repaired by mechanics skilled in the trade involved.
- F. Pipe openings shall be closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water, chemicals, and mechanical injury. Upon completion of the work, the fixtures, materials, and equipment shall be thoroughly cleaned, adjusted, and operated. Safety guards shall be provided for exposed rotating equipment.
- G. Pipe shall be accurately cut and worked into place without springing or forcing. Care shall be taken not to weaken structural portions of the building. Aboveground piping shall run parallel with the lines of the building, unless otherwise indicated. Branch pipes from service lines may be taken from top, bottom, or side of main, using crossover fittings required by structural or installation conditions. Supply pipes, valves, and fittings will be kept a sufficient distance from other work the other services to permit not less than 1/2-inch between finished covering on the different services. Bare and insulated water lines shall not bear directly against building structural elements so as to transmit sound to the structure or to prevent flexible movement of the lines. No water pipe shall be buried in or under floors unless specifically indicated or approved. Changes in pipe sizes shall be made with reducing fittings. Use of bushings will not be permitted. Change in direction shall be made with fittings, except that bending of pipe 4 inches and smaller will be permitted, provided a pipe bender is used and wide sweep bends are formed. The center-line radius of bends shall be not less than 6 diameters of the pipe. Bent pipe showing kinks, wrinkles, flattening, or other malformations will not be acceptable.
- H. Pipe drains indicated shall consist of 3/4-inch hose bibb with renewable seat and gate valve or full port ball valve ahead of hose bibb. At other low points, 3/4-inch brass plugs or caps shall be provided. Disconnection of the supply piping at the fixture is an acceptable method of draining the fixture.
- I. Allowance shall be made throughout for expansion and contraction of water pipe. Risers shall be securely anchored as required or where indicated to force expansion to loops. Branch connections form risers shall be made with ample swing or offset to avoid undue strain on fittings or short pipe lengths. Horizontal runs of pipe over 50 feet in length shall be anchored to the wall or the supporting construction about midway on the run to force expansion, evenly divided, toward the ends. Sufficient flexibility shall be provided on branch runouts from mains and risers to provide for expansion and contraction of piping. Flexibility shall be provided by installing one or more turns in the line so that piping will spring enough to allow for expansion without straining. If mechanical grooved pipe coupling systems are provided, the deviation from design requirements for expansion and contraction may be allowed pending approval of the Contractor.
- J. Commercial-type water hammer arresters shall be provided on hot- and cold-water supplies and shall be located as generally indicated, with precise location and sizing to be in accordance with PDI WH 201. Water hammer arresters, where concealed, shall be accessible by means of access doors or removable panels. Commercial-type water hammer arresters shall be in accordance with PDI WH 201. Vertical capped pipe columns will not be permitted.

- K. Unions and flanges and mechanical couplings shall not be concealed in walls, ceilings, or partitions. Unions shall be used on pipe sizes 2-1/2 inches and smaller; flanges shall be used on pipe sizes 3 inches and larger.
- L. Joints shall use fittings made for the purpose, have clearances of 0.0001 to 0.0003" be brazed or soldered, and be made with flux. Tubes shall be cut square and reamed to remove burrs. The outside surface of the tube to contact the fitting and inside surface of the fitting shall be cleaned with an abrasive material just prior to making connections. Care shall be taken to prevent annealing of the tube or fittings when making connections. Connections of 2-1/2 inches and larger shall be made with heat applied uniformly around the entire circumference of the tube and fittings by a multiflame torch.
- M. Connections between ferrous and copper pipe shall be made with dielectric unions or flanges. Connecting joints between plastic and metallic pipe shall be made with transition fittings for the specific purpose.
- N. Pipe sleeves shall be furnished and set in their proper and permanent location,
- O. Pipes passing through concrete or masonry walls or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction. Sleeves shall not be required for cast-iron pipe passing through concrete slab on grade, except where penetrating a membrane waterproof floor. A modular mechanical type sealing assembly may be installed in lieu of a water proofing clamping flange and caulking and sealing of annular space between pipe and sleeve. The seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve with corrosion-protected carbon steel bolts, nuts, and pressure plates. The links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe and the sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe and sleeve involved. Sleeves shall not be installed in structural members, except where indicated or approved. Rectangular and square openings shall be as detailed. Each sleeve shall extend through its respective floor, or roof, and shall be cut flush with each surface, except for special circumstances. Pipe sleeves passing through floors in wet areas such as mechanical equipment rooms, lavatories, kitchens, and other plumbing fixture areas shall extend a minimum of 4 inches above the finished floor. Unless otherwise indicated, sleeves shall be of a size to provide a minimum of 1/4-inch clearance all-around between bare pipe and inside of sleeve or between jacket over insulation and sleeves. Sleeves in bearing walls shall be steel pipe or cast-iron pipe. Sleeves for membrane waterproof floors shall be steel pipe, cast-iron pipe, or plastic pipe. Membrane clamping devices shall be provided on pipe sleeves for waterproof floors. Sleeves in nonbearing walls or ceilings may be steel pipe, cast-iron pipe, galvanized sheet metal with lock-type longitudinal seam, or moisture-resistant fiber or plastic. Plastic sleeves shall not be used in nonbearing firewalls, roofs, or floor/ceilings. Except as otherwise specified, the annular space between pipe and sleeve, or between jacket over insulation and sleeve, shall be sealed as indicated and with sealants conforming to FS TT-S-00230 or FS TT-S-001543 and with a primer, backstop material and surface preparation. Pipes passing through sleeves in concrete floors over crawl spaces shall be sealed as specified above. The annular space between pipe and sleeve or between jacket over insulation and sleeve shall not be sealed for interior walls, which are not designated as fire rated. Sleeves through below grade walls in contact with earth shall be recessed 1/2 inch from wall surfaces on both sides. Fill annular space between pipe and sleeve with backing material and install sealants in the joint between the pipe and masonry wall as

specified above. Sealant selected for the earth side of the wall shall be compatible with dampproofing/waterproofing materials that are to be applied over the joint sealant.

- P. Pipes passing through roof or floor waterproofing membrane shall be installed through a 4-pound lead flashing or a 16-ounce copper flashing, each within an integral skirt or flange. Flashing shall be suitably formed, and the skirt or flange shall extend not less than 8 inches from the pipe and shall be set over the roof or floor membrane in a solid coating of bituminous cement. The flashing shall extend up the pipe a minimum of 10 inches. For cleanouts, the flashing shall be turned down into the hub and caulked after placing the ferrule. Pipes passing through pitched roofs shall be flashed, using lead or copper flashing, with an adjustable integral flange of adequate size to extend not less than 8 inches from the pipe in all directions and lapped into the roofing to provide a watertight seal. The annular space between the flashing and the bare pipe or between the flashing and the metal-jacket-covered insulation shall be sealed as indicated. Flashing for dry vents shall be turned down into the pipe to form a water proof joint. Pipes, up to and including 10 inches in diameter, passing through roof or floor water proofing membrane may be installed through a cast-iron sleeve with caulking recess, anchor lugs, flashing-clamp device, and pressure ring with brass bolts. Flashing shield shall be fitted into the sleeve clamping device. Pipes passing through wall waterproofing membrane shall be sleeved as described above. In addition, a waterproofing clamping flange shall be installed.
- Q. Instead of turning the flashing down into a dry vent pipe, or caulking and sealing the annular space between the pipe and flashing or metal-jacket-covered insulation and flashing, counterflashing may be accomplished by utilizing the following:
 - 1. A standard roof coupling for threaded pipe up to 6 inches in diameter.
 - 2. A tack-welded or banded-metal rain shield around the pipe.
- R. Where pipes, fixtures drains, floor drains, cleanouts or similar items penetrate slab on grade floors, except at penetrations of floors with waterproofing membrane as specified in paragraphs Flashing Requirements and Waterproofing, form a groove 1/4 inch to 1/2 inch wide by 1/4 inch to 3/8 inch deep around the pipe, fitting or drain. Fill the groove with an approved sealant.
- S. Where pipes pass through firewalls, fire-partitions, fire-rated pipe chase walls or floors above grade, a fire seal shall be provided.

3.2 TESTING AND INSPECTIONS

- A. Each system component will be given requisite factory tests as necessary to determine that the work and materials are free from defects and to establish that the design and construction meet the requirements of the contract documents.
- B. Acceptance tests, after the equipment is completely installed, may be performed to demonstrate performance requirements as specified herein. The field tests will be governed by provisions of applicable industry and institute standards.
- C. All piping embedded in concrete or underground and designed for pressure of more than 1 psig above atmospheric shall be tested for leaks immediately prior to concreting/backfilling. The test pressure shall be 1.5 times the pressure to which the pipes will be subjected, with a minimum test pressure of 100 psig. The pressure test shall be held for two hours with no drop in pressure except that which may be caused by air temperature variations. The entire piping system shall be visually inspected for leakage. In case of leakage, leaks shall be repaired and testing repeated.

D. Pipe Testing

1. Check and plug all relevant open ends, adequately block all bends, tees, and other fittings, and do whatever else is necessary so that pipelines will safely withstand the pressures developed under the tests and so that no damage or injury will occur to the pipeline, people, or property.
2. All tests shall be conducted at the pressure specified in this section.
3. The Subcontractor is cautioned that trapped air may cause a false indication of the rate of leakage. Points of concern include ends of lines, stubs, and high points in pipelines. No credit will be made for this condition and no adjustment will be made to the allowable leakage. Where trapped air is suspected of causing a test failure, the Subcontractor shall do whatever is necessary to evacuate the air and repeat the tests until the actual leakage is equal to or less than the allowable rate of leakage.
4. Every length of pipe installed under this contract shall be tested, unless otherwise specified or approved by the Contractor.
5. All regulators, gages, traps, and other apparatus or equipment, which may be damaged by test pressures shall be isolated or removed before tests are made.
6. All leakage in pipelines and appurtenances shall be located and eliminated. Repairs shall be to the satisfaction of the Contractor, and all work found to possess leaks may be ordered to be re-excavated, removed, and replaced, with no additional compensation. In all cases, repair or replacement shall be with the prior concurrence and to the satisfaction of the Contractor. The testing procedure(s) shall then be repeated.
7. Should any test disclose leakage, or pressure drop greater than that specified, the Subcontractor shall at his own expense locate and repair the defective joints until the specified allowance is met.
8. All pressure pipes shall be leakage and pressure tested in accordance with AWWA C600 and ASME.
9. The pressure test pressure shall be 200 psig based on the lowest point in the line corrected to the elevation of the test gage.
10. The leakage test pressure shall be 120 psig based on the lowest point in the line corrected to the elevation of the test gage.
11. Allowable leakage shall be equal to or less than that given in AWWA C600 Table 3.
12. All pipes shall be tested prior to applying insulation and before they are concealed or furred-in. Restrain and brace all piping adequately prior to testing. Leave all restraining devices in place after testing.
13. With clean water, hydrostatically test all piping, which will convey water or aqueous solutions. Maintain a test pressure of 200 psig or 170 percent of the pump shutoff head, whichever is greater.
14. Provide concentrated liquid soap or a commercial leak detection apparatus to be used for locating leaks and where directed by the Contractor.
15. These tests shall be considered satisfactorily passed only when there is no evidence of leakage and no other defects are disclosed.

- E. The Subcontractor shall ensure pipe and pipe fittings, solvents and joints are compatible with the operating chemicals and surrounding environment.

* * * END OF SECTION * * *

SECTION 15500

HEATING, VENTILATION AND AIR CONDITIONING

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall supply and provide all materials, fabrication, erection, installation, testing and delivery of services as specified in this section and/or on the drawings for complete installation and proper operation of the heating ventilating and air conditioning system as part of an environmental treatment system.

This section covers the requirements for the functional design, performance, materials, construction features, quality and handling of the equipment described herein.

It is not the intent of this section and associated drawings to specify all details of design, fabrication and construction. It shall be the responsibility of the Subcontractor to design and install equipment that has been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

1.1 REFERENCES

Subcontractor shall determine submittals, with Contractor concurrence, and submit to the Contractor. Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 02500	Pre-Engineered Building
Section 09900	Painting, General
Section 16051	Electric Motors

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

BUILDING CODE OF NEW YORK STATE; OFFICIAL COMPILATION OF CODES, RULES AND REGULATIONS

BUILDING OFFICIALS AND CODES ADMINISTRATORS INTERNATIONAL, INC., NATIONAL MECHANICAL CODE/1993

BUILDING OFFICIALS AND CODES ADMINISTRATORS INTERNATIONAL, INC. NATIONAL ENERGY CONSERVATION CODE/1993

AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR CONDITIONING ENGINEERS (ASHRAE)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATES (SMACNA)

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

UNDERWRITERS LABORATORIES (UL)

1.2 SUBMITTALS

The Subcontractor shall submit five copies of each of the following to the Contractor:

- A. Ventilation and Exhaust System: Illustrations, schedules, performance charts, instructions, brochures, diagrams, and other information to illustrate the requirements and operation of the equipment and the system.
- B. Spare parts data for each different item of material and equipment specified, after approval of detail drawings and no later than two months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.
- C. Heating, Ventilation and Exhaust System: Shop drawings for fans, unit heaters, heat pumps, air filters, dampers, controls, terminal units, and associated appurtenances. Drawings shall include: an electrical connection diagram for each piece of mechanical equipment having more than one automatic or manual electrical control device; schedule of all air diffusers, registers, and grilles indicating location, size, type, specified air quantity, sound power level values, and pressure drops; ductwork and piping layout drawings showing the location of all supports and hangers, typical details for hangers, gauge reinforcement, reinforcement spacing rigidity classification, and seal classification; schematic automatic temperature control diagrams and control sequences; descriptive data of equipment with curves and installation details; and schedule of damper sizes with leakage and flow characteristic charts.
- D. Operation and Maintenance (O&M) Manuals

Ventilation and Exhaust System: Maintenance manuals listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.
- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent

scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.

1.4 SYSTEM DESCRIPTION

- A. This section serves to provide a general description of the requirements for the Heating, Ventilation and Air Conditioning (HVAC) system. The Subcontractor is to design and install heating, ventilation and air conditioning systems for the Groundwater Treatment Plant (GWTP). The packaged heat pump system shall be adequately designed to meet all requirements set forth by applicable codes. Furthermore, ambient conditions set forth by the equipment manufacturers are to be strictly addressed.
 - 1. Ventilation: Sufficient air changes to remove air contaminants, particulates, etc. and provide an air quality within the GWTP meeting the latest requirements of the applicable governing authority. Ventilation is provided by exhaust fans for the process areas and the packaged air unit for office areas.
 - 2. Air contaminants may consist of motor vehicle emissions and any fugitive emissions from treatment system equipment.
 - 3. Heating will be provided by individual electric unit heaters for the process area heating requirements as well as by a heating and cooling packaged heat pump, which will provide heat to multiple rooms by the use of ducts and diffusers. The systems will be activated by thermostat control.
 - 4. Cooling will be provided by a packaged heat pump, which will provide cooling to multiple rooms by the use of ducts and diffusers.

1.5 DESIGN CRITERIA

- A. Outdoor design temperature shall be based on the 97-1/2 percent value for heating and the 2-1/2 percent value for cooling as determined from the Energy Conservation Construction Code of New York State.
- B. Indoor design temperatures shall be as indicated in Table 15500-1.

Table 15500-1
Indoor Design Temperatures

Type of Area	Design Temperature (°F)		Outdoor Air Ventilation Criteria
	Summer	Winter	
General Plant Area	N/A	55	Thermostatic
Lavatory	78	70	50 cubic feet per minute (CFM)/person
Office/Control Room	78	70	35 cfm/person

- C. Indoor design relative humidity for heating shall not exceed 30 percent. For cooling the actual design relative humidity within the contact envelope shall be as designed in ASHRAE; Thermal Environmental Conditions for Human Occupancy.

1.6 ENVIRONMENTAL CONDITIONS

The degree day and design temperatures for the project will be as shown in Table 15500-2:

Table 15500-2
Degree Day and Design Temperatures

DEGREE DAY AND DESIGN TEMPERATURES FOR CITIES IN THE UNITED STATES				
State Station	Heating Degree Days (Yearly Total)	Design Temperatures		
		Winter	Summer	
		97-1/2%	Dry Bulb 2-1/2%	Wet Bulb 2-1/2%
New York	5,144	14	90	76
Reference: BOCA National Energy Code/1993; Seventh Edition/Appendix A.				

PART 2. PRODUCTS

2.1 EQUIPMENT - GENERAL

Electrical motor-driven equipment specified shall be provided complete with motor, motor starter (starter shall be mounted in motor control center), and controls. Unless otherwise specified, electric equipment, including wiring and motor efficiencies, shall be in accordance with Division 16. Electrical characteristics and enclosure type shall be as shown, and unless otherwise indicated, all motors of 1 horsepower (Hp) and above with open, drip proof, or totally enclosed fan cooled enclosures, shall be high (premium) efficiency type. Motor starters shall be provided complete with thermal overload protection and other appurtenances necessary. Each motor shall be in accordance with NEMA MG 1 and shall be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices, but not shown, shall be provided.

2.2 GENERAL FAN AND MOTOR REQUIREMENTS

- A. General Fan and Motor Requirements: Fans shall be tested and rated in accordance with AMCA 210. Fans may be connected to the motors either directly or indirectly with V-belt drives. V-belt drives shall be designed for not less than 150 percent of the connected driving capacity. Motors for V-belt drives shall be provided with adjustable rails or bases. Removable metal guards shall be provided for air exposed V-belt drives, and speed test openings shall be provided at the center of all rotating shafts. Fans shall be provided with personnel screens or guards on both suction and supply ends. Fan and motor assemblies shall be provided with vibration-isolation supports or mountings. Vibration-isolation units shall be standard products with published loaded ratings, and shall be single rubber-in-shear, double rubber-in-shear, springs, or springs under inertial base, unless otherwise indicated. Vibration isolators shall limit vibration transmission to 10 percent at lowest equipment resolutions per minute (RPM); Vibration isolators shall provide static deflection in inches indicated for the various items of equipment. Each fan shall be selected to produce the capacity required at the fan total pressure indicated. Sound power level dB referenced to 10 to the minus twelfth-power watt, mid-frequency, shall not exceed the value or values for the octave band or bands shown for each fan. Sound power data for each fan in all octave bands at mid-frequencies shall be submitted. The sound power level values shall be obtained in accordance with AMCA 300. Standard AMCA arrangement, rotation, and discharge shall be as indicated.

- B. Combination Exhaust Fan/Light: Fan shall meet the following specifications:
1. 4-inch duct diameter
 2. 120 volt single phase
 3. 100 W light
 4. Two-function toggle control
- C. Power Roof Ventilator/Centrifugal Fans: Fans shall have the following specifications:
1. Centrifugal V-belt drive, up-blast
 2. Backward inclined, non-overloading wheel
 3. 3-phase motors 208-220/440 volt (V)
 4. Motor compartment housing shall be hinged or removable and weatherproof, constructed of heavy gauge aluminum. Fans shall be provided with bird-screen, disconnect switch, motorized dampers, roof curb, and extended base. Motors and wheels shall be mounted on vibration isolators, which shall limit vibration transmission of 10 percent at lowest equipment driven rpm. Motors enclosure shall be totally enclosure type.
 5. Both roof ventilators shall be identical and manufactured by Dayton or Contractor approved equivalent.
- D. Exhaust Fan Guards: Fan guards shall be compatible with the supplied exhaust fans.
- E. Air Filters: Air filters shall meet the requirements of UL 900, Class 1 or 2. Filter size and capacity shall be as indicated.
- F. Air Terminal Devices: Devices shall remove or distribute the indicated quantity of air uniformly, throughout indicated space, without causing noticeable noise or drafts, air movement greater than 50 for dead spaces. Air terminal devices shall be sound rated in accordance with ADC 1062:GRD. Devices shall be factory fabricated of steel or aluminum. Steel devices shall be furnished with prime coat for field finishing in accordance with Section 09900, "Painting, General." Steel devices shall be furnished with baked enamel finish in color to match ceiling trim. Gaskets shall be provided for devices mounted in finished services, where leakage control is necessary to prevent streaking. Diffusers and registers shall be provided with opposed-blade volume dampers for face accessible key operator adjustment or with automatically controlled device, unless otherwise indicated.
- G. Louvers: Louvers for installation in exterior walls shall have blades fabricated from anodized aluminum or galvanized steel or aluminum structural shapes. Sheet metal thickness and fabrication shall conform to SMACNA-06. Blades shall be accurately fitted and secured to frames. Edges of louver blades shall be folded or beaded for rigidity and baffled to exclude driving rain. Louvers shall be provided with stainless steel bird and insect screens. Louvers shall bear AMCA Certified Ratings Seal for air performance and water penetration ratings as described in AMCA 500.
- H. Dampers: Dampers for installation in exterior walls shall have blades fabricated from anodized aluminum or galvanized steel or aluminum structural shapes. Dampers shall actuate under changes in barometric conditions or during induced draft operations of the ventilation system.

Dampers shall have adjustable weights to modify their operation as necessary. Sheet metal thickness and fabrication shall conform to SMACNA-06. Blades shall be accurately fitted and secured to frames. Dampers shall bear AMCA Certified Ratings Seal for air performance and water penetration ratings as described in AMCA 500.

- I. General Plant Area Heaters: Unit heaters shall have a built-in thermostat and motor starter and be a Vertical or Horizontal Delivery Blower Heater type as specified on Construction Drawing M-1. Heaters shall operate on 480 V, 3-phase power.
- J. Air Conditioner & Heat Pump for Office/Control Room within Mezzanine.
 - 1. Unit shall be a complete package ceiling suspended air conditioner and heat pump with wireless remote controller.
 - 2. All rotating components shall be internally isolated with vibration isolators from the main unit.
 - 3. Condenser section for self-contained package units shall be an integral part of the unit and shall be part of a complete factory assembled kit.
 - 4. A complete refrigerant piping system shall be factory fabricated and installed in the unit. Complete refrigerant system shall be cleaned, leak tested, and charged with refrigerant. Panels shall include all controls required, and all safety controls and interlocks. A complete wiring diagram shall be permanently attached to the unit.
 - 5. The complete package shall be manufactured by Sanyo or Contractor approved equivalent. The indoor Unit Model No. THS2432 of the Sanyo Model No. 24THS32 is specified.

2.3 SPARE PARTS

- A. A spare parts list shall be provided for each different item of material and equipment specified, including all parts recommended by the manufacturer to be replaced after one year of service.
- E. A set of manufacturer recommended spare parts and supplies for one year of service is to be included as part of the equipment provided under this section. Also to be provided are any unusual tools that are necessary for maintenance and repair of the system.

PART 3. EXECUTION

3.1 GENERAL

- A. Installation: Material and equipment shall be installed and prepared for service as indicated on the Contract Drawings and as recommended by the manufacturer(s).
- B. Control equipment shall be installed under the supervision of the manufacturer's representative, in accordance with manufacturer's written instructions. Unless otherwise indicated, all operators, controllers, sensors, indicators and like devices, when installed on, or which penetrate thermally insulated surfaces, shall be provided with stand-off mounting brackets, bases, nipples, adapters, or extended tubes to provide clearance between the surface and the device *not* less than the thickness of the insulation. Stand-off mounting items shall be integral with the devices or standard accessories of the control manufacturer, unless otherwise approved. Clamp-on devices or instruments where direct contact with a surface is required, is exempt from use of above mounting items. Transformers shall be provided for electric or electronic controls when required.

Sensing elements and pressure taps shall be mounted in controlled medium flow streams to sense representative conditions. A local or remote readout thermometer shall be provided adjacent to each control device temperature sensor. Wall thermostats and guarded thermostats shall be mounted on separate bases. Space thermostat shall be mounted 60 inches above finished flow, unless otherwise indicated. Where necessary to protect equipment mounted control devices, vibration isolation mountings shall be provided.

- C. Air Terminal Devices: Devices shall be located aesthetically with respect to lighting, ceiling patterns, and masonry bond. Sponge rubber gaskets shall be provided for all devices mounted in finished surfaces where leakage control is necessary to prevent streaking. Ceiling mounted diffusers shall be installed with rims tight against ceiling surface. Suitable trim for flush mounted diffusers shall be provided. Collar connecting device to duct shall not interfere with volume controller and shall be sealed airtight with sealant or by approved methods and materials.
- D. Ductwork, Sheet Metal: Ductwork shall conform to SMACNA-06. Ductwork sections shall be constructed in accordance with industry standard ductwork pressure classifications. Ductwork shall be sealed as recommended by SMACNA-06 for the appropriate pressure classification except ductwork pressure classification below 2-inch water gauge shall have a seal class C in SMACNA-06. Pressure-sensitive tape shall not be used as a primary sealant on ductwork with pressure classifications above 1-inch water gauge. Outside air intake ducts and plenums shall be fabricated with watertight soldered or brazed joints and shall be externally insulated. Dampers located behind intake or exhaust louvers shall be provided where indicated. Offsets and transformations necessary to increase headroom or avoid interference with building and other construction, and equipment, shall be provided. Horizontal locks and seams of the button punch snap lock type shall not be used in aluminum ductwork construction, sheet metal shall be lapped in direction of airflow. Where aluminum is welded, minimum thickness shall be 18-gauge. Damaged zinc shall be repaired by application of aluminum or zinc-rich paint. No air leak duct marks shall show at joints or air terminal device connections. Sealant shall be applied in accordance with manufacturer's instructions. Flexible duct shall be connected to rigid duct by metal connectors and length shall be limited to 8 feet, unless otherwise indicated. Air deflectors and access doors shall be located as indicated. Ducts shall be secured and anchored to the building structural components and framing, and shall be fabricated and supported in such a manner as to prevent vibration and pulsation under operating conditions.
- E. Dampers and Fire Doors: Units shall be installed in accordance with manufacturer's instructions of UL 555. Installation shall also comply with requirements of SMACNA-05 and SMACNA-06. Building surface penetrations shall be in accordance with approved shop drawings. Minimum thickness of building surface penetration sleeves shall be 14-gauge, except where greater thickness is required by SMACNA-05 or is indicated.
- F. Power Roof Ventilator Mounting: Foamed 2-inch thick closed-cell, flexible elastomer insulation shall cover width of roof curb mounting flange. Unistrut shall be used to facilitate securing of the unit.
- G. Power Transmission Components Adjustment: V-belts and sheaves shall be tested for proper alignment and tension prior to operation and after 72 hours of operation at final speed. Belts of drive side shall be uniformly loaded, *not* bouncing. Alignment of direct driven couplings shall be to within 50 percent of manufacturer's maximum allowable range of misalignment.

- H. Access Panels: Access panels shall be provided for all dampers and items requiring inspection or maintenance. Access panels shall be of sufficient size and so located that the concealed items may be serviced and maintained or completely removed and replaced.
- I. Building Surface Penetrations: Sleeves and prepared openings for duct mains, branches-and other item penetrations shall be provided during the construction of the surface to be penetrated. Prepared openings shall be provided for all square and rectangular ducts. Branch take-off to air terminal devices shall be in accordance with SMACNA-06. Framed openings, including fire resistive penetrations, shall be provided as specified or indicated, and in accordance with approved shop drawings. Approximately 1-inch clearance shall be provided between penetrating and penetrated surfaces, except where fire resistance criteria governs. Clearance space for non-fire-rated penetrations shall be filled and sealed. Penetrations shall be weather-tight and vapor-tight. Apply sealant to oil-free surfaces, to not less than 2-inch depth. Closure collar, not less than 4 inches wide, unless otherwise indicated, shall be provided for exposed ducts and items on each side of penetrated surfaces, except where air terminal devices are installed. Collars shall be installed tight against the surface and shall fit snugly around penetrating item without contact. Collars for square and rectangular ducts with a maximum side of 15 inches or less shall be fabricated from 20-gauge galvanized steel. Collars for square and rectangular ducts with minimum dimension over 15 inches shall be fabricated from 18-gauge galvanized steel. Collars shall be installed with fasteners on maximum 6-inch centers.
- J. Rectangular Duct Joints: Joints between sections of duct and between ducts and fittings shall be made with either gasketed flanged connections, welded flange joints, or other joints recommended in SMACNA and shall be reinforced at the joints and between the joints as recommended.
- K. Field Painting: Damaged finished surfaces shall be touched-up or repainted to match the original finish. Painting required for surfaces not otherwise specified and finish painting of items primed at the factory shall be as specified in Section 09900, "Painting, General."
- L. Duct Leakage Testing: All sheet metal ductwork that is designed to operate at static pressures above 3 inch water gauge shall be leak tested in accordance with SMACNA-10 at a test less than or equal to the allowable CFM duct leakage per 100 square feet per the appropriate leakage class in Section 4 of SMACNA-10. Test reports shall be provided in accordance with Section 6 of SMACNA-10.

3.2 SEQUENCE OF CONTROL

- A. Roof ventilators and exhaust fans shall be capable of manual or automatic control. In the manual mode, the ventilators/fans shall run continuously. In the automatic control mode, the ventilators/fans shall turn on when the space temperature sensed by a space thermostat is above a set point.
- B. When smoke is sensed by a fire detector, the roof ventilators, exhaust fans, and packaged heat pump shall shut down automatically.

3.3 TESTING AND INSPECTION

All heating, ventilation, and air conditioning equipment shall be given requisite factory tests as necessary to determine that the work and materials are free from defects and to establish that the design and construction meet the requirements of the specification and intended use.

3.4 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction, which shall be for one year after the end of the construction phase. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Subcontractor shall approve of the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. All extended warranties shall be included in the O&M Manual.

* * * END OF SECTION * * *

SECTION 15575

AIR STREAM HEATER

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall supply and provide all materials, fabrication, drawings, erection, design, installation, testing and delivery of services as specified in this Technical Specification and the Contract Drawings for completion and proper operation of the air heater as included in the Contract Documents.

This section covers the requirements for the functional design, performance, construction features, testing, quality and handling of the equipment described herein.

It is not the intent of this section and associated drawings to specify all details of design, fabrication and construction. It shall be the responsibility of the Subcontractor to provide equipment that has been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 11301	Packed Tower Air Strippers
Section 13225	Vapor-Phase Carbon Adsorption System
Section 13600	Process Control System
Section 13650	Instrumentation
Section 15000	Basic Mechanical Materials and Method
Section 15150	Pipe, Pipe Fittings, Pipe Supports and Valves
Section 15400	Plumbing, General Purpose
Section 15890	Ductwork and Accessories
Section 16000	Basic Electrical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

1.2 SUBMITTALS

The Subcontractor shall submit five copies of each of the following to the Contractor:

- A. Shop drawings showing outline and overall dimensions, connection details, weights, anchorage details, arrangement of functional parts, and parts lists if applicable, for all equipment and materials furnished.
- B. Manufacturer's detailed technical data for materials, fabrication and installation. Include catalog cuts of all equipment, hardware, anchors, fastenings and accessories.
- C. Subcontractor shall submit the Operations and Maintenance (O&M) manual including equipment manuals, maintenance procedures, testing, lubrication, preventive maintenance and a recommended spare parts list.
- D. Type and location of loadings, and size and material of anchor bolts.
- E. Electrical and instrumentation detail drawings containing sufficient detail of characteristics and locations.

1.3 SHIPPING, DELIVERY AND STORAGE

- A. Shipments of materials and equipment shall be delivered to the project/work site only during regular working hours. Shipments shall be addressed and consigned to the proper party giving name of Project, street address and city/state.
- B. The Subcontractor shall arrange deliveries of products in accordance with construction schedules and in ample time to facilitate inspection prior to installation.
- C. The Subcontractor shall coordinate deliveries to avoid conflict with work and conditions at site as directed by the Contractor.
- D. The Subcontractor shall deliver products in undamaged condition in original containers or packaging, with identifying labels intact and legible.
- E. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring or otherwise damaging products or surrounding surfaces.
- F. The Subcontractor shall handle products by methods to prevent bending or overstressing during fabrication and delivery.
- G. The Subcontractor shall lift heavy components only at designated lifting points during fabrication and delivery.

1.4 PREPARATION FOR SHIPPING REQUIREMENTS

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all components within shipping containers and on carrier.

- B. All equipment shall be sealed to prevent entry of water, dirt or other foreign material. Seals used on nozzles shall not affect, but shall protect the weld preparation or flange faces of the nozzles. Solid steel plugs shall be used to close all threaded connections. All equipment, especially all small, loose pieces, including bolting, tools, gaskets, etc. shall be adequately crated or boxed for protection during shipment.
- C. Where required to protect against condensation and humidity, a desiccant shall be provided and its presence with the need of periodic removal and dry-out shall be so marked.
- D. Boxes or other shipping units shall be clearly marked to indicate any special instructions, e.g., Fragile, Desiccant Inside, This Side Up, etc. Large and heavy shipping units shall have suitable skids for moving or provisions for lifting with slings. If location of slings is critical, these locations shall be marked accordingly.
- E. All electrical and electronic equipment or accessories installed prior to shipment shall be wrapped and sealed in plastic for rain and weather protection during shipment and storage prior to installation.
- F. Equipment shall be pre-assembled to the greatest extent possible and skid-mounted. Piping, unit valves, isolating valves, instrumentation and interconnecting piping shall be suitably secured to the units and skids to prevent damage during shipment and storage.

1.5 SYSTEM DESCRIPTION

The Subcontractor shall provide an air heater required to raise the air stripper exhaust stream from 60 degrees F to 110 degrees F. The air heaters are to be mounted in specially designed ductwork that shall connect into the air stripper exhaust piping and be able to support the heater. The heater shall be mounted inside a stainless steel enclosure that has a minimum of 24 inches clearance from all other surfaces. The electrical junction box attached to the heating element shall not be oriented to be above or below the element and shall be oriented as depicted in the Contract Drawings.

1.6 DESIGN/PERFORMANCE CRITERIA

- A. Performance:
 - 1. Heat Transfer Rate: 162 kilowatt (kw)
 - 2. Heated Media:
 - a) Flow rate: 10,000 cubic feet per minute (cfm)
 - b) Entering temperature: 60 degrees F. (may vary)
 - c) Exiting temperature: 110 degrees F.
 - d) Maximum exiting temperature: 140 degrees F.

PART 2. PRODUCTS

2.1 EQUIPMENT - GENERAL

- A. Any reference to a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired and is not to be considered

proprietary. In all cases, any comparable source or device is acceptable upon approval by the Contractor.

- B. Equipment described under this Section shall be furnished by manufacturers who are experienced, reputable and qualified in the manufacture of air heaters. The manufacturer shall be fully responsible for the proper operation and performance of the system as a whole.

2.2 AIR STREAM HEATER

- A. The air heater shall be designed to raise the temperature of a 10,000 standard cubic feet per minute (scfm) air stream from 60 degrees F. to 110 degrees F.
- B. The heater shall be Incoloy[®] sheath tubular elements. The elements shall have fasteners to allow for replacement.
- C. The heater shall have a 16-gauge wiring box which encloses individual terminal blocks for each circuit.
- D. The heater shall be flange mounted to the ductwork. A flange mounting gasket shall be provided to minimize air leakage.
- E. The air heater shall be Model ADH-162 duct heater as manufactured by Chromalox or Contractor approved equal.

2.3 HEATER DUCTWORK

- A. The heater is to be mounted in special ductwork. The ductwork is to connect via flanges to the 24-inch vapor stream ductwork. The mounting section of the ductwork for the heater (not including reducing ducts) is to be no larger than 50 inches wide by 24 inches long by 42 inches deep and constructed of stainless steel.
- B. The transition ductwork lengths and angles shall be according to the heater manufacturer, but shall not be greater than 6'-0" in overall length.
- C. The heater is to be attached via rectangular flange with 9/32 inch diameter holes, or as directed by heater manufacturer.
- D. The heater ductwork shall be structurally designed to support the weight of the heater and all associated controls.

2.4 CONTROL

- A. The electric heater shall be 480 volts, 3-phase, 60 Hertz (Hz) SCR controlled. Control panel shall contain SCR, main disconnect switch, contactor, temperature controller, temperature indicator, and all necessary relays and instruments as required for complete control of electrical heater elements.

- B. The control panel shall send/receive the following signals from the main control panel (main Programmable Logic Controller [PLC]):
 - 1. Remote shutdown signal (normally open [N.O.] dry contact) from main PLC.
 - 2. Heater on signal (normally closed [N.C.] dry contact) to main PLC.
 - 3. Heater trouble signal (N.C. dry contact) to main PLC.
 - 4. 4 – 20 mA signal from temperature controller to the main PLC for heater air temperature display.

PART 3. ERECTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install to permit removal of heater with minimum disturbance to installed equipment and piping.

3.2 TESTING AND INSPECTION

The air heater system shall be given requisite factory tests as necessary to determine that the work and materials are free from defects and to establish that the design and construction meet the requirements of the specification and intended use.

3.3 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction, which shall be for one year after the end of the construction phase. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Subcontractor shall approve of the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. All extended warranties shall be included in the O&M Manual.

* * * END OF SECTION * * *

SECTION 15890

DUCTWORK AND ACCESSORIES

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall supply and provide all materials, fabrication, drawings, erection, design, installation, testing and delivery of services as specified in this Technical Specification and the Contract Drawings.

This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the equipment described herein.

It is not the intent of this section and associated drawings to specify all details of design, fabrication and construction. It shall be the responsibility of the Subcontractor to provide equipment that has been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

The purpose of this section is to define the requirements and specifications for all heating ventilation and air conditioning ductwork and accessories.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

- Section 09900 Painting, General
- Section 15000 Basic Mechanical Materials and Methods
- Section 15500 Heating, Ventilation and Air Conditioning

The publications listed below form a part of this specification. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

- | | |
|--------|--|
| SMACNA | Sheet Metal and Air Conditioning Contractors' National Association |
| UL | Underwriters Laboratories |
| ASTM | American Society of Testing and Materials |
| ANSI | American National Standards Institute |
| NFPA | National Fire Protection Association |
| MS | Military Specification |

1.2 SUBMITTALS

The Subcontractor shall submit the following to the Contractor:

- A. Shop drawings showing outline and overall dimensions, connection details, weights, anchorage details, arrangement of functional parts, and parts lists if applicable, for all equipment and materials furnished.
- B. Manufacturer's detailed technical data for materials, fabrication and installation. Include catalog cuts of all equipment, hardware, anchors, fastenings and accessories.

1.3 SHIPPING, DELIVERY AND STORAGE

- A. Shipments of materials and equipment shall be delivered to the project/work site only during regular working hours. Shipments shall be addressed and consigned to the proper party, giving name of Project, street address, and city/state.
- B. The Subcontractor shall arrange deliveries of products in accordance with construction schedules and in ample time to facilitate inspection prior to installation.
- C. The Subcontractor shall coordinate deliveries to avoid conflict with work and conditions at site as directed by Contractor.
- D. The Subcontractor shall deliver products in undamaged condition in original containers or packaging, with identifying labels intact and legible.
- E. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring or otherwise damaging products or surrounding surfaces.
- F. The Subcontractor shall handle products by methods to prevent bending or overstressing during fabrication and delivery.
- G. The Subcontractor shall lift heavy components only at designated lifting points during fabrication and delivery.

1.4 PREPARATION FOR SHIPPING REQUIREMENTS

- A. Where required to protect against condensation and humidity, a desiccant shall be provided and its presence with the need of periodic removal and dry-out shall be so marked.
- B. Boxes or other shipping units shall be clearly marked to indicate any special instructions, e.g., Fragile, Desiccant Inside, This Side Up, etc. Large and heavy shipping units shall have suitable skids for moving or provisions for lifting with slings. If location of slings is critical, these locations shall be marked accordingly.
- C. Flanged connections shall be protected by a ½-inch or thicker plywood disc, or suitable alternate, bolted to the face of the flange.
- D. Threaded or socket weld connections shall be protected with screwed or snap-in (snap-on) type, securely held, plastic protectors. Cast iron plugs are not acceptable for protection unless part of the permanent assembly.

- E. Butt weld connections shall be protected by wooden disks that cover the entire weld end area, and are secured by metal straps and fasteners.
- F. The Contractor shall have sufficient access to audit and inspect the Subcontractor's fabrication facilities.
- G. The Subcontractor shall certify to the Contractor, in writing, that the fabrication is in complete compliance with codes, standards and specifications. Any exceptions to original codes and specification must be documented with written approvals from the Contractor.

PART 2. PRODUCTS

2.1 EQUIPMENT - GENERAL

- A. Any reference to a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired and is not to be considered proprietary. In all cases, any comparable source or device is acceptable upon approval by the Contractor.
- B. Equipment described under this Section shall be furnished by manufacturers who are experienced, reputable and qualified in the manufacture of ductwork. The manufacturer shall be fully responsible for the proper operation and performance of the system.
- C. Ductwork shall be constructed of aluminum sheets. Unless otherwise indicated or specified, sheet metal ductwork shall comply with SMACNA-06 in thickness, gauges, reinforcing and method of construction. Ductwork shall conform accurately to the dimensions indicated. Button punch or bolt connections in standing seams shall be spaced at not greater than 6 inches on centers. Longitudinal locks or seams termed "Button Punch Snap Lock" are acceptable in lieu of Pittsburgh locks on galvanized steel ductwork for duct pressure classification of 2-inches water gauge pressure or less. Wherever practicable, elbows shall be radius type with a centerline radius of 1-1/2 times the width or diameter of the duct. Where space does not permit, the use of short radius elbows having a minimum radius of 1.0 times the width or diameter of the duct, or square elbows with factory fabricated turning vanes may be used. Ductwork shall be designed for a maximum drop of 0.10 in water gauge per 100 feet of duct.
- D. Diverging airflow transitions shall be made each side pitched out a maximum of 20 degrees, for an included angle of 40 degrees. Transitions for converging air flow shall be made with each side pitched in a maximum of 30 degrees, for an included angle of 60 degrees, or shall be as indicated.
- E. Square elbows, fittings, and branch take-offs shall be designed and constructed as specified in SMACNA-06. Rectangular mitered fittings shall contain turning vanes.
- F. A flexible duct connector approximately 6 inches in width shall be provided where sheet metal connections are made to fans or where ducts of dissimilar metals are connected. For round ducts, the flexible material shall be secured by stainless steel or zinc-coated, iron clinch-type draw bands. For rectangular ducts, the flexible material locked to metal collars shall be installed using normal duct construction methods. The composite connector system shall comply with UL 214 and be classified as "flame-retarded fabrics" in UL-01.

- G. Access doors shall be provided in ductwork at all air flow measuring primaries, automatic dampers, fire dampers, fire doors, soils, thermostats, and other apparatus requiring service and inspection in the duct system, and unless otherwise shown, shall conform to applicable SMACNA-06. Access doors shall be provided upstream and downstream of air flow measuring primaries. Doors shall be made as large as practicable. Doors in insulated ducts shall be the insulated type. Leakage around access doors shall be limited to 5 percent of the design flow.
- H. Splitters and dampers shall be furnished with accessible operating mechanisms. Where operators occur in finished portions of the building, operator shall be chromium plated with all exposed edges rounded. Splitters shall be operated by quadrant operators or 3/16-inch rod brought through the side of the duct with locking set screw and bushing. Two rods shall be required on splitters over 8-inches. Manual volume control dampers shall be operated by locking-type quadrant operators. Dampers and splitters shall be two gauges heavier than the duct in which installed. Unless otherwise indicated, multi-leaf dampers shall be opposed blade type with maximum blade width of 12-inches. Access doors or panels shall be provided for all concealed damper operators and locking set screws. Unless otherwise indicated, the locking-type quadrant operator for dampers, when installed on ducts to be thermally insulated, shall be provided with stand-off mounting brackets, bases, or adapters to provide clearance between the duct surface and the operator not less than the thickness of the insulation. Stand-off mounting items shall be integral with the operator or standard accessory of the damper manufacturer. Volume dampers shall be provided where indicated.
- I. Deflectors shall be provided in all duct-mounted supply outlets, takeoff or extension collars to supply outlets, and straight tap-in branch-takeoff connections. Conical branch connections or 45 degree branch entry connections by be used in lieu of deflectors or extractors for branch connections. Air deflectors shall be factory-fabricated and factory or field-assembled units consisting of curved turning vanes or louver blades or uniform air distribution and change of direction with minimum turbulence and pressure loss. Where adjustable devices such as air deflectors or extractors are inaccessible, they shall be provided with means for adjustment and position lock external to the duct in which installed.
- J. Regulators shall be cast white metal or fabricated steel, incremental position indicated and locking type with satin finish, chrome plated, flush surface mounting occur and regulatory box where concealment is required in finished spaces.
- K. Aluminum Alloy Duct Sheets shall conform to ASTM B 209 and ANSI H35.2, ASTM B 221, Alloy 6061, T -5, and T -6. Gauge numbers specified refer to Brown and Sharp gauge.
- L. Gaskets shall be refrigerant and General Service Gaskets Polytetrafluoroethylene, 1/16-inch thick flat sheet, braided or extruded type.
- M. Sealant for heat shrinking and epoxy extrusion over round, exterior, duct joints shall be a high molecular weight, irradiated polyethylene band with interior heat activated epoxy adhesive coating.

PART 3. EXECUTION

3.1 INSTALLATION

- A. Materials and equipment shall be installed and prepared for service as indicated and as recommended by the manufacturer. Temporary air filters shall be provided for systems that are operated during the construction phase of the project.
- B. Lining and adhesive for metallic surfaces shall comply with NFPA 90A. Lining shall be applied in cut-to-size pieces attached to the interior of the duct with fire-resistant adhesive conforming to MS MIL-A-3316, Class 2. Top and bottom pieces shall lap the side pieces and shall be secured with welded pins, adhered clips of metal, nylon, or high impact plastic, and speed washers or welding cup-head pins on maximum 12-inch centers.
- C. Devices shall be located aesthetically with respect to lighting, ceiling patterns, and masonry bond. Sponge rubber gaskets shall be provided for all devices mounted in finished surfaces where leakage control is necessary to prevent streaking. Ceiling mounted diffusers shall be installed with rims tight against ceiling surface. Suitable trim for flush mounted diffusers shall be provided. Collar connecting device to duct shall not interfere with volume controller and shall be sealed airtight with sealant or by approved methods and materials.
- D. Ductwork shall conform to SMACNA-06. Ductwork sections shall be constructed in accordance with ductwork pressure classifications as required. Ductwork shall be sealed as recommended by SMACNA-06 for the appropriate pressure classification except ductwork pressure classification below 2-inch water gauge shall have a seal class C in SMACNA-06. Pressure-sensitive tape shall not be used as a primer sealant on ductwork with pressure classifications above 1-inch water gauge. Outside air intake ducts and plenums shall be fabricated with watertight soldered or brazed joints and shall be externally insulated. Dampers located behind intake or exhaust louvers shall be enclosed with sheet metal collar, and sealed to structure. Drains shall be provided where indicated. Offsets and transformations necessary to increase headroom or avoid interference with building and other construction, and equipment, shall be provided. Horizontal locks and seams of the button punch snap lock type shall not be used in aluminum ductwork construction. Sheet metal shall be lapped in direction of airflows. Where aluminum is welded, minimum thickness shall be 16-gauge and welding shall be accomplished by metallic arc or acetylene process. Where galvanized steel is welded or brazed, minimum thickness shall be 18-gauge. Damaged zinc shall be repaired by application of aluminum or zinc-rich paint. No air leak duct marks shall show at joints or air terminal device connections. Sealant shall be applied in accordance with manufacturer's instructions. Flexible duct shall be connected to rigid duct by metal connectors and length shall be limited to 8 feet, unless otherwise indicated. Air deflectors and access doors shall be located as indicated. Ducts shall be secured and anchored to the building structural components and framing and shall be fabricated and supported in such a manner as to prevent vibration and pulsation under operating conditions.
- E. Units shall be installed in accordance with manufacturer's instructions for conditions of UL 555. Installation shall also comply with requirements of SMACNA-05 and SMACNA-06. Building surface penetrations shall be in accordance with approved detail drawings. Minimum thickness of building surface penetration sleeves shall be 14-gauge, except where greater thickness is required by SMACNA-05 or is indicated.
- F. Ducts connected to vibration isolated fans, ducts crossing building expansion joints, dissimilar metal ducts, and as indicated shall be flexibly connected. Not less than 6-inch active length with

not less than 1-inch of slack shall be provided. Flexible material shall be securely fastened by galvanized steel clinch type draw bands for round ducts. For rectangular ducts, flexible material shall be locked to metal collars and installed using recommended construction methods. Joints shall be sealed with sealing compound and duct tape as recommended in SMACNA-06 for the appropriate pressure class.

- G. Supporting elements shall be suitable for stresses imposed by systems, with a safety factor of not less than 4.0. Supports shall not be anchored to metal decking. Supporting elements shall be provided in accordance with applicable provisions of referenced SMACNA and NFPA standards.
- H. Sleeves and prepared openings for duct mains, branches and other item penetrations shall be provided during the construction of the surface to be penetrated. Sleeves shall be provided for round duct and items sized 15 inches diameter and smaller, prepared openings for round duct and items sized 15 inches diameter and smaller, prepared openings for round ducts larger than 15 inches diameter and smaller, prepared openings for round ducts larger than 15 inches and all square and rectangular ducts. Branch take-off to air terminal devices shall be in accordance with SMACNA-06. Framed openings, including fire resistive penetrations, shall be provided as specified or indicated, and in accordance with approved detail drawings. Approximately 1-inch clearance shall be provided between penetrating and penetrated surfaces, except where fire resistance criteria governs. Clearance space for fire-rated penetrations shall be filled and sealed. Penetrations shall be weather-tight and vapor-tight. Apply sealants to oil-free surfaces, to not less than 1/2-inch depth. Closure collar, not less than 4-inches wide, unless otherwise indicated, shall be provided for exposed ducts and items on each side of penetrated surface, except where air terminal devices are installed. Collars shall be installed tight against the surface and shall fit snugly around penetrating item without contact. Collars for round ducts 15 inches in diameter or less shall be fabricated from 20-gauge galvanized steel. Not less than four circumferential fasteners shall be used to attach collars where the opening is 12 inches in diameter or less. Collars for square and rectangular ducts with a maximum side of 15 inches or less shall be fabricated from 20-gauge galvanized steel. Collars shall be installed with fasteners on maximum 6-inch centers.
- I. Joints between sections of duct and between ducts and fittings shall be made with either gasketed flanged connection, welded flanged joints, or other joints recommended in SMACNA and shall be reinforced at the joints and between the joints as recommended.
- J. Spiral lock seam duct, and flat oval shall be made with duct sealant and locked with not less than three equally spaced drive screws or other approved methods indicated in SMACNA-06. Sealant shall be applied to the exposed male part of the fitting collar so that the seal will be on the inside of the joint and fully protected by the metal of the duct fitting. One brush coat of the sealant shall be applied over the outside of the joint to at least 2-inch band width covering all screw heads and joint gap. When tape is used, a single wrap of a duct tape shall be applied over the wet sealant. Tape used shall be as recommended by the manufacturer of the sealant to permit proper curing of the sealant. Dents in the male portion of the slip-fitting collar will not be acceptable.
- K. Damaged finished surfaces shall be touched-up or repainted to match the original finish. Painting required for surfaces not otherwise specified and finish painting of items primed at the factory shall be as specified in Section 09900-Painting, General.

3.2 Duct Leakage Testing

All sheet metal ductwork that is designed to operate at static pressures above 3-inches water gauge shall be lead tested in accordance with SMACNA-10 at a test pressure equal to the duct pressure classification. The duct leakage shall be less than or equal to the allowable CFM duct leakage per 100 square feet per the appropriate leakage class in section 4 of SMACNA-10. Test reports shall be provided in accordance with Section 6 of SMACNA-10.

3.3 TESTING, ADJUSTING, AND BALANCING

Testing, adjusting, and balancing work shall follow recommended procedures for examination, preparation, and performance of testing, adjusting, and balancing as outlined in the NEBB Standard.

* * * END OF SECTION * * *

DIVISION 16 - ELECTRICAL

SECTION 16000

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Specifications and Drawings.

Under no circumstances shall any work begin without first obtaining permission from the appropriate agency. Existing utility lines that might interfere during construction shall be relocated.

All materials, products and equipment provided shall be UL listed.

The scope of work generally includes supply, erection, complete installation and testing of the following:

- A. Electrical Service to the building shall be in accordance with Long Island Power Authority (LIPA) requirements as described in Attachment 1600-1 of this specification.
- B. Subcontractor shall supply and install prefab concrete pad for 500 KVA Transformer supplied by utility company, LIPA. Subcontractor shall supply and install 15 KV primary cable from LIPA utility pole to the transformer and power feeder from pad-mounted 500 KVA Transformer secondary to the new Motor Control Center 'MCC-1'.
- C. Trench and Backfill for primary and secondary feeders for 500 KVA transformer by Subcontractor.
- D. 480V Motor Control Center (see spec section 16480) supply, installation and wiring, and connection to the incoming power.
- E. Power distribution to all electrical equipment.
- F. Conduits and wiring for power, lighting and instruments.
- G. Lighting (see Specification Section 16470), including lighting transformer and lighting panel.
- H. Grounding.
- I. PLC I/O control cabinet (supplied by others under Specification Section 13600), installation and wiring.
- J. Instrumentation

1. Subcontractor shall provide all power and control /signal wiring to instruments and control devices.
2. Installation of all off-line electrical instruments.
3. Shielded wire and cable shall be run separate from power or 110V control wiring, and shall be run in rigid steel conduit and/or cable trays, as shown on the drawings.

K. Extraction and Re-Injection Well Vault Electrical Connection.

1. Provide power and control wiring from the pump controller to each well pump. Power and control wiring from the controller shall be spliced with vendor furnished cables in junction boxes as specified herein.
2. Power and control wiring shall be cable type as specified under Part 2 product. Wire shall be installed in underground conduit as indicated on the drawings.
3. Trenching and backfill for conduit bank to the well vaults will be by other, subcontractor to supply and install conduits and pull boxes as shown on the electrical layout drawings.

L. Telephone System

1. Subcontractor shall provide minimum four (4) separate lines to the Water Treatment Building including wires, phone jacks, conduit and boxes as required. Subcontractor shall coordinate with the local Telephone Company for all requirements necessary to provide telephone service to the building.
2. Trenching, backfill and conduits by Subcontractor.

M. Fire Detection and Alarm System - See Specification Section 16721.

N. Security Alarm System – See Specification Section 16726.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

- Section 13600 Process Control System
- Section 13650 Instrumentation
- Section 16051 Electric Motors
- Section 16470 Lighting
- Section 16480 Motor Control Center
- Section 16721 Fire Detection and Alarm System
- Section 16726 Security Alarm System

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies. For any specific use not covered in this section, or if a conflict arises in a specific situation, the latest revision of the NEC (National Electric Code) shall be the governing body.

AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)
AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
NATIONAL ELECTRICAL SAFETY CODE (NEC)
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
NATIONAL ELECTRICAL MANUFACTURING ASSOCIATION (NEMA)
UNDERWRITERS LABORATORIES, INC. (UL) STANDARD

1.2 SUBMITTALS

The Subcontractor shall submit five copies of the following to the Subcontractor.

- A. Complete shop drawings of the Motor Control Center.
- B. The manufacturer's name, product designation or catalog number, descriptive literature and data shall be submitted for the following material and equipment.
 - 1. Conduit
 - 2. Wires and cables
 - 3. Dry type transformers
 - 4. Panel boards
 - 5. Lighting fixtures
 - 6. Receptacles
 - 7. Circuit breakers
 - 8. Disconnect Switches
 - 9. Grounding materials
- C. Prior to submittal, all shop drawings and manufacturer's literature shall be checked for accuracy and conformance to specifications and drawings.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material within shipping containers and on the carrier.
- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.
- C. Components shall be stored off of the ground and shall be protected from weather elements; and be in compliance with all manufacturer storage requirements to avoid warranty issues.

- D. All equipment, requiring placement within the Treatment Equipment Building prior to the building shell construction, shall be appropriately scheduled by the Subcontractor and coordinated with the Subcontractor.
- E. Machinery used to place equipment within the Treatment Equipment Building shall not cause stress on the floor above the allowable maximum.

PART 2. PRODUCTS

2.1 EQUIPMENT

A. Distribution Transformer

1. Distribution transformer shall be provided for purposes of supplying panel board circuits. The transformer shall be dry-type distribution transformer and construction shall be of NEMA and UL design.
2. Transformer shall be three phase 480-208/120V, four-wire, 60 Hz.
3. Transformer shall be self-cooled dry type with fully insulated non-hydroscopic vacuum impregnated thermosetting insulation or non-hydroscopic open dipped process insulation over continuous wire coil construction. All transformers are to have a aluminium winding or approved alternate.
4. Core shall be constructed of high permeable silicon steel for low hysteresis and eddy current losses and excitation current requirements. Core structures shall be designed to avoid resonating modes, which contributes to sound level increase.
5. Transformer winding shall have a 220 degree C UL component recognized insulation system and be designed not to exceed 115 degree C rise above 40 degree C ambient under full load conditions.
6. Transformer shall have two 2-1/2 percent full capacity taps above and below the rated primary voltage. Transformer shall have minimum impedance of 2.8 percent. Voltage regulations shall not exceed 2.5 percent at unity power factor.
7. Transformer shall be capable of withstanding short circuits of any secondary winding without injury with 100 percent of nominal primary voltage. The time period shall be in accordance with the two second minimum as specified in NEMA ST-20. The withstand capability shall be based on the minimum impedance as specified in above paragraph.

B. Distribution Panel Board

1. The Distribution Panel board shall be dead-front type.
2. Panel board interior shall be complete with buses, dead-front shield, circuit breakers, wire connectors, etc. Interior shall be so designed that circuit breakers can be replaced without disturbing adjacent breakers and without removing the main bus connectors and shall be so designed that circuits may be changed without machining, drilling or tapping.

Branch circuit shall be arranged using double row construction. Branch circuits shall be numbered by manufacturer.

3. Bus bars for the mains, neutrals and grounds shall be copper. A ground bar and full size neutral bars shall be included. Bussing shall be braced throughout to conform to industry standard practice governing short stresses in panel board.

Neutral and equipment ground bus shall have suitable lug for each circuit breaker and single pole space provided.

4. Boxes shall be galvanized, code gauge steel without knockouts. Boxes shall be of sufficient size to provide a minimum gutter space of 4 inches on all sides.

Hinged door covering all circuit breaker handles shall be included in panel trim. Door shall have semi-flush type cylinder lock and catch, except that door over 48 inches in height shall have a vault handle and 3 point latch. Two keys shall be supplied for each lock. All locks shall be keyed alike; directory frame and card having transparent cover shall be furnished on each door.

5. Panel board shall be furnished with circuit breakers having frame sizes and trip settings as shown on the drawings.

Circuit breakers shall be thermal-magnetic, molded case, bolt-in type with interrupting capacities of not less than 10,000 amperes RMS, symmetrical at rated voltage for 120/240 and 120/208 volt panel board. Interrupting capacities of not less than 22,000 amperes RMS, symmetrical at rated voltage for 480 volt panel board.

Circuit breakers used as switches in high intensity discharge (HID) lighting circuit shall be listed and shall be marked as HID.

6. Panel board and Circuit Breaker shall be UL listed.

2.2 MATERIALS

A. Conduit

1. Rigid steel conduit or Intermediate metal conduit shall be used for all above ground applications unless otherwise noted.

Rigid steel conduits shall be heavy-gauge steel, hot-dipped galvanized per ASTM A123 inside and outside over entire length including threads. Conduit shall be manufactured in accordance with UL standard UI-6 and ANSI spec C80.1 and be UL listed.

Intermediate metallic conduit shall be hot-dipped galvanized steel. Intermediate weight, rigid-type electrical conduit, shall be UL listed and meet the requirements of ANSI spec C80.1.

Fittings: Cast metals, screwed fittings; inch and larger shall be mogul type.

2. Polyvinyl Chloride (PVC) Conduit for underground application.

Conduit shall be rigid PVC, schedule 80, meeting the requirements of UL 651 and NEMA TC-2.

Fittings: Coupling type.

Joints: Connections shall be made by solvent welding.

3. Liquid-Tight flexible metallic conduit for final connection to motors and instruments.

Flexible galvanized steel core with continuous copper ground in the convolutions covered with extruded PVC. Conduit shall be UL listed.

Connectors: Nylon-insulated screw-in ground-core type connectors constructed of malleable iron, Thomas & Betts liquid-tight fittings or Subcontractor approved equal.

B. Wires and Cables

Wire and cable shall meet all standards and specifications applicable, and shall be in conformance with the latest edition of the NEC. Insulated wire and cable shall have size, type of insulation, voltage, and manufacturer's name permanently marked on outer covering at regular intervals not exceeding four feet. Wire and cable shall be delivered in complete coils and reels with identifying tags, stating size, type of insulation, and other pertinent information.

1. Low Voltage Power Cable

Wires installed in conduit for services 600 volt and below, shall be 600 volt, stranded copper, single conductor, heat and moisture resistant thermoplastic insulation, 75°C type THHN/THWN.

Minimum size for power wire shall be #12 AWG, except that #14 AWG shall be used for control.

2. Instrument Signal Cable

Instrument signal cable for 4-20 mA signal shall be single pair #16 AWG, stranded copper, 300V PVC insulation with overall aluminum Mylar shield, UL listed as PLTC and overall PVC jacket.

3. Extraction Well Switch Control Wire.

Wire types shall be as specified in paragraphs 1 and 2 above.

C. Outlet Boxes

1. All outlet boxes for concealed wiring shall be sheet metal, galvanized, or cadmium plated at least one and one-half inch deep, single or gauged, of a size to accommodate devices and number of conductors noted. Boxes shall be equipped with plaster ring or cover as necessary. All outlet boxes shall meet the requirements.
2. Boxes for exposed wiring shall be malleable iron, cadmium finish, or cast aluminum alloy and shall not be less than four inches square by one and one-half inch deep unless otherwise noted.. Boxes shall have gasketed cover.
3. Fixture outlet boxes shall be minimum four inches octagonal and, where required as outlet and junction boxes, they shall be four and eleven-sixteenths inches by two and one-eighth inches deep.
4. Outlet boxes for concealed telephone and signaling systems shall be of the four-inch square type with plaster cover and bushed-opening cover plate.
5. Outlet boxes for hazardous areas shall be explosion-proof with appropriate fittings, seal-off, etc.
6. Boxes for floor outlets shall be of the cast-metal threaded-conduit-entrance; waterproof type with means for adjusting cover plate to finished floor level. Boxes shall be approximately four

inches in diameter and three and one-half inches deep with an approved gasket or seal between adjusting ring and box.

D. Pull and Junction Boxes

1. Junction boxes and pull boxes inside the groundwater treatment plant (GWTP) shall be furnished and installed as shown on the drawings and as required by the NEC, or where necessary to facilitate pulling in wires and cables without damage.
2. Boxes shall be formed from sheet steel, with corners folded in and securely welded, with three-quarters inch inward flange on all four edges, with box drilled for mounting and with flanged drilled for attachment of cover. Box shall be galvanized after fabrication. Cover shall be made of one piece galvanized steel and provided with gasket and round head brass machine screws for fastening to box. Box and cover shall be made of code gage steel, or heavier as specified. Boxes shall be a minimum of four and one-half inches deep, and sized as required to meet NEC standards, or larger as specified, utilizing manufacturer's standard size or next larger to meet dimensional requirements.
3. Pull and junction boxes inside the GWTP shall be furnished with knockouts. All unused knockouts shall be plugged.
4. If pull or junction box is exposed, the box shall be painted to match the finish of the building surfaces adjacent to the box, unless indicated otherwise by the Contractor.
5. Pull or junction boxes installed below ground shall be watertight, similar to Crouse Hind Cat. No. WJBF or Subcontractor approved equal. Pull or junction boxes outside the GWTP shall be furnished without knockouts for field drilling. All unused knockouts shall be plugged.
6. Pull or junction boxes installed in hazardous areas shall be explosion-proof with appropriate fittings, seal-off, etc.

E. Cabinets

1. Cabinets used for cable supports for service entrance, feeders, and other cables or electrical components shall be of steel and shall be furnished and installed where indicated on the drawings. Boxes shall have removable screw covers fastened by corrosion-resistant machine screws and shall be of a size large enough to accommodate the feeder conduits indicated and also provide ample space to install cable supports.

F. Switches and Receptacles

1. The wiring devices specified shall be UL approved.
2. Wall switches shall be specification-grade, flush-tumbler type with operating mechanism totally enclosed in urea or nylon composition case rated at 20 A at 125 V unless otherwise noted.

Where more than one flush wall switch is indicated in the same location, the switches shall be mounted in gangs under a common plate.

3. Receptacles: shall be specification-grade, flush or surface mounted, duplex, rated at 20 A, 125 V unless otherwise noted.

Plates shall be constructed of metal with a gloss finish and shall be of matching wall color. Special markings on the plates shall be provided as indicated on the drawings. When devices

are installed in exposed outlet boxes, the plates or covers shall be of a type designed for the boxes.

Receptacle in wet (process) area shall be GFI type.

G. Disconnect Switches

1. The minimum wires bending space at terminals and minimum gutter space provided in switch enclosure shall be as required in NEC Article 373-6.
2. All switchblades shall be fully visible in the "OFF" position when the switch door is open. All current carrying parts shall be plated to resist corrosion and promote cool operation. Switches shall have removable arc suppressers where necessary to permit easy access to line side lugs. Lugs shall be front removable and UL listed for 60°C or 75°C, aluminum or copper wires.
3. Switches shall be quick-make; quick-break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started. The operating handle shall be an integral part of the box, not the cover. Provisions for padlocking the switch in the "OFF" position shall be provided. Switches shall have a dual cover interlock to prevent unauthorized opening of the switch door when the handle is in the "ON" position, and to prevent closing of the switch mechanism with the door open. The handle position shall indicate whether the switch is "ON" or "OFF".
4. Switches shall have an attached clearly legible and durable nameplate. Nameplate shall indicate: Name of manufacturer, type and model number of the device, maximum volts and ampere ratings, and maximum horsepower rating.

PART 3. EXECUTION

3.1 ERECTION/INSTALLATION

A. Codes

1. All materials and workmanship shall comply with NEC and all other applicable codes, specifications, local ordinances, industry standards, utility company, and fire insurance carrier's requirements.
2. Noncompliance: Should any work be performed that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards, fire insurance carrier's requirements, and utility company regulations, the Subcontractor will not bear the cost arising in correcting any such deficiency. Such work will be corrected at no extra cost.

B. Grounding

1. Ground neutral leg of service and all non-current carrying metallic parts of electrical equipment to ground grid, made of eight-foot by three-quarter-inch copper-weld ground rods and 2/0 bare copper ground cable. Provide ground grid around the building and ground building steel columns.

2. Metallic parts to be grounded shall include cable tray, transformer, cabinets, panel boards, outlet boxes, fixtures, and any other equipment required by the latest edition of the NEC article 250.
3. Run separate green insulated ground conductor in conduit with power conductors to each motor for grounding.

C. Concrete Pads

Concrete pads, supports, piers, bases, foundations, and encasement required for the electrical equipment and conduit shall be provided and installed. The concrete pads for electrical equipment shall be six inches larger all around than the base of the equipment unless specifically indicated otherwise.

D. Conduit

1. Conduit sizes shall be as indicated on the Contract Drawings or minimum in accordance with the NEC, including provision for given equipment-grounding conductor.
2. Conduit systems shall be installed in accordance with the latest edition of the NEC and shall be installed in a neat workmanlike manner.
3. The entire conduit system shall be installed to provide a continuous bond throughout the system to provide a grounding system.
4. Install conduit concealed in walls, ceilings, and floors where possible.
5. Install conduit in unfinished areas exposed; run square with ceilings and walls.
6. All conduit joints shall be cut square, threaded, reamed smooth, and drawn up tight. Bends or offsets shall be made with an approved bender or hickey, or hub-type conduit fittings. Number of bends per run shall conform to the NEC limitations.
7. Concealed conduits shall be run in a direct line with long sweep bends and offsets. Exposed conduits shall be parallel to and at right angles to building lines, using conduit fittings for all turns and offsets.

E. Wires and Cables

1. No wire and cable shall be pulled until the conduit system is complete from pull point to pull point.
2. Pull boxes are required in conduit runs over 100 feet or when more than three 90 degree bends are used or as indicated on the drawings.
3. Care shall be exercised while installing wire in conduits so as not to damage the conductor insulation. Wire pulling lubricant may be used in pulling on or moved conductors and shall be used if wire is pulled by mechanical means.
4. Use no wire smaller than No. 12 AWG for power and lighting circuits and no smaller than No. 14 AWG for control wiring.
5. Splices only in junction or outlet boxes.
6. Neatly train and lace wiring inside boxes, equipment, control panel and panel boards.

7. The bending radius of any wire or cable shall not be less than the minimum recommended by the manufacturer. Maximum pulling tension and side-wall pressure of any wire or cable shall not exceed manufacturer's recommended values.
8. Pull all conductors into raceway at same time.
9. Conductor shall be color coded in accordance with NEC. Identify each conductor with numbers at both ends as shown in drawings. Use Brady or approved equal wire marker.
10. Inspect wire and cable for physical damage and proper connection.
11. Perform test for continuity and correctness of wiring and identification of all conductors of lighting and receptacle branch circuits, power and contact circuits and motor leads.
12. All 600V insulated cables for power and motor leads shall be given an "Insulation Resistance Test" using a 1,000 V insulation tester.

F. Wire and Cable Termination and Splices.

1. Joints on branch circuits shall occur only where circuits divide and shall consist of one through circuit to which shall be spliced the branch from the circuit. In no case shall joints in branch circuits be left for the fixture hanger to make. No splices shall be made in conductor except at outlet boxes, junction boxes, or splice boxes.
2. Conductors No. 8 and larger terminated and spliced with Burndy, Thomas and Betts or an approved equal mechanical compression connectors. After the conductors have been made mechanically and electrically secure, the entire joint or splice shall be covered with Scotch No. 33 tape or an approved equal to make the insulation of the joint or splice equal to the insulation of the conductors. The connector shall be UL approved. The tape shall be seven-mil vinyl, self-adhesive tape.
3. Conductors No. 10 and smaller terminated and spliced with Buchanan "B-Cap" or 3M-Scotchlok self-insulated, screw-on connectors; Bakelite wire nuts are not acceptable.
4. Connect conductors to panel boards and apparatus by means of approved lugs or connectors as by Gorilla Grip, Thomas and Betts, or an approved equal.

G. Underground System

1. Install underground raceway according to routing and details shown on the drawings.
2. Install conduit with minimum grade of 3-in./100 ft. Conduit shall drain towards the pull box.
3. The minimum cover for raceway banks shall be 24 inches.
4. Lay raceway lines in trenches on mats of bank gravel not less than 6 inches thick and well graded.
5. Where bends in raceway are required, use long radius elbows, sweep, and offsets.
6. Use plastic spacers located not more than 5 feet apart to hold raceway.
7. Pull box cover shall be accessible at grade.
8. Identify underground raceway by installing 6-inch wide red metallic tape marker, a maximum of 12-inches below grade for the entire length of the raceway.

9. Underground splices for direct buried power cables and signal cables or splices inside pull box shall be made by using 3M resin splicing kit or approved equal. Tape splices are not permitted as splices will be subject to occasional submersion under water.

H. Instruments

1. All off-line instruments shall be supported using floor mounted 2-inch pipe with flange, or equivalent as approved.
2. Final connection to all instruments shall be made using UL listed flexible conduit.

I. Boxes

1. Install boxes appropriately as indicated.
2. Set boxes true and flush and rigidly secure in position.
3. Use painted or galvanized iron hangers to support ceiling outlets.
4. Set boxes so that front edges of box are flush with finished wall or ceiling line or not more than one-quarter-inch back of it except where conduit is exposed.

J. Accessories

All accessories as noted or required to install and make workable all electrical and related items contained under this section of the specification shall be furnished and installed.

3.2 TESTING AND INSPECTIONS

- A. Each system component shall be given requisite factory tests as necessary to determine that the work and materials are free from defects and to establish that the design and construction meet the requirements of the contract documents.
- B. Make the following minimum tests and checks prior to energizing electrical equipment:
 1. Mechanical inspection, testing and setting of circuit breakers, disconnect switches, motor starters, control equipment, etc. for proper operation.
 2. Test grounding system for resistance to ground.
 3. Test motor control centers as specified in manufacturer manuals.
 4. Test 600 volt power wires and cables by meg-ohm resistance testing.
 5. Check wire and cable terminations for tightness.
 6. Field set transformer taps to obtain the proper secondary voltage.
 7. Check motor nameplates for correct phase and voltage. Check bearings for proper lubrication.
 8. Check the ampere rating of thermal overloads for motors and submit a typed record to the Contractor of same, including MCC cubicle location and load designation, motor service factor, horsepower, full load current and starting code letter. If inconsistencies are found, new thermal elements shall be supplied and installed.

- 9 Check rotation of motors prior to energization. Disconnect driven equipment if damage could occur due to wrong rotation. If it rotates in the wrong direction, correct it.
 10. Check interlocking, control and instrument wiring for each system and/or part of a system to prove that the system will function properly as indicated by schematic and wiring diagrams.
 11. Verify all terminations at transformers, equipment, panels and enclosures by producing a 1-2-3 rotation on a phase sequenced motor when connected to "A", "B" and "C" phases.
- C. Testing shall be scheduled and coordinated with the Subcontractor at least two weeks in advance. Provide qualified test personnel, instruments and test equipment.
 - D. The local authority having jurisdiction must be notified in order that local inspection may be carried out at the proper stage
 - E. All local permits shall be obtained and paid by the Subcontractor.

** END OF SECTION **



175 East Old Country Road
Hicksville, NY 11801

January 5, 2005

Mr. Stavros G. Patselas
Tetra Tech FW, Inc.
2300 Lincoln Highway East
One Oxford Valley, Suite 200
Langhorne, PA. 19047-1829

Re: Navy Groundwater Treatment Plant
N.Herman Ave. & R.O.W. Bethpage, New York

Ref# T100450481; T100450484 & T100450483

Dear Mr. Patselas:

We have initiated our survey to supply electric service to the subject project. It is our understanding that your plans call for the installation of an 800 ampere, three phase, four-wire wye electric service in the building. Connected load will be approximately 430kW. Please note that the electric service characteristics for this service will be four-wire, three-phase wye with a nominal voltage of 277/480 volts.

Your service equipment should be designed to withstand a symmetrical RMS fault current of 16,000 amperes at 277/480 volts.

To confirm the breakdown of the connected load, we are designing our electric supply based on the following:

-	Total Running Load	216kW
-	Motors Converted To HP	214kW
-		
	Total	430kW

LIPA will provide 277/480 volt secondary metered service subject to the following specifications:

WORK BY ELECTRICAL CONTRACTOR

A. Provide and install the transformer pad in accordance with the following construction standards (latest revision attached):

CS# 5362 - Transformer Installation
CS# 5369 - Protection for Pad-Mount Equipment

ATTACHMENT 16000-1

CS# 5370 - Transformer Pad Location

All Construction Standards must be adhered to and final pad location should be verified with LIPA before installation. Should the pad mount transformer be located in an area subject to vehicular traffic, barrier protection must be installed according to CS# 5369. Pad mounted transformers will not be energized until barrier protection is installed in cases where deemed necessary.

- B. Provide and install three (3) 2/C #2 copper or aluminum, jacketed concentric neutral, 15 kV, shielded, cross-linked polyethylene insulated cables, from the transformer pad, to the proposed riser pole. Also, provide 37 feet per phase of cable for a 40 foot pole and 42 feet per phase of cable for a 45 foot pole, to be installed on the pole. LIPA does not require a property line splice box for direct buried XLPE cable. The pole designated for the primary cable riser will be new pole 18 on the southeast side of N.Herman Street and the R.O.W.

The concentric neutral cable must be installed in accordance with the following LIPA's guidelines:

1. 220 mil insulation thickness must be used.
 2. Cable is required to have a 50 mil semiconducting jacket extruded to fill over the concentric neutral, yet shall be free stripping from the insulation shielding.
 3. The depth of burial must be 30 inches (assuming direct-bury).
 4. If the cable crosses under a sidewalk, roadway or driveway, the cable must be installed in an approved conduit from the property line to a point near the base of the proposed riser pole.
 5. If the proposed riser pole is in concrete or macadam, the contractor will be required to install an elbow (sweep) at the base of this pole. If the pole is in a dirt or grass area, the cable can be direct buried the entire run.
 6. The first 10 feet of cable is to be attached to the pole in U-guard, as shown on drawing D5 of LIPA's Specifications and Requirements for Electric Installations (January 2000 Revision) and the cable must be installed on the northwest quadrant of the pole.
- C. As noted in #3, the cable on private property can be direct buried. If the entire cable run from transformer to the pole is to be in conduit, a property line pullbox must be installed. Refer to LIPA's CS# 6533 and 6539 ("TS" Box standards) for details.
- D. Provide and install all secondary wiring and perform all wiring within the transformer pad, including the load break elbow connections to the primary bushings and hylug connections to the secondary spade terminals. All required bonding and grounding hardware is to be provided and installed by the contractor. Refer to LIPA's CS# 5362 for additional details.
- E. Primary elbows will be delivered with the pad mounted transformer. The

ATTACHMENT 16000-1

contractor will wire the elbows in accordance with LIPA's CS# 3722 Load Break Elbow Terminator. Follow the LIPA Construction Standard, in conjunction with the manufacturer's cutback length instructions, as explained in step 6 on page 2 of 8 of LIPA's CS# 3722. Surge arrester elbows will also be delivered with the pad mounted transformer. The contractor will wire the surge arrester elbows in accordance with LIPA's CS# 4028 Surge Protection 3 Phase Radial Only.

- F. Install metering facilities in accordance with LIPA's Specifications and Requirements for Electric Installations.
- G. It will be the responsibility of the contractor to obtain any applicable permits prior to the installation of any facilities on public property or right-of-way.

WORK BY LIPA:

- A. Furnish and deliver on the pad: One pad-mounted, metal-clad transformer complete with locks, three load break elbows with bushings, three elbow lightning arresters with bushings, and one copper hot line clamp.
- B. Complete installation of cable on riser pole. LIPA will take over ownership and maintenance of the cable from the top of the riser pole to the bottom.
- C. Install meter and wire current transformer.

LIPA will own and maintain the pad mount transformer, metering current transformers, cable (described in paragraph B) and the meter. All other electrical facilities from the property line to the service location are owned and maintained by the customer.

SERVICE AT 480Y/277 VOLTS

- A. At the higher secondary distribution voltage of 480Y/277 volts, arcing faults do not tend to burn clear as readily as the lower secondary distribution voltage of 208Y/120 volts. It is therefore, important to design and construct 480Y/277 volt secondary systems in such a manner as to minimize the occurrence of electrical failures and to incorporate protective devices for sensing and rapidly clearing arcing faults in order to minimize equipment damage, safeguard against injury to personnel and maintain service continuity. For these reasons, LIPA has established certain specific design standards, and the National Electric Code requires ground fault protection of equipment for any service disconnecting means rated 1000 amperes or more (Art. 230-95, 1999 N.E.C.).

LIPA recommends ground fault protection on all 480Y/277-volt service.

- B. Services at 480Y/277 volts shall be limited to supplying one (1) meter or one (1) main disconnect switch.
- C. For multiple meter installation, ground fault protection will be required at the main disconnect switch regardless of switch size. Meter pans to be isolated neutral type if GFI is on line side of meter.
- D. All secondary cables on line and load sides of the metering equipment

ATTACHMENT 16000-1

including current carrying neutral conductors shall be insulated, 600 volt Type "USE-2" or "XHHW-2".

