EPA WORK ASSIGNMENT NUMBER: 117-2N47
EPA CONTRACT NUMBER: 68-01-7250
EBASCO SERVICES INCORPORATED

No design drawings attached

GROUNDWATER MANAGEMENT SYSTEM
REMEDIAL DESIGN
FINAL

BREWSTER WELL FIELD SITE
BREWSTER, NEW YORK
TOWN OF SOUTHEAST
PUTNAM COUNTY, NEW YORK

APRIL, 1989

Prepared By:

Mario S. Verdibello

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Site Manager
Ebasco Services Incorporated

Approved By:

Dev R. Sachdev

Dev Sachdev, Ph.D., P.E.
Regional Manager-Region II
Ebasco Services Incorporated

0130K

EBASCO SERVICES INCORPORATED

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EBASCO

April 20, 1989
RMOII-89-116

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SUBJECT: REM III PROGRAM
CONTRACT NUMBER: 68-01-7250
WORK ASSIGNMENT NUMBER: 117-2N47
BREWSTER WELL FIELD SITE - REMEDIAL DESIGN
BREWSTER, NEW YORK
FINAL DESIGN

Gentlemen:

Ebasco is pleased to submit the final design for Brewster Well Field, Operable Unit One for your review and approval.

The specifications package has been revised to incorporate the latest requirements and/or to provide a clearer understanding to the reader of such. The sections affected by such revision are:

Section 01010	Summary of Work (new)
Section 01025	Measurement and Payment (revised)
Section 01065	Health and Safety Requirements (new)
Section 02040	Dust and Vapor Control (added)
Section 02220	Excavation (revised)

Other minor changes were made throughout the document to ensure clarity and to correct some typo found during the internal review.

Also the "Issued for Proposal" drawings will be revised prior to contract award to "Issued for construction" drawings and after incorporating any special design requirements resulting from the contract negotiations.

If you have any questions please feel free to call me at 201-460-6434 or Nabeel Shaaban at 201-460-6484. Thank you for your cooperation.

Very truly yours,

Dev R. Sachdev

Dev. R. Sachdev, PhD., PE
Regional Manager-Region II

cc: J J Smith (EPA)
W Eberle (NYS-DEC)
M K Yates
M Verdibello

FINAL DESIGN

BREWSTER WELL FIELD SITE

GROUNDWATER MANAGEMENT SYSTEM

REMEDIAL DESIGN

BREWSTER, NEW YORK

SUBMITTED

TO

UNITED STATES

ENVIRONMENTAL PROTECTION AGENCY

REGION II

NEW YORK, NEW YORK

APRIL, 1989

EBASCO SERVICES INC.
LYNDHURST, NJ

0130K

BREWSTER WELL FIELD SITE
GROUNDWATER MANAGEMENT SYSTEM
TECHNICAL SPECIFICATIONS

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Section 01005 - Specification Outline

PART 1 - GENERAL

1.01 Summary

a. The purpose of this Section is to describe the organization and format to which the Specification has been prepared. This Section is intended only as an aid to the comprehension of the Specification.

1.02 Specification Format

a. The Specification has been generally prepared in accordance with Construction Specifications Institute (CSI) Format.

b. As per CSI format, the Specification is subdivided into 16 major divisions. Divisions form the basic framework of the Specification and contain most technical construction requirements. Divisions which are not applicable for this Specification are not used.

c. Sections within divisions include specific requirements for units of work based on trade or type of work. Sections within divisions are arranged in numerical order, however, section numbers may not be consistent between divisions. Page numbering is subordinate to section numbering.

d. Sections are generally sub-divided into three distinct groupings of related information as follows:

Part 1 - GENERAL: defines the administrative and procedural requirements unique to the section.

Part 2 - PRODUCTS: Details the quality and features of items required for the project.

Part 3 - EXECUTION: Details the incorporation of the products into the project.

Most sections contain all three parts described above, however, some of the parts may not be used in all sections. Paragraph designations are subordinate to part designations.

e. Sections do not stand alone and are governed by other portions of the contract documents. Certain portions of a section are specific extensions of, or are further governed by the general requirements of Division 1.

The requirements of the Contract Documents as a whole shall apply regardless of overlapping of various portions of the Specification.

f. This Specification has been generally written in the imperative mood and in some cases, streamlined form. The imperative language is directed to the Contractor, unless specifically noted otherwise.

1.03 Clarifications

a. Most technical sections begin with a paragraph in Part I entitled "Summary" or "Scope of Work". These paragraphs provide a brief description of the work generally specified in that Section. These descriptions are not intended as all-inclusive but merely brief descriptions presented for the purpose of clarifying the location of particular subject matter in the Specification.

b. Some technical sections contain a paragraph entitled "Related Sections" or "Related Work Specified Elsewhere." This paragraph lists some of the related work specified in other sections of the Contract Documents. These listings are not intended to be all-inclusive, rather, they are presented as a means of aiding the Contractor in locating some of the other Specification Sections which may contain specified work which has a close interrelationship with the work specified in that Section. The requirements of the Contract Documents as a whole, including all specifications, shall apply.

c. Wherever the following terms are used, such terms shall be designated to mean:

Terms	Meaning
EPA, Authority, Department	Owner
Engineer	USCOE or Designee
Contract	All project work covered by the Contract documents including General Conditions, Technical Specifications (Division 1 through 16) and all the drawings.
Contract Administration Manager (CAM)	Ebasco Services, Inc. - Designated CAM (only person with authority to change Contract's terms and conditions).

Inspector and Resident Engineer	Representative of the Engineer.
Laboratory	Laboratory Approved by the Engineer.
Plant Site	The earthfill area shown on the applicable drawings comprising the packed tower air stripper, appurtenances and their housing.
State	State of New Jersey

d. Reference standards are incorporated into the Specifications by reference number, title or other designations. The provisions of these standards become a part of the Specification as though included in their entirety. When there is a conflict or discrepancy between a reference standard and the Specification or with another reference standard, the more stringent requirements shall apply.

e. In the event of a discrepancy between the Specification and the drawing, the Specification shall govern.

f. No topographical or other error shall relieve the Contractor from his responsibility to perform the intent of this Contract.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

* * * * * *

Section 01010 - Summary of Work

PART 1 - GENERAL

1.01 Summary

a. 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 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 to 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.

b. The work covered by this contract calls for construction of a Groundwater Management System consisting of extraction wells, a packed column air stripper, injection wells, and associated appurtenances. The required site work to support construction of the Groundwater Management System is an integral part of this contract and includes excavation; earthfill; construction of access roads, pre-engineered building and foundations; and landscaping.

c. The Brewster Well Field Site is divided into two (2) operable units. Operable Unit 1, under this contract, includes the management and treatment of the contaminated groundwater found in the City of Brewster. Operable Unit 2, to be awarded under separate contract, includes the removal of the contamination source located southeast of the site and disposal of contaminated solids excavated under this contract.

d. Operable Unit 1 Contractor is required, within his scope of work, to arrange for the disposal of any contaminated solid material found within the site during excavation of the areas specified in this contract document with the Operable Unit 2 Contractor. Under this Contract, Operable Unit 1 Contractor is also required to accept, treat and dispose of contaminated liquids resulting from the operation of contamination source removal under the Operating Unit 2 Contract.

1.02 Related Information

a. Advertisement for Bids
b. Information for Bidders
c. Bid and Bid Bond
d. Agreement, Performance and Payment Bond
e. General Conditions and Supplements
f. Specifications
g. Drawings
h. Health and Safety Plan

1.03 Contract

a. The Contractor shall furnish equipment, labor and materials to perform all work stated in the Contract.

b. The Contract consists of all work specified in Division 1 through 16 of the Specification and shown on the Drawings, and include all addendums, modifications, amendments or changes issued to the Contract.

c. The elements of work are divided into eight (8) principal categories as outlined below. The referenced sections for each work category represent the principal construction elements. Some of the referenced sections are also applicable to other work categories and shall be implemented where and whenever applicable. Sections that are applicable to all work categories are not referenced. These include Measurement and Payment (Section 01025), Health and Safety (Section 01065), Quality Control (Section 01400).

1. Clearing, Grubbing, and soil excavation

Section 02040 Dust and Vapor Control
Section 02110 Clearing and Grubbing
Section 02140 Dewatering
Section 02220 Excavation
Section 02270 Erosion Control

2. Earthfill and Grading

Section 02040 Dust and Vapor Control
Section 02225 Earthfill and Grading
Section 02270 Erosion Control

3. Access Road

Section 02002 Geotextile
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4. Wells Installation

Section 02672	Extraction Wells
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5. Structures and Foundations

Section 03310	Concrete
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Section 04220	Concrete Unit Masonry
Section 09870	Coating System for Steel
Section 09880	Protective Coating for Concrete
Section 09900	Painting
Section 13120	Pre-Engineer Structures

6. Mechanical Systems and Equipment

Section 09870	Coating Systems for Steel
Section 09900	Painting
Section 11211	Extraction Well Pumps
Section 11212	Sump Pump
Section 11375	Packed Column Air Stripper
Section 13400	Process Control Systems
Section 15050	Basic Mechanical Materials and Methods
Section 15060	Pipes and Pipe Fittings
Section 15100	Valves
Section 15850	Air Handling
Section 15890	Duct Work

7. Electrical Systems and Equipment

Section 09870	Coating System for Steel
Section 09900	Painting
Section 13400	Process Control Systems
Section 16050	Basic Electrical Materials and Methods
Section 16500	Lighting
Section 16700	Communications
Section 16850	Electrical Resistance Heating

8. Landscaping

Section 02900	Landscaping

1.04 Work Covered by the Contract Documents

a. Clearing, Grubbing and Soil Excavation

The work consists of removal of all trees, stumps, brush, shrubs, and other vegetation within the limits of clearing and grubbing as shown on the drawings;

soil excavation to elevations shown on the drawings for the access roads, plant site, building and equipment foundations, sumps, valve pit, and pipe trenches; and removal of surface water and groundwater as needed to perform the required construction.

b. Earthfill and Grading

The work consists of furnishing, placing, compacting, and grading earthfill along the access roads and at the plant site; and backfilling pipe trenches.

c. Access Road

The work consists of furnishing and placing geotextile under the road sub-base; furnishing, placing, compacting, and grading the road sub-base material (NYSDOT Type-1); furnishing and installing a reinforced concrete pipe culvert with flared ends under the access road; and furnishing and installing asphalt paving and surfacing; all as shown on the drawings.

d. Wells Installation

The work includes installation of four (4) extraction wells with associated casings, screens, gravel pack, sand filter, access manhole, and well development; and eight (8) injection wells with associated piping, fittings, vent, screens, gravel pack, bentonite seal, grout, and well development.

e. Structures and Foundations

The work consists of furnishing, fabricating, erecting, and installing a pre-engineered building as specified and shown on the drawings; furnishing and installing the pre-cast concrete unit for the clear well, waste sump, and valve pit as shown on the drawings; furnishing and placing the concrete foundation for the air stripper column and other equipment; furnishing and placing the concrete and concrete block masonry for the footing and floor for the building; and coating and painting as specified.

f. Mechanical Systems and Equipment

The work encompasses functional design, furnishing, fabrication, erection, installation, and coating and painting, where applicable, of all mechanical systems and equipment required for the complete Groundwater

Management System as specified and shown on the drawings. These include, but are not limited to, the extraction well pumps, sump pump, packed column air stripper, air blowers, valves, piping and ductwork.

g. Electrical Systems and Equipment

The work eocompasses functional design, furnishing, fabrication, erection, installation, and coating and painting, where applicable, of all electrical systems and equipment required for the complete Groundwater Management System as specified and shown on the drawings. These includes, but are not limited to, the motor control center, power and lighting distribution, electrical accessories, conduits, and wiring.

h. Landscaping

The work consists of supplying and providing all labor, equipment, and materials necessary for topsoiling, seeding, fertilizing, mulching, and maintenance as specified and shown on the drawings.

i. Other Related Work Included in the Contract

The Contractor shall be responsible for obtaining all necessary permits; providing all temporary utilities (Section 01510), equipment and facilities (Section 01505); providing all work required for erosion control (Section 02270) and temporary control (Section 01560); performing necessary surveys (Section 01050); and all work related to demobilization.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.01 Contractor

a. The Contractor is advised that the work will be performed on a hazardous waste site as identified on the National Priorities List. Section 01065 - Health and Safety Requirements, establishes the minimum requirements for the development of a site specific Health and Safety Plan (HASP) by the Contractor. Contractor shall take all precautions necessary to protect the public and personnel from potential hazards, and shall have personnel with approved

hazardous waste training available to perform work as required. Work will be performed in Level D protection level as a minimum; however, Contractor shall be prepared to upgrade to Level C protection level if required.

b. The Contractor shall be responsible to immediately containerize and store any contaminated solids excavated from the site and arrange for their disposal with the Operating Unit 2 Contractor.

c. The contractor shall be responsible to containerize and hold any contaminated water until completion of the groundwater management system. Upon completion of the groundwater management system the Contractor shall treat contaminated water resulting from his own activities as well as those from contamination source removal performed by the Operating Unit 2 Contractor in the air stripper prior to final acceptance by the Engineer.

d. Dewatering procedures or other construction techniques shall not interfere with the operations of any public or private water supply wells.

e. The work performed is in close proximity to the properties of businesses, utilities and other parties. As such, the Contractor shall utilize every precaution to protect the property, utility lines, trees, walls and other structures from damage. Any damage that the Contractor may inflict shall be repaired or replaced to its original condition in a prompt manner as approved by the Engineer at no additional cost.

f. Contractor shall take all measures required to minimize adverse impacts from execution of the work on residences and businesses adjacent to or on the site and shall not interfere with their operations, at no additional cost.

3.02 Site Use

a. The Contractor shall minimize the use of the site area for storage. Storage and laydown areas are to be agreed upon and approved by the Engineer.

b. Contractor shall assume full responsibility for the protection and safe keeping of products under this Contract which are stored on-site.

c. Contractor shall move, without additional compensation, any stored items that interfere with the operations of the Engineer or any separate Contractor or Utility Company.

d. Contractor shall be responsible for all additional costs for the use of additional storage or work areas needed for operations to execute the work.

e. Contractor shall be responsible for restoring site to similar conditions existing prior to start of work, with the exception of the work specified herein, at no additional cost.

3.03 Other Requirements

a. The Contractor is referred to the following utility companies and agencies concerning information regarding underground utilities, hook-ups, structures and other facilities they may own or operate which may be encountered in the execution of the Work:

Water — Village of Brewster Water Department
Lou Gasparini (Operator)
Brewster, New York 10509
(914) 279-4324

Electric/Gas — New York State Electric & Gas
Michael Cenedella
Terravest Corp. Park
International Boulevard
Brewster, New York 10509

Telephone — New York Telephone Co.

This partial listing is intended as an aid to the Contractor and may not be complete. It is the responsibility of the Contractor to notify owners and operators of underground utilities to fulfill the requirements of Industrial code Rule 53, as adopted by New York State, when construction, excavation, demolition or other work may affect such facilities.

b. The Contractor is responsible for using special care and or special considerations which may be necessary for proper execution of the Work, but which may not be identified in this subsection. The Contractor shall comply with the entire requirements of the Contract Documents and shall exercise special care wherever required for proper execution of the intended Work even if not identified in this Contract.

3.04 Compensation

a. Compensation for execution of the Work as defined by the Contract Documents is specified in Section 01025, "Measurement and Payment."

* * * * * *

Section 01025 - Measurement and Payment

PART 1 - GENERAL

1.01 Mobilization/Demobilization

a. Work Included:

1. All work required to furnish, install, maintain and remove all signs, security, parking area, sanitation and utility services as defined in Section 01505.

2. All work required to furnish, install, and remove an office trailer with phone and electric services for the Engineer's Inspection Staff as defined in Section 01505.

3. All work required to provide temporary electric service to the site as defined in Section 01510.

4. All work required to furnish, install, maintain and remove the Straw Bale Dike and the construction entrance pad as defined in 02270.

5. All work required to furnish, install, maintain the decontamination pad, the trailer mounted tank, and the contaminated soil storage area as defined in Section 01560.

6. All direct invoiced cost from bonding companies and government agencies for permits.

7. All work required to provide field engineering as defined in Section 01050.

b. Measurement:

The Contractor shall provide a schedule of value to the Engineer. Measurement shall be a percentage of completed work based on an approved schedule.

c. Payment:

Payment for Mobilization will be paid at the Item's lump sum price prorated according to Measurement requirements.

1.02 Dewatering (See Section 02140)

a. Work Included:

1. Removal of all surface and subsurface water from

all work areas as defined by Section 02140.

2. Diversion of all surface and subsurface water from all work areas as defined by Section 02140.

b. Measurement:

The Contractor shall provide a schedule of value to the Engineer. Measurement shall be a percentage of completed work based on an approved schedule.

c. Payment:

Payment for Dewatering shall be paid at the Item lump sum price prorated according to Measurement requirements.

1.03 Clearing and Grubbing

a. Work Included:

All work required to clear grub and dispose of all materials within the clearing and grubbing limits as shown on the drawings and defined in Section 02110.

b. Measurement:

Measurement shall be by the area in square yards for cleared and grubbed areas. The length and width measurements shall be used to determine the square yards.

c. Payment:

Payment shall be in accordance with the unit price for each measured square yard.

1.04 Excavation

a. Work Included:

All work required to excavate top soil and objectionable subsoils to approximately two (2) feet below the existing ground at the Plant Site as defined by Section 02220.

b. Measurement:

Measurement shall be by surveyed cross-sections for the upper limit and lower limits of the excavations. Average-End Area Method shall be used to determine cubic yardage.

c. Payment:

Payment shall be in accordance with the unit price for each measured cubic yard.

1.05 Earthfill

a. Work Included:

All work required to furnish, place, compact and grade earthfill at the Plant Site as defined by Section 02225.

b. Measurement:

Measurement shall be by surveyed cross-sections for the lower limit and neat line for the upper limit of earth fill. Average-end area method shall be used to determine cubic yardage.

c. Payment:

Payment shall be in accordance with the unit price for each measured cubic yard at its final in-place density..

1.06 Paved Access Road

a. Work Included:

All work required to excavate topsoil, stockpile topsoil, excavate objectionable subsoil, prepare the subgrade, furnish the geotextile, install the geotextile, furnish earthfill as needed, compact earthfill as needed, grade earthfill as needed, furnish sub-base as shown on the drawings, compact sub-base, final grade sub-base, apply prime coat, furnish asphalt as shown on the drawings, and finish asphalt as defined in Section 02500.

b. Measurement:

Measurement shall be by linear foot of finished asphalt surface as measured along the road centerline beginning at station 0+0 to the end of the paved surface.

c. Payment:

Payment shall be in accordance with the unit price for each linear foot of installed twelve (12) foot wide paved access road.

1.07 Gravel Access Road

a. Work Included:

All work required to excavate topsoil, stockpile topsoil, excavate objectionable subsoils, prepare the subgrade, furnish the geotextile, install the geotextile, furnish the gravel as shown on the drawings, and compact the gravel as defined in Section 02230.

b. Measurement:

Measurement shall be by linear foot of compacted sub-base installed as measured along the road center line beginning at the end of the paved access road to the road ends at Injection Wells #5 and #12.

c. Payment:

Payment shall be in accordance with the unit price for linear foot of installed twelve (12) foot wide gravel access road.

1.08 Extraction Wells

a. Work Included:

All work required to install the extraction wells as shown on the drawings and defined in Section 02672.

b. Measurement:

Measurement shall be by linear foot of completed well including all required appurtenances.

c. Payment:

Payment shall be in accordance with the unit price for each measured linear foot of installed culvert.

1.09 Injection Wells

a. Work Included:

All work required to install the injection wells as shown on the drawings and defined in Section 02673.

d. Measurement:

Measurement shall be by linear foot of completed well including all required appurtenances.

c. Payment:

Payment shall be according to the unit price for linear foot of installed extraction well.

1.10 Culverts

a. Work Included:

All work required to furnish and install to line and grade a twelve (12) inch reinforced concrete culvert, grade the entrance and exit water course as shown on the drawings and defined in Section 2722.

b. Measurement:

Measurement shall be by linear foot measured along the center line of the culvert.

c. Payment:

Payment shall be in accordance with the unit price for each measured linear foot of installed culvert.

1.11 Fences and Gates

a. Work Included:

All work required to furnish and install the fence and gate as shown on the drawings and defined in Section 02830.

b. Measurement:

Measurement shall be by the linear foot of fencing installed. The gates shall be included in this measurement.

c. Payment

Payment shall be in accordance with the unit price for each measured linear foot of fence and gates installed.

1.12 Landscaping

a. Work Included:

1. All work required to grade, place and final grade topsoil and all work required to lime, disk, fertilize, seed, and mulch the disturbed areas of the site as defined by Section 02900.

b. Measurement:

Measurement shall be by the area in square yards which have been completed, the length and width measurement shall be used to determine the square yards.

c. Payment:

Payment shall be according to the unit price for each measured square yard.

1.13 Foundations

a. Work Included:

1. Column Foundation: All work required to excavate, compact, fill, grade, furnish reinforcement steel, furnish steel hardware, erect reinforcement steel, furnish concrete forms, furnish concrete, finish concrete, cure concrete, remove forms, backfill around the column foundation and embedded the anchor bolts for the packed column air stripper as defined in Section 03310.

2. Precast Units: All work required to excavate, compact, fill, grade, furnish and place the three precast units (i.e. sump, clear well and valve pit), backfill and compact around them as shown on the drawings and supply metal hatchways to each unit. See Section 03400.

3. Building Foundation: All work required to excavate, compact, fill, grade, furnish concrete, furnish concrete block, furnish mortar, install concrete footing and concrete block wall as required by the building supplier and backfill to line and grade shown on the drawings and defined in Section 03310.

4. Building Floor: All work required to fill, grade, compact floor, sub-grade, furnish and place, screen, finish, and cure concrete floor as shown on the drawings and defined in Section 03310.

b. Measurement:

The Contractor shall provide a schedule of value to the Engineer. Measurement shall be a percentage of completed work based on an approved schedule

c. Payment:

Payment for the Foundations shall be paid at the Item's lump sum price prorated according to measurement requirements.

1.14 Pre-Engineered Building (See Section 13120)

a. Work Included:

All work required to furnish and install the building structure as defined in Section 13120.

b. Measurement:

The Contractor shall provide a schedule of value to the Engineer. Measurement shall be a percentage of completed work based on the approved schedule.

c. Payment:

Payment for the Pre-Engineered Building shall be paid at the item's lump sum price prorated according to measurement requirements.

1.15 Packed Column Air Stripper

a. Work Included:

All work required to furnish, fabricate and install the Packed Column Air Stripper as defined in Section 11375.

b. Measurement:

The Contractor shall provide a schedule of value to the Engineer. Measurement shall be a percentage of completed work based on an approved schedule.

c. Payment:

Payment for the Packed Column Air Stripper shall be paid at the Item's lump sum price prorated according to measurement requirements.

1.16 Yard Pipe

a. Work Included:

All work required to furnish, install, backfill, and test the yard piping including valves and fittings as defined by Section 15060.

b. Measurement:

Measurement shall be by linear foot measured along the center line of the pipe from the extraction well's and injection well's stainless steel riser to five (5) feet from the pre-engineered building.

c. Payment:

Payment shall be in accordance with the Unit Price for each measured linear foot of installed yard piping.

1.1.7 Plant Site Piping

a. Work Included:

All work required to furnish, install and test, the plant site piping, valves and fittings as defined in Section 15060.

b. Measurement:

The Contractor shall provide a schedule of value to the Engineer. Measurement shall be a percentage of completed work based on an approved schedule.

c. Payment:

Payment for the Plant Site Piping shall be paid at the Item's lump sum price prorated according to measurement requirements.

1.18 Extraction Well Pumps

a. Work Included:

All work required to furnish, install, and test the extraction well pumps as defined in Section 11211.

b. Measurement:

Measurement shall be by each extraction well pump installed.

c. Payment:

Payment shall be in accordance with the unit price for each counted extraction well pump installed, connected and tested.

1.19 Sump and Sample Pumps

a. Work Included:

All work required to furnish, brace, anchor, connect, install, and test the sump and sample pumps as defined in Section 12345.

b. Measurement:

The Contractor shall provide a schedule of value to the Engineer. Measurement shall be a percentage of completed work based on an approved schedule.

c. Payment:

Payment for Sump and Sample Pumps shall be paid at the Item's lump sum price prorated according to Measurement requirements.

1.20 Air Blowers and Duct Work

a. Work Included:

All work required to furnish, brace, anchor, connect, insulate, install, test and balance the air blowers, duct work, vents, louvers, and accessories required for the air handling system as defined in Sections 15850 and 15890.

b. Measurement:

The Contractor shall provide a schedule of value to the Engineer. Measurement shall be a percentage of completed work based on an approved schedule.

1.21 Yard Electrical

a. Work Included:

All work required to furnish, install, test, acquire permits and inspections, of all yard electrical components including required cable sizes, conduit, switches, boxes and accessories as defined in Section 16050.

b. Measurement:

Measurement shall be by linear foot installed including all switches, boxes, junction, accessories and backfill along the length of the trench from the extraction pumps to within five feet of the Pre-Engineered Building.

c. Payment:

Payment shall be in accordance with the unit price for each measured linear foot of installed yard electrical conduit, cables and accessories.

1.22 Service Wiring and Connection

a. Work Included:

All work required to have the connection to the source of electrical power to the meter accomplished and all work required to run the service wiring from the meter to the building, through the foundation, and connected to the Motor Control Center as defined in Section 16050.

b. Measurement:

The Contractor shall provide a schedule of value to the Engineer. Measurement shall be a percentage of completed work based on an approved schedule.

c. Payment:

Payment for Service Wiring and Connection shall be paid at the Item's lump sum price prorated according to Measurement requirements.

1.23 Plant Electrical

a. Work Included:

All work required to run power to pumps, furnish, install, wire and test all instrumentation, furnish, install, wire, all lighting fixtures and electrical power outlets, and furnish, install, and test all switches, boxes, junctions, wiring, motor control center, fuses, conduits and other equipment shown on the drawings as defined in Section 16050.

b. Measurement:

The Contractor shall provide a schedule of value to the Engineer. Measurement shall be a percentage of completed work based on an approved schedule.

c. Payment:

Payment for Plant Electrical shall be at the Item's lump sum price prorated according to measurement requirements.

1.24 Painting

a. Work Included:

All work required to prepare surfaces, prime coat, and final coat all specified piping, equipment, structures, wells, sumps, instrumentation and conduits as required in Division 9 of this Technical Specification.

b. Measurement:

The Contractor shall provide a schedule of value to the Engineer. Measurement shall be a percentage of completed work based on an approved schedule.

c. Payment:

Payment for the painting shall be paid at the item's lump sum price prorated according to measurement requirements.

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

(Not Used)

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Section 01050 - Field Engineering

PART 1 - GENERAL

1.01 Summary

a. The Contractor shall provide all materials, items, operations or methods specified, listed or scheduled on the design drawings or specifications, including all materials, labor, equipment and incidentals necessary and required to conduct proper surveys required to stake and layout the Work.

b. The Engineer will identify site reference points and baselines as shown on the drawings.

c. The Contractor shall perform surveys for measurement and payment of completed Work.

d. The Contractor will provide a Field Change Request procedure for documentation and approval of any and all changes to the design affected by the Contractor, irrespective of cause, prior to or during construction.

1.02 Related Requirements

a. Contract Document - General Conditions

b. Section 01010 - Summary of Work

c. Section 01025 - Measurement and Payment

d. Section 01720 - Project Record Documents

1.03 Quality Control

a. All survey, layout and related Work shall be performed by a qualified land surveyor registered in the State of New York.

1.04 Submittals

a. Contractor shall submit name, address, telephone number and qualifications of the surveyor, crew chief, superintendent and all other persons who are proposed to perform surveys or survey related duties prior to start of any survey Work.

b. Upon request by the Engineer, Contractor shall submit documentation verifying accuracy of survey Work.

c. Contractor shall submit certificate signed by the Surveyor certifying that elevations and locations of site constructed features are in conformance, or non-conformance, with Contract Documents.

Any non-conformance shall be documented by a field change request form (see D. & E. below) and subject to review and acceptance by the Engineer prior to final disposition (i.e., payment, corrective actions, etc.).

d. Contractor shall submit a detailed Field Change Request procedure and forms that he intends to use to document changes and non-conformances for the Engineer's review and approval prior to start of construction.

e. Upon start of construction, Contractor shall submit a Field Change Request form documenting any and all changes, non-conformances and deviations from the design and/or specifications for review and disposition by the Engineer.

1.05 Project Record Documents

a. Contractor shall maintain on site a complete, accurate log of control of survey Work as it progresses.

b. Upon completion of the Work, Contractor shall submit Record Documents to the Engineer under the provisions of Section 01720, Project Record Documents.

PART 2 - PRODUCTS

2.01 General

a. All control surveys for elevation shall be ± .01 feet and for horizontal, control angles shall be to the nearest twenty (20) seconds ± 10 seconds and measured distances shall be to ± .01 feet.

All measurement surveys for elevation shall be to the nearest 0.1 feet ± 0.05 feet and for horizontal distances shall be to ± 0.1 feet.

2.02 Materials

a. Provide all materials as required to properly perform the surveys, including, but not limited to, instruments, tapes, rods, measures, mounts and tripods, stakes and hubs, nails, ribbons, other reference markers, and all else as required. All material shall be of good professional quality and in first-class condition.

b. All lasers, transits, and other instruments shall be calibrated and maintained in accurate calibration throughout the execution of the Work.

PART 3 - EXECUTION

3.01 General

Contractor shall exercise extreme care during the execution of all phases of the Work to minimize any disturbance to existing property and to the landscape in general.

3.02 Inspection

a. Contractor shall verify locations of site reference and survey control points prior to starting Work. Contractor shall promptly notify Engineer of any discrepancies discovered. Contractor shall also verify layouts periodically during construction.

3.03 Survey Reference Points

a. Contractor shall protect survey control points prior to starting sitework and preserve permanent reference points during construction. Contractor shall not relocate site reference points without prior written notice to Engineer.

b. Contractor shall promptly report to Engineer the loss, damage, or destruction of any reference point or relocation required because of changes in grades or other reasons. Contractor shall replace dislocated survey control points based on original survey control at no additional cost to the Engineer. Replacement of dislocated survey control points shall be done by a private licensed land surveyor approved by the Engineer.

3.04 Survey Requirements

a. Contractor shall reference survey and site reference points to permanent benchmarks and record locations of survey control points, with horizontal and vertical data, on Project Record Documents.

b. Contractor shall establish lines and levels, locate and lay out by instrumentation and similar appropriate means:

1. Site features to be constructed including necessary stakes for cut, fill, placement, and grading operations and stakes for utility locations, slopes, and invert elevations. During construction of pipe lines to be laid at the specified gradient, grade lines shall be maintained at all times. When necessary to remove a grade marker for construction operations, the grade lines shall be maintained parallel with the trench extending also at least three grade markers.

c. All base lines and all bench marks for grades for structures will be as shown on the Drawings. The Contractor shall, with his own forces, obtain working or construction lines or grades as needed.

d. Contractor shall furnish all materials and accessories (i.e., grade markers, stakes, pins, spikes, etc.) required for the proper location of grade points and line.

e. All marks given shall be carefully preserved and, if destroyed or removed without the Engineer's approval, they shall be reset, if necessary, at the Contractor's expense.

f. The cost to the Contractor of all Work and delays occasioned by giving lines and grades, or making other necessary measurements, will be considered as having been included in the unit and lump sum prices for items of Work.

g. All Work not done in full compliance with approved methods and without proper equipment shall be removed and replaced by the Contractor at his own expense.

h. It shall be the duty of the Contractor to keep the Engineer informed of the times and places at which he intends to work in order that the Engineer may have an ample opportunity to furnish and/or to check the lines and elevations with a minimum of inconvenience to the Engineer or of delay to the Contractor.

3.05 Surveys for Measurements and Payment

a. Contractor shall perform surveys to determine quantities of unit cost Work and percent of completed lump sum Work including surveys to establish measurement reference lines and shall notify Engineer prior to starting Work.

b. Contractor's field superintendent shall sign Surveyor's field notes or shall keep duplicate field notes and shall calculate and certify quantities for payment purposes.

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SECTION 01065
HEALTH AND SAFETY REQUIREMENTS

PART 1 - GENERAL

1.1 Summary

1.1.1 Hazard Assessment

The contaminants of concern detected at Brewster Well Field include tetrachloroethylene, (PCE), trichloroethylene (TCE), 1,2-dichloroethylene, (DCE), as well as their degradation products, vinyl chloride, methylene chloride and chloroform. PCE, TCE, and DCE have been detected most frequently at the greatest concentrations with PCE being the highest. Vinyl chloride, methylene chloride, and chloroform were only occasionally detected and at low concentrations. Reference NIOSH/OSHA Hazards in assessing the potential health risks of the contaminants.