- E. 480Y/277 volt service above 400 amperes shall only be supplied from pad-mounted or underground transformers. In overhead distribution areas, services up to 400 amperes may be supplied from pole mounted overhead transformers. Check with LIPA before proceeding with overhead service installations.
- F. The maximum single service connection shall not exceed 2500 amperes. Multiple service entrances from separate pad mounted transformers are permitted for higher rated services.
- G. 480Y/277 volt service up to and including 800 amperes, may be installed using integrated phase construction. Isolated phase construction is recommended on all 480Y/277 volt services where future plans call for the eventual increase in service size to above 800 amperes.
- H. For services over 800 amperes, all secondary conductor runs between the transformer enclosure and the service entrance equipment shall be run in an isolated phase configuration in non-metallic conduit. Because of poor voltage regulation, isolated phase construction runs in excess of 50 feet are not generally permitted and when necessary, must be reviewed with LIPA for special consideration.
- I. Services at 480Y/277 volts shall be in accordance with LIPA Specifications and Requirements for Electric Installations, section 6.0 (January 2000 revision).

ELECTRIC MOTOR REQUIREMENTS

Please refer to Section 9 of LIPA's Specifications and Requirements for Electrical Installation in which we outline the permissible starting currents for various size motors. If your particular equipment exceeds the value of inrush specified for this service, please contact the undersigned.

For your convenience, it is recommended that all motors and special apparatus be equipped with suitable undervoltage time delay tripping mechanisms for protection against sustained undervoltage and to avoid automatic interruption of equipment as a result of momentary voltage disturbances. All three-phase motors should also be equipped with suitable protection to prevent single-phase operation and improper direction of rotation and excessive heating.

GENERAL REQUIREMENTS

The New York State Department of Labor has enacted rules for notification when an excavator plans to use mechanical equipment on public or private property.

Pursuant to Industrial Code Rule 53, which became effective April 1, 1975, the excavator must notify each operator of existing underground facilities (such as Verizon, Water Co., Cablevision, etc) that are within 15 feet of the proposed work area. This notice must be given within 10 days prior to the planned date of excavation so that facilities can be marked in the field to avoid damage.

ATTACHMENT 16000-1

You are being advised that LIPA must comply with these requirements and you should take into account the additional lead time this procedure will take in order to meet your service need date.

To notify both LIPA and Verizon for mark out of underground facilities or if you require further information regarding "Rule 53", please call 1-800-272-4480.

Arrangements will be made to connect the new service when the electrical contractor has completed the installation in accordance with our Specifications and Requirements For Electric Installations and has presented to this Company a certificate, from an approved electrical inspection agency or other authority having jurisdiction, approving the wiring of the service entrance equipment.

As you develop a construction schedule for this project, it is very important to advise us of your anticipated service need date, so that LIPA can plan and schedule our installation. Please keep us apprised of any scheduling developments so that we can coordinate our efforts with your construction activity.

Please be advised that there may be customer charges associated with this project. All charges are based upon LIPA's "Tariff for Electric Service". Any applicable tariff change becomes part of this agreement and may affect your bill. LIPA reserves the right to rebill in accordance with any such change.

The electrical specifications and general terms and conditions as outlined in this letter are subject to change as dictated by field construction, status of our electric facilities and revision of our construction standards. The latest revisions should always be used. If the electrical installation has not been started within ninety (90) days of the date of this letter, it will be the responsibility of the electrician/builder to contact this office and confirm these specifications.

APPLICATION AND DEPOSIT REQUIREMENTS

We require a deposit for new accounts equivalent to two months estimated billing. Please forward your remittance in the amount of \$10,650 for the electric deposit required. **Charges in excess of \$1,000.00 must be paid by Certified or Cashiers check.**

Before service can be established to the building, the attached application must be completed and signed by an authorized representative of the applicant and returned to this office.

If you have any questions regarding this installation, kindly contact Mr. John Voyes at (516) 545-2233.

Very truly yours,



Design Engineer
Electric Design & Construction Department

ATTACHMENT 16000-1

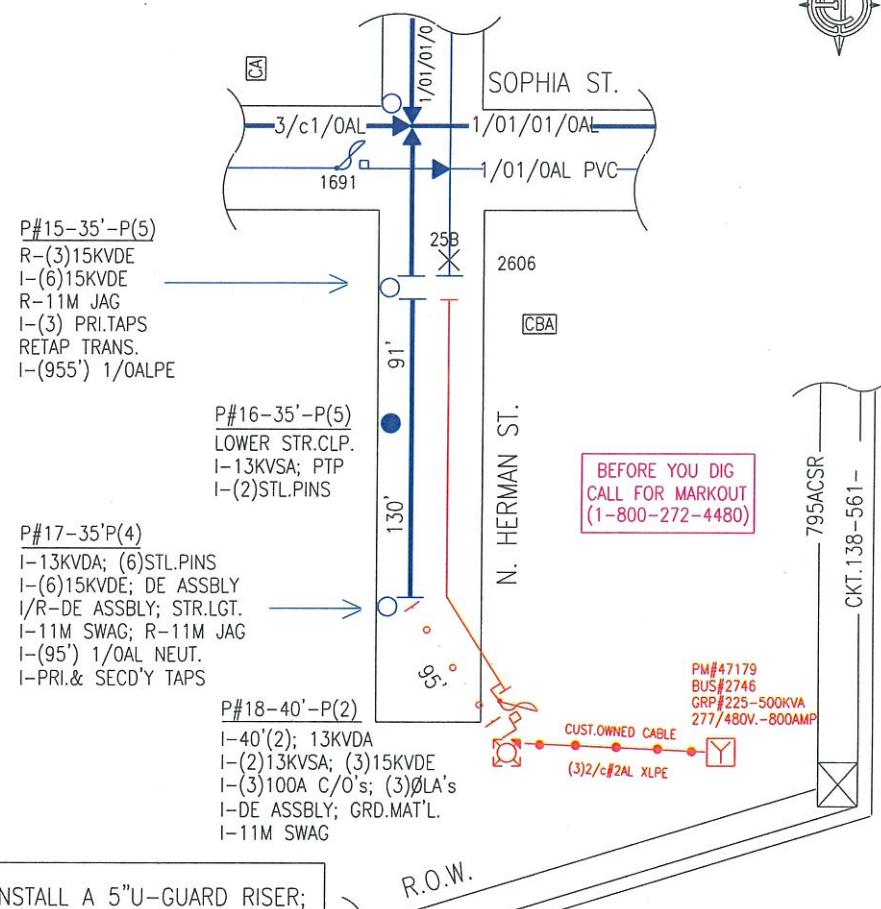
FOREMAN IN CASE WORK CANNOT BE COMPLETED AS SHOWN:		VILLAGE BETHPAGE	W.O. NO. T100450481 (OH)
NOTIFY: T. DI BELLA	AT EXT: 2223	GRID NO. 032-E-20	W.O. NO. T100450484 (UG)
PERMIT REQUIRED NONE	P.P.A OR EASEMENT REQ'D NONE	AREA 36 & 37	TAX DIST. NUMBER 300
PRIMARY OPERATING VOLTAGE 13.2 KV	SERVICE REQ'D. BY	BUDGET ITEM KO#5036/ACT#1591	CIR. NO. 6BL-129
SALES SLIP NO.	OUTRIGHT CONTRIBUTION\$	COMPLETION DATE	TYPE W.O. <input checked="" type="checkbox"/> NEW BUSINESS <input type="checkbox"/> DIVISION OPERATING <input type="checkbox"/> OPER. DEPT. REQ'D.
ASSOCIATED ORDERS SO#T100450483; TO#559572	TEL. CO. ENGINEER NONE	TEL. CO. JOB NO. NONE	C.O. DIST.
PREPARED BY: J. VOYES	AT EXT. 2233	DATE 12/16/04	TREE TRIM REQUIRED NONE
AUTHORIZED BY:	DATE	C.O. LETTER	

OWN	POLE #	LOCATION	SIZES	FURN	SET	OWN	REM	TR	RE#	REASONS				
								OWN	AS	DEF	INAD	NLR	NEW	RELOC.
L	18	S/E/S N. HERMAN ST 20' BEYOND GUARD RAIL	1-40'(2)	L	L	L							X	

ATTACHMENT RECORD		OWNERSHIP RECORD		TRANSF. LOAD	SEC'DY REG.
INITIAL ATT MADE TO	LAST ATT REM'D FROM	EL REPLACED AS	TEL TRANSFER OWNERSHIP	JOB NAME	LOAD
ELEC	TEL	ELEC	TEL	NAVY GRD. WTR. TREATMENT PLANT	800A 277/480V.SVC. CON.DEM=430KW/EST.DEM=355KW
				N.HERMAN ST. & R.O.W.	BETHPAGE

LEGEND I-INSTALL R-REMOVE

LIPA TO EXTEND THREE PHASE PRIMARY SOUTH FROM P#15 THREE SECTIONS TO A NEW 40'(2) POLE; SLACK IN AND BUILD A PRIMARY RISER.



LIPA TO INSTALL A 5"U-GUARD RISER; INSTALL (3)2/c#2AL POTHEADS AND ASSOCIATED EQUIPMENT. CUSTOMER TO INSTALL (3)2/c#2AL XLPE CABLE FROM PAD TO POLE AND 38'UP POLE IN 10' OF 5"U-GUARD. LIPA TO TIE IN.

KeySpan Energy Electric Design and Construction HICKSVILLE	
Overhead Project ID: T100450481	Date Created: 12-16-2004 Planner: J. VOYES
Underground Project ID:	Sketch Number: T100450481 SH-1

LIPA

Long Island Power Authority

Padmount Three Phase Transformer Specifications for Customers And Electrical Contractors

Revised April 2002

**Electric Design
&
Construction Department**

**ATTACHMENT 16000-1
PADMOUNT TRANSFORMER SPECIFICATIONS**

TABLE OF CONTENTS

Section I	Introduction.....	2
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ILLUSTRATIONS AND CONSTRUCTION STANDARDS (CS)

ILLUSTRATION #1: Isometric View of Concrete Footing Foundation & Pad Top

ILLUSTRATION #2: Primary & Secondary Transformer Compartments

ILLUSTRATION #3: Secondary Spade Connection Detail

CS 3722: Installation Instructions for 200 Amp Loadbreak Elbow Terminator

CS 3727: Installation Instructions for Loadbreak Bushing Insert

CS 4028: Surge Protection: 3 Phase Radial Only

CS 5362: Three Phase, 4kV or 13kV "Dead Front" Metal Clad Transformer
75 - 1500 kVA for Primary Distribution

CS 5369: Protection for Padmount Transformer Subject to Vehicular Traffic

CS 5370: Transformer Pad Location Adjacent to Buildings

CS 6533: Type "TS" Distribution Box - Precast Concrete

ATTACHMENT 16000-1
PADMOUNT TRANSFORMER SPECIFICATIONS

Section 1: Introduction

1. This specification covers the material and design requirements of the Long Island Power Authority (LIPA) for "Dead-Front", three phase padmounted transformers ranging in size from 225 kVA to 1,500 kVA.
2. Three phase secondary service supplied from 13,200GrdY/7,620V primary through padmounted transformers shall not exceed 4,000 amperes at 208Y/120 volts or 2,500 amperes at 480Y/277 volts. For 4kV primary circuits, the Customer Planning Representative will determine the maximum secondary load current.
3. The applicant or customer shall consult the Electric Design & Construction (ED&C) Department before plans are finalized, equipment or material purchased or construction commenced on facilities to be connected to the Long Island Power Authority's (LIPA's) electric distribution system.
4. All installations shall conform to the requirements of the National Electric Code (NEC), National Electric Safety Code (NESC), and the City of New York Electrical Code (where applicable), latest editions.
5. All installations shall conform to LIPA's "Specifications and Requirements for Electric Installations" (Red Book). Specific job details will be outlined in a specification letter provided to the customer/contractor by the Customer Planning Representative.
6. The customer's electrical contractor or consultant shall furnish all information requested by LIPA including but not limited to size of present load and expected future load in kW, equipment specifications, and any unusual requirements.
7. The customer or applicant shall be advised of the available service voltage and applicable fees and rates by the Customer Planning Representative.
8. Summary of General Responsibilities:
 - a) The customer/contractor is responsible for the procurement and installation of the concrete footing, foundation, and pad as specified in Section II.
 - b) The customer/contractor shall procure and install the primary cable according to the requirements in Section III.

ATTACHMENT 16000-1
PADMOUNT TRANSFORMER SPECIFICATIONS

- c) LIPA shall deliver the transformer and set it onto the concrete pad. The appropriate number of bushings, loadbreak elbow terminators and surge arresters shall be provided as specified in Section IV.
- d) The customer/contractor is responsible for the primary and secondary connections to the transformer as specified in Sections IV and V.

Section II: Concrete Footing, Foundation and Pad Installation

- 1. The customer shall furnish, install, own and maintain the concrete footing, foundation, pad, ground rods and all wiring.

Reference: Illustration #1 - page 4.

- 2. a) Precast footing, foundation and pad shall be obtained from LIPA approved suppliers listed below and shall be manufactured according to Specification, D14-07-004 Rev. 1, "Concrete Pads & Foundations" and D14-95-001 Rev. 1, "Precast Concrete Roofs, Collars & Height Extensions for Manholes". These specifications are issued to the suppliers below and are available to customers and contractors upon request.

John Potente & Sons
114 Woodbury Rd.
Hicksville, NY 11801
(516) 935-8585

Roman Stone Construction Co.
85 South 4th Street
Bayshore, NY 11706
(516) 667-0566

AFCO Precast Corp.
250 Orchard Rd.
East Patchogue, NY 11772
(516) 589-6822

- b) If field pouring is desired, the concrete shall be mixed in accordance with ASTM Specification C.94 and LIPA Specification M-43 (obtainable upon request).

NOTE: Only precast or poured footing will be accepted for installation.

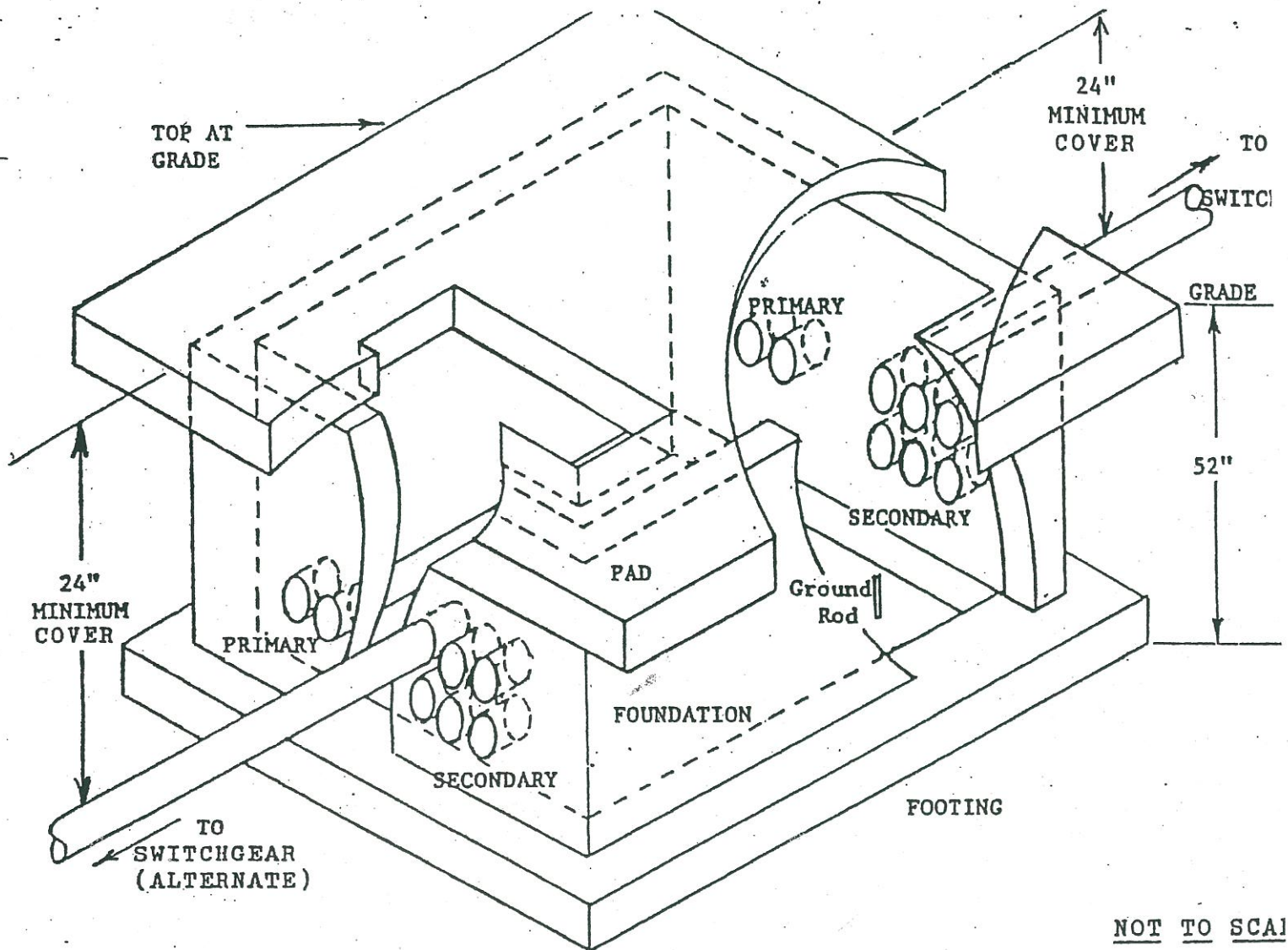


ILLUSTRATION # 1
ISOMETRIC VIEW OF FOOTING, FOUNDATION AND PAD TOP

Preparation of sub-grade for footing and foundation.

- A. Remove 52" of soil to reach undisturbed earth.
- B. Install precast footing and foundation.
- C. Install conduits and grout entrances.
- D. Install plugs or caps on all unused duct entrances.
- E. Backfill outside foundation with clean fill, mechanically compacted every 12". Do not backfill inside foundation.
- F. Install 2 - 5/8" x 10' copperweld groundrods driven flush with top of footing (6 feet apart).

**ATTACHMENT 16000-1
PADMOUNT TRANSFORMER SPECIFICATIONS**

3. CONCRETE PAD INSTALLATION CLEARANCES:

Reference: CS 5362, CS 5369, CS 5370

- a) A clear working space of 10 feet minimum shall be maintained in front of the padmounted transformer doors. The doors shall be kept clear of obstructions and shall face away from all buildings and structures. See above CS's for details.
- b) A minimum of 5 feet shall be maintained between padmounted transformer and adjacent structures. See CS 5370 for details.

Section III: Primary Wiring

1. PRIMARY CABLE SPECIFICATION:

CENTER CONDUCTOR & NEUTRAL:

2/C (two conductor) - #2 or #1/0 aluminum or copper concentric or compressed round stranded with copper concentric neutrals. #2 conductor shall have 10 - #14 neutral strands and #1/0 conductor shall have 16 - #14 neutral strands.

INSULATION SYSTEM:

Conductor shield: The center conductor shall be covered with a uniform layer of extruded semi-conducting material that is compatible with the conductor and easily removable with conventional stripping tools. The conductor shield minimum thickness shall be 12 mils.

Insulation: 15kV tree-retardant cross linked polyethylene (TR-XLPE) insulation for aluminum conductor or ethylene propylene rubber (EPR) insulation for copper conductor. Insulation thickness shall be 220 mils.

Insulation shield: Extruded over the insulation, there shall be a UV stabilized, weather resistant layer of black semi-conducting material compatible with the insulation and copper neutral strand. The insulation shield shall be easily removable with conventional stripping tools. The insulation shield minimum thickness shall be 30 mils.

Jacket: The cable shall have a 50 mil thick *semi-conducting*, black linear low density polyethylene jacket extruded to fill over the concentric neutrals, yet shall be free stripping from the insulation shielding.

**ATTACHMENT 16000-1
PADMOUNT TRANSFORMER SPECIFICATIONS**

CABLE IDENTIFICATION:

1. Cable identification shall meet the requirements of AEIC Specification No. CS-5.
2. Jacket shall have identification markings along the entire length as follows:
 - ◆ Three (225 mils wide by 6 mils thick) durable extruded red identification stripes that run longitudinally 120 degrees apart for the entire length of each conductor jacket.
 - ◆ Permanent printed information markings at maximum intervals of 24 inches apart that state the following:
 - ◆ Name of manufacturer.
 - ◆ Year of manufacturer.
 - ◆ Conductor size and material.
 - ◆ Type and thickness of insulation.
 - ◆ Type of jacket (*semi-conducting*).
 - ◆ Cable voltage rating.
 - ◆ NESC "Lightning Bolt" before and after the words "Electric Cable".
2. LIPA's Customer Planning Representative may request from the customer or contractor a three foot sample of the cable for inspection.
3. a) Primary cable may be direct buried or installed in schedule 40 PVC conduit from the transformer pad to the base of the pole or termination. Direct buried cable must be a minimum of 30 inches below final grade on private property and 42 inches below final grade in the public right-of-way. Cable installed in schedule 40 conduit must be a minimum of 24 inches below final grade.

b) A schedule 40 PVC insulating sleeve shall be installed on each primary cable opening in the concrete foundation wall. The sleeve shall be flush with the foundation wall and concreted in place.

ATTACHMENT 16000-1
PADMOUNT TRANSFORMER SPECIFICATIONS

Section IV: Padmount Transformer and Associated Equipment

Reference: ILLUSTRATION #2 - p. 10, CS 3722, CS 3727, CS 4028, CS 5362

1. The padmount transformer is delivered and set onto the concrete pad by LIPA. The customer's contractor will be supplied with the appropriate number of bushings, loadbreak elbow terminators and elbow surge arresters.
2. The customer's contractor shall install loadbreak elbow terminators onto the cable according to CS 3722 and elbow manufacturer's instructions. *For crimping instructions and tool/die requirements, see crimp chart on CS3722, sheet 8 of 8.*
3. The bushings shall be individually bonded with a #14 AWG bare copper conductor that is attached to the "bonding eye" on the bushing and bonded to the transformer ground lug that is installed by the contractor.
4. The customer's contractor shall install elbow surge arresters onto the transformer as shown on CS 4028. LIPA will supply six #2 copper lugs (two per arrester) and one copper hot line clamp. The arresters shall be individually bonded using a #10 AWG bare copper conductor that is attached to the "bonding eye" on the arrester housing, wrapped around itself and secured to the ground stud.
5. Primary and secondary cables shall have a minimum of 5 feet of slack inside foundation. Maintain as much physical separation between primary and secondary cables as possible inside foundation.

Section V: Services

Reference: Illustration #2 - page 10 and Illustration #3 - page 11.

1. All secondary conductor installations governed by the City of New York Electrical Code - latest edition, regardless of voltage characteristics, must obtain approval from LIPA prior to the commencement of work.
2. A maximum of 8 conductors are permitted, per phase, for the connection to 0 - 1500 kVA padmount transformers.
 - a) If required for the service installation, the transition from 8 to 10 sets may be permitted either, in the foundation, or in a manhole adjacent to the transformer with the use of the appropriate insulated compression connectors.

ATTACHMENT 16000-1
PADMOUNT TRANSFORMER SPECIFICATIONS

3. All connections to the transformer secondary terminals shall be made with a 2 - hole NEMA terminal lug. See illustration #3 - page 11.
4. Service conductors supplying 480Y/277 volts shall conform to the following specifications:
 - a) Services *up to and including 400 amperes* may be supplied from overhead transformers.
 - b) Services *above 400 amperes* shall only be supplied from padmount or submersible (below grade) transformers.
 - c) Radial services shall be limited to supplying one meter or one main disconnect switch.
 - d) Conductors shall be of type USE or XHHW only.
 - e) Service run (overhead or underground) shall not exceed 50 feet.
 - f) Services *up to 800 amperes* can be installed in metallic or non-metallic conduit in an integrated phase configuration.
 - g) For services *above 800 amperes*, all secondary conductor runs between the transformer enclosure and the customer's meter or main disconnect switch shall be run in an isolated phase configuration in non-metallic conduit.
 - h) Ground Fault Protection:
 - ◆ Services supplying multiple separately metered customers require a single main switch with ground fault protection.
 - ◆ Ground fault protection shall coordinate with LIPA's protection scheme and be approved by the Customer Planning Representative.
 - ◆ Services with main switches sized at 1000 amperes or more shall have ground fault protection on those switches.

**ATTACHMENT 16000-1
PADMOUNT TRANSFORMER SPECIFICATIONS**

5. Service conductors supplying 208Y/120 volts shall conform to the following specifications:

a) For integrated phase configuration:

- ◆ Metallic or non-metallic conduit may be utilized.
- ◆ There is no limitation on the length of service run. It shall be determined by the maximum allowable voltage drop.

b) For isolated phase configuration:

- ◆ Non-metallic conduit shall be used.
- ◆ The service run shall not exceed 30 feet.

DOORS REMOVED
FOR CLARITY

BAYONET FUSES

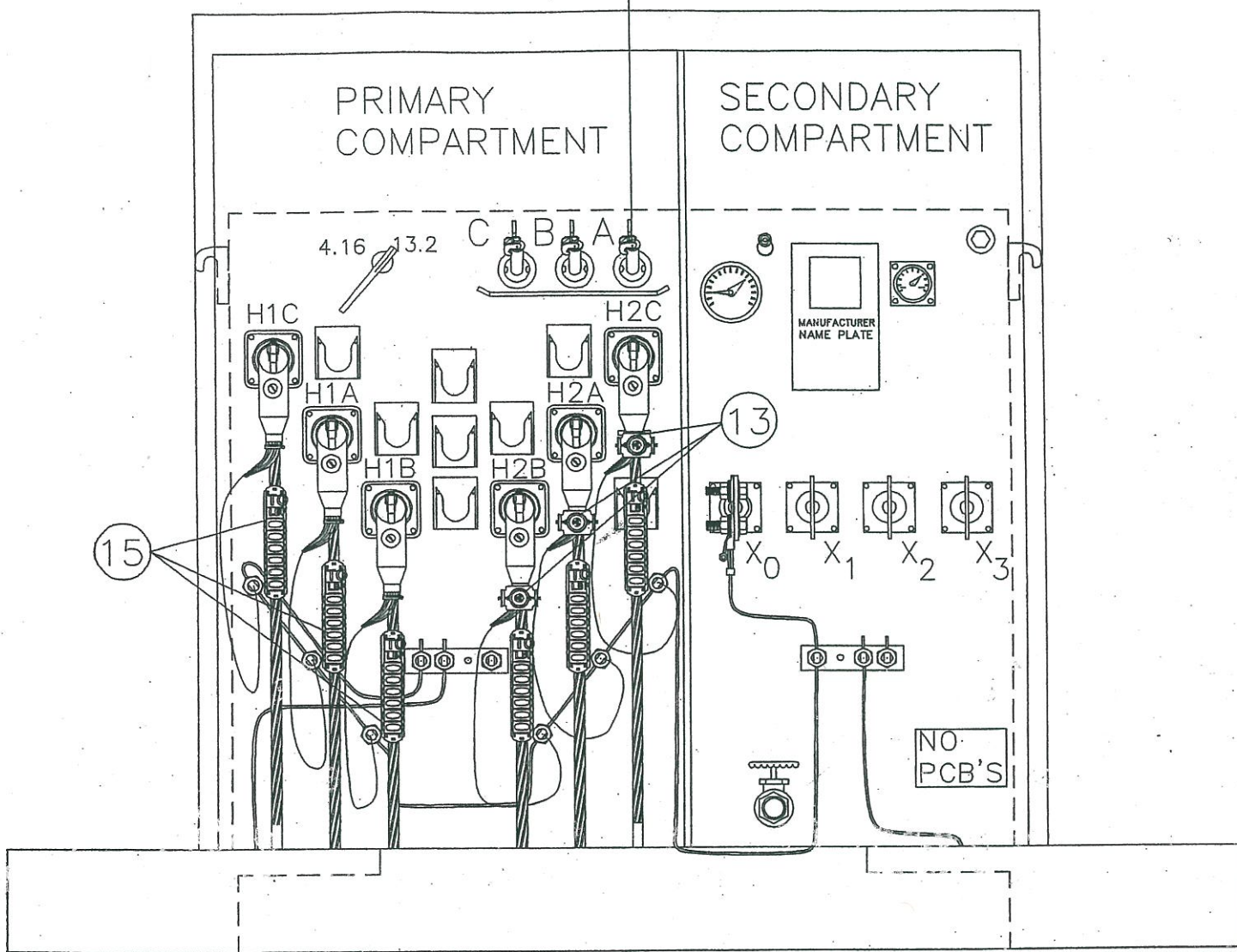


ILLUSTRATION #2: Primary & Secondary Transformer Compartments

ATTACHMENT 16000-1
PADMOUNT TRANSFORMER SPECIFICATIONS

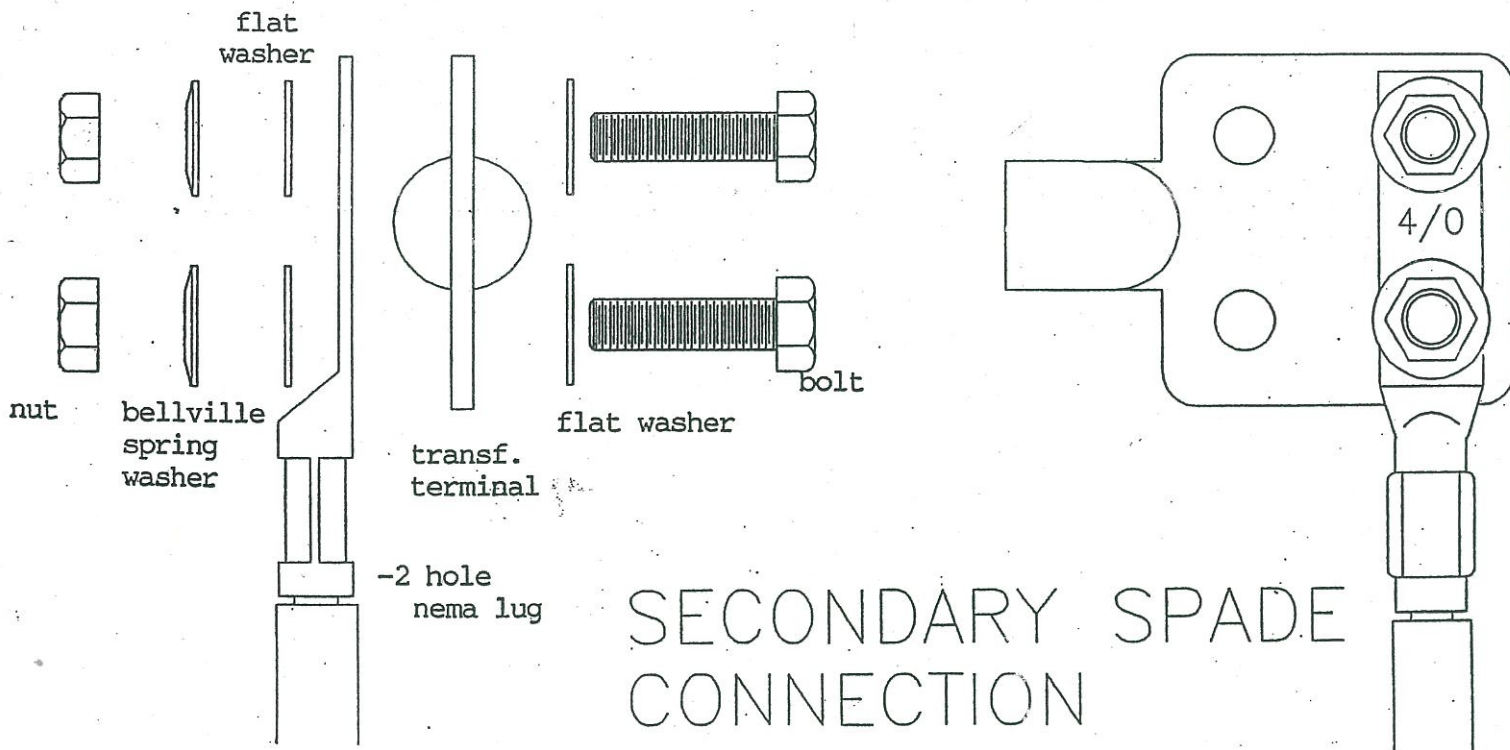
SECONDARY SPADE CONNECTION:

1. Description: Terminal Lug
 Reference: Illustration #3

Terminal Lug - Compression Connector - Tinned Aluminum or Copper. For #4/0, 350 MCM, 500 MCM or 750 MCM compressed or concentric copper or aluminum secondary cable. NEMA 2-hole pad for ½ inch diameter bolts(stud size). Aluminum lug's bore shall be coated with oxide inhibiting compound and plugged. Connector shall be marked with manufacturer's name, cable size, type of conductor stranding and die index number. Connector barrel shall not have an inspection hole. Connector shall meet or exceed EEI-NEMA Standard TDJ-162, Class A-3.

Approved suppliers: Anderson
 Burndy Corp.
 Kearny
 Blackburn
 Dossert
 Thomas & Betts

Follow manufacturer's compression tool and die recommendations for installing terminal connectors. For an aluminum to copper connection, an additional bellville spring washer must be installed on the bolt side of the lug.



SECONDARY SPADE CONNECTION

ILLUSTRATION #3 Secondary Spade Connection Detail

PADMOUNT TRANSFORMER SPECIFICATIONS

2. Lug to spade connection shall conform to the following:
 - a. All copper components shall be tin or alloy plated.
 - b. Wire brush aluminum conductor and apply oxide inhibitor compound to aluminum lug pad prior to connecting to transformer spade. All excess compound must be removed after lug is secured. (Not required for tinned copper lugs.)
 - c. Connect lug to transformer stud utilizing tinned or cadmium plated silicon bronze or stainless steel hardware. Place concave side of bellville washer toward transformer stud. Recommended torque value for bolts: 480 in-lbs for silicon bronze and 520 in-lbs for stainless steel.

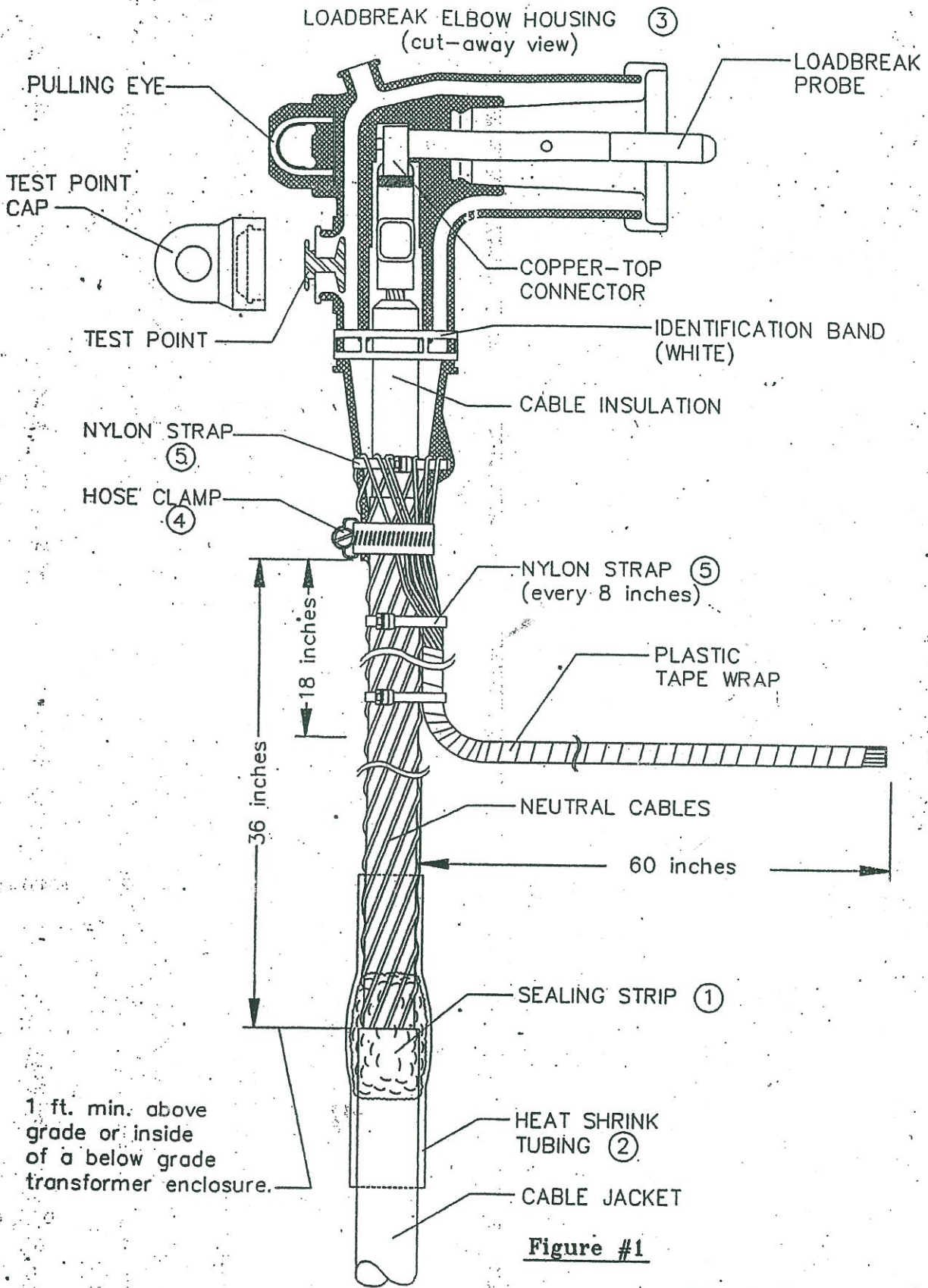


Figure #1

SEE SHEET 8 FOR BILL OF MATERIAL

APPROVED BY <i>J. P. [Signature]</i> DATE 5-11-99	REVISION 14. 04/99: REDESIGN	TERMINALS CABLE: PRIMARY INSTALLATION AND OPERATING INSTRUCTION 15kV 200 AMP LOADBREAK ELBOW TERMINATOR FOR XLPE or EPR INSULATED CU. or AL. CABLE	CONSTRUCTION STANDARD DRAWN BY ETX		
	LONG ISLAND POWER AUTHORITY prepared by KEYSpan ENERGY CORPORATION		NUMBER 3722	SHEET No 1 of 8	REV 14

INSTALLATION INSTRUCTIONS

1. Train the cable to the final assembled position. Six feet of cable should be extended beyond the bushing to provide sufficient system neutral to attach to the system neutral bus. A short length of #2 Cu cable, EPR insulated with a neoprene jacket (M&S 199428) may be hylinked to the neutral in place of four feet of additional neutral required above. There should also be sufficient cable slack to provide adequate clearance for lifting and placing elbows on operating accessories such as standoffs and feed -thru devices.
2. Slide a 6 inch length of heat shrinkable tubing over the cable.
3. Strip the cable jacket to provide flexibility for elbow operation. In most situations approximately 3 feet of jacket back from the elbow can be removed. The jacket must be retained on all primary cable in contact with soil and for a minimum of 1 foot above finished grade.
4. Install a self locking nylon strap (M&S 101003) over the neutrals 13 inches below the center of the bushing and fasten securely. Using self locking nylon straps, clamp the neutrals firmly against the insulation shield approximately every 8 inches. Carefully unwind and bend the neutrals back. Do not twist.
5. Cut the cable off 13 inches above the nylon strap.
6. Make the cable cutbacks in accordance with the manufacturers installation instruction sheet included with each kit. See manufacturers instructions for the exact cutback lengths. A brief summary is as follows.
 - a. Remove the insulation shield (semiconductor) by making a circumferential cut part way through the shield. Exercise extreme caution to avoid nicking the insulation beneath. Make several longitudinal cuts part way through the shield from the circumferential cut to the end. Again exercise care not to nick the insulation.

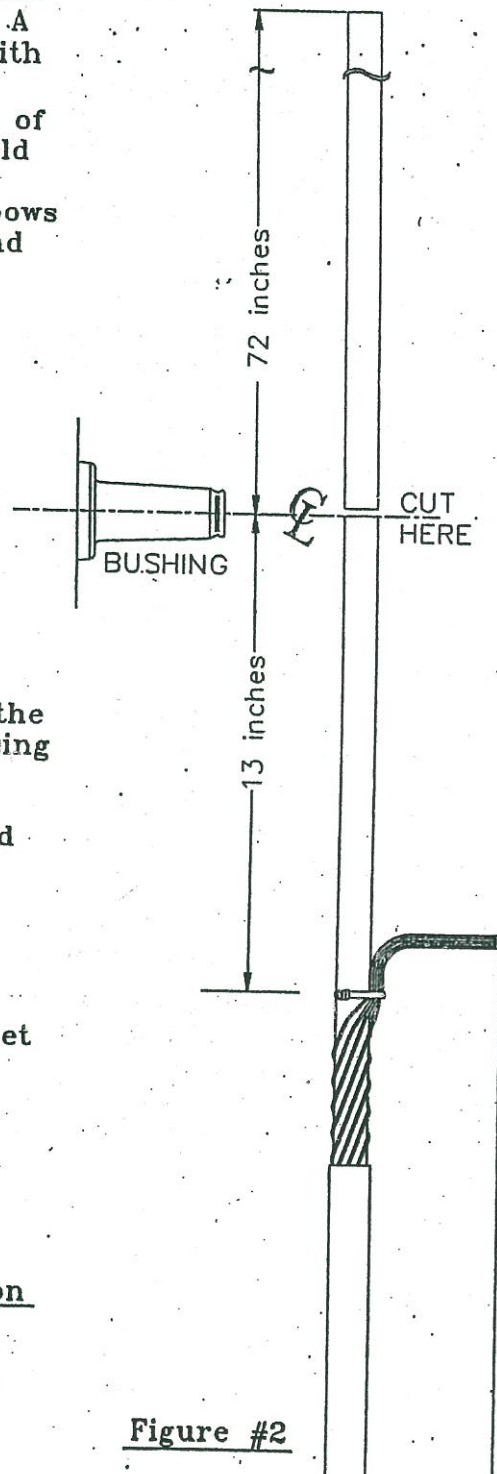


Figure #2

REVISION: 14. 04/99: REDESIGN	TERMINALS CABLE: PRIMARY INSTALLATION AND OPERATING INSTRUCTION 15kV 200 AMP LOADBREAK ELBOW TERMINATOR FOR XLPE or EPR INSULATED CU. or AL. CABLE	CONSTRUCTION STANDARD DRAWN BY STK
LONG ISLAND POWER AUTHORITY prepared by KEYSpan ENERGY CORPORATION	NUMBER: 3722 SHEET No: 2 of 8 REV: 14	NUMBER: 3722 SHEET No: 2 of 8 REV: 14

b. Prepare the cable end to accept the coppertop connector. Remove the insulation and conductor shield (semiconductor) from the end of the cable. Cut squarely being careful not to nick the conductor. Do not pencil. Apply a 1/8 inch Bevel to the end of the insulation. Fit the coppertop connector over the conductor. Check to make sure there is a 1/8 inch gap between the connector bottom and the insulation. This space is needed for expansion of the connector when it is crimped. Remove the connector and wipe the inhibitor grease off the conductor.

7. Wire brush (M&S 519030) the bare aluminum conductors. Immediately place the coppertop connector containing inhibitor grease on the conductor. Make sure the threaded hole in the coppertop connector faces the bushing. Crimp the connector in place using a tool and die combination listed in Table 1. Place one crimp centered between the connector knurl and connector bottom.

8. Clean the excess inhibitor grease from the coppertop connector. Wipe toward the threaded eye with a lint free cloth saturated with safety solvent (M&S 101374). Inhibitor residue can result in insulation damage and ultimate terminator failure.

Clean the exposed insulation surface with aluminum oxide abrasive cloth Garnet Cloth (M&S 501307) to remove all traces of semiconducting shielding and other foreign matter. Do Not Use Emery Cloth which contains conductive grit. Then wipe all exposed insulation surfaces clean with a lint free cloth saturated with safety solvent. Wipe towards the black semiconductor material without touching it. Be careful not to drag the black semiconductor material onto the clean insulation. In addition, clean the inside of the elbow housing, the cable entrance and the loadbreak bushing. [The solvent must be completely dry before applying any silicon grease.]

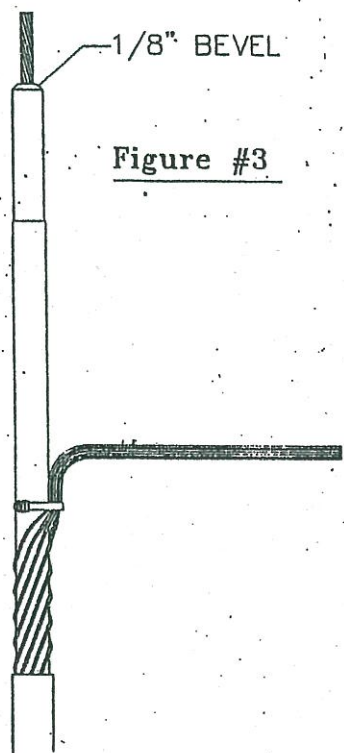


Figure #3

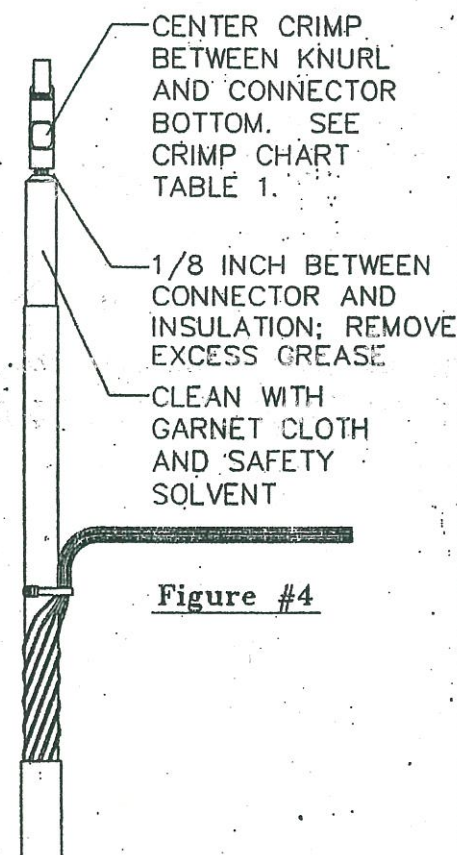


Figure #4

REVISION	TERMINALS CABLE: PRIMARY	CONSTRUCTION STANDARD <i>DRAWN BY ETK</i>		
14. 04/99: REDESIGN	INSTALLATION AND OPERATING INSTRUCTION 15KV 200 AMP LOADBREAK ELBOW TERMINATOR FOR XLPE or EPR INSULATED CU. or AL. CABLE	NUMBER	SHEET No	REV.
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110 001 TERMINAL C

9. Apply a thin coat of silicone grease supplied with the elbow kit to the exposed cable insulation, the elbow housing, the elbow cable entrance and the loadbreak bushing. Place the elbow onto the cable. With a twisting motion, push the elbow onto the cable until the threaded eye of the coppertop connector is visible through the elbow housing.

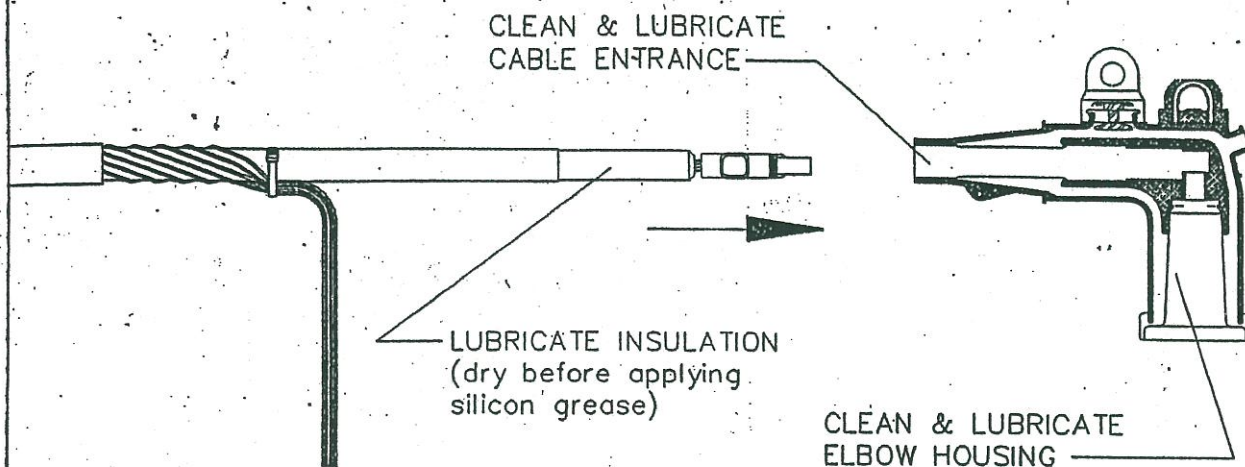
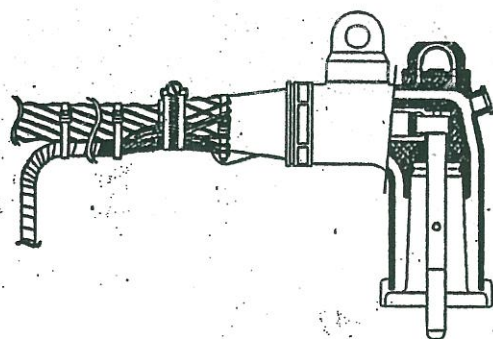


Figure #5

10. Insert the threaded end of the loadbreak probe into the elbow housing being careful not to contaminate the probe with silicone grease. By hand, thread the loadbreak probe into the threaded eye of the coppertop connector. Tighten the loadbreak probe with the torque applicator tool supplied with the elbow kit. Proper torque is applied when the torque applicator bends 180 degrees from its original shape. Discard the torque applicator. Do not reuse.



TORQUE APPLICATOR BEFORE TIGHTENING PIN



TORQUE APPLICATOR AFTER TIGHTENING PIN

Figure #6

REVISION: 14. 04/99: REDESIGN	TERMINALS CABLE: PRIMARY	CONSTRUCTION STANDARD DRAWN BY ETK		
LONG ISLAND POWER AUTHORITY Prepared by KEYSpan ENERGY CORPORATION	INSTALLATION AND OPERATING INSTRUCTION 15kV 200 AMP LOADBREAK ELBOW TERMINATOR FOR XLPE or EPR INSULATED CU. or AL. CABLE	NUMBER	SHEET No	REV
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11. Bring the neutrals onto the elbow cable entrance. See figure 1. Install a locking nylon strap over the neutrals and through the round eyelet at the base of the elbow. Bend the neutrals back over the nylon strap and install a hose clamp (M&S 121189) over both layers of neutral and the cable entrance. Tighten the hose clamp slowly until it is snug against the neutrals. Do Not Over Tighten. Gather the loose ends of the individual strands and form them into a parallel bundle of wires. Do Not Twist them tightly together; the individual strands will remain more flexible if not twisted together. Apply one half-lap layer of plastic tape to the last five feet of bundled neutral wire strands. Then, connect them to the neutral bus.
12. Apply (2) wraps of the sealing strip (M&S 185003), over the neutral wires at the point where the neutral wires come out from under the cable jacket.
13. Center the heat shrink tube over the sealing strip. Apply heat to the heat shrink tube evenly until it has fully contracted.

OPERATING INSTRUCTIONS

Before Loadmake or Loadbreak Operation:

Area must be clear of obstructions or contaminants that would interfere with the operation of the loadbreak elbow. This position should allow the operator to establish firm footing and enable the operator to grasp the shotgun stick securely, maintaining positive control over the movement of the loadbreak elbow before, during and directly after the operating sequence. Do not connect two different phases of a multi-phase system. Before closing any RUD loop, use an approved phasing tool to make sure both ends are the same phase. Do not place a loadbreak elbow on a bushing insert by hand.

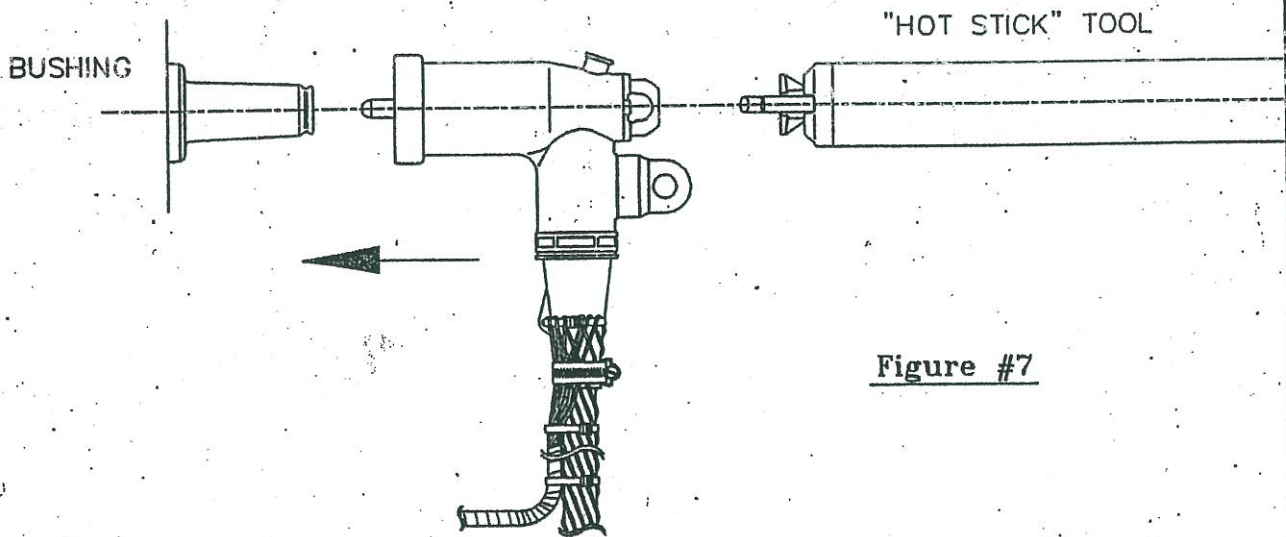


Figure #7

REVISION ▶	TERMINALS CABLE: PRIMARY.	CONSTRUCTION STANDARD <i>DRAWN BY ETK.</i>		
14. 04/99: REDESIGN	INSTALLATION AND OPERATING INSTRUCTION 15kv 200 AMP LOADBREAK ELBOW TERMINATOR FOR XLPE or EPR INSULATED CU. or AL. CABLE	NUMBER	SHEET No	REV.
LONG ISLAND POWER AUTHORITY <small>prepared by</small> KEYSpan ENERGY CORPORATION		3722	5 of 8	14

Loadmake Operation

1. Area must be clear of obstructions or contaminants that would interfere with the operation of the loadbreak elbow.
2. Securely fasten a shotgun stick to the pulling eye.
3. Place the loadbreak elbow over the bushing, inserting the load break probe into the bushing until the first slight resistance is felt. Resistance is felt when the arc follower portion of the loadbreak probe first meets the female contact of the bushing.
4. Immediately thrust the elbow onto the bushing with a fast, firm, straight motion, with sufficient force to latch the elbow to the bushing.

Fault Close

1. Do not operate the elbow on known faults.

Loadbreak Operation

1. Securely fasten a shotgun stick to the pulling eye.
2. To break surface friction between the elbow and the bushing, without exerting any pulling force, slightly rotate the loadbreak elbow clockwise while watching the bushing base. (Caution: If the base moves freely, do not turn the loadbreak elbow counterclockwise. The bushing may not be tightly seated.)
3. Withdraw the loadbreak elbow from the bushing with a fast, firm, straight motion, being careful not to place the elbow near a ground plane.
4. Place the loadbreak elbow on an appropriate accessory device.

REVISION	TERMINALS CABLE: PRIMARY INSTALLATION AND OPERATING INSTRUCTION 15kV 200 AMP LOADBREAK ELBOW TERMINATOR FOR XLPE or EPR INSULATED CU. or AL. CABLE	CONSTRUCTION STANDARD DRAWN BY <i>ETK</i>					
14. 04/99: REDESIGN		<table border="1"> <thead> <tr> <th>NUMBER</th> <th>SHEET No</th> <th>REV</th> </tr> </thead> <tbody> <tr> <td>3722</td> <td>6 of 8</td> <td>14</td> </tr> </tbody> </table>	NUMBER	SHEET No	REV	3722	6 of 8
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LONG ISLAND POWER AUTHORITY prepared by KEYSpan ENERGY CORPORATION							

1. New Construction

The loadbreak elbow and bushing insert must be installed as a matched set from the same manufacturer.

2. Maintenance

In existing installations, where routine (non-fault condition / non-loadbreak elbow failure) jobs are in progress, any loadbreak elbow found to be in good condition may be left in service. The existing elbow may be reinstalled into a new loadbreak bushing with no elbow replacement.

For field conditions where a loadbreak elbow experiences a fault or obvious failure, the elbow and bushing must be replaced with new components.

Additional situations where loadbreak elbow connector replacement is recommended:

- a. when a faulted elbow is found to have an aluminum compression lug, replace all three phases.
- b. when an elbow in an enclosure is found to be damaged, deformed or swollen.
- c. when an elbow is not imprinted with the 8.3 / 14.4 KV rating and is not accordingly marked with the white and black bands around the cable entrance portion of the elbow.

2. Refer to CS 3727 for the loadbreak bushing insert installation instructions.

3. DIFFICULT REMOVAL SITUATIONS:

When difficulty may be expected in the removal of a loadbreak elbow, a twisting movement in conjunction with greater than normal pulling force is often required to break the elbow free. It is imperative that in these removal situations an elbow "clam-shell tool" (M&S 551308) be used to insure positive leverage on the entire upper elbow body.

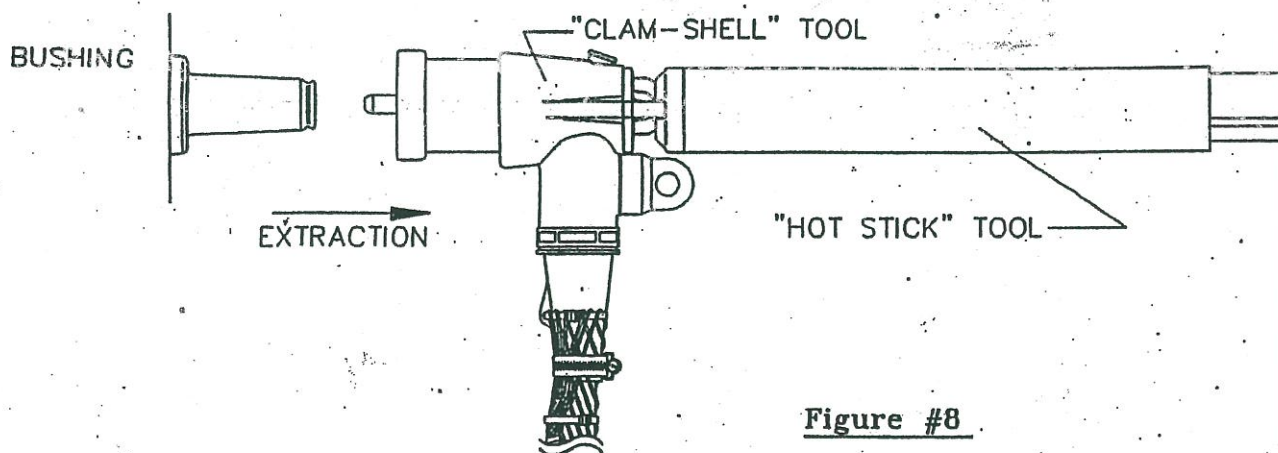


Figure #8

REVISION ▶ 14. 04/99: REDESIGN	TERMINALS CABLE: PRIMARY INSTALLATION AND OPERATING INSTRUCTION 15kV 200 AMP LOADBREAK ELBOW TERMINATOR FOR XLPE or EPR INSULATED CU. or AL. CABLE	CONSTRUCTION STANDARD DRAWN BY ETK <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="font-size: x-small;">NUMBER</th> <th style="font-size: x-small;">SHEET No</th> <th style="font-size: x-small;">REV</th> </tr> <tr> <td style="text-align: center;">3722</td> <td style="text-align: center;">7 of 8</td> <td style="text-align: center;">14</td> </tr> </table>	NUMBER	SHEET No	REV	3722	7 of 8	14
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**- Table 1
Crimp Chart**

Conductor Size	Insulation Diameter (In.) Min.-Max.**	Conn. O.D.	Elbow Term. with Bush. Insert	Tool	Die	No. of Crimps
#2 Cu. or Alum.	0.755-0.815	5/8"	M&S 160112	Y34A Y35 Y46*	A243 U243 U243	1
#1/0 Cu. or Alum.	0.830-0.890	5/8"	M&S 160114	Y34A Y35 Y46*	A243 U243 U243	1
#3/0 Cu. or ALum.	0.925-0.985	3/4"	M&S 160115	Y34A Y35 Y46*	A27AR U27ART U27ART	1

* Use with P-UADP Adapter

** Compressed Conductor with 220 Mil Insulation

Bill of Material

Item No.	Description	QTY.	M&S Code
1	Sealant Strip	+	185003
2	Tubing, Heat Shrinkable, 1.5-0.7" Recovered I.D.	+	197304
3	Terminator L/B Elbow #2 awg W/Bushing Insert	+	160112
	Terminator L/B Elbow #1/0 awg W/Bushing Insert	+	160114
	Terminator L/B Elbow #3/0 awg W/Bushing Insert	+	160115
4	Hose Clamp, Stainless Steel	+	121189
5	Nylon Strap, Self Locking	+	101003

REVISION	TERMINALS CABLE: PRIMARY	CONSTRUCTION STANDARD <i>DRAWN BY FTK</i>		
14. 04/99: REDESIGN	INSTALLATION AND OPERATING INSTRUCTION 15kV 200 AMP LOADBREAK ELBOW TERMINATOR FOR XLPE or EPR INSULATED CU. or AL. CABLE	NUMBER	SHEET No	REV
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Loadbreak Bushing Insert Installation Instructions

Precautions

- 1) All apparatus must be de-energized during the installation of the loadbreak bushing insert. Inspect the loadbreak bushing insert and bushing well for damage.
- 2) Read and follow all manufacturers instructions supplied with the loadbreak bushing inserts.

Replacement Requirements

- 3) For field conditions where a loadbreak elbow experiences a fault or obvious failure, the elbow and bushing must be replaced with new components from the same manufacturer. Bushing inserts and loadbreak elbows are stocked as a set from the same manufacturer.

In existing installations, where routine (non-fault condition / non-Loadbreak elbow failure) Jobs are in progress, any loadbreak elbow found to be in good condition may be left in service. The existing elbow may be reinstalled into a new loadbreak bushing with no elbow replacement.

Additional situations where loadbreak elbow connector replacement is recommended:

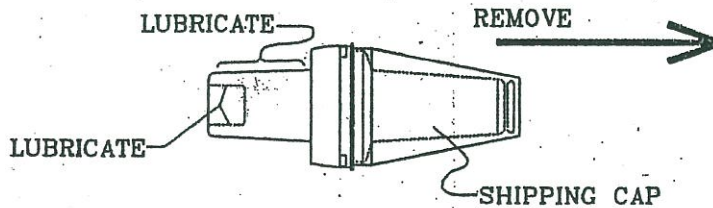
- a. when a faulted elbow is found to have an aluminum compression connector (non-coppertop), replace all three phases.
- b. when an elbow in an enclosure is found to be damaged, deformed or swollen.
- c. when elbow is not imprinted with the 8.3 / 14.4 KV rating and is not accordingly marked with the white and black bands around the cable entrance portion of the elbow.

Refer to CS 3722 for the loadbreak elbow installation instructions.

Installation Instructions

Clean and Lubricate

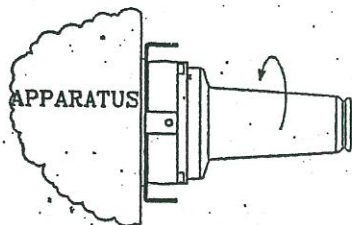
- 4) Inspect the apparatus bushing well to be sure it is dry and free from all contaminants. Contamination will cause electrical failure.
- 5) Remove the protective shipping cap from the bushing insert. Lubricate the Bushing well interface area of the bushing insert with the supplied lubricant or KeySpan M&S 101045. Do not substitute any other greases or silicone products.



APPROVED BY <i>[Signature]</i> DATE 10-15-99	REVISION 3. 05/99: COMPLETE	CABLE JOINTS: PRIMARY INSTALLATION INSTRUCTIONS 15 kV, 200 AMP LOADBREAK BUSHING INSERT	CONSTRUCTION STANDARD DRAWN BY: ETK
LONG ISLAND POWER AUTHORITY Prepared by KEYSpan ENERGY CORPORATION			NUMBER SHEET No REV 3727 1 of 5 3

Installing Older Loadbreak Bushing Insert Without an Internal Hex Broach

- 6a) Place the threaded end of the bushing insert in the apparatus bushing well. Hand tighten the bushing insert in a clockwise direction until it bottoms. Do not over tighten. This may cause the bushing well stud to snap off.

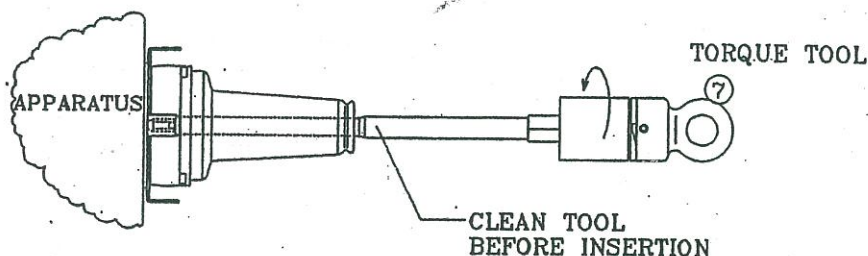


NOTE:

De-energized cleaning and lubricating instructions apply to existing bushings as well as newly installed bushing devices. On existing equipment the reuse of 15 kV bushings implies that the bushings be free of contaminants and properly lubricated with silicone grease.

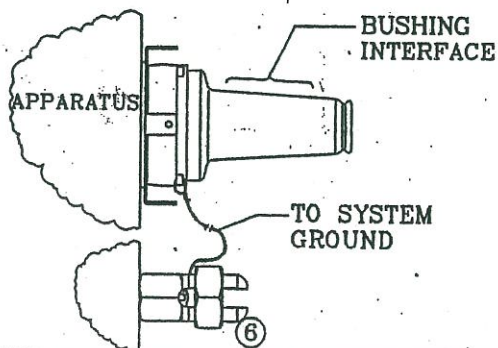
Alternate Method for Installing Newer Style Loadbreak Bushing Insert with an Internal Hex Broach Compatible with the Insert Torque Tool - M&S 160105

- 6b) Place the threaded end of the bushing insert into the apparatus bushing well. Insert the torque tool in the bore of the bushing insert. Turn the tool slightly to engage the hex broach. Insert a suitable rod through the eye of the tool and turn in a clockwise direction until the tool begins to ratchet and makes an audible click. Remove the torque tool from the bushing insert. The torque tool tightens the bushing to approximately 10 to 15 FT-LBS.



Ground

- 7) Push a length of neutral strand (or a 14 awg copper wire) through one of the grounding eyes on the bushing insert. Make a small loop and twist tight taking care not to damage the grounding eye. Connect the free end of the grounding wire to the ground pad lug (M&S 124138) of the apparatus. The grounding wire should be installed in such a manner so as not to contact the bushing interface or adjacent bushing interfaces or interfere with the placement of accessories on nearby parking stands.

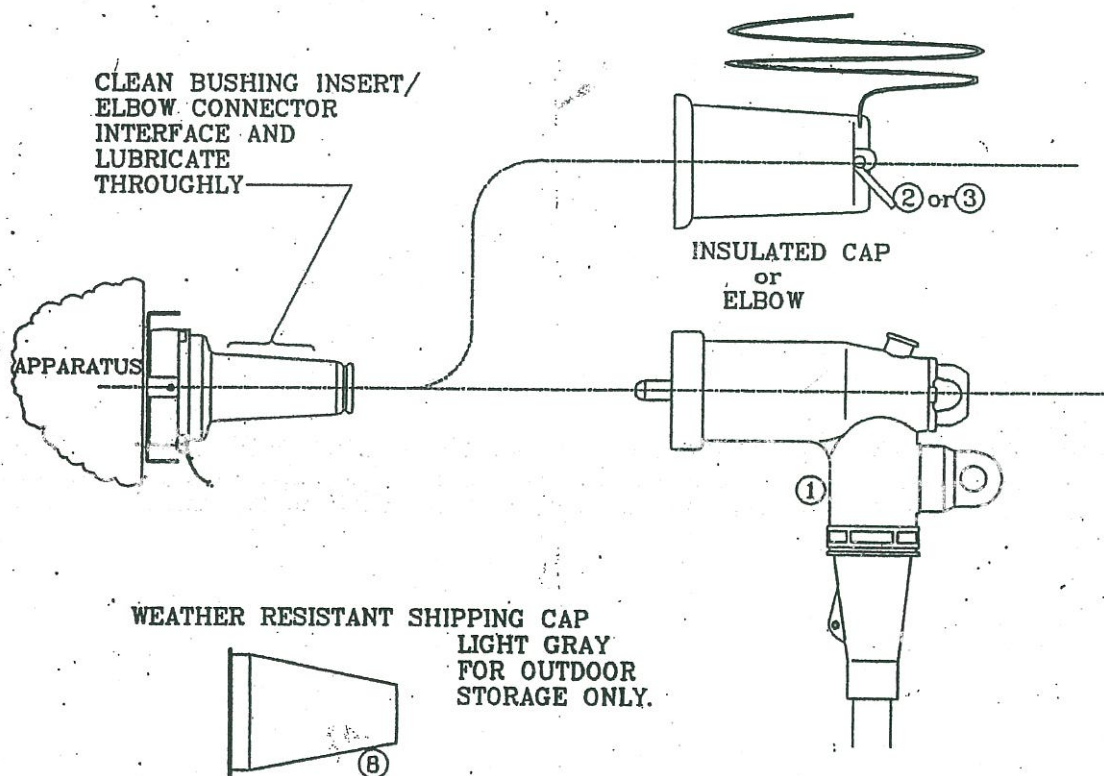


<p>REVISION </p> <p>3. 05/99: COMPLETE</p> <p>LONG ISLAND POWER AUTHORITY <small>prepared by</small> KEYSPAN ENERGY CORPORATION</p>	<p>CABLE JOINTS: PRIMARY</p> <p>INSTALLATION INSTRUCTIONS 15. kV, 200 AMP LOADBREAK BUSHING INSERT</p>	<p>CONSTRUCTION STANDARD <small>DRAWN BY ETK</small></p> <table border="1"> <thead> <tr> <th>NUMBER</th> <th>SHEET No</th> <th>REV</th> </tr> </thead> <tbody> <tr> <td>3727</td> <td>2 of 5</td> <td>3</td> </tr> </tbody> </table>	NUMBER	SHEET No	REV	3727	2 of 5	3
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Cover Loadbreak Bushing Insert

- 8) Do not leave the bushing interface exposed. Cover with the appropriate mating product as follows. Using a clean cloth, thoroughly wipe the bushing interface clean of contaminants and lubricate with the supplied lubricant. Do not apply lubricant to the arc quenching material inside the bushing insert. Install load break elbow or insulated cap on all bushing inserts left energized. Refer to CS-3722 for the loadbreak elbow installation instructions, loadmake and loadbreak operating instructions. If the bushing insert is not energized and is to be stored outdoors, install a new light gray weather resistant shipping cap M&S-160024. Do not energize or submerge the apparatus with the shipping cap on the bushing insert. This is a protective cap which is not insulated or water tight and only intended to keep the bushing surfaces clean during storage, handling and installation.

Attention: Some newer style load break bushing inserts may be equipped with a latch indicator ring that serves as a visual indicator to verify the mating component is properly seated on the bushing insert. Once the mating component has been properly installed on the bushing insert, the yellow or white ring should be completely covered. If any yellow or white is visible, the load break elbow or protective cap must be completely installed or "latched" before energizing to assure a proper connection.




CAUTION: NEVER ENERGIZE WITH SHIPPING CAP INSTALLED !

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REVISION 3. 05/99: COMPLETE	CABLE JOINTS: PRIMARY INSTALLATION INSTRUCTIONS 15 kV, 200 AMP LOADBREAK BUSHING INSERT	CONSTRUCTION STANDARD DRAWN BY ETK <table border="1" style="width: 100%; text-align: center;"> <tr> <th>NUMBER</th> <th>SHEET No</th> <th>REV</th> </tr> <tr> <td>3727</td> <td>3 of 5</td> <td>3</td> </tr> </table>	NUMBER	SHEET No	REV	3727	3 of 5	3
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Removal

- 9) De-energize apparatus, verify apparatus is de-energized and install grounds
- 10) Remove mating product and place in a stand-off device or in a clean, dry location.
- 11) Remove ground wire.
- 12) Use a 5/16" inch hex drive tool, torque tool or a strap wrench to remove.
 - a. If a hex drive tool or torque tool is used, insert the drive into the bushing insert. Turn the tool slightly to engage the hex broach. Turn counter-clock to remove.
 - b. If a strap wrench is used, wrap around the collar of the bushing insert. Turn counter-clockwise to remove. Take care not to damage the bushing insert interface during this procedure.

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BILL OF MATERIAL			
ITEM	DESCRIPTION	QTY.	M&S No.
1	BUSHING INSERT, 200A WITH LOAD BREAK ELBOW #1 AWG	+	160112*
	#1/0 AWG	+	160114*
	#3/0 AWG	+	160115*
2	INSULATING CAP WITHOUT BUSHING INSERT	+	160020
3	INSULATING CAP WITH BUSHING INSERT	+	160023
4	ELBOW SURGE ARRESTER WITH BUSHING INSERT	+	105214
5	ELBOW SURGE ARRESTER WITHOUT BUSHING INSERT	+	105213
6	GROUND PAD LUG	+	124138
7	TORQUE TOOL, LOADBREAK BUSHING INSERT INSTALLATION (200 AMP)	+	160105
8	SHIPPING CAP, WEATHER RESISTANT, LIGHT GRAY	+	160024
* BUSHING & ELBOW ARE PACKAGED AS ONE KIT			

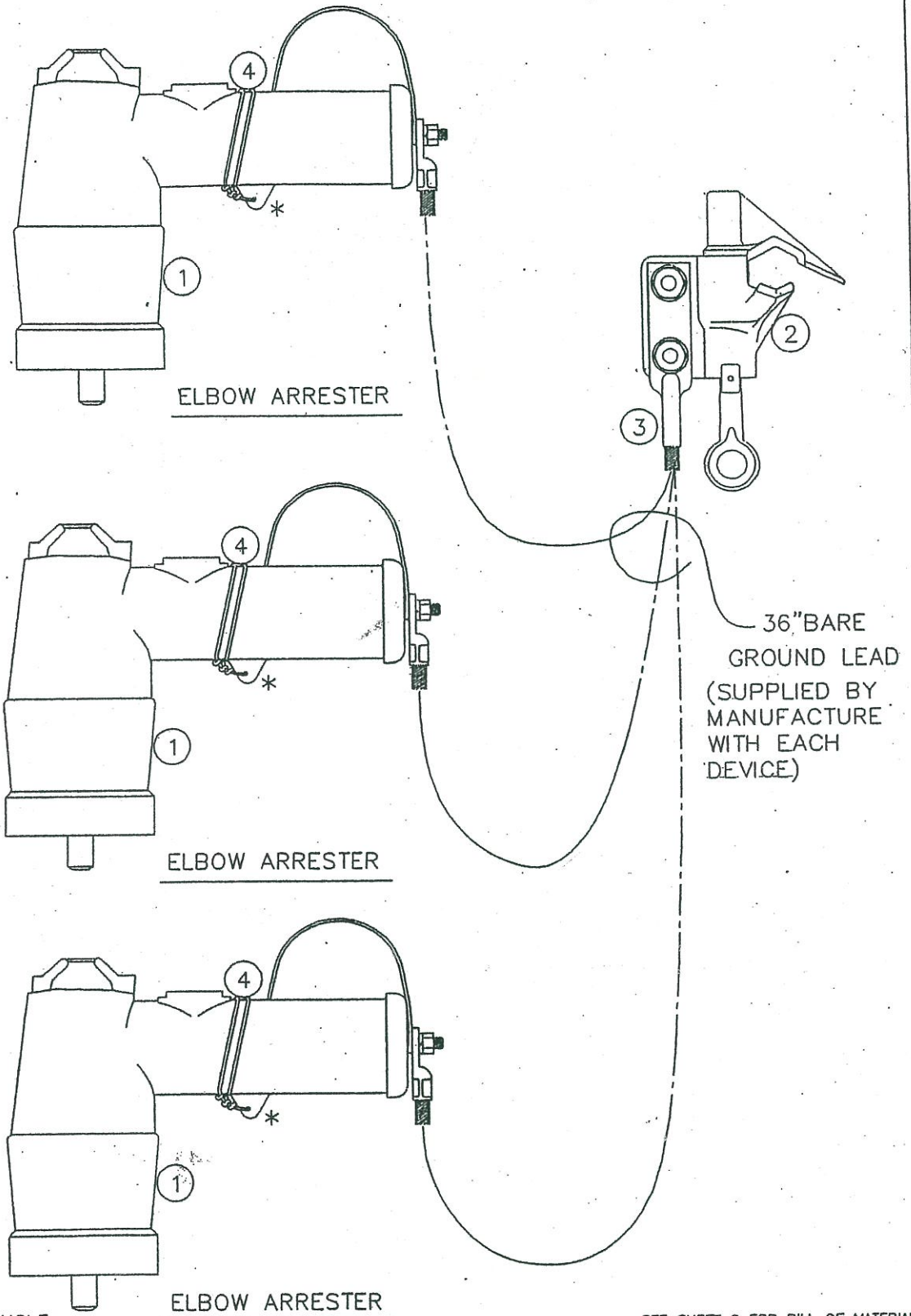
+ AS REQUIRED

REVISION ►

CS # 3727 REV. 3

* MISSING DIGITS BY TYPE OR SIZE

SHEET # 5 of 5



FIJES TRANSFORMERS

* DRAINWIRE EYEHOLE

SEE SHEET 2 FOR BILL OF MATERIAL

APPROVED BY <i>J.F. Blom</i>	REVISION	TRANSFORMER AND EQUIPMENT: GENERAL SURGE PROTECTION 3 PHASE RADIAL ONLY	CONSTRUCTION STANDARD: DRAWN BY ETK		
DATE 9/9/18			NUMBER	SHEET NO	REV
LONG ISLAND POWER AUTHORITY prepared by MARKETSPAN ELECTRIC SERVICES LLC			4028	1 of 5	0

BILL OF MATERIAL			
ITEM	DESCRIPTION	QTY.	M&S #
1	ELBOW ARRESTER WITH GROUND LEAD (with bushing*)	3	105214
2	HOT LINE CLAMP, COPPER	1	121096
3	LUG, #2 COPPER (2 HOLE) (one lug for each ground lead)	3	143070
4	WIRE, #10 BARE SOLID COPPER	50"	199010
<p>* USE OF ELBOW ARRESTER <u>WITHOUT</u> BUSHING (M&S. 105213) IMPLIES THAT ARRESTER WILL BE INSERTED INTO AN ELBOW BUSHING ON THE TRANSFORMER.</p>			
+ As Required * Missing Digits By Type or Size		CS # <u>4028</u> Rev. <u>0</u> Sheet # <u>2</u>	

PREPARATION OF DEVICES

A. TRIPLE SURGE ARRESTER ELBOWS, PREPARATION FOR OPEN POINT APPLICATION.
(SEE SHEET 1).

MATERIAL REQUIRED	M&S #
3 - ELBOW ARRESTERS WITH GROUND LEADS (WITH BUSHINGS)	105214
3 - 20" LENGTHS OF #10 BARE SOLID SOLID COPPER WIRE	199010
1 - HOT LINE CLAMP	121096
3 - #2 COPPER LUGS (2 HOLE)	143070

1. REMOVE ELBOW ARRESTERS FROM PACKAGES.
EACH ITEM IS PACKED WITH 36" LENGTH OF BARE #4 EXTRA-FINE STRANDED COPPER GROUND LEAD. (EQUIVALENT TO A #2 19 STRAND COPPER WIRE)
2. USING THE 20" LENGTHS OF #10 BARE SOLID COPPER WIRE SECURE IT TO THE DRAIN WIRE EYEHOLE ON THE BODY OF THE SURGE ARRESTER UPPER BODY AND SECURE THEM BY INTERLOCKING THE LAST WRAP AROUND ITSELF (LOOPING IT UNDER AND AROUND ITSELF). LEAVE A SHORT SLACK SECTION AS SHOWN IN THE DIAGRAM ON PAGE ONE. FINALLY, ATTACH THE FREE END TO THE SURGE ARRESTER GROUND STUD TOGETHER WITH THE GROUND LEAD LUG. TIGHTEN THE GROUND STUD NUT TO 4 TO 8 FOOT POUNDS TORQUE.
3. REPEAT STEP 2 FOR THE SECOND AND THIRD ELBOW ARRESTER DEVICES.
4. HYPRESS THE FREE ENDS OF THE 36" LENGTH(S) OF BARE #4 EXTRA-FINE STRANDED GROUND LEAD TO EACH OF THE #2 TWO HOLE LUG(S).
5. LUBRICATE BUSHING INTERFACE OF ARRESTER WITH LUBRICANT SUPPLIED.