The primary route of exposure to residents and/or on-site personnel is inhalation of organic vapors. The use of direct reading instruments such as an organic vapor meter (i.e. HNu and/or OVA) will be utilized by the Contractor in assessing contaminated exposure relative to each task performed. Due to the moderate potential for ingestion and skin absorption of on-site contaminants, procedures for contamination avoidance, personal hygiene and proper protective clothing will be strictly observed.

A thorough analysis of tasks/operations relative to potential health and safety risks shall be included in the HSP. A historical overview of the site will also be included.

1.1.2 This section describes the minimum health and safety requirements for remedial activities at the Brewster Well Field Site for the preparation of the Contractor's Site Health and Safety Plan (HSP).

1.1.3 The responsibility of development, implementation and enforcement of the Site Health and Safety Plan (HSP) lies with the Contractor and his/her health and safety personnel.

1.1.4 The HSP developed by the Contractor shall include plans for accident prevention, personnel protection, emergency response/contingency planning, air monitoring and hazardous chemicals on-site. Also refer to Paragraph 5. - General Requirements.

1.1.5 The HSP shall include but not be limited to:

a) Task/Operation Safety and Health Risk Analyses (item 1.)

b) Health and Safety Personnel (item 4.)

c) Level of protection (item 6.)

d) Safe Work Practices and Engineering Safeguards (item 7.)

e) Training (item 8.)

f) Medical Surveillance (item 9.)

g) Work zone categories (item 10.)

h) Personnel safety equipment and protective clothing (item 11.)

i) Personnel & equipment decontamination facilities (item 12.)

j) Personnel Hygiene (item 13.)

k) Emergency equipment and first aid requirements (item 14.)

l) Emergency response and contingency planning (item 15.)

m) Posted regulations, (item 16.)

n) Communication (item 17.)

o) Environmental and Personnel Monitoring (item 18.)

p) Accident Prevention Plan (item 19.)

q) Air Monitoring (item 20.)

r) Record Keeping and Reporting (item 21.)

1.2 Applicable Regulations/Publications

The Contractor shall comply, at a minimum, with the following:

1.2.1 Occupational Safety and Health Administration (OSHA), Standards and Regulations, 29 CFR 1910.

1.2.2 Occupational Safety and Health Administration (OSHA), Standards and Regulations: Hazardous Waste Operations and Emergency Response, CFR 1910.120.

1.2.3 Occupational Safety and Health Administration (OSHA), Safety and Health Regulations for Construction, CFR 1926.

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

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

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

1.2.7 Federal Acquisition Regulation (FAR); 52.236-13, Accident Prevention.

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

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

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

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

1.2.12 ANSI Requirements for Industrial Head Protection, Z89.1 (1969).

1.2.13 EPA ARCS Guidelines HS1.01 to HS1.15 and FT1.01 to FT12.01.

1.3 Submittals

1.3.1 The Contractor shall submit at the Pre-Work Conference a Site Health and Safety Plan, as specified herein, to the Contracting Officer for his/her review. The Contractor shall make all necessary amendments required by the Contracting Officer and resubmit the HSP to the Contracting Officer for approval. Mobilization on-site will not be permitted until written final approval of the HSP has been received.

1.3.2 Daily safety logs shall be maintained by the Contractor and shall be submitted to the Contracting Officer daily. The logs shall include items specified in paragraph 1.21 Record Keeping and Reporting. (Figure 1.21.2)

1.3.3 Training logs shall be maintained by the Contractor and submitted to the Contracting Officer either on request or on completion of the work. (Figure 1.21.2)

1.3.4 Reports of on-site air monitoring results shall be prepared and maintained by the Contractor and submitted to the Contracting Officer on a daily basis. (Figure 1.21-3)

1.3.5 Weekly Safety Reports (Figure 1.21.4) shall provide a summary of the range of work being done and shall include any incidents of:

a. Non-use or misuse of protective equipment;

b. Non-use of protective clothing;

c. Disregard of the buddy system, (not less than two workers working together);

d. Violation of eating, drinking, smoking and chewing regulations;

e. Any incident or injury resulting from non-compliance with the site safety program;

f. Job related injuries and illnesses.

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

1.3.7 Medical Surveillance Examinations: the name of the Occupational Physician and evidence of examinations for all on-site employees, along with evidence of their ability to wear NIOSH/MSHA approved respiratory device (as specified in ANSI Z88.2) shall be submitted to the Contracting Officer prior to allowing these employees on-site.

1.3.8 Incident Reports

Incident reporting shall, as a minimum, comply with the requirements of EPA ARCS II Program Guidelines or other approved guidelines by the Contracting Officer.

1.4 Health and Safety Personnel

1.4.1 Company Health and Safety Supervisor (CHSS)

The Company Health and Safety Supervisor (CHSS), is responsible for the development of new company safety protocols and procedures necessary for field operations. He/she has overall responsibility for development and implementation of this HSP, and will approve changes to this plan due to modification of procedures or newly proposed site activities. The CHSS is also

responsible for the resolution of any outstanding safety issues which may arise during the conduct of site work. Health and safety related duties and responsibilities will be assigned by the CHSS only to qualified individuals. Before personnel may work on-site, current acceptable medical surveillance results and health and safety training must be approved of by the CHSS.

1.4.2 Site Health and Safety Officer (HSO)

The Health and Safety Officer (HSO) is responsible for implementing and enforcing all aspects of the HSP and he/she will be present on-site during level B or high hazard level C field activities. The HSO may direct or participate in downrange activities, as appropriate, when this does not interfere with his/her primary responsibilities. The HSO will conduct regular and frequent safety inspections of the work area(s) to ensure ongoing compliance with the HSP, and he/she has the authority to stop work in case of imminent safety hazards, emergency conditions, or other potentially dangerous situations. Authorization to proceed with work will be issued by the CHSS, via the HSO following such action.

1.4.3 Assistant Health and Safety Officer

When conditions have been characterized as low-hazard level C or D, the HSO may direct the site health and safety efforts through an Assistant HSO approved of by the CHSS. The Assistant HSO may have collateral duties but will be certified for the health and safety responsibility by the CHSS. The Assistant HSO will share responsibility with the Field Operations Leader and the HSO for ensuring that all safety practices are utilized by downrange teams and that during emergency situations, appropriate procedures are immediately and effectively initiated.

For level B or high-hazard level C activities, Assistant HSOs may provide the downrange health and safety support for field teams. The number of Assistant HSOs will be dependent upon the number of downrange operations occurring simultaneously,the designated level of protection and individual assignments made by the HSO.

1.4.4 Air Monitoring Specialist

The Air Monitoring Specialist, if needed, will perform all supplemental air monitoring necessary to support specific activities as required by the HSP. These activities will include operations where special problems exist, extensive instrumentation is required or complex operations are planned. He/she will provide consultation to the project team where such services are necessary to ensure that appropriate monitoring, calibration and equipment maintenance procedures are employed. This will include specification as to the type of instrumentation and procedures to be employed to ensure proper use.

1.4.5 Medical Consultant:

The Contractor 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 Occupational Physician shall have extensive experience in occupational health and shall be familiar with site hazards and the planned remedial action. The Contractor shall submit a letter with his/her HSP which states that the medical consultant is aware of site conditions and potential work hazards at the Brewster Well Field job site.

1.5 General Requirements

1.5.1 This paragraph provides the basic general requirements for preparation of the Site Health and Safety Plan (HSP).

The Contractor, via the CHSS shall be responsible for the development and implementation of the HSP in accordance with the requirements of subsection 1.2 Applicable Regulations/ Publications above.

1.5.2 Prior to entering a site, the following information must be obtained. In addition, all potentially hazardous conditions shall be identified.

- Site location size;
- Description of response activities or job function;
- Expected duration of employee activity/each task;
- Topography;
- Accessibility by air and ground;
- Pathways for hazardous substance dispersion;
- Present status/capabilities of emergency response teams;
- Hazardous substances expected, including chemical and physical properties.

1.5.3 Site mobilization shall not be permitted until a written Notice to Proceed has been received from the Contracting Officer.

1.5.4 Determination of the appropriate level of employee safety equipment and procedures shall be made by the Contractor's Health and Safety Officer, based on an initial site survey, results of previous investigations and continuous monitoring for potential increase in contaminant levels.

As work progresses, the Health and Safety Officer shall specify personnel protection levels based on-site activity, monitored contaminant levels in the breathing zone (BZ) and his/her professional judgement.

1.5.5 Should the Contractor seek modification of any portion or provision in the HSP, such modification shall be requested in writing to the Contracting Officer and, if approved, shall be authorized in writing by those who authorized the HSP. The modifications shall be appended to the HSP. All on-site personnel shall be fully informed of the modifications and required actions.

1.5.6 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 Contractor for the applicability to this site's specific Health and Safety Plan. In such case, the Contractor shall revise or add the new requirement(s) to the HSP and resubmit it to the Contracting Officer for review and approval.

1.5.7 Disregard for the provisions of these health and safety specifications shall be deemed just and sufficient cause for ordering cessation of all site work until the matter has been corrected to the satisfaction of the Contracting Officer.

1.5.8 The Site Specific Health and Safety Plan shall include, but not be limited to, the requirements listed in subsection 1.1 Summary (Item 1.1.5) above.

1.6 Levels of Protection

1.6.1 The Contractor shall include in the Site Specific Health and Safety Plan a list of tasks and specific levels of protection for each task to be performed. Levels of protection may be upgraded or downgraded during site activities, based upon air monitoring results, meteorologic conditions and the professional judgement of the Field HSO.

1.6.2 Initial Level of Protection - Prior to conducting on-site work activities or entering uninvestigated areas, an on-site Health and Safety Reconnaissance shall be performed. Field personnel entering the site shall be accompanied by an HSO or designee equipped with an organic vapor meter. In addition personnel shall wear Level D protective clothing and carry respirators. The level of respiratory protection may be upgraded to Level C if the monitoring equipment indicates a rise in contaminant levels in the breathing zone (BZ). Decision to upgrade or downgrade these levels of protection shall be the responsibility of the Field HSO.

Provided below are expected levels of protection for anticipated activities. Interaction of activities has not been considered. These considerations will be addressed by the Contractor in the HSP.

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a. Personnel involved with excavation activities (i.e., demolition, sheet piling, dewatering, soil removal) on the site will initially require Level C protection.

b. Personnel involved with waste transfer and disposal operations involving direct handling of contaminated materials will initially require Level C protection.

c. All personnel working in the Contamination Reduction Zone (CRZ) will initially require Level D protection during personal decontamination. For heavy equipment decontamination, Level C protection shall be utilized.

d. Personnel involved in sampling and testing activities shall initially utilize Level D protection.

1.6.3 Provided below are levels of protection for anticipated site activities. Where more than one level is indicated, further definition shall be provided by the Contractor through review of site hazards, prevailing site conditions, proposed operational requirements and monitoring the Breathing Zone (BZ).

Task	Respiratory Protection	Protective Clothing
H&S Reconnaissance	D/C	D
Surveying Operations	D/C	D
Installation of Air Stripper	C	C
Water Sampling	D/C	D
Excavation	C/D	C/D
Well Installation	C/D	C
Contaminated Materials Handling	D/C	C
CRZ Activity	D/C	D
Decontamination-Personnel	D/C	D
Decontamination of Heavy Equipment	C	C
Decontamination of Sampling Equipment	D/C	D/C
General Clean Area Work	D	D

1.7 Safe Work Practices and Engineering Safeguards

The Site Specific Health and Safety Plan shall address all 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:

1.7.1 Definitions of personnel protective clothing accounting for parts of the body which may come in contact with contaminated material. Respiratory protection shall also be addressed in the HSP, identified during the site characterization and analysis.

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a. Personnel involved with excavation activities (i.e., demolition, sheet piling, dewatering, soil removal) on the site will initially require Level C protection.

b. Personnel involved with waste transfer and disposal operations involving direct handling of contaminated materials will initially require Level C protection.

c. All personnel working in the Contamination Reduction Zone (CRZ) will initially require Level D protection during personal decontamination. For heavy equipment decontamination, Level C protection shall be utilized.

d. Personnel involved in sampling and testing activities shall initially utilize Level D protection.

1.6.3 Provided below are levels of protection for anticipated site activities. Where more than one level is indicated, further definition shall be provided by the Contractor through review of site hazards, prevailing site conditions, proposed operational requirements and monitoring the Breathing Zone (BZ).

Task	Respiratory Protection	Protective Clothing
H&S Reconnaissance	D/C	D
Surveying Operations	D/C	D
Water Sampling	D/C	D
Excavation	C/D	C/D
Waste Transfer & Disposal	C/D	C/D
CRZ Activity	D/C	D
Decontamination-Personnel	D/C	D
Decontamination of Heavy Equipment	C	C
Decontamination of Sampling Equipment	D/C	D/C
General Clean Area Work	D	D

1.7 Safe Work Practices and Engineering Safeguards

The Site Specific Health and Safety Plan shall address all 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:

1.7.1 Definitions of personnel protective clothing accounting for parts of the body which may come in contact with contaminated material. Respiratory protection shall also be addressed in the HSP, identified during the site characterization and analysis.

1.7.2 The Contractor shall define the permit system in the HSP. The protocol shall include monitoring air quality, determinating required protection levels and an Emergency Contingency Plan.

1.7.3 The plan shall describe protocols for loading and operating trucks on-site and will include DOT requirements, covering such items as grounding, placarding, driver qualifications and the use of wheel blocks. Operation of other heavy construction equipment shall be in accordance with OSHA Construction Standards 29 CFR 1926.

1.7.4 General safe work practices including, but are not limited to, the buddy system, minimal number of people in the Exclusion Zone, regular equipment inspections, to remain upwind during on-going site activities, adequate illumination shall be addressed in the HSP.

1.8 Training:

1.8.1 The Contractor shall certify that all contractor and subcontractor personnel performing or supervising work for health, safety, maintenance, security/administrative purposes, or for any other site-related function, will have received site specific Health and Safety Training provided by the Contractor via the Health and Safety Officer. Proof of site-specific training will be documented and provided to the Contracting Officer.

1.8.2 The Contractor shall ensure that all personnel assigned to or entering the site shall have completed a minimum of forty (40) hours of general health and safety Hazardous Waste Site training and 3 days of supervised field experience in accordance with 29 CFR 1910.120(e). The training program shall be conducted by qualified instructors, experienced in hazardous waste operations. Training shall include, but not be limited to, the following areas:

a. Hazard analysis: chemical, physical;

b. Standard safety operating procedures;

c. Safety equipment;

d. Personnel protective equipment to include care, use and proper fit;

e. Decontamination procedures;

f. Areas of restricted access and prohibitions in work areas;

g. Emergency procedures and evacuation plans;

h. Respiratory equipment training and qualitative fit-testing protocols;

i. Emergency First Aid procedures and/or CPR;

j. Communications procedures on-site;

k. Hazardous materials handling procedures;

l. Air monitoring techniques;

m. Sample taking;

n. Hazardous material recognition;

o. The "buddy system" to be used at the site;

p. Medical surveillance requirements;

q. Names of personnel and alternates responsible for site safety and health;

r. Provisions of OSHA Standard 1910 and 1926.

1.8.3 The Contractor shall ensure that on-site management and supervisors directly responsible for, or who supervise employees engaged in hazardous waste operations, shall receive the training specified in Section 1.8.2 above and at least eight (8) additional hours of specialized training on managing such operations at the time of job assignment.

1.8.4 The Contractor shall ensure that personnel who have received the training in item 1.8.2 and/or item 1.8.3 above shall receive eight (8) hours of refresher training annually on the items specified in Section 1.8.2 and other relevant topics.

1.8.5 The Contractor's Health and Safety Officer, or designee, shall be responsible for site-specific training to visitors on the site, informing them of the hazards associated with the site, explaining emergency procedures and instructing them in the use of protective gear required during the visit. No one (visitor or employee) will be permitted into the Exclusion or Contamination Reduction Zones without documented training and medical clearance.

1.8.6 The Contractor shall be responsible for, and shall guarantee, that personnel not having successfully completed the required training and/or not having the required medical clearance are not permitted to enter the Exclusion Zone or the Contamination Reduction Zone.

1.8.7 The Contractor shall submit his/her training protocol curriculum and name/qualification of the instructor utilized with his/her HSP.

1.9 Medical Surveillance

1.9.1 Details of the medical surveillance shall be included in the HSP and shall include as a minimum the requirements specified below:

a. The Contractor shall utilize the services of the Occupational Physician (item 4. Health and Safety Personnel) to provide the medical examinations and surveillance specified herein.

b. A full medical examination shall be provided for each employee at no cost, without loss of pay and at a reasonable time and place according to the following schedule.

- o Prior to assignment of work at Brewster Well Field;
- o At least once every 12 months for each employee concerned;
- o At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last 6 months.

1.9.2 The medical surveillance protocol to be implemented is the occupational physician's responsibility, but shall meet the requirements of USEPA, OSHA Standard 29 CFR 1910.120 and ANSI Z88.2 (1980). The medical surveillance protocol shall cover as a minimum the following:

a. Medical and Occupational History;

b. General physical examination (including evaluation of major organ system);

c. Electrocardiogram;

d. Biological Blood profile (SMAC-21 or equivalent);

e. CBC;

f. Chest X-ray (performed no more frequently than every four years, except when otherwise indicated);

g. Serum lead and ZPP'

h. Pulmonary Function Testing (FVC and FEV1.0);

i. Urinalysis with microscopic examination;

j. Ability to wear respirator;

k. Visual Acuity;

l. Audiometric testing.

Additional clinical tests may be included at the discretion of the occupational physician.

1.9.3 The submitted medical surveillance program may be amended as conditions require, subject to the Contracting Officer's approval. The Contracting Officer's approval to the program and any amendments to it does not relieve the Contractor of his/her responsibility for its adequacy.

1.9.4 In addition, a non-scheduled medical examination may be conducted under the following circumstances after consulting with the Medical Consultant:

- o Following acute exposure to any toxic or hazardous materials;
- o At the discretion of the Contracting Officer, the CHSS or occupational physician;
- o Upon receipt of a request for a medical examination from an employee with demonstrated symptoms of exposure to hazardous substances.

1.9.5 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.

1.9.6 The Contractor shall include protocols, requirements, and protective measures for heat and cold stress monitoring and protective measures in the HSP. 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 professional advice and the guidance of the American Conference of Governmental Industrial Hygienists (ACGIH), in its TLV booklet 1988-1989. Such monitoring shall be performed by the HSO or his/her/ designee.

1.9.7 The Contractor shall maintain accurate records of medical surveillance in accordance with 29 CFR 1910.20.

1.9.8 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 prior to returning to work. 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 his/her written statement shall be submitted to the Contracting Officer. An accident report in accordance with 29 CFR 1910.20 shall be completed; and copies of such reports shall be submitted to the Contracting Officer.

1.10 Work Zone Categories

Work and support zones shall be established in order to contain contamination within the smallest areas possible. The Contractor shall ensure that each employee has the proper personal protective equipment for the area or zone in which he/she is to perform work. The Contractor shall include the delineated work/support zones as part of the HSP for approval.

1.10.1 An Exclusion Zone (contaminated work areas) shall be outlined on drawings provided in the HSP by the Contractor. The Exclusion Zone may require different levels of protective equipment. The required protective equipment for use by personnel working or entering the Exclusion Zones is specified in item 11 - 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 Contractor may change the Exclusion Zone with the written approval of the Contracting Officer. All personnel entering or exiting the Exclusion Zone shall pass through the Contamination Reduction Zone (item 10.2).

1.10.2 A 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 Contractor. Other emergency equipment (i.e. - SCBA's, stretchers, emergency shower or eyewash, first aid kits, etc.) will be kept in the Support Zone. The personnel protective equipment required for use by personnel working in this area is specified in subsection 11 - Personnel Safety Equipment and Protective Clothing. Decontamination equipment, supplies and stations shall be established in this area.

1.10.3 A 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.

1.11 Personal Safety Equipment and Protective Clothing:

1.11.1 The Contractor shall provide all on-site personnel with appropriate personal safety equipment and protective clothing. The Contractor shall also provide personal safety equipment and

protective clothing for five visitors. The Contractor shall ensure that all safety equipment and protective clothing is properly used, kept clean and well maintained.

1.11.2 Personal safety and protective clothing shall be compatible with and provide protection against the chemical hazards found at the site.

1.11.2.1 Level D protection shall consist of the following:

- o Cotton coveralls;
- o Neoprene (or equivalent) steel toe/shank boots that meet or exceed ANSI 24.1.1;
- o Neoprene (or equivalent) outer gloves;
- o Safety glasses or goggles;
- o Hard hat.

1.11.2.2 Level C protection shall consist of the following:

- o Poly-coated Tyvek with hoods and booties attached;
- o Surgical inner gloves;
- o NIOSH/MSHA approved full-face air purifying respirator (APR) equipped with combination organic vapor/HEPA filter cartridges;
- o Face shield attached to hard hat for tasks where a potential splash hazard exists;
- o All items included in level D protection (11.2.1).

1.11.2.3 Non-disposable clothing may be substituted for some items required for Level C protection. These substitutes shall be described in the Contractor's HSP.

1.11.3 Programs for respiratory protection shall be described and documented in the HSP and shall be in conformance with 29 CFR 1910.134 and ANSI Z88.2.

1.11.4 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.

1.11.5 Each respirator shall be individually assigned and not interchanged among employees without cleaning and sanitizing. Cartridges shall be changed daily or upon breakthrough, whichever occurs sooner.

1.11.6 All prescription eyeglasses brought on-site shall be safety glasses. Contact lenses shall not be permitted when performing site work. Prescription lenses for on-site employees requiring vision correction shall be provided in spectacle kits designed by the manufacturer of the respirators.

1.11.7 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 as determined by the HSO. The Health and Safety Officer shall ensure that all personnel protective equipment is decontaminated before being reissued.

1.12 Personnel and Equipment Decontamination Facilities:

1.12.1 The Contractor shall establish procedures for small equipment (i.e. - respirators, instruments) decontamination and personnel decontamination which shall be included in the HSP. The Contractor shall provide and maintain personnel and equipment decontamination facilities as specified hereunder. Personnel decontamination facilities shall include clean change rooms, lockers, laundry and a clean eating area for all personnel at the project site. All field personnel shall be thoroughly decontaminated before changing into their street clothes at the end of their working shift and prior to leaving the site. Personnel shall wash hands, face, and other exposed skin areas prior to work breaks and eating. The Contractor shall provide soap for washing, and towels and work clothes. Work clothes shall be left in the change facility. Except for work within the Support Zone, no work clothing, shoes or boots shall be worn off or carried out of the project area. Soiled work clothes shall be laundered on-site or off-site by the Contractor. Boots, gloves, and respirators shall be decontaminated by means of decontamination washdown procedures performed prior to the entering Support Zone. All required breathing devices shall be provided and maintained by the Contractor. Eating, chewing, smoking and drinking shall be prohibited except in facilities provided in the Support Zone.

1.12.2 Personnel Decontamination Facilities:

The Contractor shall provide for use, as needed, a Personnel Decontamination Facility consisting of a Personnel Decontamination Area and a change trailer for all of the Contractor's field personnel, as well as the Engineer and his/her field personnel. Separate change facilities shall be provided for male and female employees. These facilities shall be established and maintained by the Contractor.

1.12.2.1 Layout and Features:

The Contractor shall submit a drawing for the Contracting Officers' review and approval, showing the proposed layout of the facilities to be established. The features of the facilities 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; and provisions to remove all clothing and "shower out" before leaving the site;

b. Provisions for Contamination Reduction Zone employees to remove protective outer clothing and washup before eating before leaving site;

c. Heating, ventilating, air conditioning and adequate lighting systems;

d. Benches, tables, lockers and boot racks for clothing'

e. Chemical toilets;

f. Inner protective clothing and towels shall be washed using laundry detergent or soap and chlorine bleach;

g. Pure non-perfumed soap shall be provided.

1.12.2.2 Personnel Decontamination Area

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 personnel protection from the weather and equipment decontamination. This area shall include provisions for washing contamination and mud from boots, gloves, respirators and protective clothing and containers for collecting of outer protective clothing. Boots and gloves shall be washed with a mixture of water and Alconox or the equivalent. Respirators shall be washed with a non-alcohol sanitizer solution. Containers for collection of contaminated tyveks, gloves, nukes shall be provided. Provisions for drumming the boot and glove washes and rinses shall be made. The contaminated tyveks, gloves and other residues from decontamination of per- sonnel and equipment shall be disposed at an approved off-site facility.

1.12.2.3 Work Area Change Room

All dirty work area clothing shall be removed in this area. Benches plus tables and lockers for clothing and equipment shall be provided. A floor drain shall also be provided.

1.12.2.4 Eating/Rest Area

The eating/rest area shall be provided with a floor drain to allow for daily scrubbing of the floor with detergent and chlorine bleach.

1.12.2.5 Clean Area

This area shall include lockers for employee's street clothes, benches and a security area for valuables, as appropriate. A floor drain is optional, however, daily scrubbing of the floor with detergent and chlorine bleach is required.

1.12.2.6 Contaminated Aqueous Waste

The Contractor shall collect all contaminated aqueous waste and transport to the Operable Unit One Air Stripper for treatment (Section 01600-2).

1.12.3 Equipment Decontamination Stations:

1.12.3.1 The Contractor shall provide an equipment decontamination station within the Contamination Reduction Zone for removing contaminated soil from vehicles and equipment prior to leaving the work area. As a minimum, this station shall include a gravel pad, a high-pressure water wash area and a steam- cleaning system for use following removal of mud and dirt from the equipment. The decon pad shall be established so as to accommodate the largest piece of equipment used. The Contractor shall also provide storage tank(s) to collect the wastewater resulting from the decontamination of equipment and transport to the Operable Unit One Air Stripper for treatment. (Section 01600-2). Provisions for collection and drumming of liquids generated during equipment decontamination shall be specified in the HSP.

The Contractor shall be responsible for decontamination and removal of all equipment, including the decon pad at the decontamination station. Decontamination of the equipment and pad shall be by steam-cleaning at a specified area prior to moving to another area. Such cleaning shall be performed after completion of all work activities on-site. The Contractor shall provide the Contracting Officer with test sampling results of the decon pad to ensure no contamination remains prior to off-site disposal.

1.12.3.2 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 Zone (EZ) or Contamination Reduction Zones (CRZ) shall be decontaminated prior to maintenance work.

1.12.3.3 In general, any item taken into an Exclusion Zone must be assumed to be contaminated requiring careful inspection and/or decontamination before the item leaves the work area. Vehicles, equipment, and materials brought into the Exclusion Zone shall remain in the Exclusion Zone until it is no longer needed. Contamination avoidance procedures should be utilized to minimize personnel exposure and to potentially avoid invalidating sample results due to cross contamination. All contaminated vehicles, equipment and materials shall be cleaned and decontaminated to the satisfaction of the Contracting Officer prior to leaving the work area and/or 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.

1.13 Personnel Hygiene:

1.13.1 The Contractor 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 HSP shall address the procedures to be utilized for compliance with these provisions.

1.13.2 All on-site personnel found to disregard the personal hygiene-related provision of the HSP shall be barred from the site.

1.13.3 All on-site personnel shall wear the task designated personnel protective equipment as specified in subsection 1.11 when entering the Exclusion Zone or the Contamination Reduction Zone.

1.13.4 Used disposable outerwear shall not be re-used and shall be placed inside designated disposal containers provided by the Contractor in the Contamination Reduction Zone.

1.13.5 All personnel returning from the Exclusion or Contamination Reduction Zones shall thoroughly cleanse their hands, faces and other exposed areas before entering the eating area.

1.14 Emergency Equipment and First Aid Requirements:

1.14.1 Each active work area shall be provided with approved emergency eyewash and shower units in accordance with ANSI Standard Z358.1 and 20A-80 B:C type dry chemical fire extinguisher. These units may be portable. Water shall be potable and tempered.

1.14.2 At least one "industrial" first aid kit, approved by the Occupational Physician and a stretcher shall be provided, maintained and fully stocked at an 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 in close proximity to work locations while not entering hazardous areas.

1.14.3 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. First Aid Stations shall be supplied with buffer solutions for treating acid and caustic burns.

1.14.4 The Contractor shall have at least one person 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.

1.14.5 Dry chemical fire extinguishers, as specified in 1.14.1 shall be provided at the Contractor's office, the Contracting Officer's office and at any other site location where flammable or combustible material may present a fire risk.

1.15 Emergency Response and Contingency Planning:

1.15.1 In addition to the regulation to be posted as specified in general requirements, the Contractor shall develop and submit with the HSP an on-site Emergency Response/Contingency Plan. The Emergency Response/Contingency Plan shall meet the requirements of 29 CFR 1910.120 (l). After approval, his/her 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:

a. Name, address and telephone number of the Occupational Physician;

b. Procedure for prompt notification of local health facilities and fire department for emergency assistance;

c. Procedure for evacuation of off-site personnel in the event of a significant release;

d. Specific procedure for handling personnel with any skin or respiratory exposure to chemical or contaminated soil;

e. Special procedures for fires, explosions, evacuation of on-site personnel, or other unplanned hazardous incidents;

f. Procedures for treatment of personnel with injuries or stress related illnesses;

g. Procedure for notifying the Engineer Contracting Officer in case of accident or emergency;

h. Emergency phone numbers as follows:

o Brewster Police Dept.	(914) 225-4300
o Brewster Fire Dept.	(914) 279-3678
o Brewster Rescue Service	(914) 279-3678
o Off-Site Emergency Services - Brewster Police	(914) 225-4300
o Putnam Hospital	(914) 279-5711
o EPA National Response Center	(800) 424-8802
o NYC Poison Control Center	(212) 340-4494
o USEPA Emergency Response Region II	(201) 548-8730
o NYSDEC Hotline	(800) 457-7362
o NYSDEC Region 9 Office	(716) 847-4585
o New York State Police	(716) 373-2550

The Contractor shall also provide all additional numbers that are deemed necessary for emergency contacts.

1.15.2 The Contractor 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 Brewster Well Field site. The Contractors shall establish procedures and facilities for emergency communication with health and emergency services.

1.15.3 Site support vehicles designated for use in transportation of injured or ill personnel shall be provided with a route map to the medical facility. All on-site employees shall be thoroughly familiar with the emergency routes to the medical facility.

1.15.4 In the event of any emergency associated with remediation activities, the Contractor shall, without any delay, take diligent action to safeguard the employees, remove or otherwise mitigate the cause of the emergency, alert the Contracting Officer and institute whatever measures may be necessary to prevent repetition of the conditions or actions leading to, or resulting in, the emergency.

1.16 Posted Regulations:

1.16.1 The Contractor shall develop a series of posted regulations which shall be reviewed and approved by the Contracting Officer. These regulations shall address the on-site protocol regarding use of personnel protective equipment, personal hygiene, and provision for smoking and eating. In addition, OSHA required employee information bulletins shall be posted.

1.16.2 These protocols shall be posted in all on-site trailers, within the Contamination Reduction Zone and at the entrance to the site and shall be regularly reviewed with the Contractor's personnel.

1.17 Communications:

1.17.1 The Contractor shall provide hardline telephone communication at the site field office and the Contracting Officer's site office.

1.17.2 Emergency numbers, as listed in item 15.1-h above, shall be prominently posted near all on-site telephones.

1.17.3 The Contractor shall provide two-way radio site communication between the Communication Control Center, the CHSS, the Contracting Officer and staff, the Contractor's supervisory personnel and security and each active work location.

1.17.4 The Contractor shall provide air horns for use during emergencies at the Support Zone and each Exclusion Zone activity.

1.17.5 Strict use of hand signals shall be employed by field teams particularly within the vicinity of heavy equipment. The hand signals and corresponding meanings shall be known by all personnel on-site and reviewed during site-specific training.

1.17.6 The Security Officer shall supervise site communications and manage the Communication Control Center. The Control Center shall be located within the Security Officer's office.

1.18 On-Site and Personnel Monitoring:

1.18.1 The Contractor shall design, develop and implement an air monitoring program as specified in item 1.20. The

Contractor's responsibility shall include all air monitoring, personnel and real-time, within the site boundaries and at the site perimeter. Air Monitoring of this specification, as part of on-site monitoring, will ensure acceptable exposure levels to on-site personnel from toxic airborne vapors. As a minimum, the Contractor's air monitoring program shall provide multi-stage detection and identification of all on-site contaminants.

1.18.2 Heat Stress Monitoring:

The climate combined with the requirements for personnel 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:

- o Heart Rate (HR)
- o Body temperature
- o Body water loss
- o Visual observation of skin, eyes, body movements

The Health and Safety Officer shall specify the work cycle period and the rest period based on heat stress monitoring according to 1988-1989 ACGIH TLV's. The action levels at which the corrective action taken and heat stress control procedures shall be addressed in the Contractor's HSP.