IMPORTANT NOTES FOR RADIAL APPLICATION:

NOTE 1. USE M&S 105213 SINGLE ELBOW SURGE ARRESTERS WITHOUT BUSHINGS FOR ENERGIZED INSTALLATIONS, WHERE BUSHINGS ALREADY EXIST ON THE TRANSFORMER.
DISCARD EXISTING DEAD-END CAPS.

NOTE 2. USE ONLY M&S 105214 SINGLE ELBOW SURGE ARRESTERS WITH BUSHINGS FOR NEW RADIAL INSTALLATIONS, WHERE NEW BUSHINGS ARE REQUIRED TO INSTALL SURGE ARRESTERS ONTO TRANSFORMER.

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REVISION	TRANSFORMER AND EQUIPMENT: GENERAL	CONSTRUCTION STANDARD		
	SURGE PROTECTION	DRAWN BY ETK		
	3 PHASE RADIAL ONLY	NUMBER	SHEET NO	REV
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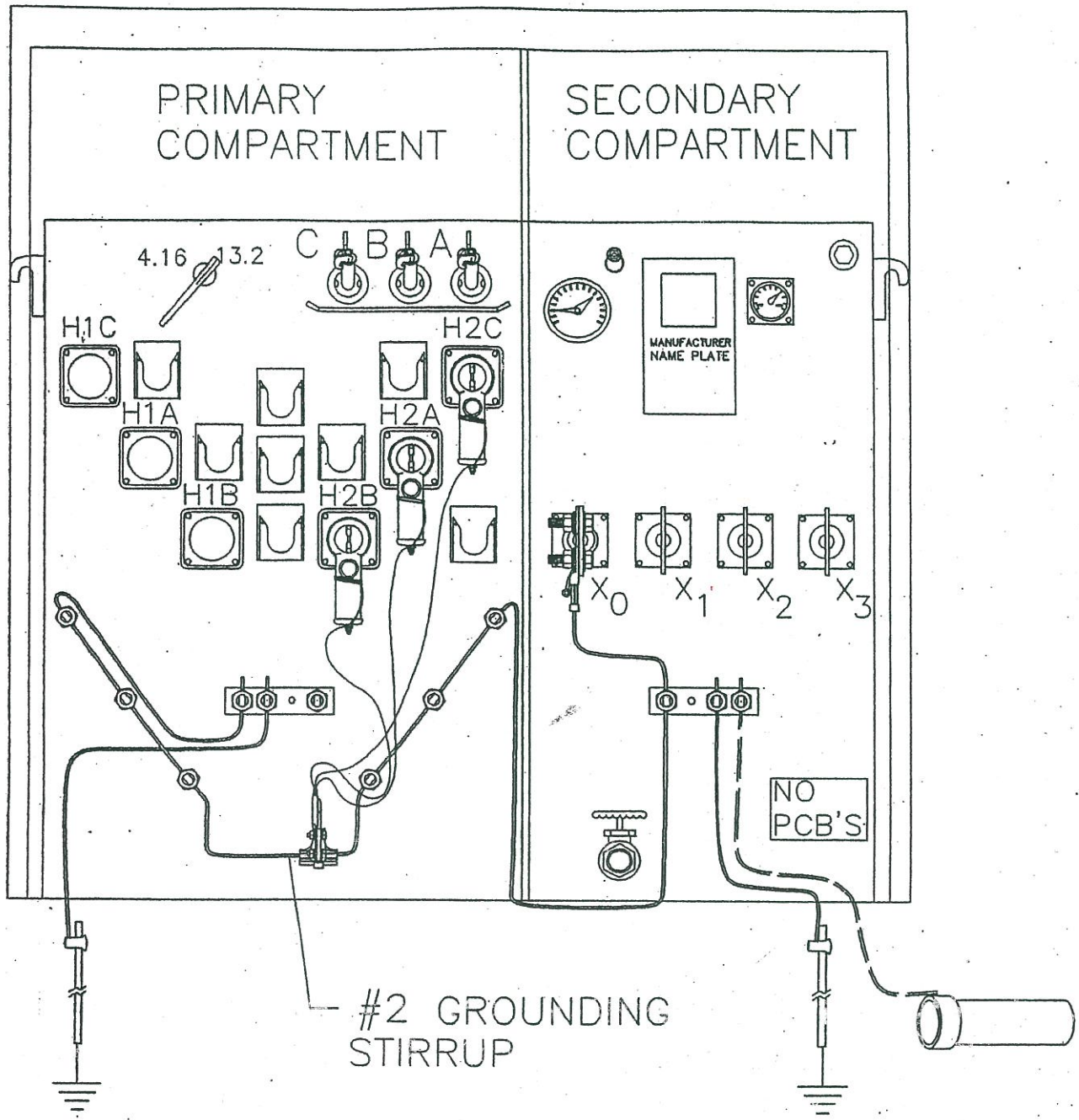
INSTALLATION OF DEVICES

A. ELBOW ARRESTER INSTALLATION ON ENERIGIZED RADIAL FEED TRANSFORMER (ENDPOINT).

NOTE: UTILIZE APPROPRIATE ENERGIZED/HOT STICK PROCEDURES FOR ALL INSTALLATION AND REMOVAL OPERATIONS.

1. OPEN THE TRANSFORMER ENCLOSURE AND IDENTIFY VISUALLY THE LOCATION OF THE TRANSFORMER ENCLOSURE GROUNDING POINT.
2. USING HOT STICK TOOL, INSTALL THE ELBOW ARRESTER'S HOTLINE CLAMP AT THE GROUNDING POINT.
3. REMOVE THE DEAD END CAPS FROM THE TRANSFORMER BUSHINGS. THE DEAD END CAPS ARE NO LONGER REQUIRED.
4. INSTALL THE ELBOW ARRESTER DEVICE ONTO THE OPEN BUSHING.
5. CLOSE AND LOCK THE TRANSFORMER ENCLOSURE.

REVISION A	TRANSFORMER AND EQUIPMENT: GENERAL	CONSTRUCTION STANDARD DRAWN BY ETK		
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FUSES TRANSFORMERS

GROUNDING DETAILS

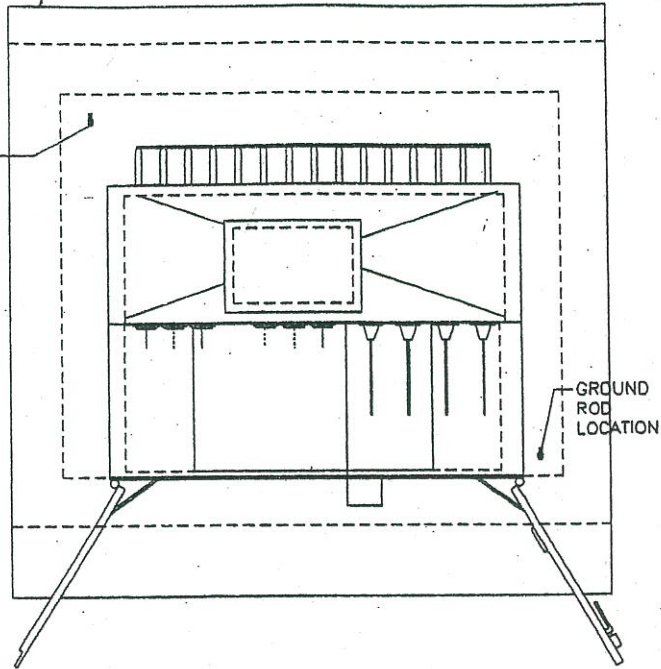
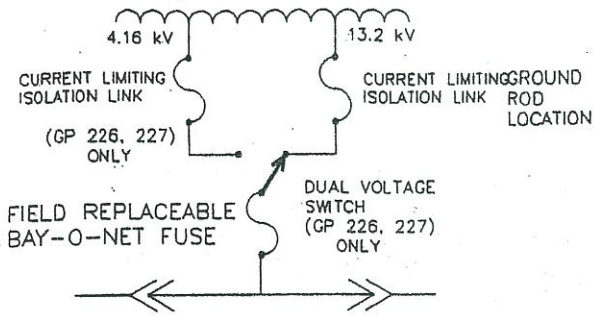
RADIAL FEED TRANSFORMER (END POINT)

REVISION	◀
LONG ISLAND POWER AUTHORITY prepared by MARKETSPAN ELECTRIC SERVICES LLC	

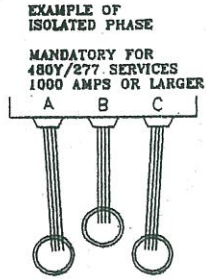
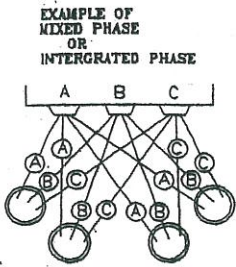
TRANSFORMER AND EQUIPMENT: GENERAL
SURGE PROTECTION
3 PHASE RADIAL ONLY

CONSTRUCTION STANDARD		
DRAWN BY STK		
NUMBER	SHEET NO	REV
4028	5 of 5	0

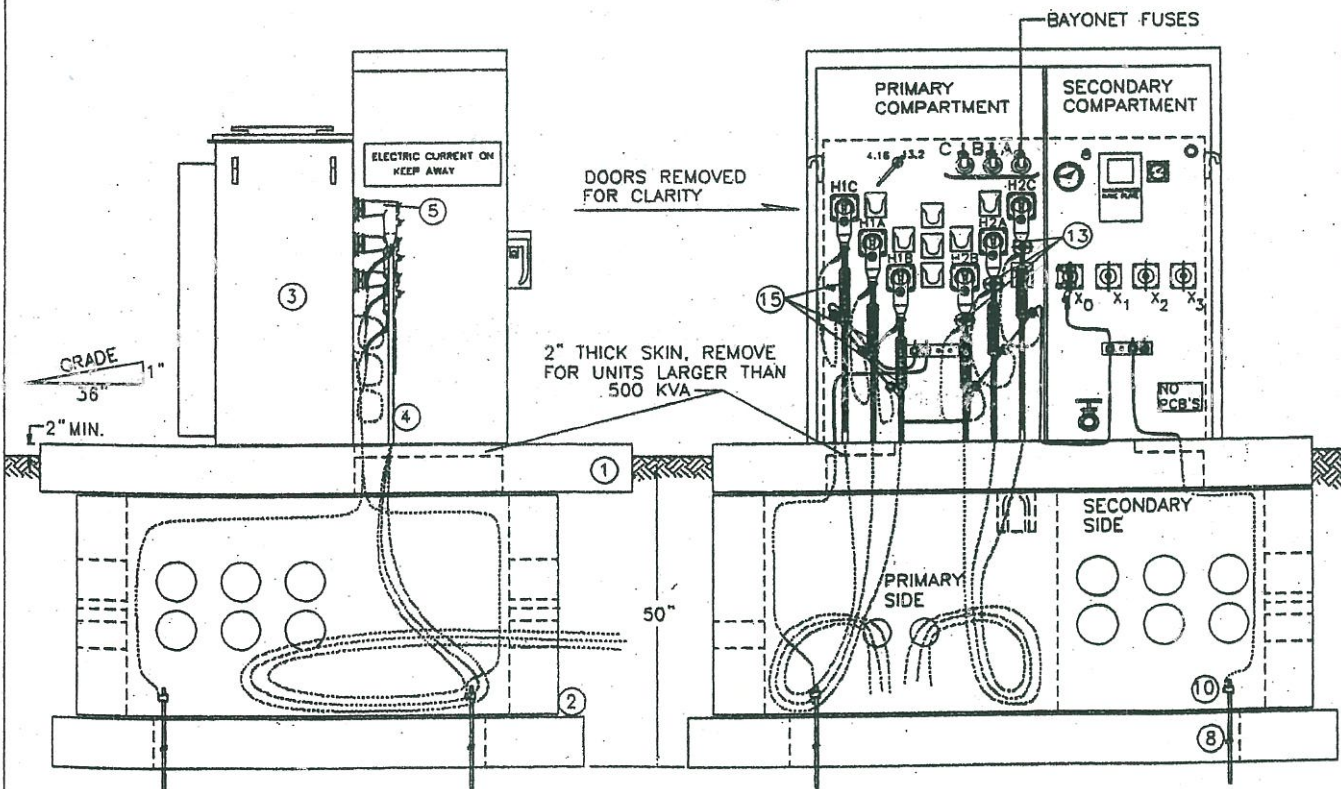
ONE LINE DIAGRAM



SECONDARY CABLE INSTALLATION



SEE SHEET 5 FOR GROUNDING DETAILS



SEE SHEET 2 FOR BILL OF MATERIAL, SHEET 3 FOR NOTES.

APPROVED BY <i>[Signature]</i> DATE 5-200	REVISION 9. 04/00: CHGD NOTE 1.9 & ITEM 11
LONG ISLAND POWER AUTHORITY prepared by KEYSpan ENERGY CORPORATION	

TRANSFORMER INSTALLATION AND HOUSING CONSTRUCTION: PAD AND ENCLOSURE HOUSED

3 PHASE 4kV OR 13kV "DEAD FRONT" METAL CLAD TRANSFORMER 75-1500KVA FOR PRIMARY DISTRIBUTION

CONSTRUCTION STANDARD DRAWN BY <i>ETK</i>		
NUMBER	SHEET No	REV
5362	1 of 5	9

3Ø PAD & SUB TRANSFORMERS

ATTACHMENT 16000-1

BILL OF MATERIAL			
ITEM	DESCRIPTION	QTY.	M&S No.
1	Concrete Pad, Re-enforced, Pre-cast (8' x 8' x 8")	1	131117
2	Foundation and Footing, Re-enforced Concrete, Precast	1	131116
3	Transformer, Three Phase- Pad Mounted (see DA 50005)	1	922*****
4	Primary Cable, 15KV, 3-2/C 1/0 Al. } KeySpan Instal.	+	199984
5	Primary Terminations/Surge Protection " "		
	Loop Installations with Feed-Thru Transf. " "		
	Terminator, Loadbreak 1/0 W/ Bushing " "	6	160114
	Loop Installations with Open Point Transf. " "		
	Terminator, Loadbreak 1/0 W/Bushing " "	6	160114
	Two Way Portable Feed-Thru " "	3	160091
	Dead End Caps (without bushing) " "	6	160020
	-or-		
	Radial Installation: } Customer Instal.		
	Terminator, Loadbreak #2 W/Bushing " "	3	160112
	Elbow Surge Arrester W/Bushing (see CS 4028) " "	3	105214
6	Secondary Cable, Copper, 600 V EPR:	+	199***
	Note: For All 480 Volt Secondary Services Cable Insulation Must Be Type "USE" or "XHHW"		
7	Terminal Connector, 2-Hole NEMA: 4/0 AWG Stranded	+	143087
	500 KCM Stranded	+	143098
8	Ground Rod, 1/2" x 8'	2	173007
9	Terminal Lug, #4 AWG Str., #2 AWG Sol., 2-Hole NEMA	1	143066
10	Connector, Ground Rod	2	121065
11	Wire Solid #2 AWG, Copper Tinned *	30'	199265
12	Connector, Ground, Thred. Lug (#2 to 2/0 AWG Str.)	12	124138
13	Fault Indicator, 400 amp, 3 amp Reset	+	101027
14	1-Way to 2-Way Connectors: (see CS 2090 if required)		
	(1) 500 KCM to (2) 4/0 AWG, Rubber Insulated	+	124021
	(1) 500 KCM to (2) 500 KCM, Rubber Insulated	+	124029
	(1) 750 KCM to (2) 500 KCM, Rubber Insulated	+	124134
15	Identification Tags for Primary Cable (see CS 2030)	+	155***
16	Nut, Jam Everdur Hex, 1/2"x13	12	110198
17	Wire Solid #6 AWG, Copper Tinned	+	199444

* #2 AWG Bare may be substituted on radial installations.

NOTES:

PRIMARY CABLE:

1. CABLES SHOULD HAVE 5 FT. OF SLACK INSIDE FOUNDATION. AS MUCH PHYSICAL SEPARATION AS POSSIBLE SHOULD BE GIVEN BETWEEN THE PRIMARY AND SECONDARY CABLES WITHIN THE FOUNDATION. PRIMARY CABLES SHALL ENTER FOUNDATION UNDER PRIMARY SIDE OF TRANSFORMER. SECONDARY CABLES SHALL ENTER UNDER SECONDARY SIDE OF TRANSFORMER ONLY.
2. INSTALL CURRENT RESET FAULT INDICATORS (M&S 101027) ON OUTGOING CABLES IN LOOP INSTALLATIONS.
3. WHEN TERMINATING CABLE, SIX FEET OF CABLE SHOULD BE EXTENDED BEYOND THE BUSHING TO PROVIDE SUFFICIENT SYSTEM NEUTRAL TO ATTACH TO THE SYSTEM NEUTRAL BUS. A SHORT LENGTH OF #2 AWG COPPER CABLE EPR INSULATED WITH A NEOPRENE JACKET M&S 199428 MAY BE HYLINKED TO THE NEUTRAL IN PLACE OF FOUR FEET OF ADDITIONAL NEUTRAL REQUIRED ABOVE. THERE SHOULD ALSO BE SUFFICIENT CABLE SLACK TO PROVIDE ADEQUATE CLEARANCE FOR LIFTING AND PLACING ELBOWS ON OPERATING ACCESSORIES.

SECONDARY CABLE

4. ISOLATED PHASE CONSTRUCTION SHALL BE USED FOR ALL 480Y/277 VOLT SERVICES LARGER THAN 800 AMPS. FOR 800 AMPS SERVICES AND LESS, EITHER INTEGRATED OR ISOLATED PHASE IS ACCEPTABLE.
5. ISOLATED PHASE CONSTRUCTION SHALL NOT EXCEED 50 FT. FOR 480Y/277. FAILURE TO COMPLY WITH THIS REQUIREMENT WILL RESULT IN LOW VOLTAGE, PARTICULARLY UNDER HIGH LOADS.
6. ALL ISOLATED PHASE INSTALLATIONS SHALL BE INSTALLED USING NON-METALLIC CONDUIT.
7. INTEGRATED PHASE CONSTRUCTION IS LIMITED TO ONE SET OF CABLES PER DUCT. (IE. ONLY ONE CABLE PER PHASE IN EACH DUCT)
8. ALL 480Y/277 VOLT SERVICES SHALL BE INSTALLED USING "USE" TYPE OR "XHHW" TYPE CABLE ONLY.
9. THREE PHASE 208Y/120 VOLT SERVICES SHALL BE INSTALLED USING INTEGRATED PHASE CONSTRUCTION, ONLY. IF ISOLATED PHASE CONSTRUCTION IS UNAVOIDABLE, CABLES MUST NOT EXCEED 30 FEET IN LENGTH AS A MAXIMUM DISTANCE.
10. IF IT BECOMES NECESSARY TO CONNECT 9 OR MORE CABLES IN ORDER TO MATCH THE CUSTOMERS SWITCHGEAR OR VOLTAGE DROP REQUIREMENTS, 1 WAY- 2 WAY CONNECTORS SHALL BE USED (B.O.M. ITEM 14). THESE CONNECTORS SHOULD BE INSTALLED WITHIN THE TRANSFORMER FOUNDATION FOR A SINGLE METERED CUSTOMER, OR IN A PULLBOX ADJACENT TO THE FOUNDATION FOR MULTIPLE METERED CUSTOMERS. 1-WAY - 2-WAY CONNECTORS SHALL BE ATTACHED TO THE CABLES THAT ARE CLOSEST TO THE TRANSFORMER TANK WALL, TO MINIMIZE THE EXTRA WEIGHT ON THE TRANSFORMER BUSHINGS.

3 Ø PAD & SUB TRANSFORMERS

<p>REVISION</p> <p>9. 04/00: CHGD NOTE 1,9 AND ITEM 11.</p> <p>LONG ISLAND POWER AUTHORITY Prepared by KEYSPAN ENERGY CORPORATION</p>	<p>TRANSFORMER INSTALLATION AND HOUSING CONSTRUCTION: PAD AND ENCLOSURE HOUSED</p> <p>3 PHASE 4kV OR 13kV "DEAD FRONT" METAL GLAD TRANSFORMER 75-1500KVA FOR PRIMARY DISTRIBUTION</p>	<p>CONSTRUCTION STANDARD <i>DRAWN BY ETK</i></p> <table border="1" style="width: 100%;"> <thead> <tr> <th>NUMBER</th> <th>SHEET No</th> <th>REV</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">5362</td> <td style="text-align: center;">5</td> <td style="text-align: center;">9</td> </tr> </tbody> </table>	NUMBER	SHEET No	REV	5362	5	9
NUMBER	SHEET No	REV						
5362	5	9						

BONDING/GROUNDING:

11. WITH #2AWG BARE TINNED COPPER WIRE, CONNECT EACH GROUND LUG LOCATED BELOW EACH PRIMARY BUSHING. CONTINUE THE #2 COPPER TO THE GROUND PAD. SEE GROUNDING DIAGRAM.
12. USING #2 AWG, BTN COPPER WIRE CONNECT THE SECONDARY NEUTRAL BUSHING TO THE RIGHT GROUND PAD, CONNECT THE TWO GROUND PADS TO ONE ANOTHER. SEE GROUNDING DIAGRAM.
13. INSTALL TWO GROUND RODS AND CONNECT ONE TO EACH GROUND PAD USING A MINIMUM OF #6 BARE COPPER WIRE. A #2 BARE COPPER MAY BE SUBSTITUTED FOR THE #6 AWG BARE COPPER WIRE IN SITUATIONS WHERE #6 AWG BARE COPPER WIRE IS NOT READILY AVAILABLE.
14. ATTACH THE CONCENTRIC NEUTRALS OF THE PRIMARY CABLES TO THE #2 AWG BTN COPPER WIRE (GROUND BUS) USING SPLIT BOLT CONNECTORS.
15. GROUND LEADS ASSOCIATED WITH SURGE PROTECTORS SHALL BE BONDED TO THE #2 AWG BTN COPPER WIRE (GROUND BUS) WITH HOT LINE HOT LINE CLAMPS AND LUGS (M&S 121096 AND M&S 143067).
16. BOND ALL METALLIC DUCT TO GROUND PAD.

REFERENCE STANDARDS:

D14-07-004	DISTRIBUTION EQUIPMENT DESCRIPTION; CONCRETE PADS & FOUNDATIONS
CS 2030	UNDERGROUND CABLE TERMINATION IDENTIFICATION
CS 3722	LOADBREAK ELBOW TERMINATOR
CS 3727	INSTALLATION OF LOADBREAK BUSHING INSERT
CS 4020	3-PHASE TRANSFORMER FUSE REPLACEMENT GUIDE
CS 4026	SURGE PROTECTION, THREE PHASE C.I.P.U.D.
CS 4028	SURGE PROTECTION, THREE PHASE RADIAL
CS 5369	PROTECTION FOR PAD MOUNT EQUIPMENT
CS 5370	TRANSFORMER PAD LOCATION ADJACENT TO BUILDINGS

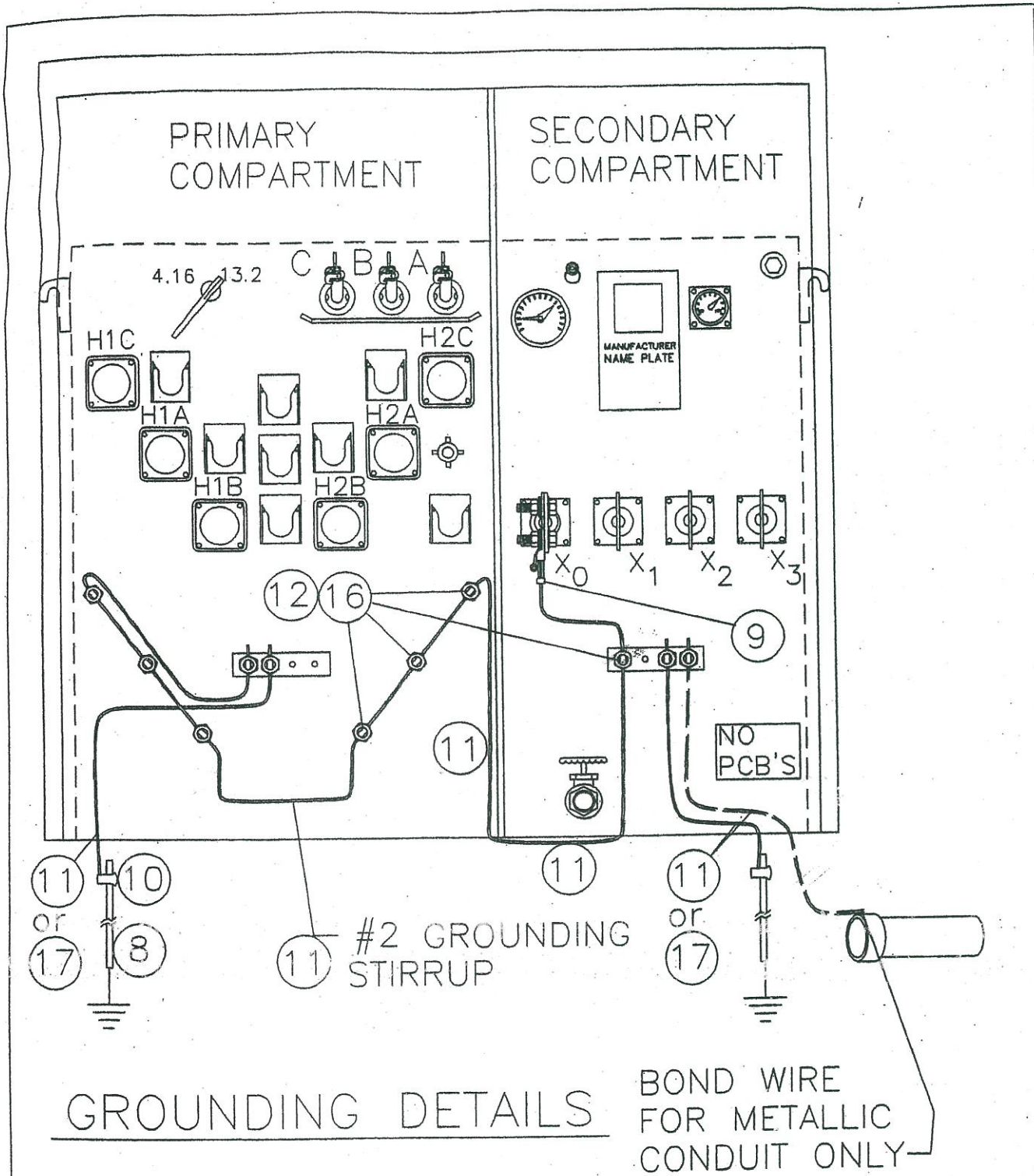
LIPA TRANSFORMER REFERENCES:

<u>GROUP#</u>	<u>P.T.#</u>	<u>DESCRIPTION</u>
224	57-16-073	13kV PRIM.; 208Y/120 V. SEC'DY.
225	57-16-073	13kV PRIM.; 480Y/277 V. SEC'DY.
226	57-16-073	DUAL VOLT PRIM.; 208Y/120 V. SEC'DY.
227	57-16-073	DUAL VOLT PRIM.; 480Y/277 V. SEC'DY.

REVISION	9. 04/00: GHGD NOTE 1,9 AND ITEM 11.
LONG ISLAND POWER AUTHORITY prepared by KEYSAN ENERGY CORPORATION	

TRANSFORMER INSTALLATION AND HOUSING CONSTRUCTION: PAD AND ENCLOSURE HOUSED
3 PHASE 4kV OR 13kV "DEAD FRONT" METAL CLAD TRANSFORMER 75-1500KVA FOR PRIMARY DISTRIBUTION

CONSTRUCTION STANDARD <i>DRAWN BY ETK</i>		
NUMBER	SHEET No	REV
5362	4 of 5	9



GROUNDING DETAILS

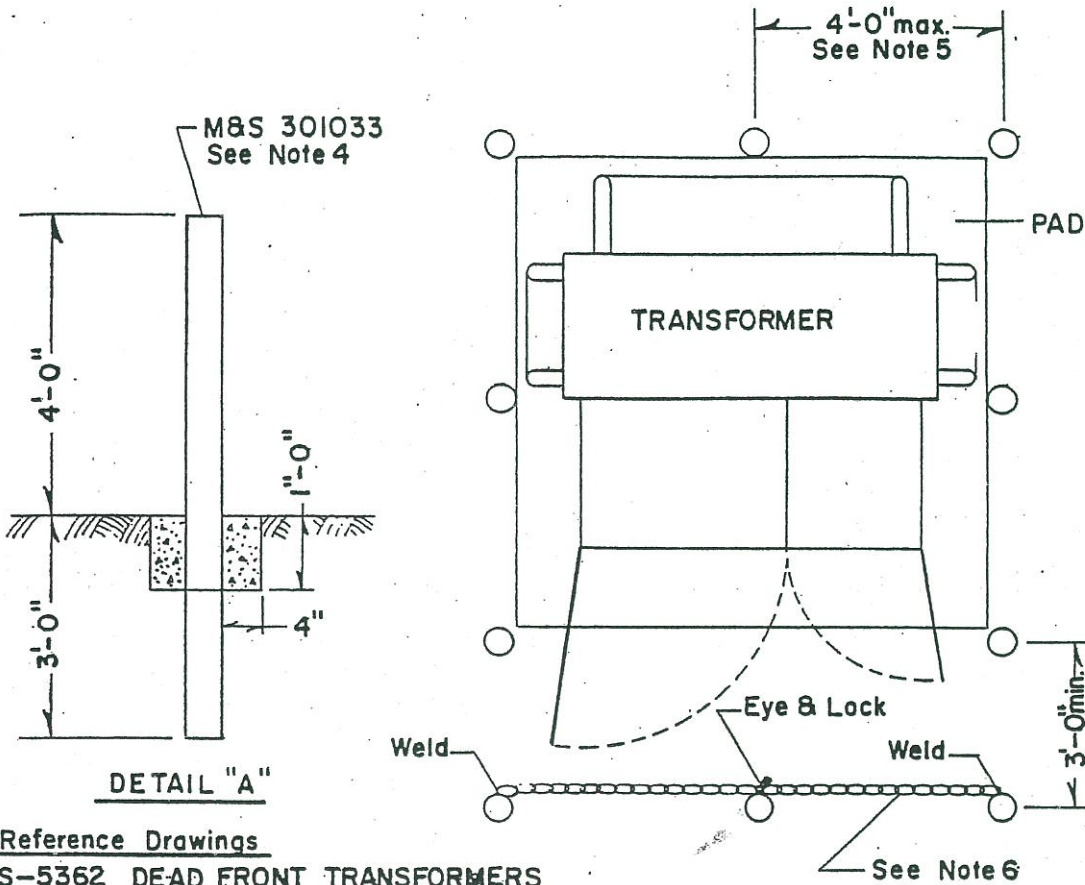
BOND WIRE FOR METALLIC CONDUIT ONLY

3 Ø PAD & SUB TRANSFORMERS

REVISION	▶
9. 04/00:	CHGD. NOTE 1,9 AND ITEM 11.
LONG ISLAND POWER AUTHORITY	
prepared by KEYSpan ENERGY CORPORATION	

TRANSFORMER INSTALLATION AND HOUSING
 CONSTRUCTION: PAD AND ENCLOSURE HOUSED
 3 PHASE 4KV OR 13KV "DEAD FRONT"
 METAL CLAD TRANSFORMER 75-1500KVA
 FOR PRIMARY DISTRIBUTION

CONSTRUCTION STANDARD		
DRAWN BY ETK		
NUMBER	SHEET No	REV
5362	5 of 5	9



Reference Drawings
CS-5362 DEAD FRONT TRANSFORMERS

Notes:

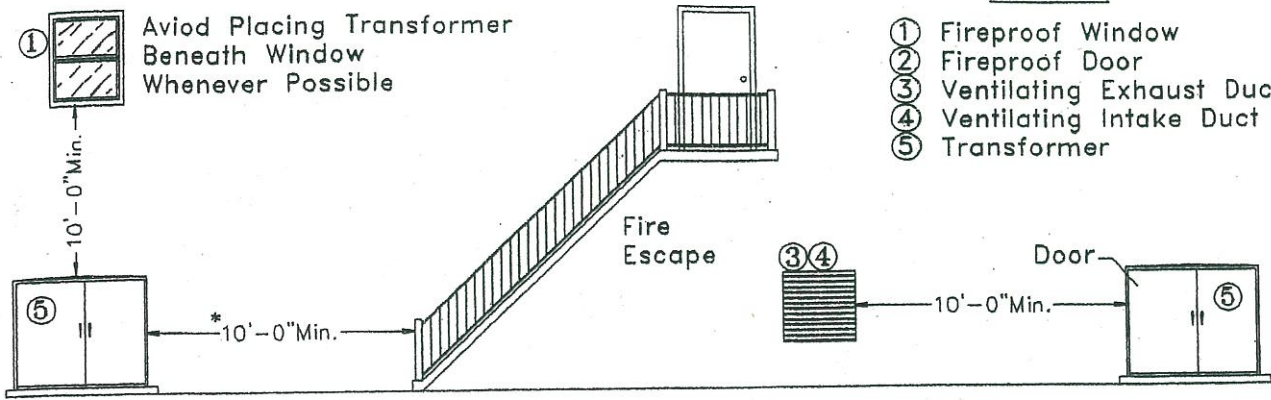
1. This standard provides recommended barrier protection for pad mounted equipment subject to vehicular traffic.
2. Posts may be omitted on side(s) not subject to vehicular traffic.
3. Barriers must not interfere with the operation of pad mount equipment by LILCO personnel.
4. A 3 1/2" heavy wall steel, concrete filled lally column purchased from local lumber yards is acceptable. Bearing plates must be removed. Set posts in concrete (see detail "A").
5. Install additional posts on sides or back as required to maintain maximum 48" spacing.
6. If spacing between front posts is greater than 48", install two 3/8" galvanized chains of sufficient length to be welded to outer posts and reach a link or eye welded to center post. Chain will be locked with LILCO supplied padlock.

3 & PAD & SIR TRANSFORMERS

DRAWN BY <i>ETK</i> APPROVED <i>[Signature]</i> DATE <i>8-18-75</i> LONG ISLAND LIGHTING COMPANY	REVISION <i>3</i> 4.09/25/90:CHGD.SHT. NOS. & TITLE	TITLE TRANSFORMER INSTALLATION AND HOUSING CONSTRUCTION PAD AND ENCLOSURE HOUSED PROTECTION FOR PAD MOUNT TRANSFORMER SUBJECT TO VEHICULAR TRAFFIC	CS			REVW DATE <i>09-90</i>
			NO	SHEET	REV	
			5369	1 of 1	4	

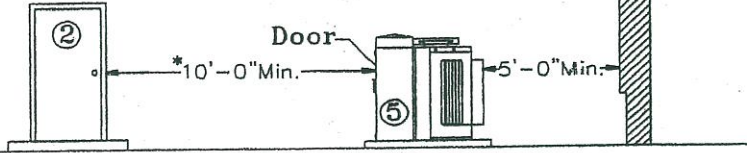
LEGEND

- ① Fireproof Window
- ② Fireproof Door
- ③ Ventilating Exhaust Duct
- ④ Ventilating Intake Duct
- ⑤ Transformer



* If This Is An Exit of A Public Assembly Room Such As An Auditorium, Change to 25 Feet.

If This Is A Non-Fireproof Opening Change To 25 Feet.



NOTES:

1. THE PRECEDING ARE MINIMUM CLEARANCES BETWEEN THE TRANSFORMER AND WINDOWS, DOORS, FIRE ESCAPES, ENTRANCES AND VENTILATING DUCTS.
2. PLACE TRANSFORMER SO THAT DOOR FACES AWAY FROM WALLS, FENCES, OR OTHER FIXED STRUCTURES. ACCESS REQUIRED FOR OPERATING LBTs WITH 8 FOOT HOT STICK HELD HORIZONTALLY.
3. NO BUSHES, TREES, OR OTHER OBSTRUCTIONS SHALL BE PLANTED OR INSTALLED IN FRONT OF TRANSFORMER DOORS.
4. NO OPENINGS IN BUILDINGS OR STRUCTURE WILL BE PERMITTED WITHIN 10 FEET OF TRANSFORMER. BUILDING MATERIAL, INCLUDING DOOR AND WINDOWS LESS THAN 25 FEET FROM TRANSFORMER SHALL BE FIREPROOF IN ACCORDANCE WITH NATIONAL FIRE CODE.
5. CLASS 1, DIVISION 1 and 2 LOCATIONS SHALL REQUIRE A MINIMUM OF 25 FEET CLEARANCE (e.g. PROPANE TANKS, GAS PUMPS, ETC. OR ANY PLACE WHERE VOLATILE LIQUID/GAS TRANSFER FILLING OCCURS)
[SEE NEC ARTICLES 500-5(a)(3) and 450-27]

REFERENCE DRAWINGS

- CS 3960 1Ø PADMOUNT TRANSFORMER 25-167kVA
- CS 5315 3Ø 13kV-4kV 1500kVA STEP-DOWN TRANSFORMER
- CS 5322 500 and 1000kVA NETWORK TRANSFORMERS
- CS 5325 1500 and 2000kVA NETWORK TRANSFORMERS
- CS 5362 3Ø 4kV OR 13kV 75-1500kVA "DEAD FRONT" TRANSFORMER

3Ø PAD & SUB TRANSFORMERS

APPROVED BY <i>[Signature]</i>	REVISION B. 03/01: KEYSpan FORMAT.
DATE 5-9-04	
LONG ISLAND POWER AUTHORITY prepared by KEYSpan ENERGY	

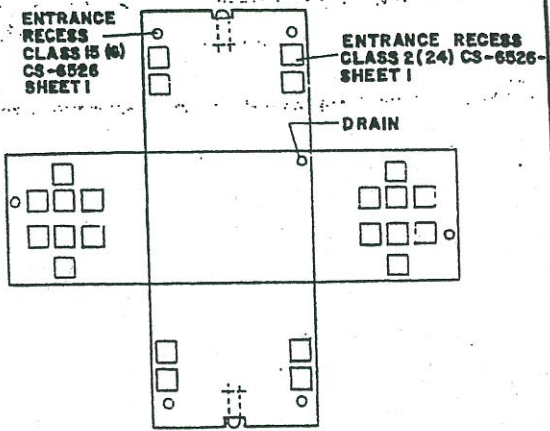
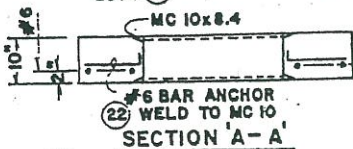
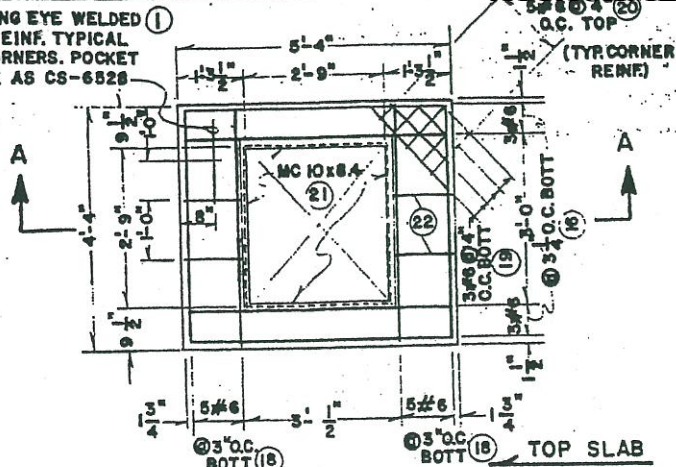
TRANSFORMER INSTALLATION AND HOUSING
CONSTRUCTION: PAD AND ENCLOSURE HOUSED

TRANSFORMER PAD LOCATION
ADJACENT TO BUILDINGS

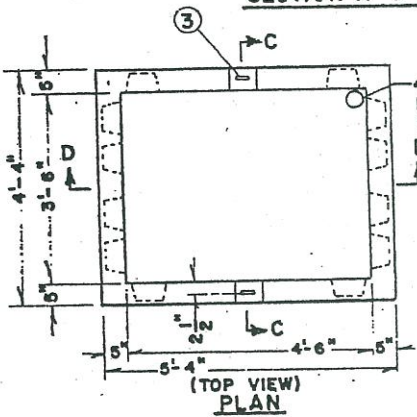
CONSTRUCTION STANDARD DRAWN BY ETK		
NUMBER	SHEET NO	REV
5370	1 of 1	8

ATTACHMENT 16000-1

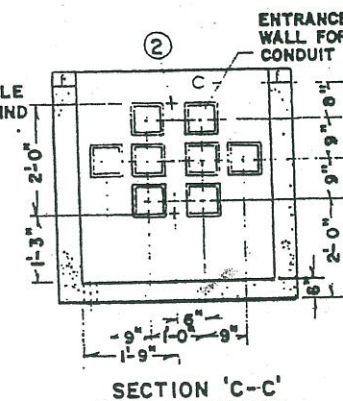
LIFTING EYE WELDED TO REINF. TYPICAL 4 CORNERS. POCKET SAME AS CS-6528



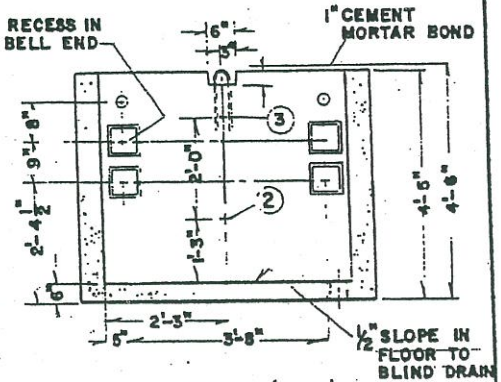
EXPLODED VIEW



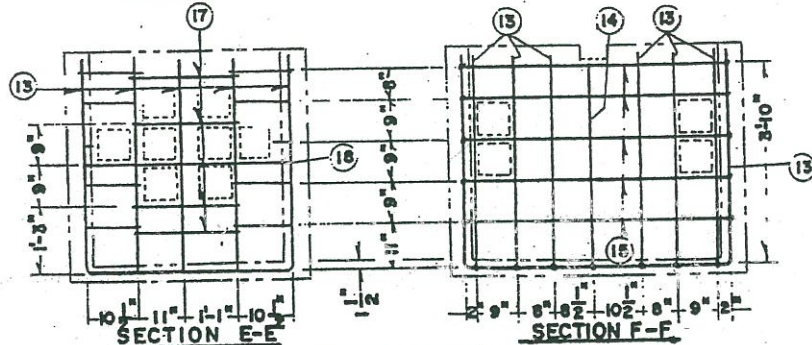
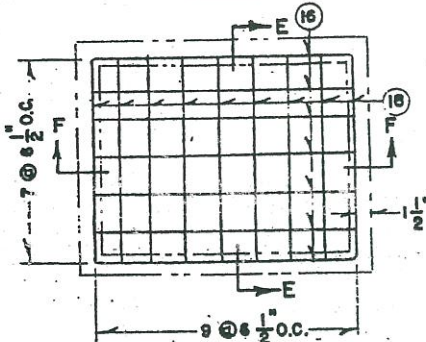
PLAN-REINFORCEMENT



SECTION C-C



SECTION D-D



SPECIFICATIONS

- (INSTALLATION) GROUT LIFTING SLOTS AND HOLES AT INSTALLATION
- (MATERIAL) ALL REINFORCEMENT BARS SHALL BE DEFORMED AND SHALL CONFORM TO A.S.T.M. SPEC. DES. A-615 GRADE 40
- ALL STRUCTURAL STEEL SHALL CONFORM TO A.S.T.M. SPEC A-36
- CONCRETE SHALL CONFORM TO ASTM SPEC C.94 & LILCO SPEC ME-43
- (WEIGHT OF STEEL) WALLS & FLOOR - 260 LBS
- ROOF..... 256 LBS
- (WEIGHT OF BOX) Less Frame And Cover
- WALLS & FLOOR 5,800 LBS
- ROOF..... 2,100 LBS

NOTE-BARS IN SIDE WALLS WILL EXTEND INTO BOTTOM SLAB 1'-6"

- REFERENCE DRAWINGS
- CS-6502 CAST IRON COVER
 - CS-6512 CAST IRON FRAME
 - CS-6570 LIFTING AND PULLING EYES
 - CS-6528 RECESSES, KNOCKOUTS AND LIFTING HOLES
 - CS-6564 STEEL FRAME FOR 4'-6" MANHOLES
 - PT-14-03-002

M&S NO. 131008

SEE REVERSE SIDE FOR BILL OF MATERIAL

DRAWN BY: ETK	REVISION
APPROVED	6. 2/17/72-REDRAWN
	7. 5/8/75-ADD:REF.DWG.
	8. 06/93-REACTIVATE CS
DATE: 2/17/72	
LONG ISLAND LIGHTING COMPANY	

TITLE

MANHOLES AND BOXES
TYPE TS DISTRIBUTION BOX
4'-6" x 3'-6" x 4'-0"
PRECAST CONCRETE
FOR H-20 ROADWAY LOADS

NO	CS		REV	DATE
	SHEET	REV		
6533	1 OF 1	8		06-93

LILCO MANHOLE CS

BILL OF MATERIAL

ITEM NO.	DESCRIPTION	QUAN-TITY	M & S CODE
1.	Lifting Eyes - CS-6570 Item 7	2 0 2	
2.	3/8" Inserts		
3.	Lifting Eyes - CS-6570 Item 8		

REINFORCEMENT SCHEDULE

	LOCATION	QUAN.	LENGTH	BAR SIZE	SHAPE
13	Side Walls & Floor	22	5'-6"	#4	
14	Side Walls & Floor	2	5'-3"	#4	
15	Side Walls	10	6'-9"	#4	
16	Floor & Roof	13	5'-1"	#6	
17	End Walls	8	2'-2"	#4	Straight
18	Floor & Roof	20	4'-1"	#6	Straight
19	Roof	12	*	#6	Straight
20	Roof	20	*	#6	Straight
21	Roof	4	2'-9"	10x8.4	Straight
22	Roof	4	1'-3	#6	Channel

* As Required

SECTION 16051

ELECTRIC MOTORS

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

The plans and specifications of this project are performance-based documents and hence motor sizes are not exact to certain portions of the process. Regardless of size or use, all electric motors must conform to the minimum requirements of this section unless the Supplier can demonstrate non-applicability due to specific environmental or torque requirements.

Motors furnished under other sections of these specifications shall be in conformance with the requirements listed in this section unless otherwise noted.

All materials. Products and equipment shall be UL listed.

Motors specified herein are three-phase, squirrel cage induction type for 1/2 horsepower and above; single phase for less than 1/2 horsepower; or direct current (DC) motors.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 16000 Basic Electrical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

UNDERWRITERS LABORATORIES, INC. (UL)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

1.2 SUBMITTALS

The Subcontractor shall submit five copies of the following to the Contractor.

- A. Motor data for approval shall include complete nameplate data and test characteristics in accordance with NEMA Standard MG1-12.54 "Report of Test Form for Routine Tests on Induction Motors" and, in addition, the following for motors typical of the units furnished:

1. Efficiency at 1/2, 3/4 and full load
2. Power factor at 1/2, 3/4 and full load
3. Motor outline, dimensions and weight
4. Descriptive bulletins, including full description of insulation system
5. Bearing design data
6. Special features (i.e., space heaters, temperature detectors, etc.)
7. For variable speed motor provide speed range.

1.3 SHIPPING, HANDLING AND DELIVERY

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material within shipping containers and on the carrier.
- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.
- C. Components shall be stored off of the ground; shall be protected from weather elements; and be in compliance with all manufacturer storage requirements to avoid warranty issues.
- D. All equipment requiring placement within the Groundwater Treatment Plant (GWTP) building prior to the building shell construction shall be appropriately scheduled by the Subcontractor.
- E. Machinery used to place equipment on the GWTP building shall not cause stress on the floor above the allowable maximum.

PART 2. PRODUCTS

2.1 RATING

- A. Motors shall be suitable for across the line starting at full voltage and 80% rated voltage. They shall also satisfy the speed-torque requirements of the driven equipment over their entire starting and operating range.
- B. The motor shall not be required to deliver more than its rated nameplate horsepower, at unity (1.0) service factor, under any condition of mechanical or hydraulic loading.
- C. All motors shall be continuous time rated suitable for operation in a 40 degrees C ambient environment unless noted otherwise.
- D. Specific motor data such as horsepower (Hp), revolutions per minute (RPM), enclosure type, etc., is specified under the detailed specification for the mechanical equipment with which the motor is supplied.

2.2 NAMEPLATES

The motor manufacturer's nameplates shall be engraved or embossed on stainless steel and fastened to the motor frame with stainless steel screws or drive pins. Nameplates shall indicate clearly all of the items of information enumerated in NEMA Standard MGI-10.38 or MGI-20.60, as applicable.

2.3 CONDENSATION HEATERS

- A. Condensation heaters, where specified under the detailed specification for the mechanical equipment with motor, shall conform to the following:
 - 1. Heaters shall be of the cartridge or flexible wrap around type installed within the motor enclosure adjacent to core iron. Heaters shall be rated for 120 V, single phase with wattage as required. The heater wattage and voltage shall be embossed on the motor nameplate. Power leads for heaters shall be brought out to a separate conduit box.

2.4 SINGLE PHASE MOTORS

- A. Unless otherwise specified, motors smaller than 1/2 horsepower shall be single phase, capacitor start. Small fan motors may be split-phase or shaded pole type if such are standard for the equipment. Wound rotor or commutator type single-phase motors are not acceptable unless their specific characteristics are necessary for the application.
- B. Motors shall be rated for operation at 115 volts, single phase, 60 Hz.
- C. Locked rotor current shall be greater than specified in NEMA Standard MGI-12.32, Design "N".
- D. Motors shall be totally enclosed in conformance with NEMA Standard MGI-10.35. Small fan motors may be open type if suitably protected from moisture, dripping water, and lint accumulation.
- E. Motors shall be provided with sealed ball bearings lubricated for 10 years normal use.
- F. Motor shall be explosion proof in Class I, electrical area classification.

2.5 THREE PHASE MOTORS-FRAMES

- A. Unless otherwise specified, motors 1/2 horsepower and larger shall be 3-phase, squirrel cage induction type.
- B. All motors 3/4 HP and larger shall be a NEMA frame 143T or larger. 1/2 horsepower motors, and 3/4 horsepower motors rated 1800 and 3600 rpm, shall be a 56 frame. Motors shall be designed and connected for operation on a 460 volt, 3 phase, 60 hertz altering current system. Dual voltage (230/460) rated motors are acceptable.
- C. Unless otherwise required by the load, all motors shall be NEMA Design B, normal starting torque. Locked rotor kilovolt-amperes/ horsepower (KVA/HP) shall not exceed Code Letter G as described in NEMA Standard MG1-10.37 for motors 20 HP and larger.
- D. Anti-friction motor bearings shall be designed to be regreasable and initially shall be filled with grease suitable to ambient temperature of 40 degrees C. Bearings shall be AFBMA Types BC or

RN, heavy duty, or shall otherwise be shown to be suitable for the intended application in terms of B-10 rating life, Class M3 or better.

- E. All grease lubricated bearings, except those specified to be factory sealed and lubricated, shall be fitted with easily accessible grease supply, flush, drain and relief fittings. Extension tubes shall be used when necessary. Grease supply fittings shall be standard hydraulic type as manufactured by the Alemite Division of the Stewart-Warner Corporation or Contractor approved equal.
- F. Insulation systems shall be Class F, operated at Class B temperature rise and shall be manufacturer's premium grade, resistant to attack by moisture, acids, alkalis, and mechanical or thermal shock.
- G. Motors for outdoor service shall have vacuum/pressure impregnate epoxy insulation for moisture resistance.
- H. Motors shall have a steel or cast iron frame and cast iron or stamped steel conduit box, as specified below. Conduit box shall be split from top to bottom and shall be capable of being rotated to four positions. Synthetic rubber-like gaskets shall be provided between the frame and the conduit box and between the conduit box and its cover. Motor leads shall be sealed with a non-wicking, non-hygroscopic insulating material. A frame-mounted pad with drilled and tapped hole, not less than 1/4-in diameter, shall be provided inside the conduit box for motor frame grounding. Motors specified throughout this Specification shall conform to one of the following standard enclosure designs:
 1. Open drip-proof: Manufacturer's standard design with steel or cast iron frame, cast iron end brackets, stamped steel conduit box and 1.15 service factor at 40 degrees C.
 2. Totally enclosed fan cooled (TEFC): TEFC motors shall have a steel or cast iron frame, cast iron end brackets, cast iron conduit box, 1.15 service factor at 40 degrees C, tapped drain holes (corrosion resistant plugs for frames 286T and smaller and automatic breather/drain devices for frames 324T and larger) and upgraded insulation by additional dips and bakes to increase moisture resistance.
 3. Totally enclosed non-ventilated (TENV): TENV motors shall include the same rating and accessories as specified for TEFC motors.
 4. Explosion proof motor shall have a cast iron frame, cast iron end brackets, cast iron conduit box, 1.15 service factor at 40 degrees C, tapped drain holes (corrosion resistant plugs for frames 286T and smaller and automatic breather/drain devices for frames 324T and larger) and be UL listed for Class 1, Division 1, Group D hazardous areas.
 5. Severe duty: Motors shall be of the corrosion resistant type conforming to motors designed by the manufacturer as "Corro-Duty", "Mill and Chemical", "Custom Severe Duty", or similar quality designation. Severe duty motors shall have a cast iron frame, cast iron end brackets, cast iron conduit box and 1.15 service factor at 40 degrees C and tapped drain holes (corrosion resistant plug for frames 286T and smaller and automatic breather/drain devices for frames 324T and larger).
- I. Three phase motors rated 1 hp and larger shall be of the high efficiency type. Minimum efficiencies for motors shall be 85%.
- J. Variable speed drive motors shall have Inverter Grade Insulation and shall comply with NEMA MG-1, Part 31 'Specification for Inverter Duty Application'.

- K. Submersible motor shall be of water-lubricated design and meet NEMA standard for submerged condition. Motor shall have 1.15 minimum service factor. Motor leads and power cable from pump to the extraction well junction box, shall be furnished by the well pump manufacturer. Power cable shall be flat-jacketed cable with Tefzel insulation (santoprene) type or Contractor approved equal.
- L. Fans shall be of non-sparking, corrosion resistant material.

2.6 QUALITY ASSURANCE

Routine tests shall be performed on representative motors, and shall include the information described in NEMA MG1-12.54 "Report of Test Form for Routine Tests on Induction Motor". Efficiency shall be determined in accordance with IEEE Publication No. 112, Method B. Power factor shall be measured on representative motors.

PART 3. EXECUTION

Not used.

** END OF SECTION **

SECTION 16470

LIGHTING

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Specifications and Drawings.

All materials, products, and equipment provided shall be UL listed.

The work includes supply, erection, complete installation and testing of the following:

- A. Interior Building Lights
- B. Exterior Building Lights

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 16000 Basic Electrical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

NATIONAL FIRE PROECTION ASSOICATION (NFPA)

NFPA-70 National Electrical Code

UNDERWRITERS LABORATORIES (UL)

1.2 SUBMITTALS

Subcontractor shall submit five copies of shop drawings showing outline and overall dimensions, connection details, weights, anchorage details, and parts lists if applicable, for all equipment and materials furnished under this section. Shop drawings shall include overall dimensions and details of the location of all connections, supports and accessories and a bill of material.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material within shipping containers and on the carrier.

- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.
- C. Components shall be stored off of the ground; shall be protected from weather elements; and be in compliance with all manufacturer storage requirements to avoid warranty issues.

PART 2. PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. The lighting equipment includes interior and exterior area lighting, emergency lighting and exit lights for the building. Control Room, Lavatory and Mechanical Room interior lighting shall be controlled and used on an as required basis. Interior process area lighting shall be controlled by their switches as shown on drawing. The exterior light shall be controlled by a photoelectric eye that turns the light on at dusk and off at sunrise. The lights shall operate on 120 VAC electrical service.
- B. In general, high-pressure sodium (HPS) lighting fixture shall be used for process area lighting and fluorescent lighting fixture shall be used for the Control Room, Lavatory and Mechanical Room.
- C. The layout of lighting fixtures shall give a calculated average intensity as follows:

Enclosed process area	30 foot-candles
Control room	80 foot-candles
Lavatory	80 foot-candles
Mechanical Room	50 foot-candles

2.2 EQUIPMENT

- A. HPS fixtures shall be compact and lightweight. Ballast housing and mounting shall be cast copper-free aluminum construction with epoxy powder finish for corrosion resistance. Exterior hardware shall be stainless steel. Fixture shall be UL listed for the damp location. Provide fixture with globe/guard and dome reflector.
- B. Fluorescent lighting fixture shall be premium specification grade troffer with full static door.
- C. Exit lighting fixture shall include a solid state charging circuit, batteries, relays, and both normal alternating current (AC) and direct current (DC) emergency lamps all packaged in a single steel, aluminum or plastic housing and shall be suitable for surface, ceiling or end mounting and contain a prismatic down-lens. Face shall be white stencil with red letter and universal snap-out directional arrows.
- D. Emergency lighting unit shall include solid-state charging circuit, batteries, relays and two 25-watt, sealed-beam lamp-heads, all neatly packaged in a single unit suitable for wall mounting. Battery shall be sealed, maintenance free, rechargeable type with capacity to supply 100 Watt for

1 1/2 hours at rated voltage. A test switch shall be provided to simulate a power failure condition. Provide lamps to indicate AC on and recharging.

- E. Subcontractor shall provide brackets, supports, anchors, frames fast starters and ballast required for a complete, operable system.
- F. Subcontractor shall provide all rapid start, cool white fluorescent lamps for fluorescent fixture.
- G. All lighting materials shall conform to the requirements of the NBFU and shall have appropriate Underwriters' Laboratories (UL) acceptance.
- H. Subcontractor shall provide high-pressure sodium wall-mounted lighting fixture to be installed outside the building as shown on the drawings. Lights shall operate on 120 VAC.
- I. Outdoor light shall be automatically controlled by an incandescent motion sensor, so that the light is motion activated during the night time period.
- J. Exterior light shall be waterproof and suitable for extreme weather service.
- K. Each basic fluorescent fixture shall be equipped with the necessary number and type of ballast to operate only the lamps with the particular basic unit. Single lamp fixtures shall contain single lamp ballast; two lamp fixtures shall contain one two-lamp ballast.
- L. Ballast protectors shall be of the thermally actuated automatic-reset built-in type.

2.3 REQUIREMENTS

- A. All materials and equipment shall be suitably grounded and conform with NEC Standards.
- B. Light fixtures and accessories shall be painted, galvanized, white metal, or treated to ensure a service life of ten years.
- C. Subcontractor shall provide materials and accessories, whether or not specifically described of best grade of commercial manufacturer.

PART 3. EXECUTION

3.1 ERECTION/INSTALLATION

- A. Lighting fixtures shall be installed and or erected in accordance with the requirements of the Contract Documents and the manufacturer's instructions and recommendations. Building lighting fixtures shall be arranged as shown on the Contract Drawings.
- B. All work shall be performed by competent, trained workmen, skilled in the field to which they are executing the work.
- C. All work shall conform to the NEC Standards.
- D. The furnishing and installation of the lighting fixtures or lighting equipment must be executed in a manner that will insure completion coincident with the completion of the construction of the project unless otherwise required by the Contract Document.

- E. Lighting fixture installation shall be level, plumb and square; and fastened rigidly in place.
- F. Wiring between fluorescent lamp holder and associated operating and starting equipment shall be of sizes not smaller than the leads furnished with the approved types of ballast and shall have equal or better insulating and heat resisting characteristics. All other wiring within fluorescent lighting fixtures or from the fixture to the splice with the building wiring shall conform to the requirements of the latest issue of the NEC, and shall not be less than No. 12 gauge. Wiring shall be protected with tape or tubing at all points where abrasion is liable to occur. Wiring shall be concealed within fixture construction, except where the fixture design or mounting dictates otherwise.
- G. Suspended fixtures shall be provided with swivel hangers in order to ensure a plumb installation. Pendant rods or chains 4 feet or longer excluding fixture shall be braced to limit swinging. Bracing shall be 3 directional and 120 degrees apart. Single unit suspended fluorescent fixtures shall have twin stem hangers. Multiple unit or continuous row fluorescent units shall have a tubing or stem for wiring at one point, and a tubing or rod suspension provided for each length of chassis including one at each end.
- H. Ceiling fixtures shall be coordinated with and suitable for installation in, or on from the suspended ceiling provided by other. Installation and support of fixture shall be in accordance with NEC and manufacturer's recommendations.
- I. Lamps of the type, wattage, and voltage rating indicated shall be delivered to the project in the original cartons and installed in the fixtures just prior to the completion of the project.
- J. All outdoor lighting shall be wired in series with the corresponding incandescent motion sensor.

3.2 TESTING AND INSPECTIONS

- A. After installation, the Subcontractor shall check each unit to determine that there are no broken lenses or burned-out bulbs. Broken lenses and bad bulbs shall be replaced by the Subcontractor at no additional expense to the Contractor.
- B. Subcontractor shall operate each lighting fixture from a switch or breaker, to determine if the fixture is working and identify the circuit breaker in the lighting panel feeding the fixture.
- C. For emergency lighting unit, the test switch on each unit shall be depressed to simulate a power failure. The Subcontractor shall observe that each lamp head is illuminated, and mark the circuit directory at lighting panel supplying these circuits "Do Not Turn Off", and install clips on circuit breaker operating handles to ensure breakers are maintained in "ON" position.
- D. The Subcontractor shall operate the test switch of exit lights units with self contained emergency supply to determine if emergency lamps will operate in the event of failure of normal power to the assembly.

* * * * END OF SECTION * * * *

SECTION 16480

MOTOR CONTROL CENTER

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Specifications and Drawings.

Furnish the Motor Control Center (MCC), known as "MCC-1," and variable speed drive units mounted inside the MCC in accordance with this specification and the single line diagram (Drawing Nos. E-2 and E-3).

All materials, products, and equipment shall be UL listed.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 16000 Basic Electrical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

Z55.1 Gray Finishes for Industrial Apparatus and Equipment (No. 24 Dark Gray and No. 61 Light Gray).

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- AB-1 Molded Case Circuit Breakers
- ICS-1 General Standard for Industrial Controls and Systems
- ICS-2 Standards for Industrial Control Devices, Controllers
- ICS-4 Terminal Blocks for Industrial Control Equipment
- ICS-6 Enclosures for Industrial Controls and Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

70 National Electrical Code

UNDERWRITERS LABORATORY INC. (UL)

44	Standard for Rubber-Insulated Wires and Cables
489	Molded-Case Circuit Breakers and Circuit-Breaker Enclosures
508	Electric Industrial Control Equipment
845	Electric Motor Control Centers

1.2 SUBMITTALS

The Subcontractor shall submit five copies of the following to the Contractor:

- A. Shop Drawings - Shop drawings shall be stamped with the date checked and a statement indicating that the shop drawings conform to the specifications and drawings.
- B. Operation and Maintenance Manuals - The manuals shall be prepared specifically for this installation and shall include catalog data sheets, drawings, equipment lists, descriptions, parts lists, etc., to instruct operating and maintenance personnel unfamiliar with such equipment.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material within shipping containers and on the carrier.
- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.
- C. Components shall be stored off of the ground; shall be protected from weather elements; and be in compliance with all manufacturer storage requirements to avoid warranty issues.
- D. All equipment, requiring placement within the Groundwater Treatment Plant (GWTP) building prior to the building shell construction, shall be appropriately scheduled by the Subcontractor and coordinated with the Contractor.
- E. Machinery used to place equipment within the GWTP Building shall not cause stress on the floor above the allowable maximum.

PART 2. PRODUCTS

The MCC vertical sections and units shall be UL listed.

2.1 SERVICE

The MCC shall be suitable for operation on a 480/277-volt, three-phase, four wire, 60 Hertz system.

2.2 INCOMING LINE

- A. The incoming line cables shall be bottom entry. All cables will be copper and will be terminated on the main lugs or main circuit breaker as indicated on the one line diagram.
- B. Main circuit breaker shall be molded case, thermal magnetic type breaker and shall be 100 % rated to carry continuously nameplate current. Main breaker shall be UL classified as suitable for service entrance.

2.3 WIRING

The MCC wiring shall be NEMA Class 1, Type B.

2.4 STRUCTURE

- A. Structures shall be totally enclosed, dead front, free standing assemblies, 90 inches high and not less than 20 inches deep. Working height shall be 72 inches to accommodate starter units in multiples of 6-inch increments with a minimum of 12 inches. Removable lifting angles will be provided.
- B. Structures shall contain a horizontal wire way at the top, isolated from horizontal bus and readily accessible. Each structure shall contain an isolated vertical wire way with cable supports, accessible through hinged doors and a horizontal wire way at the bottom.
- C. All structure doors to be mounted on removable pin hinges and secured with quarter turn indicating type fasteners.
- D. Structure enclosure shall be NEMA 1, gasketed.
- E. Structure will be 'L' shape, as shown on Drawing No. E-5.

2.5 BUS SYSTEM

- A. Bus shall be braced to withstand a fault of minimum 22,000 root mean square (RMS) symmetrical amperes. Bus shall be tin plated copper.
- B. Main horizontal bus continuous ampere rating shall be as indicated on contract drawings and be effectively isolated from all wire ways and working areas.
- C. Vertical bus rating is to be a minimum of 300 amperes
- D. Full height of vertical bus bars to be protected against accidental contact by a single sheet of glass reinforced polyester with cutouts for stab openings.
- E. A horizontal copper ground bus shall be provided full width at the bottom of the MCC line-up. Ground bus shall be drilled and compression type, two-hole lugs furnished to accept a 4/0 AWG bare copper ground cable to be terminated at each end of bus.
- F. MCC shall be designed to permit future additions, changes, or regrouping of units by the Contractor. Provisions shall be included for the future addition of vertical sections on both ends of the MCC.

- G. All space not presently used or indicated as spare, shall be furnished with all necessary bussing and stabs for insertion of combination starter or feeder units at a later date. Removable blank doors shall be provided.

2.6 UNIT COMPARTMENTS

- A. Each unit compartment shall be provided with an individual front door. Starter and feeder tap unit doors shall be interlocked mechanically with the unit disconnect device to prevent unintentional opening of the door while energized and unintentional application of power while the door is open. An interlock between the unit disconnect device and the structure will prevent removal or reinsertion of a unit when the disconnect switch is in the 'ON' position. Means shall be provided for releasing the interlock for intentional access and/or application of power.
- B. Padlocking arrangements shall permit locking the disconnect device OFF with the door closed or open.
- C. Means shall be provided to top padlock the unit in a partially withdrawn position (test) with the stabs free of the vertical bus.
- D. All full voltage starter units through NEMA size 5 shall be of the draw out type. Draw out provisions shall include a positive guide rail system and stab shrouds to absolutely ensure alignment of stabs with the vertical bus. Power wiring to stabs shall be contained within the draw out unit.
- E. All draw out units shall be secured by a spring-loaded, quarter turn indicating type, fastening device, located at the top front of the unit.
- F. Combination motor controller and feeder tap units shall employ molded case circuit breakers. Circuit breaker disconnects for combination motor starters shall be thermal magnetic or magnetic only type.
- G. Motor overload relay shall be 3-pole, thermal bi-metallic type with push-to-test feature. Overload relays for submersible pump motor shall be ambient compensated, quick trip, class 10. Overload relay shall be capable of being reset from outside the enclosure by means of an insulated button. Overload heater elements, based on the motor full load amperage (FLA), shall be supplied with the starter. Solid-state adjustable overload relays are acceptable.
- H. Two 150 Amp frame circuit breakers shall fit the same size compartment as a Size 1 combination starter such that the plug-in units are interchangeable.
- I. Control power shall be provided as follows: Individual 480-120V control power transformers with two primary fuses and one secondary control fuse. The other secondary lead shall be grounded.
- J. Starter units shall contain auxiliary contacts, unit mounted hand-off auto selector switch and indicating lights, control relays, overload heaters and other devices as shown on contract drawing. Starters shall have 120 V operating coils.

2.7. VARIABLE SPEED DRIVE

- A. Variable speed drives (VSDs) shall be adjustable frequency, pulse width modulated (PWM) inverter type, designed for use with standard induction motors up to 100 horse power (Hp). Controller shall be suitable for constant or variable torque as required for the load application. Variable speed drive shall be mounted inside the MCC enclosure.
- B. Provide a 120 V control power transformer for operation of VSD control circuitry.
- C. Minimum Drive Efficiency: 95 percent or better at motor base speed and rated torque.
- D. Displacement Power Factor: 0.95 or better at any speed, measured at drive input terminals.
- E. Drive Output: 100 percent rated current continuous, suitable for operation of the driven equipment over a 20:1 speed range overloading or slow speed clogging. Drive shall be capable of a continuous overload up to 110 percent rated current and a maximum 150 percent overload for one minute.
- F. Voltage Regulation: plus or minus 1 percent of rated value, no load to full load.
- G. Output Frequency Drift: no more than plus or minus 0.5 percent from set-point.
- H. Drive shall withstand five cycle transient voltage dips of up to 15 percent of rated voltage without an under-voltage trip or fault shutdown.
- I. VSD shall limit harmonic distortion reflected in power system to voltage and current level defined in IEEE 519 for general system application.

2.8 VSD CONTROLLER FAULTS

- A. Controller shall be protected against following faults:
 - 1. Short circuit at controller output
 - 2. Ground fault at controller output
 - 3. Input under-voltage
 - 4. Direct current (DC) bus over-voltage
 - 5. Loss of input phase
 - 6. Transient surge or over-current
 - 7. Instantaneous overload
 - 8. Over-temperature

2.9 VSD CONTROLLER MONITORING

- A. The controller shall monitor and indicate the following conditions:
 - 1. Under-voltage
 - 2. Over-voltage
 - 3. Ground Fault

4. Instantaneous Over-current
5. Over-temperature
6. Drive Enabled
7. Motor Fault

2.10 VSD CIRCUIT BREAKER

Provide a circuit breaker type main disconnect switch with an external operating handle. The disconnect switch shall have a provision to padlock in the off position.

2.11 VSD AUXILIARY ITEMS

- A. The following auxiliary items shall be mounted on the MCC compartment door:
 1. Manual/Automatic selector switch
 2. Start/Stop pushbuttons
 3. Potentiometer for speed control
 4. Speed Indicator
- B. Solid state operator interface module mounted on the door is acceptable in lieu of above hard-wired devices.

2.12 VSD CONTROL INTERFACE

- A. In the 'Manual' mode, control shall be from the panel-mounted devices. In the 'Automatic' mode, control shall be from input signals from a remote location.
- B. Make provisions to accept a remote dry contact closure to start and stop the drive with drive control system in the 'Automatic' mode.
- C. Make provision to accept a remote dry contact closure for permission to start drive.
- D. Make provision to accept a 4-20 mA DC input signal for remote speed control. Input shall be isolated at the drive and active with the drive control system in the 'Automatic' mode.
- E. Provide a 4-20 mA DC isolated, loop powered output signal, proportional to speed for remote speed indication.
- F. Provide one set of Form C auxiliary contact for remote indication of VSD running status.
- G. Provide one set of Form C auxiliary contact for remote indication of VSD fault status.
- H. Following an over or under-voltage trip, the drive shall automatically restart after a short time delay after the incoming line voltage is back within a specified range.
- I. Submersible well pump motors (RW-1 and RW-2) and VSD are separated by long distance (500 feet), a load reactor and low pass filter shall be provided, so that motor speed can be controlled.

2.13 NAMEPLATES

- A. Nameplates shall be satin finish white phenolic with black core and beveled edges, 1/16 inch thick; letters shall be at least 3/16 inch high. Nameplates shall be attached with corrosion resistant screws to each unit door.
- B. A master nameplate for the MCC shall be provided indicating designation; volts, phase, wires, frequency and main bus amperes; short circuit symmetrical ampere, bracing; name of manufacturer, model, type and serial number; date of manufacture.
- C. Nameplate engraving shall be as shown on single line diagram.

2.14 METERING

- A. Metering shall be provided as shown on single line diagram (Drawing No. E-2).
- B. Solid state meters are acceptable in lieu of analog indicating meters.

2.15 DATA AND INFORMATION

- A. Instruction Manuals (two sets).
- B. Certified construction drawings indicating final general arrangements, equipment ratings, bus and wiring connections.
- C. Field erection and installation procedures.
- D. Elementary control diagrams for each type of breaker, and starter.
- E. Equipment bill of material identifying all equipment ratings.
- F. MCC heat loss data.
- G. List of recommended spare parts for one year's operations.

2.16 SPARE PARTS

Supply manufacturer recommended spare parts for one year of plant operation.

PART 3. EXECUTION

3.1 INSTALLATION

- A. MCC floor sills shall be bolted directly to the equipment pad. Structure shall be leveled and plumb. Anchor bolts shall be ½-inch diameter.
- B. Install the equipment in accordance with the manufacturer's instructions.
- C. Remove temporary lifting angles, lugs and shipping braces. Touch-up damaged paint finishes.
- D. Make wiring interconnection between shipping splits.

- E. Install bus splice plates and torque connections.
- F. Field installed interior wiring shall be neatly grouped by circuit and bound by plastic tie wraps.

3.2 FIELD TESTING

- A. Megger incoming line terminals and buses, phase to phase and phase to ground after disconnecting devices sensitive to megger voltage.
- B. Check mechanical interlock for proper operation.
- C. Test ground connection for continuity and resistance
- D. Adjust motor circuit protectors and voltage trip devices to their correct settings.
- E. Install overload heaters or adjust relays for the actual motor nameplate current.

3.3 CLEANING

Remove all rubbish and debris from inside and around the MCC. Remove dirt or concrete spatter from the interior and exterior of the equipment using brushes, vacuum cleaner, or clean lint-free rags do not use compressed air.

* * * END OF SECTION * * *

SECTION 16721

FIRE DETECTION AND ALARM SYSTEM

PART 1. GENERAL

The Contractor is the Navy’s representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy’s representative or agent.

The Contractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Specifications and Drawings.

All electrical installation inside the process area (Blower Room) shall meet NEC Class I, Division 2, Group D area classification requirements.

Provide a complete fire detection and alarm system including microprocessor based control panel and all associated devices.

All materials, products, and equipment provided shall be UL listed.

In the publications listed below, references to the “authority having jurisdiction” shall mean the Atlantic Division, Naval Facilities Engineering Command Fire Protection Engineer.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 16000 Basic Electrical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

FACTORY MUTUAL (FM)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 70 National Electrical Code
- NFPA 72 Installation, Maintenance and Use of Protective Signaling Systems
- NFPA 90A Installation of Air Conditioning and Ventilating Systems

UNDERWRITERS LABORATORIES (UL)

- UL-04 Fire Protection Equipment Directory UL 6
- UL 38 Manually Actuated Signaling Boxes for Use with Fire-Protective Signaling Systems
- UL 228 Door Closers-Holders, with or without Integral Smoke Detectors

- UL 268 Smoke Detectors for Fire Protective Signaling Systems
- UL 464 Audible Signal Appliances
- UL 521 Heat Detectors for Fire Protective Signaling Systems
- UL 864 Control Units for Fire-Protective Signaling Systems

1.2 SUBMITTALS

A. The Subcontractor shall submit five copies of the following to the Contractor:

1. Spare Parts

Spare parts data for each different item of material and equipment specified, not later than 2 months prior to the date of beneficial occupancy. Data shall include a complete list of parts and supplies with the current unit prices and source of supply and a list of the parts recommended by the manufacturer to be replaced after one year of service.

2. Qualifications

Qualifications, with verification or license number, of the registered Fire Protection Engineer or a Registered Professional Engineer who has at least 4 years of current experience in the design of the fire protection and detection systems.

3. Drawings

Fire Alarm Reporting System

Detail drawings, signed by the Fire Protection Engineer, consisting of a complete list of equipment and material, including manufacturer’s descriptive and technical literature, catalog cuts, and installation instructions. Detail drawings shall also contain complete wiring and schematic diagrams for the equipment furnished, equipment layout, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit.

Detailed point-to-point wiring diagram signed by the Fire Protection Engineer, showing all points of connection. Diagram shall include connections between system devices, appliances, control panels, supervised devices, and all equipment that is activated or controlled by the panel.

4. Instructions

Fire Alarm Reporting System

Six copies of operating instructions outlining step-by-step procedures required for system startup, operation, and shutdown. The instructions shall include the manufacturer’s name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Six copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The instructions shall include conduit layout, equipment layout and simplified wiring, and control diagrams of the system as installed. Instructions shall be approved prior to training.

Test Procedures

Detailed test procedures, signed by the Fire Protection Engineer, for the fire detection and alarm system 60 days prior to performing system tests.

Testing

Test reports in booklet form showing all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall document all readings, test results and indicate the final position of controls.

5. Certificates

Equipment

Certified copies of current approvals or listings issued by UL, Factory Mutual (FM) or other nationally recognized testing laboratory, showing compliance with specified NFPA standards.

Installer

Evidence that the installer of the system is listed in UL-04 under Protection Signaling Services-Local, Auxiliary Remote Station Proprietary (UUJS).

The Atlantic Division, Naval Facilities Engineering Command Fire Protection Engineer will review and approve all submittals required by this section.

1.3 SHIPPING, DELIVERY, AND STORAGE

- A. In order to prevent damage during shipment, the supplier shall carefully pack and brace all material either within shipping containers or on the carrier.
- B. The supplier shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The supplier shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The supplier shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.
- C. Components shall be stored off of the ground and shall be protected from weather elements; and be in compliance with all manufacturer storage requirements to avoid warranty issues.
- D. All equipment, requiring placement within the Groundwater Treatment Plant prior to the building shell construction, shall be appropriately scheduled by the Subcontractor and coordinated with the Contractor.
- E. Machinery used to place equipment within the Ground Water Treatment Plant shall not cause stress on the floor above the allowable maximum.

PART 2. PRODUCTS

2.1 STANDARD PRODUCTS

- A. Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall be items that have been in satisfactory use for at least two years. Equipment shall be supported by a service organization that can provide service within 24 hours.

1. Nameplates

Major components of equipment shall have the manufacturer's name, address, type or style, voltage and current rating, and catalog number on a non-corrosive and non heat-sensitive plate, which is securely attached to the equipment.

2. Keys and Locks

Locks shall be keyed alike.

3. Tags

Tags with stamped identification number shall be furnished for keys and locks.

4. Compliance

The fire detection and internal alarm system and the central reporting system shall be configured in accordance with NFPA 72 and the New York State Building Code. The equipment furnished shall be compatible and be UL listed or FM approved or listed by a nationally recognized testing laboratory in accordance with the applicable NFPA standards.