1.18.3 Cold Stress Monitoring:

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

- o Personnel 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;
- o All personnel certified shall adhere to the work warmup schedule as specified in the 1988-1989 ACGIH TLV's.

1.19 Accident Prevention Plan:

As part of the Contractor Health and Safety Plan, the Contractor shall have the responsibility of developing, implementing and enforcing a site specific Accident Prevention Plan (APP).

The Accident Prevention Plan shall address, at a minimum, the following requirements:

1. Administrative Section:

a. Administrative responsibilities for effecting the APP involves identification of Contractor personnel responsible and accountable for accident prevention;

b Local Requirements which must be complied with such as noise control, traffic problems;

c. Method the prime Contractor proposes to control and coordinate work of his subcontractors, if any;

d. Layout of temporary roads and detours, and the method the Contractor plans to use;

e. Initial indoctrination, continued safety education and training for the Contractor's employees;

f. Traffic control and marking of hazards to cover haul roads, utilities, restricted areas, intersections;

g. Maintaining continued job cleanup, safe access and egress;

h. Fire protection, emergency ambulance service, fire, police;

i. Inspection of the jobsite by competent persons including reports to be kept, results of the inspections and corrective actions taken;

j. Procedures to be used for accident investigation;

k. Description and sketch of temporary power distribution system;

l. Description of safe clearance procedures;

m. Description of office trailer anchoring system;

n. Contingency plans for severe weather.

2. Activity Hazard Analysis Section:

a. An Activity Hazard Analysis shall be developed for each contract activity and operation occurring in each major phase of work;

b. The Contractor shall develop the plan to identify the sequence of work, the specific hazards anticipated and the control measures. The hazard analysis shall be job specific and shall address the following major points:

- o Activity being performed (identify major phases);
- o Sequence of work;
- o Hazards to be controlled in each activity.

1.20 Air Monitoring:

1.20.1 General Requirements:

1.20.1.1 The Contractor's Health and Safety Officer shall design, develop and implement an Air Monitoring Program to detect and quantify any volatilization of soil and groundwater contaminants or release of soil particles associated with remedial work in the on-site ambient air. The program shall be submitted as part of HSP for review and approval by the Contracting Officer.

1.20.1.2 Information gathered during the air monitoring program shall be used by the Health and Safety Officer to determine appropriate safety and protective measures to be used during remedial operations and to document potential on-site employee and off-site resident exposure to the contaminants in order that appropriate control measures and/or contingency plans may be implemented, if necessary.

1.20.1.3 Information gathered during this air monitoring program shall be logged and included in the project records and safety and health log.

1.20.2 General Responsibilities:

1.20.2.1 The Contractor's Health and Safety Officer shall be responsible for establishing air monitoring strategies and protocols, using real time instrumentation, appropriate industrial hygiene sampling and analytical procedures in order to characterize and quantify the airborne release and transport of contaminants during remediation work. These strategies and protocols shall address appropriate air monitoring for volatile organic compounds in the active work zones of the site.

1.20.2.2 The Contractor shall be responsible for establishing and documenting baseline (ambient) air quality prior to commencement of work and for conducting continuous air monitoring during on-site activities.

1.20.2.3 All air monitoring equipment required, to include that for on-site and perimeter monitoring, shall be provided by the Contractor and shall be maintained and calibrated daily by the Contractor in accordance with NIOSH analytical methods, equipment manufacturers' recommendations and industrial hygiene procedures.

Such maintenance and calibration data shall be recorded and included in the project record documents.

1.20.2.4 All air monitoring equipment shall be operated for designated use by trained personnel only (i.e. Health and Safety Officer and/or designee and the CHSS).

1.20.2.5 The Contractor shall utilize the action levels designated in section 1.20.4.8. These action levels shall determine the level of protection/action to be taken, the adequacy of air monitoring and stop work or emergency/ contingency action.

1.20.2.6 The Contractor shall provide the support necessary for the sampling and analysis of all samples collected during the program, for interpretation of the analytical results, presentation and documentation of all results.

1.20.3 Meteorological Monitoring

1.20.3.1 The Contractor Officer shall supply and maintain meteorological monitoring equipment as required.

1.20.4 Real-Time Air Monitoring

1.20.4.1 The Contractor shall furnish and maintain real-time air monitoring equipment at each monitoring and perimeter station to include: an explosimeter and an organic vapor monitor (photoionization detector or flame ionization detector). All monitoring equipment shall be intrinsically safe.

1.20.4.2 The Contractor shall perform ambient air monitoring prior to commencement of work in order to establish baseline data. Monitoring shall be provided during active cleanup operations adjacent to each active work zone. Real-time air monitoring will be required during excavation, staging and loading of potentially contaminated soils/groundwater, and handling of chemicals and/or contaminated liquids. Air monitoring shall also be performed adjacent to each open soil excavation, dewatering activity, demolition, staging/loading area and any chemical and/or contaminated liquids handling area in the Exclusion Zone. Monitoring shall be performed in the area of highest employee exposure risk in the Exclusion Zone.

1.20.4.3 The Contractor shall provide continuous air monitoring for volatile organic compounds with a flame ionization detector (FID) and/or a photoionization detector (PID).

1.20.4.4 Monitoring for organic vapor concentrations shall consist of measurements taken above background in the breathing zone (BZ) and downwind of all active site activities.

1.20.4.5 Any departures from general background shall be reported to the Site Health and Safety Officer and the Contracting Officer who, under advisement of the Health and Safety Officer, shall determine when operations should be shut down and contingency plans activated.

1.20.4.6 The frequency of real-time monitoring for all on-site activities shall include as a minimum:

- Continuous monitoring for organic vapors adjacent to all active work locations in the Exclusion Zone.
- Monitoring in the CRZ and Support Zone.

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

1.20.4.8 The Action Levels for real-time monitoring adjacent to each on-site activity in the Exclusion Zone are as follows:

Instrument	Action Level (Volatiles)	Level of Respiratory Protection/Action
PID/FID	0-25 ppm (TWA) above background in BZ	Level D
PID/FID	25-50 ppm (TWA) above background in BZ	Level C

	At Point of Operation	Action
CGI	0-25% LEL	Proceed Normally
CGI	25-50% LEL	Proceed, Continuous Monitoring
CGI	50%	Cease work, vent

Verbal reports shall be given to the Contracting Officer by the Health and Safety Officer whenever conditions require an upgrade/ downgrade in protection levels.

1.20.4.9 If the air monitoring indicates an abnormal rise in contaminant levels or the Health and Safety Officer indicates an imminent health hazard, work at that location shall be shut down and personnel shall be evacuated to a predetermined upwind location. The Contracting Officer shall be notified immediately and work will not resume until:

- o appropriate corrective measures are implemented;
- o authorization to continue work is given by the Contracting Officer after consultation with the Health and Safety Officer and approval by the CHSS.

1.20.4.10 If organic vapor levels in the Support Zone begin to exceed baseline ambient levels and approach action levels, appropriate action shall be taken as directed by the Contractor's 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 in the Health and Safety Plan.

1.20.4.11 The action levels for air monitoring at the perimeter stations shall be the responsibility of the Contractor and his/her personnel.

Instrument	Action Level	Action to be taken
FID	10 PPM	Stop work, initiate off-site evacuation procedure.
CGI	20% LEL	Stop, initiate off-site evacuation procedure, contact fire department.

1.20.4.12 A data sheet shall be developed and implemented by the Health and Safety Officer upon which is to be recorded the following real-time monitoring data information:

a. Date and time of monitoring.

b. Air monitoring location/operation(s).

c. Instrument, model #, serial #.

d. Calibration/background levels.

e. Monitored levels of contaminants.

f. Signature of Health and Safety Officer.

g. Interpretation of the data by the Health and Safety Officer.

These results shall be given verbally to the Contracting Officer following each site scan and documented in writing by the end of each work day with three (3) copies provided. Copies of the data sheets shall be included in the daily safety log.

1.20.5 Time Weighted Average (TWA) Air Sampling

1.20.5.1 The Contractor shall provide personnel air sampling pumps (two minimum) and appropriate sampling media for conducting required on-site TWA personnel sampling. All necessary support equipment, supplies for operating, maintenance and calibration of all equipment shall be supplied by the Contractor.

1.20.5.2 Prior to initiating any on-site activities, the Contractor shall perform background ambient air quality monitoring for volatile organics to generate baseline background data.

1.20.5.3 The background air quality for organics shall be sampled and analyzed in accordance with NIOSH Analytical Method 1003 (see attachment to this section). This background data or other available data from previous site studies may be used to identify key indicator parameters for further air sampling and analyses during the site operations.

1.20.5.4 During on-site construction activities (i.e., excavation, dewatering, handling of soils/sediments and groundwater, backfilling, handling of contaminated liquids/soils and other earthmoving work), air monitoring for volatile halogenated hydrocarbons (VOHs) shall be conducted on a daily basis, or as otherwise proposed by the Health and Safety Officer and approved by the Contracting Officer.

- One (1) location in the Exclusion Zone shall be established for TWA measurements. This will be accomplished by sampling the employee expected to receive maximum exposure with a personal sampling pump or by sampling adjacent to the employee's immediate work area (i.e., if the backhoe operator is to be monitored, it may be more desirable to attach the sampling equipment directly to the machinery in an area that approximates the employee's breathing zone).

- All samples from daily personnel monitored in the Exclusion Zone will be retained and, initially, the sample representing the day of heaviest activity shall be analyzed. Samples for volatile organics shall be refrigerated. The Health and Safety Officer shall also have samples taken from all personnel analyzed if the real-time monitoring indicates on-site air contaminant levels exceeds any of the action levels, necessitating the upgrading of protective equipment.

1.20.5.5 The selection of the maximum risk employee exposure for personnel sampling shall be proposed by the Health and Safety Officer and approved by the Contracting Officer prior to the commencement of each day's work activities.

1.20.5.6 The Contractor shall provide verbal analytical results with interpretation of the data for volatile organics and the Health and Safety Officer's recommendation, if any, to the Contracting Officer within 72 hours of sampling. The results shall be confirmed in a written report with three (3) copies provided to the Contracting Officer within 24 hours of providing the verbal results as specified in part 20.4. The Contractor shall inform the employees of their respective monitoring results in accordance with OSHA requirements.

1.20.5.7 The Contractor shall collect a duplicate sample for volatile organics as stipulated in Chemical QC Section 01430.

1.20.5.8 Personnel samples and all air samples requiring laboratory analysis shall be analyzed by a laboratory accredited by the American Industrial Hygiene Association (AIHA).

1.20.6 Dust Control

1.20.6.1 The Contractor shall conduct operations and maintain the project site so as to minimize the creation and dispersion of dust. Visible dust is not necessarily the criterion if hazardous wastes are involved.

1.20.6.2 The Contractor shall provide foam or water spraying equipment and clean potable water, free from salt, oil, and other deleterious materials for dust suppression.

1.20.6.3 Refer to Section 02040 - Dust Control

1.21 Record Keeping and Reporting:

The Contractor shall maintain logs and reports covering the implementation of the Health and Safety Plan. The format shall be developed by the Contractor 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 Contracting Officer as specified.

1.21.1 Training logs shall be completed by the Health and Safety Officer and submitted to the Contracting Officer prior to allowing personnel on-site. In addition, the logs and reports noted in Figure 1.21.1, shall include:

a. Employee's name, Social Security number, and attendance record;

b. Time allocation in the training session;

c. Topics covered;

d. Materials used;

e. Equipment demonstrated;

f. Equipment practice for each employee;

g. Prohibitions covered;

h. Explanation of the buddy system;

i. Fit-testing performed, and results;

j. Signature of trainer;

k. Other pertinent information.

1.21.2 A Daily Safety Log shall be completed daily by the Health and Safety Officer and submitted to the Contracting Officer in the daily safety log. These logs shall follow the format shown in Figure 1.21-2 and shall include:

a. Date;

b. Work area(s) checked;

c. Employees present in work area(s);

d. Equipment being utilized by employees;

e. Protective clothing being worn by employees;

f. Protective devices being used by employees;

g. Accidents or breaches of procedure.

1.21.3 Air Monitoring Reports shall be completed by the Health and Safety Officer and submitted to the Contracting Officer in the daily safety log. These reports shall follow the format shown on Figure 1.21.3 and shall include:

a. Date of Report;

b. Equipment utilized for air monitoring;

c. Air monitoring results from each work location;

d. Time-Weighted-Average of personnel sampling, date of actual sampling, and personnel sampled;

e. Calibration methods of equipment and results.

1.21.4 Weekly Safety Reports shall be completed by the Health and Safety Officer and submitted weekly to the Contracting Officer. These reports shall follow the format shown on Figure 1.21-4 and shall include:

a. Non-use or misuse of protective devices in an area where required;

b. Non-use or misuse of protective clothing;

c. Disregard of the buddy system;

d. Violation of eating, smoking, drinking, or chewing prohibition;

e. Job-related injuries and illness;

f. Summary of air monitoring done that week.

1.21.5 Close-Out Safety Report:

At the completion of the work, the Contractor shall submit a Close-Out Safety Report. The report shall be signed and dated by the Health and Safety Officer and submitted to the Contracting Officer. The report shall include:

a. Final medical examination results for all site personnel, if required;

b. Equipment decontamination certificate;

c. Procedures and techniques used to decontaminate equipment, vehicles, shower, laundry, toilet and decontamination facilities.

d. Violation of eating, smoking, drinking, or chewing prohibition;

e. Job-related injuries and illness;

f. Summary of air monitoring done that week.

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

PART 2 - PRODUCTS
Not used

PART 3 - EXECUTION
Not used

* * * * * *

FIGURE 1.21.1

TRAINING LOG

Date: _____

Employee in Attendance

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

9793b

FIGURE 1.21.2

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 _____

9793b

FIGURE 1.21.3

AIR MONITORING RESULTS REPORT

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 (Safety Monitor/ Safety & Health Specialist)

_____ Signature

9793b

FIGURE 1.21.4

WEEKLY SAFETY REPORT

Week Ending: _____

Summary of Any Violations of Procedures Occurring That Week:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Summary of Air Monitoring Data That Week (Include any sample analyses, action levels exceeded, and actions taken):

_____

_____

_____

_____

_____

_____

Comments: _____

_____

_____

_____

_____

_____

_____

Attach Meteorological Station Data.

_____ _____

Name Title

_____

Signature

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Section 01070 - Abbreviations and Symbols

PART 1 - GENERAL

1.01 Summary

a. This section lists and explains the abbreviations and symbols that are used throughout the Contract Documents. These are often included on the drawings.

b. Similar abbreviations may have different meanings, and if there is no concise delineation, the Engineer should be consulted.

1.02 Codes and Standards

AA	Aluminum Association
AASHO or AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AGA	American Gas Association
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron & Steel Institute
AMCA	Air Moving and Conditioning Association, Inc.
ANSI	American National Standards Institute (formerly ASA)
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
CIPRA	Cast Iron Pipe Research Association
CRSI	Concrete Reinforcing Steel Institute
CS	Commercials Standard
DEC	State of New York, Department of Environmental Conservation
EIA	Electronic Industries Association
EPA	United States Environmental Protection Agency
ETL	Electrical Testing Laboratories, Inc.
FM	Factory Mutual Laboratories
IEEE	Institute of Electrical and Electronics Engineers
IPCEA	International Power Cable Engineers Association
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association

NFPA	National Fire Protection Association
NSC	National Safety Council
NSF	National Sanitation Foundation
NYSDOT	New York State Department of Transportation
NYSE&G	New York State Electric and Gas
PCI	Prestressed Concrete Institute
PS	Product Standard
OSHA	United States Occupational Safety and Health Administration
SSPC	Steel Structures Painting Council
UL	Underwriters Laboratories, Inc.
WPCF	Water Pollution Control Federation

1.03 Other Abbreviations

A.C. (AC)	alternating current
Alum.	aluminum
AWG	American or Brown and Sharpe Wire Gage
NPT	American National Taper Pipe Treads
Amp, A or a.	amperes
aux.	auxiliary
B.V.	butterfly valve
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CIP	cast iron pipe
CISP	cast iron soil pipe
cm	centimeters
C.V.	check valve
CB	circuit breaker
cu.	cubic
cc	cubic centimeters
C.F.	cubic feet
CFS or cfs	cubic feet per second
CFM	cubic feet per minute
C.Y.	cubic yards
CT	current transformer
DL	dead load
°C	degrees Centigrade
°F	degrees Farenheit
D.C.	direct current
Dwg.	drawing
eff.	efficiency
el. or elev.	elevation
ft.	feet
FOP	Field Operations Plan
fps	feet per second
gal.	gallons
GPD or gpd	gallons per day
GPM or gpm	gallons per minute
galv.	galvanized

G.V.	gate value
ga.	gauge
g.	grams
HDPE	High Density Polyethylene
HZ or hz	hertz
HP	horsepower
HASP	Health and Safety Plan
HSO	Health and Safety Officer
I.D.	inside diameter
IP	instrument panel
inv.	invert
KVA or kva	kilovolts-amperes
KW or kw	kilowatts
KW-hr.	kilowatt-hours
L	length
lin.	linear
L.F.	linear feet
LL	live load
MH	manhole
max.	maximum
m.	meters
mA	milliamperes
mg	milligrams
mg/l	milligrams per liter
mm	millimeters
MGD or mgd	million gallons per day
min.	minutes or minimum
MCC	motor control center
NPL	National Priorities List
N.T.S.	not to scale
O.D.	outside diameter
ppm	parts per million
%	percent
PCE	perchloroethylene
PVC	polyvinyl chloride or polyvinyl chloride pipe
P.C. conc.	Portland cement concrete
lbs.	pounds
PPD	pounds per day
plf	pounds per linear foot
psi, psig	pounds per square inch gauge (above atmospheric pressure
psf	pounds per square foot
P/B	pullbox
red.	reducer
REM	Remedial Engineering Management
sch.	schedule
sec.	secondary or seconds
sq.	square
S.F.	square feet
S.Y.	square yards
std.	standard

Stl. W.G.	U.S. Steel Wire, Washburn and Moer, American Steel and Wire Co., or Roebling Gage
TCE	trichloroethylene
TDH	total dynamic head
TVO	total volatile organic
typ.	typical
USS Gage	United States Standard Gage
v	velocity
V or v	volts
V	volume
VHO	volatile halogenated organics
VOC	volatile organic compounds
W.S.	wall sleeve
W or w	watts
w/	with
yd.	yards
125-lb standard	American Standard for Cast Iron Pipe Flanges and Flanged Fittings, Class 125

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

* * * * * *

Section - 01080 Identification Systems

PART 1 - GENERAL

1.01 Summary

a. This section covers the general requirements for the identification marking of equipment and components that comprise the Groundwater Management System.

b. The work includes the tagging and marking of the system equipment and components for ease of identification and installation.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 Equipment Marking

a. A corrosion-resistant nameplate with clearly legible writing shall be permanently attached to each assembled piece of equipment at an easily visible place. It shall provide all necessary information pertaining to the equipment, but as a minimum the following must be included: Manufactuer's name, type of equipment, serial number, shop order number, Engineer's Tag No., project identification number, weight, motor speed, horsepower and Volts/Amps/Hertz ratings, and any other pertinent information. Any special maintenance instructions shall also be shown at this or other suitable location.

b. If it is not practical to include Engineer's equipment identification, or tag number on the equipment nameplate, a separate durable stainless steel tag with identification number shall be securely attached to the equipment.

c. All valves, fittings and loose materials shall have a metal tag with identifying number securely attached with a metal chain. All such material shall be piece and match-marked to aid in field assembly of equipment. Piece- and match-marking shall be done with steel dies. All markings shall be clearly shown on the Bill of Materials and on Contractor's drawings for ease of identification and erection.

d. All bolts, nuts and gaskets for flange joints shall be placed in separate containers with each identified by flange size, pressure standard, and flange material.

* * * * * *

Section 01200 - Project Meetings

PART 1 - GENERAL

1.01 Summary

This section describes the general requirements for the convening of project meetings that are deemed necessary by the Engineer during all phases of the implementation of the Bog Creek Farm Soil, Sediment and Water Treatment Systems.

1.02 Conditions

a. The meetings may be called by either the Owner or the Engineer on behalf of the Owner at the project site or some other location that is satisfactory to both the Owner/Engineer and the Contractor.

b. A meeting may be called during any stage of the project, up until turnover to the Owner, at any time when it is deemed necessary to raise any significant questions, establish new guidelines, introduce a new aspect to the project, etc.

c. Attendance at any meeting may not be limited to the Owner or his representative, the Engineer, and the Contractor. If it is necessary, any or all Subcontractors and Suppliers under the direction of the Contractor may be required to attend.

d. All expenses associated with attending the meetings that are incurred by other than Owner and Engineer shall be borne by the Contractor.

e. The Contractor will administer the following general requirements for the progress meetings.

1. Prepare agenda for meeting.

2. Make physical arrangements for meetings.

3. Preside at meetings.

4. Record the minutes; include significant proceedings and decisions.

1.03 Submittals

The Contractor shall record the minutes of the meetings and include any significant proceedings and decisions. The Contractor shall reproduce and submit to the Engineer within three days after each meeting three copies of the minutes of meeting and shall distribute copies to each participant in the meeting and to parties affected by decisions made at the meeting.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION (not used)

* * * * * *

Section 01300 - Submittals

Part 1 - GENERAL

1.01 Summary

a. This section describes the requirements for data submittal by the Contractor to the Engineer. A schedule is presented, and also the type of submittal; i.e., review and comment, for information only, etc., that is necessary to ensure the successful completion of this project.

b. The information submitted by the Contractor, including drawings and data sheets, shall have suitable unique designation and when reviewed, and if necessary approved, by Owner's Engineer shall be considered Final.

c. Final submittals shall bear the Owner's purchase order number, Contractor's shop order number and be stamped as Certified for Construction, or some similar designation. No alterations may be made to the design after Certification without the written approval of the Engineer.

d. Drawings and other pertinent data submitted shall provide complete and current information for engineering, erection, operation and maintenance requirements, including all necessary Subcontractor's drawings and data. Contractor shall indicate on each of its drawings the source of equipment supply by symbols or notes.

e. Final Contractor submittals shall be considered an integral part of, but shall not negate, the Contract Documents.

f. Review and approval of Contractor data and drawings by the Engineer shall not relieve the Contractor of the responsibility for engineering, design, workmanship, installation and materials as specified under the Contract Documents.

1.02 Related Sections

This section is intended to supplement and clarify the information contained in the submittals paragraph which is a part of various sections of the Contract Document.

Also reference Section 01730 for Operating and Maintenance Manuals.

Part 2 - PRODUCTS

2.01 Technical Data

Contractor shall submit the following drawings and information for the type of review indicated and in the time limit provided,

		Type of Submittal	
a -	Drawings showing the outline of all equipment and overall dimensions and detailing the location of all connections, supports and accessories.	30 Days After Award	Review and Comment
b -	Foundation requirements drawings, including loadings and type and location of embedded items and anchorbolt sizes and materials.	30 Days After Award	Review and Comment
c -	Sectional drawing depicting the arrangement of the functional parts and showing construction of internal parts.	30 Days After Award	Review and Comment
d -	Flow diagram showing system piping with sizes, valves and instruments with Owner's identification numbers added.	30 Days After Award	Review and Comment
e -	Contractor shall provide detail or assembly drawings which display all specification requirements which are not shown on outline drawings.	60 Days After Award	Review and Comment
f -	Piping drawings showing all lines with sizes and valves.	30 Days After Award	Review and Comment
g -	Detailed drawings and/or written description for any special requirements for handling, storing on site, and final erection.	90 Days After Award	Review and Comment
h -	Detailed drawings of weld-end preparation, surface finishes, etc.	60 Days After Award	Information Only

		Type of Submittal	
i -	Detailed fabrication drawings of the control panel including instrumentation layout. Exact location of terminals and controls shall be shown.	60 Days After Award	Review and Comment
j -	Wiring and connection diagrams After Award	60 Days Comment	Review and
k -	Simple logic diagrams for all automatic modes and system interlocks.	60 Days After Award	Information Only
l -	Instrumentation drawings for all of Contractor's equipment containing sufficient detail of electrical characteristics to permit check by Engineer as to applicability.	90 Days After Award	Review and Comment
m -	All other drawings required by this specification; including but not limited to site work details, road work details and well installation details	10 Days After Award	As Specified
n -	Detail drawing for the building showing structural detail, foundation connection, bolt detail, fabrication instruction, material list, manufacturer name, suppliers Architect's seal.	60 Days After Award	Review and Comment
o -	Detail drawing showing all precast concrete unit, dimensions, steel type, size and location, typical cross-section, base detail and lip detail.	10 Days After Award	Review and Comment
p -	Material suppliers and manufacturer's data for geoxtextile, earthfill, bituminous pavement, well riser, gravel filter, 12" culvert, pre-cast units, seeding, grout and concrete	10 Days After Award	Information Only

2.02	Schedules		
a -	A detailed overall schedule, sufficient to demonstrate Contractor ability to perform the work within the specified time.	10 Days After Award	Review and Comment
b -	A detailed schedule showing the time of delivery of all pieces of equipment to jobsite	30 Days After Award	Review and Comment
2.03	Procedure		
a -	Welding procedures, repair welding procedures, procedures qualification test records	4 Weeks After Award	Review and Comment
b -	Hydrostatic and leak test procedures	4 Weeks After Award	Review and Comment
c -	Cleaning, painting, lining and preparation for shipment procedure	4 Weeks After Award	Review and Comment
d -	Details of final cleaning packaging, protection and preservation provisions for shipment	4 Weeks After Award	Review and Comment
e -	Acceptance test procedure	4 Weeks After Award	Review and Comment
f -	Performance test procedure	4 Weeks After Award	Review and Comment
g -	Well Development procedure	4 Weeks After Award	Review and Comment
2.04	Plans		
a -	A dewatering plan detailing the Contractor's method to divert surface water and intercept groundwater	10 Days After Award	Review and Comment

2.05 As-Built Drawings

Contractor shall provide red-lined as-built drawings to the Engineer for information within 5 days of the field change. These as-built drawings will be included as a part of the Contract Documents.

2.06 Operating and Maintenance Instruction

Contractor shall provide in the manner as detailed in Section 01730, ten final copies of the complete operating and maintenance manual to the Engineer. Two copies of the preliminary manual shall be submitted to the Engineer for review and comment 30 days prior to final acceptance testing of the Soil, Sediment and Water Treatment Systems.

Part 3 - EXECUTION (NOT USED)

* * * * * *

Section 01400 Quality Control

PART 1 - GENERAL

1.01 SUMMARY

This section covers the general requirements for the quality control of the equipment supplied as part of the Groundwater Management System.

1.02 REQUIREMENTS

a. Contractor shall have a quality control program which will ensure that the work and equipment will properly reflect Engineer's requirements. The program shall cover, as a minimum, the following areas:

   a - Design and procurement control

   b - Control of purchased material

   c - Inspection and test performance and status

   d - Handling and storage

   e - Corrective action

b. Contractor shall provide inspection and test personnel and facilities to maintain control of quality of materials, components and fabrication throughout design and construction.

c. Engineer's Inspector or his representative shall have sufficient access to audit and inspect Contractor's facilities to verify that quality control is maintained. Inspector shall be permitted free access to all parts of Contractor's shop concerned with the fabrication. Free access by Inspector shall be maintained at all times while work is being performed.

d. Inspector shall have access to the facilities of those supplying materials, subassemblies or labor to Contractor's shop.

e. Contractor shall keep Engineer's Inspector informed of the progress of the work and shall notify the Inspector reasonably in advance of any required tests and/or inspections.

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

g. All work shall be performed by trained, qualified and certified workers.

h. All work shall be of high quality in accordance with the strictest codes and standards relating to the Work.

Part 2 PRODUCTS (not used)

Part 3 EXECUTION (not used)

* * * * * *

Section 01505 - Mobilization/Demobilization

PART 1 - GENERAL

1.01 Summary

a. This specification covers the requirements for proper site mobilization prior to the start of construction activities and subsequent demobilization at the finish of such.

b. The work shall consist of the mobilization of the Contractor's forces and equipment necessary for performing the work required under the contract.

It shall include the purchase of contract bonds; transportation of personnel, equipment, and operating supplies to the site; establishment of offices, buildings, and other necessary facilities at the site, and other preparatory work and the removal of temporary facilities at completion of work.

It shall not include mobilization for any specific item of work for which payment for mobilization is provided elsewhere in the contract.

c. The Contractor shall supply and provide all materials, fabrication, installation, and delivery of services as specified in this section and as shown on the drawings for complete and proper site mobilization and demobilization.

1.02 Related Sections

Related Work which is specified in other sections of the technical specification includes but is not limited to the following:

Section 01050 Field Engineering
Section 01510 Temporary Utilities
Section 01561 Temporary Controls (Hazardous Materials)
Section 01563 Erosion and Sediment Control

1.03 Quality Assurance

a. The Contractor shall ensure that the equipment and services provided for mobilization will properly reflect the Engineer's requirements.

PART 2 - PRODUCTS

2.01 Materials

a. Materials required shall include an Engineer's trailer, signs, fencing and temporary utility and sanitation facilities.

1. Engineer's Trailer

The Engineer's trailer shall be nominally 10 feet by 40 feet and shall meet the following requirements:

- o All metal frame
- o All metal exterior, sides, and roof
- o Security guard screens on all windows
- o Insulated double walls, floor, and roof
- o Electric base board heat
- o Self-contained, built-in air conditioning
- o Fluorescent ceiling lights
- o 110-Volt electric wall plugs
- o Minimum interior height - 7 feet
- o Minimum interior width - 7-1/2 feet
- o Stable set of stairs

The trailer shall be equipped with the following features and equipment.

2	Desks
2	Offices - 15' wide
2	Door with cylinder locks
4	Windows
1	Paper towel dispenser with towels
1	Paper cup dispenser with cups
1	Water cooler/heater
4	Swivel chairs
4	Straight chairs
1	Draft table
2	Two drawer file cabinets
1	Plan rack and plan hanger
1	Book shelf
2	Waste paper baskets
1	Coat rack
1	First aid kit
1	Fire extinguisher
2	Telephone with 12 foot cords

2. Signs

The Contractor shall supply two signs the signs shall be 4' x 8' supported by three 4x4 posts. They shall be set at 5 feet above the ground. All letters shall be six inches high.

The Project Sign shall read:

Brewster Well Field Project
Groundwater Management System
CERCLA Remedial Action
REM III Program

Engineer:	Sponsors:
Ebasco Services Inc.	USEPA NYSDEC NYSDOT
Contractor:	Village of Brewster

Letters to be white with green background, letters shall be six inches high. The sign shall have the official EPA logo on it.

The Safety Sign shall read:

Think Safety
Hard Hats Required
Beyond
This Point

Letters to be black on white background, letters shall be six inches high.

3. Temporary fencing shall be snow fencing as required for safety around excavation.

4. Phone service shall be applied for in the Engineer's name.

5. A minimum of two chemical toilets shall be supplied with cleaning service for the duration of the job.

PART 3 - EXECUTION

3.01 Performance

a. All work shall be performed by competent, trained workmen, skilled in the field to which they are executing the work.

b. Mobilization shall consist of the furnishing, installation and removal of the Engineer's trailer, with a phone and electric services for the Engineer's Inspection Staff. It shall also include the furnishing, installation and maintenance of all signs,

security, parking area, and sanitary and utility services. Additionally it shall include furnishing, installing, and removal of the contractor's trailers and services.

3.02 Inspection

a. The Engineer shall inspect all work as mobilization proceeds to ensure conformance with the requirements of the contract documents.

* * * * * *

Section 01510 - Temporary Utilities

PART 1 - GENERAL

1.01 Summary

a. The work under this section shall include the installation of all temporary electric service, water service, and sanitation service required to perform the work describe in the Technical Specification and provide for employees needs required by OSHA, Department of Labor, and local employment practices.

b. The Contractor shall provide electric service to the site sufficient to perform the Work. Additionally the Contractor shall provide two chemical toilets to the site with a weekly cleaning service. These services shall be provided for the duration of the contract.

1.02 Regulatory Requirements

OSHA PART 1926
NATIONAL ELECTRIC CODE
NEW YORK STATE ELECTRIC AND GAS

PART 2 - PRODUCTS

2.01 Equipment

a. All electrical equipment such as meter boxes, fuse boxes, safety cut-off, electrical outlets, security lighting etc. shall be in accordance with NEC and JCP&L requirements.

b. All equipment shall be good, clean, and workable condition when installed.

PART 3 - EXECUTION

3.01 Installation

a. The Contractor shall provide the services of a licensed New York State Electrician to install the temporary electric service to the site and wire the necessary trailer connection and power outlet. All temporary electric service connections shall be in the name of the Contractor.