5. Manufacturer's Services

Services of a manufacturer's representative who is experienced in the installation, adjustment, testing, and operation of the equipment specified shall be provided. The representative shall supervise the installation, adjustment, and testing of the equipment.

2.2 SYSTEM DESIGN

A. Operation

The fire alarm and detection system shall be a complete, supervised fire alarm system providing 100 percent coverage. The system shall be activated into the alarm mode by actuation of any alarm initiating device. The system shall remain in the alarm mode until the initiating device is reset and the fire alarm control panel is reset and restored to normal. Alarm initiating devices shall be connected to initiating device circuits (IDC), Style D, or to signal line circuits (SLC), in accordance with NFPA 72. Alarm indicating appliances shall be connected to indicating appliance circuits (IAC), in accordance with NFPA 72. A two-loop conduit system shall be provided so that if any one conduit and all conductors contained in that conduit are severed all IDC, IAC, or SLC on that circuit shall remain functional. All textual, audible, and visual appliances and systems shall comply with NFPA 72.

Addressable system shall be microcomputer (microprocessor or micro controller) based with a minimum word size of eight bits.

1. Sufficient memory shall be provided to perform as specified for an addressable system.
2. Individual identify of initiating and notification appliances shall be provided for the following conditions:
 - a) alarm
 - b) trouble
 - c) open
 - d) short

- e) appliances missing/failed
 - f) remote detector - sensitivity adjustment from the panel for smoke detectors
3. All initiating and notification appliances shall have the capability of individually being disabled or enabled from the panel.

B. Operational Features

The system shall have the following operating features:

1. Electrical supervision of alarm IDC, SLC and IAC as required. Smoke detectors shall have combined alarm initiating and power circuits.
2. Electrical supervision of the primary power alternating current (AC) supply, battery voltage, placement of alarm detector module (card, PC board) within the control panel, and transmitter tripping circuit integrity.
3. Trouble buzzer and trouble lamp (light emitting diode or neon light) to activate upon a single break, open, or ground fault condition, which prevents the required normal operation of the system. The trouble signal shall also operate upon loss of primary power AC supply, low battery voltage, removal of alarm detector module (card, PC board), and disconnection of the circuit used for transmitting alarm signals off-premises. A trouble alarm silence switch shall be provided which will silence the trouble buzzer, but will not extinguish the trouble indicator lamp. After the system returns to normal operating conditions, the trouble buzzer shall again sound until the silencing switch returns to normal position, unless automatic trouble reset is provided.
4. Transmitter disconnect switch to allow testing and maintenance of the system without activating the transmitter but shall provide a trouble signal when disconnected and a restoration signal when reconnected.
5. Evacuation alarm silencing switch or switches which, when activated, will silence alarm devices, but will not affect the detector indicating lamp nor the operation of the transmitter. This switch shall be over-ridden upon activation of a subsequent alarm from an unalarmed detector and the alarm devices will be activated.
6. Electrical supervision of circuits used for supervisory signal services. Supervision shall detect any open, short, or ground.
7. The alarm detector locations shall be determined by Subcontractor/designer and shown on a fire alarm riser diagram.

C. Alarm Functions

An alarm condition on a circuit shall automatically initiate the following functions:

1. Transmission of signals over the station fire reporting system.
2. Visual indications of the alarmed detectors on the fire alarm control panel annunciator.
3. Continuous sounding of alarm notification appliances throughout the building.
4. Deactivation of the all heating ventilation and air conditioning (HVAC) units in the alarmed detectors throughout the building.

5. Common trouble alarm (Dry Contact) to plant Programmable Logic Controller (PLC).

D. Primary Power

Operating power sourced from 208/120 VAC system shall be provided as required by paragraph 3.1 AC Power Supply for the System. Transfer from normal to emergency power or restoration from emergency to normal power shall be fully automatic and not cause transmission of a false alarm. Loss of AC power shall not prevent transmission of a signal via the fire reporting system upon operation of any initiating circuit.

E. Battery Backup Power

Battery backup power shall be through use of rechargeable, sealed-type storage batteries and battery charger.

F. Fire Alarm System 4-Detector (minimum) Panel

1. Provide a dedicated Alarm, Trouble, and Supervisory Detector for the Control Room.

G. Detection Device Type By Area

1. Heat Detectors: All areas shall be protected by heat detectors.
2. Smoke Detectors: In addition to the heat detectors, the following areas shall also be protected by smoke detectors.
 - a) Control Room, Lavatory and Mechanical Room.

2.3 CONTROL PANEL

- A. Control panel shall comply with all the applicable requirements of UL 864. Panel shall be modular, installed in a mounted steel cabinet with hinged door and cylinder lock. Control panel shall be a clean, uncluttered, and orderly assembled panel containing all components and equipment required to provide the specified operating and supervisory functions of the system. The panel shall have prominent rigid plastic, phenolic or metal identification plates for all lamps, detectors, controls, meters, fuses, and switches. Nameplates for fuses shall also include ampere rating. Separate alarm and trouble lamp shall be provided for each alarm detector located on exterior of cabinet door or be visible through the cabinet door. Control panel switches shall be within the locked cabinet. A suitable means shall be provided for testing the control panel visual indicating devices (meters or lamps). Meters and lamps shall be plainly visible when the cabinet door is closed. Signals shall be provided to indicate by any alarm detector, supervisory or trouble condition on the system. Each initiating circuit shall be powered and supervised so that a signal on one detector does not prevent the receipt of signals from other detectors. Loss of power, including any or all batteries, shall not require the reloading of a program. Upon restoration of power, startup shall be automatic, and shall not require any manual operation. The loss of primary power or the sequence of applying primary or emergency power shall not affect the transmission of alarm.
- B. Visual annunciators shall be provided for each active and spare detector. One spare detector shall be provided. Each lamp shall provide specific identification of the detector by means of a

permanently attached rigid plastic, phenolic or metal sign with either raised or engraved letters. Detector identification shall consist of a word description of the detector.

- C. Cabinets shall be provided with ample gutter space to allow proper clearance between the cabinet and live parts of the panel equipment.

- 1. Remote System Trouble Audible/Visual Appliance

Audible appliance shall have a minimum sound level output rating of 85 dBA at 10 feet and operate in conjunction with the panel's integral trouble signal. The audible device shall be silenced by the system trouble silence switch. A rigid plastic, phenolic or metal identification sign, which reads "Fire Alarm System Trouble", shall be provided at the audible appliance. The visual appliance located with the audible appliance shall not be extinguished until the trouble has been cleared.

- D. Circuit Connections

- E. Circuit conductors entering or leaving the panel shall be connected to screw-type terminals with each terminal marked for identification.

2.4 STORAGE BATTERIES

Storage batteries shall be provided and shall be the sealed, lead-calcium type requiring no additional water. The batteries shall have ample capacity, with primary power disconnected, to operate the fire alarm system for a period of 60 hours. Following this period of operation via batteries, the batteries shall have ample capacity to operate all components of the system, including all alarm signaling devices in the total alarm mode for a minimum period of 15 minutes. Batteries shall be sized to deliver 50 percent more ampere/hours based on a 60 hour discharged rate than required for the calculated capacities.

2.5 BATTERY CHARGER

Battery charger shall be completely automatic, with high/low charging rate, capable of restoring the batteries from full discharge to full charge within 12 hours. A separate ammeter shall be provided for indicating rate of charge. A separate voltmeter shall be provided to indicate the state of the battery charge. A pilot light indicating when batteries are manually placed on a high rate of charge shall be provided as part of the unit assembly if a high rate switch is provided. Charger shall be located in the control panel or battery cabinet.

2.6 MANUAL FIRE ALARM STATIONS

Manual fire alarm stations shall conform to the applicable requirements of UL 38. Manual stations shall be connected into alarm-initiating circuits. Stations shall be installed on mounted outlet boxes. Stations shall be double action type. Stations shall be finished in red, with raised letter operating instructions of contrasting color. Stations requiring the breaking of glass or plastic panels for operation are not acceptable. Stations employing glass rods are not acceptable. The use of a key or wrench shall be required to reset the station. Gravity or mercury switches are not acceptable. Switches and contacts shall be rated for the voltage and current upon which they operate. Stations shall have a separate screw terminal for each conductor. Surface mounted boxes shall be painted the same color as the fire alarm manual stations.

2.7 FIRE DETECTING DEVICES

- A. Fire detecting devices shall comply with the applicable requirements of NFPA 72, NFPA 90A, UL 268, and UL 521. Detector base shall have screw terminals for making connections. No solder connections will be allowed. Detectors shall be connected into alarm initiating circuits. Detectors located in concealed locations (above ceiling, etc.) shall have a remote visible indicator lamp. Installed devices shall conform to the classification of the area. Addressable fire detecting devices except flame detectors shall be dynamically supervised and uniquely identified in the control panel.

1. Heat Detectors

Heat detectors shall be designed for detection of fire by fixed temperature or combination fixed temperature and rate-of-rise principle. Heat detectors shall be rated for a minimum of 50 foot spacing (smooth-ceiling rated) in accordance with UL 521. Detectors located in areas subject to moisture, exterior atmospheric conditions or hazardous locations as defined by NFPA 70, shall be types approved for such locations.

2. Combination Fixed-Temperature and Rate-of-Rise Detectors

Detectors shall be designed for surface or semi-flush outlet box mounting and supported independently of wiring connections. Contacts shall be self-resetting after response to rate-of-rise principle. Under fixed temperature actuation, the detector shall have a permanent external indication, which is readily visible. Detector units located in boiler rooms, showers, or other areas subject to abnormal temperature changes shall operate on fixed temperature principle only.

3. Fixed Temperature Detectors

Detectors shall be designed for surface or semi-flush outlet box mounting and supported independently of wiring connections. Detectors are designed to detect high heat.

B. Smoke Detectors

Smoke detectors shall be designed for detection of abnormal smoke densities. Smoke detectors shall be ionization or photoelectric type. Detectors shall contain a visible indicator lamp that shows when the unit is in alarm condition. Detectors shall not be adversely affected by vibration or pressure. Detectors shall be the plug-in type in which the detector base contains terminals for making all wiring connections. Detectors that are in concealed (above false ceilings, etc.) locations shall have a remote visible indicator lamp.

1. Photoelectric Detectors

Detectors shall operate on a light scattering concept using a Light Emitting Diode (LED) light source. Failure of the LED shall not cause an alarm condition. Detectors shall be factory set for sensitivity and shall require no field adjustments of any kind.

2.8 NOTIFICATION APPLIANCES

- A. Audible appliances shall be heavy duty and conform to the applicable requirements of UL 464. Devices shall be connected into alarm indicating circuits. All devices shall have a separate screw terminal for each conductor.

1. Alarm Horns

Horns shall be surface mounted, with the matching mounting back box grill and vibrating type suitable for use in an electrically supervised circuit. Horns shall produce a minimum sound rating of at least 85 dBA at 10 feet. Horns used in exterior locations shall be specifically listed or approved for outdoor use and be provided with metal housing and protective grills.

2. Visual Notification Appliances

Visual notification appliances shall have high intensity optic lens and flash tubes. Strobes shall flash at approximately 1 flash per second and a minimum of 1 candela (8,000 peak candle power).

3. Combination Audible/Visual Notification Appliances

Combination audible/visual notification appliances shall provide the same requirements as individual units except they shall mount as a unit in standard back boxes. All units shall be factory assembled. Any other audible indicating appliance employed in the fire alarm systems shall be approved by the authority having jurisdiction.

4. Master Box

Master box shall have a weatherproof enclosure, and shall be suitable for surface mounting.

2.9 FIRE DETECTION AND ALARM SYSTEM PERIPHERAL EQUIPMENT

A. Conduit

Conduit in the process area shall be rigid galvanized steel (RGS) conduit or intermediate metallic conduit, (IMC). Electrical metallic tube (EMT) can be used in dry office and/or control room.

B. Wiring

Wiring for 120V AC power shall be No. 12 AWG minimum. Wiring for low voltage DC circuits shall be No. 14 AWG minimum. Power wiring (over 28 volts) and control wiring shall be isolated. All wiring shall conform to NFPA 70. System field wiring shall be solid copper and installed in metallic conduit or EMT, except rigid plastic conduit may be used under slab-on-grade. All conductors shall be color-coded. Conductors used for the same functions shall be similarly color-coded. Wiring code color shall remain uniform throughout the circuit. Pigtail or T-tap connections to alarm initiating, supervisory circuits, and alarm indicating circuits are prohibited. T-tapping using screw terminal blocks is allowed for addressable systems.

C. Special Tools and Spare Parts

Special tools necessary for the maintenance of the equipment shall be furnished. Two spare fuses of each type and size required and five spare lamps and LEDs of each type shall be furnished. Two percent of the total number of each different type of detector, but no less than two each, shall be furnished. Fuses and lamps shall be mounted in the fire alarm panel.

All equipment installed in the process and/or utility areas shall be suitable for damp location, NEMA 1 enclosure is not acceptable.

PART 3. EXECUTION

3.1 INSTALLATION

- A. All work shall be installed in accordance with the manufacturer's diagrams and recommendations, unless otherwise specified. Smoke detectors shall not be installed until the building has been thoroughly cleaned.

1. Power Supply for the System

A single dedicated branch-circuit connection for supplying power to the building fire alarm system shall be provided. Breaker shall be marked "FIRE ALARM CIRCUIT CONTROL" with a rigid plastic nameplate.

2. Wiring

Wiring for systems shall be installed in 3/4-inch minimum diameter conduit. Wiring for the fire alarm system shall not be installed in conduits, junction boxes, or outlet boxes with conductors of lighting and power systems. No more than one conductor shall be installed under any screw terminal. All circuit conductors entering or leaving any mounting box, outlet box enclosure or cabinet shall be connected to screw terminals with each terminal marked in accordance with the wiring diagram. Connections and splices shall be made using screw terminal blocks. The use of wire nut type connectors is prohibited in the system. Wiring within any control equipment shall be readily accessible without removing any component parts. The fire alarm equipment manufacturer's representative shall be present for the connection of wiring to the control panel.

3. Control Panel

The control panel and its assorted components shall be mounted so that no part of the enclosing cabinet is less than 12 inches or more than 78 inches above the finished floor. All manually operable controls shall be between 36 inches to 42 inches above the finished floor. Panel shall be installed to comply with the requirements of UL 864.

4. Detectors

Detectors shall be installed in accordance with NFPA 72. Detectors shall be at least 12 inches from any part of any lighting fixture. Detectors shall be located at least 3 feet from diffusers of air handling systems. Each detector shall be provided with appropriate mounting hardware as required by its mounting location. Detectors which mount in free space shall be mounted directly to the end of the stubbed down rigid conduit drop. Conduit drops shall be firmly secured to minimize detector sway. Where length of conduit drop from ceiling or wall surface exceeds 3 feet, sway bracing shall be provided.

5. Notification Appliances

Notification appliances shall be mounted a minimum of 8 feet above the finished floor unless limited by ceiling height or otherwise indicated.

3.2 OVERVOLTAGE AND SURGE PROTECTION

All equipment connected to AC circuits shall be protected from surges per IEEE C62.41 and NFPA 70. All cables and conductors, which serve as communications links, except fiber optics, shall have surge protection circuits installed at each end. Fuses shall not be used for surge protection.

3.3 TESTING

- A. The Subcontractor shall notify the Contractor 30 days before the preliminary and acceptance tests are to be conducted. The tests shall be performed in accordance with the approved test procedures in the presence of the Contractor. The control panel manufacturer's representative shall be present to supervise all tests. The Subcontractor shall furnish all instruments and personnel required for the tests.

1. Preliminary Tests

Upon completion of the installation, the system shall be subjected to functional and operational performance tests including tests of each installed initiating and notification appliance. Tests shall include the meggering of all system conductors to determine that the system is free from grounded, shorted, or open circuits. The megger test shall be conducted prior to the installation of fire alarm equipment. If deficiencies are found, corrections shall be made and the system shall be retested to assure that it is functional by the Subcontractor and at no additional expense to the Contractor.

Audibility Testing of Notification Appliances

Using an A-frequency weighted sound level meter with a minimum range of 30-130 dB, test all areas accessible for human occupancy for compliance with the alarm sound level requirements of NFPA 72 for public mode signaling. Perform tests only after all specified wall, floor, and ceiling finishes have been installed. Perform tests with all heating, ventilating, and air conditioning (HVAC) systems and showers running and all doors and windows closed. Correct any areas where sound levels do not comply and then retest sound levels to verify compliance. Submit a written record of the measured sound levels to the Contracting Officer when requesting a final acceptance test.

2. Acceptance Test

Testing shall be in accordance with NFPA 72. The recommended tests in NFPA 72 shall be considered mandatory and shall verify that all previous deficiencies have been corrected. The test shall include the following:

- a) Test of each function of the control panel.
- b) Test of each circuit in both trouble and normal modes.
- c) Tests of alarm initiating devices in both normal and trouble conditions.
- d) Tests of each control circuit and device.
- e) Tests of each alarm notification appliance.
- f) Tests of the battery charger and batteries.
- g) Complete operational tests under emergency power supply.
- h) Visual inspection of all wiring connections.
- i) Opening the circuit at each alarm initiating device and notification appliance to test the wiring supervisory feature.

- j) Ground fault
- k) Short circuit faults
- l) Stray voltage
- m) Loop Resistance

Do not submit a request for formal test and inspection until the preliminary test and corrections are completed. Submit a written request for formal inspection and test at least 15 working days prior to desired inspection date. An experienced technician regularly employed by the system installer shall be present during the inspection. The Atlantic Division, Naval Facilities Engineering Command Fire Protection Engineer shall witness formal tests and approve systems before they are accepted.

* * * * END OF SECTION * * * *

SECTION 16726

SECURITY ALARM SYSTEM

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Specifications and Drawings.

Under no circumstances shall any work begin without first obtaining permission from the appropriate agency. Existing utility lines that might interfere during construction shall be relocated.

Provide complete security detection and alerting system to be installed, connected, tested and left in first-class operating condition.

All materials, products, and equipment shall be UL listed.

The security alarm system shall monitor the integrity of all alarm initiating circuits and shall be provided with automatically charged standby batteries to maintain system operation for 60 hours in the normal supervisory mode plus have sufficient capacity to operate in the alarm mode for 5 minutes at the conclusion of this supervisory time period. Batteries shall be supervised for connection to the system and a low voltage threshold. The automatic battery charger shall be capable of charging fully the discharged system batteries to 100 percent in 12 hours.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the Contract Document includes, but is not limited to, the following:

Section 16000 Basic Electrical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

UL 681 Installation and Classification of Mercantile and Bank Regular Alarm Systems
UL 1076 Proprietary Burglar Alarm System Units

The Security System Subsystem shall comply with the current UL Standard 1076 Proprietary Burglar Alarm System Units, and UL Standard 681 Installation and Classification of Mercantile and Bank Burglar Alarm Systems.

All wiring for the system shall be in accordance with Articles 760, 725 and 800 of the National Electric Code and all other applicable codes.

1.2 SUBMITTALS

The Subcontractor shall submit five copies of the following to the Contractor:

- A. Shop drawings and instructions, including complete wiring diagrams and catalog data for all components shall be submitted for acceptance prior to the start of the installation for the alarm system and its components. Shop drawings shall indicate locations, installation details and operational details of all equipment associated with the alarm system.
- B. Point-to-point wiring diagrams for the entire system showing all devices and interconnecting wiring.

1.3 SHIPPING, DELIVERY AND STORAGE

- A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material within shipping containers and on the carrier.
- B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.
- C. Components shall be stored off of the ground; shall be protected from weather elements; and be in compliance with all manufacturer storage requirements to avoid warranty issues.
- D. All equipment, requiring placement within the Groundwater Treatment Plant prior to the building shell construction, shall be appropriately scheduled by the Subcontractor and coordinated with the Contractor.
- E. Machinery used to place equipment within the Groundwater Treatment Plant shall not cause stress on the floor above the allowable maximum.

1.4 SEQUENCES OF OPERATION

- A. The system shall be comprised of the number of zones shown on the Drawings. Zones shall be programmable for Instant, Delay, Day Supervisory, Silent, Priority (non shuntable). Loop Response Time shall be programmable. System shall detect faulty read only memory (ROM) on power up. System shall be continually supervised by a watchdog Microprocessor Timer.
- B. The system shall be armed, disarmed, reset, monitored and altered by the use of remote keypads. The system shall support up to three remote keypads. The system shall provide "fail safe arming" preventing arming of the system if a zone has been violated or is ajar. System shall indicate which zone is ajar.
- C. Three keypad-operated zones shall be provided to alert of medical, panic/emergency and fire emergency situations. Functional parameters, such as dialer activation and signaling shall be fully programmable.

- D. Actuation of any zone shall cause the following to occur:
1. Sound the exterior siren.
 2. Sound the interior siren.
 3. Activate the built-in digital communicator, seize the protected premises telephone line and automatically report the alarm to a remote location as directed by the Contractor.
 4. Indicate the alarm condition at the remote keypad.
 5. Activate common trouble alarm contact (Dry Contact) for remote alarm to the plant Programmable Logic Controller (PLC).
- E. Acknowledgement of alarms or troubles, in conjunction with the interrogation of other systems activity (i.e. alarm memory, bypassing of zones, etc) shall require the use of a Personal Authorization Code (PAC) number to be entered in the keypad.
- F. Up to four user PAC codes can be utilized with the system. Programming of these codes shall be field programmable into EEPROM without the use of any special programming tools (i.e. Prom burners or factory programming methods). Programming will occur through the systems digital remote keypad. A user programming code will be required to make such changes. The remote keypad shall provide a means to verify programmed instructions through binary information displayed by the system's status indicators. No special displays or other associated hardware will be permitted to review program contents.
- Power outages or complete battery discharge shall not affect programmed field instructions.
- G. Two zones shall be programmable for exit/entry time delays (1 to 255 seconds), providing a warning tone when in the timing sequence. All other zones shall provide an instant alarm if system has been armed and in the timing sequence.
- H. During a daytime "disarmed" condition, all motion detectors, glass-break detectors, door switches or any initiating alarm appliance if in alarm condition shall be indicated through the system status indicators. The system ready lamp will extinguish. If the panel is "armed" these appliances will actuate the control, sound the signals and alert the monitoring station through the built-in communicator.
- I. Signal cutoff time shall be programmable from 1 to 255 minutes.
- J. The panel shall contain a daytime "disarmed" supervisory mode. It shall be configurable to either provide a latching or auto-restore mode of operation. With this function any zone that is violated will provide local annunciation without sounding the signals or activating the communicator. If in the auto-restore mode, the keypad sounder will activate and restore when the contact is open then closed. If in the latching mode, the keypad will sound until reset from the keypad with the PAC code. A SPDT relay will be provided in the control to activate auxiliary sounding devices or remote notification.
- K. The system shall incorporate a door strike output timed or toggled (on/off) to provide either automatic timed entrance when disarmed or manual activation through the keypad with PAC number.

- L. System alarms shall be retained in EEP ROM memory until reset using the PAC number. Complete power outage shall not affect alarm memory recall.
- M. An auxiliary contact output shall be provided when system is in alarm.
- N. The system shall include the following features as a minimum:
 - 1. Supervised monitoring of all indicating appliance wiring both in the Daytime or Bypassed condition.
 - 2. Separate alarm, trouble, bypass, ready to arm and secure indicators at each keypad control station. Keypad shall be either flush or surface mountable on standard electrical box.
 - 3. "Dead front" design control panel/with all indicators and control switches located behind a locked door.
 - 4. Automatic transfer to standby batteries upon power failure.
 - 5. Inclusion for a digital dialer compatible with all major receivers including Adcor; Ademco; Franklin; Osborne; Hoffman; Radionics; SESCOA; Silent Knight and Varitech.
 - 6. Watch dog microprocessor monitoring.
 - 7. Fully field keypad programmable EEPROM memory.
 - 8. Dynamic 24-hour battery load test.
 - 9. Continuous monitoring of fuses for auxiliary voltage outputs.
 - 10. Six state lightning protection.
 - 11. Shunt by zone from keypad.
 - 12. Zone auto shunt or auto/restore after alarm.
 - 13. Retained alarm memory.
 - 14. Digital communicator shall be approved to comply with applicable FCC codes. Unit shall feature either pulse or touch tone dialing. "Call Waiting" tones shall not prevent proper operation. The following communicator parameters shall be programmable from the keypad and not require either Prom burners or other factory programming methods.
 - a. Report by zone.
 - b. Single or two line extended reporting.
 - c. Two account codes.
 - d. Split reporting.
 - e. Opening and closing reports by user codes.
 - f. Closing ring back.
 - g. Restoral reporting.
 - h. Programmable abort.
 - i. Supervisory reporting of all trouble conditions.
 - j. Programmable delay before dialing.
 - k. Programmable dial attempts.

- l. Programmable delay between dial attempts.
 - m. Programmable test reporting for intervals of 12 hours up to 7 days.
 - n. Shunt by zone reporting.
 - o. AC failure and AC restoral reporting.
 - p. Low battery and battery restoral reporting.
 - q. Memory error reporting.
 - r. Listen in capabilities.
15. Auxiliary light output during alarm conditions.
16. Door strike output either timed or keypad accessible.
17. Uploading of memory contents available to International Business Machines (IBM) PC compatible host.

PART 2: PRODUCTS

2.1 MATERIALS

A. Control Panel

- 1. Provide a four-zone minimum, security control panel.
- 2. Control panel shall have built-in battery backup and shall provide sufficient capacity to power all auxiliary devices. Voltage shall be regulated. Automatic system shutdown will occur on low battery power to prevent false alarming.
- 3. During alarm conditions sufficient power shall be available to drive all sirens and provide auxiliary functions.
- 4. Control panel shall be provided with a two sound siren driver.
- 5. Control shall be listed UL Commercial Grade A Local Burglar, Grade B and C Central Station Burglar. Unit shall be provided with attach proof enclosure featuring heavy gauge/welded seam construction and be provided with two tamper switches to supervise front and rear tampering.
- 6. Provide zone expander module permitting the connection of three N/O zones in addition to the basic four zones.
- 7. Provide expansion module in conjunction with four zone LED display to provide an additional four zones of annunciation.

B. Keypad

Provide keypads. Keypads shall be provided with a built-in sounder for audible system signaling. Keypads are not to be externally mounted unless mounted in weatherproof enclosures. Keypads shall operate via multiplex communications to provide total system indication and access code authorization over four conductors.

C. Door/Window Contacts

Listed magnetic flush or surface mounted contacts and magnets. Each contact shall be provided with matching magnet. All contacts shall be hermetically sealed for long term 10,000,000 cycle contact. Switch contacts shall be of the reed blade type with rhodium plating eliminating cold-welding; sticking and resistance build-up. All switches shall be 100 percent factory tested prior to installation.

D. Outside High Powered, Weather Resistant, Siren Speaker

Provide, as required, 30 watt Siren Speaker. Unit shall feature 125 DB at 10-foot sound output and shall be provided with N/C tamper loop to supervise against removal.

E. Outside Tamper Resistant Weatherproof Enclosure

Provide, as required, tamper resistant enclosure provided with two tamper switches to supervise against front cover and wall mounting.

F. Inside Sounder with Built In Siren Driver

Provide, as required, Siren Sounder with 12 volt two tone siren driver. Unit shall provide 101 DB at 10 feet.

G. Grade A and B UL Listed Bell

Provide UL listed 12 volt bell. Unit shall be constructed of heavy steel to resist attack. Unit will come complete with two tamper switches mounted and wired. Unit shall be supervised against cover removal and wall mounting. Unit shall be rated at 90 DB at 10 feet.

H. Glass Break Detectors

Provide UL listed Glass Break Detector type #724-L and #725-L as required. Units shall feature state of the art, thick film technology and be of the solid state piezo electric glass break detector type. Device type shall contain discriminating circuits that detect only the specific mechanical ultrasonic frequencies generated by breaking glass. Sensors shall protect a 10-foot radius of glass area. Sensors shall be of the N/C variety and shall each feature a latching LED to indicate the appropriate detector in alarm.

I. Motion Detectors (Passive Infrared)

Provide, as required, Passive Infrared Detector. Unit shall operate from 6 to 12 volts DC and draw a maximum of 25 mA. Sensor shall offer wall, corner, ceiling or flush mounting and offer a tamper switch to supervise cover removal. An optional gimbal mounting bracket shall provide mounting to a standard single gang electrical box and permit the detector to be swiveled into position for adjustment. Testing the unit will be facilitated with a walk test/alarm LED. Internal voltage test pins shall provide pattern location and background disturbance evaluation utilizing a standard electrical test meter. Operating range shall be from minus 20 degrees F to plus 120 degrees F. Sensor shall provide a 30 foot by 30 foot wide angle of protection or by flipping the optic lens provides a 30-foot by 4 foot barrier pattern. An optional long-range lens shall provide a 100 foot by 9 foot long range barrier or by flipping the optic lens provide a 20 foot by 20 foot trap pattern.

PART 3: EXECUTION

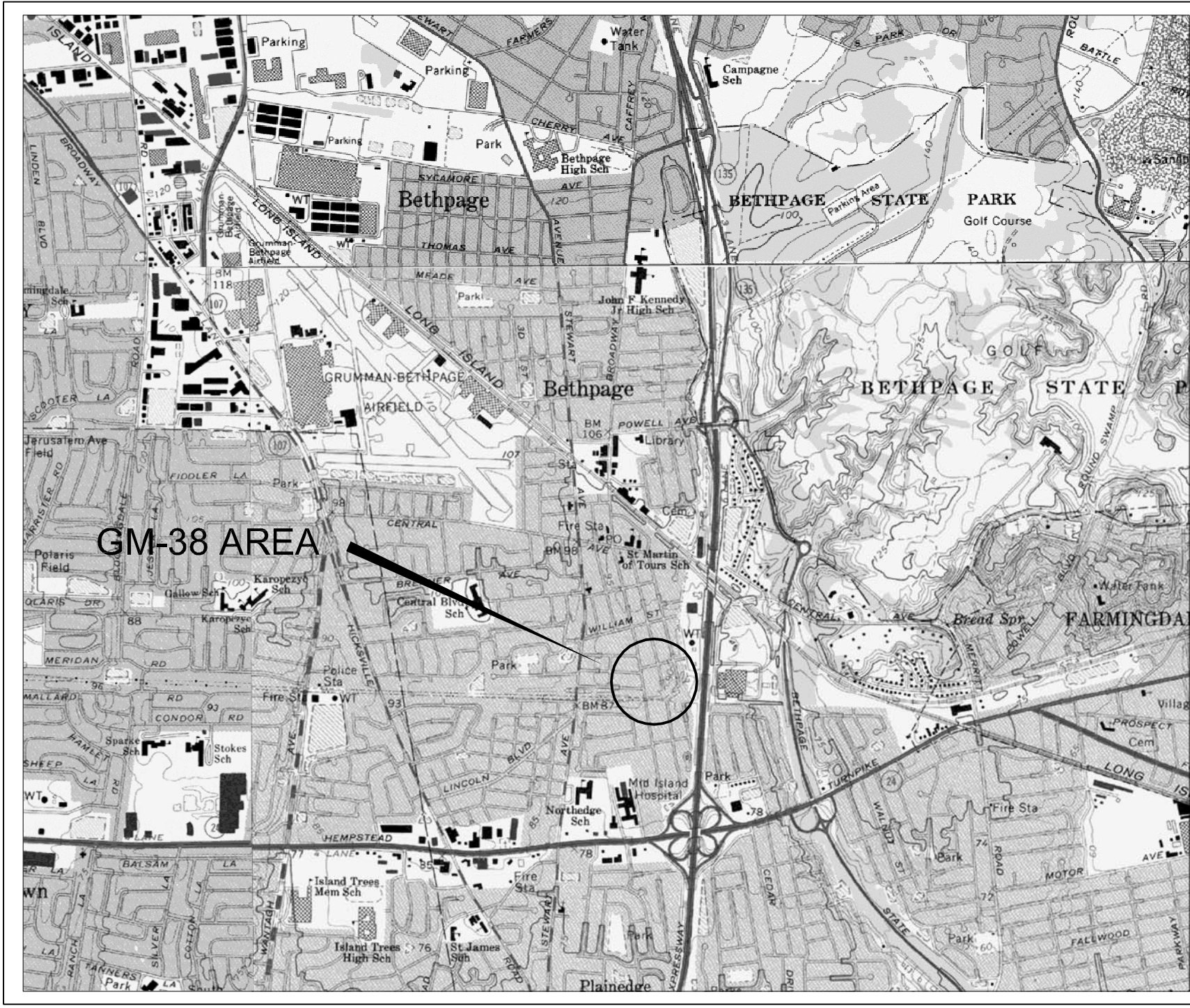
3.1 INSTALLATION

- A. Provide all equipment, wiring, conduit and outlet boxes required for the installation of a complete and operating system in accordance with applicable local, state and national codes, the manufacturer's recommendations, and these specifications. All wiring shall be in a completely separate rigid steel conduit or intermediate metallic conduit system. Electric metallic tubing shall be permitted only in control room. Color-coded wires shall be used throughout. Wiring shall conform to the NEC Article 725.
- B. The manufacturer's authorized representative shall provide supervision of final system panel connections, perform a complete functional test of the system and submit a written report to the Contractor attesting to the proper operation of the system.
- C. All equipment and wiring shall be guaranteed against defects in materials and workmanship for a one-year period from the start up and beneficial use of the system. Warranty service for the equipment shall be provided by the system supplier's factory trained representative during normal working hours, Monday through Friday, excluding holidays.
- D. Upon satisfactory completion of system tests, the system supplier's representative shall present for the Contractor's consideration a proposal to provide semi-annual inspection and tests of the system.
- E. Upon completion of the installation, the electrical contractor shall provide the Contractor, with a copy to the system supplier's representative, a signed written statement attesting that all system equipment was installed in accordance with these specifications and in accordance with wiring diagrams, instructions and directions provided to the Contractor by the system supplier.
- F. Instructions shall be given to Contractor personnel on the proper operation of the system.

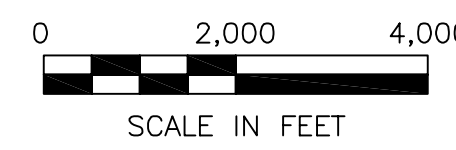
* * * END OF SECTION * * *

ATTACHMENT 2

Contract Drawings



NWIRP BETHPAGE VICINITY MAP



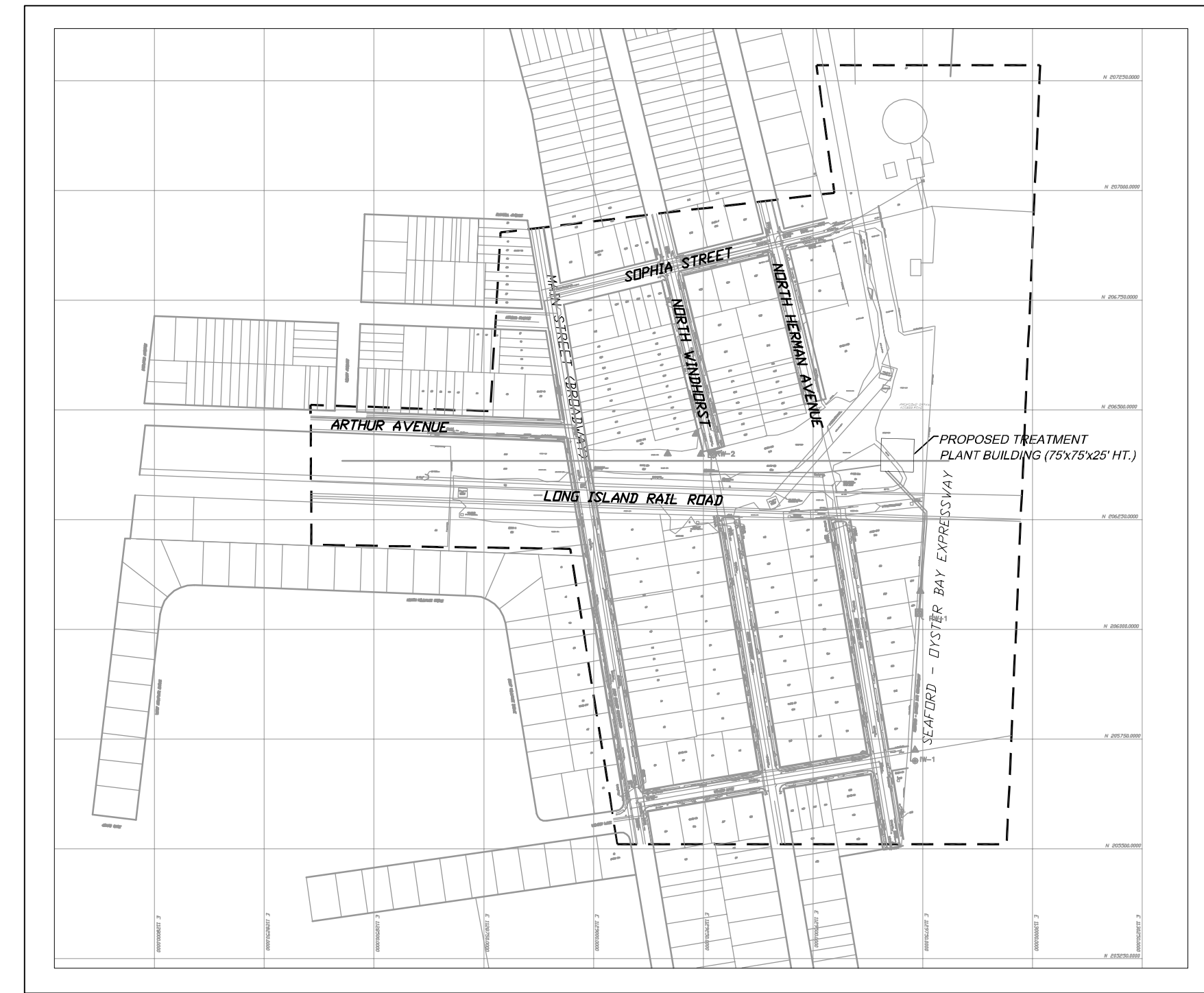
DESIGN-BUILD CONSTRUCTION FOR INTERIM REMEDIAL ACTION

FINAL DESIGN

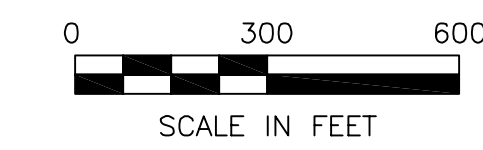
GM-38 AREA NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

BETHPAGE, NEW YORK

CONTRACT No. N62472-99-D-0032
CONTRACT TASK ORDER No. 096



INTERIM REMEDIAL ACTION AREA PLAN



DRAWING INDEX

T-1 TITLE SHEET

- C-1 SITE LAYOUT - EXISTING CONDITIONS
- C-2 PIPING AND UTILITY SITE LAYOUT
- C-3 PIPING AND UTILITY ROUTE DETAIL (SHEET 1 OF 3)
- C-4 PIPING AND UTILITY ROUTE DETAIL (SHEET 2 OF 3)
- C-5 PIPING AND UTILITY ROUTE DETAIL (SHEET 3 OF 3)
- C-6 TRENCH SECTIONS AND DETAILS
- C-7 SOIL EROSION AND SEDIMENT CONTROL DETAILS AND NOTES
- C-8 SITE GRADING PLAN, ACCESS ROAD PROFILE & CROSS SECTIONS
- C-9 SITE RESTORATION PLAN
- C-10 GROUNDWATER EXTRACTION WELLS - VAULT DETAILS
- C-11 TRAFFIC CONTROL
- C-12 MISCELLANEOUS DETAILS

- A-1 LAYOUT PLAN
- A-2 DETAILS AND ELEVATIONS (SHEET 1 OF 2)
- A-3 DETAILS AND ELEVATIONS (SHEET 2 OF 2)
- A-4 CONTROL ROOM DETAILS

- S-1 BUILDING FOUNDATION PLAN
- S-2 BUILDING FOUNDATION SECTIONS AND DETAILS
- S-3 BUILDING SUMP FOUNDATION PLAN, SECTIONS AND DETAILS
- S-4 AIR STRIPPER SUMP FOUNDATION PLAN, SECTIONS AND DETAILS

- P-1 PROCESS FLOW DIAGRAM
- P-2 PIPING AND INSTRUMENTATION DIAGRAM LEGEND
- P-3 PIPING AND INSTRUMENTATION DIAGRAM (SHEET 1 OF 5)
- P-4 PIPING AND INSTRUMENTATION DIAGRAM (SHEET 2 OF 5)
- P-5 PIPING AND INSTRUMENTATION DIAGRAM (SHEET 3 OF 5)
- P-6 PIPING AND INSTRUMENTATION DIAGRAM (SHEET 4 OF 5)
- P-7 PIPING AND INSTRUMENTATION DIAGRAM (SHEET 5 OF 5)
- P-8 PROCESS EQUIPMENT LIST
- P-9 PROCESS PIPING ARRANGEMENT PLAN (SHEET 1 OF 2)
- P-10 PROCESS PIPING ARRANGEMENT PLAN (SHEET 2 OF 2)
- P-11 UTILITY PIPING ARRANGEMENT PLAN

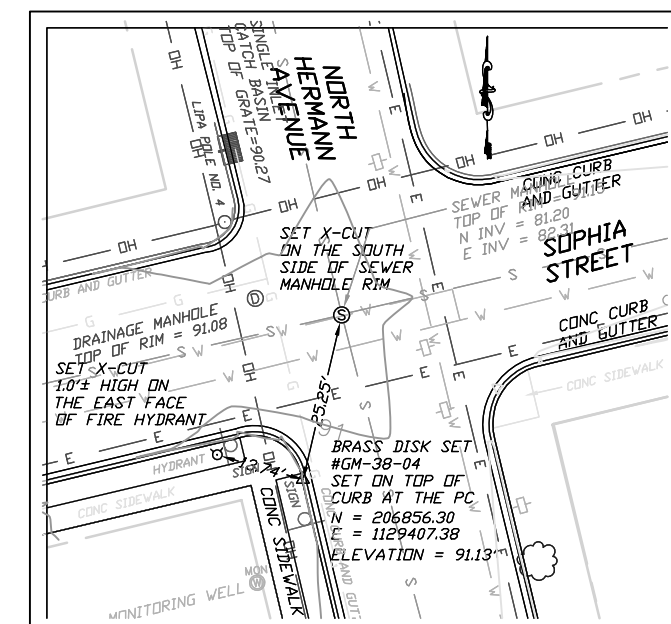
M-1 HVAC LAYOUT PLAN AND DETAILS

- E-1 ELECTRICAL LEGEND AND GENERAL NOTES
- E-2 ELECTRICAL SINGLE LINE DIAGRAM (SHEET 1 OF 2)
- E-3 ELECTRICAL SINGLE LINE DIAGRAM (SHEET 2 OF 2)
- E-4 PULL BOX DETAILS
- E-5 POWER PLAN
- E-6 GROUNDING AND LIGHTING PLAN
- E-7 INSTRUMENT PLAN
- E-8 FIRE ALARM AND SECURITY PLAN
- E-9 MISCELLANEOUS ELECTRICAL SCHEMATICS
- E-10 MISCELLANEOUS ELECTRICAL DETAILS
- E-11 LIGHTNING PROTECTION LAYOUT

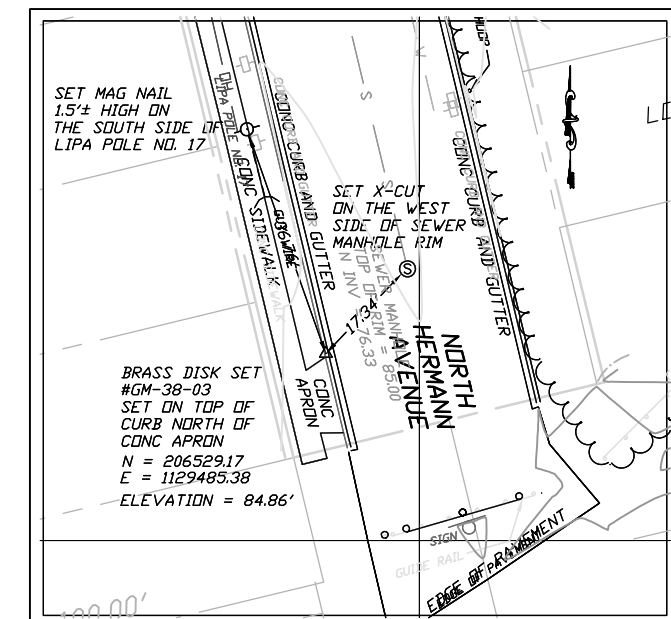
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REVISION	DATE	APPROVED	DATE
DESCRIPTION	DATE	APPROVED	DATE
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DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY - NORTHEAST BETHPAGE, NEW YORK GM-38 AREA GROUNDWATER TREATMENT PLANT TITLE SHEET			
BRONKHORST PROFESSIONAL ENGINEER STATE OF NEW YORK No. 082572 Brian Keith Blomchard, P.E. NYPE NO. 082572			
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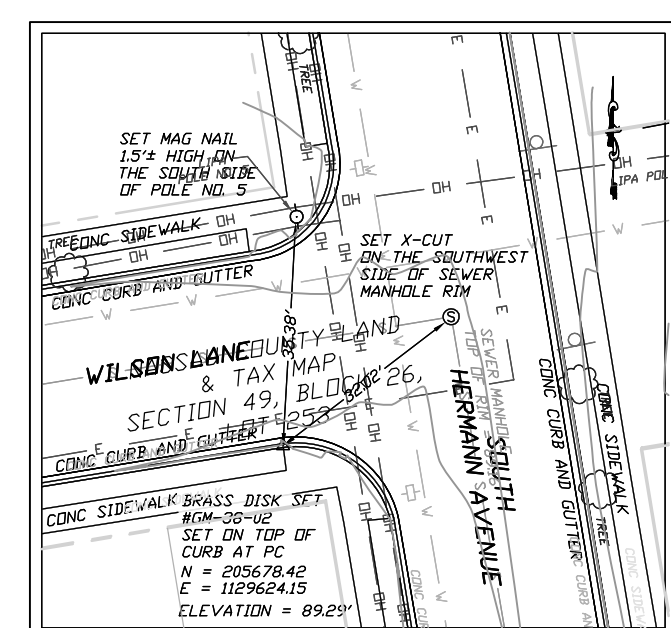
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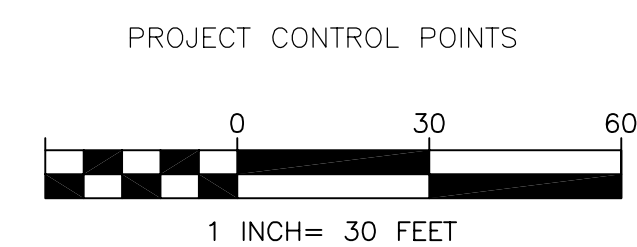
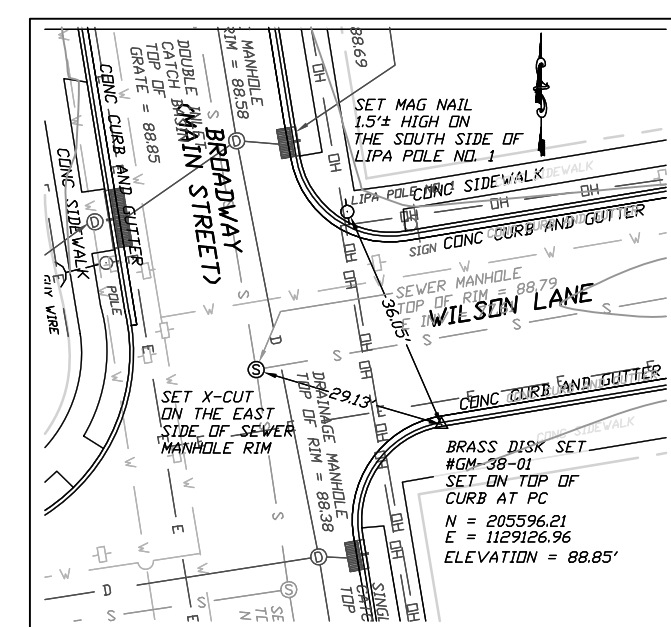
GM-38-03



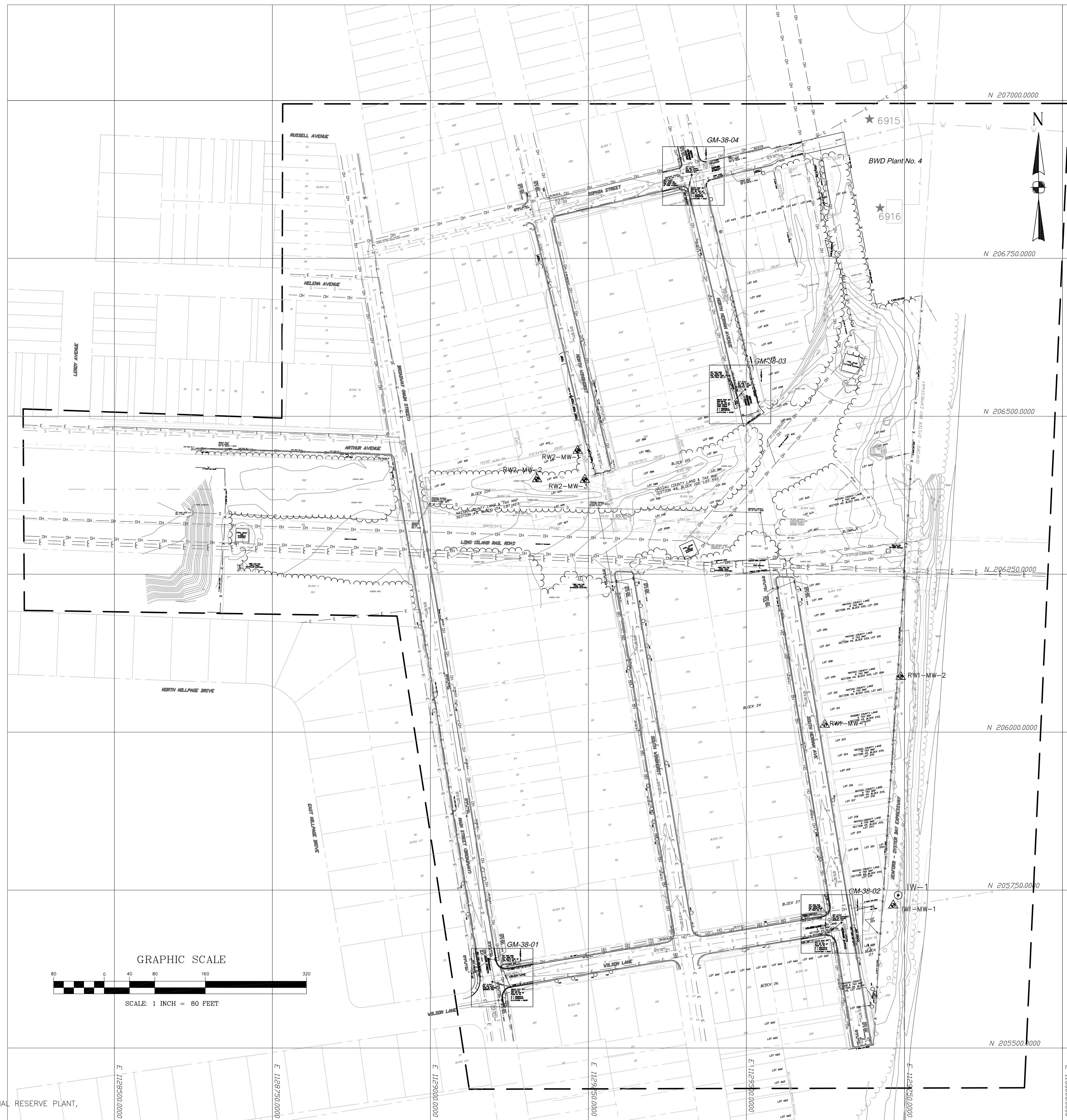
GM-38-02



GM-38-01



REFERENCE: L. K. McLEAN ASSOCIATES, P.C. 437 SO. COUNTRY ROAD, BROOKHAVEN, NY TOPOGRAPHIC SURVEY, NAVAL WEAPONS INDUSTRIAL RESERVE PLANT, GM-38 AREA, FILE # 04033.000 AUGUST 2, 2004



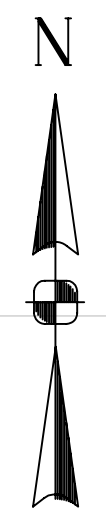
- NOTES: 1. SANITARY SEWER MANHOLE LOCATIONS AND RIM ELEVATIONS ARE AS PER L.K. McLEAN ASSOCIATES FIELD DATA EXCEPT WHERE OTHERWISE NOTED. 2. THE LOCATION OF OVERHEAD AND UNDERGROUND ELECTRIC LINES SHOWN ON THIS MAP ARE AS PER UTILITY MAPS PROVIDED BY LIPA UNLESS OTHERWISE NOTED. 3. THE LOCATION OF GAS MAINS SHOWN ON THIS MAP ARE AS PER UTILITY MAPS PROVIDED BY KEYSpan. 4. THE LOCATION OF WATER MAINS SHOWN ON THIS MAP ARE AS PER UTILITY MAPS PROVIDED BY THE BETHPAGE WATER DISTRICT. 5. STORM SEWER DRAINAGE MANHOLE LOCATIONS, AND CATCH BASIN LOCATIONS AND RIM ELEVATIONS ARE AS PER L.K. McLEAN ASSOCIATES FIELD DATA EXCEPT WHERE OTHERWISE NOTED. 6. THE LOCATION OF THE DRAINAGE (STORM SEWER) PIPES ON SOPHIA STREET HAVE NOT BEEN ESTABLISHED. THERE IS NO DATA ON RECORD AT THE TOWN OF OYSTER BAY DEPARTMENT OF PUBLIC WORKS. 7. MEASUREMENTS ARE IN ACCORDANCE WITH U.S. STANDARDS. 8. COORDINATES AND BEARINGS SHOWN ARE IN LONG ISLAND ZONE OF THE NEW YORK STATE PLANE COORDINATE SYSTEM NAD 1983. ELEVATIONS REFER TO NAVD 1929. 9. UNAUTHORIZED ALTERATION OR ADDITION TO A SURVEY MAP BEARING A LICENSED LAND SURVEYOR'S SEAL IS A VIOLATION OF SECTION 7209, SUBDIVISION 2, OF NEW YORK STATE EDUCATION LAW. 10. ONLY COPIES FROM THE ORIGINAL OF THIS SURVEY MARKED WITH AN ORIGINAL OF THE LAND SURVEYOR'S "EMBOSSED" SEAL OR "INKED" SEAL SHALL BE CONSIDERED TO BE VALID TRUE COPIES. 11. CERTIFICATIONS INDICATED HEREON SIGNIFY THAT THIS SURVEY WAS PREPARED IN ACCORDANCE WITH THE EXISTING CODE OF PRACTICE FOR LAND SURVEYORS ADOPTED BY THE NEW YORK STATE ASSOCIATION OF PROFESSIONAL LAND SURVEYORS. SAID CERTIFICATIONS SHALL RUN ONLY TO THE PERSON FOR WHOM THE SURVEY IS PREPARED, AND ON HIS BEHALF TO THE TITLE COMPANY, GOVERNMENTAL AGENCY AND LENDING INSTITUTION LISTED HEREON, AND TO THE ASSIGNEES OF THE LENDING INSTITUTION. CERTIFICATIONS ARE NOT TRANSFERABLE TO ADDITIONAL INSTITUTIONS OR SUBSEQUENT OWNERS. 12. RIGHTS-OF-WAY NOT SHOWN ARE NOT CERTIFIED.

- LIST OF UTILITIES: NEW YORK CITY ONE-CALL CENTER (800) 272-4480 LONG ISLAND POWER AUTHORITY (LIPA) [ELECTRIC] 175 EAST OLD COUNTRY ROAD HICKSVILLE, NY 11801 (800) 272-4480 BETHPAGE WATER DISTRICT 25 ADAMS AVE. BETHPAGE, NY 11714 (516) 931-0093 (631) 567-7800 (LOCATIONS SERVICE) CABLEVISION (516) 393-3295 MCI (800) 840-0338 COUNTY OF NASSAU DEPARTMENT OF PUBLIC WORKS [SANITARY SEWER] 1550 FRANKLIN AVENUE MINEOLA, NY 11501-4822 (516) 571-7319, 20 TOWN OF OYSTER BAY DEPARTMENT OF PUBLIC WORKS [STREETS AND STORM SEWER] SYOSSET, NY 11791-5699 (516) 677-5935 VERIZON (718) 471-4206 KEYSpan ENERGY [GAS] 175 EAST OLD COUNTRY ROAD HICKSVILLE, NY 11801 (800) 272-4480 (631) 567-7800 (LOCATIONS SERVICE)

- LEGEND: EXISTING GRADE-MAJOR CONTOUR, EXISTING GRADE-MINOR CONTOUR, PROPOSED GRADE, TAX LOT LINE, OVERHEAD ELECTRIC WIRES, UNDERGROUND ELECTRIC WIRES, WATER MAIN, GAS MAIN, DRAINAGE LINES (STORM SEWER), SANITARY SEWER MAIN, WOODED AREA, CHAIN-LINK OR BOARD FENCE, DIRT TRAIL, LIMITS OF CLEARING, SILT FENCE, NEW UNDERGROUND ELECTRIC WIRES, NEW WATER LINE, NEW SANITARY SEWER MAIN, HDPE PIPE AND ELECTRICAL CONDUIT, TAX LOT NUMBER, WATER VALVE, GAS VALVE, MONITORING WELL, RECOVERY WELL, INJECTION WELL, PULL BOX, LEAK DETECTION ACCESS PORT, EXISTING DECIDUOUS TREE, EXISTING CONIFEROUS TREE, WHITE PINE TREE LOCATION, SIGN, MANHOLE, GRAVEL, TEMPORARY ACCESS ROAD, PUBLIC WATER SUPPLY WELL.

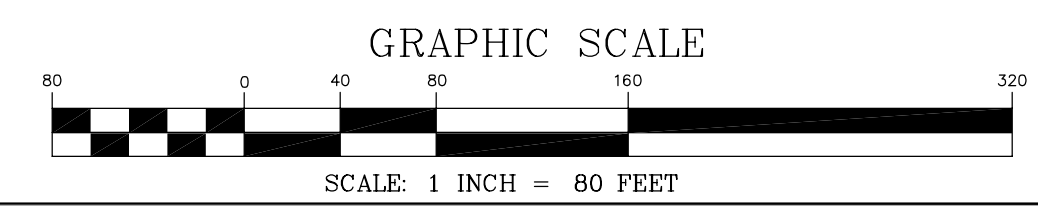
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Professional Engineer information including: TETRA TECH EC, INC., ENGINEERING FIELD ACTIVITY - NORTHEAST, GM-38 AREA, GROUNDWATER TREATMENT PLANT, SITE LAYOUT - EXISTING CONDITIONS, and various approval and revision stamps.



- NOTES:**
- SANITARY SEWER MANHOLE LOCATIONS AND RIM ELEVATIONS ARE AS PER L.K. McLEAN ASSOCIATES FIELD DATA EXCEPT WHERE OTHERWISE NOTED. ALL SEWER PIPE INVERTS (WHERE SHOWN) ARE AS PER NASSAU COUNTY SANITARY SEWER RECORD PLANS.
 - THE LOCATION OF OVERHEAD AND UNDERGROUND ELECTRIC LINES SHOWN ON THIS MAP ARE AS PER UTILITY MAPS PROVIDED BY LIPA UNLESS OTHERWISE NOTED.
 - THE LOCATION OF GAS MAINS SHOWN ON THIS MAP ARE AS PER UTILITY MAPS PROVIDED BY KEYSAN.
 - THE LOCATION OF WATER MAINS SHOWN ON THIS MAP ARE AS PER UTILITY MAPS PROVIDED BY THE BETHPAGE WATER DISTRICT.
 - STORM SEWER DRAINAGE MANHOLE LOCATIONS, CATCH BASIN LOCATIONS AND RIM ELEVATIONS ARE AS PER L.K. McLEAN ASSOCIATES FIELD DATA EXCEPT WHERE OTHERWISE NOTED.
 - THE LOCATION OF THE DRAINAGE (STORM SEWER) PIPES ON SOPHIA STREET HAVE NOT BEEN ESTABLISHED. THERE IS NO DATA ON RECORD AT THE TOWN OF OYSTER BAY DEPARTMENT OF PUBLIC WORKS.
 - MEASUREMENTS ARE IN ACCORDANCE WITH U.S. STANDARDS.
 - COORDINATES AND BEARINGS SHOWN ARE IN LONG ISLAND ZONE OF THE NEW YORK STATE PLANE COORDINATE SYSTEM NAD 1983. ELEVATIONS REFER TO NAVD 1929.
 - UNAUTHORIZED ALTERATION OR ADDITION TO A SURVEY MAP BEARING A LICENSED LAND SURVEYOR'S SEAL IS A VIOLATION OF SECTION 7209, SUBDIVISION 2, OF NEW YORK STATE EDUCATION LAW.
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 - RIGHTS-OF-WAY NOT SHOWN ARE NOT CERTIFIED.
 - FOUR INJECTION WELLS POSITIONED 80 FEET APART ARE EACH PREDICTED TO HANDLE SUSTAINABLE INJECTION FLOW RATES OF 275 GALLONS PER MINUTE (GPM) FOR A CUMULATIVE FLOW OF 1,100 GPM. NUMBER OF INJECTION WELLS AND SPACING IS BASED UPON REGIONAL GROUNDWATER MODEL RESULTS PRESENTED BY TETRA TECH NUS, INC. IN THE "GROUNDWATER REMEDY ANALYSIS REPORT" DATED FEBRUARY 2003.
 - LINE IDENTIFIED ON THIS DRAWING AS PART OF GWTP PROJECT ILLUSTRATE APPROXIMATE AND DO NOT REPRESENT ACTUAL PIPE/WIRE SIZES OR TRENCH WIDTHS.
 - TEMPORARY ACCESS ROAD ENTRANCE FROM BROADWAY AVE. SHALL INCLUDE 20 FT. CURB CUT FOR INSTALLATION OF CONCRETE DRIVEWAY APRON (PERMIT REQUIRED).
 - SANITARY LINE SHALL MAINTAIN 1-2% SLOPE FROM BUILDING TO THE DESIGNATED MANHOLE. CONNECTION INTO MANHOLE SHALL BE A MINIMUM OF 48" BELOW MANHOLE RIM ELEVATION. SEWER CONNECTION PERMIT SHALL BE OBTAINED FROM THE COUNTY OF NASSAU, DEPT. OF PUBLIC WORKS PRIOR TO WORK INITIATION.
 - ELECTRICAL AND TELEPHONE TIE-IN CONNECTIONS ARE AT POLE LIPA (FORMALLY L.I.L.) #18.
 - POTABLE WATER LINE TIE-IN LOCATION SHALL BE ON THE EASTERN SIDE OF THE FUTURE PERMANENT ACCESS ROAD TO THE TREATMENT BUILDING. WATER METER PIT SHALL BE LOCATED ADJACENT TO THE ACCESS ROAD ENTRANCE AT SOPHIA STREET. A REDUCED PRESSURE ZONE DEVICE SHALL BE LOCATED DOWNSTREAM OF METER PIT IN AN ABOVEGRADE VAULT. PLANS AND APPLICATIONS MUST BE APPROVED BY THE BETHPAGE WATER DISTRICT AND NASSAU COUNTY DEPT. OF HEALTH PRIOR TO INSTALL.
 - THE RW-2 EFFLUENT PIPING TRENCH SHALL ALSO CONTAIN A DOUBLE WALLED 12 IN DIA.(OUTER) X 8 IN. DIA.(INNER) HDPE PIPE FOR POTENTIAL FUTURE WELL CONNECTION AND A 10 IN. DIA. HDPE PIPE FOR POTENTIAL FUTURE ALTERNATE DISCHARGE POINT. BOTH PIPES FOR POTENTIAL FUTURE USE SHALL BE BLIND FLANGED AND INSIDE A TERMINATION VAULT.

- LEGEND:**
- = EXISTING GRADE—MAJOR CONTOUR
 - - - = EXISTING GRADE—MINOR CONTOUR
 - = PROPOSED GRADE
 - - - = TAX LOT LINE
 - — — — — = OVERHEAD ELECTRIC WIRES
 - — — — — = UNDERGROUND ELECTRIC WIRES
 - — — — — = WATER MAIN
 - — — — — = GAS MAIN
 - — — — — = DRAINAGE LINES (STORM SEWER)
 - — — — — = SANITARY SEWER MAIN
 - — — — — = WOODED AREA
 - — — — — = CHAIN-LINK OR BOARD FENCE
 - — — — — = DIRT TRAIL
 - — — — — = LIMITS OF CLEARING
 - — — — — = SILT FENCE
 - — — — — = NEW UNDERGROUND ELECTRIC WIRES
 - — — — — = NEW WATER LINE
 - — — — — = NEW SANITARY SEWER MAIN
 - — — — — = HDPE PIPE AND ELECTRICAL CONDUIT
 - — — — — = TAX LOT NUMBER
 - — — — — = WATER VALVE
 - — — — — = GAS VALVE
 - — — — — = MONITORING WELL
 - — — — — = RECOVERY WELL
 - — — — — = INJECTION WELL
 - — — — — = PULL BOX
 - — — — — = LEAK DETECTION ACCESS PORT
 - — — — — = EXISTING DECIDUOUS TREE
 - — — — — = EXISTING CONIFEROUS TREE
 - — — — — = WHITE PINE TREE LOCATION
 - — — — — = SIGN
 - — — — — = MANHOLE
 - — — — — = GRAVEL
 - — — — — = TEMPORARY ACCESS ROAD



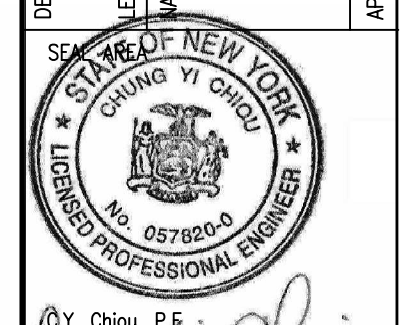
REFERENCE:
 L. K. McLEAN ASSOCIATES, P.C.
 437 SO. COUNTRY ROAD, BROOKHAVEN, NY
 TOPOGRAPHIC SURVEY, NAVAL WEAPONS INDUSTRIAL RESERVE PLANT,
 GM-38 AREA, FILE # 04033.000
 AUGUST 2, 2004

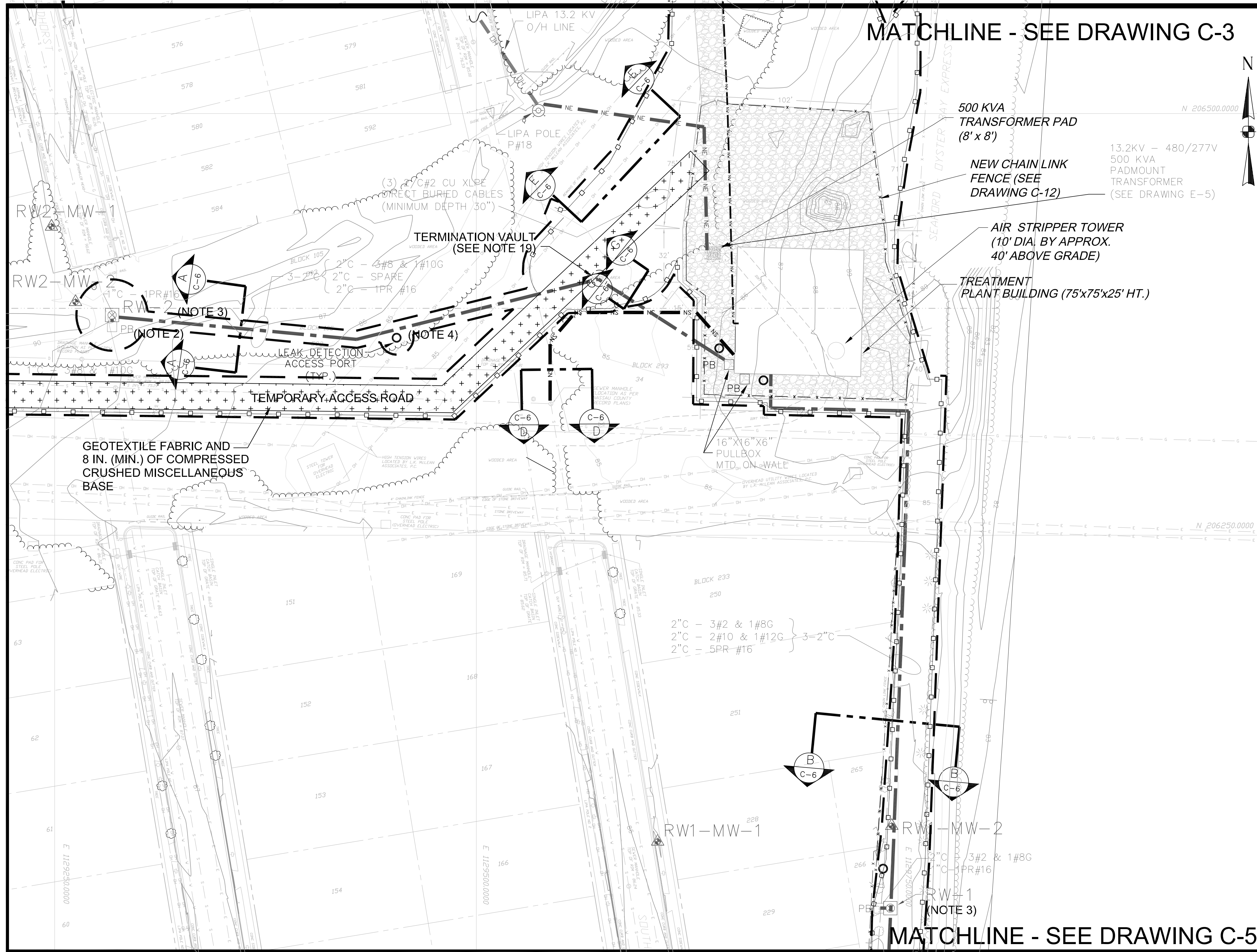
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DEPARTMENT OF THE NAVY NAVAL WEAPONS INDUSTRIAL RESERVE PLANT ESTER	NAVAL FACILITIES ENGINEERING COMMAND PENNSYLVANIA BETHPAGE, NEW YORK	ENGINEERING FIELD ACTIVITY - NORTHEAST GM-38 AREA GROUNDWATER TREATMENT PLANT PIPING AND UTILITY SITE LAYOUT	DATE: _____
			APPROVED: _____ DATE: _____
TETRA TECH EC, INC. 1000 ROUTE 108 NORTHWOOD, OH 44131 TEL: (440) 326-1000 FAX: (440) 326-1001 WWW.TETRA-TECH.COM		CODE ID. NO.: 80091 SCALE: AS SHOWN SPEC. NO.: CONSTR. CONTR. NO.: N62472-99-D-0032 NAVFAC DRAWING NO.:	SHEET OF: D C-2 DIS. SH. NO.:



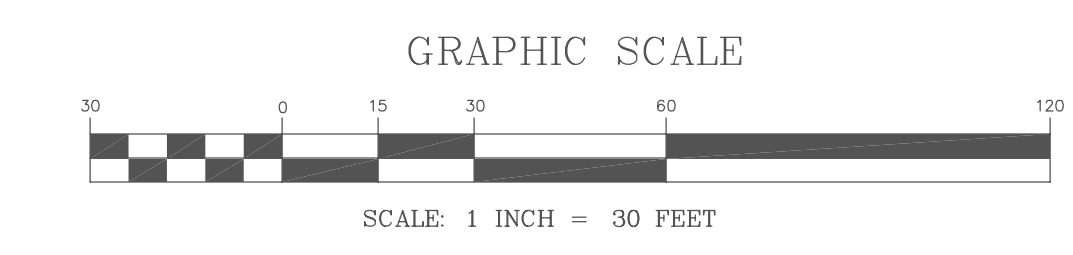


- NOTES:
- SEE NOTES ON DRAWING C-2.
 - FOR CONCRETE PULL BOX SEE DETAIL 1 ON DRAWING E-4.
 - FOR RECOVERY WELL CONSTRUCTION DETAILS, SEE DETAIL 1 ON DRAWING C-10.
 - FOR LEAK DETECTION ACCESS PORT DETAILS, SEE DETAIL 5 ON DRAWING C-10.

REFERENCE:
 L. K. McLEAN ASSOCIATES, P.C.
 437 SO. COUNTRY ROAD, BROOKHAVEN, NY
 TOPOGRAPHIC SURVEY, NAVAL WEAPONS INDUSTRIAL RESERVE PLANT,
 GM-38 AREA, FILE # 04033.000
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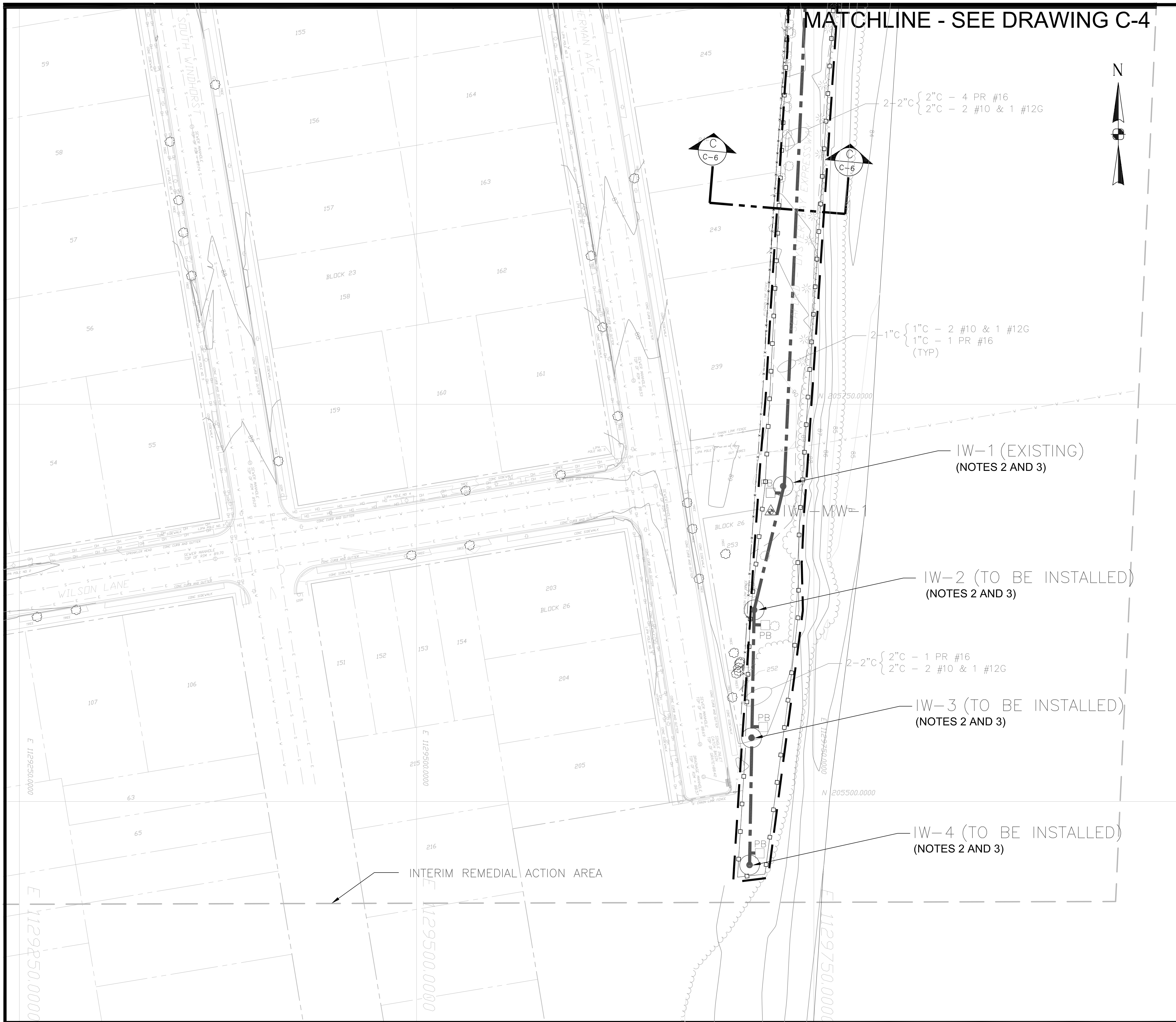
LEGEND:

	EXISTING GRADE-MAJOR CONTOUR
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	PROPOSED GRADE
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	OVERHEAD ELECTRIC WIRES
	UNDERGROUND ELECTRIC WIRES
	WATER MAIN
	GAS MAIN
	DRAINAGE LINES (STORM SEWER)
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	LIMITS OF CLEARING
	SILT FENCE
	NEW UNDERGROUND ELECTRIC WIRES
	NEW WATER LINE
	NEW SANITARY SEWER MAIN
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	TAX LOT NUMBER
	WATER VALVE
	GAS VALVE
	MONITORING WELL
	RECOVERY WELL
	INJECTION WELL
	PULL BOX
	LEAK DETECTION ACCESS PORT
	EXISTING DECIDUOUS TREE
	EXISTING CONIFEROUS TREE
	WHITE PINE TREE LOCATION
	SIGN
	MANHOLE
	GRAVEL
	TEMPORARY ACCESS ROAD
	PUBLIC WATER SUPPLY WELL



TETRA TECH EC, INC.	
DATE	DATE
APPROVED	APPROVED
DATE	DATE
PREP BY	DATE
DESCRIPTION	REV
NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY - NORTHEAST GM-38 AREA GROUNDWATER TREATMENT PLANT PIPING AND UTILITY ROUTE DETAIL (SHEET 2 OF 3)	
DATE	DATE
DEPARTMENT OF THE NAVY NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK EAFAC FOR COMMANDER, NAVFAC	
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SCALE	AS SHOWN
SPEC. NO.	
CONSTR. CONTR. NO.	N62472-99-D-0032
NAVFAC DRAWING NO.	
SHEET	OF
SIZE	DIS. SH. NO.
D	C-4

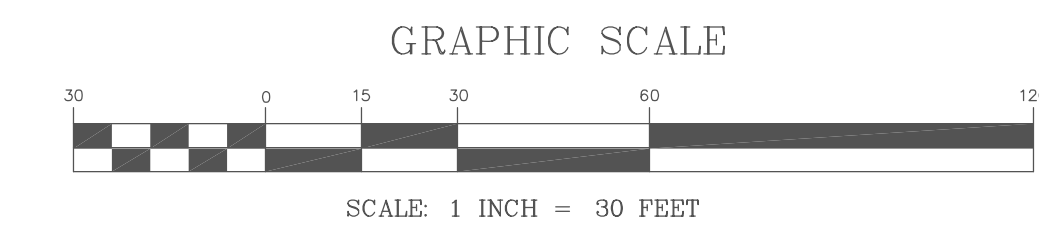
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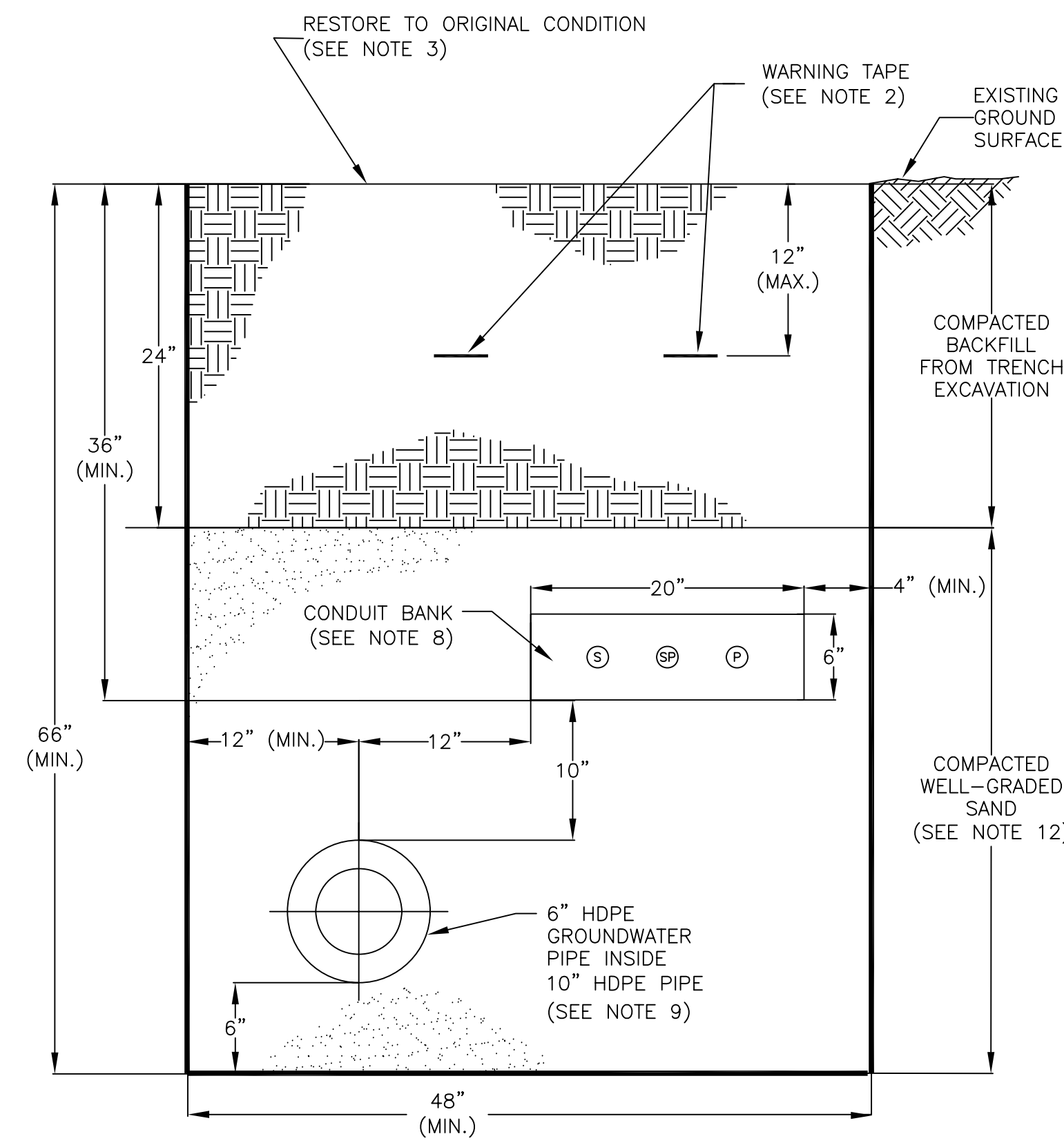
- NOTES:**
- SEE NOTES ON DRAWING C-2.
 - FOR INJECTION WELLHEAD VAULT CONSTRUCTION DETAILS, SEE DETAIL 2 ON DRAWING C-10.
 - INJECTION WELL IW-1 IS CURRENTLY EXISTING. INJECTION WELLS NOS. 2 THROUGH 4 ARE TO BE INSTALLED DURING CONSTRUCTION PHASE. LOCATIONS OF THE INJECTION WELLS (3) TO BE INSTALLED ARE APPROXIMATE AND MAY BE ADJUSTED BASED ON REQUIREMENTS OF PROPERTY OWNERS (NYS DOT).

REFERENCE:
 L. K. McLEAN ASSOCIATES, P.C.
 437 SO. COUNTRY ROAD, BROOKHAVEN, NY
 TOPOGRAPHIC SURVEY, NAVAL WEAPONS INDUSTRIAL RESERVE PLANT,
 GM-38 AREA, FILE # 04033.000
 AUGUST 2, 2004

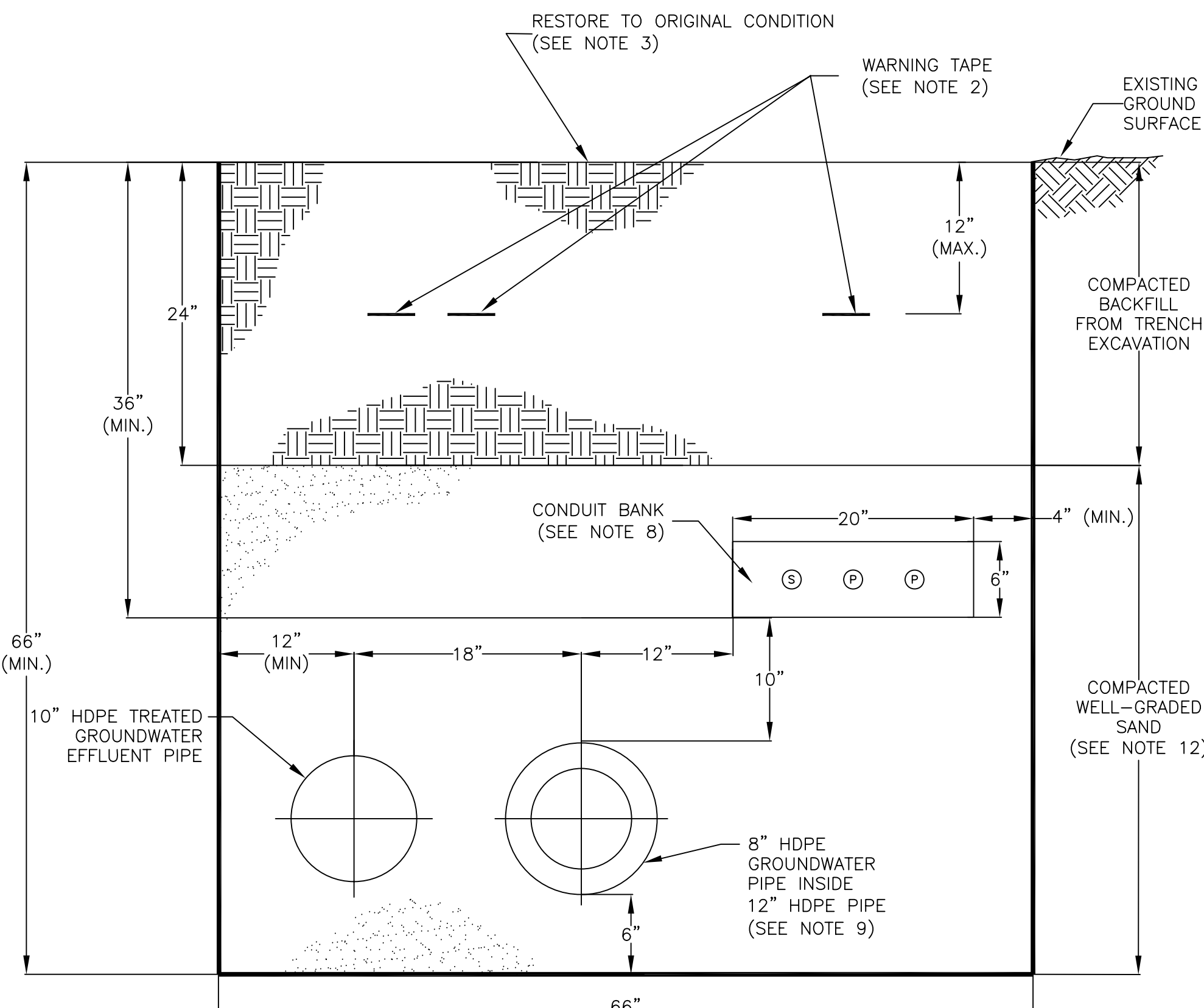
- LEGEND:**
- — — — — = EXISTING GRADE-MAJOR CONTOUR
 - — — — — = EXISTING GRADE-MINOR CONTOUR
 - — — — — = PROPOSED GRADE
 - — — — — = TAX LOT LINE
 - — — — — = OVERHEAD ELECTRIC WIRES
 - — — — — = UNDERGROUND ELECTRIC WIRES
 - — — — — = WATER MAIN
 - — — — — = GAS MAIN
 - — — — — = DRAINAGE LINES (STORM SEWER)
 - — — — — = SANITARY SEWER MAIN
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 - x — x — x — = CHAIN-LINK OR BOARD FENCE
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 - — — — — = LIMITS OF CLEARING
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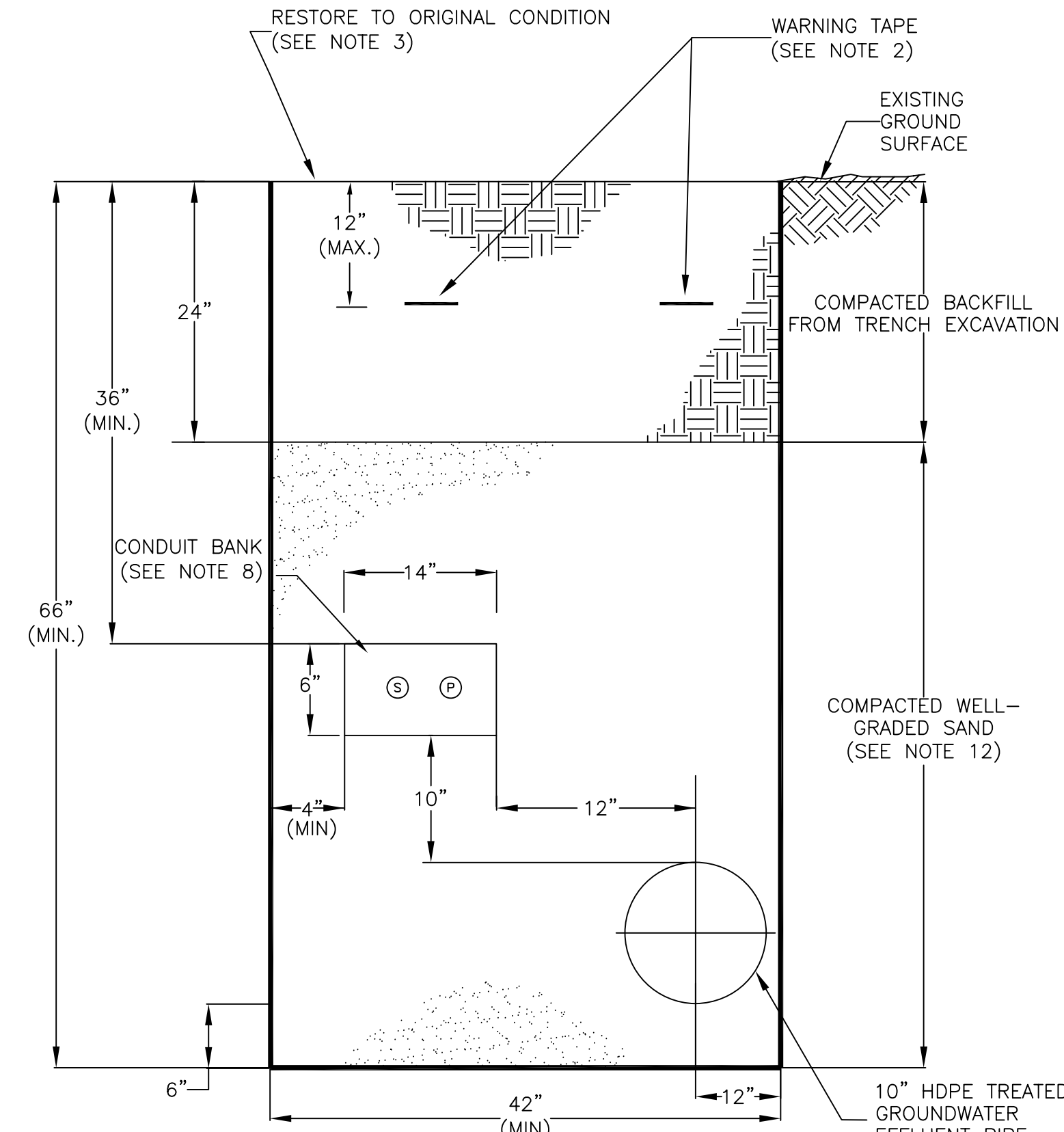
	APPROVED	DATE	PREP BY	DATE	APPROVD	DATE
	ENGINEERING FIELD ACTIVITY - NORTHEAST DEPARTMENT OF THE NAVY NAVAL WEAPONS INDUSTRIAL RESERVE PLANT GM-38 AREA GROUNDWATER TREATMENT PLANT PIPING AND UTILITY ROUTE DETAIL (SHEET 3 OF 3)					
Y. Chiu, P.E. TYPE NO. 057820-9 DATE	NAVAL FACILITIES ENGINEERING COMMAND PENNSYLVANIA BETHPAGE, NEW YORK EFAVE FOR COMMANDER, NAVFAC					
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SHEET OF DIS. SH. NO.	D C-5					



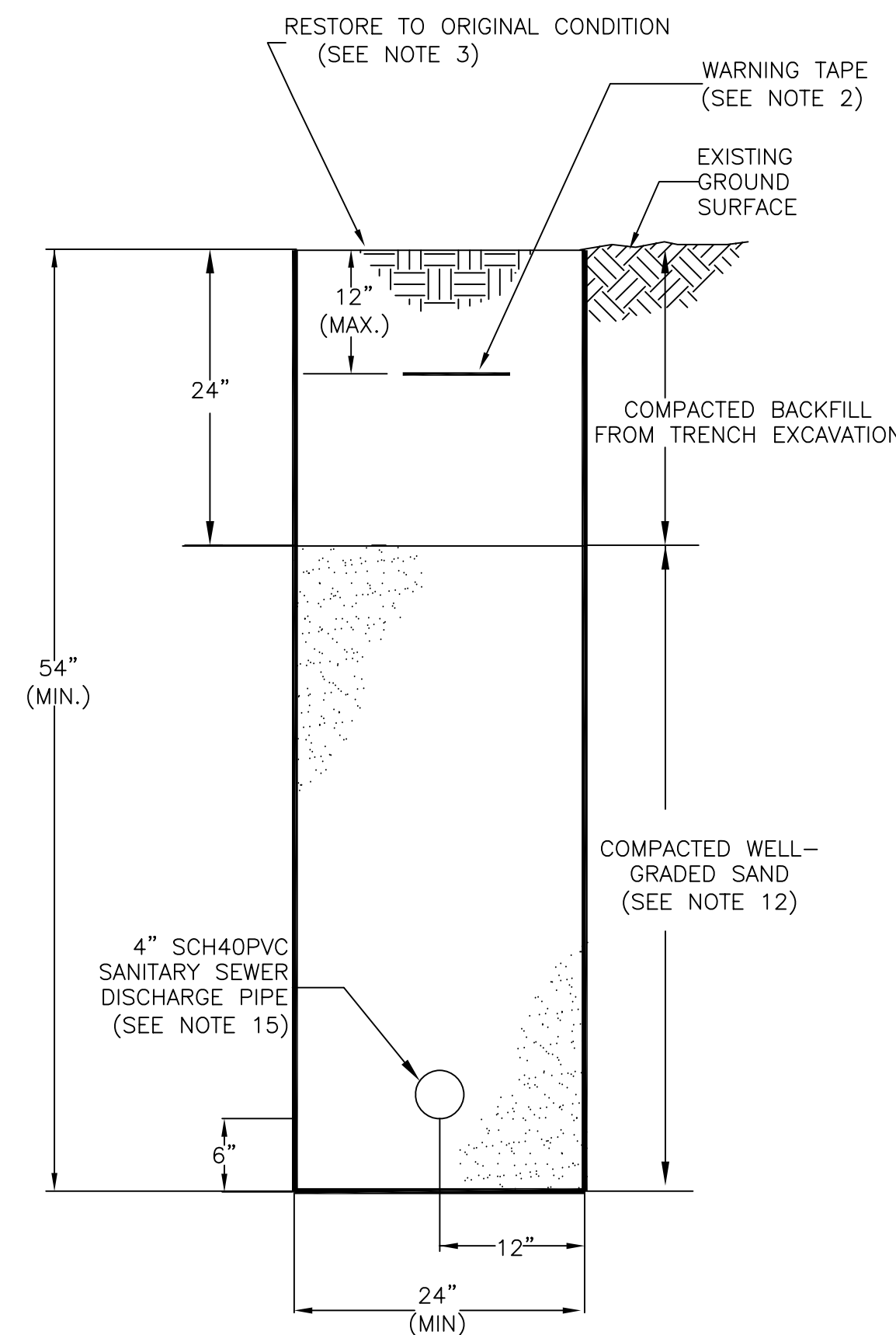
SECTION A (N.T.S.) C-4 EXTRACTION PIPING FROM WELL RW-2



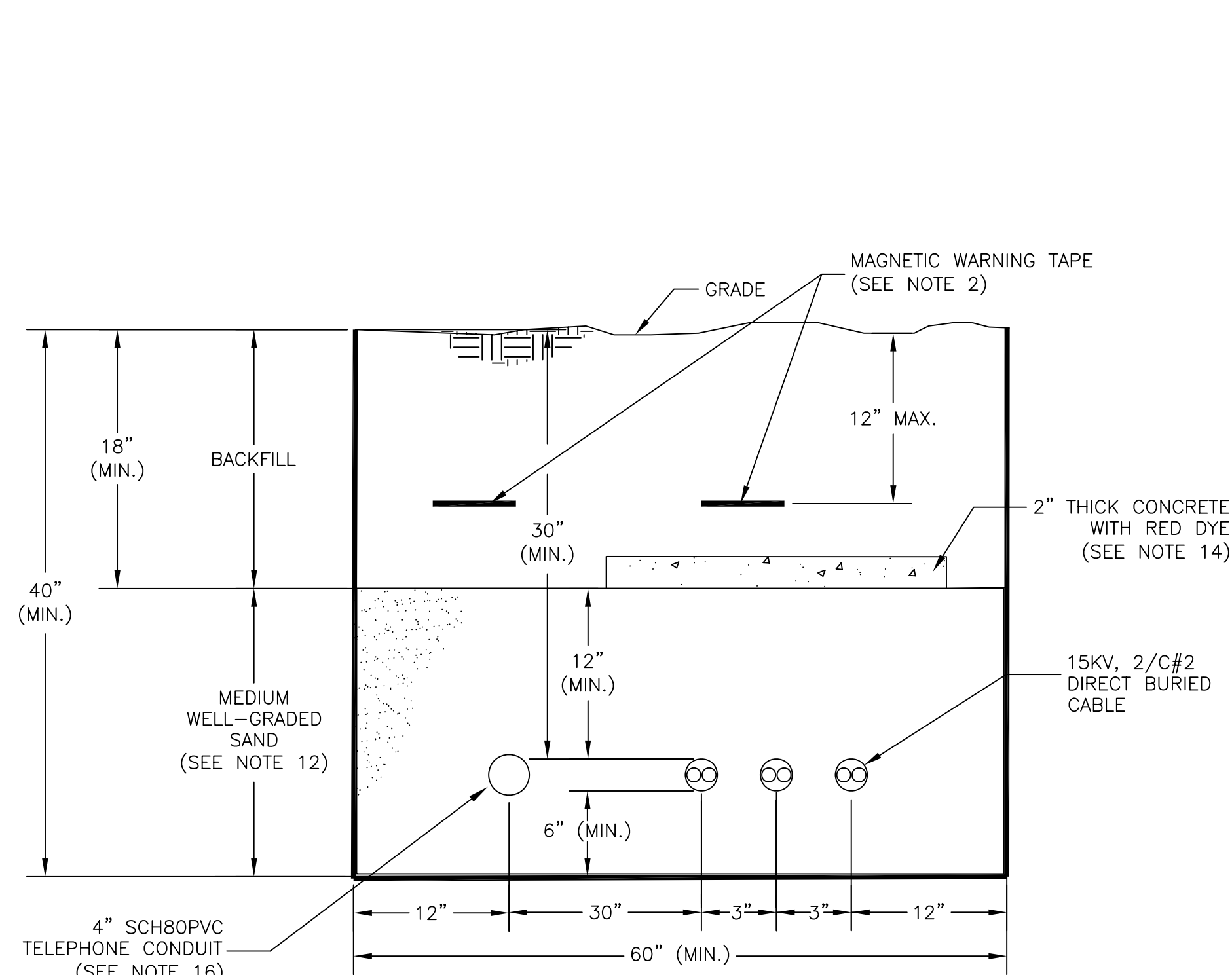
SECTION B (N.T.S.) C-4 EXTRACTION PIPING FROM WELL RW-1 AND INJECTION PIPING TO WELLS IW-1 THRU IW-4



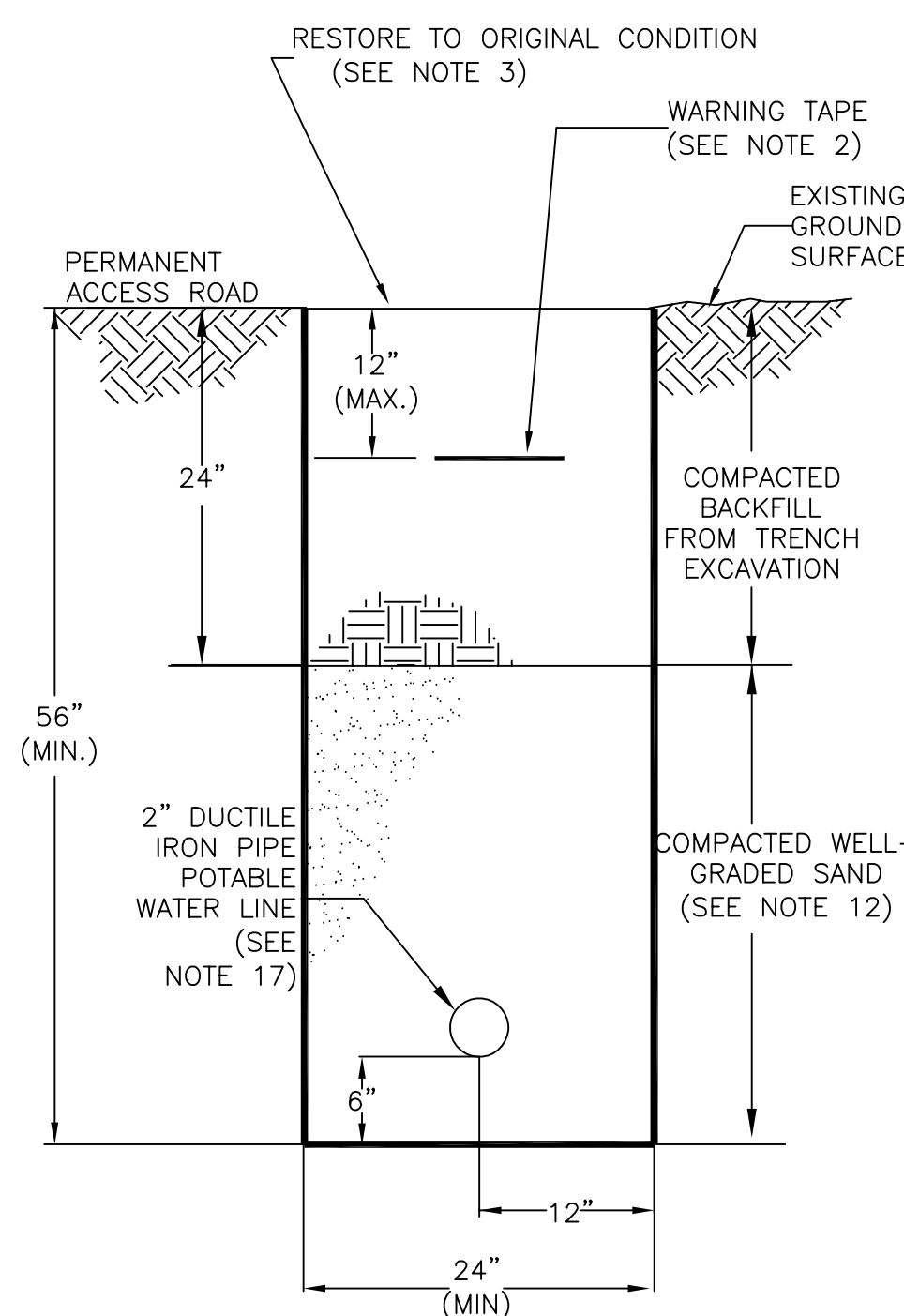
SECTION C (N.T.S.) C-5 INJECTION PIPING TO WELLS IW-1 THRU IW-4



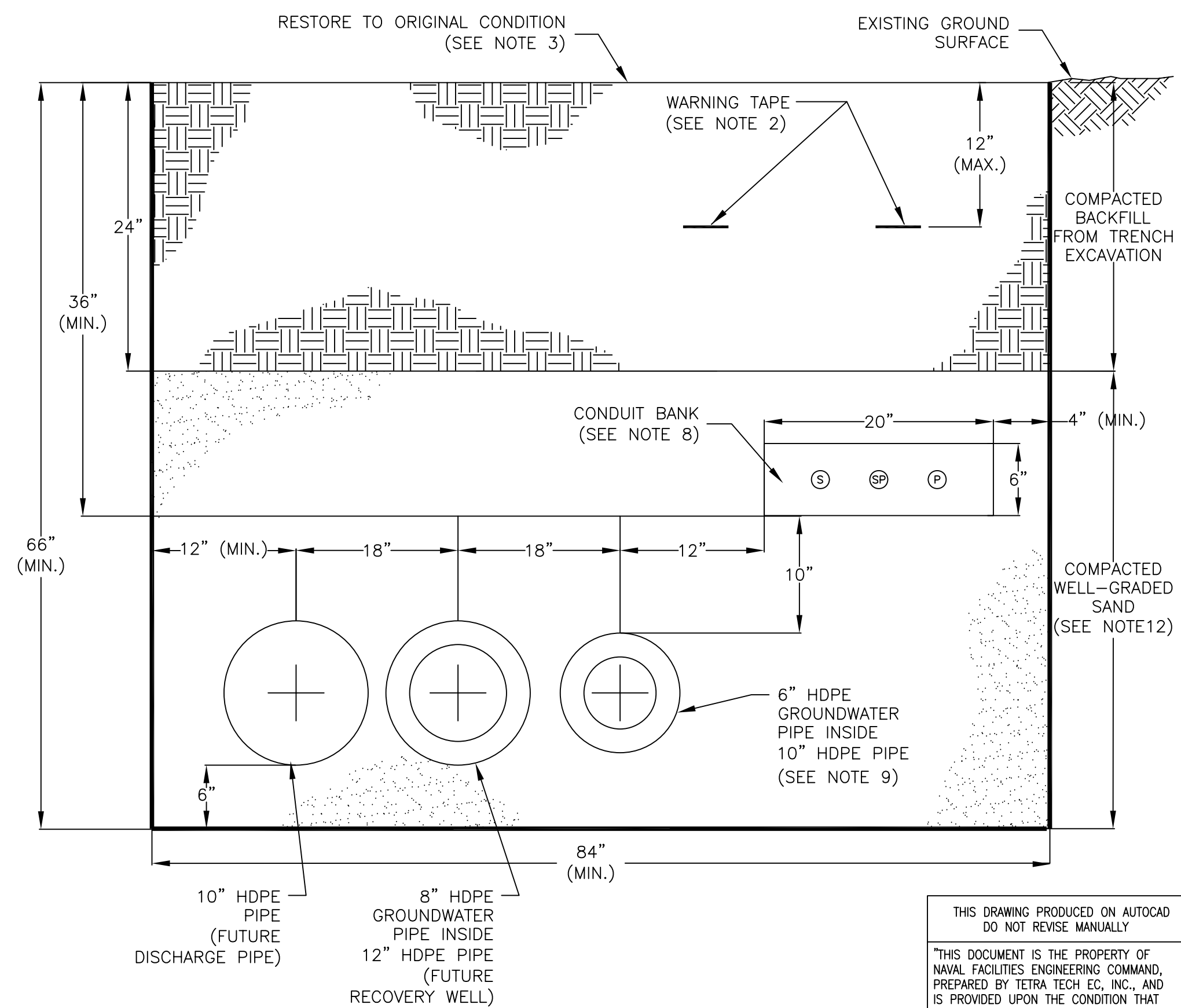
SECTION D (N.T.S.) C-4 NEW SANITARY SEWER MAIN (SEE NOTE 10)



SECTION E (N.T.S.) C-4 NEW UNDERGROUND ELECTRIC CABLE WIRES AND TELEPHONE LINE (SEE NOTES 7 AND 10)



SECTION F (N.T.S.) C-3 NEW POTABLE WATER LINE (SEE NOTE 10)



SECTION G (N.T.S.) C-4 EXTRACTION PIPING FROM WELL RW-2 WITH FUTURE DISCHARGE PIPE AND RECOVERY WELL

NOTES:

- FOR MULTIPLE PIPELINES PLACED IN THE SAME TRENCH, SPACE PIPES AT LEAST 6 INCHES APART AS MEASURED FROM OUTSIDE DIAMETER OF CONTAINMENT PIPING.
- WARNING TAPE SHALL CONSIST OF A SOLID ALUMINUM CORE, A COATED IMPRINT, AND A REINFORCED PROTECTIVE PLASTIC JACKET BONDED TO THE FOIL CORE. MINIMUM WIDTH SHALL BE 6 INCHES AND THE MINIMUM THICKNESS SHALL BE 4.5 MILS. THE PIPELINE WARNING TAPE SHALL BE YELLOW AND STATE: "CAUTION - BURIED PIPELINE BELOW". THE ELECTRICAL WARNING TAPE SHALL BE RED AND STATE: "CAUTION - BURIED ELECTRICAL LINE BELOW". THE POTABLE WATER LINE WARNING TAPE SHALL BE BLUE AND STATE: "CAUTION-BURIED WATER LINE BELOW".
- CONTRACTOR SHALL PLACE A MINIMUM OF 6 INCHES OF COMPACTED TOPSOIL OVER THE PIPE TRENCH EXCEPT WHERE PAVEMENT IS LOCATED. CROWN TOPSOIL APPROXIMATELY 1 INCH ABOVE EXISTING GROUND TO ALLOW FOR SETTLEMENT. EXISTING PAVEMENT REMOVED DURING CONSTRUCTION WILL BE REPLACED IN KIND.
- ELECTRICAL CONDUIT AND PIPE WILL BE PLACED IN THE SAME TRENCH WITH A MINIMUM OFFSET OF 6 INCHES FROM THE OUTSIDE OF THE CONDUIT TO THE OUTSIDE OF THE PIPING.
- FOR WELL VAULT CONSTRUCTION DETAILS, SEE DRAWING C-10.
- FOR WELL VAULT ELECTRICAL DETAILS, SEE DETAIL 2 ON DRAWING E-10.
- FOR HIGH VOLTAGE ELECTRICAL DUCT BANK DETAILS, SEE DRAWING E-4.
- FOR CONDUIT BANK DETAIL, SEE DETAIL 2 ON DRAWING E-4.
- ALL DOUBLE-CONTAINED HDPE PIPE SHALL BE PREFABRICATED BY PIPING MANUFACTURER, AND SHALL NOT BE FIELD FABRICATED.
- FOR UTILITY CONTACT INFORMATION, SEE DRAWING C-1.
- EXCAVATED CONCRETE, ASPHALT, AND ANY OTHER UNSUITABLE MATERIAL FROM THE TRENCH SHALL BE DISPOSED OFF-SITE.
- THE WELL-GRADED SAND SHALL BE CLASSIFIED AS SW IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM.
- THE COMPACTED BACKFILL FROM TRENCH EXCAVATION SHALL BE A SUITABLE MATERIAL WITH A MAXIMUM SIZE NOT TO EXCEED 3 INCHES AND NOT MORE THAN 12% BY WEIGHT GREATER THAN 2 INCHES.
- CONCRETE WARNING BARRIER SHALL BE PLACED ABOVE HIGH-VOLTAGE FEED WIRES OVER THE LENGTH OF THE TRENCH.
- SANITARY LINE SHALL MAINTAIN 1-2% SLOPE FROM BUILDING TO THE DESIGNATED MANHOLE. CONNECTION INTO MANHOLE SHALL BE A MINIMUM OF 48" BELOW MANHOLE RIM ELEVATION. SEWER CONNECTION PERMIT SHALL BE OBTAINED FROM THE COUNTY OF NASSAU, DEPT. OF PUBLIC WORKS PRIOR TO WORK INITIATION.
- ELECTRICAL AND TELEPHONE TIE-IN CONNECTIONS ARE AT LIPA POLE #18.
- POTABLE WATER LINE SHALL BE CEMENT LINED, DUCTILE IRON PIPE. THE TIE-IN LOCATION SHALL BE ON THE EASTERN SIDE OF THE PERMANENT ACCESS ROAD TO THE TREATMENT BUILDING. WATER METER PIT SHALL BE LOCATED ADJACENT TO THE ACCESS ROAD ENTRANCE AT SOPHIA STREET. A REDUCED PRESSURE ZONE DEVICE SHALL BE LOCATED DOWNSTREAM OF METER PIT IN AN ABOVEGRADE VAULT. PLANS AND APPLICATIONS MUST BE APPROVED BY THE BETHPAGE WATER DISTRICT AND NASSAU COUNTY DEPT. OF HEALTH PRIOR TO INSTALL.

LEGEND:

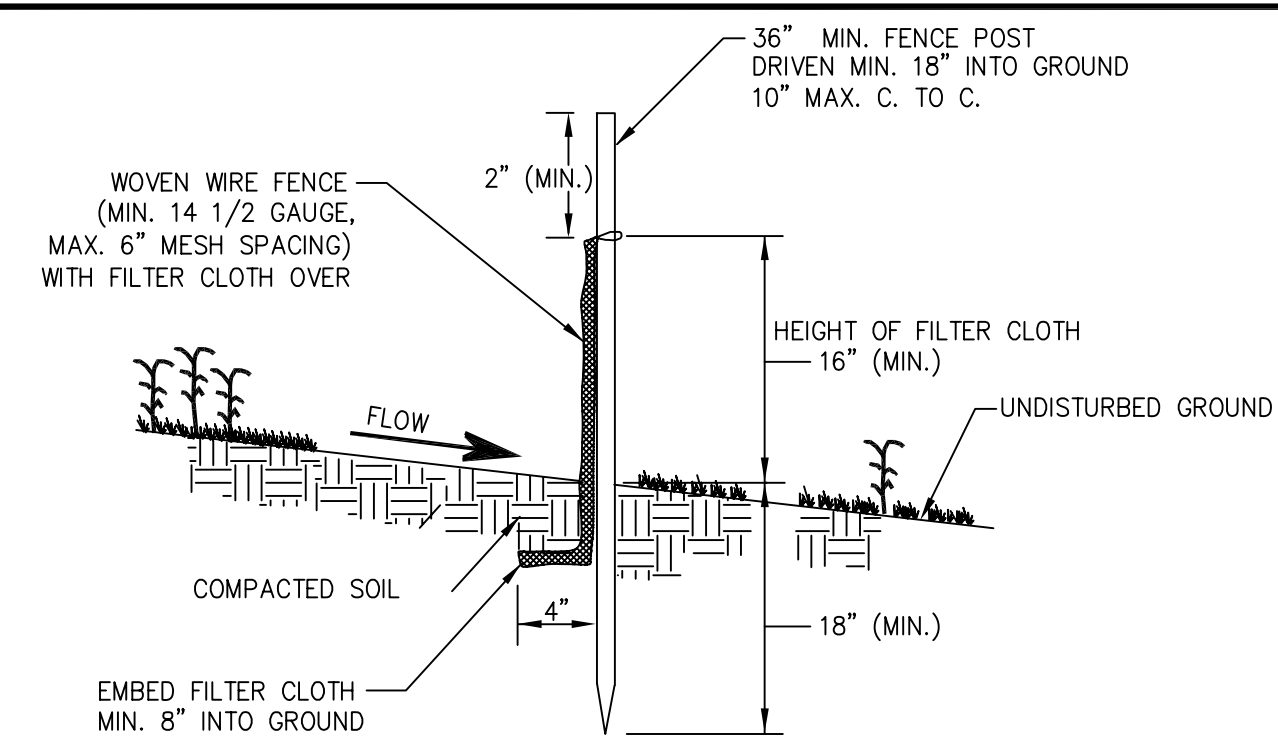
- (S) SIGNAL CONDUIT
- (SP) SPARE CONDUIT
- (P) POWER CONDUIT

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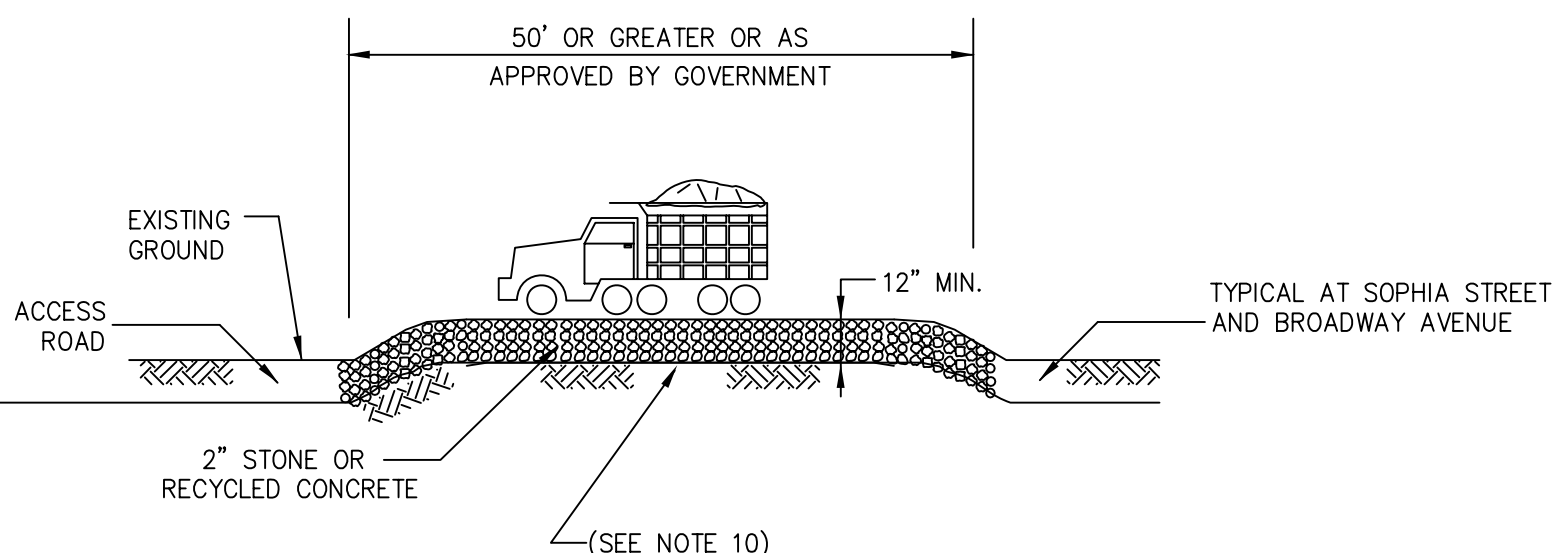
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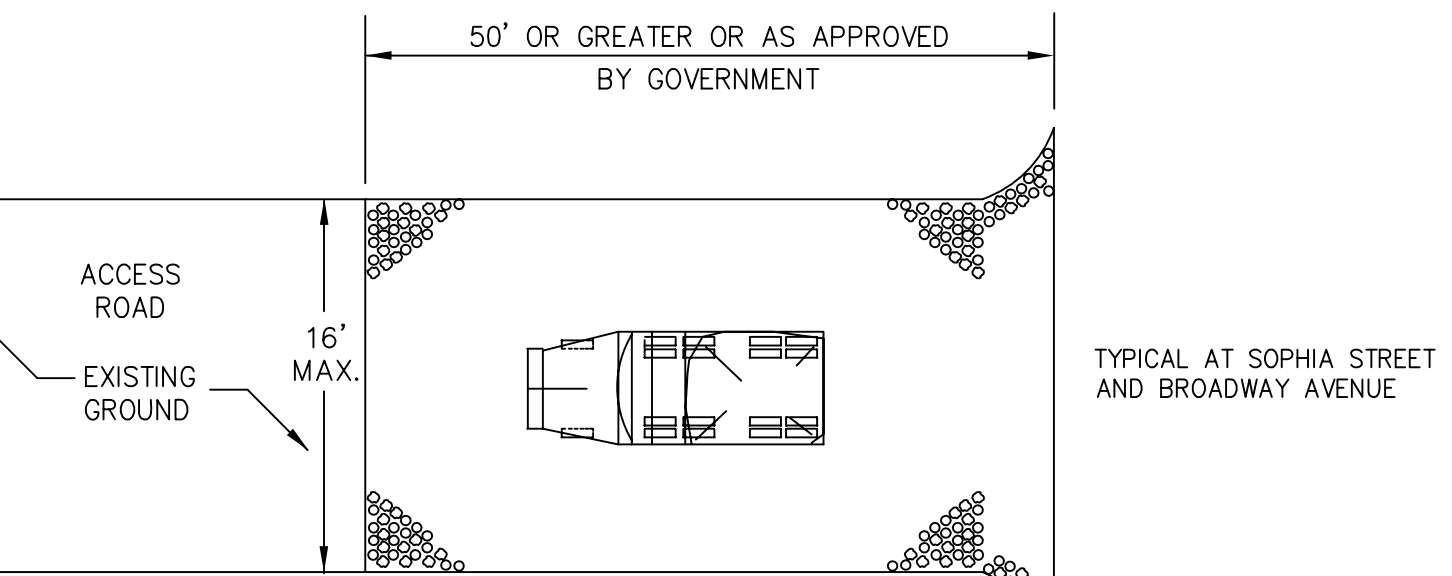
TETRA TECH EC, INC.		DATE
ISSUED BY	DATE	DATE
DESIGNED BY	DATE	DATE
CHECKED BY	DATE	DATE
APPROVED BY	DATE	DATE
DESCRIPTION	DATE	DATE
REV	DATE	DATE
NAVAL FACILITIES ENGINEERING COMMAND PENNSYLVANIA BETHPAGE, NEW YORK ENGINEERING FIELD ACTIVITY - NORTHEAST GM-38 AREA GROUNDWATER TREATMENT PLANT TRENCH SECTIONS AND DETAILS DATE APPROVED EPCAF FOR COMMANDER, NAVFAC		
DEPARTMENT OF THE NAVY NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK ESTER APPROVED DATE		
STATE OF NEW YORK COUNTY OF ONTARIO LICENSED PROFESSIONAL ENGINEER No. 057800-A P.E. Chiu, P.E. No. 057800-A DATE		
CODE ID. NO.	80091	
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SPEC. NO.		
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SHEET	OF	
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D	C-6	



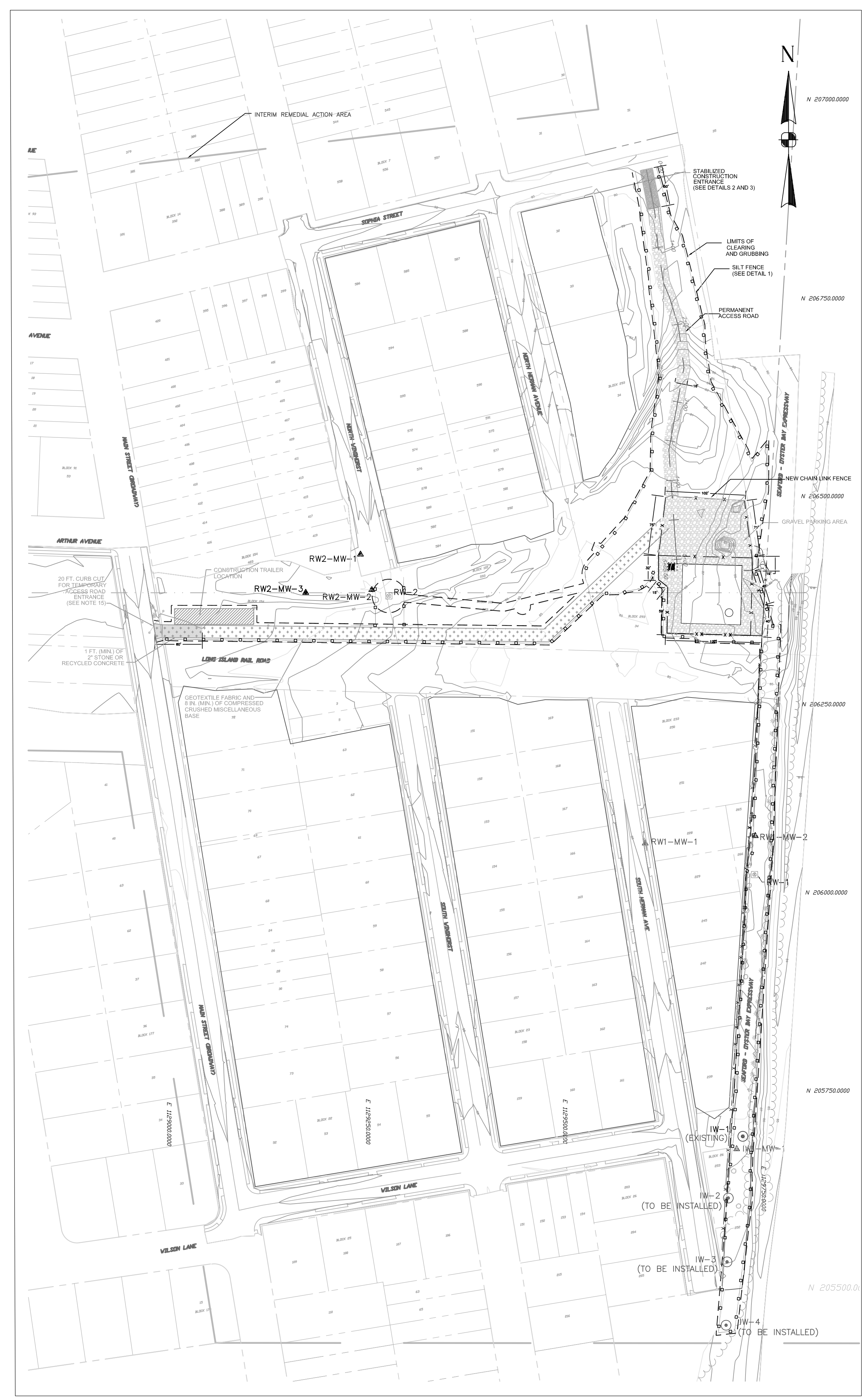
DETAIL 1 SILT FENCE (N.T.S.)



DETAIL 2 STABILIZED CONSTRUCTION ENTRANCE (N.T.S.)



DETAIL 3 STABILIZED CONSTRUCTION ENTRANCE - PLAN VIEW (N.T.S.)



SILT FENCE NOTES:

- WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES.
- FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24 INCHES AT TOP AND MID SECTION.
- WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY 6 INCHES AND FOLDED.
- MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.
- MATERIALS:
POSTS: STEEL EITHER "T" OR "U" TYPE OR 2 INCH HARDWOOD
FENCE: WOVEN WIRE, 14 1/2 GA., 6 INCH MAXIMUM MESH OPENING.
FILTER CLOTH: FILTER X, MIRAFI 100X, STABLELINK T140N, OR APPROVED EQUAL.
PREFABRICATED UNIT: GEOFAB, ENVIROFENCE, OR APPROVED EQUAL.

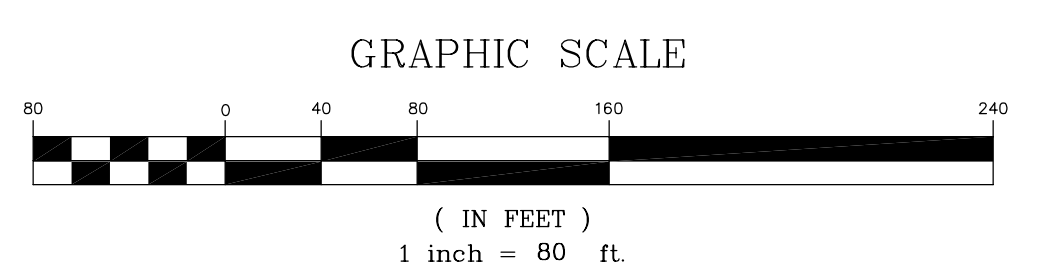
CONSTRUCTION ENTRANCE NOTES:

- STONE SIZE - USE 2 INCH STONE OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
- LENGTH - NOT LESS THAN 50 FEET.
- THICKNESS - NOT LESS THAN (12) INCHES.
- WIDTH - SIXTEEN (16) FEET MINIMUM. BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
- FILTER CLOTH - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
- SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE, IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
- MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
- WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
- PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.
- FOR THE STABILIZED CONSTRUCTION ENTRANCE, PERMANENT ACCESS ROAD, AND PARKING AREAS, USE HEAVY DUTY ROAD FILTER CLOTH SUCH AS TREVIRA SPUNBOND 1135, MIRAFI 600X, OR EQUIVALENT, WITH THE FOLLOWING PROPERTIES:

FABRIC PROPERTIES	HEAVY DUTY HAUL ROADS ROUGH GRADED	TEST METHOD
GRAB TENSILE STRENGTH (LBS)	220	ASTM D1682
ELONGATION AT FAILURE (%)	60	ASTM D1682
MULLEN BRUSH STRENGTH (LBS)	430	ASTM D3786
PUNCTURE STRENGTH (LBS)	125	ASTM D751 MODIFIED
EQUIVALENT	40-80	US STD SIEVE
OPENING SIZE	---	CW-02215
AGGREGATE DEPTH (IN)	10	---

LEGEND:

- = EXISTING GRADE-MAJOR CONTOUR
- = EXISTING GRADE-MINOR CONTOUR
- = PROPOSED GRADE
- = TAX LOT LINE
- OH --- OH --- OH --- OH --- = OVERHEAD ELECTRIC WIRES
- E --- E --- E --- E --- = UNDERGROUND ELECTRIC WIRES
- W --- W --- W --- W --- = WATER MAIN
- G --- G --- G --- G --- = GAS MAIN
- D --- D --- D --- D --- = DRAINAGE LINES (STORM SEWER)
- S --- S --- S --- S --- = SANITARY SEWER MAIN
- = WOODED AREA
- X --- X --- X --- X --- = CHAIN-LINK OR BOARD FENCE
- = DIRT TRAIL
- = LIMITS OF CLEARING
- = SILT FENCE
- NE --- NE --- NE --- NE --- = NEW UNDERGROUND ELECTRIC WIRES
- NW --- NW --- NW --- NW --- = NEW WATER LINE
- NS --- NS --- NS --- NS --- = NEW SANITARY SEWER MAIN
- = HDPE PIPE AND ELECTRICAL CONDUIT
- 242 = TAX LOT NUMBER
- W --- W --- W --- W --- = WATER VALVE
- 242 = GAS VALVE
- RW1-MW-1 = MONITORING WELL
- RW-1 = RECOVERY WELL
- IW-1 = INJECTION WELL
- PB = PULL BOX
- = LEAK DETECTION ACCESS PORT
- = EXISTING DECIDUOUS TREE
- = EXISTING CONIFEROUS TREE
- = WHITE PINE TREE LOCATION
- = SIGN
- = MANHOLE
- = GRAVEL
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- ★ 6916 = PUBLIC WATER SUPPLY WELL



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DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
PENNSYLVANIA
BETHPAGE, NEW YORK

ENGINEERING FIELD ACTIVITY - NORTHEAST
GM-38 AREA
GROUNDWATER TREATMENT PLANT
SOIL EROSION AND SEDIMENT CONTROL DETAILS AND NOTES

6916

DATE: 05/20/06

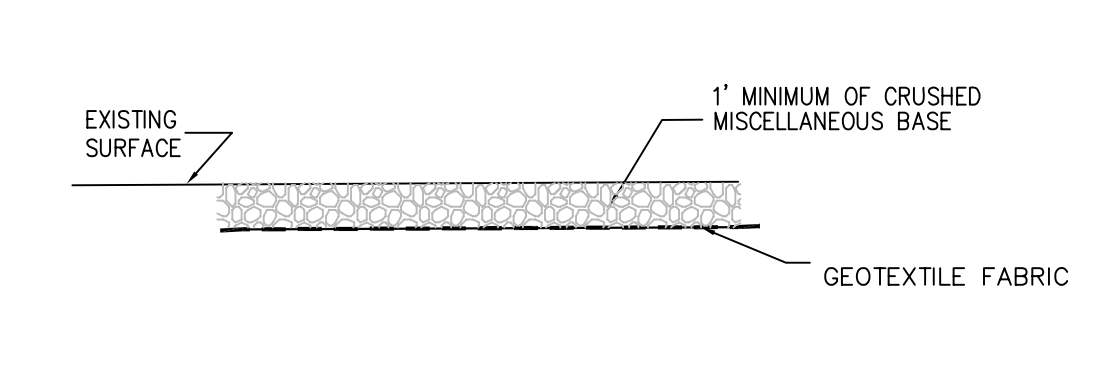
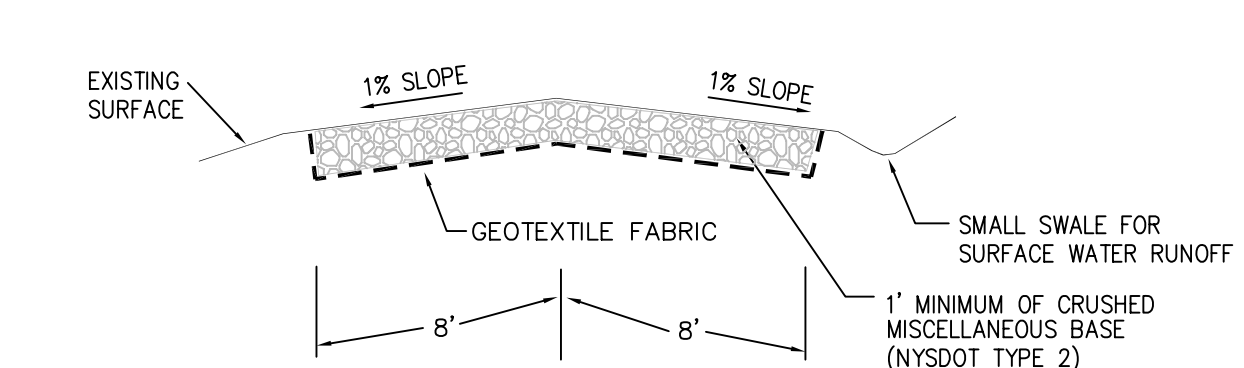
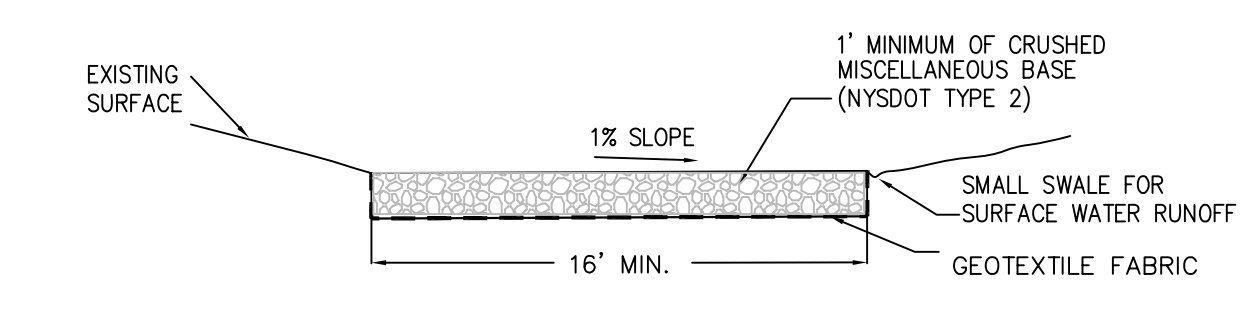
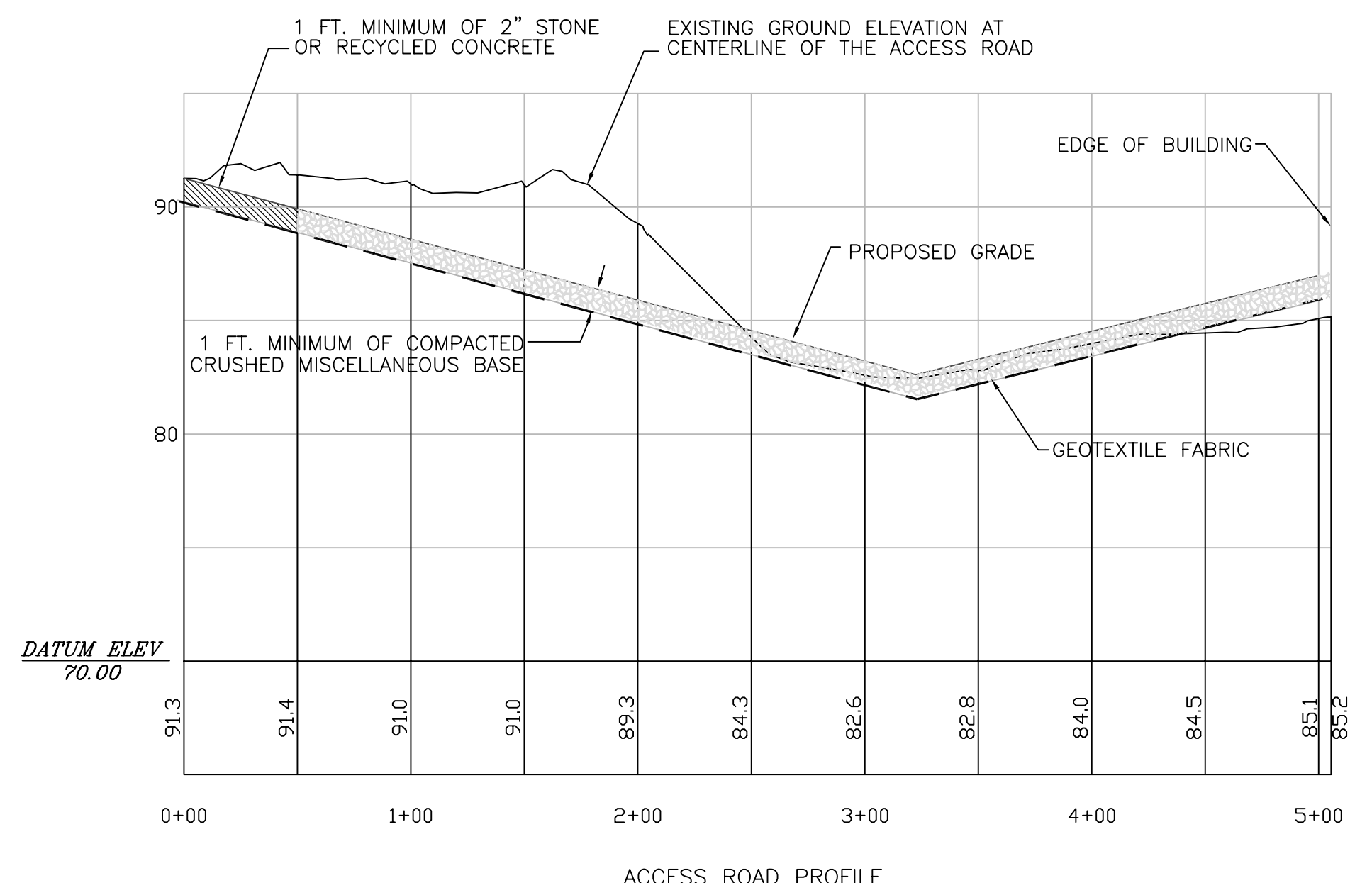
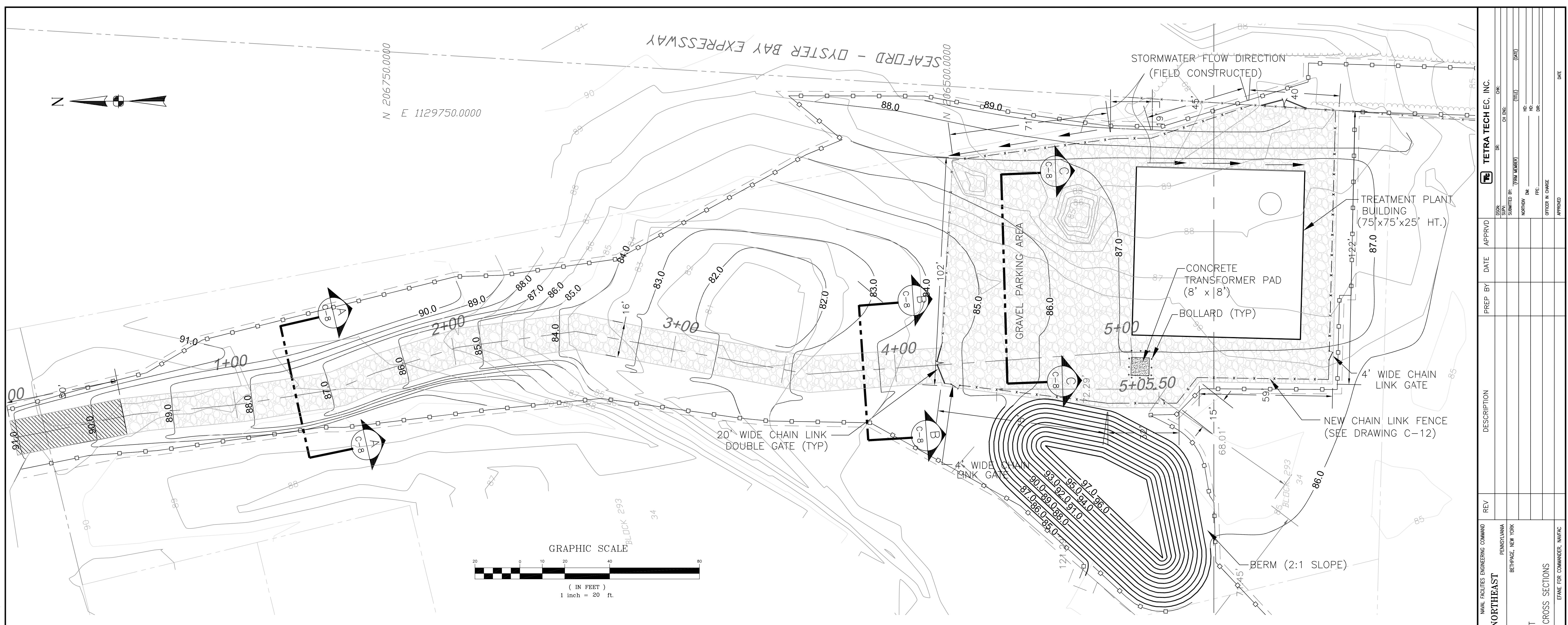
APPROVED: [Signature]

DATE: 05/20/06

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NAVFAC DRAWING NO.

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NAVY FACILITIES ENGINEERING COMMAND
PENNSYLVANIA
BETHPAGE, NEW YORK

ENGINEERING FIELD ACTIVITY - NORTHEAST
GM-38 AREA
GROUNDWATER TREATMENT PLANT
SITE GRADING PLAN, ACCESS ROAD PROFILE & CROSS SECTIONS

DEPARTMENT OF THE NAVY
NAVFAC INDIANAPOLIS RESERVE PLANT
NAVFAC INDIANAPOLIS
NAVFAC INDIANAPOLIS
NAVFAC INDIANAPOLIS

TETRA TECH EC, INC.
SUBMITTED BY: (TERRI BURBES)
DRAWN BY: (TERRI BURBES)
CHECKED BY: (TERRI BURBES)
DATE: (DATE)
SCALE: (SCALE)
PROJECT: (PROJECT)
SHEET: (SHEET)
OF: (OF)
DATE: (DATE)

APPROVED: (Signature)
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SCALE: AS SHOWN

SPEC. NO.

CONSTR. CONTR. NO. N62472-99-D-0032

NAVFAC DRAWING NO.

SHEET OF DIS. SH. NO. D C-8



SEEDING NOTES:

THIS PRACTICE APPLIES TO ALL DISTURBED AREAS VOID OF VEGETATION EXCEPT WHERE SPECIFIC SEEDING/PLANTING RECOMMENDATIONS EXIST IN OTHER STANDARDS AND SPECIFICATIONS FOR SPECIFIC USES SUCH AS RECREATION.

1. SURFACE AND SUBSURFACE WATER CONTROL PRACTICES MAY BE REQUIRED.
2. PLANNED USE OF THE AREA MUST BE CONSIDERED WHEN SELECTING AN APPROPRIATE SEED MIX.
3. SITE PREPARATION WILL INCLUDE:
 - A. SEEDBED PREPARATION - SCARIFY IF COMPACTED. REMOVE DEBRIS AND OBSTACLES SUCH AS ROCKS AND STUMPS.
 - B. SOIL AMENDMENTS
 - 1) LIME TO pH OF 6.0.
 - 2) FERTILIZE WITH 600 LBS. OF 5-10-10 OR EQUIVALENT PER ACRE (14 LBS./1000 SQ. FT.).
 - C. SEED MIXTURES
 - 1) TEMPORARY SEEDINGS
 - A. RYEGRASS (ANNUAL OR PERENNIAL) @ 30 LBS. PER ACRE (0.7 LBS./1000 SQ. FT.)
 - B. CERTIFIED 'AROSTOOK' WINTER RYE (CEREAL RYE) @ 100 LBS. PER ACRE (2.5 LBS./1000 SQ. FT.).
 USE WINTER RYE IF SEEDING IN OCTOBER/NOVEMBER.
 - 2) PERMANENT SEEDINGS
 - A. ROUGH OR OCCASIONALLY MOWED AREAS:

	LBS./ACRE	LBS./1000 SQ. FT.
EMPIRE BIRDSFOOT TREFOIL ² OR COMMON WHITE CLOVER ²	8	0.20
PLUS TALL FESCUE	20	0.45
PLUS RED TOP OR RYEGRASS (PERENNIAL)	2	0.05
5	0.10	
 - B. FREQUENTLY MOWED AREAS: REFER TO STANDARD AND SPECIFICATION FOR RECREATION AREA IMPROVEMENT ON PAGE 3.5 OF THE NEW YORK GUIDELINES FOR URBAN EROSION AND SEDIMENT CONTROL DATED APRIL 1997.
 - 2) ADD INOCULANT IMMEDIATELY PRIOR TO SEEDING.
 - D. TIME OF SEEDING
 THE OPTIMUM TIME FOR PERMANENT SEEDINGS WITH LEGUMES (BIRDSFOOT TREFOIL OR CLOVER) IS EARLY SPRING. PERMANENT SEEDINGS MAY BE MADE ANY TIME OF YEAR IF PROPERLY MULCHED AND ADEQUATE MOISTURE IS PROVIDED. MID SUMMER IS NOT A GOOD TIME TO SEED, BUT THESE SEEDINGS, IF CONSTRUCTION IS COMPLETE, WILL FACILITATE COVERING THE LAND. PORTIONS MAY FAIL AND MAY NEED RESEEDING THE FOLLOWING YEAR. TEMPORARY SEEDINGS SHOULD BE MADE WITHIN 24 HOURS OF CONSTRUCTION OF DISTURBANCE. IF NOT, THE SOIL MUST BE SCARIFIED PRIOR TO SEEDING.
 - E. METHOD OF SEEDING
 BROADCASTING, DRILLING WITH CULTIPACK TYPE SEEDER OR HYDROSEEDING ARE ACCEPTABLE. GOOD SOIL TO SEED CONTACT IS THE KEY TO SUCCESSFUL SEEDINGS.
 - F. MULCHING AND MULCH ANCHORING
 MULCHING IS ESSENTIAL TO OBTAIN A UNIFORM STAND OF PLANTS. SEE STANDARD AND SPECIFICATIONS FOR MULCHING ON PAGE 3.31 OF THE NEW YORK GUIDELINES FOR URBAN EROSION AND SEDIMENT CONTROL DATED APRIL 1997.
 - G. IRRIGATION
 WATERING MAY BE ESSENTIAL TO ESTABLISH A NEW SEEDING. WEATHER CONDITIONS AND THE INTENDED USE OF THE AREA WILL DICTATE WHEN TO WATER. IRRIGATION IS A SPECIALIZED PRACTICE AND CARE NEEDS TO BE TAKEN NOT TO EXCEED THE APPLICATION RATE/INFILTRATION RATE OF ANY GIVEN SOIL.

NOTE:

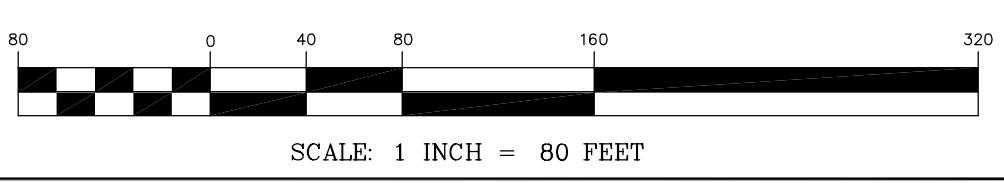
1. A MAXIMUM OF 100 PINUS STROBUS (WHITE PINE) SHALL BE PLANTED AT THE APPROXIMATE LOCATIONS SHOWN ON THIS CONTRACT DRAWING. THESE EASTERN WHITE PINE TREES ARE SELECTED DUE TO THEIR RAPID GROWTH AND ABILITY TO PROVIDE A VISUAL AND NOISE BARRIER WHEN FULLY GROWN. THE TREES WILL BE 10'-12' IN HEIGHT WITH 3" MINIMUM AVERAGE DIAMETER AND SPACED APPROXIMATELY 10 FEET ON CENTER. THE WHITE PINE TREES PARALLELING THE SEAFORD OYSTER BAY EXPRESSWAY WILL BE SPREAD AROUND EXISTING TREES AND PREVIOUSLY PLANTED WHITE PINE TREES. PEAT MOSS AND FERTILIZERS CONSISTING OF NITRATE OF SODA AND HOLLY TONE ACID WILL BE USED DURING PLANTING.
2. THE CONTRACTOR IS RESPONSIBLE FOR THE PLANTINGS FOR A PERIOD OF AT LEAST ONE YEAR AFTER THE INSTALLATION AND MUST REPLACE ANY DEAD OR DAMAGED PLANTINGS IN A TIMELY FASHION. AFTER THIS MAINTENANCE PERIOD, THE NAVY SHOULD ASSUME THIS RESPONSIBILITY UNTIL THE SYSTEM IS DECOMMISSIONED.