* * * * * *

Section 01560 - Temporary Controls (Hazardous Materials)

PART 1 - GENERAL

1.01 Summary

a. This specification covers the technical requirement for temporary controls for contaminated soil and water.

b. The work shall include furnishing, installing and removing a contaminated soil storage area and a lined wheelwash and decontamination pad for trucks and water and soil storage containers as specified in this section and on the drawings.

c. It is not the intent of this section and associated drawings to specify all details of design, installation and construction. It shall be the responsibility of the Contractor to provide equipment, material and labor to construct the decontamination pad and contaminated soil storage area in accordance with high standards of workmanship that is suitable for the specified work.

1.02 Related Sections

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

Section 02140	Dewatering
Section 02220	Excavation
Section 02225	Earthfill and Grading
Section 02672	Extraction Wells
Section 02673	Injection Wells

PART 2 - PRODUCTS

2.01 Equipment

a. A 2" pump shall be place in the sump at the decontamination pad.

b. The Contractor shall supply a water-tight tank(s) suitable for storing water resulting from the construction activities prior to the operation of his air stripper. The tank shall prevent any release of emissions to the air from the stored water.

c. The contractor shall supply Department of Transportation (DOT) approved containers for storing excavated soils.

2.02 Materials

The Contractor shall supply a 30 mil HDPE liner, perforated drainage pipe, clean gravel fill, and a fifty-five (55) gallon drum.

PART 3 - EXECUTION

3.01 Contaminated Soil Storage

The Contractor shall store all contaminated soil (from below the water table) from the development of the extraction and injection wells and other site activities in DOT-approved containers on the site. These containers will be removed by the Operable Unit 2 Contractor.

3.02 Contaminated Water Storage

The Contractor shall store all water resulting from well development and other construction activities in a leak-proof tank(s) until the air stripper is operating and able to treat it. The Contractor shall ensure no emission releases to the atmosphere from the tank.

3.03 Lined Decontamination Pad

A 30 mil HDPE lined Decontamination Pad shall be constructed as shown on the drawings. The topsoil from the pad area shall be stripped and stockpiled. The liner shall be placed directly on the prepared subsoil followed by the gravel fill. A six inch perforated Schedule 40 PVC pipe shall be provided leading to a collection sump. The collected wash water shall be stored in the water-tight tank(s), if necessary, and treated in the air stripper. The collection sump shall be a buried 55 gallon drum.

* * * * * *

Section 01600 - Material and Equipment

PART 1 - GENERAL

1.01 Summary

a. This section covers the general requirements for the transportation, handling, storage and protection of materials and equipment that are part of the Brewster Well Field Groundwater Management system.

b. It is not the intent of this section to specify completely all details for the safe shipping and storage of the equipment specified in the Contract documents. It shall be the responsibility of the Contractor to provide adequate and complete protection for the system equipment.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION

3.01 Packing, Shipping and Storage Instructions

a. In order to prevent damage during shipment, Contractor shall carefully pack and brace all components either within shipping containers or on carrier. Any damage shall be repaired by Contractor. Seals shall be removed from pumps after testing and shipped in separate containers. All valve packings, gaskets, or seals containing graphoil or any graphite material shall be removed and packed separately.

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, and all boxes, crates and shipment shall be marked with the equipment piece number.

c. Where required to protect against condensation and humidity, a desiccant shall be provided and its presence shall be so marked including the need of periodic removal and dry-out requirements.

d. Equipment, which is hydrostatically tested by Contractor, 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, GG, 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. All openings and machined surfaces shall be provided with protection to prevent damage, corrosion and entrance of foreign matter during shipment and storage.

g. Flanged connections shall be protected by a 1/2 inch or thicker plywood disc, or suitable alternate, bolted to the face of the flange.

h. 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.

i. Butt weld connections shall be protected by wooden disks that cover the entire weld end area, and are secured by metal straps and fasteners.

j. Metal straps, fasteners or covers shall not be tack welded to any manufactured part of the components.

k. 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.

l. Equipment shall be preassembled 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.

m. All vertical pumps shall be mounted to Contractor supplied support plates and shipped prepiped and prewired to a terminal block.

n. All motors, other than those with grease lubricated bearings, shall be shipped with cleaned and sealed bearings which have been coated with a rust preventative film. This film shall be soluble in the lubricant recommended by Manufacturer for motor bearings without deterring normal operation.

o. All motors with antifriction bearings shall be equipped with oil or grease fittings so that lubricant may be forced through the bearing housing without disassembling the motor. The motors shall be shipped with housings correctly packed or filled with Manufacturer's approved lubricant, but provided with relief drains and attached instruction cards for any adjustment required prior to service operation. Motors shall be shipped with plugs instead of fittings.

p. The storage will be in an environment similar to the installed location, i.e., indoor equipment will be stored indoors (without heating and ventilation), and outdoor equipment will be stored outdoors. Where required to protect against condensation and humidity a desiccant shall be provided and its presence shall be so marked including the need of periodic removal and dryout. When electric space heaters are provided for that purpose, these should be wired to the outside of the equipment such that energization immediately upon receipt is possible without disassembly of crates, etc. This also requires that no combustible material be left in the inside of the equipment.

q. Contractor shall provide storage and handling instruction including descriptions for periodic inspection and/or storage maintenance to ascertain that no deterioration will occur during storage. One set of these instructions shall be fastened securely to the outside of the shipping unit.

r. Contractor shall provide at Engineer's request, recommended instructions for long-term storage.

* * * * * *

Section - 01660 - Testing, Adjusting and Balancing of Systems

Part 1 - GENERAL

1.01 Summary

a. This section describes the work and requirements for testing, adjusting and balancing of all equipment and systems.

b. The work includes all services and materials required for execution of the testing as specified in this section and/or on the drawings.

1.02 Related Sections

a. Related work and/or equipment includes all sections of the contract documents.

b. The Contractor is directed specifically to the Part 3, Testing and Inspections subpart of each section of the Contract Documents for individual and specific requirements for related work.

1.03 Submittals

a. Contractor shall furnish a complete written description and procedure for all testing to be performed for approval by the Engineer prior to testing. Test procedures shall include test instrument calibration procedures, preoperational tests and operational tests.

Part 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.01 Material Tests

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 this specification.

b. Examination, inspection and testing of material shall be governed by provisions of the ASTM material specification utilized, ASME Sections V and VIII.

3.02 Mechanical Tests

a. Pump Tests

(1) Seller shall test and indicate testing methods for determining shaft deflection (and Seller shall indicate where the shaft deflection is measured), that sound levels are within OSHA requirements and that critical speeds are well above the pump operating speed.

(2) All motors shall be disconnected and bumped to ensure proper rotation then recoupled and properly aligned.

(3) Each pump and its components shall be given routine factory tests as necessary to determine that the work and materials are free from defects and to establish that design and construction are satisfactory.

(4) Shop hydrostatic tests at one and one half times the shutoff head or 150 psig whichever is greater shall be made on all pump casings.

(5) Certified performance curves showing head, efficiency and power requirements at various capacities shall be supplied by Seller for Contractor's acceptance. Test shall conform to the Hydraulic Institute Standards, Centrifugal Pump Test Code.

b. Piping Tests

(1) Hydrostatic Testing

- Each assembled system shall be flushed clean with water and hydrostatically tested at 1.5 times the normal operating pressure. The water to be used during this is the normally available "city water" supply quality.

- All tubing and piping connections, welds and valve stems and seats shall be checked for leaks. No leakage shall be permitted. All leaks shall be repaired and the equipment retested.

- Following the piping hydrostatic test, the instrument devices shall be connected and tested for a minimum period of five minutes.

- o During the test, all instrument devices shall be subjected to a pressure no greater than the lowest pressure rated instrument. Contractor shall be responsible for proper protection of instrument.

- o All hydrostatic tests and all radiographic, liquid penetrant and magnetic particle inspections that may be required are to be completed and approved prior to any application of equipment coatings. Equipment and nozzle interiors are to be inspected and approved for adequate cleanliness and smoothness prior to any coating application. All sandblasting or other abrasive cleaning operations must be done prior to hydrostatic test. All surfaces to be lined or coated are to be thoroughly dried before coating. Should rusting occur on blasted surfaces prior to application of coating, the surfaces shall be reblasted in accordance with these specifications.

3.03 Electrical Tests

a. The equipment being furnished shall be checked to assure that physical fit and clearances between the moveable unit and stationary structure are satisfactory.

b. Design test data from previously conducted test meeting the same or more stringent requirements specified herein shall be submitted for review. Certified test reports are required.

c. The following design tests shall be performed:

NEMA Standard	Test
a - ICS 1-109.01 through 15	Temperature rise test of buses operating coals and heat generating components (coils, contacts, field wiring terminals, etc.)
b - ICS 1-109.21	Power Frequency Dielectric Test
c - ICS 1-109.30	Coil operating voltage test for the specified values

NEMA Standard	Test
d - ICS 2-222.40	Overload relay design tests
e - ICS 2-322.40 through 42	Short circuit tests for buses and short circuit interrupting tests for motor control and feeder tap units

d. Production Tests - All completely assembled and wired motor control centers shall be adjusted at the factory, inspected and tested to conform to all applicable current ANSI/IEEE Standards along with the requirements of this specification.

- The motor control center shall be checked for completeness and agreement with approved arrangement drawings and bill of material
- The wiring shall be checked, visually, for continutity and agreement with wiring diagrams
- All drawout units shall be checked for alignment by removal and reinsertion
- All circuit breakers shall be checked for manual and electrical operation when so specified
- Each starter shall be electrically operated three times
- Dielectric tests for power control wiring shall be performed in accordance with NEMA ICS 1-109-1

e. Contractor shall provide equipment, instruments, tools and personnel and all expenses incidental to the foregoing tests, including replacement of parts damaged during testing.

f. The electrical test shall demonstrate freedom from grounds and accuracy of the wiring to all rack mounted devices. The test shall include point-to-point continuity tests and electrical insulation tests in accordance with NEMA Standard SG5-4-09, Paragraphs A and B (exception: Megger or other high voltage tests shall not be applied to any coaxial or shielded cables, voltage tests on these cables shall not exceed 230 volts). Instruments shall be disconnected during the electrical tests. Contractor shall be responsible for proper protection of all devices that may be damaged due to any high voltage test.

g. All testing should be performed with multipin connectors and actual harness installed.

- Each panel circuit and component shall be given a continuity and functional check.

- Each circuit shall be given insulation resistance test with all equipment connected, using a 1000 volt-megger. The insulation resistance shall be no less than 25 Megohms.

- All switches, solenoids and relays shall be energized to check operation. The electrical elementary diagrams supplied by Contractor shall be used for these tests.

- Electrical interlocks shall be tested under simulated operating conditions.

3.04 Acceptance Tests

Acceptance tests, after equipment is completely installed, may be performed by the Contractor to demonstrate performance requirements, as specified herein. The field tests will be governed by provisions of applicable industry and institute standards for pumps, vessels and equipment.

If the system or any part thereof, fails to meet the specified performance guarantee, Seller shall correct/rework or replace, as mutually agreed upon, that part which fails.

* * * * * *

Section 01720 - Project Record Documents

PART 1 - GENERAL

1.01 Summary

a. This section covers the requirements for maintenance and submittal of record documents and samples.

1.02 Related Sections

a. Related Work that is specified in other sections of the Contract Documents includes but is not limited to the following:

Section	01050	Field Engineering
Section	01300	Submittals
Section	01735	Final Inspection and Acceptance

1.03 Maintenence of Documents and Samples

a. The Contractor shall maintain at the site for the Engineer one record copy of:

1. Construction schedule and progress record
2. The Technical Specification and drilling logs
3. Addenda and Modifications
4. Change Orders and other modifications to the Contract
5. Engineer Field Orders
6. Manufacturer's certificates
7. Daily work activity summary reports, including:

    - Reports on any emergency response actions
    - Test records
    - Records of all site work
    - Chain-of-custody documents
    - Reports on all spill incidents

b. Record Documents and samples shall be stored in the Contractor's Field Office apart from documents used for construction. The Contractor shall provide files, racks, and secure storage for Record Documents and samples.

c. Record Documents are to be maintained in a clean, dry and legible condition and not used for construction purposes.

d. The Contractor shall keep Record Documents and samples available for inspection by Engineer.

1.04 Recording

a. The Contractor shall record information on a set of blue line drawings, provided by Engineer.

b. Information is to be recorded concurrently with construction progress. No work shall be concealed or covered in a manner that would prevent inspection until required information is recorded.

c. Contract Drawings and Shop Drawings shall be legibly marked and each item of actual construction recorded including:

- o Measured depths of elements of construction in relation to survey datum.
- o Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
- o Field changes of dimension and detail.
- o Changes made by Modifications.
- o Details not on original Contract Drawings.
- o References to related shop drawings and Modifications.

e. Specifications shall be legibly marked and each item of actual construction recorded including:

- o Manufacturer, trade name, and catalog number of each product actually installed, particularly optional items and substitute items.
- o Changes made by Addenda and Modifications.

f. Additionally the Contractor shall maintain manufacturer's certifications, inspection certifications, field test records required by individual Specification Sections.

1.04 Submittals

a. Record Documents and samples shall be delivered at Final Acceptance under provisions of Section 01735: Final Inspection and Acceptance.

b. Transmit with cover letter in triplicate, listing:

- o Date.
- o Project title and number.
- o Contractor's name, address, and telephone number.

- Number and title of each Record Document.
- Signature of Contractor or authorized representative.

Documents must be submitted to and accepted by Engineer at Completion of Work as a condition of final payment.

* * * * * *

Section 01730 - Operating and Maintenance Manuals

PART 1 - GENERAL

1.01 Summary

a. This section covers the requirements for the content and arrangement of the operating and maintenance manuals for the equipment that is part of the Brewster Well Field Groundwater Management System.

b. The work shall include the compilation into a complete and comprehensive volume any and all instructions, procedures and techniques for the continued operation and proper maintenance of various components of the Groundwater Management System.

1.02 Submittals

a. Contractor shall submit, in the manner and within the time limit as set forth in the contract documents a complete set of Operation and Maintenance instructions as detailed in this section.

Also see Section 01300 - Submittals.

b. Review of the operating and maintenance manual by the Engineer shall not relieve the Contractor of the entire responsibility for its content.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION

3.01 Organization

The operating and maintenance manual shall be written with the entire groundwater management system as a basis. Each system component shall be described as a part of the system. Each piece of equipment must have its own O & M manual section, in addition, its individual requirements should be incorporated into the system instructions.

3.02 General Instruction

a. The operating and maintenance manual for plant equipment shall be issued at the due dates as specified in the Contract documents. Shop test curves and data shall not delay shipment of the manuals at the due dates; but rather, characteristic performance curves, etc., shall be included and the shop test information forwarded as soon as possible thereafter.

b. When Vendor dimensioned prints for equipment supplied are considered proprietary, the manufacturer shall provide general assembly drawings, outline drawings and detailed drawings (including cutaway drawings of the equipment) required to permit installation, operation and maintenance of the equipment. The Manufacturer shall provide dimensioned prints when spare parts are not available.

c. When standard manuals are provided which include, among other types and models, the equipment purchased and its auxiliary components, the specific sections or parts of the manual, along with any and all modifications which apply to the item, shall be clearly stated. Explanation of special features or components shall include:

- o Why special features or components were supplied;
- o How special features or components operate;
- o How special features or components are to be adjusted or set to meet State, Local and Insurance Company requirements.

d. If the purchased equipment requires lubrication, the manuals shall contain a complete description of the lubrication system, which should include, but not be limited to, the following:

- o Total capacity of system
- o Recommended lubricant
- o Recommended operating pressures and temperatures
- o Adjustments, settings, and points requiring periodic maintenance and/or inspection.

3.03 Manual Contents

The operating and maintenance shall conform to the following format and will include, but not be limited to, these sections.

A. Cover

The cover shall list as a minimum:

1. Client and project name
2. System or component title
3. Plant identification
4. Supplier's name
5. Purchase order number

B. Title Page

The title page shall include the information from the cover as indicated above plus the following as applicable:

1. Contractor's address, telephone number
2. Supplier's addresses, telephone numbers
3. Manual identification number
4. Date of issue
5. Nameplate & serial number

C. Table of Contents

The table of contents shall include section, title and page number, headings and applicable data descriptions for all sections. The table of contents shall be divided by volume if applicable.

D. List of Illustrations, Drawings and Tables

The list of illustrations shall include titles and figure numbers for all illustrations in the manual. All illustrations shall be prepared to indicate clear, sharp distinction of lines. Illustrations shall be consistent in style and lettering.

The list of drawings shall include the drawing and revision numbers in effect at the time of shipment for all drawings in the manual.

The list of tables shall include the table number, title and page number for all tables in the manual.

E. Equipment Description

This section shall provide overall concepts of the equipment and its purpose. It shall include rating and normal and emergency short-time performance limits of the equipment's main characteristics and functions. Subsections shall identify and describe important features of all major components or subassemblies. The identity and function of each shall be tabulated with rating data, drawing numbers and other descriptive references. Designation, function and setting of all controls and indicators shall be given with detailed instructions to aid understanding. This section shall include all equipment identifying symbols, including those for terminals and remotely mounted components. Diagrams, charts, schematics, drawings, and tables shall be used liberally for clarity and brevity. Pictures of the equipment shall be used to identify adjustments and indicators, when required.

Electrical power sources and other inputs including permissible variations shall be listed.

Controlled or driven loads shall be listed.

F. Storage

Instructions regarding handling, extended storage prior to operation and extended idle periods after the equipment has been placed in operation shall be included.

G. Installation

This section shall contain instructions for unpacking, inspection prior to installation, installing, and initial and future charging of equipment when required. This includes reference to applicable standards, handling, mounting, aligning mechanical parts, connecting, shielding, grounding, properational checking (equipment de-energized) and instructions for removal of equipment from service. These procedures shall be listed in numbered, step-by-step sequence.

H. Operation

This section shall provide the operator with information that describes when and how to operate the equipment, including precautions, limitations and set points. Procedures listed in step-by-step sequence shall include preoperational checkout, start-up, normal, remote or emergency modes of operation and stopping or shutting down part or all of the subject equipment.

I. Equipment Maintenance

This section shall provide servicing procedures and time intervals required to ensure proper operation. Instructions shall cover removing, dismantling and/or replacing components. These procedures shall include, but not be limited to:

1. Master table listing the what, when and how of servicing, in brief, and referencing detail servicing instructions as required - acceptable operating limits shall be stated with action to be taken when these limits are exceeded.

2. A series of routine electrical and mechanical procedures tests and checks for cleaning, lubricating, inspecting and otherwise caring for the equipment at scheduled times to ensure continuity of optimum performance. These procedures shall clearly indicate whether the check is to be accomplished with installed (or included) facilities or by customer-furnished instruments.

3. Special instructions pertaining to: a) maintenance of interlocks and other safety features, b) the protection of personnel and c) errors in assembly which could damage equipment.

J. Inactivation Procedures

Special actions required prior to, or following a shutdown shall be described in the order that they are to be performed for removal from, or restoration to service.

K. Alignment and Calibration

Step-by-step procedures shall instruct the operator in making every adjustment or performing a system calibration check. Input and output values with acceptable tolerances shall appear in tabular form for each checkpoint in the system test procedure.

All referenced instruments shall be positively identified and verifiable accuracy shown. Procedures shall show which calibration equipment is installed (or included) and which is to be user-furnished.

L. Troubleshooting

Charts and tables shall be used to list likely evidence of malfunction and to show what wear, component failures or maladjustments could be responsible. These shall reference the diagnostic tests, disassembly, inspection, reassembly, verification and alignment procedures required. Voltage levels and test points and critical part dimensions shall be given and/or the appropriate paragraph references.

Detailed fault isolation procedures may be limited to module or circuit isolation. However, necessary voltages and wave shapes shall be provided to provided to aid in isolating failed components.

M. Parts Lists

All replaceable parts, components, or subassemblies used in the equipment shall be listed in the instruction book. Lists on drawings included in the manual need not be repeated, but all parts essential to a clear understanding of text material shall be referenced - even those of a subassembly. A list of recommended spare parts shall be included in this section.

N. Special Tools and Instruments List

A list of all tools and other unattached items furnished with the equipment shall be provided. The list shall fully identify each item, giving model number and where applicable, manufacturer.

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Section 01735 - Final Inspection and Acceptance

PART 1 - GENERAL

1.01 Summary

a. This specification covers the requirements for final cleaning, inspection and other procedures necessary for contract closeout.

b. The work shall consist of the complete cleaning of the piping system, building and site area, restoration of vegetation to pre-construction conditions, inspection, and administrative provisions for substantial completion and for final acceptance.

1.02 Related Sections

a. Related Work which is specified in other sections of the technical specifications include but is not limited to the following:

Section	01720	Project Record Documents
Section	01660	Testing, Adjusting and Balancing of Systems
Section	01300	Submittals

1.03 Submittals

a. Contractor shall submit, in the manner and within the time limit set forth in the Contract documents, Project Record Documents under the provisions of Section 01720 Project Record Documents and application for final payment. Also see Section 01300 submittals.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 Final Cleaning

a. Project Site

At the completion of Work, all waste such as excess construction materials, wood, bituminous concrete, debris and any other foreign material shall be removed from the site. All fences, structures, etc. existing prior to construction shall be restored to their pre-construction condition.

b. Equipment

At time of acceptance, equipment shall be clean inside and outside. All waste such as metal chips or filings, welding stubs, dirt, rags, debris and any other foreign material shall be removed from the interior of each component. All mill scale, rust, oil, grease, chalk, crayon or paint marks and other deleterious material shall be removed from all interior and exterior surfaces.

All assembled piping runs shall be flushed with water at ambient temperature to ensure that the lines are free of dirt and any other debris. The piping shall be flushed at the design flow rate until there is no visible evidence (e.g., oil, discoloration) of the effluent flush water. After cleaning, the piping shall be sealed where appropriate to prevent subsequent entry of contamination.

The Contractor shall maintain a high standard of cleanliness during fabrication and assembly to ensure accuracy and trouble-free performance. Introduction of foreign materials and compounds into the process system by contaminants in instruments is objectionable and might be cause for rejection. The parts of any instrument in contact with process fluids shall be thoroughly cleaned of chips, dust, rust, abrasives, scale, oils and grease.

Cleaning of stainless steel surfaces shall be performed with solvents, cloths and abrasives that do not contain halides. Only stainless steel, clean, iron-free hand or power tools or aluminum oxide abrasives shall be used on stainless steel components. Materials used to clean carbon steel or cast iron shall not be used to clean stainless steel surfaces.

Solvent cleaning shall be performed in accordance with SSPC-SP1.
Hand tool cleaning shall be performed in accordance with SSPC-SP2.
Power tool cleaning shall be performed in accordance with SSPC-SP3.

The wiping or scrubbing operation of an oil or grease bearing surface shall be followed by degreasing with a hot alkaline solution and rinsing with clean water.

In welded areas, all scale, spatter and excess metal shall be removed in accordance with SSPC SP2 and/or SP3. Cleaning of all welded areas shall include grinding of weld beads to remove sharp prominences and provide a smooth contour. Removal of spatter from surfaces away from the welded areas shall also be accomplished.

3.02 Substantial Completion

a. Prior to substantial completion, the Engineer shall present to the Contractor a punch list of work items to be completed in accordance with the Contract Documents.

b. When Contractor considers the work on the punch list to be substantially complete, he shall submit written notice with a list of items to be completed or corrected.

c. Should inspection by the Engineer find the work is not substantially complete, the Engineer will promptly notify Contractor in writing, listing observed deficiencies.

d. The Contractor shall remedy the deficiencies and send a second written notice of substantial completion.

e. When the Engineer finds the work to be substantially complete, he will prepare a Certificate of Substantial Completion in accordance with provisions of the General Requirements.

3.03 Final Acceptance

a. When the Contractor considers the work to be complete, he shall submit written certification that:

1. Contract Documents have been reviewed.
2. Work has been inspected for compliance with Contract Documents.
3. Work has been completed in accordance with Contract Documents, and deficiencies listed with Certificate of Substantial Completion have been corrected.
4. Work is complete and ready for final inspection.

b. Should the Engineer inspection find work incomplete, the Engineer will promptly notify Contractor in writing listing observed deficiencies.

c. The Contractor shall remedy the deficiencies and send a second certification of final completion.

d. When the Engineer finds work is complete, the Engineer will consider closeout submittals, and a Final Acceptance Certificate will be issued to the Contractor.

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Section 02002 - Geotextile

PART 1 - GENERAL

1.01 Summary

a. The Contractor shall supply and provide all materials, fabrication, drawings, installation, testing and delivery of services as specified in this section and/or on the drawings for completion and proper operation of the geotextile as included in the Contract documents.

b. This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the geotextile described herein.

c. 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 Contractor to provide equipment and systems that have been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

d. The work under this section shall include all work required to furnish, place, join, and tack down the geotextile required by the Engineer.

1.02 Related Sections

a. Related Work that is specified in other sections of the contract documents includes but is not limited to the following:

Section 02225	Earthfill
Section 02230	Road Sub-Base

1.03 Submittals

a. Contractor shall submit, in the manner and within the time limit as set forth in the Contract documents, shop drawings showing outline and overall dimensions, seaming details, and anchorage details, material samples, and a typical material certification for the geotextile furnished under this section.

1.04 Quality Assurance

a. Contractor shall ensure the materials and workmanship properly reflect the Engineer's requirements.

b. Contractor shall assist inspection and test personnel during installation of the fabric

c. Contractor shall certify to the Engineer, in writing, that the materials and installation are in complete compliance with codes, standards and specifications. Any exceptions to original codes and specifications must be documented with written approvals from the Engineer.

PART 2 - PRODUCTS

2.01 Materials

Geotextile fabric shall be DuPont Typar spunbonded polypropylene style 3401, Celanese Fibers "Marifi" 500x woven polypropylene or Monsanto "Biden" C 28 polyester fabric or an approved equal, described as a sheet structure composed entirely of preferentially oriented isotatic polypropylene continuous filaments thermally bonded mostly at the crossover points. The fabric shall meet or exceed the average roll minimum values stipulated below:

Properties	Test Method	Value
Unit Weight	ASTM D-3776	4.0
Tensile Strength (lbs)	ASTM D-4632	145
Elongation at Break (%)	ASTM D-4632	70+
Mullen Burst Strength (PSI)	ASTM D-3786	175
Puncture Strength (lbs)	ASTM D-751 modified	50
A.O.S. (equivalent sieve) (mm)	ASTM D-4751	70/100 0.17
Modulus at 10% Elongation (lbs)	ASMT D-4632	790
Trapezoid Tear (lbs)	ASTM D-4533	75
Coefficient of Permeability (cm/sec)	ASTM D-4491	$3x10^{-2}$
Flux ($gal/ft^2/min$)	ASTM D-4491	62
Permittivity (sec-1)	ASTM D-4491	.8

PART 3 - EXECUTION

3.01 Installation

The subgrade for the geotextile fabric shall be prepared as per Section 02225 Earthfill of this specification. Any material which may puncture the fabric shall be removed.

The fabric shall be spread uniformly over the surface. The fabric shall be unrolled directly on the soil surface and shall be lapped a minimum of twelve inches. The Contractor shall place fill material in such a way as to not tear, puncture, or shift the fabric. Tears or rips shall be patched with fabric lapped a minimum of twelve inches on all sides of the tear. Tracked or wheeled equipment shall not be permitted on the fabric.

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Section 02040 - Dust and Vapor Control

PART 1 - GENERAL

1.01 Summary

a. This section covers the technical requirements for dust and vapor control during active construction.

b. The Contractor shall provide all material, equipment and labor required for dust and vapor control as specified herein.

c. The Contractor shall conduct operations and maintain the project site so as to minimize the creation and dispersion of dust. Dust and vapor control shall be used throughout the work at the site, especially during soil excavation, handling and transport, rough grading, and earthfill.

1.02 Related Sections

a. Related work that is specified in other sections of the contract documents includes but is not limited to the following:

Section 01065	Health and Safety Requirements
Section 02220	Excavation
Section 02225	Earthfill and Grading

PART 2 - PRODUCTS

2.01 Materials

a. The Contractor shall provide clean water, free from salt, oil, and other deleterious material for dust control.

b. If foam is required, it shall be 3M Foam Concentrate FX 9162 or an equivalent approved by the Engineer.

2.02 Equipment

a. The Contractor shall supply water spraying equipment capable of accessing all work areas. Foam spraying equipment shall be used in conjunction with the water spraying equipment so as to allow foam application of 0% to 6% concentrations.

PART 3 - EXECUTION

3.01 General

a. The Contractor shall implement strict dust control measures during active construction periods on-site. These control measures will generally consist of water applications that shall be applied a minimum of once per day during dry weather or more often as required to prevent dust emissions.

b. If air monitoring indicates a stop-work condition as specified in Section 01065, foam shall be utilized to suppress excessive dust or toxic vapors. The foam shall be sprayed at a 1% to 6% concentration to be determined by the Engineer depending on site conditions. Foam shall also be used for odor suppression at the direction of the Engineer.

3.02 Application

a. For water application to soil surfaces, the Contractor shall:

1. Apply water with equipment consisting of a tank, spray bar, pump with discharge pressure gauge.

2. Arrange spray bar height nozzle spacing and spray pattern to provide complete coverage of ground with water.

3. Disperse water through nozzles on spray bar at 20 psi, minimum. Keep areas damp without creating nuisance conditions such as bonding.

b. For water application to soil surfaces during excavation, the Contractor shall:

1. Apply water with equipment consisting of a tank, pump with discharge gauge, hoses and mist nozzles.

2. Locate tank and spraying equipment so that the entire excavation area can be misted without interfering with excavation equipment or operations. Keep areas damp without creating nuisance conditions such as bonding.

3. Apply spray water in a manner to prevent movement of spray beyond site boundaries.

c. For foam application to soil surfaces during excavation, the Contractor shall:

1. Apply foam with equipment consisting of a tank, hoses, pump with discharge gauge and concentration control, used in conjunction with the water spraying equipment.

2. Locate tank and spraying equipment so that the entire excavation area can be foamed without interfering with excavation equipment or operations.

3. Apply foam in a manner to prevent movement of foam beyond the site boundaries.

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Section 02110 - Clearing and Grubbing

PART 1 - GENERAL

1.01 Work Included

The work under this section shall include clearing and grubbing all areas within the limits shown on the drawings. Clearing shall consist of removal of all trees, logs, brush, stumps, shrubs, debris, snags, and cuttings from the site. Grubbing shall consist of removal from the site of all stumps, roots, and root clusters of a diameter greater than one inch, to a depth of two feet.

1.02 Related Work

Section 02220 Excavation
Section 02225 Earthfill and Grading
Section 02270 Erosion Control

1.03 Regulatory Requirements

A. Material shall not be buried at the site.

B. Burning shall not be allowed unless all permits have been provided to the Engineer.

C. Off-site disposal of debris shall be performed in accordance with all applicable laws and regulations.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 Clearing and Grubbing

All trees, stumps, snags, logs, brush shrubs and other vegetation shall be cut and removed from the site along with any debris or rubbish within the clearing and grubbing area to a depth no less than two (2) feet below natural ground.

3.02 Protection of Property

Felling of trees, trimming of branches and grubbing of stumps shall be performed in a manner to avoid damage to adjoining structures.

3.03 Disposal

Material shall not be buried at the site. Material may be salvaged and removed from site Materials may be burned if permitted by New York State and after permits are obtained. Material removed from the site shall be disposed of in accordance with local and state regulations.

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Section 02140 - Dewatering

PART 1 - GENERAL

1.01 Summary

a. This section covers the temporary diversion of surface water and dewatering of the construction site and borrow areas during the construction period.

b. The work shall consist of the removal of surface water and ground water as needed to perform the required construction in accordance with the specifications. It shall include (1) building and maintaining all necessary temporary impounding works, channels, and diversions, (2) furnishing, installing and operating all necessary pumps, piping and other facilities and equipment, and (3) removing all such temporary works and equipment after they have served their purposes. It shall not include special disposal of potentially hazardous water.

c. The Contractor shall supply and provide all materials, drawings, installation, testing and services as specified in this section for complete and proper dewatering.

d. 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 Contractor to provide equipment and systems that have been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

1.02 Related Sections

Related work that is specified in other sections of the contract documents includes but is not limited to the following:

Section 01560 Temporary Controls (Hazardous Materials)
Section 02220 Excavation
Section 02270 Erosion Control

1.03 Submittals

a. The Contractor shall furnish to the Engineer, in writing, his plan for dewatering before beginning the construction work for which the dewatering is required. Acceptance of this plan will not relieve the Contractor of responsibility for completing the work as specified.

1.04 Environmental Conditions

All hazardous water handling and disposal shall be performed in accordance with Section 01560 and the Contractor's Health and Safety Plan.

1.05 Quality Assurance

a. Contractor shall take the necessary action to ensure that the equipment and services provided, will properly reflect the Owner's/Engineer's requirements.

Engineer or his representative shall inspect the Contractor's dewatering activities.