LEGEND:

	= EXISTING GRADE-MAJOR CONTOUR
	= EXISTING GRADE-MINOR CONTOUR
	= PROPOSED GRADE
	= TAX LOT LINE
	= OVERHEAD ELECTRIC WIRES
	= UNDERGROUND ELECTRIC WIRES
	= WATER MAIN
	= GAS MAIN
	= DRAINAGE LINES (STORM SEWER)
	= SANITARY SEWER MAIN
	= WOODED AREA
	= CHAIN-LINK OR BOARD FENCE
	= DIRT TRAIL
	= LIMITS OF CLEARING
	= SILT FENCE
	= NEW UNDERGROUND ELECTRIC WIRES
	= NEW WATER LINE
	= NEW SANITARY SEWER MAIN
	= HDPE PIPE AND ELECTRICAL CONDUIT
	= TAX LOT NUMBER
	= WATER VALVE
	= GAS VALVE
	= MONITORING WELL
	= RECOVERY WELL
	= INJECTION WELL
	= PULL BOX
	= LEAK DETECTION ACCESS PORT
	= EXISTING DECIDUOUS TREE
	= EXISTING CONIFEROUS TREE
	= WHITE PINE TREE LOCATION
	= SIGN
	= MANHOLE
	= GRAVEL

	= TEMPORARY ACCESS ROAD
	= PUBLIC WATER SUPPLY WELL

REFERENCE:
 L. K. McLEAN ASSOCIATES, P.C.
 437 SO. COUNTRY ROAD, BROOKHAVEN, NY
 TOPOGRAPHIC SURVEY, NAVAL WEAPONS INDUSTRIAL RESERVE PLANT,
 GM-38 AREA, FILE # 04033.000
 AUGUST 2, 2004

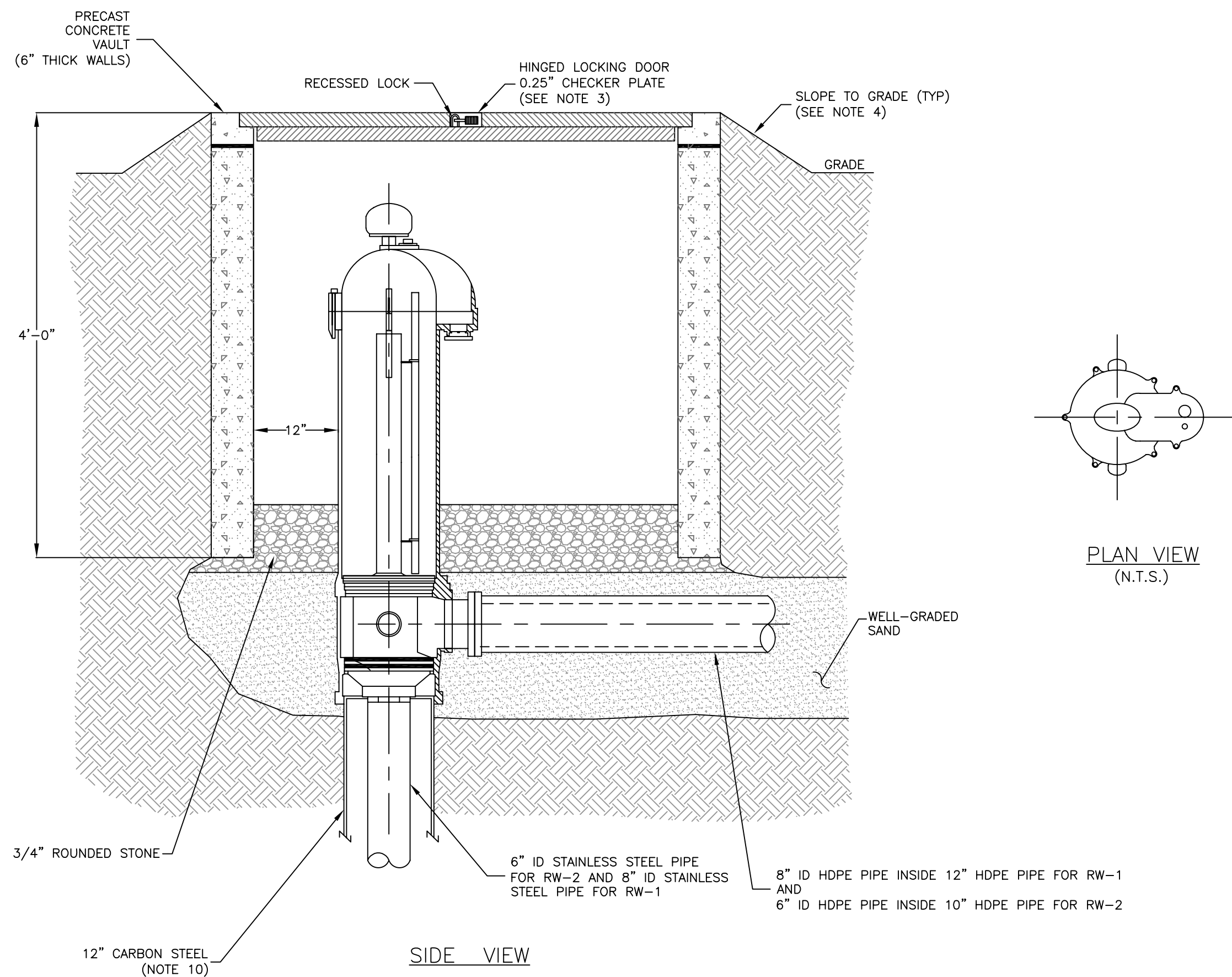


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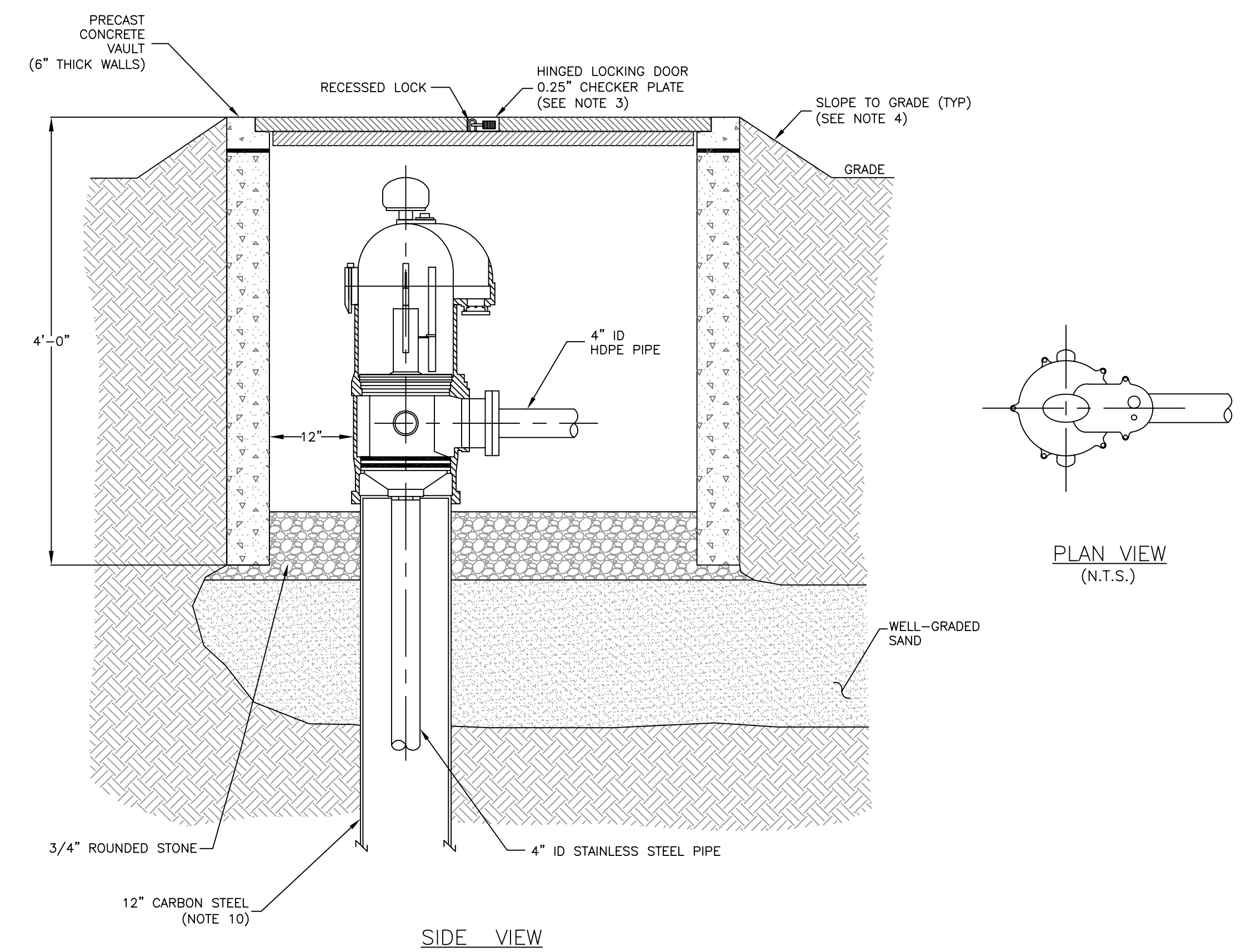
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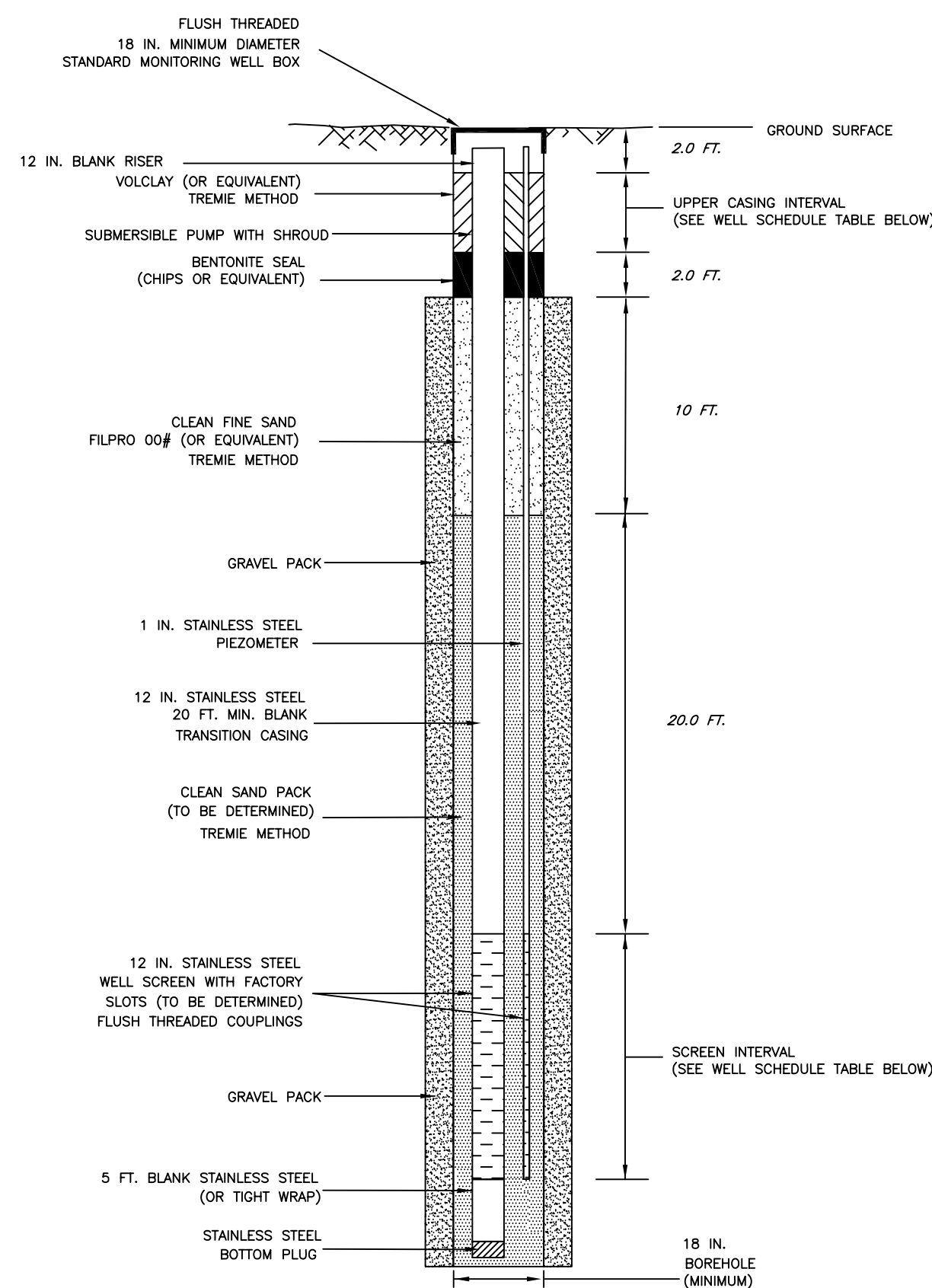
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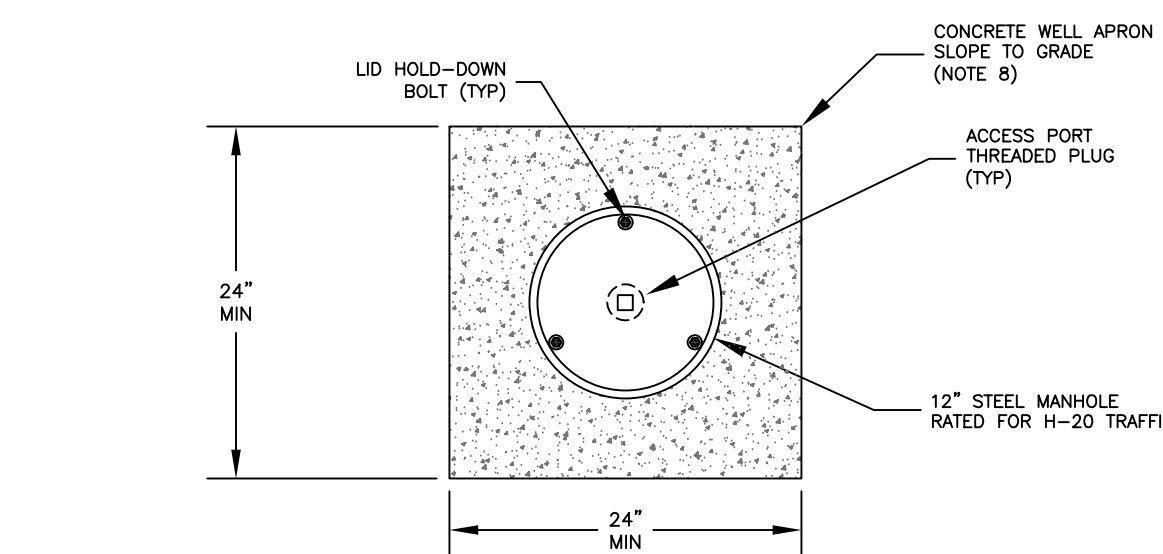
DETAIL 1 RECOVERY WELLHEAD VAULT (TYP.)
(N.T.S.) C-4 (SEE NOTE 11)



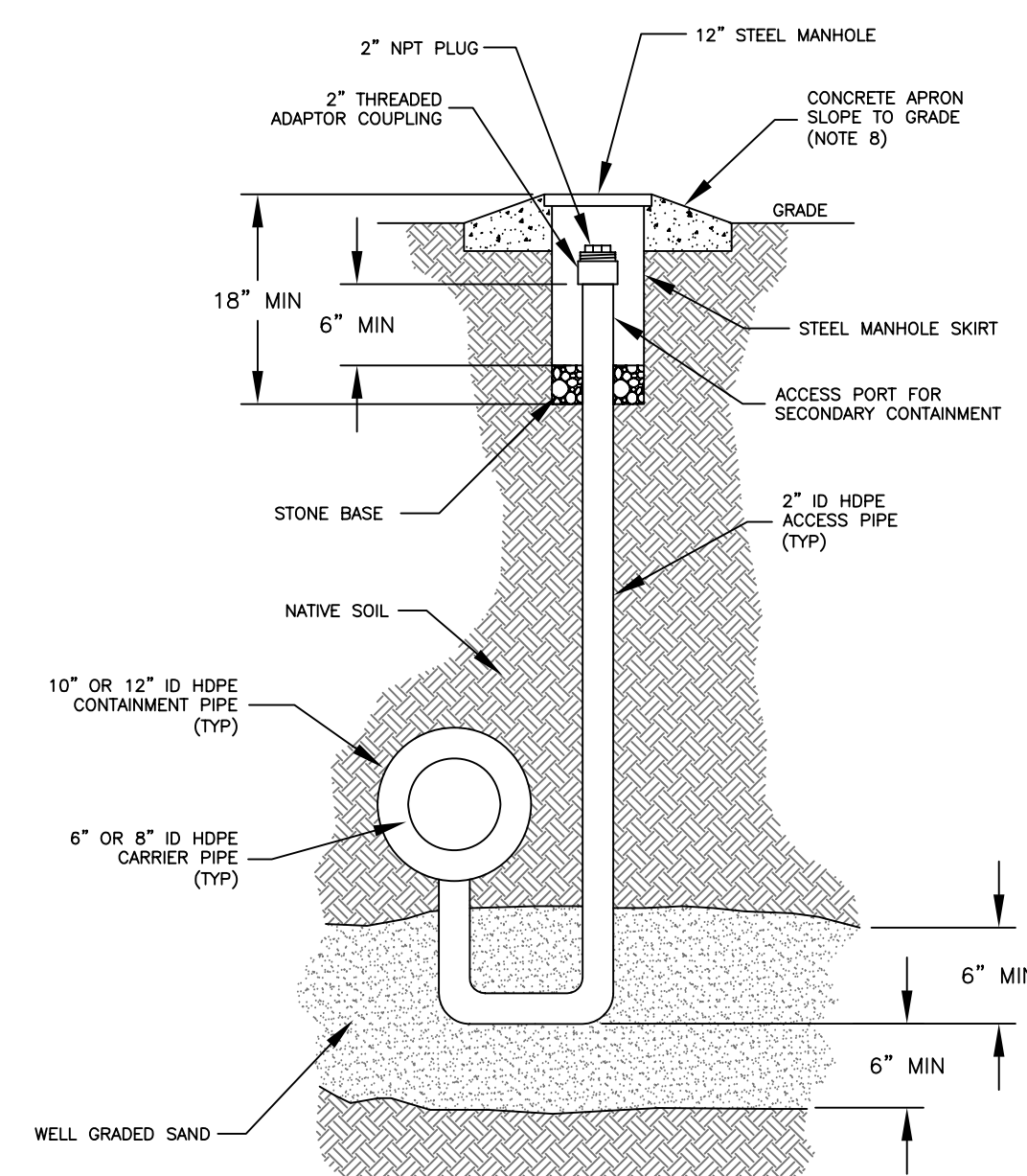
DETAIL 2 INJECTION WELLHEAD VAULT (TYP.)
(N.T.S.) C-5 (SEE NOTE 12)



DETAIL 3 RECOVERY WELL (TYP.)
(N.T.S.) C-4



DETAIL 4 LEAK DETECTION ACCESS PORT PLAN VIEW (TYP.)
(N.T.S.) C-4



DETAIL 5 LEAK DETECTION ACCESS PORT SECTION VIEW (TYP.)
(N.T.S.) C-4

WELL SCHEDULE							
WELL NO.	NORTHING (FEET) (SEE NOTE 10)	EASTING (FEET) (SEE NOTE 10)	UPPER CASING INTERVAL (FEET BGS)	TRANSITION CASING INTERVAL (FEET BGS)	SCREEN INTERVAL (FEET BGS)	TOP OF PUMP DEPTH (FEET BGS)	TOP OF TRANSDUCER DEPTH (FEET BGS)
RW-1	206028.8186	1129745.4442	0 - 315	315-335	335 - 395	150	140
RW-1					410 - 430		
RW-2	206380.5302	1129284.0306	0 - 414	414-440	440 - 510	150	140

WELL PUMP SCHEDULE							
WELL NO.	PUMP ID	GRUNDFOS MODEL NO.	FLOW RATE (GPM)	TOTAL HEAD (FT)	HORSEPOWER (HP)	VOLTAGE (V)	PHASE
RW-1	P-1	800S500-2A	800	112	60	460	3
RW-2	P-2	300S150-4	300	100	15	460	3

- NOTES:
- FOR ELECTRICAL LAYOUT AND DETAILS, SEE DWG E-10.
 - FOR WELL AND PIPING LAYOUT, SEE DWGS C-2 THROUGH C-5.
 - VAULT DOORS ARE ALUMINUM DOUBLE-DOOR TYPE WITH 1/4" DIAMOND PLATE AT A RATING OF 300-PSF. DOORS ARE SEALED TO RESIST WATER INFILTRATION. VAULT LID AND DOORS HAVE BEEN CONSTRUCTED PER MANUFACTURER FOR ALUMINUM "JUST SET" DOORS (MFR: PA INSERT CORP.). DOORS INCLUDE STAINLESS STEEL HINGES, 316SS PNEUMATIC ASSIST, AUTO HOLD-OPEN ARM, 304SS HARDWARE, DRAIN COUPLING, ETC.
 - TOP OF VAULTS EXTEND TO A MINIMUM OF 2" TO MAXIMUM OF 6" ABOVE GRADE. SOIL PLACED AROUND VAULTS AT A MAXIMUM SLOPE OF 10%.
 - JOINTS OF PRECAST CONCRETE AND VAULT DOORS ARE SEALED WITH A PREFORMED RUBBER GASKET OR JOINT SEALANT PER MANUFACTURER'S REQUIREMENTS.
 - ACCESS PORT MANHOLE IS 6" DIAMETER MINIMUM. MANHOLE LID HAS A MINIMUM BOLT PATTERN OF TWO OR THREE AND A MINIMUM RATING OF H-20.
 - RGS CONDUIT SLEEVES SHALL BE SEALED ON BOTH SIDES OF THE VAULT WALLS WITH A MASONRY CAULK/SEALANT.
 - CONCRETE APRON FOR MANHOLES ARE A MINIMUM OF 24" x 24" SQUARE OR 24" DIAMETER. MINIMUM THICKNESS IS 4". CONCRETE IS 3,000 PSI WITH 6x6 WWF. CONCRETE APRON PITCHED AWAY FROM MANHOLE AT AN APPROXIMATE SLOPE OF 2%.
 - THE 304 STAINLESS STEEL PUMP RISER PIPE IS INSTALLED IN 10-FOOT LONG SECTIONS OF PIPE AND THREADED ON EACH END. THIS IS DONE TO FACILITATE DISASSEMBLY OF PIPE DURING PUMP REMOVAL.
 - CONTRACTOR IS RESPONSIBLE FOR CUTTING THE WELL CASING DOWN TO ITS FINAL ELEVATION. DUE TO PRESENCE OF WELL VAPORS, THE CONTRACTOR MAY NEED TO PROVIDE A MEANS TO ELIMINATE THE POTENTIAL FOR COMBUSTION DURING CUTTING ACTIVITIES.
 - THE RECOVERY WELL VAULT SHALL BE CONSTRUCTED OF PRECAST REINFORCED CONCRETE WITH INTERNAL DIMENSIONS OF 8'x8'x4'H AND A 6" WALL THICKNESS.
 - THE INJECTION WELL VAULT SHALL BE CONSTRUCTED OF PRECAST REINFORCED CONCRETE WITH INTERNAL DIMENSIONS OF 6'x6'x4'H AND A 6" WALL THICKNESS.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY - NORTHEAST
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
GM-38 AREA
GROUNDWATER TREATMENT PLANT
GROUNDWATER EXTRACTION WELLS - VAULT DETAILS

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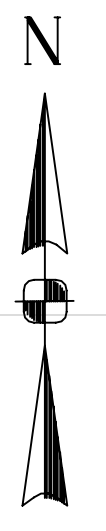
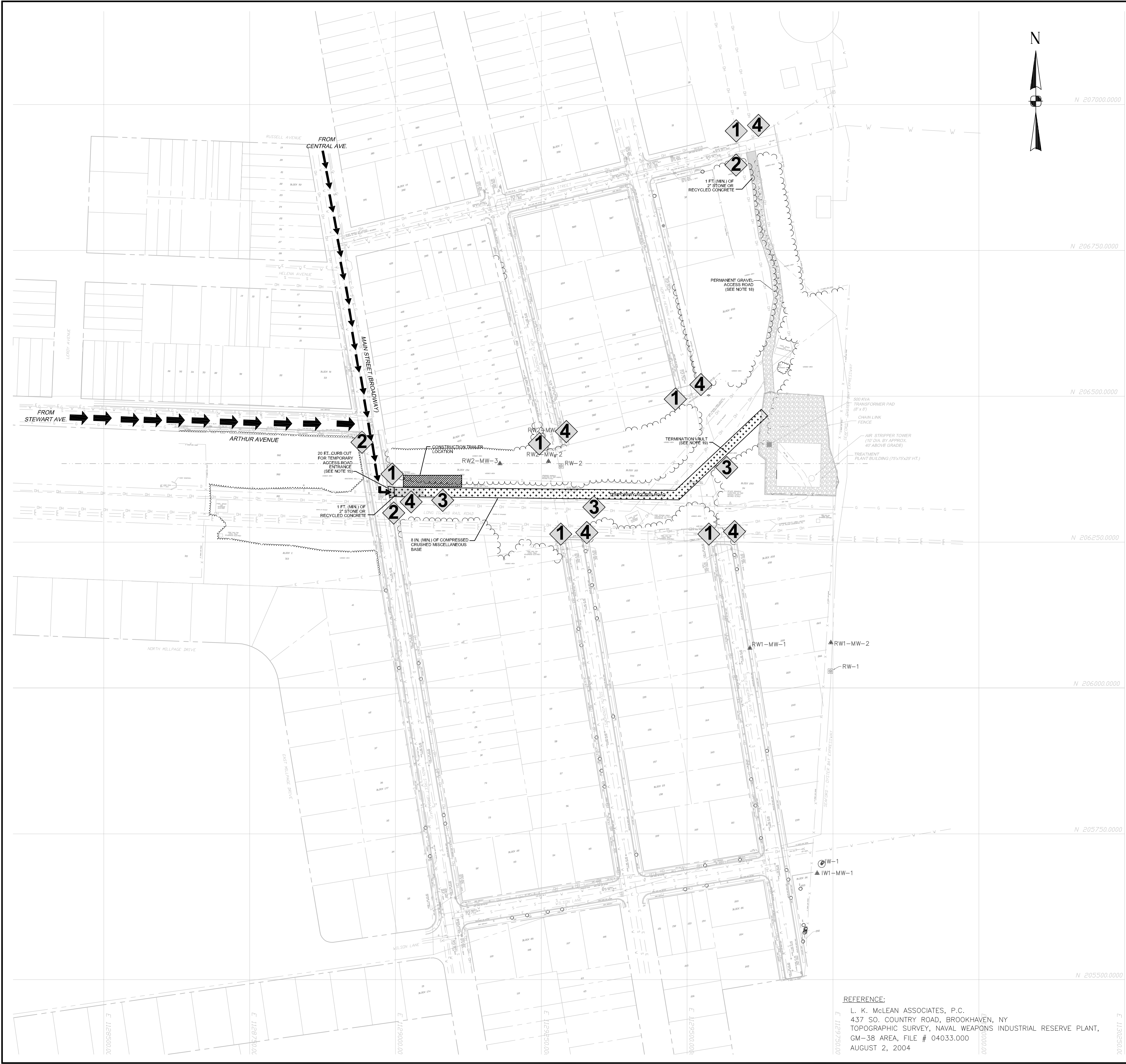
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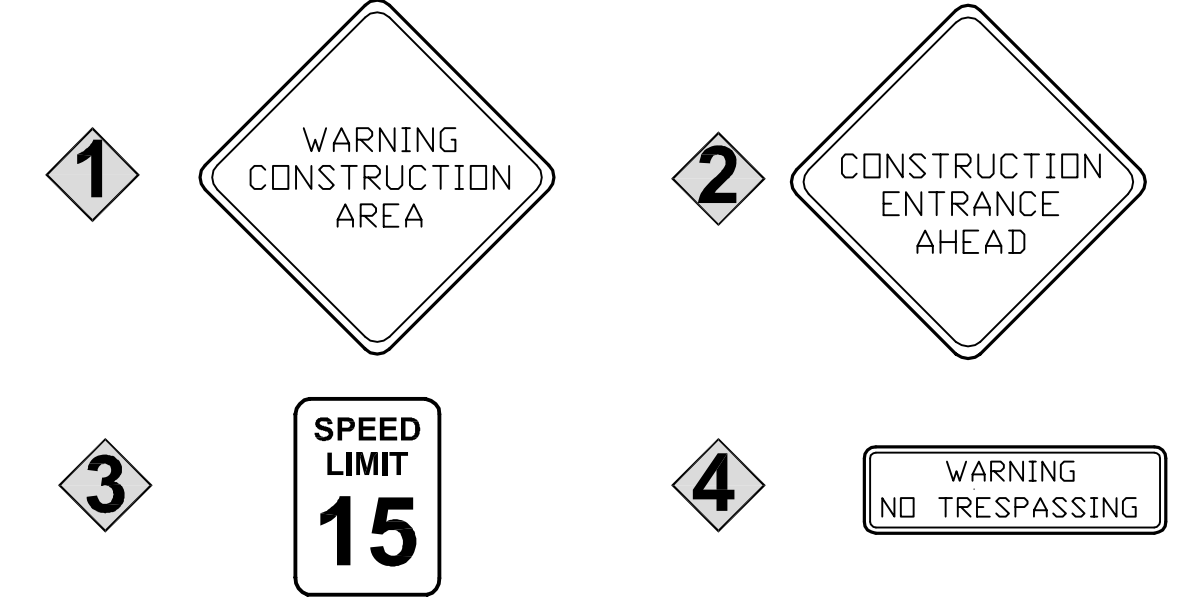
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NOTES:

1. SANITARY SEWER MANHOLE LOCATIONS AND RIM ELEVATIONS ARE AS PER L.K. McLEAN ASSOCIATES FIELD DATA EXCEPT WHERE OTHERWISE NOTED. ALL SEWER PIPE INVERTS (WHERE SHOWN) ARE AS PER NASSAU COUNTY SANITARY SEWER RECORD PLANS.
2. THE LOCATION OF OVERHEAD AND UNDERGROUND ELECTRIC LINES SHOWN ON THIS MAP ARE AS PER UTILITY MAPS PROVIDED BY LIPA UNLESS OTHERWISE NOTED.
3. THE LOCATION OF GAS MAINS SHOWN ON THIS MAP ARE AS PER UTILITY MAPS PROVIDED BY KEYSpan.
4. THE LOCATION OF WATER MAINS SHOWN ON THIS MAP ARE AS PER UTILITY MAPS PROVIDED BY THE BETHPAGE WATER DISTRICT.
5. STORM SEWER DRAINAGE MANHOLE LOCATIONS, CATCH BASIN LOCATIONS AND RIM ELEVATIONS ARE AS PER L.K. McLEAN ASSOCIATES FIELD DATA EXCEPT WHERE OTHERWISE NOTED.
6. THE LOCATION OF THE DRAINAGE (STORM SEWER) PIPES ON SOPHIA STREET HAVE NOT BEEN ESTABLISHED. THERE IS NO DATA ON RECORD AT THE TOWN OF OYSTER BAY DEPARTMENT OF PUBLIC WORKS.
7. MEASUREMENTS ARE IN ACCORDANCE WITH U.S. STANDARDS.
8. COORDINATES AND BEARINGS SHOWN ARE IN LONG ISLAND ZONE OF THE NEW YORK STATE PLANE COORDINATE SYSTEM NAD 1983. ELEVATIONS REFER TO NAVD 1929.
9. UNAUTHORIZED ALTERATION OR ADDITION TO A SURVEY MAP BEARING A LICENSED LAND SURVEYOR'S SEAL IS A VIOLATION OF SECTION 7209, SUBDIVISION 2, OF NEW YORK STATE EDUCATION LAW.
10. CERTIFICATIONS INDICATED HEREON SIGNIFY THAT THIS SURVEY WAS PREPARED IN ACCORDANCE WITH THE EXISTING CODE OF PRACTICE FOR LAND SURVEYORS ADOPTED BY THE NEW YORK STATE ASSOCIATION OF PROFESSIONAL LAND SURVEYORS. SAID CERTIFICATIONS SHALL RUN ONLY TO THE PERSON FOR WHOM THE SURVEY IS PREPARED, AND ON HIS BEHALF TO THE TITLE COMPANY, GOVERNMENTAL AGENCY AND LENDING INSTITUTION LISTED HEREON, AND TO THE ASSIGNEES OF THE LENDING INSTITUTION. CERTIFICATIONS ARE NOT TRANSFERABLE TO ADDITIONAL INSTITUTIONS OR SUBSEQUENT OWNERS.
11. RIGHTS-OF-WAY NOT SHOWN ARE NOT CERTIFIED.
12. LINES IDENTIFIED ON THIS DRAWING AS PART OF GWTP PROJECT ILLUSTRATE APPROXIMATE AND DO NOT REPRESENT ACTUAL PIPE/WIRE SIZES OR TRENCH WIDTHS.
13. TEMPORARY ACCESS ROAD ENTRANCE FROM BROADWAY AVE. SHALL INCLUDE 20 FT. CURB CUT FOR INSTALLATION OF CONCRETE DRIVEWAY APRON.

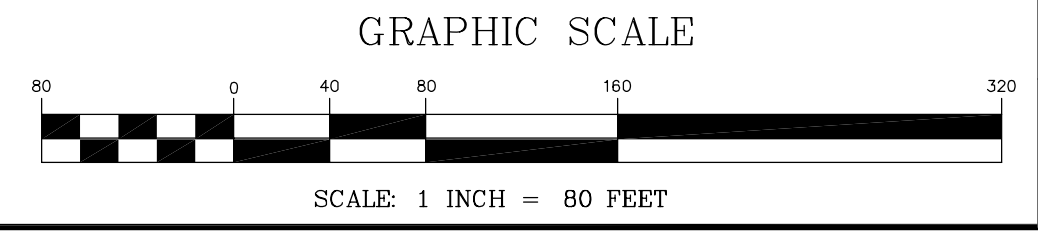


LEGEND:

- = EXISTING GRADE—MAJOR CONTOUR
- = EXISTING GRADE—MINOR CONTOUR
- = PROPOSED GRADE
- = TAX LOT LINE
- = OVERHEAD ELECTRIC WIRES
- = UNDERGROUND ELECTRIC WIRES
- = WATER MAIN
- = GAS MAIN
- = DRAINAGE LINES (STORM SEWER)
- = SANITARY SEWER MAIN
- = WOODED AREA
- = CHAIN-LINK OR BOARD FENCE
- = DIRT TRAIL
- = LIMITS OF CLEARING
- = SILT FENCE
- = NEW UNDERGROUND ELECTRIC WIRES
- = NEW WATER LINE
- = NEW SANITARY SEWER MAIN
- = HDPE PIPE AND ELECTRICAL CONDUIT
- 242 = TAX LOT NUMBER
- = WATER VALVE
- = GAS VALVE
- = MONITORING WELL
- = RECOVERY WELL
- = INJECTION WELL
- = PULL BOX
- = LEAK DETECTION ACCESS PORT
- = EXISTING DECIDUOUS TREE
- = EXISTING CONIFEROUS TREE
- = WHITE PINE TREE LOCATION
- = SIGN
- ★ 6916 = PUBLIC WATER SUPPLY WELL
- = MANHOLE
- = GRAVEL
- = TEMPORARY ACCESS ROAD

REFERENCE:

L. K. McLEAN ASSOCIATES, P.C.
 437 SO. COUNTRY ROAD, BROOKHAVEN, NY
 TOPOGRAPHIC SURVEY, NAVAL WEAPONS INDUSTRIAL RESERVE PLANT,
 GM-38 AREA, FILE # 04033.000
 AUGUST 2, 2004

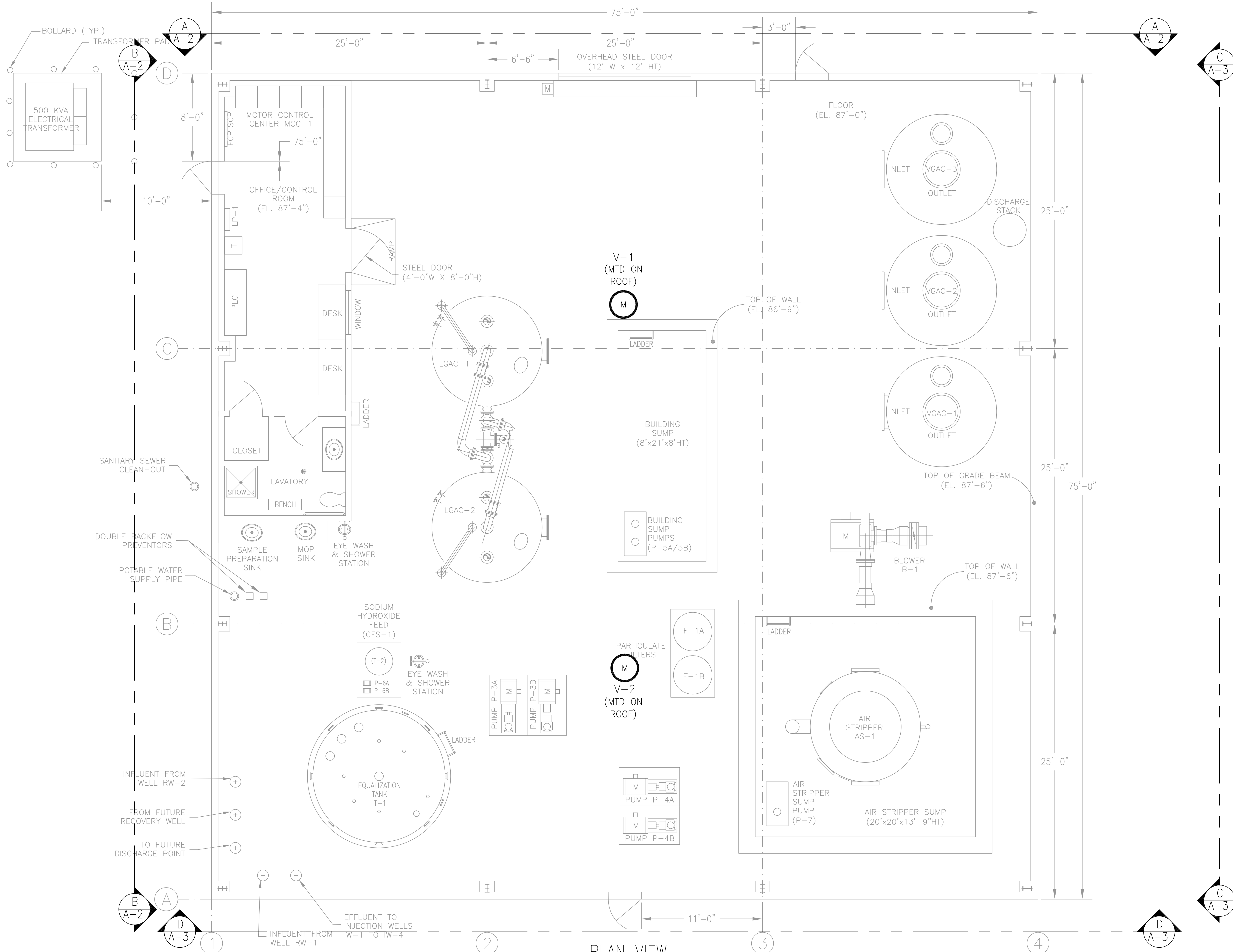


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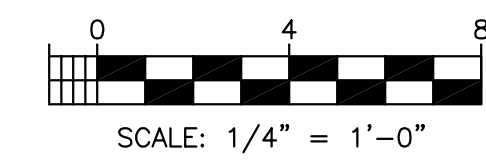
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TETRA TECH EC, INC.		DATE
DESIGNER	DATE	APPROVED
PREP BY	DATE	APPROVED
DESCRIPTION	REV	DATE
NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY - NORTHEAST GM-38 AREA GROUNDWATER TREATMENT PLANT TRAFFIC CONTROL ROUTES	PENNSYLVANIA BETHPAGE, NEW YORK NAVAL WEAPONS INDUSTRIAL RESERVE PLANT	DATE APPROVED EFAHE FOR COMMANDER, NAVFAC
CODE ID. NO. 80091 SCALE: AS SHOWN SPEC. NO. CONSTR. CONTR. NO. N62472-99-D-0032 NAVFAC DRAWING NO.	SHEET OF DIS. SH. NO. C-11	DATE



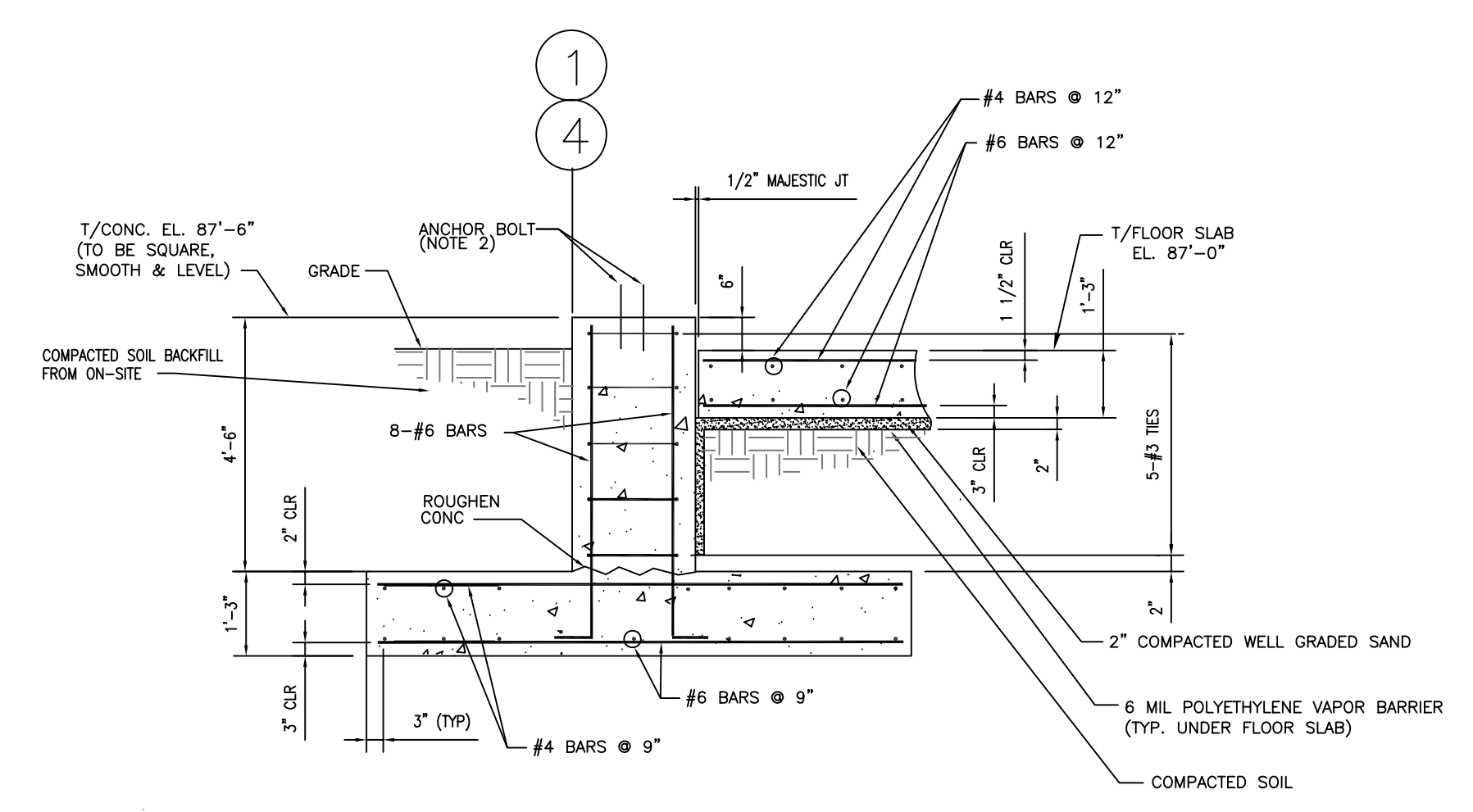
PLAN VIEW
SCALE: 1/4"=1'-0"



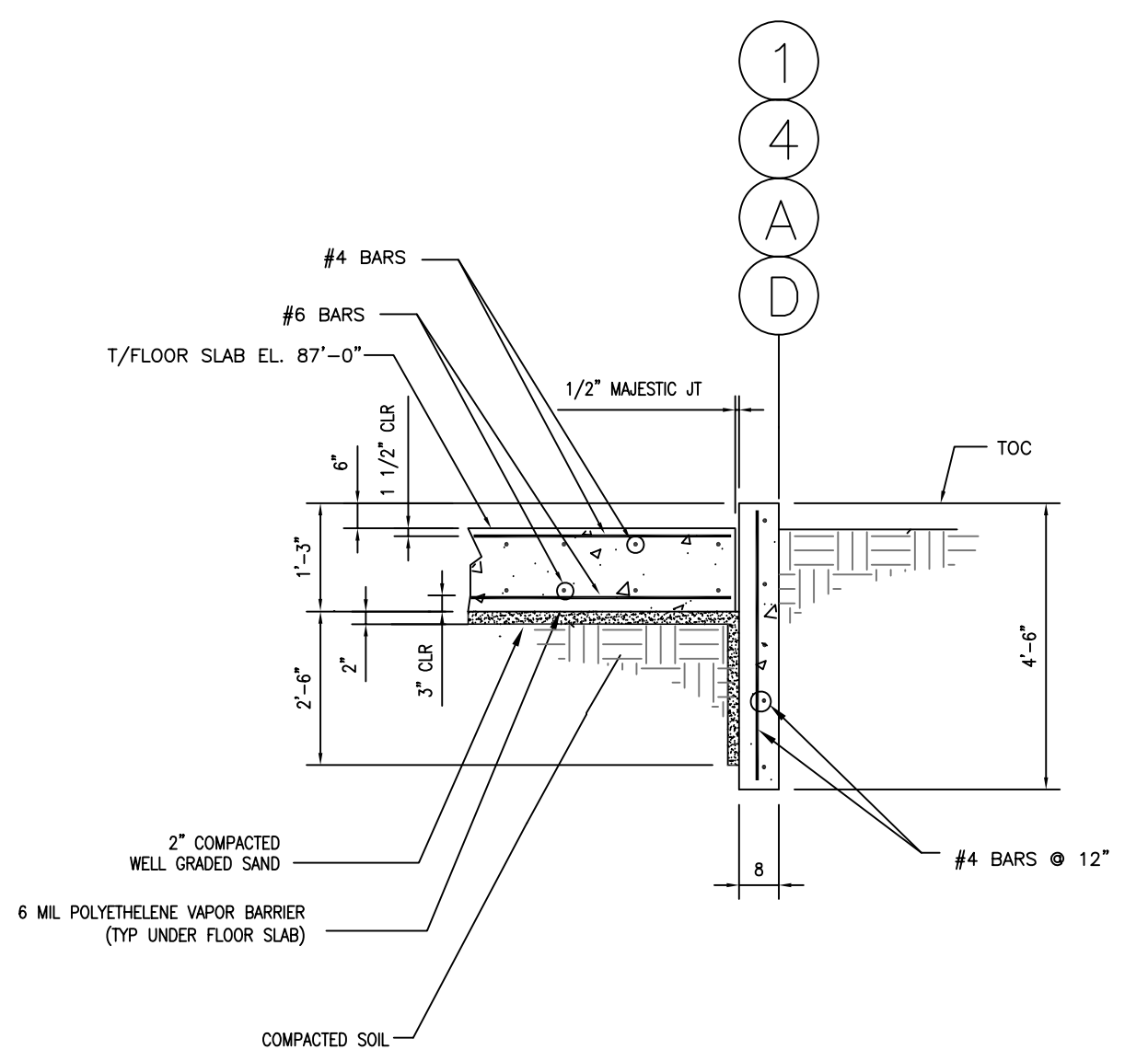
		TETRA TECH EC. INC. 1000 ROUTE 208 BETHPAGE, NY 11702 TEL: 609-426-1000 FAX: 609-426-1001 WWW.TETRA-TECH.COM	
DESIGNED BY: _____ CHECKED BY: _____ SUBMITTED BY: (FORM NUMBER) _____ APPROVED BY: _____ DATE: _____	APPROVED BY: _____ DATE: _____	DESCRIPTION: _____ REV: _____ DATE: _____	PREP BY: _____ DATE: _____
DEPARTMENT OF THE NAVY ENGINEERING FIELD ACTIVITY - NORTHEAST NAVAL FACILITIES ENGINEERING COMMAND PENNSYLVANIA BETHPAGE, NEW YORK		GM-38 AREA GROUNDWATER TREATMENT PLANT LAYOUT PLAN	
ESTER NAVAL WEAPONS INDUSTRIAL RESERVE PLANT APPROVED: _____ DATE: _____ EFMF FOR COMMANDER, NAVFAC		Brian Klein Blonchard, P.E. NYPE NO. 082572 SAT TO: _____ DATE: 05/05/06 CODE I.D. NO.: 80091 SCALE: AS SHOWN SPEC. NO.: _____ CONSTR. CONTR. NO.: N62472-99-D-0032 NAVFAC DRAWING NO.: _____	
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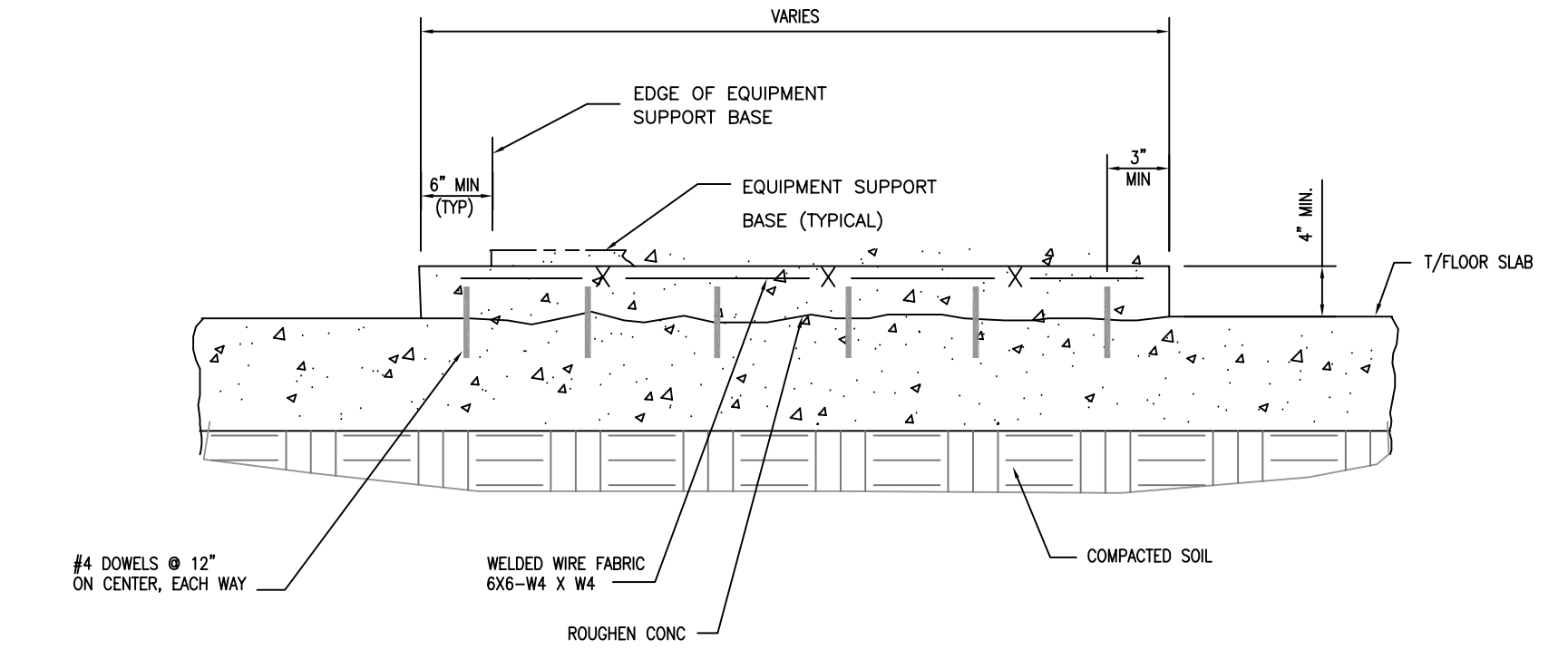
- NOTES:
- FOR NOTES SEE DRAWING S-1
 - ANCHOR BOLTS FOR BUILDING COLUMNS TO BE PROVIDED BY VENDOR.



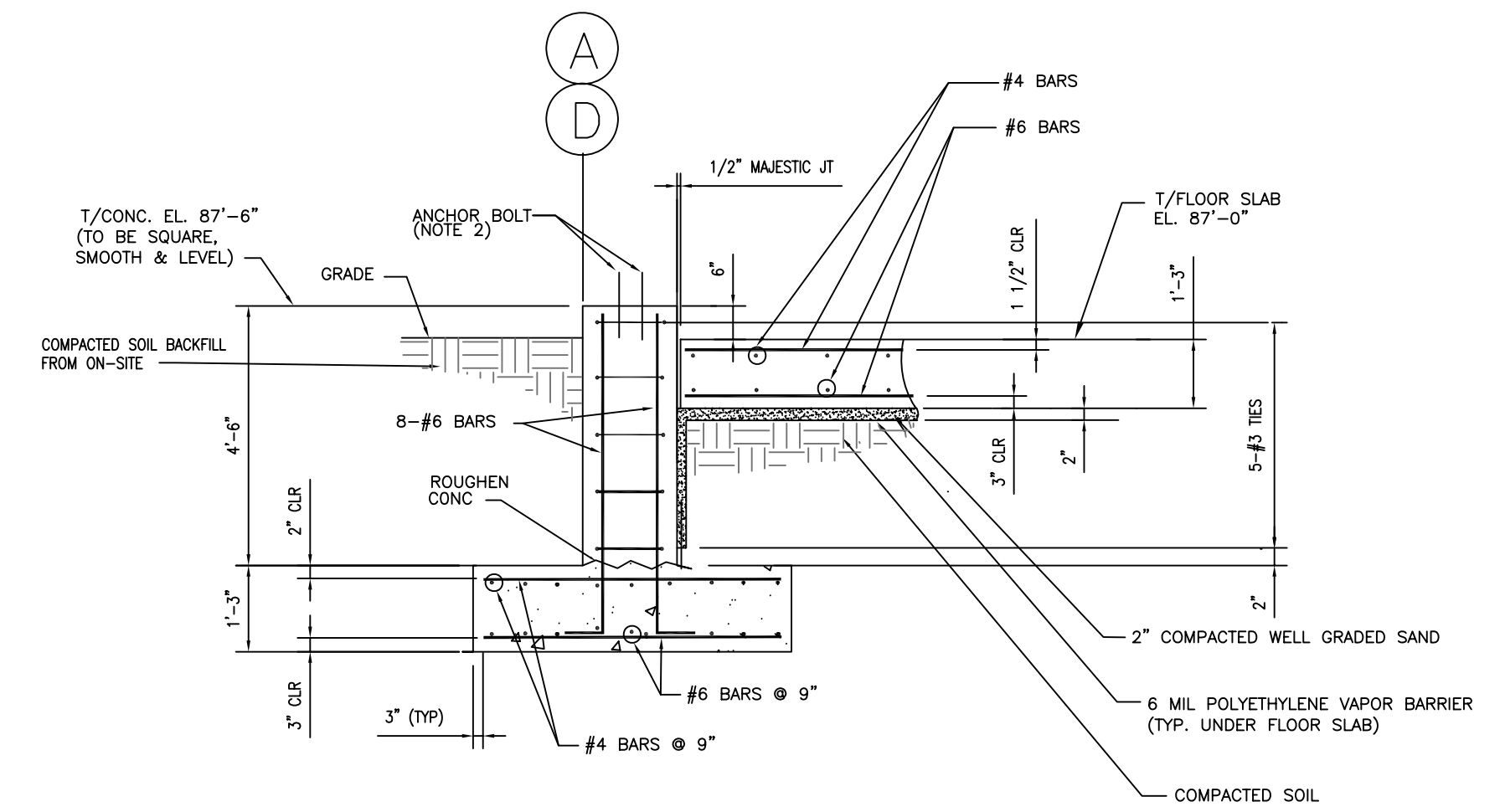
SECTION A
(N.T.S.) TYPICAL 4 PLACES



SECTION C
(N.T.S.) TYPICAL 4 PLACES

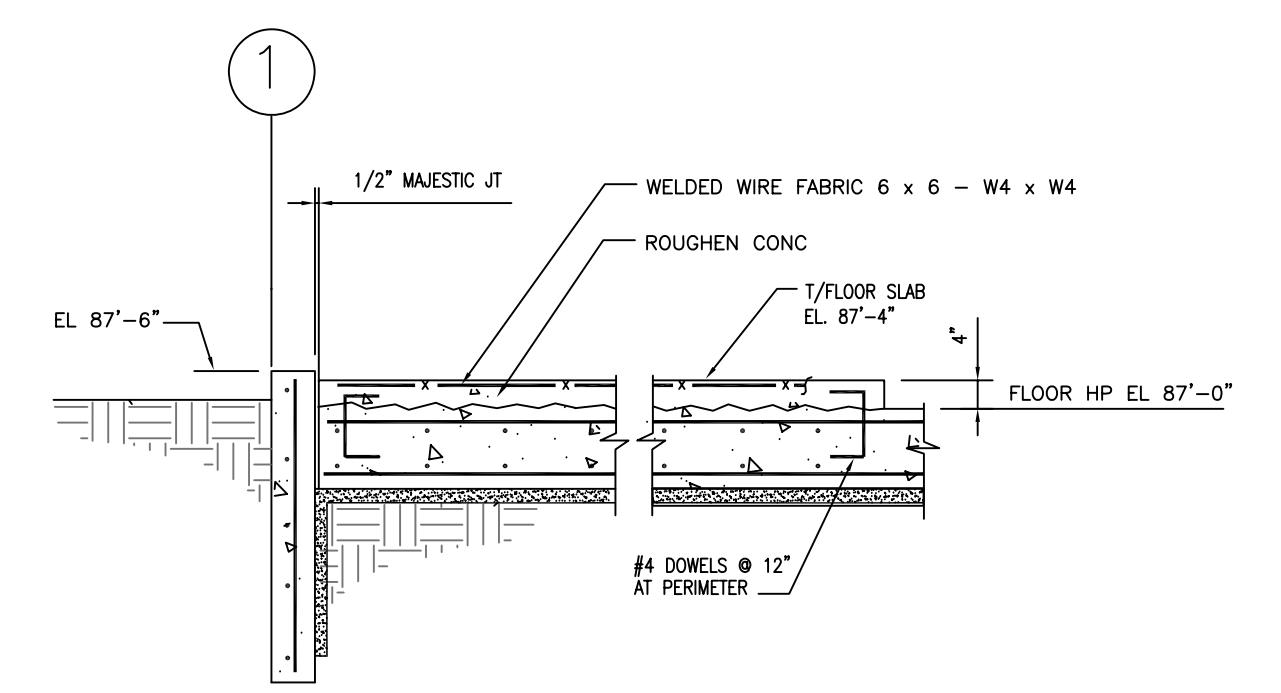


TYPICAL SECTION THRU EQUIPMENT PAD

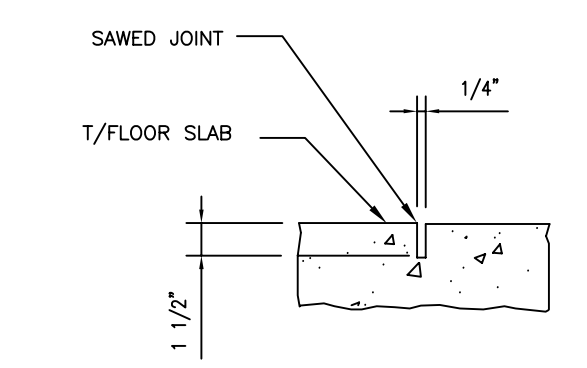


SECTION B
(N.T.S.) TYPICAL 4 PLACES

SECTION B'
(N.T.S.) TYPICAL 4 PLACES (SIMILAR)

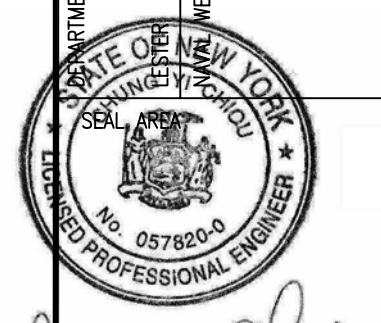


SECTION E
(N.T.S.) TYPICAL CONTRACTION JOINT (REBARS NOT SHOWN)



SECTION D
(N.T.S.) TYPICAL CONTRACTION JOINT (REBARS NOT SHOWN)

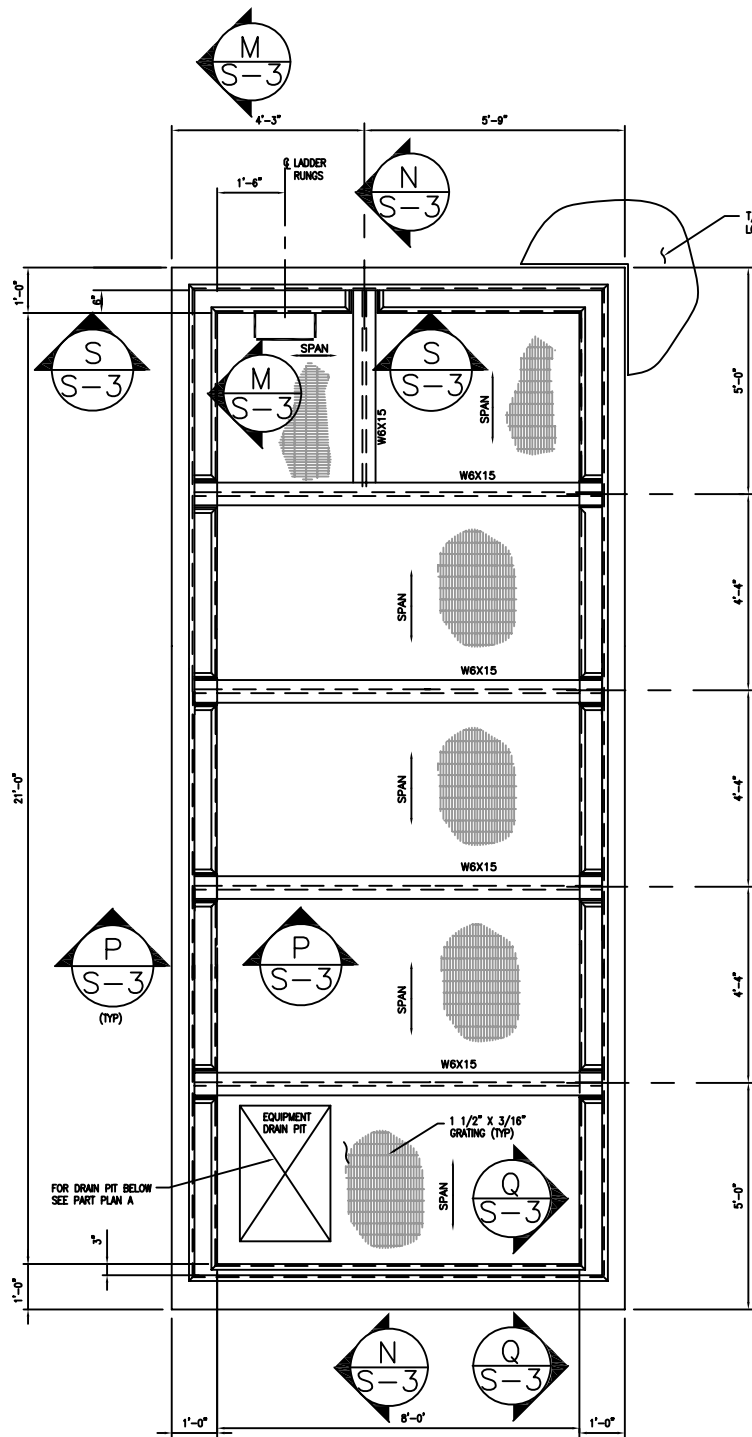
TETRA TECH EC. INC.		DATE	DATE
DESIGN	DATE	DATE	DATE
APPROVED	DATE	DATE	DATE
PREP BY	DATE	DATE	DATE
DESCRIPTION	REV	DATE	DATE
NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY - NORTHEAST PENNSYLVANIA BETHPAGE, NEW YORK GM-38 AREA GROUNDWATER TREATMENT PLANT BUILDING FOUNDATION SECTIONS AND DETAILS EAFNE FOR COMMANDER, NAVFAC			
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SHEET OF SIZE: D DIS. SH. NO. S-2		SPEC. NO.	
		CONSTR. CONTR. NO.	N62472-99-D-0032
		NAVFAC DRAWING NO.	



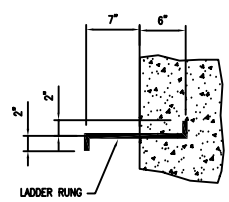
Ching M. Chiu
 Chiu, P.E.
 License No. 057820-0

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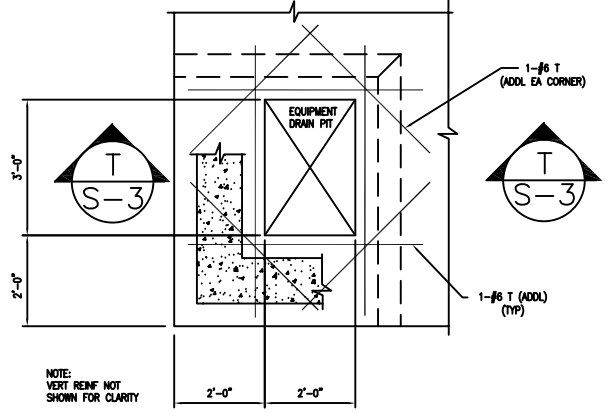
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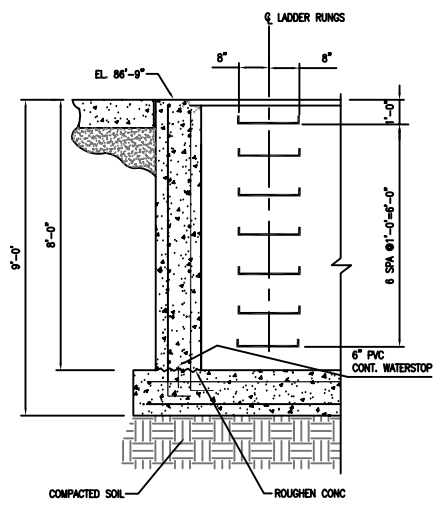
DETAIL 1 BUILDING SUMP PLAN VIEW (N.T.S.) S-3



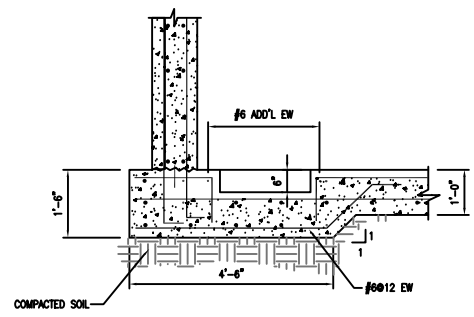
SECTION M (N.T.S.) S-3



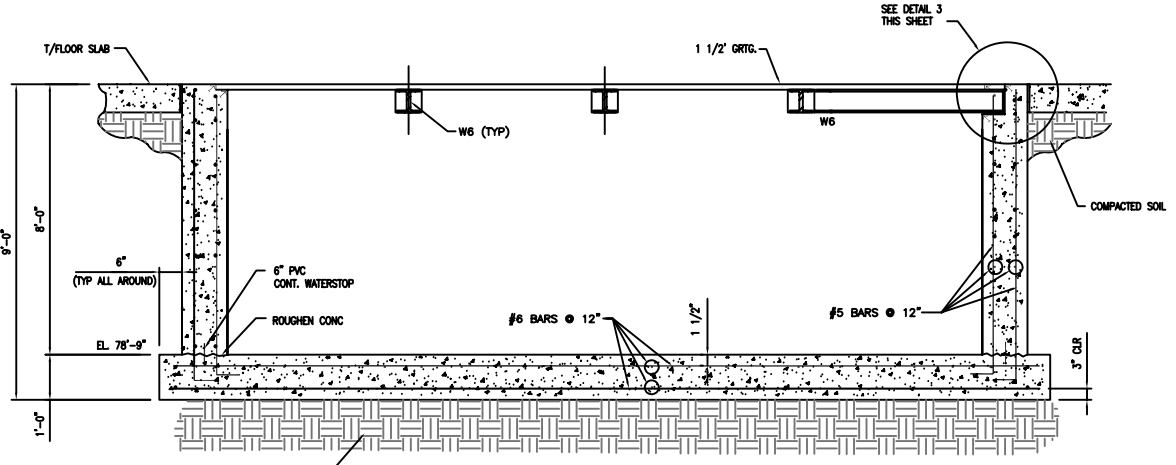
PART PLAN "A" (N.T.S.)



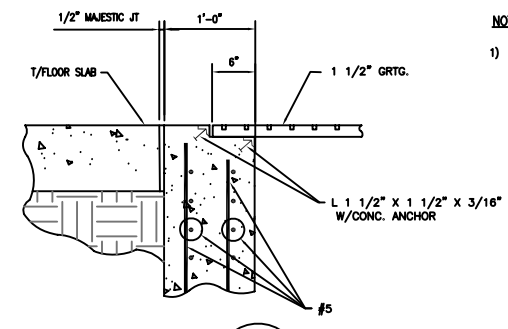
SECTION S (N.T.S.) S-3



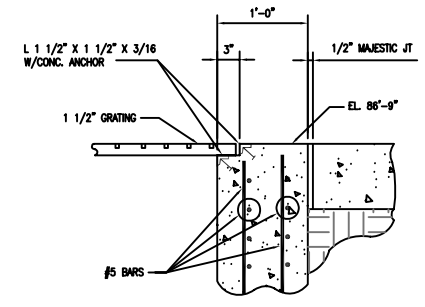
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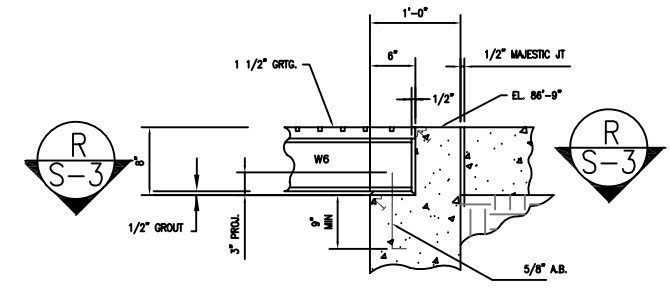
SECTION N (N.T.S.) S-3



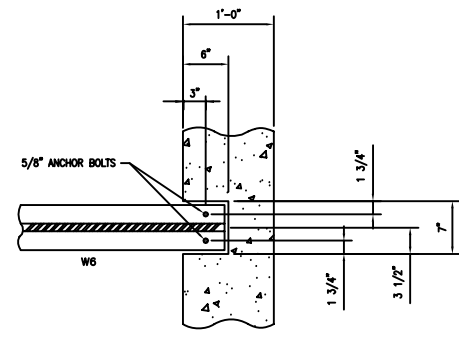
SECTION P (N.T.S.) S-3



SECTION Q (N.T.S.) S-3



DETAIL 3 GRATING BEAM SUPPORT (TYPICAL) (N.T.S.) S-3

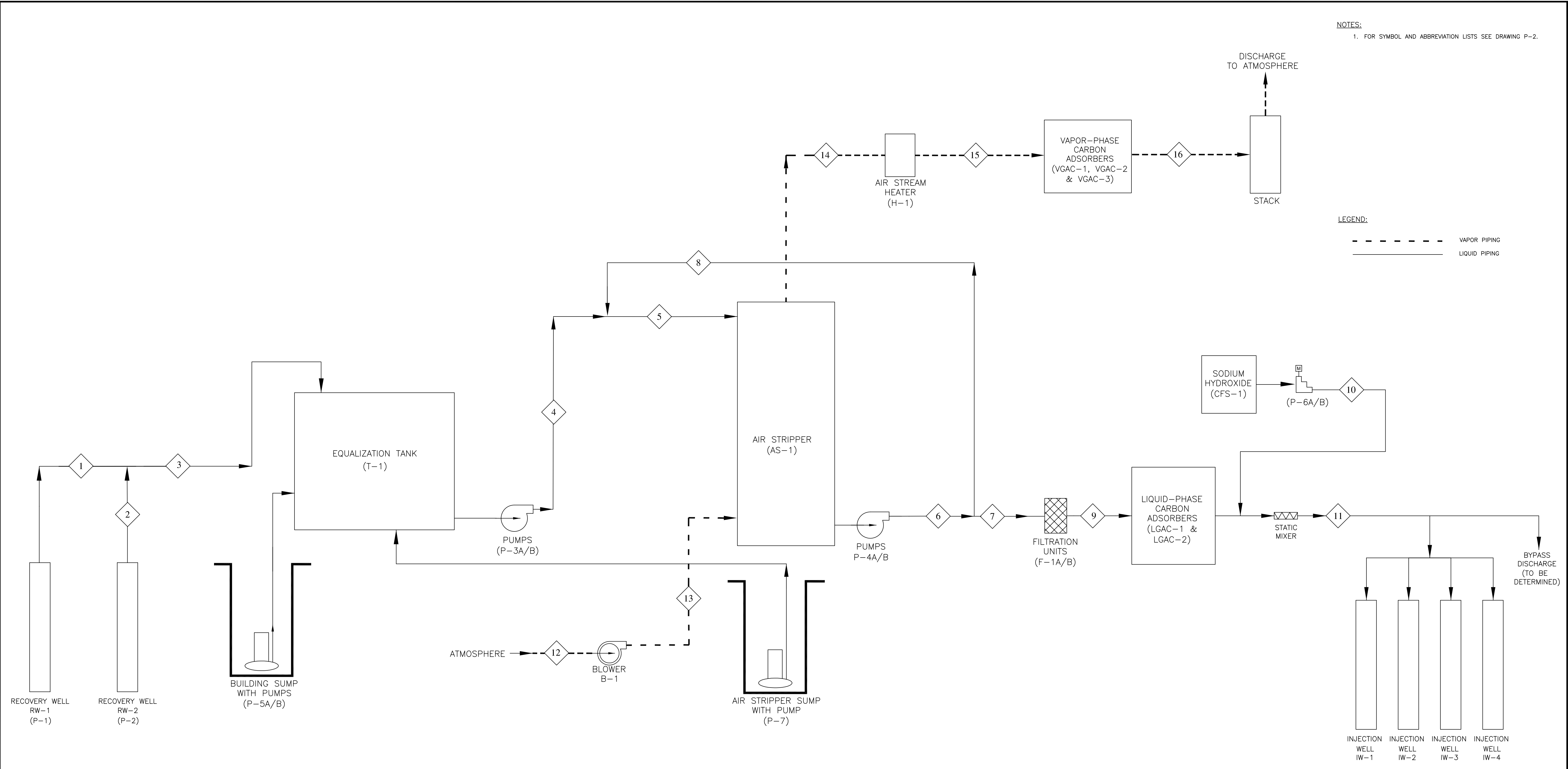


SECTION R (N.T.S.) S-3

NOTES:
1) FOR NOTES SEE DWG. S-1

DESIGN	DATE	APPROV'D	DESCRIPTION	REV
PREPARED BY	DATE	APPROV'D	DESCRIPTION	REV
CHECKED BY	DATE	APPROV'D	DESCRIPTION	REV
DESIGNED BY	DATE	APPROV'D	DESCRIPTION	REV
IN CHARGE	DATE	APPROV'D	DESCRIPTION	REV
OFFICE IN CHARGE	DATE	APPROV'D	DESCRIPTION	REV
TETRA TECH, INC. ENGINEERING FIELD ACTIVITY - NORTHEAST GM-38 AREA GROUNDWATER TREATMENT PLANT BUILDING SUMP FOUNDATION PLAN, SECTIONS AND DETAILS EFWAC FOR COMMANDER, WAWAC				
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CODE ID. NO.	80091	DATE		
SPEC. NO.		DATE		
CONSTR. CONTR. NO.	N62472-99-D-0032	DATE		
WAWAC DRAWING NO.		DATE		
SHEET	OF	DATE		
SIZE	D	DATE		
DIS. SH. NO.		DATE		
S-3		DATE		

P:\Bethpage\CAD - GIS from LHM Nbr 2004\DRIVE_P\040333000 (Naval Weapons Industrial Reserve Plant - GM-38)dwg\PHL DWGS\P-1_PHL.dwg, 5/22/2006 2:27:40 PM



NOTES:
1. FOR SYMBOL AND ABBREVIATION LISTS SEE DRAWING P-2.

LEGEND:
- - - - - VAPOR PIPING
_____ LIQUID PIPING

STREAM NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
COMPOSITION (UG/L, UNLESS OTHERWISE NOTED)																	
BENZENE	4	4	4	4	3	-	-	-	-	-	-	-	-	-	-	-	-
TOLUENE	15	15	15	15	12	-	-	-	-	-	-	-	-	-	-	-	-
XYLENES, TOTAL	16	16	16	16	12	-	-	-	-	-	-	-	-	-	-	-	-
1,2-DICHLOROETHANE	3	3	3	3	2.8	-	-	-	-	-	2.7 E-07	-	-	-	-	-	-
cis 1,2-DICHLOROETHENE	1100	1100	1100	1100	1008	0.10	0.10	0.10	0.10	1008	1.0 E-04	-	-	-	-	-	-
VINYL CHLORIDE	300	300	300	300	275	0.03	0.03	0.03	0.03	275	2.7 E-05	-	-	-	-	-	-
TETRACHLOROETHENE (PCE)	900	900	900	900	825	0.08	0.08	0.08	0.08	825	8.2 E-05	-	-	-	-	-	-
TRICHLOROETHENE (TCE)	3400	3400	3400	3400	3117	3.12	3.12	3.12	3.12	3117	3.1 E-03	-	-	-	-	-	-
WATER FLOW RATE (GPM)	800	300	1100	1100	1200	1200	1100	100	1100	1.1 gpd	1100	-	-	-	-	-	-
TEMPERATURE (°F)	55	55	55	55	55	55	55	55	55	60	55	-	-	-	-	-	-
PRESSURE (PSIG)												-0.27	1.50	1.36	1.18	0.53	
DENSITY (lb/ft³)										95.5		0.077	0.085	0.084	0.082	0.079	
MASS FLOW RATE (lb/hr)	400364	150136	550500	550500	600545	600545	550500	50,045	550500		550500	36,960	40,800	40,320	39,360	37,920	
RELATIVE HUMIDITY (%)												50	50	100	50	50	
STATIC PRESSURE (PSIA)												0.214	0.214	0.214	0.275	0.275	
pH (S.U.)	5.5	5.5	5.5	5.5	5.5	6.0	6.0	6.0	6.0	14	7.0						
VAPOR FLOW RATE (CFM)																	
TOTAL VAPOR VOC (PPMV)												8000	8000	8000	8000	8000	
TOTAL VAPOR VOC (LBS/HR)												-	-	25.5	25.5	1.2	
												-	-	3.18	3.18	0.15	

TETRA TECH EC, INC.