PART 2 - PRODUCTS

2.01 Equipment

Pumps, sumps, hoses, piping and related equipment necessary to perform the Dewatering shall be sized by the Contractor in order to meet the requirements of this section.

PART 3 - EXECUTION

3.01 Performance

a. All work shall be performed by competent, trained workmen, skilled in the field to which they are executing the work.

b. The Contractor shall build, maintain and operate all cofferdams, channels, flumes, sumps, and other temporary diversion and protective works needed to divert streamflow and other surface water through or around the construction site and away from the construction work while construction is in progress. Unless otherwise specified, a diversion must discharge into the same natural drainageway in which its headworks are located.

c. Foundations, cutoff trenches and other parts of the construction site shall be dewatered and kept free of standing water or excessively muddy conditions as needed for proper execution of the construction work. The Contractor shall furnish, install, operate and maintain all drains, sumps, pumps, casings wellpoints, and other equipment needed to perform the dewatering as specified. He shall maintain the borrow areas in

drainable condition or otherwise provide for timely and effective removal of surface and ground waters that accumulate within the borrow areas from any source.

d. Dewatering shall be accomplished in such a manner that erosion and the transmission of sediment and other pollutants are minimized.

e. Hazardous water shall be handled and disposed of in accordance with Section 01560 of this technical specification.

f. After the temporary works have served their purposes, the Contractor shall remove them or level and grade them to the extent required to present a sightly appearance and to prevent any obstruction of the flow of water or any other interference with the operation of or access to the permanent works.

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Section 02220 - Excavating & Handling Clean Material

PART 1 - GENERAL

1.01 Summary

a. This section covers the requirements for all excavation at the site.

b. The work under this section shall include all work required to strip and stockpile clean topsoil and to excavate subsoils to elevations shown on the drawings for the access road, piped utilities, plant site, foundations for the building and the column, clear well, waste sump, valve pit, trenching for piping and the decontamination pad.

1.02 Related Sections

Related work is specified in other sections of the contract documents includes but is not limited to the following:

Section 01560 Temporary Controls Hazardous Materials)
Section 02140 Dewatering
Section 02225 Earthfill
Section 02270 Erosion Control

1.03 References

OSHA Part 1926: Excavation shall conform to safety requirements.
Project Drawings.

1.04 Environmental Conditions

All contaminated soil handling shall be performed in accordance with Sections 01560 and the Contractor's Health and Safety Plan.

1.05 Quality Assurance

a. The Contractor shall survey and stake all excavations. Elevation benchmarks and control monument will be supplied by the Engineer.

b. The Contractor shall assist with the inspection and test personnel for elevation checks during the excavation operations and for cross-section surveys for quantity at the end of the excavation.

PART 2 - PRODUCTS

2.01 Equipment

The Contractor shall supply all equipment necessary to complete the work described in this section.

PART 3 - EXECUTION

3.01 Performance

a. Excavation under this section shall be designated as "Unclassified Excavation." Material excavated from below the groundwater table (8 feet below surface) shall be considered contaminated and containerized as specified in Section 01560. Material taken from above the groundwater table may be used as earthfill along the access road and at the plant site, for backfilling piping and to correct overexcavation.

b. Topsoil shall be stripped and stockpiled from the areas shown on the drawing for the access road, piped utilities, plant site and all foundations for the building and the column. The remaining subsoil is to be excavated to the elevations shown on the drawings for these areas.

c. Overexcavation in earth shall be corrected by filling the resulting voids only with approved compacted earthfill. Overexcavation in rock shall be corrected by filling the resulting voids with portland cement concrete made of materials and mix proportions approved by the Engineer.

d. Trenching shall be performed for the yard piping, piped utilities, and all other underground utilities.

e. The Contractor shall excavate the decontamination pad to the line and grade shown on the drawings.

* * * * * *

SECTION 02225 - Earthfill and Grading

PART 1 - GENERAL

1.01 Summary

a. This section covers the requirements for the materials, placement, compaction, grading and testing of earthfill work at the site.

b. The work under this section shall include all work required to furnish, place, compact and grade earthfill along the access road, at the plant site and backfill along piping.

c. The Contractor shall supply all material, equipment, and services required for earthfill operations.

d. It is not the intent of this section and associated drawings to specify all details of design and construction. It shall be the responsibility of the Contractor to provide equipment and systems that have been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

1.02 Related Sections

a. Related work that is specified in other sections of the contract documents includes but is not limited to the following:

Section 01560 Temporary Controls (Hazardous Materials)
Section 02270 Erosion Control
Section 02220 Excavation

1.03 Submittals

a. The Contractor shall submit a sample of the imported earth fill along with test results indicating unified soil classification in accordance with ASTM D2487, source location, and Standard Proctor Compaction test results based on ASTM D698.

b. Test results of in-place density and moisture content requirements specified in paragraph 3.06.

1.04 Applicable Standards and Specifications

ASTM - American Society for Testing and Materials

D422-72 Particle - Size Analysis of Soils

D698-78 Standard Test Methods for Moisture - Density Relations of Soils and Solil-Aggregate Mixtures Using 5.5 lb (2.49-kg) Rammer and 12-in. (305 mm) Drop

D1556-82 Density of Soil in Place by the Sound Cove Method

D2216-80 Laboratory Determination of Water (Moisture) Contents of Soil, Rock and Soil- Aggregate Mixtures

D2487-85 Standard Test Method for Classification of Soils for Engineering Purposes

1.05 Quality Assurance

a. Contractor shall ensure that the material and workmanship provided, will properly reflect the Owner's/Engineer's requirements.

b. Engineer or his representative shall have sufficient access to audit and inspect the Contractors work.

PART 2 - PRODUCTS

2.01 Materials

a. Soil excavated from areas above the groundwater table may be used as fill as specified on the drawings. The selection of imported fill materials, if required, for the various fills shall be subject to approval by the Engineer.

b. Fill materials shall contain no sod, brush, roots or other perishable materials. Rock particles larger than 2" shall be removed prior to compaction of the fill.

PART 3 - EXECUTION

3.01 Preparation

a. Foundations for earthfill shall be stripped to remove vegetation and other unsuitable materials or shall be excavated as specified.

b. The subgrade for the road and the plant site shall be cleared of rocks larger than 2" and other unsuitable material then compacted as per Section 3.04 of this specification.

c. Except as otherwise specified, earth foundation surfaces shall be graded to remove surface irregularities and shall be scarified parallel to the axis of the fill or otherwise acceptably scored and loosened material shall be controlled as specified for the earthfill.

d. All subgrade areas of the road and the plant site shall be compacted with a minimum of 3 passes of the vibratory roller or equivalent prior to any fill placement.

3.02 Placement

a. Fill shall not be placed until the required excavation and foundation preparation have been completed and the foundation has been inspected and approved by the Engineer. Fill shall not be placed upon a frozen surface, nor shall snow, ice,or frozen material be incorporated in the fill.

b. Fill shall be placed in approximately horizontal layers. The thickness of each layer before compaction shall not exceed 9". Materials placed by dumping in piles or windrows shall be spread uniformly to not more than 9" before being compacted. Hand compacted fill, including fill compacted by manually directed power tampers, shall be placed in layers whose thickness before compaction does not exceed the maximum thickness specified for layers of fill compacted by manually directed power tampers.

c. Adjacent to structures, fill shall be placed in a manner which will prevent damage to the structures and will allow the structures to assume the loads from the fill gradually and uniformly. The height of the fill adjacent to a structure shall be increased at approximately the same rate on all sides of the structure.

3.03 Moisture Content

a. During placement and compaction of fill, the moisture content of the materials being placed shall be maintained within the range of 5% optimum.

3.04 Grading

a. The road sub-base shall receive a finish grading to the elevations shown on the drawings. This grading shall be subject to acceptance by the Engineer prior to application of the prime coat.

b. Earthfill areas shall receive a rough grading to the elevations shown on the drawings prior to placement of the topsoil.

c. The topsoil shall receive a finish grading to the elevations shown on the drawings prior to placement of the topsoil.

c. The topsoil shall receive a finish grading to the elevations shown on the drawings. This grading shall be to a reasonably smooth surface subject to acceptance by the Engineer.

d. The entire site shall be finish graded to the contours shown on the drawings to accommodate proper site drainage. This grading, including a drainage swale along the access road, shall be inspected by the Engineer for final acceptance.

3.05 Compaction

a. Compaction of earthfill shall consist of each 9" layer of fill being compacted by 3 passes of a vibratory roller. Each pass shall consist of at least one passage of the roller wheel or drum over the entire surface of the layer.

b. Fill adjacent to structures shall be compacted to a density equivalent to that of surrounding fill by means of hand tamping or manually directed power tampers or plate vibrators. Unless otherwise specified, heavy equipment including backhoe mounted powertampers, or vigrating rollers, shall not be operated within 2 feet of any structure.

c. Compacting of fill adjacent to structures shall not be started until the concrete has attained the strength specified in Section 03310 for this purpose.

3.06 Testing

The Contractor shall perform gradation analysis in accordance with ASTM D422, sand cone density, visual identification tests as required to identify materials, determine compaction characteristics, determine moisture content in accordance with ASTM D2216, and determine density of fill in place in accordance with ASTM D1556 to verify that the fills conform to this section's requirements and is the same material approved prior to the start of the Work.

* * * * * *

Section 02230 - Road Sub-Base

PART 1 - GENERAL

1.01 Summary

a. This specification covers the technical requirements for the road sub-base.

b. The work shall consist of all work required to furnish, place, compact, and final grade the road sub-base material.

c. It is not the intent of this section and associated drawings to specify all details of construction. It shall be the responsibility of the Contractor to provide the materials specified and construct the sub-base in accordance with high standards of workmanship that is suitable for the specified work.

1.02 Related Sections

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

Section 2002 Geotextile
Section 2140 Dewatering
Section 2220 Excavation
Section 2225 Earthfill
Section 2500 Paving and Surfacing

1.03 References

NJDOT Standard Specifications, Construction and Material, 1985

PART 2 - PRODUCTS

2.01 Equipment

a. Equipment shall include spreading equipment that can spread aggregate without segregation, and one or more motor graders. The compaction equipment shall be pneumatic-tire rollers or dynamic compactors.

2.02 Materials

a. The sub-base material shall be natural or prepared mixtures consisting of fragments of stone, slag, gravel or sand and containing some silt-clay or stone dust. The moisture content shall not be excessive.

b. The sub-base shall be Type-1 sub-base material defined by NYSDOT.

PART 3 - EXECUTION

3.01 Construction

a. Prior to the placing of any subbase, the subgrade shall be shaped and compacted to grade and contour in accordance with Section 2225 Earthfill and shall be free from water pockets.

Subbase material shall not be placed on soft, muddy, or frozen areas, or until all irregularities in the prepared areas, including soft areas in the foundation, have been corrected, and the geotextile is properly in place.

b. The subbase material shall be deposited on prepared areas as uniformly as possible to avoid segregation.

The subbase shall be constructed in two layers of approximately 4-1/2" thickness each.

c. Density of the sub-base shall be within 5% of the maximum dry density and the water content shall be between 95% and 100% optimum moisture content according to test results submitted to the Engineer.

3.02 Testing

The inspection personnel will sample and test the gravel material for conformance to material requirement of this section. Failure of material will require the Contractor to remove and replace all sub-base material at his own expense.

* * * * * *

Section 02270 - Erosion Control

PART 1 - GENERAL

1.01 Summary

a. This section covers the technical requirements for controlling erosion and limiting discharge of turbid water into streams and waterways from construction operations in accordance with local ordinance.

b. The Contractor shall furnish, install and maintain all erosion control measures as specified in this section.

1.02 Related Sections

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

Section 02140 Dewatering
Section 02220 Excavation
Section 02225 Earthfill and Grading

1.03 References

Materials and services furnished shall be in accordance with state or local laws and ordinances and the regulations listed below.

EPA - Environmental Protection Agency

EPA-430/9-73-007 - Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity

Federal Regulations

Section 402 of the Federal Water Pollution Control Act - Amendments 1972
40 CFR 423, Subpart D - Area Runoff Subcategory

1.04 Quality Assurance

a. Contractor shall have a quality assurance program which will ensure that the equipment and services provided, will properly reflect the Owner's/Engineer's requirements.

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

PART 2 - PRODUCTS

2.01 Materials

a. Hay bales, silt fencing or mulching shall be utilized as necessary to control erosion from construction activities.

b. Construction entrance pad shall use size No. 2 or No. 3 coarse aggregate as defined by ASTM C-33.

PART 3 - EXECUTION

3.01 Installation

a. The Contractor shall install the straw bale dike and construction entrance pad prior to the start of any work as the site.

b. The Contractor shall furnish, install and maintain all erosion control measures during the course of construction. He shall make every effort to minimize erosion from clearing and grubbing, excavation, earthfill and well installation operations including, but not limited to, the following: installation of a 50 foot gravel construction entrance pad, providing hay bales or silt fences to trap sediment as shown on the drawings; spreading straw mulch on bare soil or newly completed construction areas.

c. Erosion and sediment control measures shall be phased-out upon completion of the construction work and the stabilization of the drainage areas. Any standing water shall be removed from basin(s) prior to regrading.

* * * * * *

Section 02500 - Paving and Surfacing

PART 1 - GENERAL

1.01 Summary

a. This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the materials for the construction of a bituminous concrete surface course.

b. The Work shall consist of furnishing all materials, installation, testing and delivery of services as specified in this section and shown on the drawings for the following items as included in the Contract documents:

1) Prime coat;
2) Asphalt surfacing materials;
3) Placing asphaltic concrete;
4) Flood test;

c. It is not the intent of this section and associated drawings to specify all details of construction. It shall be the responsibility of the Contractor to provide equipment and materials in accordance with stated standards and high standards of workmanship.

1.02 Related Sections

Related work that is specified in other sections of the Contract documents includes but is not limited to the following:

Section 02722 Culverts
Section 02230 Road Sub-base
Section 02225 Earthfill

1.03 Submittals

a. The Contractor shall submit the job mix formula of the bituminous pavement to be used to the Engineer before commencing paving activities.

1.04 References

NYSDOT - Standard Specifications, Construction and Materials, 1985

PART 2 - PRODUCTS

2.01 Equipment

a. The equipment shall consist of a bituminous concrete pavers and rollers, sufficient number of vehicles for transporting bituminious mixtures, small tools and all other equipment necessary for the construction of the bituminous pavement surface course and for conditioning the previously constructed base course.

- o Compacting equipment shall be self-propelled tandem rollers having a minimum weight of ten tons, except that hand-held vibrator compactors may be used in areas not accessible to rollers when specially approved by the Engineer.

- o Coating equipment shall be specifically designed for that purpose and shall be subject to the inspection and approval of the Engineer.

- o Paving equipment shall be spreading, self-propelled asphalt paving machines capable of maintaining line, grade, and the minimum surface thickness specified, except that spreader boxes may be used in areas where specifically approved by the Engineer. Paver shall be equipped with a heated vibrating screed.

2.02 Materials

a. Prime Coat

Prime coat material shall be asphaltic oil, Grade MC-0 or MC-1, or tar, Grade RT-1 or RT-2, or emulsified asphalt, Grade SS-1.

b. Bituminous Pavement Materials

1) The bituminous pavement mixture shall be NYSDOT Type 6.

2) All materials incorporated in the mix shall conform to the NYSDOT requirements.

3) All grading, blending, mixing and transporting procedure shall confirm to the NYSDOT requirements.

c. Other Materials

All other materials, not specifically described but required for proper and complete installation of the work of this Section, shall be as selected by the Contractor subject to the approval of the Engineer.

PART 3 - EXECUTION

3.01 Inspection

The Contractor shall:

Examine the areas and conditions under which work of this Section will be conducted.

Inspect the grades and condition of the sub-base as to its preparation for asphaltic concrete placement.

Correct conditions detrimental to proper and timely completion of the Work.

Not proceed until unsatisfactory conditions have been corrected.

3.02 Application of Prime Coat

Prior to paving, the sub-base course shall be cleaned of all loose aggregate and binder and given a prime coat of asphaltic oil, tar or emulsified asphalt at the rate of 0.5 gallons per square yard. Application of the prime coat shall be made not less than twelve hours prior to the placing of the bituminous concrete and shall not be made when the sub-base course is wet or frozen.

Application of prime coat methods and equipment shall meet with the approval of the Engineer.

3.03 Placement of Asphaltic Concrete

1) Receipt of materials:

A. Material will not be accepted unless it is covered with tarpaulins until unloaded, and unless it has a temperature of at least 280 degrees F.

B. No asphaltic concrete shall be placed when the atmospheric temperature is below 50 degrees F, nor during fog, rain, or other unsuitable conditions.

2) Spreading:

The Contractor shall spread material in one layer in a manner which requires the least handling.

3) Rolling:

A. After the material has been spread to the proper depth, the Contractor shall roll with the specified equipment until the surface is hard, smooth, unyielding, and true to the thickness and elevations shown on the Drawings.

B. The surface shall be rolled in at least two directions until no roller marks are visible.

C. Finished surfaces shall be free from birdbaths, and shall show no variation from the designed elevations greater than 1/8" when checked with a 6'-0" straight edge.

3.04 Flood Test

1) Schedule:

After the asphaltic concrete is spread and rolled, the Contractor shall perform a flood test in the presence of the Engineer.

2) Method:

(1) Perform the flooding by use of a water tank truck.

(2) If a depression is found where water ponds to a depth of more than 1/8", fill or otherwise correct to provide proper drainage.

(3) Feather and smooth the edges of fill so that the joint between fill and original surface is invisible.

3.05 Protection

Work shall be protected from traffic during all operations, and traffic shall not be permitted on newly finished surfaces prior to 12 hours after their completion except by permission of the Engineer.

3.06 Testing and Inspection

The final asphaltic concrete course shall be not less than 1-1/2" thick, true to the elevations plus or minus 0.05' at any point from line and grade shown on the drawings and of a density not less than 145 lbs/cubic feet.

* * * * * *

Section 02672 - Extraction Wells

PART 1 GENERAL

1.01 Summary

The work under this Section shall include the installation of the extraction well casings, screens, gravel pack, sand filter, backfill, access manhole, manhole frame and cover, and well development.

1.02 Related Sections

a. Related work that is specified in other sections of the technical specifications includes but is not limited to the following:

Section 01560 Temporary Controls (Hazardous Materials)
Section 02673 Injection Wells
Section 03480 Precast Concrete
Section 11211 Extraction Well Pumps

1.03 Submittals

Riser material, screen material, gravel gradation, sand gradation and well installation details shall be submitted to the Engineer for approval prior to installation.

1.04 Environmental Conditions

All contaminated soils and water shall be handled in accordance with Section 01560 and the Contractor's Health and Safety Plan.

PART 2 - PRODUCTS

2.01 Materials

a. The extraction well riser and screen shall be four (4) inch diameter Schedule 40 stainless steel, Type 304.

b. The extraction well screenings shall be 50 slot (.050 inch) stainless steel screens. The screen length shall be fifteen (15) feet.

c. The gravel filter gradation shall be 50% Morie #2 and 50% Morie #3. This gravel filter gradation conforms to the following:

% of Gravel Retained	Screen Size (inch)
50%	.071
70%	.065
80%	.060
90%	.055

d. The precast manhole tops shall be a eccentric cone type. Concrete compressive strength shall be 4000 psi. The tops shall be manufactured according to ASTM C 478.

e. The manhole cover and frame shall be Campbell Type 1208 or approved equal.

PART 3 - EXECUTION

3.01 Location and Depth of Wells

The plan location and the depth of each extraction well shown on the drawings are based on design estimates. The final depth and location of the components of each well will be determined by the Engineer on the basis of his examination of the well log and samples recovered during drilling. The location of a well will be changed where obstructions are encountered during drilling requiring abandonment of the well.

3.02 Drilling

The wells shall be drilled vertically by a rotary drilling method. The diameter of each borehole shall be a minimum of twelve (12) inches to permit the placement of the specified thickness of the gravel filter. Drilling methods that may reduce the yield of the well will not be permitted.

The well shall be cased with a temporary casing of a type that:

a. Shall have sufficient thickness to retain its shape and maintain the true section throughout its depth;

b. Shall be removable in a manner that will not disturb the gravel filter, well screen or well riser.

3.03 Installing Riser Pipe and Screen

The riser, including well screens, couplings and fittings, shall be measured and inspected as it is assembled and placed in the well. Spiders, or other centering devices, shall be attached to the assembled

riser in sufficient numbers to center it in the well and hold it securely in position while the gravel filter is being placed.

Before the riser is placed, gravel filter materials shall be placed on the bottom of the well to the elevation prescribed by the Engineer for the bottom of the well screen. The riser shall be placed in the well in such a manner as to avoid shock and to prevent damage to any of its components. The top of the riser shall be held at the designated elevation during the placement of the filter.

3.04 Placing Gravel Filter

The gravel filter shall be placed by tremie to an elevation not less than one foot above the top of the well screen. At the start of placement the tremie shall rest on the bottom of the well and be filled with filter material. The tremie and the temporary casing shall be raised in increments of not more than two feet allowing the filter material to flow out the bottom of the tremie. The top surface of the filter material in the tremie shall be maintained above the water surface at all times. The top surface of the filter material in the well shall be maintained at least two (2) feet above the bottom of the casing as the casing is pulled.

3.05 Backfilling

Prior to the well being developed, the annular space around the riser pipe above the filter shall be filled with selected moist impervious earthfill or Portland cement concrete. Backfill shall be placed in layers not over twelve (12) inches in thickness and each layer shall be tamped firmly into place. The temporary casing shall be withdrawn in twelve (12) inch increments as the backfill is placed.

3.06 Developing

After the gravel filter is placed and backfilled, the well shall be developed by an approved method. Prior to development the Contractor shall submit his plan for accomplishing the work to the Engineer for approval.

All materials pulled into the screen during development shall be containerized with contaminated material in accordance with Section 01560.

Any well that continues to produce appreciable amounts of fines after development for four (4) hours will be abandoned and another well relocated by the Engineer.

* * * * * *

Section 02673 - Injection Wells

PART 1 - GENERAL

1.01 Summary

The work under this section shall include the installation of the injection wells piping, fittings, vent, vent insulation, screens, gravel pack, bentonite seal, grout and well development.

1.02 Related Sections

a. Related work that is specified in other sections of the technical specifications includes but is not limited to the following:

Section 01560 Temporary Controls (Hazardous Materials)
Section 02672 Extraction Wells

1.03 Submittals

Material type for piping, fitting, screens, vent and vent insulation, gradation of gravel and installation details shall be submitted to the Engineer for approval prior to installation.

An injection well development plan shall be submitted to the Engineer for approval prior to start of installation.

1.04 Environmental Conditions

All contaminated soils and water shall be handled in accordance with Section 01560 and the Contractor's Health and Safety Plan.

PART 2 - PRODUCTS

2.01 Materials

a. The injection well piping, flanges, fittings and screens shall be six (6) inch diameter Schedule 40 stainless steel, Type 304.

b. The injection well screen shall be a 50 slot (.050 inch) stainless steel screen. The screen length shall be ten (10) feet.

c. The gravel filter gradation shall be 50% Morie #2 and 50% Morie #3. This gravel filter gradation conforms to the following:

% of Gravel Retained	Screen Size (inch)
50%	.071
70%	.065
80%	.060
90%	.055

d. The vent insulation shall be rated R-10 and shall be moldable about the vent. It shall be non-flammable.

e. The vent piping and goose neck shall be four (4) inch diameter Schedule 40 steel pipe painted and insulated. It shall be fabricated as shown on the drawings.

PART 3 - EXECUTION

3.01 Location and Depth of Wells

The plan location and the depth of each injection well shown on the drawings are based on design estimates. The final depth and location of the components of each well will be determined by the Engineer on the basis of his examination of the well log and samples recovered during drilling. The location of a well will be changed where obstructions encountered during drilling require abandonment of the well.

3.02 Drilling

The wells shall be drilled vertically by a rotary drilling method. The diameter of each well shall be a minimum of eighteen (18) inches to permit the placement of the specified thickness of the gravel filter. Drilling methods that may reduce the yield of the well will not be permitted.

The well shall be cased with a temporary casing of a type that:

a. Shall have sufficient thickness to retain its shape and maintain the true section throughout its depth;

b. Shall be removable in a manner that will not disturb the gravel filter, well screen or permanent riser.

3.03 Installing Riser Pipe and Screen

The riser assembly, consisting of the piping, well screens, couplings and fittings, shall be measured and inspected as it is assembled and placed in the well. Spiders, or other centering devices, shall be attached to

the assembled injector in sufficient numbers to center it in the well and hold it securely in position while the gravel filter is being placed.

Before the riser is placed, gravel filter materials shall be placed on the bottom of the well to the elevation prescribed by the Engineer for the bottom of the well screen. The riser shall be placed in the well in such a manner as to avoid shock and to prevent damage to any of its components. The top of the riser shall be held at the designated elevation during the placement of the filter.

3.04 Gravel Filter Placement

The gravel filter shall be placed by tremie to an elevation not less than two (2) foot above the top of the highest well screen. At the start of placement the tremie shall rest on the bottom of the well and be filled with filter material. The tremie and the temporary casing shall be raised in increments of not more than two feet allowing the filter material to flow out the bottom of the tremie. The top surface of the filter material in the tremie shall be maintained above the water surface at all times. The top surface of the filter material in the well shall be maintained at least 2 feet above the bottom of the temporary casing as that casing is pulled.

3.05 Bentonite Seal, Grout, and Backfill

The well shall be sealed with 2 feet of Bentonite. The remaining depth from the Bentonite seal to one (1) foot below the inlet flange shall be grouted with a 9 to 1 Bentonite and Portland Concrete Grout Mix. The placement of the Bentonite seal and grout and the removal of the temporary casing shall follow the same procedure as the gravel filter placement. The remaining depth shall be backfill with selected moist impervious earthfill material.

3.06 Developing

After the filter is placed the well shall be developed by an approved method. Prior to development the Contractor shall submit his plan for accomplishing the work to the Engineer for approval.

All materials pulled into the screen during development shall be containerized with contaminated material in accordance with Section 01560.

Any well that continues to produce appreciable amounts of fines after development for four hours will be abandoned and another well relocated by the Engineer.

* * * * * *

Section 02722 - Culverts

PART 1 - GENERAL

1.01 Summary

a. This section covers the technical requirements for the drainage culvert under the access road.

b. The work shall consist of furnishing and installing a reinforced concrete pipe (RCP) culvert with flared ends as shown on the drawings.

c. It is not the intent of this section and associated drawings to specify all details of the culvert installation. It shall be the responsibility of the Contractor to provide materials, equipment and labor to perform the work in accordance with the stated standards and specifications.

1.02 Related Sections

a. Related work that is specified in other sections of the technical specifications includes but is not limited to the following:

Section 02140 Dewatering
Section 02220 Excavation
Section 02270 Erosion Control
Section 02225 Earthfill

1.03 Submittals

a. Concrete pipe material and installation details shall be submitted to the Engineer for approval prior to construction.

PART 2 - PRODUCTS

2.01 Materials

a. The culvert shall be 12-inch inside diameter Class II reinforced concrete pipe (RCP) conforming to the requirements of ASTM Specification C76. Both ends shall be flared-end RCP.

b. Cement mortar for joints shall consist of one part by weight of portland cement and two parts by weight of fine sand with enough water added to produce a workable consistency. At the time of assembly the inside surface of the bell and the outside surface of the spigot shall be clean and moist.

PART 3 - EXECUTION

3.01 Installation

a. Pipe shall be laid to the line and grade shown on the drawings. Pipe shall be laid with the bell at the upstream end of each section.

The end of the spigot shall be fully inserted into the bell so that the pipe sections are closely fitted and aligned.

Joints shall be made sound and watertight by filling with cement mortar. The annular space between the bell and the spigot shall be filled completely with mortar and beveled off at an angle of approximately forty-five (45) degrees with the outside of the bell.

b. Backfilling shall be in accordance with Section 02225: Earthfill and in accordance with details shown on the drawings.

c. Entrance and exit of each culvert shall be cleared of all brush and debris and culvert ends shall be mitered flush with the slope of the access road fill material.

* * * * * *

Section 02830 - Fences and Gates

PART 1 - GENERAL

1.01 Summary

a. This section covers the requirements for fencing and gate materials, construction features, quality and handling of the materials described herein.

b. The work under this section shall include fabricating and furnishing all materials, installation of fences and gates shown on the drawings, and alterations of the existing fence.

c. It is not the intent of this section and associated drawings to specify all details of fabrication and construction. It shall be the responsibility of the Contractor to provide and install materials that have been specified in accordance high standards and workmanship that is suitable for the specified work.

d. The work includes supply, erection, complete installation, and alteration of the following:

1. Concrete Footings
2. Fencing
3. Gates
4. Existing Fence

1.02 Related Sections

a. Related work that is specified in other sections of the Contract documents includes but is not limited to the following:

Section 02210 Earthfill
Section 03310 Concrete

1.03 Submittals

a. Contractor shall submit the name of the fence fabricator, size of fabric and type of posts, upon delivery of fencing materials to the site. Also see Section 01300-Submittals.

PART 2 - PRODUCTS

2.01 Materials

a. Posts and Rails

All posts, rails, gate frames, and post braces shall be Schedule 40 standard steel pipe produced to the requirements of ASTM A120, (no hydrostatic testing is required) and hot-dip galvanized in accordance with ASTM A123, except for sliding gate posts which shall be Schedule 80.

1. Minimum NPS pipe diameters shall be as follows:

End, corner and pull posts	2-1/2"
Line posts	2"
Swing gate posts	
a. Double swing (up to 12 feet)	2"
Double swing (from 12 to 26 feet)	3-1/2"
Top rail	1-1/4"
Horizontal post braces	1-1/4"

2. All posts shall be equipped with pressed steel combination tops. Tops shall be provided with a hole to permit through passage of the top rail.

3. Post tops, extension arms, rail sleeves, and miscellaneous clamps shall be hot-dip galvanized in accordance with ASTM A123.

b. Fence Fabric

1. Wire for chain link fence fabric shall be No. 9 coated wire gage carbon steel produced in accordance with ASTM A817.

2. Fence fabric shall be zinc coated steel mesh.

3. Coated fence fabric shall be produced from helically wound and interwoven steel wire forming a continuous 2 inch mesh in accordance with ASTM A392 when zinc coating is specified, and ASTM A491 for aluminum coated fabric.

4. Ties or clips of adequate strength shall be provided in sufficient number for attachment of the fabric to line posts at intervals not exceeding 15 inches and to the top rail at a maximum 24 inch spacing.

c. Tension Bars

1. Tension bars shall be minimum 3/16 inch by 3/4 inch flat steel plates and no more than 2 inches shorter than the fabric height. Bars shall be hot-dip galvanized in accordance with ASTM A123.

d. Terminal Post Bands

1. Bands or clips of adequate strength shall be provided in sufficient number for attachment of the fabric and stretcher bars to all terminal posts at intervals not exceeding 15 inches. Tension bands shall be formed from No. 12 gage flat or beveled steel and attached with 3/8 inch diameter carriage bolts hot-dip galvanized in accordance with ASTM A153.

e. Gates shall be double swing as indicated on the drawings, complete with latches, stops, keepers and hinges.

1. Gate frames shall be constructed of Schedule 40, 1-1/4 inch NPS diameter standard steel pipe produced to the requirements of ASTM A120 and hot-dip galvanized in accordance with ASTM A123. Frames shall be welded at corners or assembled with fittings, and when fittings are used, 3/8 inch minimum diameter truss rods shall be provided to prevent sag or twist.

2. Gate leaves shall have vertical intermediate bracing as required, spaced so that no members are more than 8 feet apart. Gate leaves 10 feet or over shall have a horizontal brace or one 3/8 inch minimum diameter diagonal truss rod.

3. Gate fabric shall be the same type as used in the fence construction.

4. Hinges for swing gates shall permit full opening to a position paralled to the fence. Hinges shall not twist or turn under gate motion, and shall be non-removable after installation. The gate should be easily opened by one person.

5. Gate latches, stops, and keepers shall be provided for all gates. Latches shall have a plunger-bar arranged to engage the center stop, except that for single gates for openings less than 10 feet wide a forked latch may be provided. Catches shall be arranged for locking. Center stops shall consist of a device arranged to be set in concrete and to engage a plunger bar of the latch of double gates. No stop is required for single gates. Keepers shall consist of a mechanical device for securing the free end of the gate in the full open position.

6. All gate hardware shall be zinc coated in accordance with ASTM A153.

PART 3 - EXECUTION

3.01 Requirements

a. Fence and gates shall be 6 feet in height.

b. Line posts shall be spaced equally not more than 10 feet on centers.

c. Rails shall be furnished in random lengths averaging a minimum of 20 feet. Joints shall be made up with extra long pressed steel sleeves to provide a rigid connection while permitting expansion and contraction.

d. All end and corner posts shall be braced horizontally to the adjoining line post at the mid-height of the fabric by means of standard steel pipe.

e. Diagonal tension bracing shall be provided from end, corner, or gate posts to line posts, consisting of 3/8 inch minimum diameter steel truss rods with turnbuckles or equivalent provision for adjustment.

f. One tension bar shall be provided for each end and gate post, and two (2) for each corner and pull post.