DATE: 05/05/06

APPROVED: [Signature]

DESCRIPTION: ENGINEERING FIELD ACTIVITY - NORTHEAST GM-38 AREA GROUNDWATER TREATMENT PLANT PROCESS FLOW DIAGRAM

REVISIONS:

REV	DESCRIPTION	DATE	APPROVED

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
PENNSYLVANIA
BETHPAGE, NEW YORK

LESTER
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

Brion Keith Bonchard, P.E.
TYPE NO. 082572

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SHEET OF DIS. SH. NO. P-1

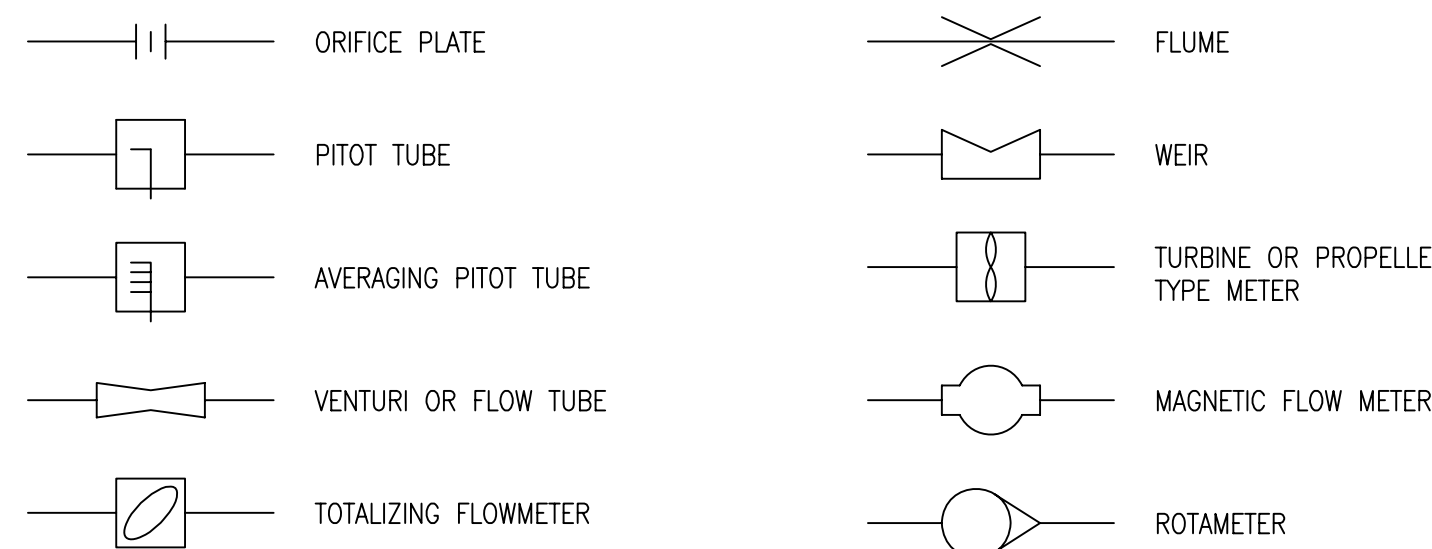
VALVE AND PIPING SYMBOLS



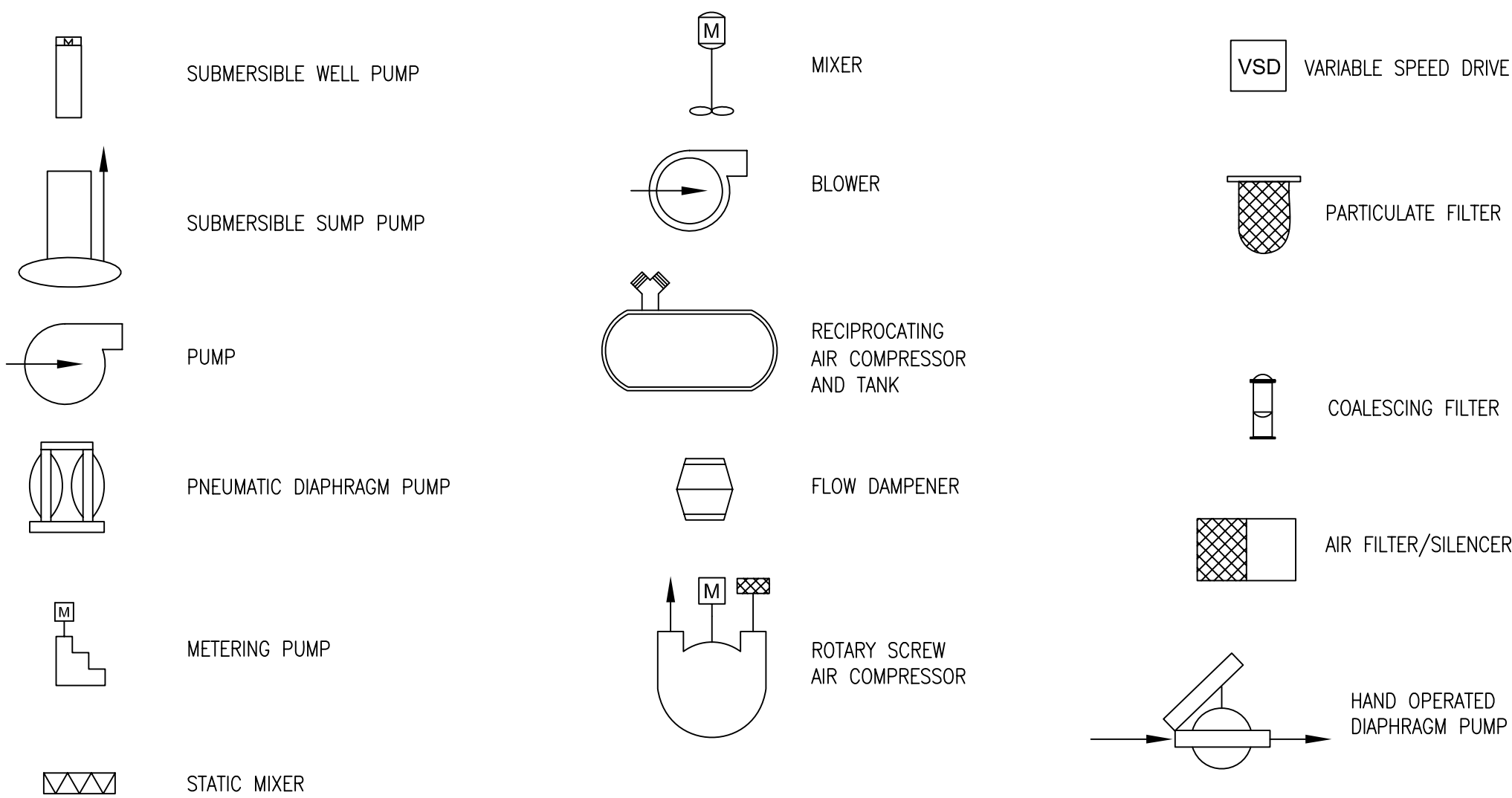
VALVE OPERATOR SYMBOLS



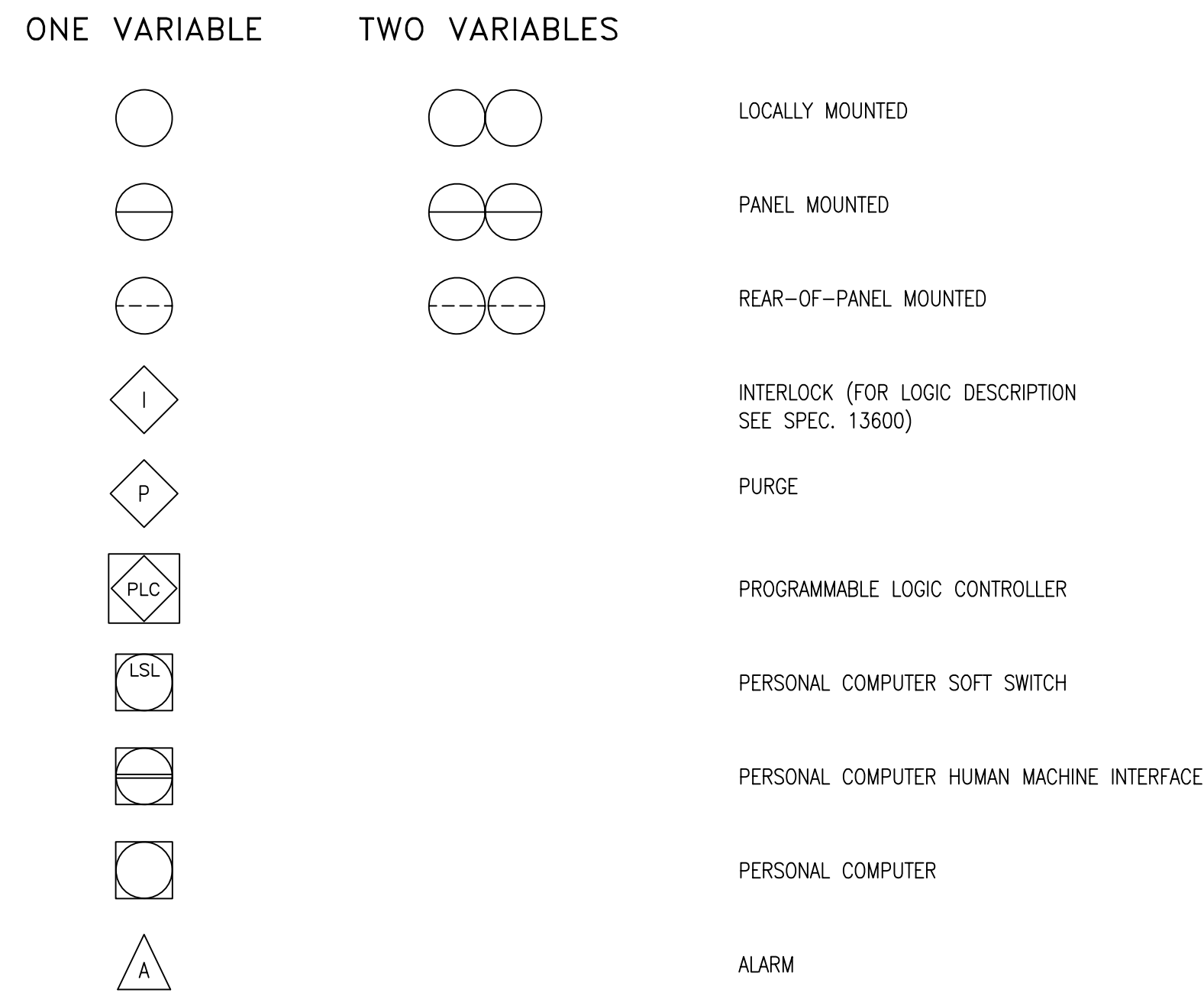
PRIMARY ELEMENT SYMBOLS - FLOW



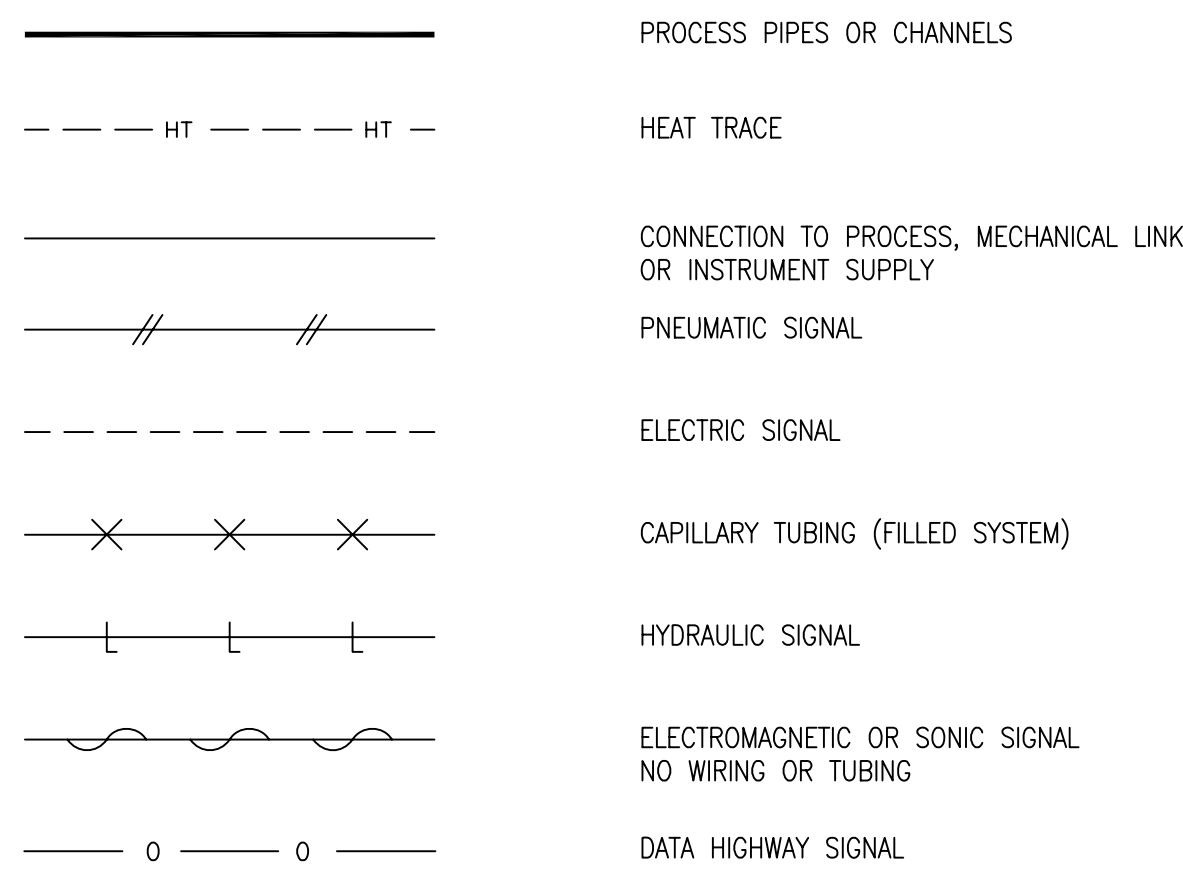
EQUIPMENT SYMBOLS



GENERAL INSTRUMENT SYMBOLS



LINE SYMBOLS



PROCESS LINE ABBREVIATIONS

AIR	AIR, ATMOSPHERIC PRESSURE
BW	BACKWASH
CA	COMPRESSED AIR
CF	CHEMICAL FEED
CGW	CONTAMINATED GROUNDWATER
D	DRAIN
EFF	EFFLUENT
EXH	EXHAUST
GW	GROUNDWATER
NPW	NON-POTABLE WATER
P	PRODUCT
PROP	PROPANE
PW	POTABLE WATER
S	SANITARY
SL	SLUDGE
SP	SAMPLE PORT
SS	STORM SEWER
TF	TOTAL FLUIDS
V	VENT
VAP	VAPOR

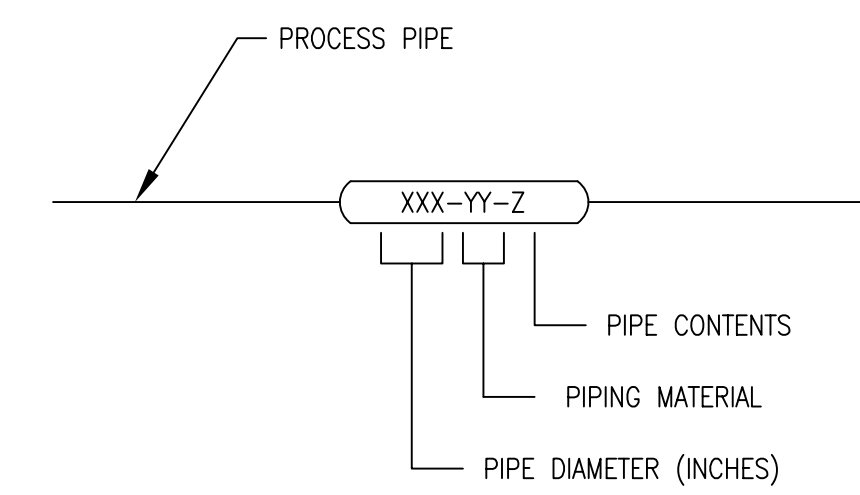
PIPING MATERIAL ABBREVIATIONS

AL	ALUMINUM
CPVC	CHLORINATED POLYVINYL CHLORIDE
CS	CARBON STEEL
COP	COPPER
CMP	CORRUGATED METAL PIPE
CIP	CAST IRON PIPE
DIP	DUCTILE IRON PIPE
FLEX	FLEXIBLE PIPE/DUCT/TUBING
GALV	GALVANIZED STEEL
HDPE	HIGH DENSITY POLYETHYLENE
NEO	NEOPRENE HOSE
PE	POLYETHYLENE
PP	POLYPROPYLENE
PVC	POLYVINYL CHLORIDE
RCP	REINFORCED CONCRETE PIPE
RUB	RUBBER HOSE
SS	STAINLESS STEEL PIPE/TUBING
TEF	TEFLON TUBING
VCP	VITRIFIED CLAY PIPE

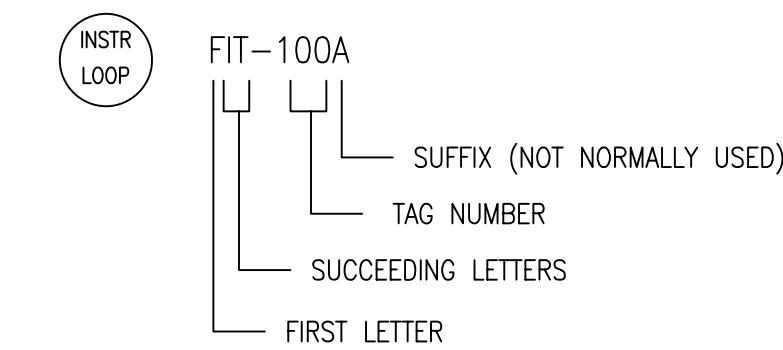
INSTRUMENT IDENTIFICATION TABLE

FIRST LETTER		SUCCEEDING LETTERS		
MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM	
B	BURNER FLAME			
C	CONDUCTIVITY		CONTROL	
D	DENSITY (SP. GR.)	DIFFERENTIAL		
E	VOLTAGE		PRIMARY ELEMENT	
F	FLOWRATE	RATIO		
G	GAUGING (DIMENSIONAL)		GLASS	
H	HAND (MANUAL)			HIGH
I	CURRENT		INDICATE	
J	POWER	SCAN		
K	TIME OR SCHEDULE		CONTROL SWITCH	
L	LEVEL		LIGHT (PILOT)	LOW
M	MOISTURE OR HUMIDITY			MIDDLE
N				
O			ORIFICE	
P	PRESSURE OR VACUUM		POINT (TEST)	
Q	QUANTITY OR EVENT	INTEGRATE		
R	RADIOACTIVITY		RECORD OR PRINT	
S	SPEED OR FREQUENCY	SAFETY	SWITCH	
T	TEMPERATURE		TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	
V	VISCOSITY		VALVE OR DAMPER	
W	WEIGHT OR FORCE		WELL	
X	UNCLASSIFIED		UNCLASSIFIED	
Y			RELAY OR COMPUTE	
Z	POSITION		DRIVE ACTUATE	

PROCESS PIPING IDENTIFICATION



INSTRUMENT IDENTIFICATION



FUNCTION ABBREVIATIONS

DO	DISSOLVED OXYGEN	OC	OPEN-CLOSE
FC	FAIL CLOSED	OO	ON-OFF (MAINTAINED)
FL	FAIL LOCKED	ORP	OXIDATION REDUCTION POTENTIAL
FO	FAIL OPEN	OXC	OPEN-STOP-CLOSE (MOMENTARY)
HOA	HAND-OFF-AUTOMATIC	SI	MOTOR SPEED INDICATION
I/P	CURRENT-TO-CURRENT	SS	START-STOP (MOMENTARY)
LCP	LOCAL CONTROL PANEL	↑	HIGH SELECT
LEL	LOWER EXPLOSIVE LIMIT	↓	LOW SELECT
LR	LOCAL-REMOTE	√	SQUARE ROOT
MI	MOTOR RUN INDICATION	Σ	ADD OR TOTALIZE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY - NORTHEAST
PENNSYLVANIA
BETHESDA, NEW YORK
GM-38 AREA
GROUNDWATER TREATMENT PLANT
PIPING AND INSTRUMENTATION DIAGRAM LEGEND
EFANE FOR COMMANDER, NAVFAC

APPROVED: [Signature]
DATE: 05/05/06

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DATE: 05/05/06

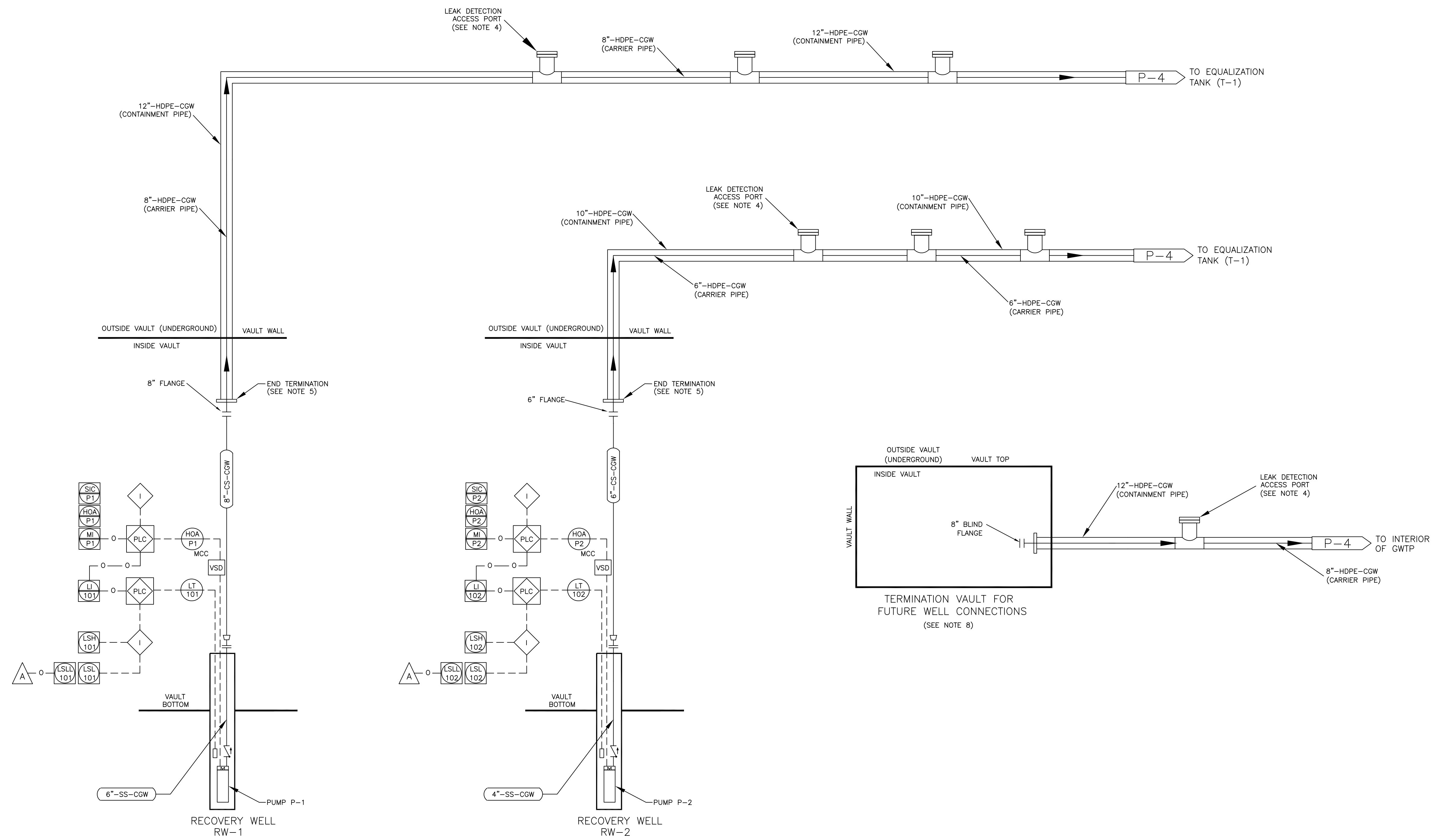
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SCALE: AS SHOWN
SPEC. NO.
CONSTR. CONTR. NO. N62472-99-D-0032
NAVFAC DRAWING NO.

SHEET OF [Blank]
DIS. SH. NO. P-2

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- NOTES:**
1. PIPING WITHIN WELL VAULTS TO HAVE HEAT TRACING AND INSULATION FOR FREEZE PROTECTION. FOR DETAILS SEE DRAWING E-10.
 2. ALL PVC PIPING IS SCHEDULE 80 UNLESS OTHERWISE NOTED.
 3. PRESSURE INDICATORS SHALL INCLUDE GAUGE GUARDS, SNUBBERS, GLYCERIN FILL AND READ IN PSI.
 4. LEAK DETECTION ACCESS PORTS TO BE LOCATED AS IDENTIFIED ON DRAWING C-4. ADDITIONAL ACCESS PORTS MAY NEED TO BE INSTALLED OR PROPOSED LOCATIONS MODIFIED TO ENSURE PROPER PLACEMENT AT LOW ELEVATION POINTS ALONG THE PIPING ROUTE. ENSURE THAT ALL ACCESS PORT INSTALLATIONS ARE PERFORMED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS. FOR ACCESS PORT CONSTRUCTION DETAILS SEE DRAWING C-10.
 5. END TERMINATIONS USED TO SEAL SECONDARY CONTAINMENT PIPING AT THE ENDS OF THE PIPING RUNS.
 6. ALL STAINLESS STEEL PIPING IS SCHEDULE 40, 304L.
 7. HDPE PIPING FOR CONTAINMENT CARRIER USE IS SDR-17.
 8. THE SAME TERMINATION VAULT SHALL BE USED FOR THE POTENTIAL FUTURE RECOVERY WELL CONNECTION AND FUTURE BYPASS DISCHARGE POINT. BOTH PIPES SHALL HAVE A CARBON STEEL BLIND FLANGE INSTALLED FOR POTENTIAL FUTURE CONNECTIONS.

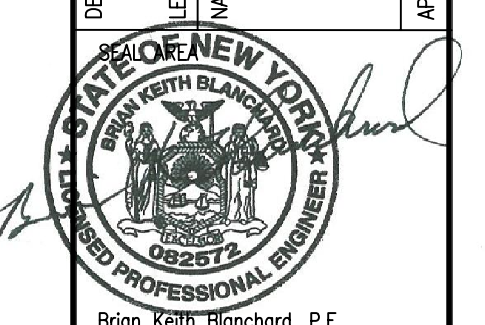
TETRA TECH, INC. 1000	
APPROVED DATE PREP BY DESCRIPTION REV	SUBMITTED BY DATE CHECKED BY DATE ORDER IN CHARGE APPROVED DATE
DEPARTMENT OF THE NAVY ENGINEERING FIELD ACTIVITY - NORTHEAST NAVAL FACILITIES ENGINEERING COMMAND PENNSYLVANIA BETHESDA, NEW YORK GM-38 AREA GROUNDWATER TREATMENT PLANT PIPING AND INSTRUMENTATION DIAGRAM (SHEET 1 OF 5)	
APPROVED DATE EFAVE FOR COMMANDER, NAVFAC	

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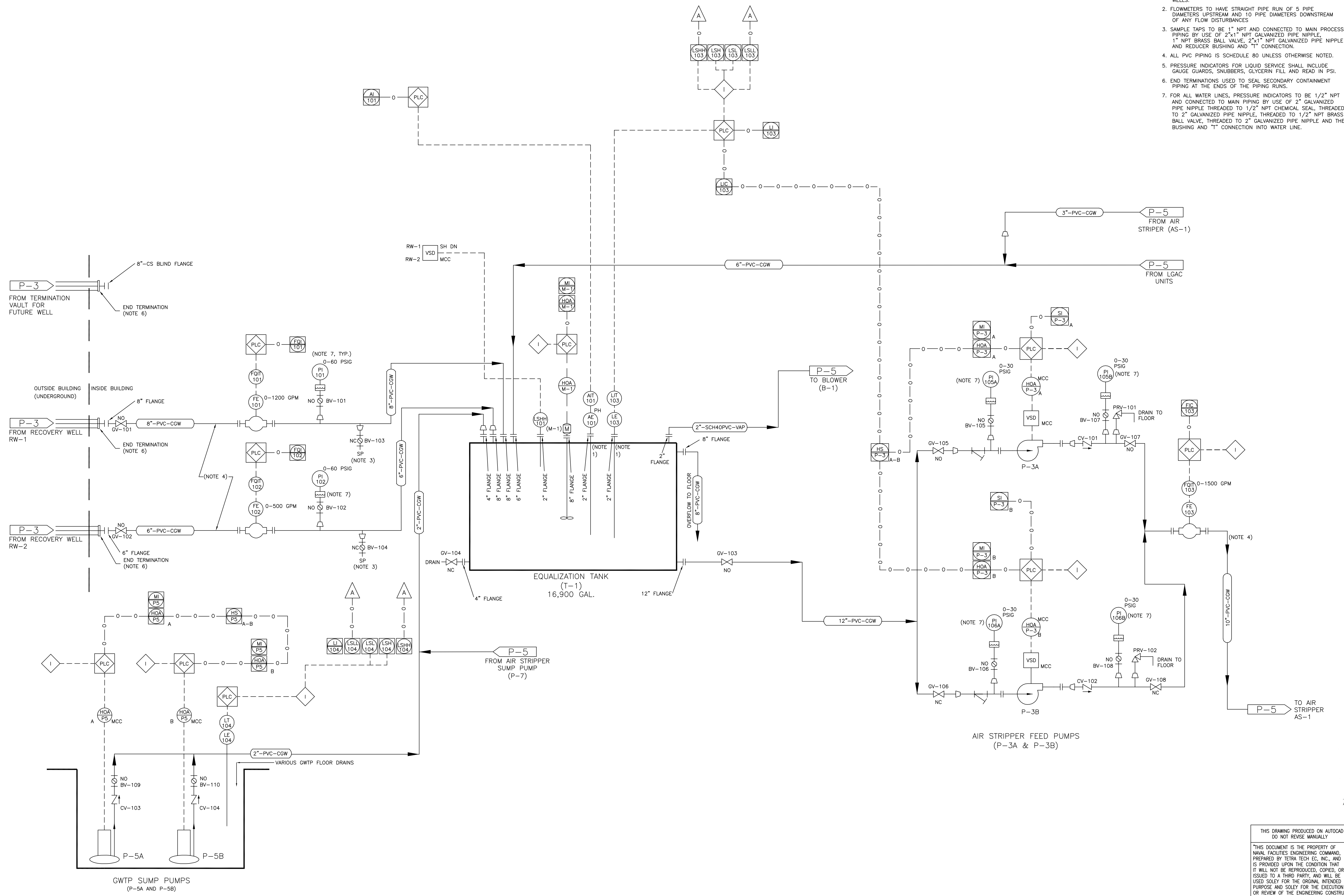
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 SPEC. NO.:
 CONSTR. CONTR. NO.: N62472-99-D-0032
 NAVFAC DRAWING NO.:
 SHEET OF: P-3
 DIS. SH. NO.:
 SIZE: D

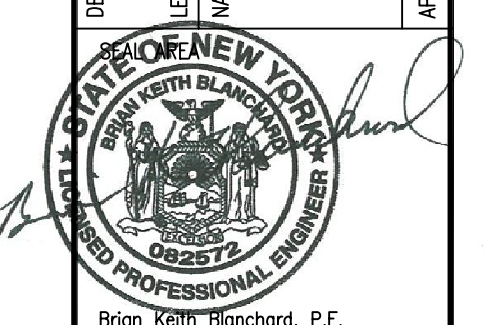


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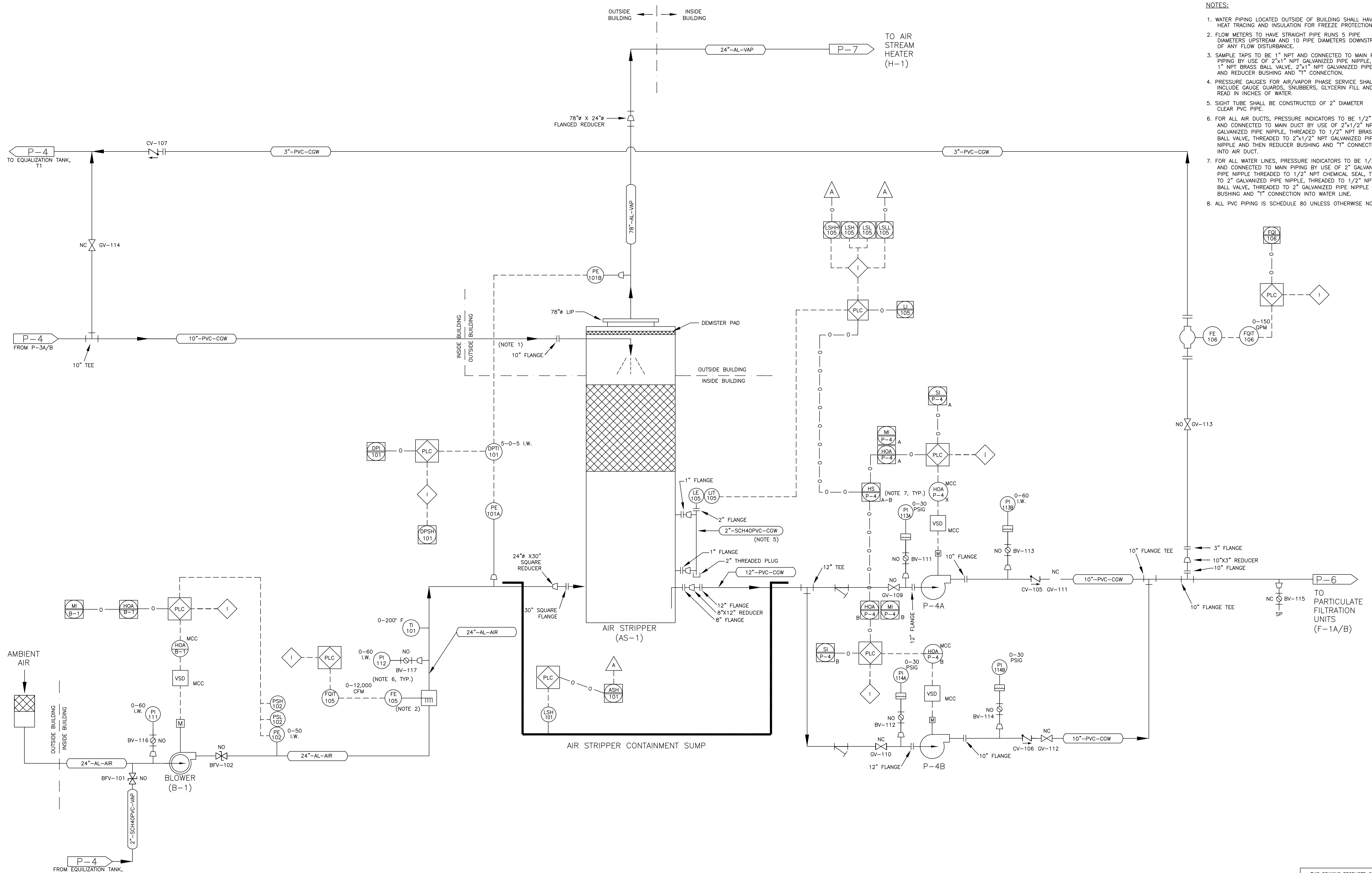


- NOTES:
1. LEVEL TRANSMITTER AND PH PROBE TO BE LOCATED IN STILLING WELLS.
 2. FLOWMETERS TO HAVE STRAIGHT PIPE RUN OF 5 PIPE DIAMETERS UPSTREAM AND 10 PIPE DIAMETERS DOWNSTREAM OF ANY FLOW DISTURBANCES.
 3. SAMPLE TAPS TO BE 1" NPT AND CONNECTED TO MAIN PROCESS PIPING BY USE OF 2"x1" NPT GALVANIZED PIPE NIPPLE, 1" NPT BRASS BALL VALVE, 2"x1" NPT GALVANIZED PIPE NIPPLE AND REDUCER BUSHING AND "T" CONNECTION.
 4. ALL PVC PIPING IS SCHEDULE 80 UNLESS OTHERWISE NOTED.
 5. PRESSURE INDICATORS FOR LIQUID SERVICE SHALL INCLUDE GAUGE GUARDS, SNUBBERS, GLYCERIN FILL AND READ IN PSI.
 6. END TERMINATIONS USED TO SEAL SECONDARY CONTAINMENT PIPING AT THE ENDS OF THE PIPING RUNS.
 7. FOR ALL WATER LINES, PRESSURE INDICATORS TO BE 1/2" NPT AND CONNECTED TO MAIN PIPING BY USE OF 2" GALVANIZED PIPE NIPPLE THREADED TO 1/2" NPT CHEMICAL SEAL, THREADED TO 2" GALVANIZED PIPE NIPPLE, THREADED TO 1/2" NPT BRASS BALL VALVE, THREADED TO 2" GALVANIZED PIPE NIPPLE AND THEN BUSHING AND "T" CONNECTION INTO WATER LINE.

		DATE: _____ DESIGNED BY: _____ CHECKED BY: _____ DRAWN BY: _____ IN CHARGE: _____ APPROVED: _____
APPROVED: _____ DATE: _____	PREP BY: _____ DATE: _____	DESCRIPTION: _____ REV: _____
DEPARTMENT OF THE NAVY ENGINEERING FIELD ACTIVITY - NORTHEAST NAVAL FACILITIES ENGINEERING COMMAND PENNSYLVANIA BERTRAND, NEW YORK NAVAL WEAPONS INDUSTRIAL RESERVE PLANT GM-38 AREA GROUNDWATER TREATMENT PLANT PIPING AND INSTRUMENTATION DIAGRAM (SHEET 2 OF 5)		DATE: _____ APPROVED: _____ EFLANE FOR COMMANDER, NAVFAC
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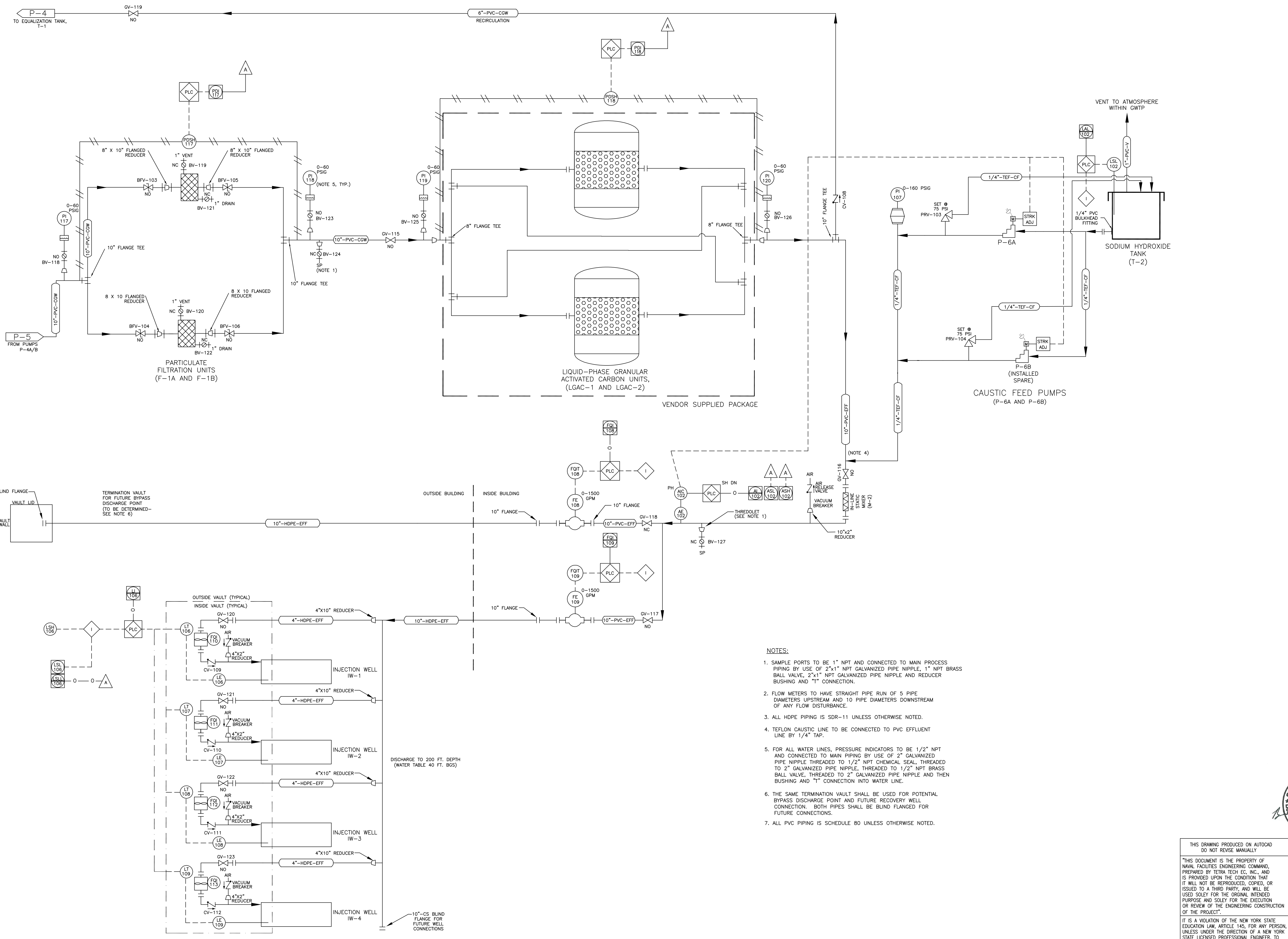
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- NOTES:
1. WATER PIPING LOCATED OUTSIDE OF BUILDING SHALL HAVE HEAT TRACING AND INSULATION FOR FREEZE PROTECTION.
 2. FLOW METERS TO HAVE STRAIGHT PIPE RUNS 5 PIPE DIAMETERS UPSTREAM AND 10 PIPE DIAMETERS DOWNSTREAM OF ANY FLOW DISTURBANCE.
 3. SAMPLE TAPS TO BE 1" NPT AND CONNECTED TO MAIN PROCESS PIPING BY USE OF 2"x1" NPT GALVANIZED PIPE NIPPLE, 1" NPT BRASS BALL VALVE, 2"x1" NPT GALVANIZED PIPE NIPPLE AND REDUCER BUSHING AND "T" CONNECTION.
 4. PRESSURE GAUGES FOR AIR/VAPOR PHASE SERVICE SHALL INCLUDE GAUGE GUARDS, SNUBBERS, GLYCERIN FILL AND READ IN INCHES OF WATER.
 5. SIGHT TUBE SHALL BE CONSTRUCTED OF 2" DIAMETER CLEAR PVC PIPE.
 6. FOR ALL AIR DUCTS, PRESSURE INDICATORS TO BE 1/2" NPT AND CONNECTED TO MAIN DUCT BY USE OF 2"x1/2" NPT GALVANIZED PIPE NIPPLE, THREADED TO 1/2" NPT BRASS BALL VALVE, THREADED TO 2"x1/2" NPT GALVANIZED PIPE NIPPLE AND THEN REDUCER BUSHING AND "T" CONNECTION INTO AIR DUCT.
 7. FOR ALL WATER LINES, PRESSURE INDICATORS TO BE 1/2" NPT AND CONNECTED TO MAIN PIPING BY USE OF 2" GALVANIZED PIPE NIPPLE THREADED TO 1/2" NPT CHEMICAL SEAL, THREADED TO 2" GALVANIZED PIPE NIPPLE, THREADED TO 1/2" NPT BRASS BALL VALVE, THREADED TO 2" GALVANIZED PIPE NIPPLE AND THEN BUSHING AND "T" CONNECTION INTO WATER LINE.
 8. ALL PVC PIPING IS SCHEDULE 80 UNLESS OTHERWISE NOTED.

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APPROV	DATE	
DEPARTMENT OF THE NAVY ENGINEERING FIELD ACTIVITY - NORTHEAST NAVAL FACILITIES ENGINEERING COMMAND PENNSYLVANIA BETHPAGE, NEW YORK GM-38 AREA GROUNDWATER TREATMENT PLANT PIPING AND INSTRUMENTATION DIAGRAM (SHEET 3 OF 5)		
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SIZE	DIS. SH. NO.	80091
SPEC. NO. CONSTR. CONTR. NO. N62472-99-D-0032 NAVFAC DRAWING NO.		

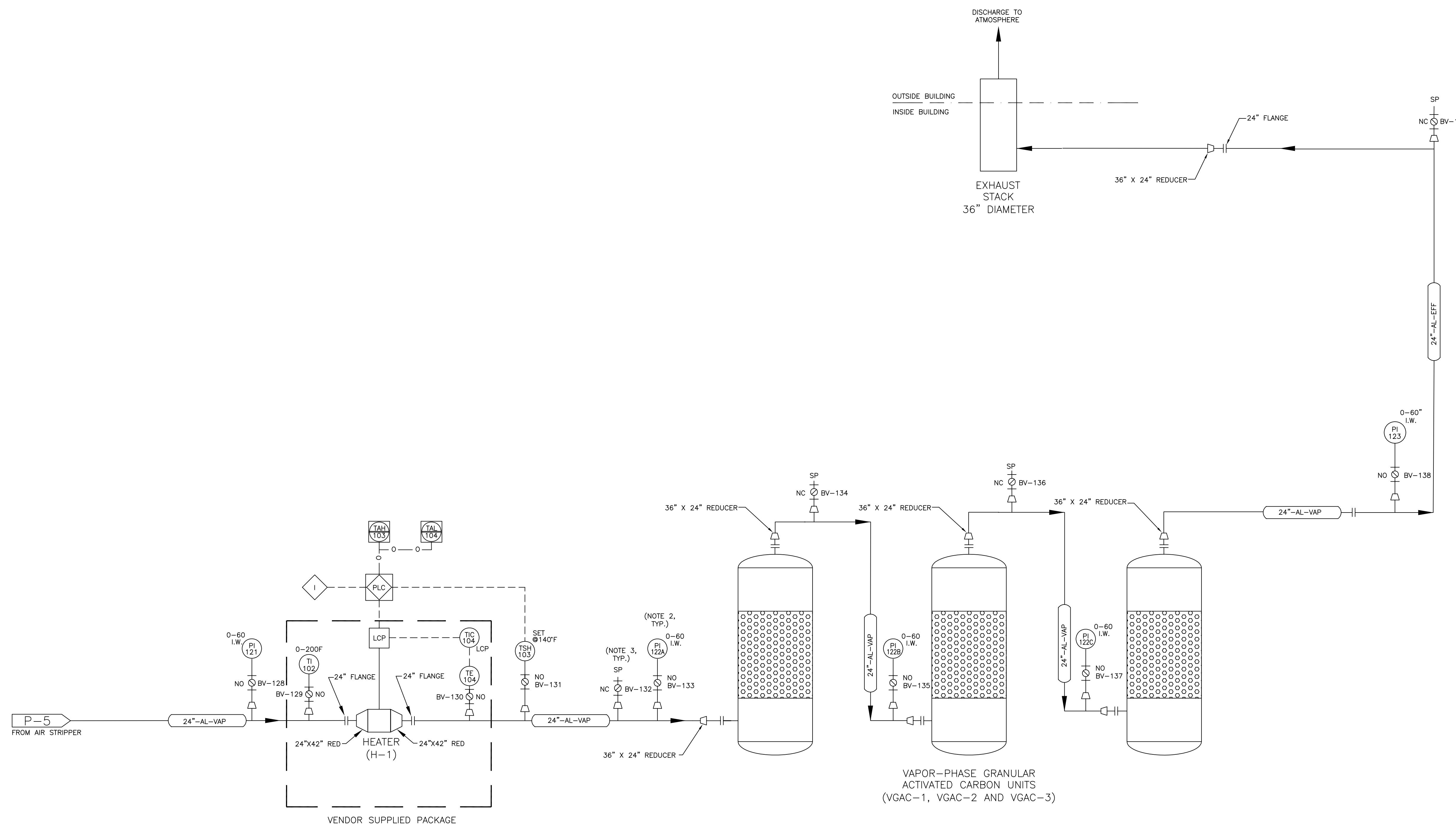
P:\Bertpage\CAD - GIS\From LKH Nov 2014\DRIVE_PIPING\FINAL DWGS\VP-5_FINAL.dwg, 5/4/2006 7:47:15 AM



- NOTES:**
1. SAMPLE PORTS TO BE 1" NPT AND CONNECTED TO MAIN PROCESS PIPING BY USE OF 2"x1" NPT GALVANIZED PIPE NIPPLE, 1" NPT BRASS BALL VALVE, 2"x1" NPT GALVANIZED PIPE NIPPLE AND REDUCER BUSHING AND "T" CONNECTION.
 2. FLOW METERS TO HAVE STRAIGHT PIPE RUN OF 5 PIPE DIAMETERS UPSTREAM AND 10 PIPE DIAMETERS DOWNSTREAM OF ANY FLOW DISTURBANCE.
 3. ALL HDPE PIPING IS SDR-11 UNLESS OTHERWISE NOTED.
 4. TEFLON CAUSTIC LINE TO BE CONNECTED TO PVC EFFLUENT LINE BY 1/4" TAP.
 5. FOR ALL WATER LINES, PRESSURE INDICATORS TO BE 1/2" NPT AND CONNECTED TO MAIN PIPING BY USE OF 2" GALVANIZED PIPE NIPPLE THREADED TO 1/2" NPT CHEMICAL SEAL, THREADED TO 2" GALVANIZED PIPE NIPPLE, THREADED TO 1/2" NPT BRASS BALL VALVE, THREADED TO 2" GALVANIZED PIPE NIPPLE AND THEN BUSHING AND "T" CONNECTION INTO WATER LINE.
 6. THE SAME TERMINATION VAULT SHALL BE USED FOR POTENTIAL BYPASS DISCHARGE POINT AND FUTURE RECOVERY WELL CONNECTION. BOTH PIPES SHALL BE BLIND FLANGED FOR FUTURE CONNECTIONS.
 7. ALL PVC PIPING IS SCHEDULE 80 UNLESS OTHERWISE NOTED.

		DATE 05/05/06
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DEPARTMENT OF THE NAVY ENGINEERING FIELD ACTIVITY - NORTHEAST NAVAL WEAPONS INDUSTRIAL RESERVE PLANT GM-38 AREA GROUNDWATER TREATMENT PLANT PIPING AND INSTRUMENTATION DIAGRAM (SHEET 4 OF 5)		CONSTR. CONTR. NO. N62472-99-D-0032
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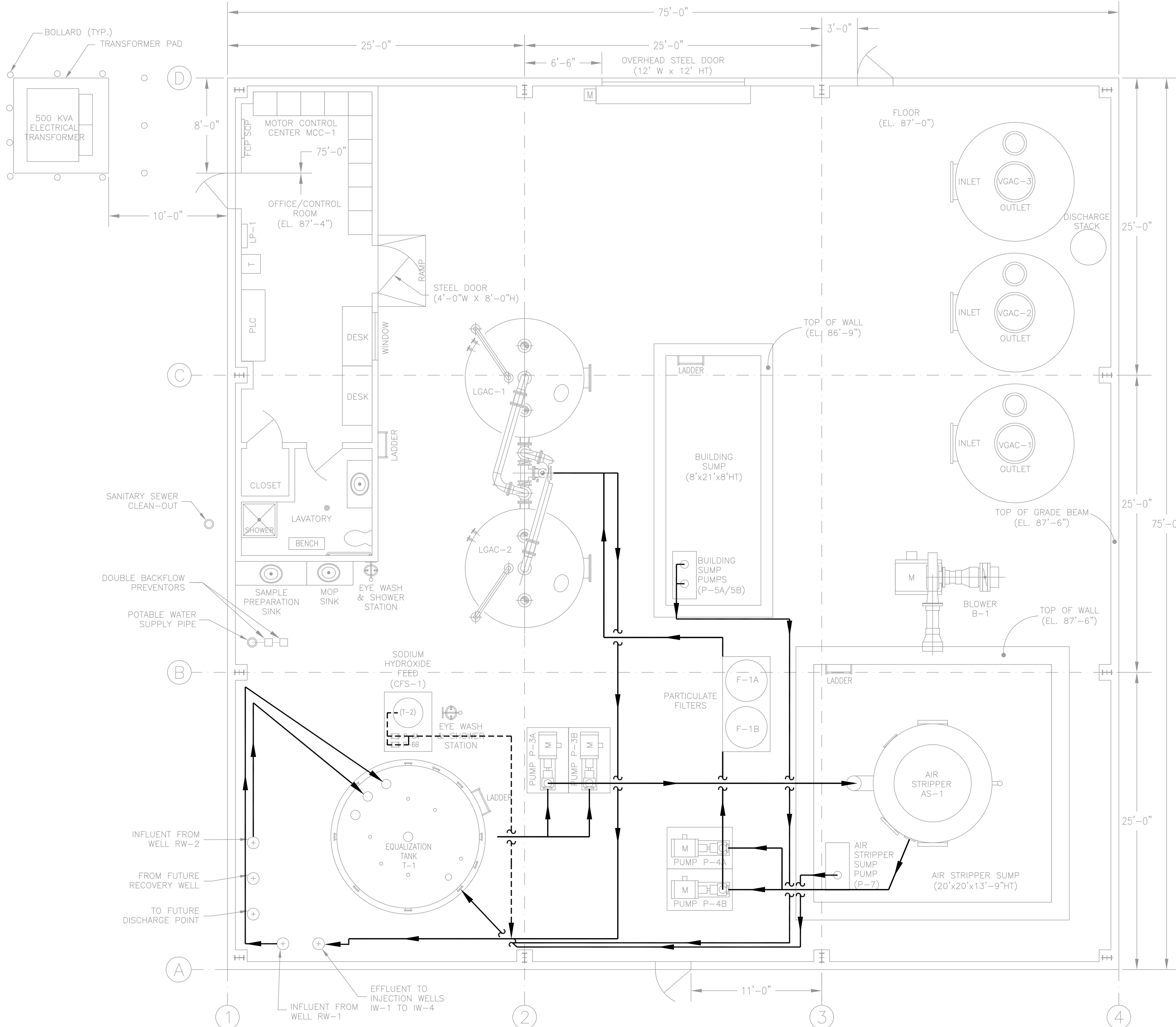
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- NOTES:
1. OUTLET FLANGES TO VAPOR PHASE CARBON VESSELS TO HAVE 1 FOOT SPOOL PIECE OF 24" DIAMETER CARBON STEEL PIPING WITH 24" X 36" REDUCERS.
 2. FOR ALL AIR DUCTS, PRESSURE INDICATORS TO BE 1/2" NPT AND CONNECTED TO MAIN DUCT BY USE OF 2"x1/2" NPT GALVANIZED PIPE NIPPLE, THREADED TO 1/2" NPT BRASS BALL VALVE, THREADED TO 2"x1/2" NPT GALVANIZED PIPE NIPPLE AND THEN REDUCER BUSHING AND "T" CONNECTION INTO AIR DUCT.
 3. SAMPLE TAPS TO BE 1" NPT AND CONNECTED TO MAIN PROCESS PIPING BY USE OF 2"x1" NPT GALVANIZED PIPE NIPPLE, 1" NPT BRASS BALL VALVE, 2"x1" NPT GALVANIZED PIPE NIPPLE AND REDUCER BUSHING AND "T" CONNECTION.

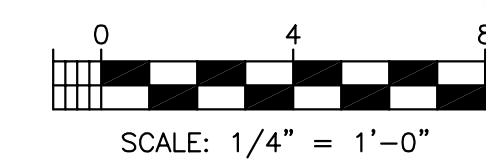
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REV	DESCRIPTION	PREP BY	DATE	APPROV
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		APPROVED: _____ DATE: _____ ERFAC FOR COMMANDER, NAVFAC		

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SHEET OF	DIS. SH. NO.	
D	P-7	



- NOTES:**
- 1) ALL PIPING INSTALLED ALONG GWTP WALLS SHALL BE AT AN ELEVATION OF 18 FEET ABOVE THE FINISHED FLOOR. ALL PIPING RUNS THROUGHOUT THE CENTRAL AREAS OF THE GWTP SHALL BE A MINIMUM OF 10 FEET ABOVE THE FINISHED FLOOR.
 - 2) ALL PIPING SHALL BE INSTALLED AND SECURED IN ACCORDANCE WITH TECHNICAL SPECIFICATION 15150.
 - 3) EQUIPMENT PADS NOT SHOWN FOR CLARITY.
 - 4) FOR CONTINUATION OF UNDERGROUND DISCHARGE AND HEADER PIPES, SEE DRAWING C-4.

- LEGEND:**
- GROUNDWATER PROCESS PIPING
 - - - CHEMICAL FEED SYSTEM PIPING
 - PIPING TURNS UPWARD IN THE DIRECTION OF FLOW
 - ⊖ PIPING TURNS DOWNWARD IN THE DIRECTION OF FLOW



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SUBMITTED BY: TETRA TECH EC, INC. DATE: 05/05/06

DESIGNED BY: DATE: 05/05/06

CHECKED BY: DATE: 05/05/06

APPROVED BY: DATE: 05/05/06

OFFICER IN CHARGE: DATE: 05/05/06

APPROVED: DATE: 05/05/06

DESCRIPTION: GROUNDWATER TREATMENT PLANT

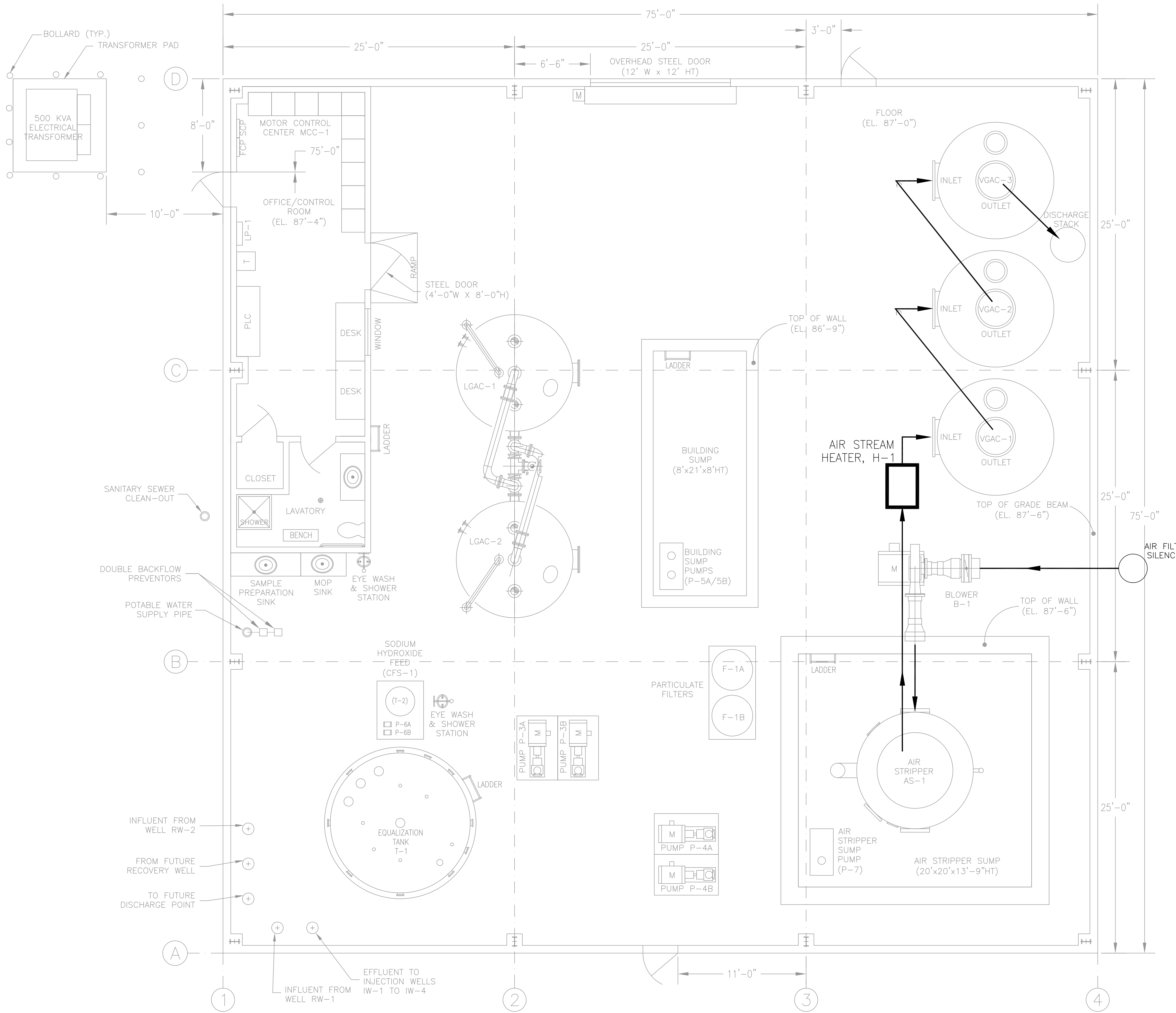
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NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING FIELD ACTIVITY - NORTHEAST
PENNSYLVANIA
BETHPAGE, NEW YORK

ESTER
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
GM-38 AREA
GROUNDWATER TREATMENT PLANT
PROCESS PIPING ARRANGEMENT PLAN (SHEET 1 OF 2)

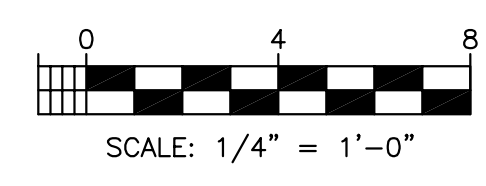
APPROVED: Brian Keith Blomchard, P.E.
NYPE NO. 062572

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- NOTES:**
- 1) ALL PIPING INSTALLED ALONG GWTP WALLS SHALL BE AT AN ELEVATION OF 18 FEET ABOVE THE FINISHED FLOOR. ALL PIPING RUNS THROUGHOUT THE CENTRAL AREAS OF THE GWTP SHALL BE A MINIMUM OF 10 FEET ABOVE THE FINISHED FLOOR.
 - 2) ALL PIPING SHALL BE INSTALLED AND SECURED IN ACCORDANCE WITH TECHNICAL SPECIFICATION 15150.
 - 3) EQUIPMENT PADS NOT SHOWN FOR CLARITY.
 - 4) FOR CONTINUATION OF UNDERGROUND DISCHARGE AND HEADER PIPES, SEE DRAWING C-4.

- LEGEND:**
- VAPOR PROCESS PIPING AND DUCTWORK
 - PIPING TURNS UPWARD IN THE DIRECTION OF FLOW
 - ∩ PIPING TURNS DOWNWARD IN THE DIRECTION OF FLOW

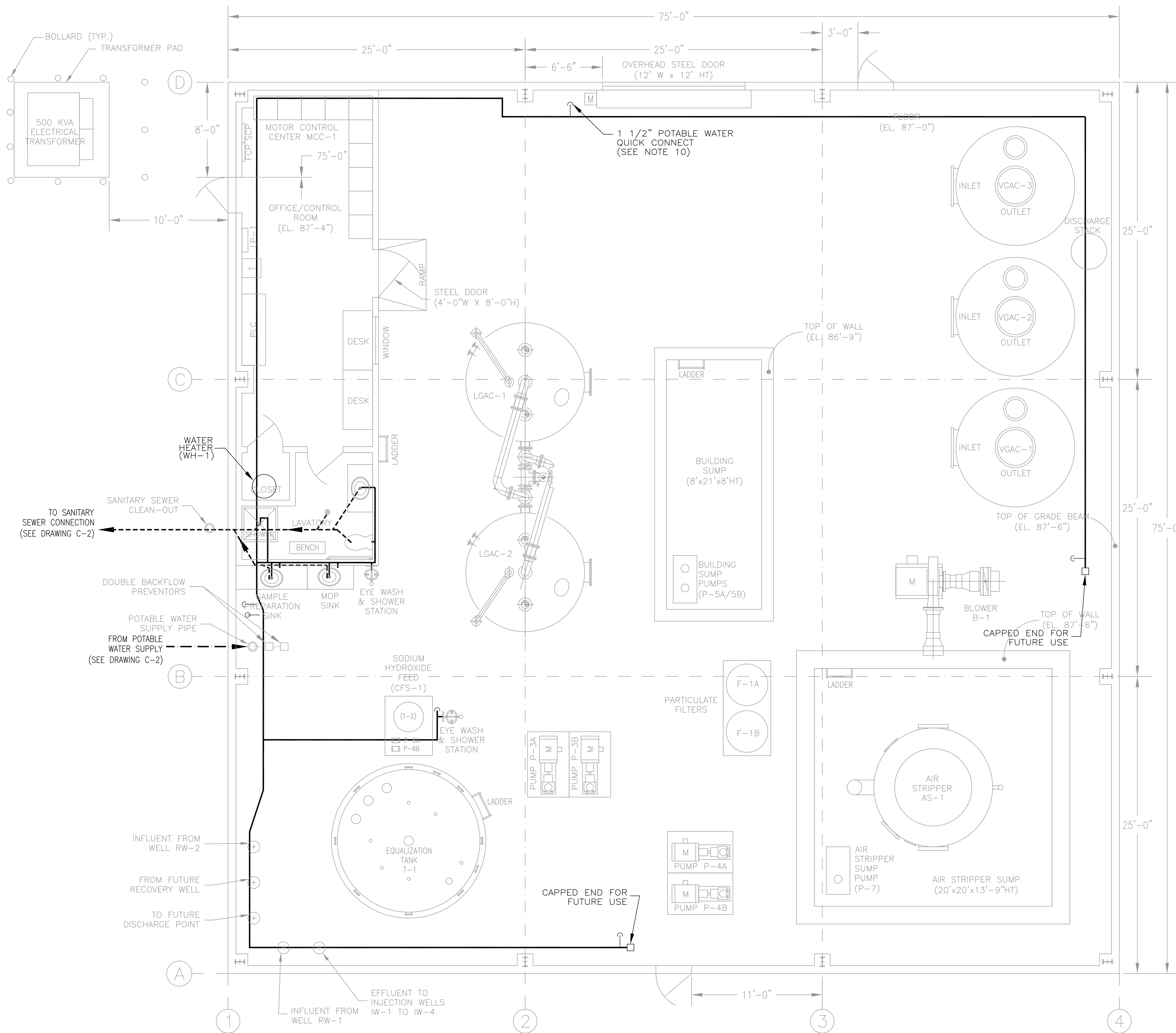


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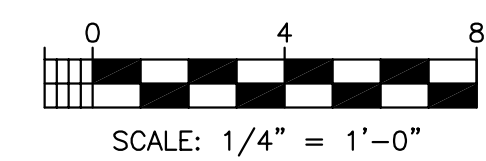
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SUBMITTED BY: (NAME)	CHECKED BY: (NAME)	APPROVED BY: (NAME)	DATE:
DESIGNER: (NAME)	DRAWN BY: (NAME)	DATE:	DATE:
DESCRIPTION:		PREP BY:	DATE:
REV:		DATE:	DATE:
NAVAL FACILITIES ENGINEERING COMMAND PENNSYLVANIA BETHPAGE, NEW YORK NAVAL WEAPONS INDUSTRIAL RESERVE PLANT GM-38 AREA GROUNDWATER TREATMENT PLANT PROCESS PIPING ARRANGEMENT PLAN (SHEET 2 OF 2)			
APPROVED:		DATE:	
EPLN FOR COMMANDER, NAVFAC		DATE:	



- NOTES:**
- ALL PIPING INSTALLED ALONG GWTP WALLS SHALL BE AT AN ELEVATION OF 18 FEET ABOVE THE FINISHED FLOOR. ALL PIPING RUNS THROUGHOUT THE CENTRAL AREAS OF THE GWTP SHALL BE A MINIMUM OF 10 FEET ABOVE THE FINISHED FLOOR.
 - ALL PIPING SHALL BE INSTALLED AND SECURED IN ACCORDANCE WITH TECHNICAL SPECIFICATION 15150.
 - EQUIPMENT PADS NOT SHOWN FOR CLARITY.
 - WATER HEATER LOCATED ON THE DECK ABOVE. THE SHOWER IS NOT SHOWN FOR CLARITY. WATER HEATER DETAILS ARE LOCATED ON DRAWING M-1. DRAIN PIPING FROM WATER HEATER RELIEF VALVE TO SPILL PAN NOT SHOWN FOR CLARITY.
 - THE SANITARY SEWER CONNECTION SHALL BE INSTALLED IN COMPLIANCE WITH THE REGULATIONS AS ESTABLISHED BY THE GOVERNING SEWER AUTHORITY. THE CONNECTION SHALL BE MADE INTO THE EXISTING CONCRETE MANHOLE LOCATED AT NY STATE PLANE COORDINATES NORTING 206347 AND EASTING 1129522.
 - THE SANITARY/SEPTIC DRAIN PIPING SHALL BE INSTALLED IN COMPLIANCE WITH BOCA-1996 CODES. THE CONTRACTOR SHALL INSTALL CLEAN OUTS WHERE NECESSARY THROUGHOUT THE PIPING RUN. THE SANITARY/SEPTIC LINE SHALL BE VENTED TO OUTSIDE OF THE BUILDING. THE VENT LINES ARE NOT SHOWN FOR CLARITY.
 - THE PIPING RUNS FOR THE POTABLE WATER PIPING THAT ARE FOR GENERAL MAINTENANCE USE (4 PLACES) SHALL BE COMPLETED TO A HEIGHT OF 4- FEET ABOVE THE FINISHED FLOOR. THE POTABLE WATER LINES SHALL HAVE BRONZE HOSE BIBS WITH THREADS FOR HOSE CONNECTIONS IDENTIFIED LOCATIONS ARE APPROXIMATE.
 - FOR CONTINUATION OF UNDERGROUND DISCHARGE AND HEADER PIPES, SEE DRAWING C-4.
 - COMBINATION EMERGENCY EYEWASH AND SHOWER STATIONS ARE IDENTIFIED AS EYE WASH & SHOWER STATIONS.
 - A 1 1/2-INCH POTABLE WATER LINE SHALL BE RUN TO THIS POINT TO FACILITATE LGAC FILLING/REMOVAL ACTIVITIES.

- LEGEND:**
- POTABLE WATER SUPPLY PIPING
 - POTABLE WATER SUPPLY PIPING (UNDERGROUND)
 - POTABLE HOT WATER SUPPLY PIPING
 - SANITARY/SEPTIC DRAIN PIPING
 - PIPING TURNS UPWARD IN THE DIRECTION OF FLOW
 - PIPING TURNS DOWNWARD IN THE DIRECTION OF FLOW



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		NAVFAC DRAWING NO.	
SHEET	OF	DIS. SH. NO.	
D	P-11		

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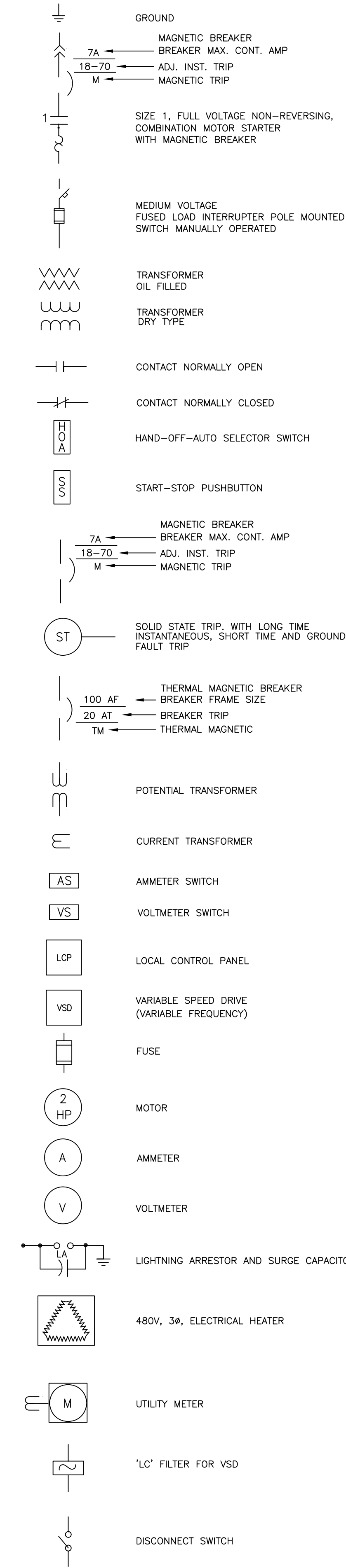
ENGINEERING FIELD ACTIVITY - NORTHEAST

GM-38 AREA
GROUNDWATER TREATMENT PLANT
UTILITY PIPING ARRANGEMENT PLAN

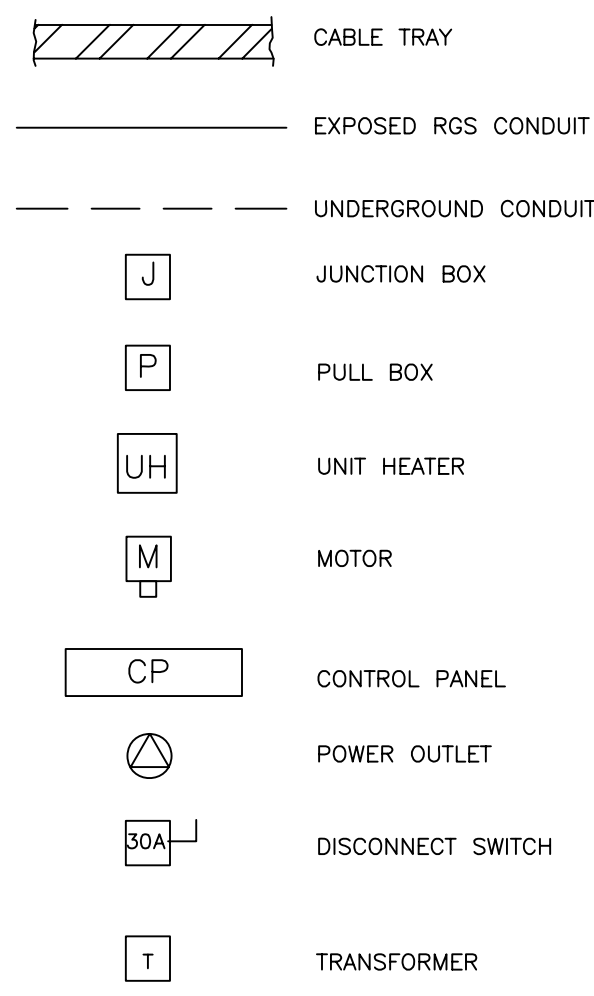
DEPARTMENT OF THE NAVY
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

TETRA TECH EC, INC.
DATE: 05/05/06
APPROVED: [Signature]
DATE: 05/05/06

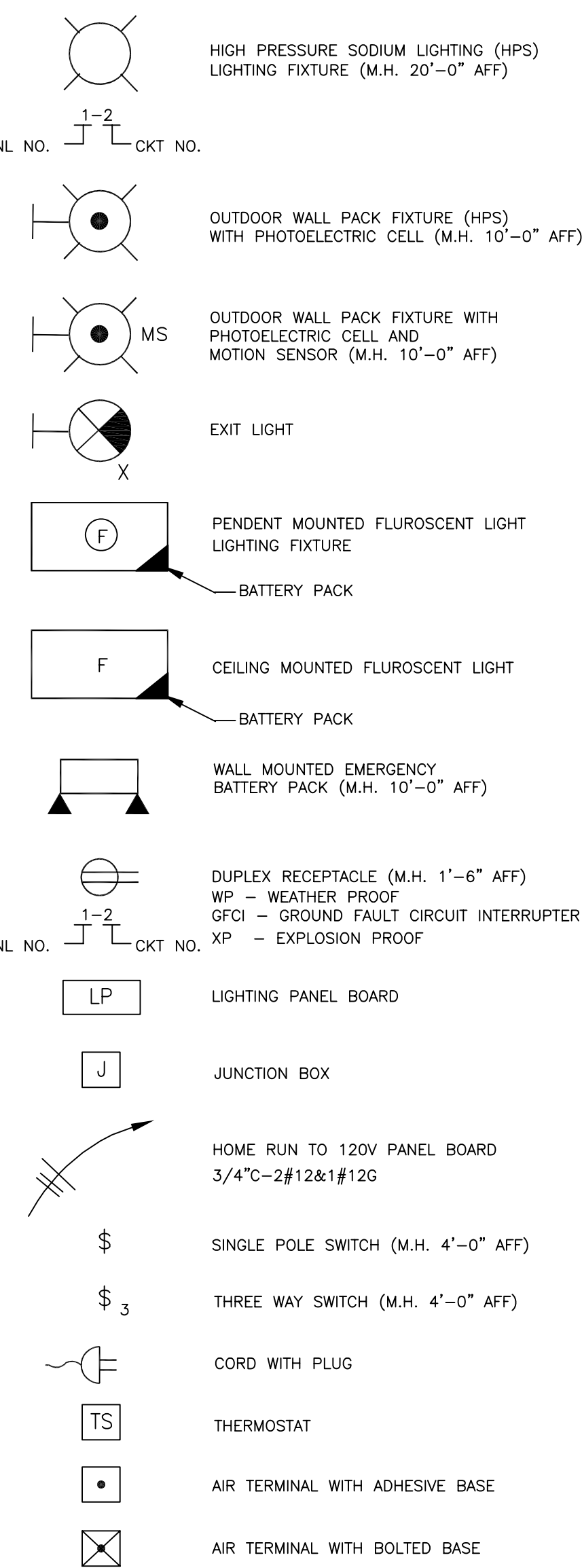
LEGEND FOR SINGLE LINE



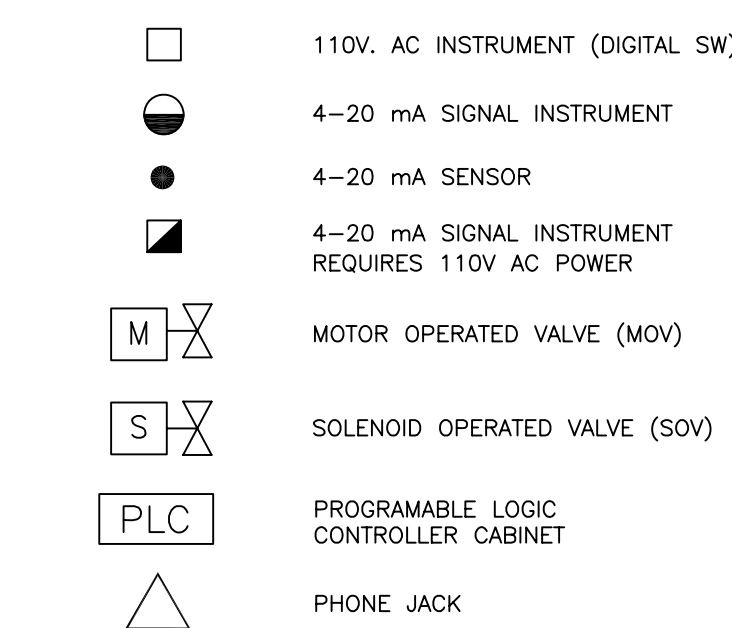
LEGEND FOR POWER



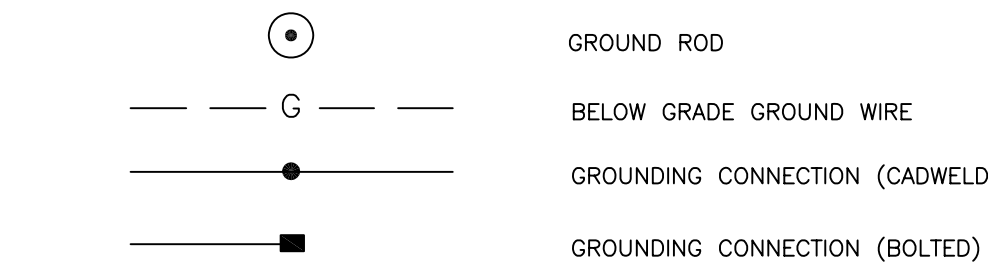
LEGEND FOR LIGHTING



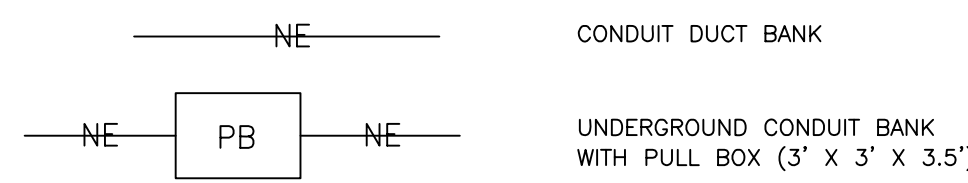
LEGEND FOR INSTRUMENTS



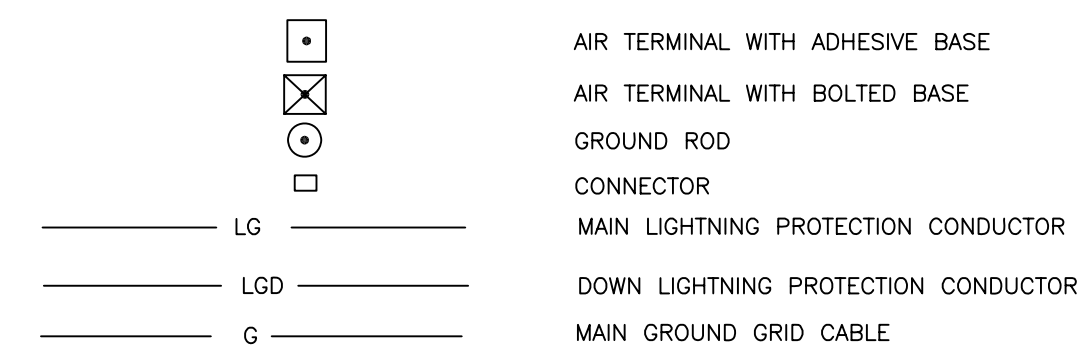
LEGEND FOR GROUNDING



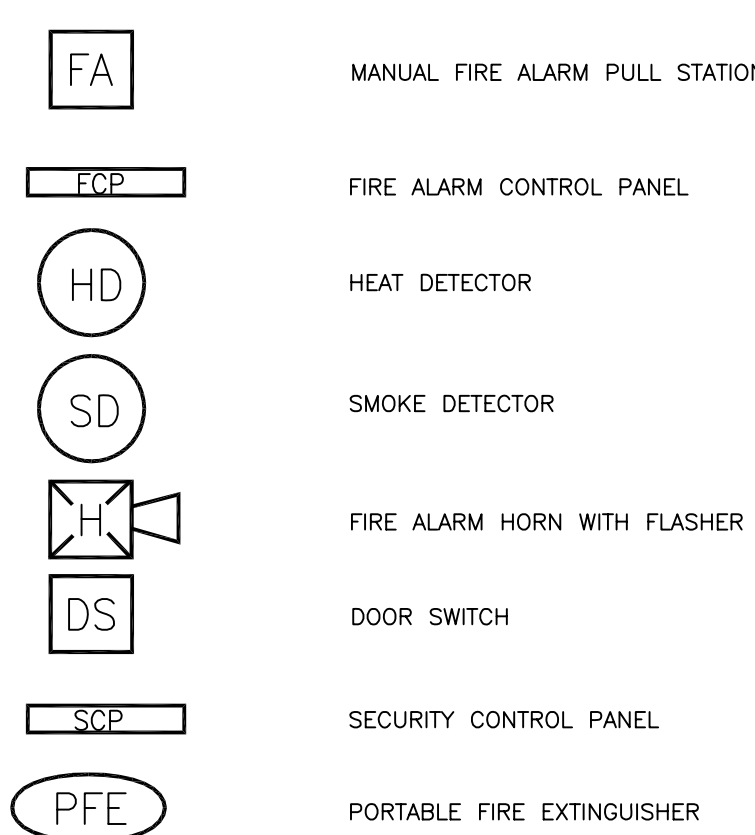
LEGEND FOR UNDERGROUND



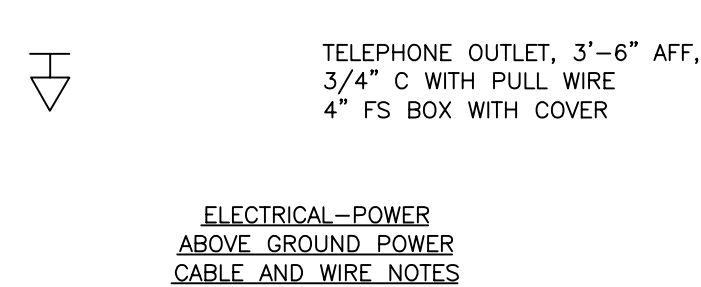
LEGEND FOR LIGHTNING PROTECTION



LEGEND FOR FIRE ALARM AND SECURITY



LEGEND FOR MISCELLANEOUS



- THE SMALLEST WIRE SIZE FOR POWER CIRCUITS 600 VOLTS & BELOW SHALL BE #12 AWG, EXCEPT THAT #14 AWG SHALL BE USED FOR CONTROL.
- WHERE WIRES IN CONDUIT ARE USED, WIRES FOR POWER & CONTROL LEADS TO MOTORS 600 VOLTS & BELOW SHALL BE INSTALLED IN THE SAME CONDUIT WHEN THE POWER WIRE IS #2 AWG. OR SMALLER. FOR POWER WIRES LARGER THAN #2 AWG POWER & CONTROL WIRES SHALL BE INSTALLED IN SEPARATE CONDUITS.
- POWER & CONTROL WIRES SHALL BE LABELED WITH A WIRE NUMBER AS SHOWN IN ELEMENTARY & INTERCONNECTION WIRING DIAGRAMS.
- THE COLOR CODING FOR SINGLE CONDUCTOR WIRES SHALL BE AS FOLLOWS:
 - POWER PHASE LEADS - 480V SYSTEM SHALL BE IDENTIFIED WITH BROWN/ORANGE/YELLOW MARKING TAPE
 - ALL CONTROL LEADS INCLUDING THOSE FOR CONTROL STATIONS, INTERLOCKING CIRCUITS, CURRENT TRANSFORMERS ETC., SHALL BE RED.
 - ALL GROUNDING SHALL BE EITHER BARE OR HAVE A GREEN COVERING.
 - TWO WIRE 120VAC BRANCH CIRCUITS SHALL BE AS FOLLOWS THE GROUNDED CONDUCTOR SHALL BE WHITE THE UNGROUNDED CONDUCTOR SHALL BE BLACK ALL BRANCH CIRCUIT WIRES SHALL BE IDENTIFIED & LABELLED TO MATCH PANEL CIRCUIT DIRECTORIES.
- WIRES INSTALLED IN CONDUIT:
 - FOR SERVICES 600 VOLT & BELOW WIRE #14 AWG & LARGER SHALL BE 600 VOLT SINGLE CONDUCTOR, STRANDED COPPER HEAT & MOISTURE RESISTANT THERMOPLASTIC INSULATION 75°C TYPE THHN/THWN.
 - FOR 15KV SERVICE, CABLE SHALL BE 2/C #2 COPPER, JACKETED CONCENTRIC NEUTRAL, 15 KV, SHIELDED, CROSS-LINKED POLYETHYLENE INSULATED.

ELECTRICAL-POWER ABOVE GROUND POWER GENERAL NOTES

- ALL ELECTRICAL INSTALLATIONS SHALL BE COMPLETED IN A WORKMANLIKE MANNER IN CONFORMANCE WITH ITEC ELECTRICAL SPECIFICATIONS FOR THIS CONTRACT, THE NATIONAL ELECTRICAL CODE, ALL LOCAL CODES AND REGULATIONS. (AND ALL APPLICABLE DRAWINGS AND DETAILS).
- ALL EQUIPMENT AND MATERIALS FURNISHED TO COMPLETE INSTALLATIONS SHALL BE TESTED, LABELLED OR OTHERWISE DETERMINED TO BE SUITABLE FOR THEIR INTENDED USE BY A RECOGNIZED INDEPENDENT TESTING LABORATORY SUCH AS UNDERWRITERS LABORATORIES INC., OR FACTORY MUTUAL ENGINEERING CORP. (U.L. OR F.M.).
- BEFORE INSTALLING ELECTRICAL RACEWAY SYSTEM, A CAREFUL CHECK SHALL BE MADE TO AVOID INTERFERENCES WITH EQUIPMENT, PIPING & STRUCTURES. THE RACEWAY SYSTEM IS SHOWN DIAGRAMMATICALLY AND EXACT ROUTING MUST BE DETERMINED IN FIELD.
- RACEWAY SYSTEM SHALL BE PROPERLY SUPPORTED. SUPPORTS SHALL NOT BE MORE THAN 10'-0" APART AND WITHIN 3'-0" OF A BOX, FITTINGS OR CABINET. RACEWAY SYSTEM SHALL BE GROUNDED.
- ALL CONDUITS, COUPLINGS & ELBOWS SHALL BE RIGID STEEL OR INTERMEDIATE METAL CONDUIT WITH A HOT DIPPED GALVANIZED COATING INSIDE & OUTSIDE. THREADS SHALL HAVE A PROTECTIVE ZINC COATING, UNLESS OTHERWISE NOTED.
- MINIMUM CONDUIT SIZE FOR ABOVE GROUND INSTALLATION SHALL BE 3/4".
- ALL UNUSED OPENINGS IN FITTINGS, BOXES, ETC., SHALL BE PLUGGED WITH A CONDUIT PLUG. DURING CONSTRUCTION, ALL OPENINGS SHALL BE KEPT CLOSED TO PREVENT MOISTURE & FOREIGN MATERIAL, SUCH AS DIRT & DEBRIS, FROM ENTERING THE CONDUIT SYSTEM.

- CONNECTIONS IN MOTOR TERMINAL BOXES AND ALL OTHER SPLICES, WHERE NECESSARY, SHALL BE MADE WITH SOLDERLESS CONNECTORS PER MANUFACTURERS INSTRUCTIONS.
- CONDUIT FITTINGS SHALL BE STANDARD THREADED WITH COVERS & GASKETS, TYPE FORM 8 FERALOY OR APPROVED EQUAL, FOR UNCLASSIFIED & CLASS 1, DIV.2 AREAS.
- IN UNCLASSIFIED NON-PROCESS BUILDINGS, ELECTRIC METALLIC TUBING (EMT) CONDUIT MAY BE USED IN FALSE CEILINGS OR IN CONCEALED AREAS OF GENERAL USE, EXCEPT ALL 480V & ABOVE CIRCUITS MUST BE RUN IN RIGID STEEL CONDUIT.
- ALL WIRE & CABLES SHALL BE PULLED INTO THEIR CONDUITS BY APPLICATION OF A SUITABLE COMMERCIAL PULLING COMPOUND, "PLOY-EAS" FOR POLYETHYLENE INSTALLATION. PULLING DISTANCE SHALL NOT EXCEED THE EQUIVALENT OF 300 FEET STRAIGHT RUN, OR A PULL SHALL CONTAIN NOT MORE THAN THE EQUIVALENT OF THREE (3) 90° BENDS.
- WIRES INSTALLED IN CONDUIT:
 - FOR SERVICES 600 VOLT & BELOW WIRE #14 AWG & LARGER SHALL BE 600 VOLT SINGLE CONDUCTOR, STRANDED COPPER HEAT & MOISTURE RESISTANT THERMOPLASTIC INSULATION 75°C TYPE THHN/THWN.
 - FOR 15KV SERVICE, CABLE SHALL BE 2/C #2 COPPER, JACKETED CONCENTRIC NEUTRAL, 15 KV, SHIELDED, CABLE-LINKED POLYETHYLENE INSULATION.
- ALL CABLES FURNISHED WITH SHIELDING SHALL BE TERMINATED WITH STRESS CONES & GROUNDED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATION.
- CONTROL WIRING SHALL BE IDENTIFIED USING SLEEVE TYPE WIRE MARKERS WITH IDENTIFICATION CORRESPONDING TO THAT ON WIRING DIAGRAMS. WIRE MARKERS SHALL BE INSTALLED AT ALL TERMINAL & JUNCTION POINTS. WIRE MARKER SHALL BE RAYCHEM "TMS" HEAT SHRINKABLE SLEEVES.
- CABLES INSTALLED IN TRAY:
 - CABLES INSTALLED IN TRAY FOR SERVICES 600 VOLT AND BELOW SHALL BE 600 VOLT MULTI-CONDUCTOR TYPE "TC" CABLE WITH STRANDED COPPER CONDUCTORS, HEAT AND MOISTURE RESISTANT THERMOPLASTIC INSULATION, 70°C TYPE THHN/THWN AND AN OVERALL BLACK PVC JACKET. POWER CABLES SHALL HAVE GROUNDING CONDUCTOR, WHICH IS EITHER GREEN INSULATED OR RE-IDENTIFIED WITH GREEN TAPE.
- INSTRUMENT SIGNAL CABLE:
 - INSTRUMENT SIGNAL CABLE SHALL BE SINGLE TWISTED PAIR #16, STRANDED COPPER, 300V, PVC INSULATION WITH OVERALL ALUMINUM MYLAR SHIELD, UL LISTED AS PLTC AND OVERALL PVC JACKET.

ELECTRICAL-UNDERGROUND GENERAL NOTES

- ALL ELECTRICAL UNDERGROUND INSTALLATIONS INCLUDING GROUNDING SYSTEM SHALL COMPLY WITH OSHA (OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION), THE LATEST EDITIONS OF THE NATIONAL ELECTRICAL CODE, APPLICABLE STATE AND LOCAL CODES AND REGULATIONS.
- CONDUIT BANK & GROUNDING SYSTEM SHALL BE INSTALLED PER UNDERGROUND INSTALLATION DRAWINGS & CONSTRUCTION DETAILS.
- ALL UNDERGROUND CONDUITS & ELBOWS SHALL BE SCHEDULE 80 PVC, MINIMUM CONDUIT SIZE SHALL BE 1".
- WHERE PVC CONDUIT IS SPECIFIED, STUB UPS SHALL BE MADE BY USING A METALLIC ELBOW, COUPLING & EXTENSION NIPPLE. THE TRANSITION TO METALLIC CONDUIT SHALL BE MADE BY USING AN APPROVED ADAPTER. ALL JOINTS IN PVC CONDUIT & FITTINGS SHALL BE CEMENTED FOR WATERPROOFING. CONDUIT STUB UPS ABOVE GRADE SHALL BE AS SPECIFIED IN UNDERGROUND DETAILS. NO REDUCTION IN CONDUIT SIZE SHALL BE MADE IN UNDERGROUND CONDUITS.
- ALL UNDERGROUND HORIZONTAL BENDS AND OFFSETS WILL BE MADE IN FIELD AND SHALL HAVE MINIMUM BENDING RADIUS OF 48". ALL STUB-UPS UNLESS OTHERWISE SPECIFIED WILL BE FIELD MADE CONDUIT BENDS HAVING A MINIMUM BENDING RADIUS OF 24" FOR 2" CONDUIT AND SMALLER AND 36" RADIUS FOR 3" CONDUIT AND LARGER.
- DUCT BANKS, IF REQUIRED, SHALL BE ENCASED IN RED COLORED CONCRETE ENVELOPES HAVING A MINIMUM STRENGTH OF 2500 PSI. DUCT BANK SHALL BE FREE OF VOIDS AND SHALL HAVE A MINIMUM COVER OF 3" ENCASED THE PERIPHERAL CONDUITS OR REBAR IN BANK.
- CONCRETE SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION 03300 & 03200 EXCEPT THAT THE AGGREGATE SIZE SHALL NOT EXCEED 1/2". TO ACHIEVE COLORING, 15 TO 20 LB. OF RED OXIDE SHALL BE ADDED PER CUBIC YARD OF CONCRETE.
- CONDUIT STUB-UPS FROM UNDERGROUND BANKS SHALL BE PLUMB, AND ACCURATELY LOCATED AS DIMENSIONED ON THE INSTALLATION PLAN DRAWINGS.
- THE TOP OF CONCRETE ENCASEMENT OF DUCT BANKS AND CONDUIT RUNS SHALL BE A MINIMUM OF 18 INCHES BELOW GRADE FOR STEEL CONDUITS & 24 INCHES FOR PVC CONDUITS. AT ROAD & RAILROAD CROSSINGS, THE TOP OF THE ENCASEMENT SHALL BE A MINIMUM 30 INCHES BELOW THE ROAD SURFACE OF RAIL BASE AND SHALL BE REINFORCED PER UNDERGROUND DETAILS.
- WHERE CONDUITS RISE ABOVE GRADE THE CONCRETE ENCASEMENT SHALL EXTEND 4" ABOVE GRADE AS PER UNDERGROUND CONDUIT STUB-UP DETAILS.
- ALL SPARE CONDUITS SHALL BE STUBBED-UP FROM UNDERGROUND BANKS AND SEALED UTILIZING A COUPLING AND SQUARE HEAD PLUG.
- COPPER GROUND CONDUCTORS SHALL BE LAID DIRECTLY IN THE GROUND, WITH SLACK, WITHOUT BREAKS OR JOINTS AND SHALL HAVE 12" MINIMUM COVER. GROUND CONDUCTORS RUN UNDER ROADWAYS OR OTHER HEAVY TRAFFIC AREAS, SHALL HAVE 24" MINIMUM COVER AND SHALL BE RUN IN RIGID METAL CONDUIT OR PIPE SLEEVES AS SPECIFIED IN UNDERGROUND DETAILS.
- UNDERGROUND SPLICES FOR DIRECT BURIED POWER CABLES AND SIGNAL CABLES OR SPLICES INSIDE THE UNDERGROUND PULL BOX SHALL BE MADE USING 3M RESIN SPLICE KIT (WATER PROOF) OR APPROVED EQUAL TAPE SPLICES ARE NOT PERMITTED.

ELECTRICAL-LIGHTING GENERAL NOTES

- LIGHTING PANELS, LIGHTING FIXTURES, RECEPTACLES AND OTHER ITEMS SHALL BE LOCATED AS SHOWN ON THE DRAWINGS. IF ANY DEVIATION IS REQUIRED, APPROVAL SHALL BE OBTAINED FROM THE ELECTRICAL FIELD SUPERINTENDENT PRIOR TO CHANGE. LOCATION OF LIGHTING FIXTURES SHOWN ON THE DRAWINGS ARE IN GENERAL, APPROXIMATE. EXACT LOCATIONS TO AVOID INTERFERENCE WITH PIPING AND STRUCTURES, ETC., ARE TO BE DETERMINED IN THE FIELD, EXCEPT WHERE THE LOCATIONS ARE FIXED BY DIMENSIONS ON DRAWINGS.
- CONDUIT RUNS AND WIRES ARE NOT SHOWN ON LAYOUT DRAWING. CONTRACTOR TO DETERMINE CONDUIT SIZE, RUNS & WIRE SIZES.
- CONDUIT SUPPORTS SHALL BE PROVIDED WHERE REQUIRED SUCH AS AT FIXTURE LOCATIONS, RECEPTABLES, ELEVATION CHANGES, FITTING AND BOXES, ALL CONDUIT SUPPORT HARDWARES SHOWN AS GALV. CLAMPS, STRAPS, CLIPS, CHANNEL SHALL BE HOT-DIPPED GALVANIZED STEEL FINISH.
- CONTRACTOR SHALL INSTALL UNIONS, BUSHINGS, COUPLINGS AND NIPPLES AS REQUIRED FOR PROPER CONDUIT MAKE UP. CONDUIT FITTINGS SHALL BE INSTALLED WITH COVER OPENING IN THE VERTICAL PLANE OR DOWNWARD IN THE HORIZONTAL PLANE.
- ALL UNUSED OPENINGS IN FIXTURES, BOXES AND FITTINGS SHALL BE PLUGGED.
- BEFORE INSTALLING LIGHTING CONDUITS, FIXTURES, ETC., A CAREFUL CHECK SHALL BE MADE TO AVOID INTERFERENCES WITH PIPING, EQUIPMENT, ETC., IF NOT OTHERWISE SPECIFIED CONDUIT RUNS MUST BE KEPT AT LEAST 12" AWAY FROM HOT SURFACES. A MINIMUM CLEARANCE OF 6" SHALL BE KEPT WHERE A CONDUIT CROSSES A HOT PIPE.
- CONDUIT AND WIRING NOT IDENTIFIED ON DRAWINGS SHALL BE DETERMINED IN FIELD AS FOLLOWS:
 - MAXIMUM CONDUIT SIZE SHALL BE 1" EXCEPT DROPS TO PANELBOARDS MAY BE 1 1/2"
 - WIRE SIZE SHALL BE #12 AWG EXCEPT THAT #14 AWG, STRANDED, 600 VOLT TYPE SF-2 FIXTURE WIRE SHALL BE INSTALLED BETWEEN EACH LIGHTING FIXTURE AND THE NEAREST CONDUIT FITTING IN THE RUN. WIRE SIZE MIGHT BE LARGER THAN #12 AWG TO MEET VOLTAGE DROP REQUIREMENTS AND WILL BE SPECIFIED ON DRAWINGS.
- ALL ABOVE GROUND CONDUIT SHALL BE RIGID STEEL UNLESS OTHERWISE NOTED, ALL ABOVE GROUND LIGHTING CONDUIT SHALL BE 3/4" INCH MINIMUM OR 1" INCH MAXIMUM, WHERE PRACTICAL.
- ALL LIGHTING FIXTURE ELEVATIONS ARE SHOWN FROM FINISHED GRADE, FINISHED FLOOR OR PLATFORM ELEVATION TO THE BOTTOM OF FIXTURE GLOBE. MINOR VARIATIONS TO SUIT FIELD CONDITIONS ARE ALLOWABLE.

TETRA TECH EC, INC.

DATE: 05/05/06

SCALE: AS SHOWN

CONSTR. CONTR. NO. N62472-99-D-0032

NAVAF DRAWING NO.

DATE: 05/05/06

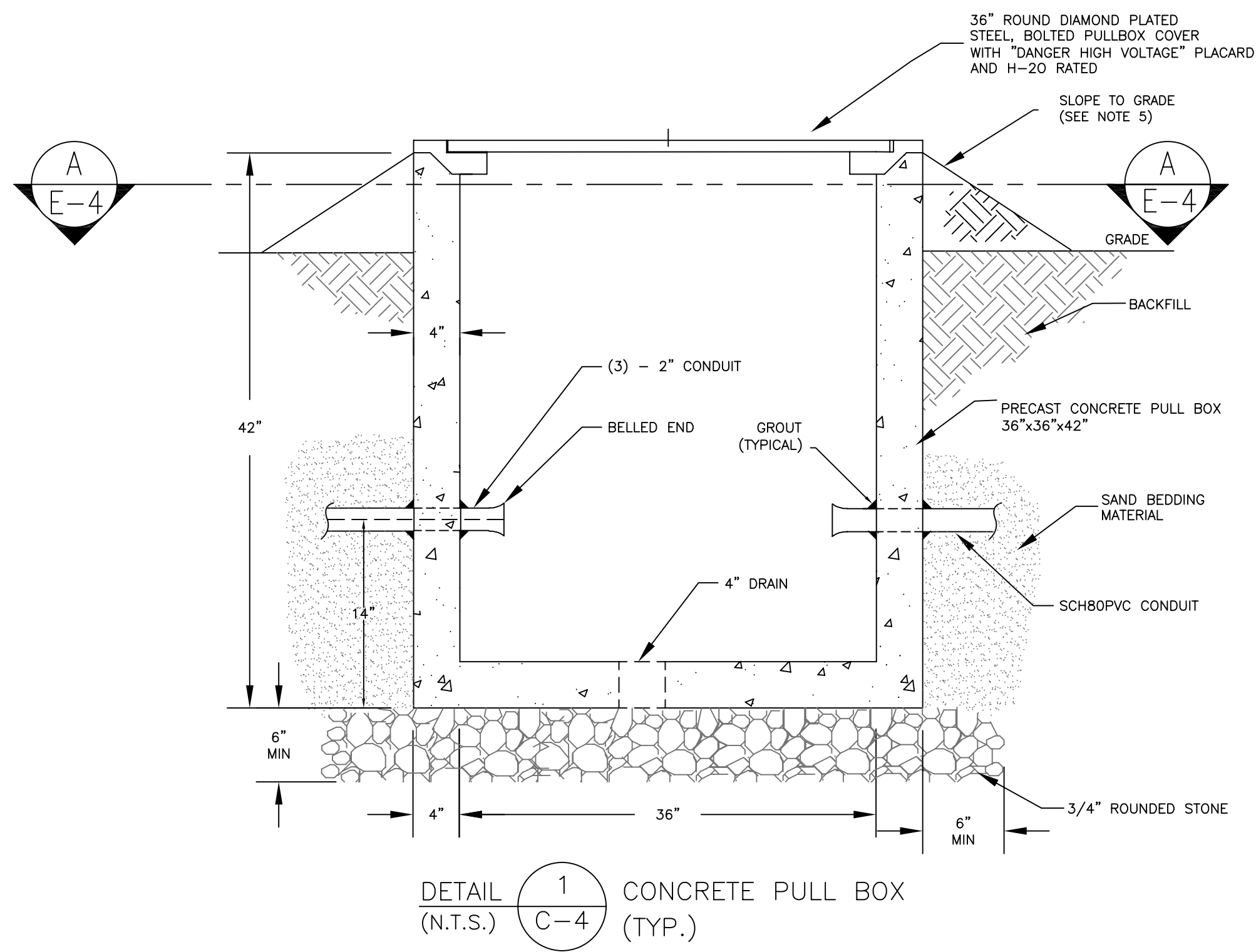
DIS. SH. NO. E-1

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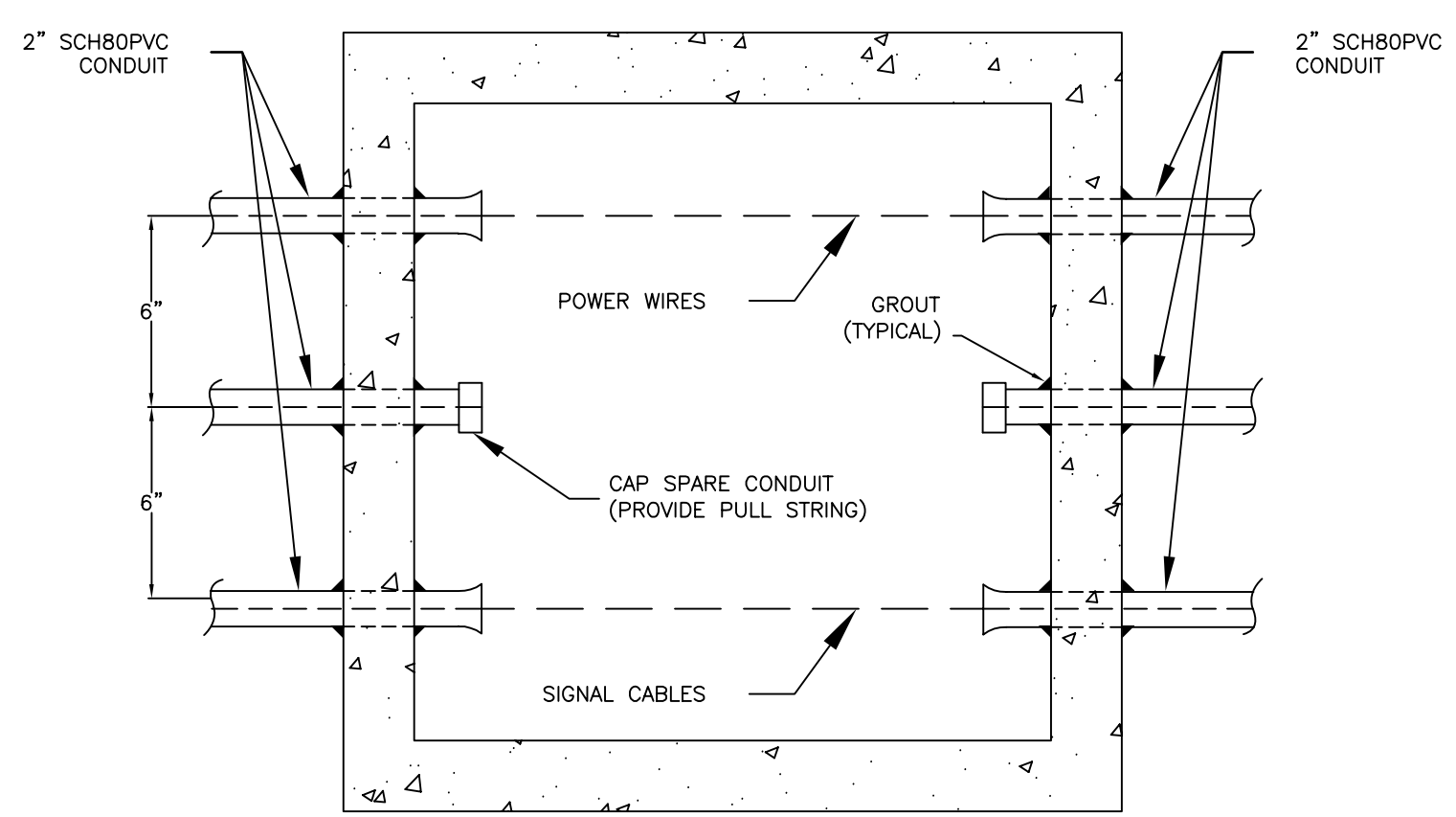
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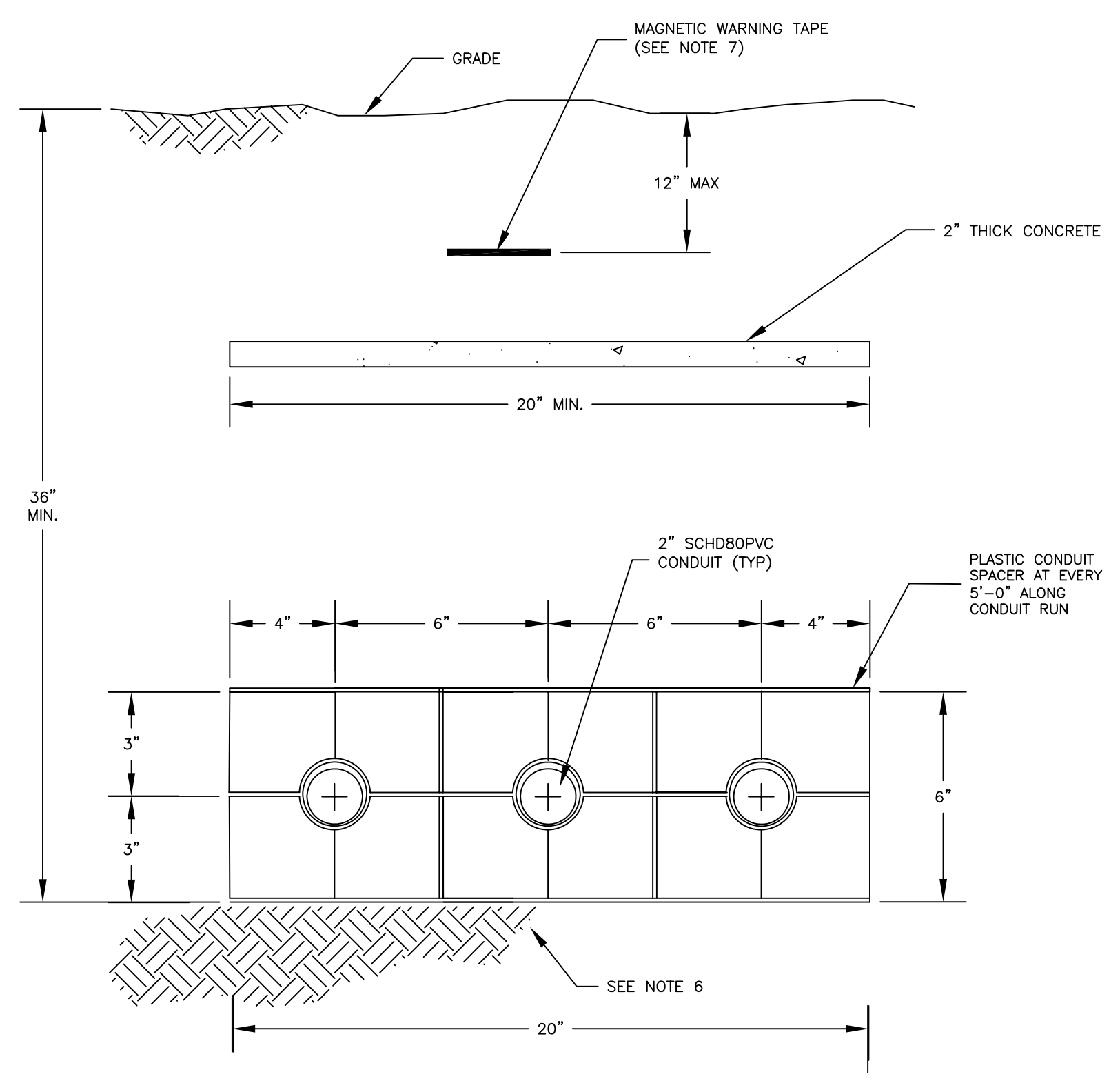
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DETAIL 1
(N.T.S.) (TYP.)
C-4



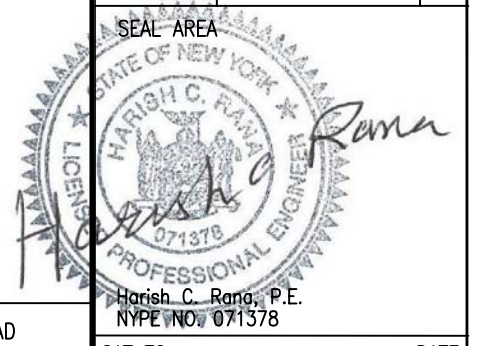
SECTION A
(N.T.S.) (TYP.)
E-4



DETAIL 2
(N.T.S.) (TYP.)
C-6

- NOTES:
- FOR ELECTRICAL LEGEND AND GENERAL NOTES, SEE DRAWING E-1.
 - FOR PULL BOX LOCATIONS SEE DRAWINGS C-4 AND C-5.
 - INSIDE PULL BOX KEEP A 4" (MIN) SEPARATION BETWEEN SIGNAL CABLES AND POWER WIRES.
 - POWER WIRES SHALL BE SPLICED IN PULL BOX ONLY. USE 3M FUSION TYPE SPLICE KIT. SIGNAL CABLE (#16 PAIR). SPLICING SHALL BE MINIMIZED.
 - PULL BOX SHALL EXTEND MINIMUM OF 2" TO A MAXIMUM OF 6" ABOVE GRADE. ALONG NEW ACCESS ROAD FLUSH WITH GRADE. SLOPE SHALL NOT EXCEED 10%.
 - WHERE DUCT BANK IS INSTALLED IN BACKFILLED AREA, GROUND SHALL BE COMPACTED TO A MINIMUM OF 90% OF MAX. DRY DENSITY PER ASTM D-698.
 - WARNING TAPE SHALL CONSIST OF A SOLID ALUMINUM CORE, A COATED IMPRINT, AND A REINFORCED PROTECTIVE PLASTIC JACKET BONDED TO THE FOIL CORE. MINIMUM WIDTH SHALL BE 6-INCHES AND THE MINIMUM THICKNESS SHALL BE 4.5-MILS. THE ELECTRICAL WARNING TAPE SHALL BE RED AND STATE: "CAUTION - BURIED ELECTRICAL LINE BELOW".

TETRA TECH EC, INC.		DATE	DATE
DESIGNER	DATE	APPROVED	DATE
CHECKED	DATE	DATE	DATE
DRAWN	DATE	DATE	DATE
SCALE	DATE	DATE	DATE
PROJECT	DATE	DATE	DATE
DESCRIPTION	DATE	DATE	DATE
REV	DATE	DATE	DATE
NAVAL FACILITIES ENGINEERING COMMAND		PENNSYLVANIA	
ENGINEERING FIELD ACTIVITY - NORTHEAST		BETHPAGE, NEW YORK	
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT		GM-38 AREA	
GROUNDWATER TREATMENT PLANT		PULL BOX DETAILS	
EPAFE FOR COMMANDER, NAVFAC		APPROVED	
DATE		DATE	



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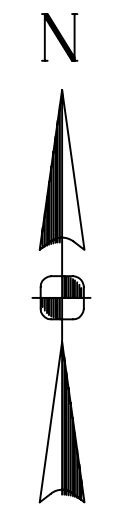
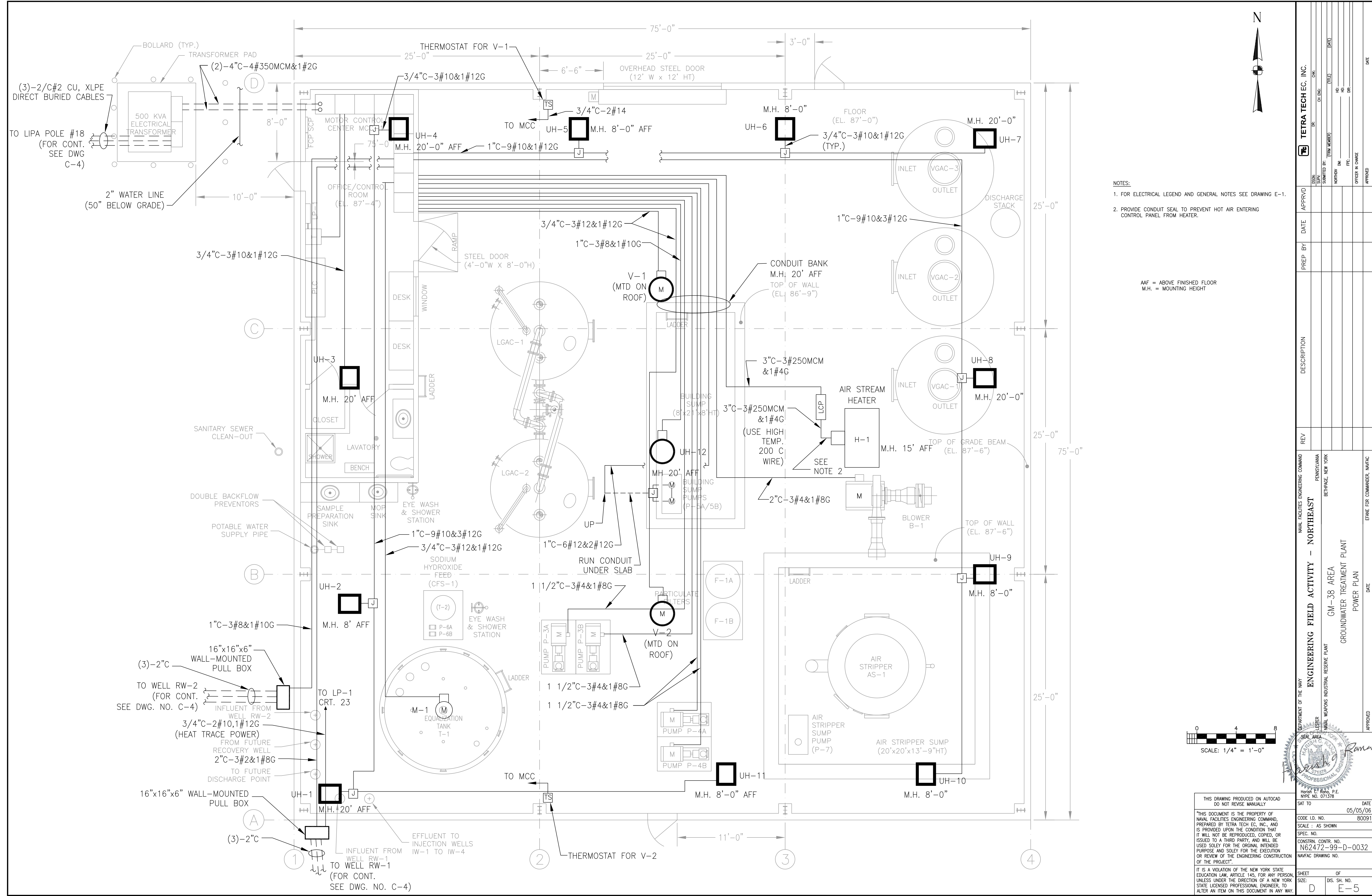
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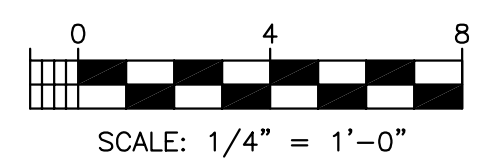
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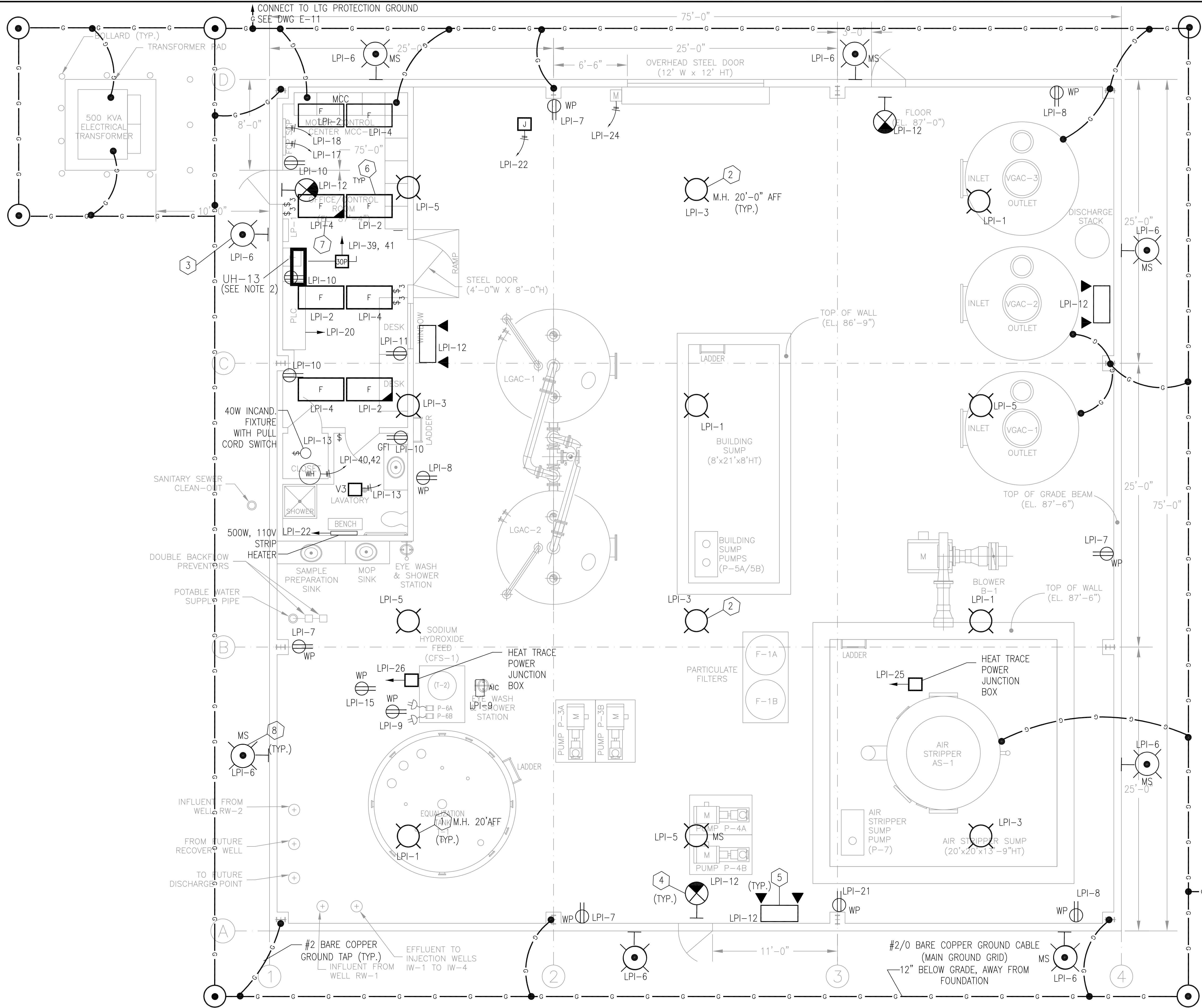


- NOTES:
- FOR ELECTRICAL LEGEND AND GENERAL NOTES SEE DRAWING E-1.
 - PROVIDE CONDUIT SEAL TO PREVENT HOT AIR ENTERING CONTROL PANEL FROM HEATER.

AFF = ABOVE FINISHED FLOOR
M.H. = MOUNTING HEIGHT

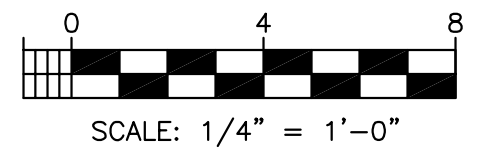


TETRA TECH EC, INC. LOCAL: [] SUBMITTED BY: [] PROJECT NO.: [] SHEET NO.: [] DATE: []	
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DESCRIPTION	
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NAVAL FACILITIES ENGINEERING COMMAND PENNSYLVANIA BETHPAGE, NEW YORK GM-38 AREA GROUNDWATER TREATMENT PLANT POWER PLAN	
DEPARTMENT OF THE NAVY NAVAL WEAPONS INDUSTRIAL RESERVE PLANT EFAHE FOR COMMANDER, NAVFAC	
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SHEET NO. D	OF DIS. SH. NO. E-5



- NOTES:
- FOR LEGEND AND GENERAL NOTES SEE DRAWING E-1.
 - HVAC CONDENSER UNIT UH-13 IS MOUNTED ON TOP OF CONCRETE DECK ABOVE MEZZANINE.
 - ALL OUTDOOR LIGHTING WILL BE MOTION ACTIVATED AND FITTED WITH A SHROUD TO REFLECT LIGHT DOWNWARD ONLY.

- BILL OF MATERIALS:
- 250 W, 120 V, HPS, HIGH BAY, PENDANT MOUNTED LIGHTING FIXTURE WITH DOME REFLECTOR AND HIGH POWER FACTOR BALLAST. FIXTURE SHALL BE U.L. LISTED FOR DAMP LOCATION.
RUDD CAT.# A1525-M OR APPROVED EQUAL
 - SAME AS ITEM #1 EXCEPT WITH ADDITIONAL 100 W QUARTZ LAMP FOR INSTANT RE-STRIKE.
RUDD CAT.# A1525-M-Q OR APPROVED EQUAL
 - 70 W, 120 V, HPS, OUTDOOR WALL MOUNTED LIGHTING FIXTURE WITH SHROUD FOR SHIELDING FRONT BRIGHTNESS AND 500 W, 120 V INCANDESCENT LIGHTING MOTION SENSOR.
LIGHT: RUDD CAT.# E8507-1-P-B5 OR APPROVED EQUAL
MOTION SENSOR: GRANGER CAT.# 4WNB8 OR EQUAL
 - WALL MOUNTED, 120 V AC WITH BATTERY BACKUP, EXIT LIGHTING FIXTURE WITH LED IN STEEL HOUSING. UNIVERSAL FACE WITH RED LETTER.
RUDD CAT.# EXSBUR OR APPROVED EQUAL
 - EMERGENCY BATTERY PACK WITH SEALED MAINTENANCE FREE LEAD ACID BATTERIES FOR 90 MIN OPERATION AND TWO 9 W, 12 V TUNGSTEN LAMPS.
RUDD CAT.# EMHC12100 OR APPROVED EQUAL
 - 2' X 4' FLUSH CEILING GRID MOUNTED, SPECIFICATION PREMIUM T8 STATIC TROFFER WITH 4 - 32 W FLUORESCENT LAMP WITH ELECTRONIC BALLAST.
LITHONIA CAT.# 2SP8G32 A12-120-GEB OR APPROVED EQUAL
 - SAME AS ITEM #6, EXCEPT WITH EMERGENCY BATTERY BACKUP.
LITHONIA CAT.# 2SP8G32A12-120-GEB-EL OR APPROVED EQUAL
 - 70W, 120V, OUTDOOR WALL-MOUNTED LIGHTING FIXTURE WITH PHOTO CELL AND MOTION SENSOR WITH SHROUD.



CONNECT TO LTG PROTECTION GROUND SEE SHEET E-11

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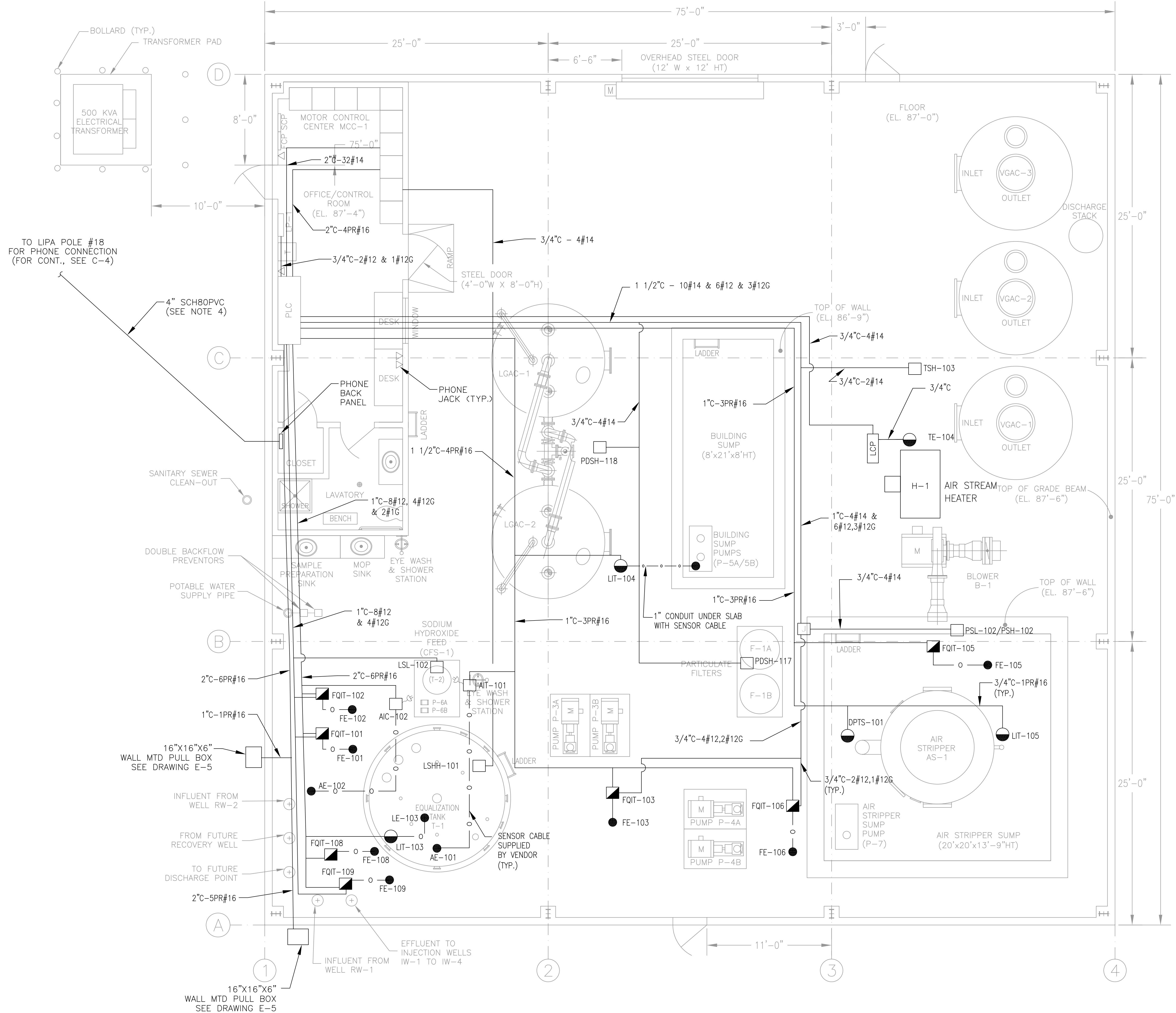
DATE: 05/05/06

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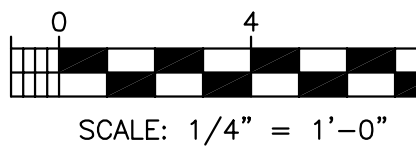
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SHEET OF DIS. SH. NO. E-6

TETRA TECH EC, INC. 1000 ROUTE 208 SUITE 200 HIGHTSTOWN, NJ 08520 TEL: 609-426-1000 FAX: 609-426-1001 WWW.TETRA-TECH.COM	
APPROVED: [Signature] DATE:	PREP BY:
DESCRIPTION:	REV:
ENGINEERING FIELD ACTIVITY - NORTHEAST GM-38 AREA GROUNDWATER TREATMENT PLANT GROUNDING AND LIGHTING PLAN	DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND PENNSYLVANIA BETHPAGE, NEW YORK NAVAL WEAPONS INDUSTRIAL RESERVE PLANT GM-38 AREA GROUNDWATER TREATMENT PLANT GROUNDING AND LIGHTING PLAN
SEAL: [Professional Engineer Seal] NAME: [Name] NO. [Number] EXPIRES: [Date]	DATE:

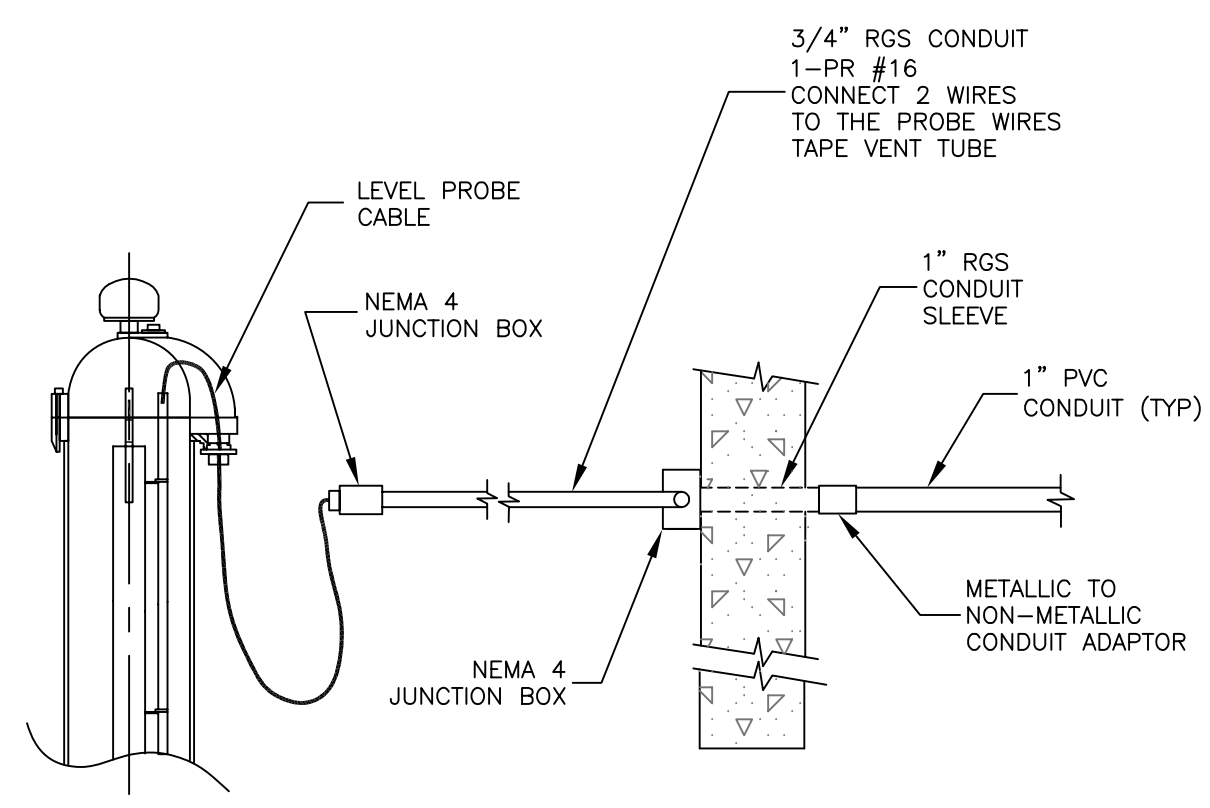


- NOTES:**
- FOR ELECTRICAL LEGEND AND GENERAL NOTES SEE DRAWING E-1.
 - INSTRUMENT LOCATIONS ARE SHOWN DIAGRAMATICALLY ONLY. EXACT LOCATION TO BE DETERMINED IN THE FIELD.
 - ALL WIRING SHOWN ON THESE DRAWINGS RUN TO THE PLC CABINET UNLESS OTHERWISE NOTED.
 - INSTALL 4" SCH80PVC CONDUIT 30" BELOW GRADE FOR PHONE COMPANY. WIRING BY PHONE COMPANY.

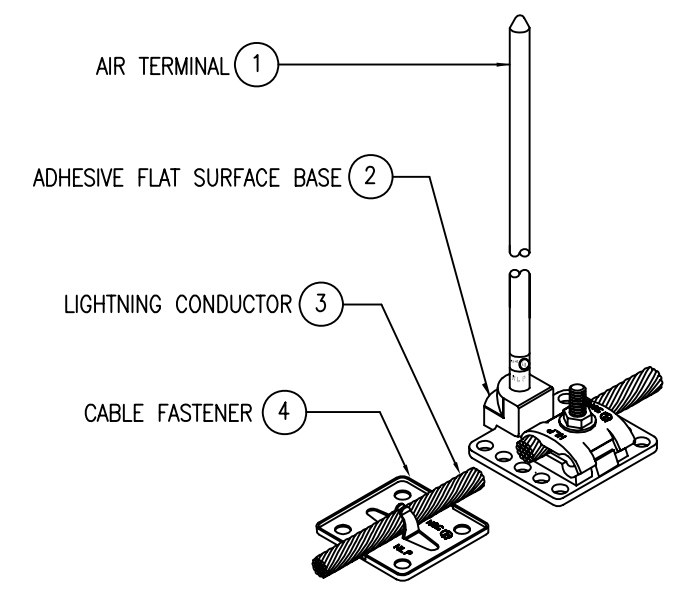


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SHEET D	OF DIS. SH. NO. E-7	DATE	

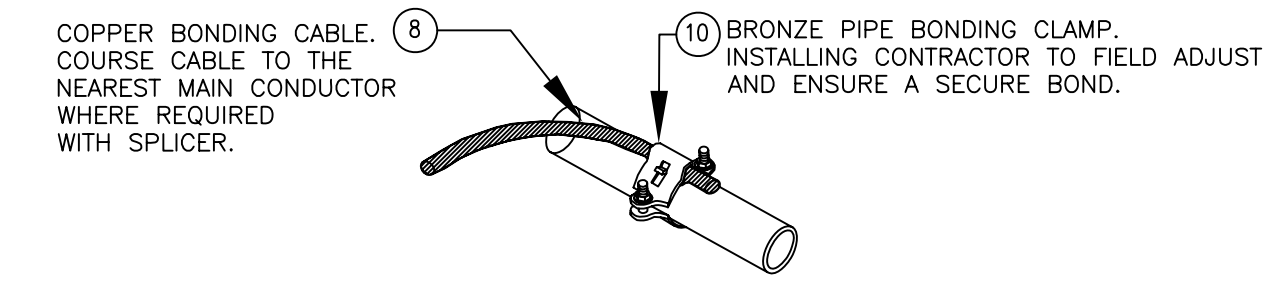
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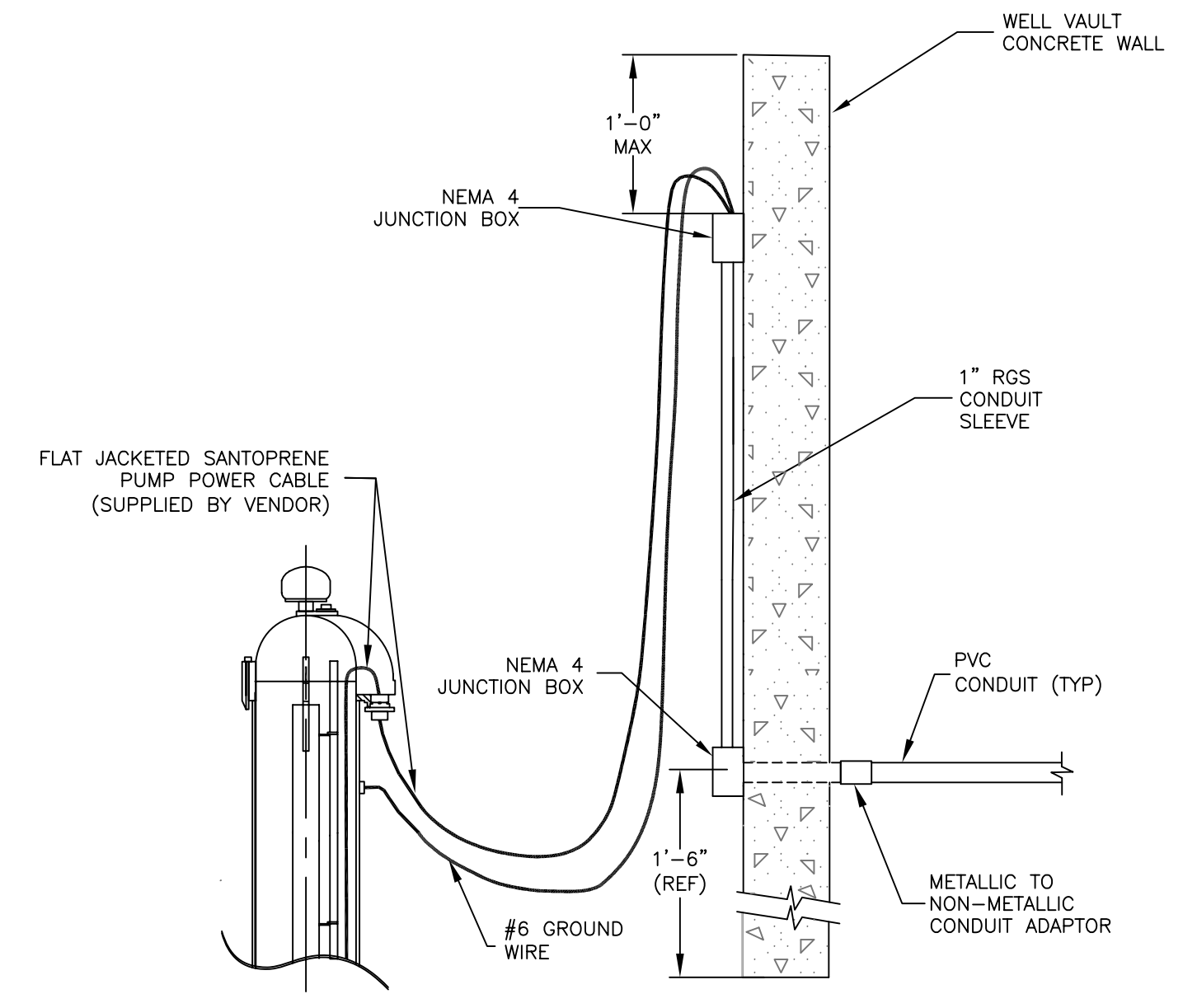
DETAIL 8 LEVEL PROBE CONNECTION
N.T.S. E-10 (TYP)



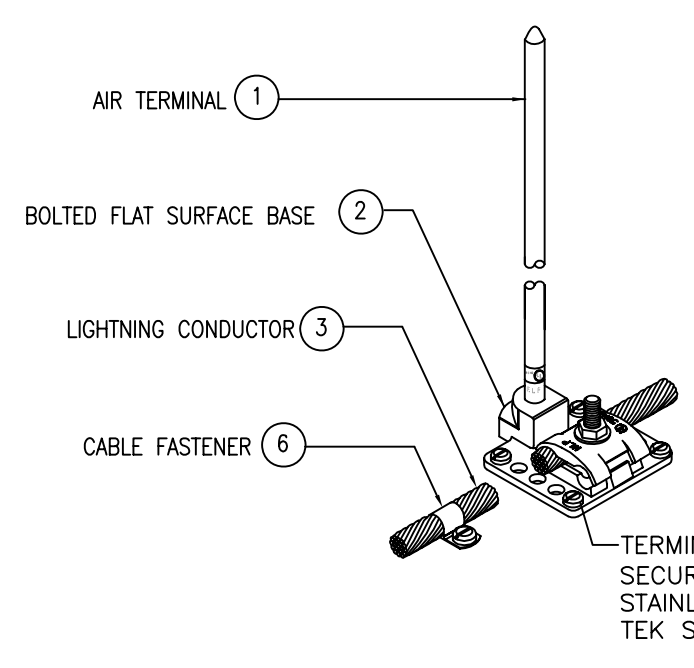
DETAIL 1 ADHESIVE AIR TERMINAL DETAIL
N.T.S. E-11



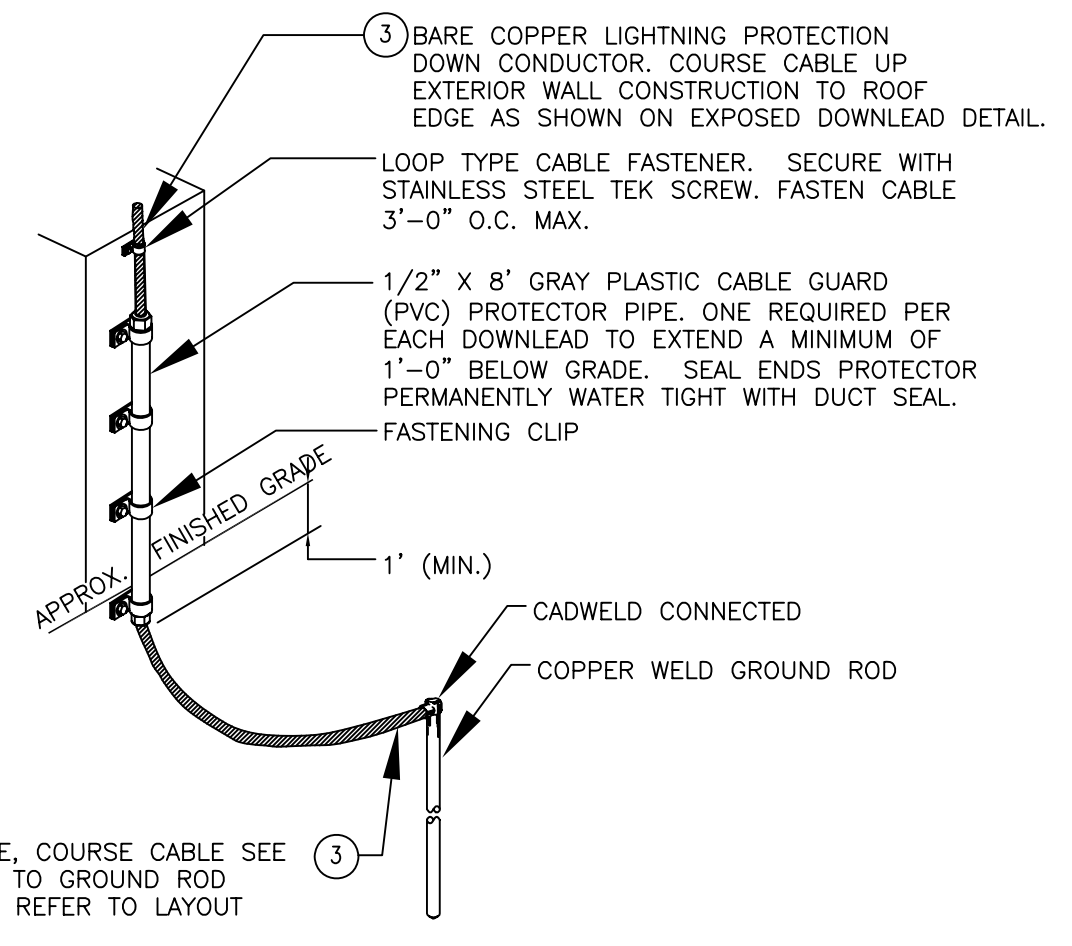
DETAIL 5 PIPE BONDING CLAMP
N.T.S. E-11



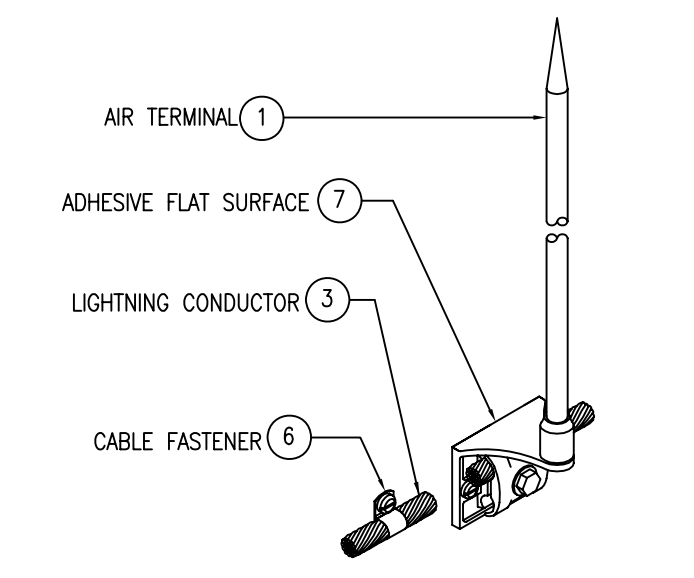
DETAIL 9 PUMP POWER CONNECTION
N.T.S. E-10 (TYP)



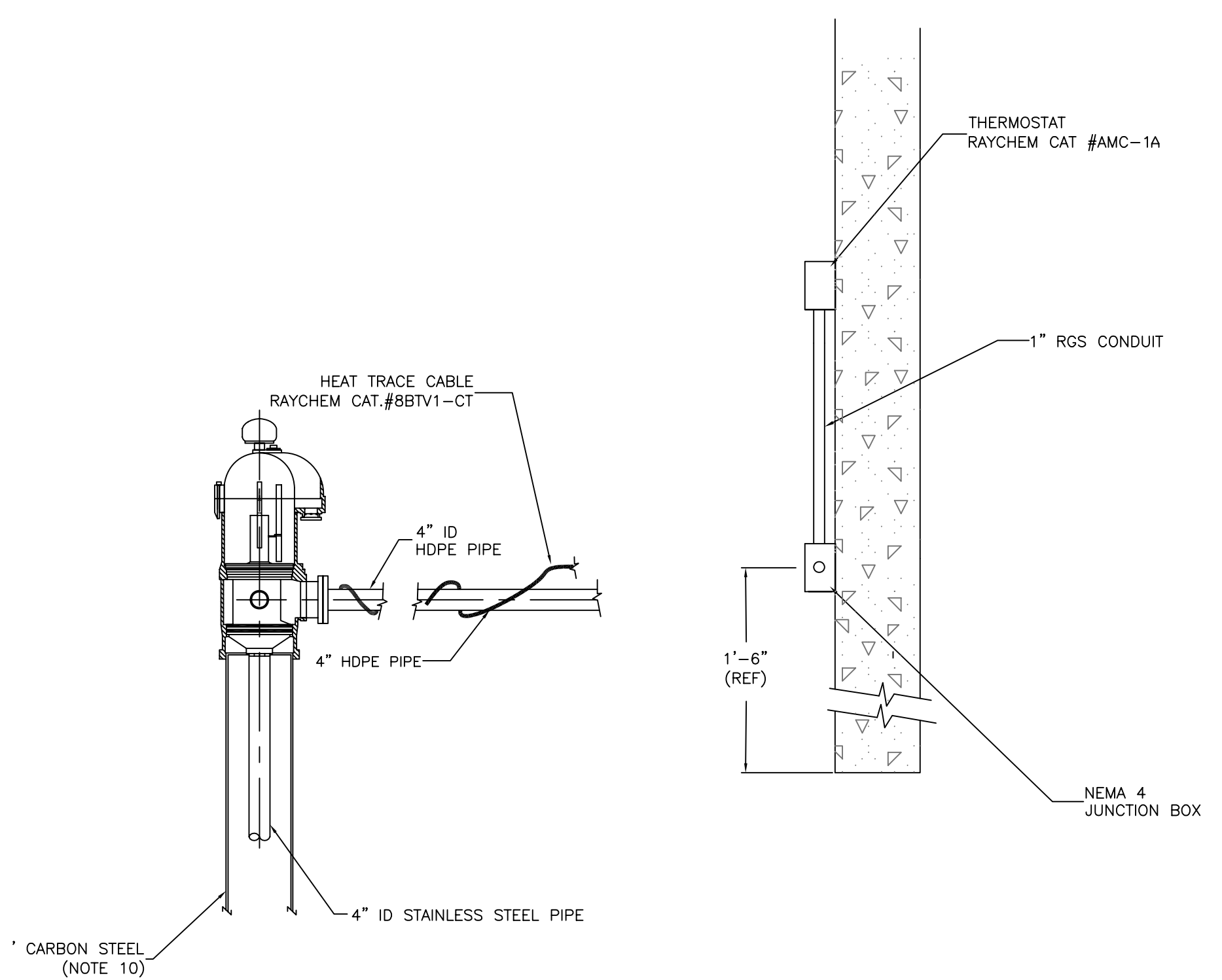
DETAIL 2 BOLTED AIR TERMINAL DETAIL
N.T.S. E-11



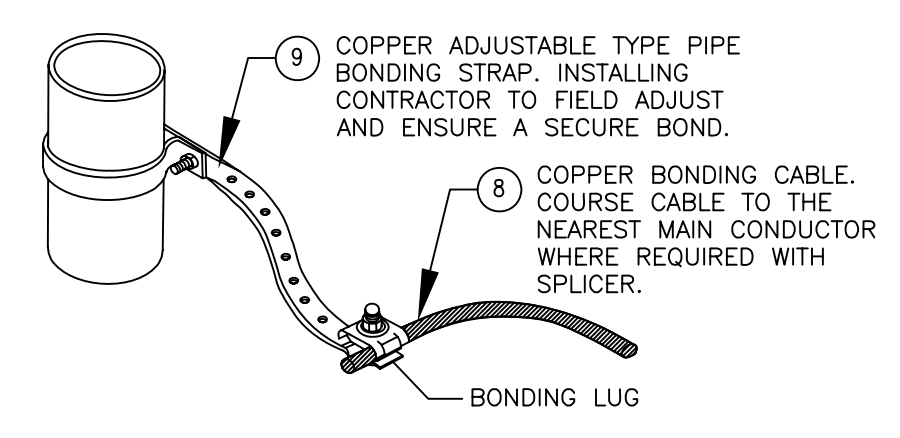
DETAIL 6 EXPOSED DOWNLEAD TO GROUNDING CONNECTION
N.T.S. E-11



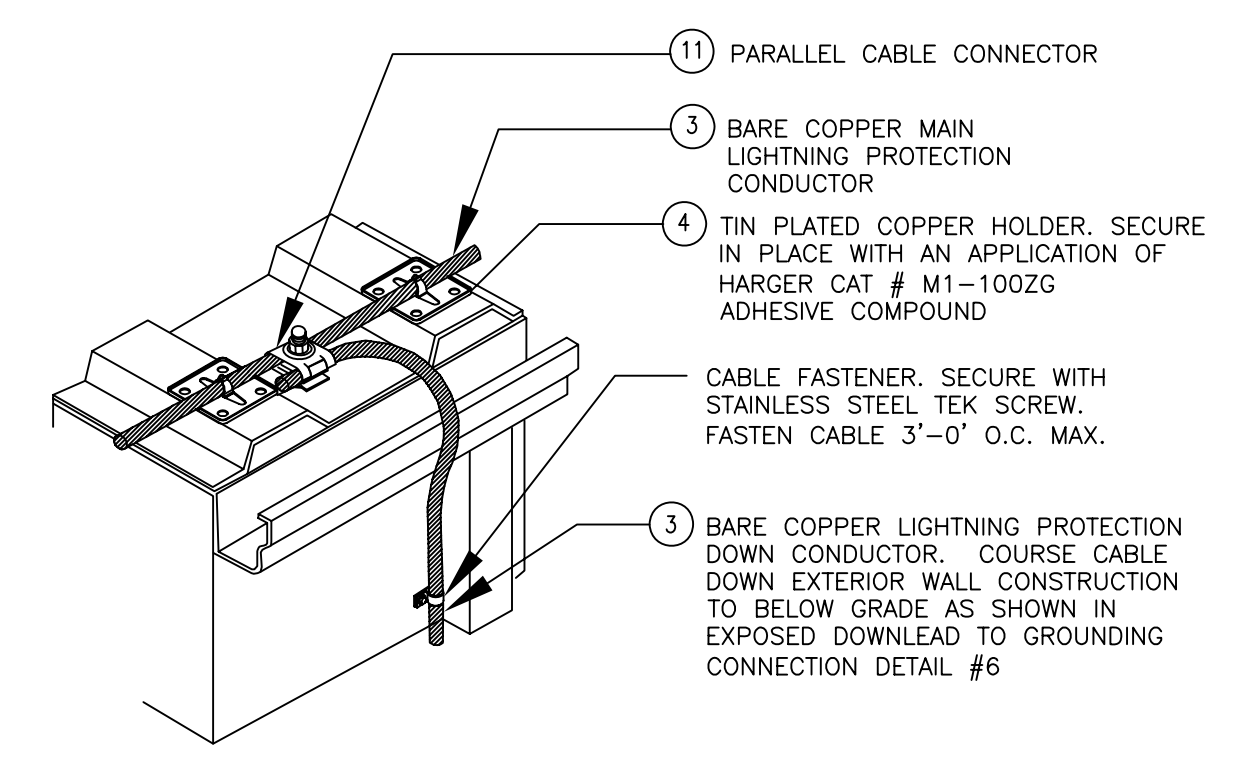
DETAIL 3 OFFSET PARAPET AIR TERMINAL DETAIL
N.T.S. E-11



DETAIL 10 HEAT TRACE POWER CONNECTION (TYP)
N.T.S. E-10 FOR INJECTION WELL FOR HEAT TRACE SCHEMATIC SEE DWG E-9



DETAIL 4 ROOF PIPE BOND
N.T.S. E-11

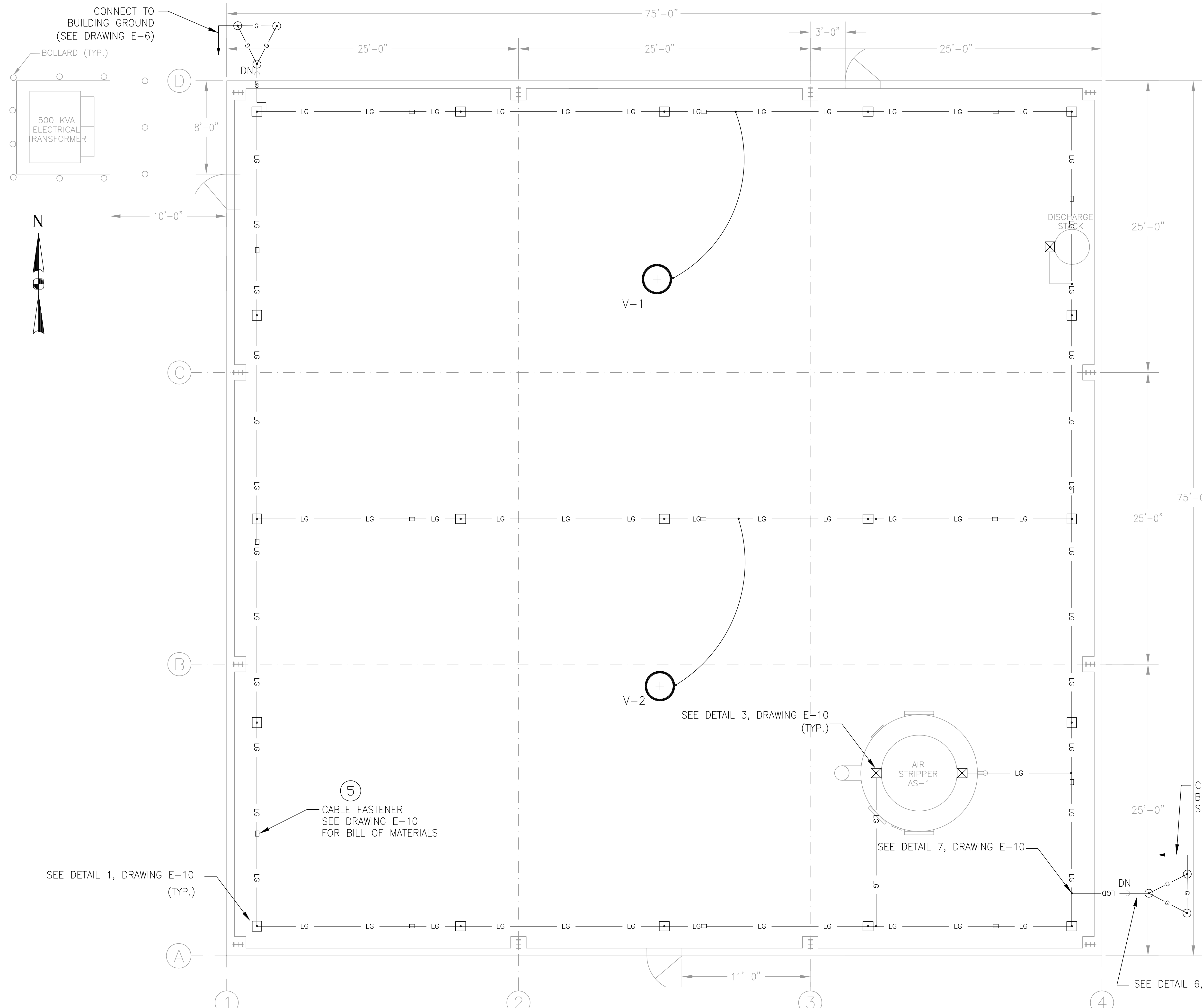


DETAIL 7 EXPOSED DOWNLEAD TO ROOF EDGE
N.T.S. E-11

- NOTES:
- FOR ELECTRICAL LEGEND AND GENERAL NOTES SEE DRAWING E-1.
 - FOR WELL AND PIPING LAYOUT, SEE DRAWINGS C-2 THROUGH C-5.
 - FOR WELL VAULT INSTALLATION DETAILS SEE DRAWING C-10.

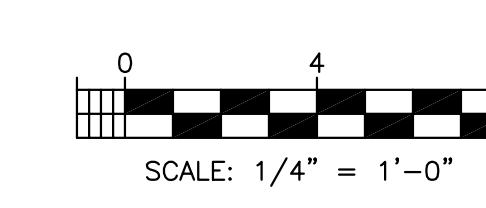
- BILL OF MATERIALS
- 12" LONG, 1/2" DIA. CLASS II TIN PLATED COPPER AIR TERMINAL HARGER CAT. #1210CUATT OR APPROVED EQUAL
 - UNIVERSAL MOUNTING BASE, TIN PLATED BRONZE, 1/2" THREADED HUB FOR AIR TERMINAL HARGER CAT. #10UBU121 OR APPROVED EQUAL
 - CLASS II BARE COPPER MAIN LIGHTNING PROTECTION CONDUCTOR APPROX. DIA. 1/2" HARGER CAT. #28-250 OR APPROVED EQUAL
 - TIN PLATED COPPER ADHESIVE CABLE HOLDER (NEAR AIR TERMINAL) HARGER CAT. #262T OR APPROVED EQUAL
 - TIN PLATED COPPER ADHESIVE CABLE HOLDER FOR HOLDING CABLE BETWEEN AIR TERMINALS HARGER CAT. #261T OR APPROVED EQUAL
 - TINNED COPPER CABLE CLIP HARGER CAT. #CCC3T OR APPROVED EQUAL
 - OFFSET PARAPET BASE, TIN PLATED BRONZE WITH AIR TERMINAL ADAPTER BASE HARGER CAT. #154T OR APPROVED EQUAL ADAPTER, HARGER CAT. #121T OR APPROVED EQUAL
 - COPPER BONDING CONDUCTOR HARGER CAT. #14 OR APPROVED EQUAL
 - COPPER ADJUSTABLE TYPE PIPE BONDING STRAP WITH BONDING LUG HARGER CAT. #231 OR APPROVED EQUAL
 - BRONZE PIPE BONDING CLAMP HARGER CAT. #GC OR APPROVED EQUAL
 - PARALLEL CABLE CONNECTOR (SPLICE) TIN PLATED COPPER HARGER CAT. #212T OR APPROVED EQUAL

TETRA TECH EC, INC.		DATE
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NAVAL FACILITIES ENGINEERING COMMAND	REVISION	DATE
ENGINEERING FIELD ACTIVITY - NORTHEAST		
GM-38 AREA		
GROUNDWATER TREATMENT PLANT		
MISCELLANEOUS ELECTRICAL DETAILS		
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT		
BETHPAGE, NEW YORK		
PENNSYLVANIA		
REVISION	DATE	
APPROVED		
FOR COMMANDER, NAVFAC		
DATE		
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	SHEET OF	DATE
	DIS. SH. NO.	
	D	E-10



- NOTES:**
1. THE COMPLETED INSTALLATION SHALL MEET THE REQUIREMENTS OF THE NATIONAL FIRE PROTECTION ASSOCIATION'S LIGHTNING PROTECTION CODE-2000 (NFPA 780) AND THE INSTALLATION REQUIREMENTS FOR LIGHTNING PROTECTION SYSTEMS, UL 96A OF UNDERWRITERS LABORATORIES. MASTER LABEL SHALL BE FURNISHED TO THE OWNER UPON COMPLETION.
 2. ALL LIGHTNING PROTECTION RODS AND CABLES ARE SHOWN INSTALLED ON TOP OF ROOF.
 3. ALL LIGHTNING PROTECTION SYSTEMS SHALL BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER.
 4. ADHESIVE USED WITH ADHESIVE AIR TERMINAL BASES AND CONDUCTOR FASTENERS SHALL BE COMPATIBLE WITH ROOFING MEMBRANE - VERIFY WITH ROOFING CONTRACTOR.
 5. METAL BODIES OF INDUCTANCE LOCATED ABOUT THE ROOF SUCH AS METAL FLAVERS, GRAVEL STOPS, ROOF DRAINS, SOIL PIPE VENTS, INSULATION VENTS LOUVERS AND DOOR FRAMES SITUATED WITH 6'-0" OF A LIGHTNING CONDUCTOR OR BONDED METAL BODY SHALL BE INTERCONNECTED TO THE LIGHTNING CONDUCTOR SYSTEM.
 6. CONDUCTORS SHALL INTERCONNECT ALL AIR TERMINALS AND SHALL FORM A TWO-WAY PATH FROM EACH AIR TERMINAL HORIZONTALLY OR DOWNWARD TO CONNECTIONS WITH GROUND TERMINALS.
 7. ALL LIGHTNING PROTECTION CONDUCTORS SHALL BE FASTENED NOT MORE THAN 3'-0" MAXIMUM SPACING.
 8. AIR TERMINALS SHALL BE PLACED AT ALL UNPROTECTED OUTSIDE CORNERS AND LOCATED INTERMEDIATELY ON 20'-0" MAXIMUM SPACING AROUND THE ROOF PERIMETER OR RIDGE AND WITHIN 2'-0" OF OUTSIDE EDGE.
 9. MID ROOF AIR TERMINALS SHALL BE PLACED ON 50'-0" MAXIMUM SPACING.
 10. BARE COPPER LIGHTNING PROTECTION MATERIALS SHALL NOT BE INSTALLED ON ALUMINUM ROOF OR SIDING OR OTHER ALUMINUM SURFACES OR VICE VERSA.
 11. ALL LIGHTNING PROTECTION MATERIALS ARE CLASS II MATERIALS.
 12. ALL COMPONENTS SHOWN ARE MANUFACTURED BY HARGER LIGHTNING PROTECTION INC.
 13. FOR BUILDING SYSTEM GROUNDING PLAN SEE DRAWING E-6.
 14. FOR LIGHTNING PROTECTION DETAILS AND BILL OF MATERIALS SEE DRAWING E-10.
 15. FOR ELECTRICAL LEGEND AND GENERAL NOTES, SEE DRAWING E-1.

		DATE: _____ DRAWN BY: _____ CHECKED BY: _____ SUBMITTED BY: _____ NORTH BY: _____ PROJECT NO.: _____ OFFICE IN CHARGE: _____ APPROVED: _____
APPROVED: _____ DATE: _____	PREP BY: _____ DATE: _____	DESCRIPTION: _____
REV: _____	DESCRIPTION: _____	APPROVED: _____ DATE: _____
NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING FIELD ACTIVITY - NORTHEAST PENNSYLVANIA BETHPAGE, NEW YORK GM-38 AREA GROUNDWATER TREATMENT PLANT LIGHTNING PROTECTION LAYOUT EPMR FOR COMMANDER, NAVFAC		
DEPARTMENT OF THE NAVY NAVAL WEAPONS INDUSTRIAL RESERVE PLANT SEAL AREA PROFESSIONAL ENGINEER HORIZON Q. RENO, P.E. NYPE NO. 071378		
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