3.02 Installation

a. The fence and gates shall be installed 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 the work.

c. All equipment shall be properly and securely installed such that undue stresses are not exerted on fences, gates and connections.

d. Contractor shall construct footings and install all fencing and accessories to the extent indicated on the drawings using skilled personnel experienced in this type of work. Dimensions of footings are shown on the drawings.

e. Post footings shall be place monolithically, and the top surface shall be approximately 2 inches above the surrounding ground line. A concrete block or flat stone shall be placed at the bottom of an augered hole before the post concrete is placed.

f. Concrete shall cure for minimum of 72 hours after posts are set before fence installation continues.

3.03 Testing and Inspections

a. Each material shall be given requisite inspections, 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 fence is completely installed, shall be performed by the Contractor to demonstrate performance requirements, as specified herein.

c. Contractor shall certify that materials and coatings furnished have been tested and conform to the referenced ASTM Specifications.

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Section 02900 - Landscaping

PART 1 - GENERAL

1.01 Summary

a. This specification covers the technical requirements for landscaping seeding, fertilizing and mulching.

b. The work shall consist of supplying and providing all items of labor, equipment and materials necessary for landscaping activities as specified in this section and shown on the design drawings.

c. It is not the intent of this section and associated drawings to specify all details of landscaping. It shall be the responsibility of the Contractor to provide equipment and services that produce landscaping work in accordance with stated standards and high standards workmanship that is suitable for the specified work.

1.02 Related Sections

a. Related work that is specified in other sections of the contract documents includes but is not limited to the following:

Section 02225 Earthfill

Section 02270 Erosion Control

1.03 References

a. All work shall be performed in compliance with the requirements of the Standard Specifications of the American Association of Nursery-men, Inc., latest edition.

1.04 Submittals

a. The Contractor shall submit to the Engineer the bag tag of the seed mix upon delivery to the site. Any exceptions to the original standards or specification must be documented with written approvals from the Engineer.

PART 2 - PRODUCTS

2.01 Materials

a. Soil Amendment Materials

The amount of ammonium sulphate or limestone necessary to adjust the planting soil to the proper pH range will be determined at the time of closure. Ammonium sulphate shall be unadulterated, delivered in containers with the name of the material, manufacturer and net weight of contents, complete with application instructions.

Agricultural limestone will be ground limestone containing a minimum of 88 percent calcium and magnesium carbonates and will have the following gradation:

Square Mesh Sieve	% Passing by Weight
No. 10	100
No. 20	90
No. 100	50

b. Fertilizer

Fertilizer will be a commercial grade fertilizer. The percentages of nitrogen, potassium and phosphoric acid in the fertilizer will be based on laboratory test recommendations conducted at the time of the closure.

The fertilizer will be delivered to the site in new, sealed, clean containers, which bear a label fully describing the contents, the chemical analysis of each nutrient, the fertilizer grade, the net bulk, as well as the brand name and address of the manufacturer. Any fertilizer which becomes caked or otherwise damaged will not be accepted.

c. Seeds

Grass seed will be fresh, clean, new crop certified seed. Material other than pure live seed will be comprised of only non-viable seed, chaff, hulls, live seed of crop plants other than those specified, harmless inert matter and weed seeds. Weed seeds other than seeds of noxious weeds will be permitted up to one percent of the gross weight of each kind of seed.

The grass seed mixture shall be composed of the following seeds, mixed in proportions by weight:

Name of Grass	Proportion by Weight
Annual Rye	10%
Perenial Rye	30%
Creeping Red Fescue	20%
Blue Grass	40%

If the Contractor proposes to change the types or proportions of the grass seeds as herein specified, he shall first obtain written permission from the Engineer not less than four weeks prior to commencing seeding.

d. Topsoil

The stockpiled topsoil from the road and soil stockpile areas shall be used for all areas to be seeded. If additional topsoil is needed, the Contractor shall supply it at no additional cost. Topsoil spread over disturbed areas shall have a minimum thickness of 4 inches.

Topsoil shall be a natural, fertile, agricultural soil, capable of sustaining vigorous plant growth. It shall be of uniform composition throughout and without admixtures of subsoil, and shall be free of stones, lumps, plants, roots, sticks or other extraneous matter and shall not be placed while in a frozen or muddy condition. The topsoil shall contain not less than five percent organic matter.

e. Mulches

Wood cellulose fiber mulch will be used in the hydraulic mulching of grasses. It will consist of specially prepared wood cellulose fibers, having no growth or germination inhibiting factors and dyed green to facilitate visual metering during application. The wood cellulose fiber will have the additional characteristic of dispersing rapidly in water to form a homogenous slurry and remain in such state when agitated in the hydraulic mulching unit, with the specified materials.

Hay for mulching will be mowings of acceptable herbaceous growth which are free from noxious weeds. Straw for mulching will be stalks of oats, wheat, rye, or other approved crops which are free from noxious weeds. Materials which are low grade and unfit for farm use such as "U.S. Sample Grade" are considered acceptable.

PART 3 - EXECUTION

3.01 Installation

a. Planting Season: Seeding shall proceed as quickly as possible following the establishment of finished contour elevations.

Lawns shall be seeded with permanent grass seed from March 15th to May 15th and from August 15th to October 1st.

The actual planting of lawns, however, shall be done during periods within these seasons as determined by weather conditions and by acceptable practice in the locality of the project.

b. Spreading Topsoil: Prior to the placement of topsoil, the subgrade soil shall be loosened to a depth of 2" and graded so that it will be parallel to the proposed finished grade. Topsoil shall be spread, raked and compacted to form, after settlement, smooth draining grades as shown on the drawings. The minimum depth of topsoil after compaction shall be four (4) inches.

c. Seeding: The preferred method of applying seed, fertilizer, pH soil amendment, mulch and, if necessary, a chemical soil stabilizer is by hydroseeding. Seed, fertilizer and mulch will be mixed with water and applied to the areas shown on the drawings. The amount of fertilizer will be determined from the results of soil testing. The seed shall be uniformly applied at a rate of 200 lbs. per acre of area.

Mulch will be applied at the following rates:

- Wood cellulose materials (for hydroseeding admixtures)
  4:1 slope - 1800 lbs./acre
  2:1 slope - 2000 lbs./acre

- Straw as hay application (dry)
  4:1 slope - 1500 lbs./acre
  2:1 slope - 2000 lbs./acre

In the absence of hydroseeding equipment, seeding may be done by broadcast or drill seed, fertilized and mulched with hay, straw or cellulose wood fiber.

After seed and fertilizer have been applied to the areas prepared for seeding and before the areas are mulched, the seed shall be lightly wood raked into the ground, rolled with a 500 lb. roller, and then thoroughly watered with a fine spray. After the watering operation, mulch shall be applied.

d. Mulching

A wood cellulose mulch will be applied with the seed and fertilizer during seeding operations or as a temporary soil stabilizer during non-seeding seasons. Hay or straw will be spread uniformly by hand, mechanical spreaders or by blowers within 24 hours after seeding.

e. Clean-Up

The Contractor shall remove all debris from the site including, but not necessarily limited to, branches, rocks, paper, and rubbish in all areas which are being seeded as the work proceeds. All areas will be kept in a neat and orderly condition at all times.

3.02 Maintenance

Maintenance of lawn areas will be continuous until the time of final acceptance by the Owner or his representative. Maintenance shall include, but not necessarily be limited to, the following items:

- Proper and adequate watering
- Refilling of rain-washed gullies and rutted areas
- Refertilization after the first two cuttings of grass (or as otherwise directed) with the same analysis and rate of application of fertilizer as was originally applied.
- Mowing grass and weeds to a height of 1-1/2 inches to 2 inches when grass attains a height of three (3) inches or when growth tends to smother new seedlings, or as directed. A minimum of three mowings are to be completed before final acceptance.
- Reworking and reseeding of any areas which fail to show a uniform stand of grass. All of the aforementioned work shall be done at the Contractor's expense with the same seed mixture applied at the original rate. This reworking and reseeding shall be repeated until all areas are covered with a satisfactory stand of grass.

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Section 03310 - Concrete

PART 1 - GENERAL

1.01 Summary

a. This section covers the requirements for the materials, performance, placement, testing, quality and handling of the concrete described herein.

b. The Work under this section shall include the concrete foundation for the air stripping column, the footing and floor for the building, fence post footings, and equipment pads.

c. 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 Contractor to provide equipment and systems that have been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

1.02 Related Sections

a. Related Work that is specified in other sections of the contract documents includes but is not limited to the following:

Section 04220 Concrete Unit Masonry

1.03 References

a. The Contractor's Work shall comply with the codes and standards below in addition to State and local ordinances.

ACI - American Concrete Institute

301-81 Specifications for Structural Concrete for Buildings

ASTM - American Society for Testing and Materials

A82-79 Standard Specification for Cold-Drawn Steel Wire for Concrete Reinforcement

A185-79 Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement

A615-82 Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement

C33-82 Standard Specification for Concrete Aggregates

C94-83 Standard Specification for Ready-Mixed Concrete

C150-83 Standard Specification for Portland Cement

C-260-77 Standard Specification for Air-Entraining Admixtures for Concrete

C494-82 Standard Specification for Chemical Admixtures for Concrete

1.04 Submittals/Samples

The Contractor shall submit a design mix from his concrete supplier to the Engineer two weeks prior to the start of the concrete work. Also see Section 01300 Submittals.

1.05 Quality Assurance

a. Contractor shall have a quality assurance program which will ensure that the equipment and services provided, will properly reflect the Owner/Engineer's requirements.

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

PART 2 - PRODUCTS

2.01 Materials

a. Steel Reinforcement

Reinforcing steel shall be deformed bars produced from new billet steel and conforming to ASTM A615, Grade 60 (60,000 psi minimum yield), unless noted otherwise on Engineer's design drawings.

Welded wire fabric shall conform to ASTM A185 (minimum yield strength of 65,000 psi). Welded intersections shall not be spaced farther apart than 12 inches in the direction of the principal reinforcement.

b. Concrete

Concrete shall be proportioned for workability, maximum density, strength, and durability requirements in accordance with Chapter 3 of ACI 301. The 28-day design compressive strength of concrete shall be 4000 psi. The Contractor shall submit for review by Engineer a design mix and test data for the concrete to be furnished.

Production of concrete shall conform to Chapter 7 of ACI 301. Concrete furnished may be a commercial ready-mix, provided that delivery to the placing location is satisfactorily established as occurring not later than 30 minutes after addition of water to the mix. Slump of delivered concrete shall not exceed four inches.

Concrete materials shall conform to the requirements of Chapter 2 of ACI 301 and the following:

Cement shall be an established commercial brand of Type II Portland Cement conforming to ASTM C150.

Coarse Aggregate shall be normal weight concrete aggregates conforming to ASTM C33. The size of aggregate shall be No. 57.

Fine Aggregate shall be as defined in ASTM C33.

Admixtures shall be used in concrete as indicated below:

- An appropriate air-entraining agent conforming to ASTM C60 to produce entrained air within the percentages listed in ASTM C94.

- A water-reducing or water-reducing and retarding chemical admixture meeting the requirements of ASTM C494, Type A and D, respectively. Type D shall be used whenever the dry bulb temperature equals or exceeds 85°F or when the temperature of the fresh concrete equals or exceeds 75°F. Type A shall be used for all other concrete.

Water shall be free from any injurious amounts of acid, alkali, salts, oil, sediment, or organic matter.

c. Formwork

Formwork shall be the responsibility of Contractor and shall be designed and constructed in accordance with Chapter 4 of ACI 301.

PART 3 - EXECUTION

3.01 Installation

a. Concrete shall be placed for the foundation for the air stripping column, the footing and floor for the building fence post footings and equipment pads as shown in the drawings. All Work shall be performed by competent, trained workmen, skilled in the field in which they are executing the work.

b. Concrete shall be placed and cured in accordance with Chapters 8 through 12 and formwork placing tolerances shall be in accordance with Chapter 4 of ACI 301.

c. When hot weather conditions prevail (dry bulb temperature equals or exceeds 85°F), the interval between mixing and placing shall not exceed 60 minutes.

d. Bonding at construction joints shall be developed by roughening the surface of the existing concrete in an acceptable manner and keeping the surface wet for at least two (2) hours prior to concrete placement.

e. The exposed exterior formed surfaces of concrete shall be "smooth form finished" and placed to the specified elevations shown on Engineer's design drawings. All form ties shall be broken back and the holes shall be filled with patching mortar.

3.02 Material Tests

Testing of concrete materials and operations shall be in accordance with Chapter 16 of ACI 301, with the exception that strength tests shall not be waived even if the total concrete quantity is less than 50 cubic yards. Contractor shall submit to Engineer for review all test data and material certification prior to or during installation, as applicable.

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Section 03400 - Precast Concrete

PART 1 - GENERAL

1.01 Summary

a. This section covers the technical requirements for all pre-cast units and metal hatchways to be supplied and installed under this contract.

b. The work shall consist of furnishing and installing the clear well, waste sump, valve box and metal hatchways for each unit to the line and grade shown on the drawings, including all labor, equipment, tools, and materials necessary and incidental to complete this work.

1.02 Related Sections

a. Related Work specified in other sections of the technical specification includes but is not limited to:

Section	02220	Excavation
Section	02225	Earthfill
Section	03310	Concrete
Section	03600	Grout
Section	09880	Protective Coatings for Concrete

1.03 Design/Performance Requirements

a. The clear well shall have a 500 gallon capacity. The well shall be rectangular. The maximum depth of the clear well's floor shall be set four (4) feet below the floor and the top of the well shall be twelve (12) inches above the finished floor.

b. The Waste Sump shall have a 1500 gallon capacity. The sump shall be rectangular. The maximum depth of the sump's floor shall be 5 feet 6 inches below the finished floor elevation. The top of the sump shall be at finish floor elevation.

c. The valve box shall be large enough to allow for installation, and maintenance of the valves, and permit gravity flow of the water from the clear well to the injection wells or waste sump. The top of the box shall be 6" above finish floor elevation.

d. The clear well, waste sump and valve box shall be watertight. All air holes on the interior and exterior shall be properly patched. All lifting holes shall be dry packed and properly patched. All exit and entrance piping from the clear well shall be cast in the walls at the elevations shown on the drawings.

e. The concrete shall be air entrained and have a 28-day compressive strength of 4000 psi.

f. The metal hatchways shall completely cover each precast unit. The hatchway for the sump shall be designed to support the sump pump firmly and vibration free. Hatchway doors shall have recessed handles and shall be spring loaded so a normal person may lift the hatchway door. All hatchway shall be designed to support 300 lbs.

1.04 Submittals

a. The Contractor shall submit a shop drawing for each precast unit prior to site delivery. The drawings shall show wall and base thicknesses, interior and exterior dimensions, location and spacing of reinforcement steel, a cross section detail of the wall top for cover connection, and casting details for piping.

b. The drawing shall state the 28-day compressive strength of concrete to be used, type of steel reinforcement (grade and size) and shall be reviewed and sealed by a Registered New York State Professional Engineer.

c. The Contractor shall submit fabrication and connection show drawings for each metal hatchway.

PART 2 - PRODUCTS

2.01 Material

a. The materials used in the precast unit shall conform to the following requirements:

1. Cement - ASTM C-150
   Manufacturer to specify type

2. Aggregate - ASTM C-33
   Manufacturer to set gradation for large aggregate. No aggregate shall be larger than 1-1/2".

3. Admixture - ASTM C-494, and ASTM C-260
   Manufacturer to specify types and amounts

4. Steel reinforcement - ASTM A-615 or A-185
   Manufacturer to specify type

b. The material for metal hatchways shall be either a coated shell or aluminum.

PART 3 - EXECUTION

3.01 Installation

a. The Contractor shall excavate to the base elevations for the precast units.

b. The Contractor shall grade and compact the area directly below each unit prior to installation. The area must be inspected by the Engineer prior to placement.

c. The Contractor shall backfill and compact in six (6) inch lifts around the entire perimeter of each unit.

d. The order of installation shall be as follows:

1. Waste Sump
2. Valve Box
3. Clear Well

e. The Contractor shall schedule the various craftsmen and laborers to accomplish this work with a minimum amount of delay between placement of each unit.

f. The metal hatchways shall not be installed until after the building is erected and the major piping and valves installed.

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Section - 03600 - Grout

Part 1 - GENERAL

1.01 Summary

a. The work shall consist of all grouting required for pipe penetration of walls of pre-cast units, equipment grouting, and grouting of wells.

1.02 Related Work

Section 03400 Precast Concrete

Section 26782 Extraction Well

Section 02673 Injection Well

Part 2 - PRODUCT

a. The grout required for pipe penetrations shall be non shrink grout.

b. The grout required for equipment bolt down shall be non shrink grout.

c. The grout required for wells shall be a Portland Cement and Bentenite Mix of 9 to 1.

Part 3 - EXECUTION

3.01 Pipe Penetration

a. The Contractor shall prepare the pipe, the precast surface and the flanged gasket by cleaning all surfaces with water prior to applying the grout.

b. The Contractor shall dry pack the grout the space between the pipe and the precast surface. It shall be packed on both sides of the gasket and filled out to the line of the wall.

3.02 Equipment Bolt Down

The Contractor shall prepare the surfaces to receive the grout and then dry pack the space between the floor built-up floor and the motor base plates and grout the end downs.

3.03 Injection Well Seal

Refer to Section 02673

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Section 04220 - Concrete Unit Masonry

PART 1 - GENERAL

1.01 Summary

a. This specification covers the technical and other requirements for concrete block masonry and related items.

b. Contractor shall provide all items of labor, material and equipment necessary to furnish and install the concrete block masonry as shown on Engineer's design drawings.

c. The work under this section shall include supplying, installing and testing the concrete unit masonry foundation for the building.

d. 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 Contractor to provide equipment and systems that have been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

1.02 Related Sections

a. Related Work that is specified in other sections of the Contract documents includes but is not limited to the following:

Section 03310 Concrete
Section 13120 Pre-Engineered Structures

1.03 References

The Contractor's work shall comply with the codes and standards below in addition to State and local ordinances.

ACI - American Concrete Institute

531.1-76 Specification for Concrete Masonry Construction

ASTM - American Society for Testing and Materials

A82-79 Standard Specification for Cold-Drawn Steel Wire for Concrete Reinforcement

A153-80	Specification for Zinc-Coating (Hot-Dip) on Iron and Steel Hardware
A615-82	Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement
C33-81	Standard Specification for Concrete Aggregates
C90-81	Standard Specification for Hollow Load-Bearing Concrete Masonry Units
C150-81	Standard Specification for Portland Cement
C207-79	Standard Specification for Hydrated Lime for Masonry Purposes
C270-80a	Standard Specification for Mortar for Unit Masonry
C331-80a	Standard Specification for Lightweight Aggregates for Concrete Masonry Units
C476-80	Standard Specification for Grout for Reinforced and Nonreinforced Masonry

1.04 Submittals

a. The Contractor shall submit, prior to concrete unit masonry construction, material samples and the following documents:

1. A Certificate of Compliance stating that all work provided under this specification complies with all requirements of this specification and accepted deviations.

2. Documents identifying deviations and their acceptance.

3. Masonry unit certification to ASTM C90 or ASTM C145.

4. Mortar material certification to ASTM C270 and ASTM C476.

5. Grout material certification to ASTM C476.

PART 2 - PRODUCTS

2.01 Materials

a. Concrete Masonry Units

Concrete masonry units shall be two core hollow units as indicated on Engineer's design drawings and shall conform to the requirements specified herein. Units shall be of the thickness specified on Engineer's design drawings with nominal face dimensions of 8 inches x 16 inches. Special starter block heights shall be furnished where shown on Engineer's design drawings.

All hollow load-bearing concrete masonry units shall be manufactured from lightweight expanded shale, clay, pumice, or slag aggregates conforming to ASTM C331. All units shall be steam cured with a moisture content expressed as a percentage of total absorption of not more than 30 percent at time of delivery.

Hollow load-bearing concrete masonry units shall conform to ASTM C90, Type I, Grade N-1 units, having a minimum net compressive strength of 1000 psi, and shall be used where shown on Engineer's design drawing. Moisture content and maximum linear shrinkage shall comply with Table 1 of ASTM C90 for the existing relative humidity condition.

b. Mortar and Grout

Mortar for all plain non-reinforced masonry units shall comply with the property specifications for Type S mortar of ASTM C270. Mortar for all reinforced masonry units shall comply with the material requirements of ASTM C476.

Grout for filling cores of reinforced hollow concrete masonry units shall comply with the material requirements of ASTM C476.

Cement for mortar and grout shall be Portland Cement Type II conforming to ASTM C150.

Hydrated lime shall be Type S conforming to ASTM C207.

Aggregate 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.

Water shall be free from any injurious amounts of acid, alkali, salts, oil, sediment or organic matter.

c. Horizontal Masonry Reinforcement

Horizontal masonry reinforcement for masonry walls shall be standard #8 "DUR-O-WAL" truss type with "BRITE" steel side rods and galvanized cross rods or alternate acceptable to Engineer. Reinforcement shall conform to ASTM A82.

d. Vertical Masonry Reinforcement, Anchors, and Ties

Vertical masonry reinforcement and stirrups shall be grade 60 conforming to ASTM A615, and shall be fabricated in accordance with ACI 531.1. Size and location shall be as shown on Engineer's design drawings.

Anchors and ties shall be of zinc-coated ferrous metal conforming to ASTM A153, Class B-2. Size and configuration shall be as shown on Engineer's design drawings.

e. Control Joint Material

Control joining material shall be "Weathertite R" as manufactured by Williams Products, Inc. or alternate acceptable to Engineer.

PART 3 - EXECUTION

3.01 Material Handling

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 plainly 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. Block, 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 Contractor.

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.

3.02 Installation

a. Concrete masonry units shall be installed by Contractor in accordance with ACI 531.1 "Specification for Concrete Masonry Construction," and as noted herein. 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 relaid with fresh mortar.

Concrete masonry units shall be either 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.

All masonry units shall be laid in running bond unless otherwise specified on Engineer's design 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.

When concrete masonry units are to be laid in extremely hot weater, 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.

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.

All exposed concrete masonry joints, both vertical and horizontal, shall be tooled to a neat and slightly concave surface.

b. Cutting and Fitting

Cutting and fitting of all concrete masonry units, including that required to accommodate the work of others, shall be done by the Contractor. Wherever possible, full units of the proper size shall be clean, true, and sharp. Openings shall be carefully cut, formed, or otherwise neatly made for recessed items or installations so that wall plates, cover plates, or escutcheons will not be required to completely conceal the openings. Webs of hollow masonry units shall be cut the minimum required for the installation.

c. Embedded Items

Spaces around control joints, unit support brackets, and other items shall be filled solidly with mortar. Anchors, ties, wall plugs, accessories, flashings, reinforcing lintels, control joint material, pipe sleeves, and other items requiring embedment shall be embedded as the masonry work progresses. Anchors, ties, and masonry reinforcement shall be fully embedded in mortar. Hollow masonry units shall be filled solidly with grout. Control joints shall be kept free of mortar.

d. Unfinished Work and Protection

For hollow load-bearing concrete masonry units, unfinished work shall be stepped back for joining with new work. Toothing may be resorted to only when specifically authorized by Engineer. Loose mortar shall be removed and the exposed joint shall be thoroughly cleaned before laying new work.

Surfaces of concrete block masonry not being worked on shall be properly protected at all times. At the end of each workday period, and when rain is imminent, the tops of all exposed concrete block masonry 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

Mortar for all concrete masonry units shall be thoroughly mixed and only in quantities needed for immediate use.

Mortar shall be placed in final position within 2-1/2 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 2-1/2 hour limitation. Harsh, non-plastic mortar should not be retempered or used.

Only machine-mixing shall be used, except for small jobs when hand mixing is specifically authorized by Engineer. At least three (3) and a maximum of five (5) 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.

Joints in exposed-to-view or painted hollow load-bearing concrete masonry unit walls and partitions, except control joints, joints to be painted or caulked or sealed, and openings around flush-mounted electrical outlet boxes in wet locations 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.

f. Vertical Masonry Reinforcement Stirrups

Vertical masonry reinforcement shall be continuous and rigidly secured at top and bottom and at intervals as necessary to hold in proper position. Splices shall be 30 diameters in length and shall be held centered in the masonry blocks. Stirrups shall be secured to vertical reinforcement in the manner indicated on Engineer's design drawings. Splices in vertical reinforcing bars shall be made only at such points and in such a manner that the structural strength of the member will not be reduced.

g. Grouting

All cores of hollow masonry units shall be filled solidly with grout. Grout shall be poured in four-foot maximum lifts, and shall be rodded or puddled to ensure complete filling of the hollow masonry core.

h. Cleaning

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.

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.

Concrete masonry unit surfaces shall be dry brushed at the end of each day's work and after any required pointing.

3.03 Tests

Contractor shall furnish material certification for concrete masonry units, mortar, and grout.

Acceptance tests, after the foundation is completely installed, shall be performed by the Contractor to demonstrate performance requirements, as specified herein.

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Section 09870 - Coating Systems for Steel

PART 1 - GENERAL

1.01 Summary

a. This section covers the general requirements for the testing, quality and handling of coatings for steel as described herein.

b. The Work shall include all materials and delivery of services as specified in this section and/or on the drawings.

c. It shall be the responsibility of the Contractor to provide materials and services in accordance with stated standards and high standards of engineering and workmanship that are suitable for the specified service.

1.02 Related Sections

a. Related Work and/or equipment that is specified in other sections of the contract documents includes but is not limited to the following:

Section 13120 - Pre-Engineered Structures
Section 09900 - Painting

1.03 Submittals

a. Contractor shall furnish a complete description of the coatings and corrosion protection he intends to provide including cleaning and coating procedures and a specific description of coating materials to be used.

PART 2 - PRODUCTS

2.01 Materials

a. Contractor shall select a coating system to provide corrosion protection during shipment, storage and operation for the environment specified in this specification.

b. All external cast iron, carbon steel and low-alloy steel surfaces shall, as a minimum, be protected by application of a primer and top coat.

Primer and top coat shall be by the same manufacturer. Final color shall be as shown in Section No. 09900 - Painting.

PART 3 - EXECUTION

3.01 Execution/Installation

a. All external cast iron, carbon steel and low-alloy steel surfaces shall be prepared for priming by blast cleaning in accordance with the applicable Steel Structures Painting Council Specification and the Coating Manufacturer's recommendation. Surface preparation shall provide an approximate substrate anchor profile height 35 percent of the primer dry film thickness.

b. Primer shall be applied within eight hours after blast cleaning and before rusting occurs.

c. Application of primer shall be in accordance with SSPC-PA1, "Shop, Field and Maintenance Painting" and Manufacturer's written instructions. In the event of discrepancy or contradiction, Manufacturer's instructions shall govern. Measurement of dry film thickness shall be in accordance with SSPC-PA2, "Measurement of Dry Film Thickness with Magnetic Gauges."

d. Stainless steel, aluminum, bronze and other nonferrous surfaces do not require coating.

e. Surfaces within four inches of field weld ends shall be protected with a certified weld-through primer, strippable protective coating or protective tape.

f. All machined cast iron, carbon steel and low-alloy steel surfaces shall be coated with an easily removable (by alkaline solution, steam or hot water) corrosion-preventive compound meeting MIL-C-16173, Grade 1 requirements. Contractor shall inform Engineer of the name, make, type, properties and removal instructions of the compound he intends to use.

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Section 09880 - Protective Coatings for Concrete

PART 1 - GENERAL

1.01 Summary

a. This specification covers the technical requirements for protective coatings on the concrete clearwell and waste sump.

b. The Contractor shall supply and provide all items of labor, equipment and materials necessary for the proper application of protective coatings for concrete as specified in this section. Workmen shall be experienced in the work specified herein.

c. It is not the intent of this section and associated drawings to specify all details of design and application. It shall be the responsibility of the Contractor to provide equipment and materials that have been designed in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

1.02 Related Sections

a. Related work that is specified in other sections of the contract documents includes but is not limited to the following:

Section 03400 - Precast Concrete

1.03 References

ASTM - American Society for Testing and Materials

D570	Water Absorption of Plastics
D522	Elongation
D968	Abrasion Resistance
D3359	Adhesion Classification
C882	Bond Strength
C883	Effective Shrinkage

1.04 Submittals

The Contractor shall submit the manufacturer's notarized certification attesting to compliance with the requirements of this specification.

PART 2 - PRODUCTS

2.01 Equipment

a. A slow speed drill and paddle shall be utilized to mix the components of the epoxy coating. The coating shall be applied with high-quality brushes, rollers or spray equipment.

2.02 Material

a. The protective coating shall be Sikagard 62, manufactured by Sika Corporation, Lyndhurst, NJ, or equal approved by the Engineer.

PART 3 - EXECUTION

3.01 Application

a. Surface Preparation - All surfaces to be coated must be clean, sound, and surface dry. Surfaces must be free of standing water, dust, laitance, grease, oil, curing compounds, waxes, impregnations, foreign particles, other coatings, and disintegrated materials. All projections, rough spots, etc. shall be dressed off.

b. Mixing - All mixing shall be done mechanically, using a slow speed drill and paddle (400/600 rpm). Be sure to stir each component thoroughly before proportioning. Pour equal volumes of each component into a clean mixing container. Mix at slow speed until a uniform color and consistency is obtained (3-5 minutes).

c. Application - The two solvent-free, epoxy coatings shall be applied only to approved prepared surfaces with high-quality brushes, rollers or spray equipment. Surfaces must be saturated surface dry or drier. Coating shall be applied at ambient and substrate temperatures between 50 and 90F. Application thickness shall be between 4-7 mils per coat. The second coat shall be applied within 48 hrs of the first coat. The two coats shall be of different colors. Care is to be taken to avoid sags or runs. If they occur they are to be sanded out and the area re-coated.

d. Special Conditions

Coating shall be applied only on cured concrete not less than 21 days old. The manufacturer of the coating shall be consulted for recommendations if 48 hours or more passes in between coats.

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SECTION 09900 - Painting

PART 1 - GENERAL

1.01 Summary

a. This section covers the requirements for the performance, materials, quality and handling of all painting as described herein.

b. The work shall include all materials, and delivery of services as specified in this section and/or on the drawings.

c. It shall be the responsibility of the Contractor to provide services and materials in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

1.02 Submittals

Contractor shall furnish a complete description of the paints he intends to provide, including applicable cleaning and coating procedures and specific description of the materials to be used.

1.03 Environmental Conditions

a. Do no interior painting until the building has been enclosed, ventilated, and thoroughly dried out. Do no exterior painting in rainy, snowy, damp, or frosty weather nor until surfaces are thoroughly dry.

b. Maintain temperature of rooms at 70°F or higher where varnish, lacquer, or enamel is being applied and at 50°F or higher during other painting and finishing. Exterior painting shall be done only when air temperature is 40°F or higher and only in dry weather.

PART 2 - PRODUCTS

2.01 Materials

a. Use all material in accordance with the directions of the manufacturer subject to the approval of the Engineer. Use of thinners at any time must have the approval of the Engineer.

b. Mix paints, varnishes, and lacquers only in a designated space at the site. Provide galvanized steel pans in which all mixing pails or barrels shall be kept. No mixing will be permitted outside the pans.

c. Undercoats shall be of approximate shade of final coat, but each coat shall be of slightly different tint. Each coat shall be inspected and approved before application of the succeeding coats; otherwise, no credit for coat applied will be given and the work in question shall be recoated.

d. Allow exterior paints and finishes to dry at least forty-eight hours between coats. Allow interior paints to dry at least twenty-four hours between coats. Allow enamels, lacquers, and varnishes to dry at least forty-eight hours between coats. Sand lightly between coats with No. 00 sandpaper and dust well before succeeding coat is applied. Allow additional drying time if conditions warrant to assure that all coats are perfectly dry before applying succeeding coats.

e. Finish to match adjacent work all returns, edges, and recesses which will be exposed in the finished work and which will be seen from any angle. Finish with flat gray-black paint all surfaces situated behind grilles or any other form or construction which will permit the surface to be seen from any angle except interior duct surfaces.

f. All door closers, brackets, and other hardware items specified to be furnished with a prime coat shall be painted to match adjacent surfaces.

g. All lighting fixtures, ventilating grilles, public address speakers, and other mechanical or electrical devices mounted in or on ceilings or walls shall be painted to match surrounding surfaces as directed by the Engineer.

h. All exposed iron and steel work throughout the finished spaces of the building including, but not limited to, hollow steel frames and doors, piping, hangers, mechanical, and other equipment and installations shall be enameled over a priming coat or shop coat where provided. Hollow metal and miscellaneous metal installations in unfinished spaces shall be similarly painted. The painting of mechanical piping and equipment shall include the painting of non-ferrous piping and valve and trap bodies in finished spaces.

i. Access, electric, and other panels which occur in block or plaster walls shall be painted to match the surface in which they are mounted. If panels occur in unpainted surfaces, paint as directed.

j. Paint shall be as stated or an approved equal.

(1) Exterior Ferrous Metal:
First Coat--Rust Control Primer-3 to 5 mils thick
Second Coat--Exterior - Interior Enamel
Third Coat--Exterior - Interior Enamel

(2) Interior Ferrous Metal:
First Coat-- Red Primer-3 to 5 mils thick
Second Coat--Lo-Lustre Enamel
Third Coat--Lo-Lustre Enamel

(3) Interior Galvanized Metal:
First Coat--White Galvanized Steel Primer-3 to 5 mils thick
Second Coat--Semi-Gloss Enamel
Third Coat--Semi-Gloss Enamel

(4) Interior Block (Semi-Gloss Finish):
First Coat--Latex Masonry Block Filler/Sealer
Second Coat--Latex Interior Semi-Gloss Enamel
Third Coat--Latex Interior Semi-Gloss Enamel

(5) Exterior and Interior Wood:
First Coat--Color-Tone Alkyd Resin
Second Coat--Color-Tone Alkyd Resin

(6) Submerged Metals/Pipes
First Coat--Bare Metal Primer
Second Coat--Bitumastic No. 300M
Third Coat--Bitumastic No. 300M

k. Color Schedule

Surface	Sheen	Color
Raw Water Piping	Gloss	Light Green
Treated Water Piping	Gloss	Dark Blue
Exterior Doors, Windows louvers, and other trimwork	Gloss	Deep Brown
Exterior Structural Steel, Steel posts and walls	Gloss	Desert Gold

Surface	Sheen	Color
Exterior Wood	Flat	Semi Transparent Acrylic Latex Stain
Interior Walls	Gloss	Desert Gold

PART 3 - EXECUTION

3.01 Performance

a. Furnish and lay drop cloths in all areas where painter's finish work is being done to protect floors and all other adjacent work and materials from defacement. Remove and properly replace all temporary protections and coverings removed from any part of the work or finish. Any damage resulting from neglect of this requirement shall be repaired at Contractor's expense to the complete satisfaction of the Engineer.

b. Submit samples of all finishes for approval and change before starting work, if required, in triplicate and label with all pertinent information including brand names. Show all specified coats.

c. All surfaces left unfinished by the requirements of the specifications shall be painted or finished as part of this section unless specifically noted as not to be painted or finished.

d. Apply materials under adequate illumination and ventilation. Finished surface shall be uniform in finish and color and free of brush marks, sagging, corduroy, and other imperfections. Should any coat be judged unsatisfactory, sandpaper or otherwise clean off this coat and apply another. If the undercoating is disturbed, complete refinishing will be required.

e. Edges of paint or finish adjoining other materials or colors shall be sharp and clean without overlapping. Should workmanship be found defective, proper preparatory work shall be done and additional coats applied as necessary to give a finish in accordance with specified requirements.

f. Before starting work at the site, examine the condition of all work scheduled or specified to be finished under this section and, if any defects or discrepancies are discovered, notify the Engineer immediately. Beginning work shall constitute

acceptance of the surfaces, and the Contractor shall be responsible for failure to obtain the required results.

g. Smooth rough spots off concrete block and joints with a hone or sander.

h. Clean all metal surfaces of all dust, grease, rust, and scale using benzene, steel wool, and wire brushes if necessary. Clean damaged areas of factory-applied priming coats and repaint with metal primer.

i. Remove or protect during painting all finish hardware, accessories, fixtures, and similar items installed prior to painting and not required to be painted. If removed, carefully replace and adjust on completion of painting.

j. All lined pipes and fittings shall be clearly permanently marked as such:

"Lined Pipe"

"No Welding, Brazing, Soldering or Flame Cutting"

Markings shall appear in a sufficient number of places to ensure identification. In addition, the liner material must be permanently marked or stamped on a band containing the raised letters of the material such as "PVDF". One band is required on fittings and on pipe lengths up to 6 feet. For pipe lengths greater than 6 feet, two bands are required. The band will typically be located near the flanges.

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Section 10990 - Miscellaneous Specialties

PART 1 - GENERAL

1.01 Summary

a. This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the various miscellaneous specialties described herein.

b. The work shall include supply of all materials, 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 this equipment as included in the Contract documents.

c. It is not the intent of this section to specify all details of design, fabrication and construction. It shall be the responsibility of the Contractor 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.

d. The work includes supply, erection, complete installation and testing of the following:

1. One fire extinguisher.

2. One first aid kit.

3. Appropriate safety and other interior signs.

4. Health and Safety equipment for Contractor's workers.

1.02 Submittals

a. Contractor shall submit, in the manner and within the time limit as set forth in the Contract documents literature and details, where appropriate, for the equipment and materials furnished under this section. Also see Section 01300 - Submittals.

b. The Contractor's drawings shall be direct reading reproducibles able to produce clear, sharp, and legible prints.

c. Review of the details by the Engineer shall not relieve the Contractor of the entire responsibility for the engineering, design, workmanship and material under the Contract documents.

d. Prior to ordering the materials specified in this section, all drawings shall be certified, approved and signed by a registered Professional Engineer. No alterations will be made to the design after certification without the approval of the Engineer.

1.03 Quality Assurance

d. Contractor shall certify to the Engineer, in writing, that the equipment and materials supplied are in complete compliance with codes, standards and specifications. Any exceptions to original codes and specifications must be documented with written approvals from the Engineer.

PART 2 - PRODUCTS

2.01 Equipment

a. The portable fire extinguisher shall be dry chemical type to be used for extinguishing Class B and C fires and be of 20 pounds capacity. The unit will have a minimum UL rating of 80B:C. Also to be provided are standard mounting brackets as recommended or supplied by the manufacturer.

b. Supply and install a wall mounted First Aid Kit that meets OSHA requirements for this application. The kit shall be by Johnson and Johnson, or approved equal.

c. Safety signs shall be noncorrosive metal, or self adhesive vinyl, large enough so as to be conspicuous. Signs will be supplied with appropriate mounting hardware.

The type and number of signs to be provided include:

- "FIRE EXTINGUISHER" (1)
- "FIRST AID" (1)
- "CAUTION: Rotating Equipment" (3)

d. Health and Safety equipment.

PART 3 - EXECUTION

3.01 Installation

a. The materials shall be installed 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 the work.

Section 11211 - Extraction Well Pumps

PART I - GENERAL

1.01 Summary

a. The Contractor shall supply and provide all materials, fabrication, drawings, design, installation, testing and delivery of services as specified in this section and/or on the drawings for completion and proper operation of the extraction well pumps.

b. This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the equipment described herein.

c. 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 Contractor 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.

d. The work includes supply, complete installation and testing of the following:

1. Four electrically driven extraction well pumps and associated piping accessories and installation.

1.02 Related Sections

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

Section 15050 - Basic Mechanical Materials and Methods
Section 15060 - Pipes and Pipe Fitting
Section 15100 - Valves
Section 16050 - Basic Electrical Materials and Methods

1.03 System Description

The four electrically driven submersible well pumps will pump groundwater from the bottom of the extraction wells at an estimated depth of 40 feet, one pump per well, and pump it into a common header at an average flow of 12.5 gpm each. The flows will be combined for an average total of 50 gpm and will be directed to the top of the packed column air stripper for processing. Control of the pumps will be from a remote control panel, located inside the building provided for in this contract. The control will be manual on-off switch as well as

the automatic shut off due to system failure, i.e.; insufficient air flow from the blower or high-high level in the clearwell. Check valves and manual gate valves will be provided in each pump discharge line to the common header.

1.04 Performance Requirements

The well pump will be designed for 10 year life and shall be able to deliver, as a minimum, 15 gpm each at a total dynamic head of approximately 50 psi.

1.05 Submittals

a. Contractor 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 lists if applicable, for all equipment and materials furnished under this section.

   Also see Section 01300 - Submittals

b. The Contractor's drawings shall be direct reading reproducibles able to produce clear, sharp, and legible prints. Fabrication of the equipment shall not be started until after the Contractor has received written drawing review approvals from the Engineer.

c. Review of the drawings by the Engineer shall not relieve the Contractor of the entire responsibility for the engineering, design, workmanship and material under the Contract documents.

d. Prior to fabrication, all outline, assembly and detail drawings shall be certified, approved and signed by a registered Professional Engineer. No alterations will be made to the design after certification without the approval of the Engineer.

e. The drawings shall include, but will not be limited to, the following details:

   - shop drawings showing outline and overall dimensions, connection details, weights, anchorage details, design loads and materials of construction.

   - The arrangement of the functional parts and construction of internal parts. Exact location of terminals and controls shall be shown.

   - Details of weld-end preparation, surface finishes, etc.

- o Electrical and instrumentation detail drawings containing sufficient detail of characteristics and locations.

- o Detailed drawings for any special requirements for handling, storing and final erection of equipment and systems.

- o Pump manufacturer's certified pump performance curve including capacity, efficiency, HP, total discharge head and motor speed.

- o Manufacturer's electric motor data including rated HP, efficiency and power requirements at varying load conditions.

- o Pump manufacturer's Certificate of Compliance

1.06 Quality Assurance

a. Contractor shall have a quality assurance program which will ensure that the equipment and services provided will properly reflect the Owner's/Engineer's requirements. The program shall cover, as a minimum, the following areas:

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

b. Contractor shall provide inspection and test personnel and facilities to maintain control of quality of materials, components and fabrication throughout design and construction.

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

d. Contractor shall certify to the Engineer, 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 Engineer.

1.07 Environmental Conditions

- o Environmental Design Conditions
  - Wind Velocity (mph) 100 max
  - Snowfall (inch/year) 30

- Seismic Zone	1
- 100 year Flood Elevation (MSL)	342.3

o Groundwater Conditions

Temperature (°F)	50
pH	6.0-8.0
VHO	6000 ppb (max.)

1.08 Maintenance

a. See Section 01730 for specific details and correct procedures for compilation of the Operation and Maintenance manual.

b. The services of a factory trained and certified manufacturer's representative are to be provided for instruction of the plant operating personnel on the correct start-up, maintenance, operating and troubleshooting procedures and techniques for the extraction well pumps.

c. A set of manufacturer recommended spare parts and supplies 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 pumps.

PART 2 - PRODUCTS

2.01 Equipment

a. Each extraction well pump shall be electrically driven, water lubricated, vertical turbine submersible type. Included with each pump will be a matched, waterproof, electric motor and a watertight junction box for cable to motor terminal connections. Capacity of the pump will be 15 gpm at 50 psi total dynamic head. The pumps will be four inch size to fit in a four inch well casing.

b. The four electrically motor driven extraction well pumps shall be Grundfos Pump Corporation Model SP-4 or approved equal, and any and all necessary appurtenances for their complete installation and continued operation as specified under this section shall be supplied.

c. All wetted components of the well 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 electric motor drive shall be completely submersible, self cooling and capable of resisting the extraction well environment including sand and other 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 a sufficient design to handle the design pressure loads and forces.

The motors shall be rated 1.5 Hp, designed to operate on three phase, 240 volt, 60 Hz AC power.

e. Alternating-current 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.

f. 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.

g. Motors shall be so constructed that they will withstand without mechanical injury at least 120 percent of rated speed in the forward or reverse direction in accordance with NEMA Standard MG-1.

h. Vibration limits for the motors shall not exceed values specified in NEMA Standard MG1-12.05.

i. The cables, connections and junction boxes for the pump motor unit shall be of water tight construction. Each motor main power lead shall extend into its respective conduit box only as far as necessary to assure that the completed terminal connections between the internal leads and corresponding external cables will be within the central working space of the conduit box, taking into account the type and size of terminal connectors used and the space required for taping the leads and cables.

2.02 Fabrication

Each pump shall be completely factory assembled, including motor and shipped as a complete operable unit.

PART 3 - EXECUTION

3.01 Erection/Installation

a. The equipment shall be installed 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 the work.

c. All equipment shall be properly and securely installed such that undue stresses are not exerted on equipment and connections.

d. Spiders and other centering devices shall be used to ensure centering of the pump in the well.

e. Pump and stainless steel discharge pipe shall be assembled and pressure tested for leaks prior to installation in the well.

f. Power wire shall be waterproof and secured to the discharge pipe at one foot intervals with noncorrodible straps.

3.02 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. Acceptance tests, after the equipment is completely installed, shall be performed by the Contractor to demonstrate performance requirements, as specified herein. The field tests will be governed by provisions of applicable industry and institute standards.

c. Refer to Section 01660 for additional testing requirements.

d. Each motor shall be given factory Routine Test or manufacturer's Initial Short Commercial Test as necessary to determine that it is free from electrical and mechanical defects and to establish that the design and construction of the motor are satisfactory. Tests shall include rotation, megger and high potential tests.

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Section 11212 - Sump Pump

PART 1 - GENERAL

1.01 Summary

a. The Contractor shall supply and provide 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 the waste sump pump.

b. This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the equipment described herein.

c. 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 Contractor 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.

d. The work includes supply, erection, complete installation and testing of the following:

1. One sump pump including motor and accessories.

1.02 Related Sections

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

Section 15050 - Basic Mechanical Materials and Methods
Section 15060 - Pipes and Pipe Fittings
Section 16050 - Basic Electrical Materials and Methods

1.03 System Description

The sump pump to be supplied, will be installed in the waste sump. This sump will provide storage for sample sink wastewater, water drained out of the system during maintenance and high turbidity water collected at system startup. It will also provide hold up for maintenance cleaning water containing either chlorine or a mild acid. The pump will be used to empty the sump into a truck for offsite disposal or recirculate system water back to the tower to dilute the influent.

1.04 Design/Performance Requirements

The sump pump will be designed for ten year life and shall be able to deliver, as a minimum, 50 gpm with dynamic head of 25 psi.

1.05 Submittals

a. Contractor shall submit, in the manner and within the time limit as set forth in the Contract documents, 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 under this section.

   Also see Section 01300 - Submittals

b. The drawings shall include, but will not be limited to, the following details:

   - Shop drawings showing outline and overall dimensions, connection details, weights, anchorage details, design loads and materials of construction.
   - The arrangement of the functional parts and construction of internal parts. Exact location of terminals and controls shall be shown.
   - Details of weld-end preparation, surface finishes, etc.
   - Electrical and instrumentation detail drawings containing sufficient detail of characteristics and locations.
   - Detailed drawings for any special requirements for handling, storing and final erection of equipment and systems.
   - Pump manufacturer's certified pump performance curve including capacity, efficiency, HP, total discharge head and motor speed.
   - Manufacturer's electric motor data including rated HP, efficiency and power requirements at varying load conditions.
   - Pump manufacturer's Certificate of Compliance

1.06 Quality Assurance

a. Contractor shall have a quality assurance program which will ensure that the equipment and services provided will properly reflect the Owner's/Engineer's requirements. The program shall cover, as a minimum, the following areas:

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

1.07 Maintenance

a. See Section 01730 for specific details and correct procedures for compilation of the Operation and Maintenance manual.

b. The services of a factory trained and certified manufacturers representative are to be provided for instruction of the plant operating personnel on the correct start-up, maintenance, operating and troubleshooting procedures and techniques for the extraction well pumps.

c. A set of manufacturer recommended spare parts and supplies 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 of the pumps.

PART 2 - PRODUCTS

2.01 Equipment

a. The sump pump shall be an electrically driven, self lubricating vertical type. Included with the pump to complete a manufactured unit will be an electric motor. Capacity of the pump will be 50 gpm. The total pump depth shall be to 5 inches above the floor of the waste sump.

b. The sump pump and any and all necessary appurtenances for its complete installation and continued operation as specified under this section shall be manufactured by Goulds Pump Model 3171 or Engineer approved equal.

c. All wetted components of the sump pump, including, but not limited to, the impeller, diffuser vanes, shaft and couplings shall be constructed of stainless steel for resistance to wear, corrosion and abrasion.

d. The motor shall be a totally enclosed, fan cooled, squirrel cage type construction NEMA frame size 145T. It will be rated 2 hp and 3600 rpm. The motor will be designed to operate on 3 phase, 240V, 60 Hz Ac power.

e. Motor bearings shall be constructed so as to exclude dirt and water and to prevent lubricant from reaching windings.

f. Alternating-current 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.

g. 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.

h. Motors shall be so constructed that they will withstand without mechanical injury at least 120 percent of rated speed in the forward or reverse direction in accordance with NEMA Standard MG-1.

i. Vibration limits for the motors shall not exceed values specified in NEMA Standard MG1-12.05.

2.02 Fabrication

The sump pump shall be completely factory assembled, including motor and shipped as a complete operable unit. It shall have a heavy column pipe to provide rigid support for the pump and bearings and one piece pump shaft to assure long life and low maintenance.

2.03 Accessories

The sump pump shall have a float type level control incorporated into it. The unit shall control the on-off operation of the sump pump and shall have high-high level alarm contacts for alarm signal telemetering.

PART 3 - EXECUTION

3.01 Erection/Installation

a. The equipment shall be installed 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 the work.

c. All equipment shall be properly and securely installed such that undue stresses are not exerted on equipment and connections.

d. The sump pump shall be secured to the waste sump cover with sufficient attaching bolts of stainless steel construction.

e. Motor and pump shall be installed plumb. Float should operate smoothly without binding.

3.02 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. Acceptance tests, after the equipment is completely installed, shall be performed by the Contractor to demonstrate performance requirements, as specified herein. The field tests will be governed by provisions of applicable industry and institute standards.

c. Refer to Section 01660 for additional testing requirements.

d. Each motor shall be given factory Routine Test or Manufacturer's Initial Short Commercial Test as necessary to determine that it is free from electrical and mechanical defects and to establish that the design and construction of the motor are satisfactory. Tests shall include rotation, megger and high potential tests.

* * * * * *

Section 11375 - Packed Column Air Stripper

PART 1 - GENERAL

1.01 Summary

a. The Contractor shall supply and provide 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 a packed column air stripper as included in the Contract documents.

b. This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the equipment described herein.

c. 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 Contractor 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.

d. The work includes supply, erection, complete installation and testing of the following:

1. One air stripping column complete with all piping, connections, manways and supports as specified and shown on the drawings.

2. One lot of column packing of type and volume specified.

3. All column internals such as distributions and separators as specified and shown on the drawings.

4. All appurtenances required for a complete unit including hardware.

1.02 Related Sections

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

Section 03310 - Concrete
Section 15050 - Basic Mechanical Materials and Methods
Section 15060 - Pipes and Pipe Fittings
Section 15850 - Air Handling
Section 15890 - Ductwork

1.03 System Description

a. This section describes the general operation of the Packed Column Air Stripper and is intended only as a guide to aid the Contractor's understanding of the entire system operation.

b. The Packed Column air stripper is a vertical, cylindrical vessel which provides large surface areas for transfer of contaminants from the downward flowing ground water to the upward flowing stripping air.

The column has a middle section of randomly placed (dumped) objects (packing) of one inch size which have a shape that optimizes the surface area in the tower.

The contaminated groundwater is pumped to the top of the tower where it is equally distributed and flows down the column over the packing. At various points in the tower, rings (redistributors) around the inner wall of the tower serve to catch any water that is flowing down the walls of the column and redistribute it over the packing. As the water flows downward through the packing by gravity, it is finely dispersed and contacts the upward flowing air which removes the volatile organic contamination. The water at the bottom of the tower flows into a clearwell.

The stripping air which enters near the bottom of the tower is supplied by air blowers. The air flows up through the packing, through a mist eliminator which removes entrained water and then out the top of the tower.

c. The equipment is to be designed to have a minimum service life of ten years and is intended to treat contaminated groundwater continuously with minimal yearly maintenance.

1.04 Design/Performance Requirements

a. The packed column air stripper shall be designed to treat an influent with the following general characteristics:

Liquid - groundwater @ 50°F avg.
Flowrate - 50 gpm (see (c) below)

Groundwater Contaminant Concentrations

Tetrachloroethylene (PCE)	- 5600 ug/l
Trichloroethylene (TCE)	- 120 ug/l
Vinyl Chloride (VC)	- 20 ug/l
1,2 Dichloroethylene (1,2DCE)	- 210 ug/l
Volatile Halogenated Organics	- 6000 ug/l

b. The packed column air stripper shall be designed to treat the contaminated groundwater as described in (a.) above to an effluent quality with the following characteristics:

	Removal Efficiency	Effluent Conc. Limit
Volatile Halogenated Organics	- 99.9%	6 ug/l
Trichloroethylene	- 95.9%	5 ug/l
Vinyl Chloride	- 95.0%	1 ug/l

c. The system shall be designed, as shown on the drawings, to allow for 50 percent recirculation of the treated effluent, which increases the packed column flowrate to 75 gpm. This scheme would only be used in situations where the packed column effluent is not meeting the stated effluent requirements.

1.05 References

a. The Contractor is referenced, for design and guarantee purposes, to the following publication which contains significant pilot scale data performed by the EPA at the Brewster Well Field Site in January 1986:

"Design Scale-Up Suitability For Air Stripping Columns," U.S. Environmental Protection Agency, Cincinnati, Ohio, NTIS PB86-154176, EPA/600/2-86/009, Jan. 1986.

1.06 Submittals

a. Contractor 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 lists if applicable, for all equipment and materials furnished under this section.

Also see Section 01300 - Submittals

b. The Contractor's drawings shall be direct reading reproducibles able to produce clear, sharp, and legible prints. Fabrication of the equipment shall not be started until after the Contractor has received written drawing review approvals from the Engineer.

c. Review of the drawings by the Engineer shall not relieve the Contractor of the entire responsibility for the engineering, design, workmanship and material under the Contract documents.

d. Prior to fabrication, all outline, assembly and detail drawings shall be certified, approved and signed by a registered Professional Engineer. No alterations will be made to the design after certification without the approval of the Engineer.

e. The drawings shall include, but will not be limited to, the following details:

1 Overall dimensions and details of the location of all connections, supports and accessories and a bill of materials.

2 Foundation requirements including loadings type and location, and size and materials of anchor bolts.

3 The arrangement of the functional parts and construction of internal parts. Exact location of terminals and controls shall be shown.

4 Details of weld-end preparation, surface finishes, etc.

5 Detailed drawings for any special requirements for handling, storing and final erection of equipment and systems.

1.07 Quality Assurance

a. Contractor shall have a quality assurance program which will ensure that the equipment and services provided, will properly reflect the Owner's/Engineer's requirements. The program shall cover, as a minimum, the following areas:

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

b. Contractor shall provide inspection and test personnel and facilities to maintain control of quality of materials, components and fabrication throughout design and construction.

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

d. Contractor shall certify to the Engineer, 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 Engineer.

1.08 Environmental Conditions

a. The design of the packed column air stripper should include the following environmental conditions:

stripping air temperature - 40°F
wind velocity - 100 mph max.
groundwater pH - 6.0 - 9.0
groundwater temperature - 50°F

1.09 Maintenance

a. Refer to Section 01730 for requirements.

PART 2 - PRODUCTS

2.01 Equipment

a. The column structure shall be designed and fabricated by a manufacturer who is experienced in the manufacture of such equipment and can demonstrate significant previous experience and installations such as Hydro Group Environmental Products Division, Calgon Carbon Corporation or manufacturer of acceptable equivalent products.

b. The drawings represent general features of the equipment but do not cover all details of the design. They also represent a particular arrangement of equipment which may change depending upon the type of equipment supplied by the Contractor. If the final arrangements or equipment details differ from those presented in the Contract Documents, the changes shall be at no additional cost to the Owner.

c. The column shall have a minimum diameter of 30 inches and a minimum packing depth of 25 feet, for an overall column height of approximately 33 feet.

d. The column shall be designed to withstand a hydrostatic pressure of 33 feet water gage (Flooded Column).

e. The column shall be flat bottomed, freestanding, base anchored to the concrete with sufficient anchoring points compatible with the concrete slab design. No guy wires or other supporting devices will be accepted.

f. A sufficient quantity of random type packing having the following properties shall be supplied:

size/type	- 1" Saddles
Material	- Polypropylene
Surface Area	- 70-80 sq. ft/Cubic Ft.
Minimum Free Space	- 80-90%
Packing Factor	- 30-35 per ft.
Bulk Density	- Approx. 5 lb./Cu. ft.

g. A distribution tray shall be provided to uniformly distribute the water flow over the surface of the packing. In addition, the tray must be capable of allowing free passage of the air and must also resist clogging. The distributor shall be capable of evenly distributing a water flow range of 20 to 80 gallons per minute. The distributor shall be complete with an influent velocity breaker, air exhaust ports, and distributor orifices.

h. Air exhaust ports shall be sized to ensure that at the peak design column air flow, the velocity in the ports does not exceed 25 feet per second.

i. Sufficient distributor orifices shall be provided to ensure even distribution, and sized to retain a sufficient static head of water over the full range of anticipated liquid flows.

j. Spray nozzles or pipe distributors shall not be used in the distributor.

k. Liquid redistribution shall be provided as shown on the drawings, and as required for efficient packing performance.

l. A packing support plate shall be supplied and designed with a minimum of 70 percent free space of the cross sectional area. The plate shall retain the packing and shall be able to withstand the load of the packing and the maximum liquid hold-up per design flow rates. Cross beams may be used for structural strength.

m. The packing support plate shall be attached to the column via a continuous support ledge or insertion between the flanges connecting the bottom sections of the columns.

n. A moisture separator shall be provided as shown on the drawings and shall be a monofilament polypropylene mesh type (York or equal).

2.02 Materials

a. All materials used in the construction of the column, internals and other wetted parts shall not be toxic nor degraded for the design life of the unit by the process liquid as described in Part 1, Subpart 1.04 of this specification.

b. All materials shall be first quality, new and free from rust and scale.

c. The base bid stripping column shall be constructed of 6000 Series Structural Grade Aluminum, designed in accordance with the specifications of the Aluminum Association. As an alternate bid, 304 stainless steel may be used at a design thickness sufficient to withstand the loads on the column.

d. All fasteners such as bolts, washers, clips, nuts, etc., shall be made of stainless steel.

e. Packing support plate shall be constructed of aluminum or stainless steel. Fiberglass will not be accepted.

f. The inlet distributor tray shall be constructed of aluminum or stainless steel and shall be structurally designed to withstand the maximum hydrostatic head anticipated without excessive deflection.

g. Liquid redistributors shall be constructed of aluminum or stainless steel.

h. Manways shall be constructed of aluminum or stainless steel and shall have minimum 1/8 inch thick gaskets of a material suitable for the service intended. Covers shall be bolted, gasketed, water and air-tight.

i. All pipe flanges shall be 150 lb ANSI standard flanges and shall have bolt hole drilling. All bolt hole sizes and circles shall be as specified in ANSI-B16.1. All flanges shall be as equipped with 1/8 inch thick gaskets of suitable material.

j. If the tower is supplied in flanged sections, the flanges shall be ANSI standard flanges.

k. The column shall be provided with aluminum or stainless steel external pipe supports, as required, to support all necessary piping.

2.03 Fabrication

a. Workmanship shall be first quality and all welding shall be in accordance with American Welding Society standard and in accordance with qualified welding procedures of the governing standards and include but are not limited to the following guidelines:

1. AWS - A2.0 - Structural Welding Symbols
   AWS - D1.1 - Structural Welding Code

2. The edges or surfaces of the parts to be joined by welding shall be machined or thermal cut and cleaned of all oil, grease, scale, rust, or other deleterious material. Where thermal cutting is used, all loose scale must be removed. All remaining kerf material (that fused during the cutting process) and sharp cut surface cavities must be removed or blended by grinding or chipping to assure proper weld penetration.

3. Filler metal to be used for joining must be analytically compatible with base metal; primary consideration shall be given to mechanical properties, corrosion resistance and welding response, as applicable for the particular application.

b. All column nozzles and manways shall be attached by full penetration welds of both the column wall and the reinforcing attachment. Welds which penetrate the full thickness of the nozzle neck or manway neck will not be accepted.

c. The column shall be installed plumb and all elements which impact on the flow through the column shall be level to the nearest ± 1/4 inch.

d. All nozzles, manways and internal components shall be accurately located both verticaly and radially in accordance with the approved design drawing to the nearest ± 1/4 inch.

e. All flange connections shall be flush trimmed with the inside surface of the column and finished, unless indicated otherwise on the drawings.

2.04 Accessories

a. Clips and brackets shall be provided for pipe supports and shall be constructed of the same material as the column.

b. Lifting lugs, supports, rings or other attachments required for installation and erection shall be provided.

c. All equipment and materials required for acceptance testing of the column shall be supplied by the Contractor.

d. All materials required for proper shipment of the column and accessories to the site shall be supplied and may include crating, covers, etc.

PART 3 - EXECUTION

3.01 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 the work.

c. All equipment shall be properly and securely installed such that undue stresses are not exerted on equipment and connections.

3.02 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. Acceptance tests, after the equipment is completely installed, may be performed by the Owner's Engineer to demonstrate performance requirements, as specified herein. The field tests will be governed by provisions of applicable industry and institute standards and by the requirements set forth in the contract documents.

c. Refer to Section 01660 for additional testing requirements.

d. The packed column shall be pressure tested at 30 in. water gage to insure the shell is free of imperfections and leaks. The tower must hold the pressure for one-hour. Any imperfections detected shall be repaired or corrected at the Contractors expense.

e. The acceptance test of the column will demonstrate the ability to produce the required effluent quality and quantity as specified herein. The manufacturer's representative shall be commissioned by the Contractor to assist in start-up and testing of the column, at no cost to the engineer, for the duration of testing.

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Section 12345 - Laboratory Tops, Sinks and Accessories

PART 1 - GENERAL

1.01 Summary

a. The Contractor shall supply and provide all materials, fabrication, drawings, installation, and delivery of services as specified in this section and/or on the drawings for a sample sink station.

b. 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 Contractor to provide equipment and systems that have 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. The work includes supply, erection, complete installation and testing of the following:

1. Sample sink and accessories

2. Sample Pump and accessories

1.02 Related Sections

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

Section 15050 - Basic Mechanical Materials and Methods

1.03 Submittals

a. Contractor 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 lists if applicable, for all equipment and materials furnished under this section.

Also see Section 01300 - Sumittals

1.04 Quality Assurance

a. Contractor shall have a quality assurance program which will ensure that the equipment and services provided, will properly reflect the Owner's/Engineer's requirements. The program shall cover, as a minimum, the following areas:

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

PART 2 - PRODUCTS

2.01 Equipment

a. Contractor shall supply one stainless steel sample sink and sink support legs as shown on the drawings.

b. One positive displacement, self priming, sample pump shall be provided. The pump shall run on 120 VAC electrical supply and take suction from the clearwell discharge pipe. Pump shall have a flow capacity of up to 6 gallons per minute.

d. Sink shall have a suitable trap and drain piping leading to the waste sump.

2.02 Materials

a. Sample sink and sample valves shall be stainless steel.

b. Drain piping from the sink to the waste sump can be P.V.C. or other noncorrosive metal.

c. Pump wetted parts can be plastic or non corrosive metal.

PART 3 - EXECUTION

3.01 Installation

a. The equipment shall be installed 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 the work.

c. All equipment shall be properly and securely installed such that undue stresses are not exerted on equipment and connections.

d. Sink assembly should be firmly secured to the concrete floor and/or wall via lag bolts and lag shields.

e. Sample valves shall be secured above the sink via unistrut or angle iron support.

f. Sample lines shall be stainless steel tubing.

3.02 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. Acceptance tests, after the equipment is completely installed, shall be performed by the Contractor to demonstrate performance requirements, as specified herein. The field tests will be governed by provisions of applicable industry and institute standards.

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Section - 13120 Pre-Engineered Building

PART 1 - GENERAL

1.01 Summary

a. This section covers the requirements for the design, performance, materials, construction features, and quality for a pre-engineered building.

b. The work shall consist of furnishing, fabricating, erecting and installing a pre-engineered building as specified in this section and as shown on the drawings including all labor, equipment, tools, and materials necessary and incindental to complete this work.

c. It is not the intent of this section and associated drawings to specify all details of design, fabrication and construction.

d. The Pre-engineered building shall be reviewed and sealed by a licensed New York State Professional Engineer or Architect.

1.02 Related Sections

a. Related Work that is specified in other sections of the technical specification but is not limited to the following:

Section 02220 Excavation
Section 2225 Earthfill
Section 03310 Concrete

1.03 Design/Performance Requirements

a. The Contractor shall provide a panelized, rigid frame, clear span steel building designed and constructed to be weathertight, easily erected and capable of being dismantled and re-erected. Building design and construction shall conform to the Metal Building Manufacturers Association "Metal Building Systems Manual," and the New York State Building Code (NYSBC). Design and allowable stresses shall be in accordance with the AISC or AISI Specification, as applicable.

The Contractor shall provide a building in accordance with the dimensions and general arrangement as shown on the specification drawing.

b. The building shall be designed for the following loading, unless noted otherwise in the NYSBC:

1. The vertical live load on the roof shall be 40 pounds per square foot applied to the horizontal projection of the roof.

2. The horizontal wind load on the building shall be 25 pounds per square foot and shall be distributed and applied as directed in the MBMA Manual.

3. The dead load of the building shall be the weight of all permanent construction, such as framing and panel members. Dead loads of mechanical system, electrical system and ceiling as indicated on the drawings shall be estimated by Contractor and included as applicable.

c. Deflection of roof and wall panels and their supports shall not exceed L/180 of the span when supporting the loading specified.

1.04 Submittals

a. Contractor shall submit, as soon as practically possible after contract award, shop drawings showing outline and overall dimensions, connection details, weights, anchorage details, arrangement of functional parts, and parts lists as applicable, for all equipment and materials furnished under this section. Also see Section 01300 Submittals.

b. The Contractor's drawings shall be clear, sharp, and legible. Fabrication of the equipment shall not be started until after the Contractor has received written drawing review approvals from the Engineer.

c. Review of the drawings by the Engineer shall not relieve the Contractor of the entire responsibility for the engineering, design, workmanship and material under the Contract documents.

d. Prior to fabrication, all outline, assembly and detail drawings shall be certified, approved and signed by a registered New York State Professional Engineer. No alterations will be made to the design after certification without the approval of the Engineer.

e. The drawings shall include, but will not be limited to, the following details:

1. Overall dimensions and details of the location of all connections, supports and accessories and a bill of materials.

2. Foundation requirements including loadings type and location, and size and materials of anchor bolts.

3. The arrangement of the access routes, vents, louvers, etc.

4. Details of weld-end preparation, surface finishes, etc.

1.05 Quality Assurance

a. Contractor shall have a quality assurance program which will ensure that the equipment, material, and services provided, will properly reflect the Owner's/Engineer's requirements. The program 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

b. Contractor shall provide inspection personnel and facilities to maintain control of quality of materials, components and fabrication throughout design and construction.

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

d. Contractor shall certify to the Engineer, 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 Engineer.

1.06 Operating and Maintenance Requirements

a. Refer to Section 01730 for requirements.

PART 2 - PRODUCTS

2.01 Materials

a. Structural steel for building framing shall meet the loading requirements of Paragraph 1.03.

b. Roof and wall panels shall be formed from not less than No. 24 US gage hot-dip galvanized steel sheet produced to the requirements of ASTM A446, Grade A, and ASTM A525, coating designation G90.

1. All roof panels shall be supplied in single continuous lengths extending from the eave line to eave line and shall be tightly interlocked so that no caulking or fasteners will be required at intermediate points along the panel side laps. All roof panels shall be factory punched for connection at the eave line of the building.

2. All wall panels shall be supplied in single continuous lengths extending from the base channel to the roof line of the building except where interrupted by wall openings, and shall have inward-turned interlocking side ribs.

3. Panel fastening systems shall be detailed so that no fasteners will be exposed on the exterior face.

4. Openings in wall and roof panels for piping, doors and windows shall be framed and designed to structurally replace the panels.

c. The wall and roof panels shall be insulated. They shall consist of the following components:

1. An exterior panel conforming to Paragraph 2.01b.

2. An interior liner panel formed from not less than No. 22 US gage hot-dip galvanized steel sheet produced to the requirements of ASTM A446, Grade A, and ASTM A525, coating designation G90.

3. One and a half (1-1/2) inches of insulation of 0.6 pound density glass fiber conforming to Federal Specification HH-1-521e, Type I and having a wall "U" value of 0.15 BTU/HR/SQ FT/°F. The "U" value at the insulated roof shall be approximately 0.17 BTU/HR/SQ FT/°F. The insulation material shall have a Underwriter's Laboratories (UL label) fire hazard rating indicating a flame spread of 25 or less when tested in accordance with ASTM E84.

d. Eave gutters and downspouts shall be formed from aluminum sheet, as used for the roof and wall panels.

1. Downspouts shall be rectangular shaped, with a 45° elbow at the bottom, and a splash block shall be provided.

2.02 Accessories

a. Hollow metal (HM) doors shall be provided to the dimensions shown on the drawing. Doors shall be 1-3/4 inch thick, flush construction type and fabricated from two (2) No. 18 US gage patent leveled, prime quality, cold rolled steel sheets. The interior of doors shall be completely filled with sound-deadening material permanently bonded to both door faces, and capped to prevent moisture from penetrating the door.

b. Hollow metal door frames shall be of the double rabbeted type formed from not less than No. 16 US gage cold rolled steel, of factory welded construction and mortised, reinforced, drilled, tapped for all hardware including strikes and hinges, and equipped with rubber bumpers.

c. The fire rated doors and frames as indicated, shall be manufactured in accordance with Underwriters Laboratories' requirements and carry a UL label.

d. Hardware for hollow metal doors shall be:

1) Butts:

Butt hinges to be brass pivot for door to be forged with three sixteenth-inch vertical adjustment, US26D finish. One and one half (1-1/2) pair are required.

2) Locks:

The lock is to be mortise type with cast-iron case and forged brass beveled front. Armored scalp plate and strikes to be bronze. Latch bolt to be a two-piece mechanical anti-friction bolt. The lock shall have an auxiliary dead-locking latch bolt to prevent retraction of regular latchbolt when door is locked. Lock trim to be bronze with 0.080 knob and 0.070 rose thickness. Trim to be sectional type with concealed fastenings. There will be no exposed screws for fastening knobs and roses. Lock finish to be US32D. The lock is to

receive wrought box with strike (WBX). The lock and cylinder are to be manufactured by the same manufacturer. Contractor shall supply the Engineer with four (4) sets of keys.

3) Closers:

Closer shall be rack and pinion with cast-iron case. Closing and latching speeds are to be fully adjustable by independent valves with adjustable backcheck by means of a third valve. One-position mounting for all openings up to 180 degrees. Closer is to be surface-applied with rectangular cover plate finished to match other hardware. The closer shall be furnished with hex nuts and bolts.

e. Louvers, as indicated on the drawings, shall be the chain operated adjustable type with insect screens, and formed from hot-dip galvanized steel. Blades on louvers shall be overlapping to provide maximum weather tightness while allowing for air flow.

f. Caulking, closures and fasteners for mounting of wall and roof panels shall be a two layer seal with a mastic inner seal and a silicon caulk outer seal. The Contractor shall indicate on the shop drawings the types of material proposed for these standard accessories.

PART 3 - EXECUTION

3.01 Erection/Installation

a. The Building shall be installed and erected in accordance with the requirements of this technical specification section and the manufacturer's instructions and recommendations and as shown on the applicable drawings.

b. All work shall be performed by competent, trained workmen, skilled in the field in which they are executing the work.

c. All Building Components shall be properly and securely installed such that undue stresses are not exerted on equipment and connections.

3.02 Inspection

a. Each system component shall be given requisite factory inspections 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 this technical specification section.

b. Acceptance inspections, after the building is completely installed, shall be performed by the Contractor. The field inspections will be governed by provisions of the NYSBC and the Town of Southeast Building Ordinances.

c. Refer to Sections 01660 for additional testing requirements.

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SECTION 13400 - PROCESS CONTROL SYSTEMS

Part 1 - GENERAL

1.01 Summary

a. This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of all process control equipment described herein.

b. The work shall include all materials, fabrication, drawings, installation, testing and delivery of services as specified in this section and/or on the drawings for completion and proper operation of the groundwater management system.

c. 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 Contractor to provide equipment and systems that have been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

d. The work includes but is not limited to the supply, complete installation and testing of the following instrumentation and controls:

1. Level controls
2. Limit Switches
3. Flow Controls/Indicators
4. System Interlocks
5. Pressure Indicators

1.02 Related Sections

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

Section 11375 - Packed Column Air Stripper
Section 16050 - Basic Electrical Materials and Methods

1.03 System Description

a. System Interlocks - The extraction well pumps, and air blowers, will be interlocked with the following control instruments to ensure proper operation of the system:

i Air Flow indicator/Switch
ii Clearwell Level Probe

The interlocks will ensure that prior to starting the extraction wells, stripping air is flowing through the column at an acceptable flowrate as indicated by the Air Flow Indicator/Switch. In addition, the extraction well pumps will be controlled by the clearwell level probe which will shut down all pumps on high level and let all 4 pumps run at lower levels.

b. Local pressure and flow instruments are provided in areas of the system where indication would be needed for either start-up rate setting or monitoring of the process parameters.

1.04 Submittals

a. Contractor shall submit, in the manner and within the time limit as set forth in he Contract documents, 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 under this section.

b. Review of the drawings by the Engineer shall not relieve the Contractor of the entire responsibility for the engineering, design, workmanship and material under the Contract documents.

c. The drawings shall include, but will not be limited to, the following details:

1. Overall dimensions and details of the location of all connections, supports and accessories and a bill of materials.

2. The arrangement of the functional parts and construction of internal parts. Exact location of terminals and controls shall be shown.

3. Electrical and instrumentation detail drawings containing sufficient detail of characteristics and locations.

1.05 Quality Assurance

a. Contractor shall have a quality assurance program which will ensure that the equipment and services provided, will properly reflect the Owner's/Engineer's requirements. The program shall cover, as a minimum, the following areas:

1 - Design and procurement control
2 - Control of purchased material

3 - Inspection and test performance and status
4 - Handling and storage
5 - Corrective action

Part 2 - PRODUCTS

2.01 Equipment

a. Contractor shall provide one conductivity type level controller, or approved equal, for installation in the clearwell. The unit shall have four sensing probes and one ground probe as shown on the drawings and shall be manufactured by B&W controls, Fisher Controls or approved equal. The level probes shall be fixed length, corrosion resistant metal or coated metal type, mounted in a watertight probe holder unit.

The unit shall have all necessary relays, and contacts suitable for 120 VAC service. All relays shall be industrial type and solid state.

The relays shall be factory mounted in a NEMA 4 enclosure. All contacts shall be rated a minimum of 10 amperes at 120 VAC. The level controller will be interlocked with the clearwell outlet solenoid valve the extraction well pump starters and the high level alarm telemetering system.

b. A pitot type air flow indicator, or approved equal, shall be supplied for measurement, indication and interlocking of the equipment.

The unit shall measure and indicate the range of 0 to 1000 CFM at $\pm$ 1% full scale accuracy. The unit shall have automatic compensation for temperature and pressure. Unit shall be corrosion resistant and have a direct reading scale. Unit shall be sized to measure flow in a 12 inch square air duct or equivalent. Unit shall have an integral flow switch, control relay and contacts as required by the drawings. Unit shall operate on 120 VAC and shall have relay contacts rated a minimum of 10 amps at 120 VAC. The unit shall operate properly for duct pressures up to 20 inches of water.

c. An orifice type flow measurement and indicator unit shall be provided for measuring liquid flow into the inlet of the air stripping column. The unit shall operate in the range of 0 to 100 gallons per minute $\pm$ 0.5% full scale accuracy and shall have a direct reading scale in gpm. The unit shall be designed for

pressures up to 125 psi and shall have corrosion resistant wetted parts. The unit shall be supplied with a three valve manifold and all other accessories for a complete unit. The unit shall include an integral flow totalizer that counts in gallons and totalizes up to 999 thousand units. Unit shall include a matched stainless steel flow orifice and flange accessories.

d. Pressure indicators shall be supplied as shown on the drawings and shall be direct reading industrial type gages manufactured by Barton, Omega or approved equal. The gages shall have ± 0.5% accuracy, double strength break resistant glass, 316 stainless steel wetted parts and be rated at 270°F max. Water line pressure gages shall have a rage of 0 to 75 psi. Air pressure gages shall have ranges from 0 to 20 inches of water. Gages shall be minimum 4.5 inches in diameter and shall be mechanical, non oil filled, bourdon tube type.

e. The waste sump pump shall be supplied with a float type on-off level control complete with high-high level contacts for signal telemetering. The float shall be corrosion resistant, non-sinking and shall operate switch contacts rated 10 amps at 120 VAC. Switches shall be in a sealed watertight enclosure.

f. Contractor shall supply all switches, mounting brackets, pipe nipples, valves and appurtenances for complete, properly operating equipment.

g. Limit switches, as required by the drawings, shall be installed securely on the valves and/or other equipment to ensure proper actuation. Switches shall be sealed units with contacts rated a minimum of 10 amps at 120 VAC. Switches shall have corrosion resistant actuators and waterproof housing and connection points for control wiring.

Part 3 - EXECUTION

3.01 Erection/Installation

a. The equipment shall be installed and/or erected in accordance with the requirements of the Contract documents and the manufacturer's instruction and recommendations.

b. All work shall be performed by competent, trained workmen, skilled in the field to which they are executing the work.

c. All equipment shall be properly and securely installed such that undue stresses are not exerted on equipment and connections.

3.02 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. Acceptance tests, after the equipment is completely installed, shall be performed by the Contractor to demonstrate performance requirements, as specified herein. The field tests will be governed by provisions of applicable industry and institute standards.

* * * * * *

Section 15050 - Basic Mechanical Materials and Methods

PART 1 - GENERAL

1.01 Summary

a. This section covers the general requirements for the functional design, performance, materials, and construction features of all the equipment and systems required for the complete installation and continued operation of the Brewster Well Field Groundwater Management System.

b. 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 Contractor 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.

1.02 Related Sections

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

Section 11211 Extraction Well Pumps
11212 Sump Pump
11375 Packed Column Air Stripper

Division 15 - Mechanical

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 Construction Methods

a. Piping Layout:

1) Run piping parallel with or at right angles to walls except as otherwise noted.

2) Pitch piping uniformly to drain.

3) Run exposed piping as close as possible to walls and ceiling.

4) Size and location of piping as indicated on drawings.

b. Workmanship

1) Complete installation to present a neat and orderly appearance.

2) Keep inside of pipes and fittings free from dirt and debris.

3) Exposed piping shall show no tool marks.

4) After cutting, ream pipes out to full bore.

5) Cut pipes accurately and install without springing or forcing.

c. 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.

d. Supports

1) Support horizontal piping with malleable iron clevis or split-ring type hangers with machine thread.

- o Do not support piping from other piping.
- o Use multiple or trapeze hangers where several pipes are installed parallel.

2) Hangers shall be in accordance with the following schedule:

Hanger Rod Schedule

Pipe Size	Rod Size
Up to 2"	3/8" Dia.

Hanger Rod Spacing

Pipe Size	1"	1-1/4"	1-1/2"	2"
Maximum Allowance Spacing	7 Ft.	8 Ft.	9 Ft.	10 Ft.

NOTE: For trapeze hanger take spacing of smallest pipe on trapeze.

3) Hangers shall be attached to building structure with beam clamps.

4) Support vertical risers with finished ring clamps at approximately eight feet from floor.

5) Support piping underground by gravel bedding.

e. Joints

(1) Ferrous Pipe Screwed Joints:

- Right hand threads, pipe standard, clean cut, full depth, and tapered (ANSI Standard B2.1).
- Joints made tight without use of lead or paint.
- Use no lubricant.
- 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:

- Make pipe and fitting mechanically clean, bright and fluxed.
- Apply flux and solder as recommended by manufacturer of solder-type fittings

(3) PVC Pipe Joints:

- Joints for PVC pipe shall be solvent welded.
- Clean dirt and moisture from pipe and fittings for solvent welding.
- Apply solvent cement of proper grade as recommended by PVC pipe manufacturer.

(4) Stainless Steel Tubing Joints

- o Joints for stainless steel shall be made using Swagelok type fitting connectors.
- o Install fitting connection as recommended by manufacturer.

(5) Miscellaneous Pipe Joints

- o Make joints between steel and copper pipe with adapters using sweat joints.

f. 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.

g. Cutting and Patching

(1) The Contractor 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 Contractor, where necessary, to install his work. The Contractor will close all such openings around piping, ductwork, and conduit 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 the special permission of the Engineer.

(4) Consult contract documents for openings being provided by others.

h. Piping Insulation (Preformed Fiberglass Insulation)

(1) Surface: Clean surface to be insulated of all dirt, dust, oil, paint, or scale.

(2) Joints: Butt sections of insulation tightly together and seal with four-inch wide vapor barrier sealing strips over white vapor barrier lap cement. Lap longitudinal joints and seal with white vapor barrier cement or self-sealing pressure joints; no staples.

(3) Fastening: Fasten concealed piping insulation with aluminum bands, three bands per section; fasten exposed piping with sixteen-gauge annealed wire on twelve-inch center over which is applied glass cloth or canvas cover.

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Section 15060 - Pipes and Pipe Fittings

PART 1 - GENERAL

1.01 Summary

a. The Contractor shall supply and provide all materials, fabrication, drawings, erection design, installation, testing and delivery of services as specified in this section and/or on the drawings for complete installation and proper operation of all pipes of fittings as included in the Contract documents.

b. This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the equipment described herein.

c. 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 Contractor to provide equipment and systems described herein.

d. The work includes supply, erection, complete installation and testing of the following:

1. Lined and unlined ductile iron pipes and pipe fittings

2. Stainless steel tubing

3. Pipe Installation

1.02 Related Sections

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

Section 11211 - Extraction Well Pumps
Section 11212 - Sump Pump
Section 11375 - Packed Column Air Stripper
Section 15050 - Basic Mechanical Materials and Methods

1.03 Submittals

a. Contractor 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, arrangement of functional parts, and parts lists if applicable, for all materials furnished under this section.

b. The Contractor's drawings shall be direct reading reproducibles able to produce clear, sharp, and legible prints. Fabrication of the equipment shall not be started until after the Contractor has received written drawing review approvals from the Engineer.

c. Review of the drawings by the Engineer shall not relieve the Contractor of the entire responsibility for the engineering, design, workmanship and material under the Contract documents.

d. Prior to fabrication, all outline, assembly and detail drawings shall be certified, approved and signed by a NYS registered Professional Engineer. No alterations will be made to the design after certification without the approval of the Engineer.

e. The drawings shall include, but will not be limited to, the following details;

1. Overall dimensions and details of the location of all connections, supports and accessories and a bill of materials.

2. The arrangement of the functional parts and construction of internal parts. Exact location of terminals and controls shall be shown.

3. Details of weld-end preparation, surface finishes, etc.

1.04 Quality Assurance

a. Contractor shall have a quality assurance program which will ensure that the equipment and services provided, will properly reflect the Owner's/Engineer's requirements. The program shall cover, as a minimum, the following areas:

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

b. Contractor shall certify to the Engineer, 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 Engineer.

1.05 Environmental Conditions

a. All underground piping shall be installed below the frost line as shown on the drawings to prevent freezing and cracking of the pipes.

1.06 Operating and Maintenance Instructions

a. Refer to Section 01730 for requirements.

PART 2 - PRODUCTS

2.01 Materials

a. Pipe and pipe fittings shall be as called for on the Contract drawings.

b. Ductile iron pipe shall be Schedule 40 Kynar lined pipe and fittings for the yard piping. Pipe shall conform to ASTM F-491-77. Piping inside the building shall be seamless Schedule 40 unlined ductile iron, conforming to material specification A106 Gr. B. Pipe and fittings shall have flanged ends.

c. Stainless steel tubing for sample lines and instrumentation connection shall be one-half inch nominal diameter, tube wall thickness of 0.035 inch conforming to ASTM A269 or A213.

d. Underground and concrete encased pipes or fittings shall be coated on the outside in accordance with ANSI Specification A21.51.

e. Flanged ends shall be ductile or gray iron, shall conform to ANSI Specification A210.10, 250 psi pressure rating and shall be drilled to ANSI Specification B16.1, 125 lb standard. Gaskets shall be full face flat ring gaskets of approved composition. Gaskets having diameter smaller or equal to 12 inches shall be 1/26 inch thick. Machined surfaces shall be cleaned and coated with a suitable, rust-preventative coating immediately after being machined.

f. Bolts and nuts used for flanged joints shall be grade B in accordance with ASTM Specification for Carbon Steel Externally and Internally Threaded Standard Fasteners Designated A307-74. Bolt studs and studs shall be of the same quality as machine bolts.

g. 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.

h. Ductile iron pipes and fittings shall be marked with manufacturer's initials, year cast, class letter or number, mark number, and weight. All markings shall conform to ANSI Specification A21.51, Section 51.10 and A21.10, Section 10-9.

i. All ductile iron pipe and fittings shall be inspected and approved by the Engineer. All equipment appurtenances shall be installed properly as to ensure functionality.

2.02 Pipe Insulation

a. Insulation shall be fiberglass preformed and sectonal, with all service jacket with embossed vapor barrier-laminate, vinyl coating and self sealing, pressure seal lap adhesive.

b. Insulation for fittings shall be premolded one piece, PVC, insulated fitting cover.

c. Insulation shall conform to NFPA 90A. It shall have thermal conductivity of 0.26 BTU/hr, square foot, degrees F, inches at 75 degrees F mean temperature.

PART 3 - EXECUTION

3.01 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 the work.

c. All equipment shall be properly and securely installed such that undue stresses are not exerted on equipment and connections.

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. Bolts should be tightened using proper bolt torques. The torque values given in the table below apply to lined pipe and fittings with Class 150 flanges.

f. Threads must be clean and well lubricated and washers should be used to ensure correct torque. Bolts should be tightened alternately and evenly, following the sequence shown in the charts on the reverse side.

g. If a flange leak occurs and the bolts of the leaking side have been properly torqued, THEY SHOULD NOT BE TIGHTENED FURTHER or permanent damage to the sealing face may result. Instead, the bolts on the opposite side should be loosened a half turn at a time and then the bolts on the leaking side should be tightened by the same amount. If the leak persists, the bolts should be removed and the sealing faces should be examined for scratches or dents across an entire face which could provide a leak path. Any scratches or dents which do not exceed 20% of the liner thickness can be eliminated by hand polishing with fine abrasive cloth or paper.

h. NO WELDING, BRAZING, SOLDERING OR FLAME CUTTING which can permanently damage the plastic liner should be done close to the metal housings unless adequate precautions are taken to prevent their being exposed to excessive heat.

i. 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.

3.02 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. Acceptance tests, after the equipment is completely installed, shall be performed by the Contractor to demonstrate performance requirements as specified herein. The field tests will be governed by provisions of applicable industry and institute standards.

c. Refer to Section 01660 for additional testing requirements.

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Section 15100 - Valves

PART 1 - GENERAL

1.01 Summary

a. This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of all valves described herein.

b. 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 valving as included in the Contract documents.

c. 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 Contractor 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.

d. The work includes supply, erection, complete installation and testing of the following:

1. Valves and Related Accessories

1.02 Related Sections

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

Section 11375	Packed Column Air Stripper
Section 11211	Extraction Well Pumps
Section 11212	Sump Pump
Section 15050	Basic Mechanical Materials and Methods
Section 15060	Pipes and Pipe Fittings

1.03 Submittals

a. Contractor 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 lists, if applicable, for all equipment and materials furnished under this section.

Also see Section 01300 - SUBMITTALS

b. The drawings shall include, but will not be limited to, the following details:

1 Overall dimensions and details of the location of all connections, supports and accessories and a bill of materials.

2 The arrangement of the functional parts and construction of internal parts.

3 Details of weld-end preparation, surface finishes, etc.

1.04 Quality Assurance

Contractor shall have the quality assurance program which will ensure that the equipment and services provided, will properly reflect the Owner's/Engineer's requirements. The program shall cover, as a minimum, the following areas:

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

1.05 OPERATING AND MAINTENANCE INSTRUCTIONS

Refer to Section 01730 for requirements.

PART 2 - PRODUCTS

2.01 Materials

a. Gate Valves

(1) Two Inches and Smaller: All bronze except as indicated elsewhere, screwed end, inside screw, nonrising spindle, solid or split wedge, screwed bonnet.

(2) Two and One-Half Inches and Larger: Iron body, bronze mounted, flanged ends, outside screw and yoke, rising stem, solid or split bronze wedge, renewable seat rings and bolted bonnet.

b. Check Valves

(1) Two Inches and Smaller: All bronze except as indicated elsewhere, renewable composition disc, horizontal swing type, screwed bonnet, screwed ends.

(2) Two and One-Half Inches and Larger: Iron body, bronze mounted, renewable seat ring and composition disc, horizontal swing type, bolted bonnet, flanged ends.

c. Globe and Angle Valves

(1) Two Inches and Smaller: All bronze, renewable composition disc, screwed bonnet, and screwed ends.

(2) Two and One-Half Inches and Larger: Iron body, bronze mounted, renewable seat ring and composition disc, outside screw and yoke, bolted bonnet, flanged ends.

d. Solenoid Valves

(1) Iron body, bronze mounted full port pilot valve with wetted parts of stainless steel, with flanged ends. Housing of malleable iron with self contained terminal box with tapped conduit connection.

(2) Close when energized, fail open type solenoid operator. Coil to be designed for continuous duty and 120 VAC, 60 Hz, single phase electrical service. Operator shall have sufficient torque to actuate the valve under worst case pressure conditions.

e. Construction

(1) Valves of type that can be packed under pressure when wide open.

(2) Manufacturer's name and working pressure cast integral on valve body.

(3) Sleeve end type for solder joints used on copper pipe.

(4) All valves shall be full line size valves.

PART 3 - EXECUTION

3.01 Installation

a. The equipment shall be installed in accordance with the requirements of the Contract documents and the manufacturer's instruction and recommendations.

b. All work shall be performed by competent, trained workmen, skilled in the field to which they are executing the work.

c. All equipment shall be properly and securely installed such that undue stresses are not exerted on equipment and connections.

3.02 Testing and Inspections

a. Each piece of 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 Contract document.

b. Acceptance tests, after the equipment is completely installed, shall be performed by the Contractor to demonstrate performance requirements, as specified herein. The field tests will be governed by provisions of applicable industry and institute standards.

c. Refer to Section 01660 for additional testing requirements.

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Section 15850 - Air Handling

PART 1 - GENERAL

1.01 Summary

a. The Contractor shall supply and provide 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 the air blowers for the air stripper.

b. This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the equipment described herein.

c. 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 Contractor 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.

d. The work includes supply, erection, complete installation and testing of the following:

1. Two air blowers with intake filter and accessories.

1.02 Related Sections

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

Section 11375	Packed Column Air Stripper
Section 15050	Basic Mechanical Materials and Methods
Section 15890	Ductwork
Section 16050	Basic Electrical Materials and Methods

1.03 System Description

During normal operation of the system, only one air blower will be operating. The purpose of the blower is to supply forced air up through the packed column to remove the volatile organics from the groundwater that is trickling down the packing. Having two blowers accomplishes two ends; a redundant supply of air in case of breakdown of the other blower; and an additional source of stripping air should the influent water flowrate be increased via recirculation from the sump.

1.04 Design/Performance Requirements

The stripping air blowers will be designed for ten year life and each shall be able to deliver approximately 500 cfm with a static head of nine inches of water. The air supply will be heated, when necessary, to a temperature of 40°F by an electric duct heater, described in Section 16850.

1.05 Submittals

a. Contractor 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 lists, if applicable, for all equipment and materials furnished under this section.

   Also see Section 01300 - SUBMITTALS

b. The Contractor's drawings shall be direct reading reproducibles able to produce clear, sharp, and legible prints. Fabrication of the equipment shall not be started until after the Contractor has received written drawing review approvals from the Engineer.

c. Review of the drawings by the Engineer shall not relieve the Contractor of the entire responsibility for the engineering, design, workmanship and material under the Contract documents.

d. The drawings shall include, but will not be limited to, the following details:

   - Shop drawings showing outline and overall dimensions, connection details, weights, anchorage details, design loads and materials of construction.
   - The arrangement of the functional parts and construction of internal parts. Exact location of terminals and controls shall be shown.
   - Details of weld-end preparation, surface finishes, etc.
   - Electrical and instrumentation detail drawings containing sufficient detail of characteristics and locations.
   - Detailed drawings for any special requirements for handling, storing and final erection of equipment.

- o Blower manufacturer's certified performance curve including capacity, efficiency, HP, static head and motor speed.

- o Manufacturer's electric motor data including rated HP, efficiency and power requirements at varying load conditions.

- o Air blower manufacturer's Certificate of Compliance.

1.06 Quality Assurance

a. Contractor shall have the quality assurance program which will ensure that the equipment and services provided, will properly reflect the Owner's/Engineer's requirements. The program shall cover, as a minimum, the following areas:

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

1.07 Maintenance

a. See Section 01730 for specific details and correct procedures for compilation of the Operation and Maintenance manual.

b. The services of a factory trained and certified manufacturer's representative are to be provided for instruction of the plant operating personnel on the correct start-up, maintenance, operating and troubleshooting procedures and techniques for the extraction well pumps.

c. A set of manufacturer recommended spare parts and supplies 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 air blowers.

PART 2 - PRODUCTS

2.01 Equipment

a. The stripping air for the packed column shall be normally supplied by one of two electrically driven backward inclined centrifugal blowers with airfoil blades. The blowers will be delivered complete with the appropriate electric motor to constitute a complete

operable unit. The motors shall be 208 VAC, 60 HZ, 3 phase, open, drip proof type and rated 3 HP. They shall have OSHA approved type drive belt guard and the housing shall be of steel construction (if required).

b. The blower intake air filters shall be disposable types of medium efficiency. They shall be pleated filters constructed of tufted, non-woven reinforced cotton fabric. The media shall be fully supported and bonded to a wire grid with sufficient open area.

c. The air blowers and any and all necessary appurtenances for their complete installation and continued operation as specified under this section shall be manufactured by Cincinnati Fan and Ventilator Co. or approved equal.

d. Motor bearings shall be constructed so as to exclude dirt and water and to prevent lubricant from reaching windings.

e. Alternating-current 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.

f. 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.

g. Motors shall be so constructed that they will withstand, without mechanical injury, at least 120 percent of rated speed in the forward or reverse direction in accordance with NEMA Standard MG-1.

h. Vibration limits for the motors shall not exceed values specified in NEMA Standard MG1-12.05.

i. Blowers shall not exceed noise levels, when operating at full capacity, exceeding latest OSHA standards.

2.02 Fabrication

a. The centrifugal air blowers shall be completely factory assembled, including electric motor and shipped as a completed operable unit.

b. The skid mounted unit shall have a steel support channel and/or baseplate for anchoring to the foundation pad.

PART 3 - EXECUTION

3.01 Erection/Installation

a. The equipment shall be installed in accordance with the requirements of the Contract documents and the manufacturer's instruction and recommendations.

b. All work shall be performed by competent, trained workmen, skilled in the field to which they are executing the work.

c. All equipment shall be properly and securely installed such that undue stresses are not exerted on equipment and connections.

3.02 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 document.

b. Acceptance tests, after the equipment is completely installed, shall be performed by the Contractor to demonstrate performance requirements, as specified herein. The field tests will be governed by provisions of applicable industry and institute standards.

c. Refer to Section 01660 for additional testing requirements.

d. Each motor shall be given factory Routine Tests or Manufacturer's Initial Short Commercial Test as necessary to determine that it is free from electrical and mechanical defects and to establish that the design and construction of the motor are satisfactory. Tests shall include rotation, megger and high potential tests.

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Section 15890 - Ductwork

PART 1 - GENERAL

1.01 Summary

a. This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the building ductwork described herein.

b. The work shall include the supply of all materials, fabrication, drawings, installation, testing and delivery of services as specified in this section and/or on the drawings for completion and proper operation of all building ductwork and accessories.

c. 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 Contractor 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.

d. The work includes supply, erection, complete installation and testing of the following:

1. All building ductwork.

2. Ductwork accessories.

3. Duct Insulation.

1.02 Related Sections

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

Section 11375 Packed Column Air Stripper
Section 15850 Air Handling

1.03 System Description

The duct work required shall be as shown on the drawings, to route air from the air intake louver, through the duct heater and into the blower and then from the blower into the bottom of the packed column air stripper.

1.04 Submittals

a. Contractor shall submit, in the manner and within the time limit as set forth in the Contract documents, 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 under this section.

Also see Section 01300 - SUBMITTALS

b. The drawings shall include, but will not be limited to, the following details:

- o Shop drawings showing outline and overall dimensions, connection details, weights, anchorage details, design loads and materials of construction.
- o The arrangement of the functional parts and construction of internal parts. Exact location of terminals and controls shall be shown.
- o Details of weld-end preparation, surface finishes, etc.

1.05 Quality Assurance

a. Contractor shall have the quality assurance program which will ensure that the equipment and services provided, will properly reflect the Owner's/Engineer's requirements. The program shall cover, as a minimum, the following areas:

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

1.06 Maintenance

a. See Section 01730 for specific details and correct procedures for compilation of the Operation and Maintenance manual.

PART 2 - PRODUCTS

2.01 Equipment

a. The ductwork shall be of galvanized steel and shall conform to ASHRAE recommended construction for rectangular medium pressure ducts.

b. The flexible connections shall be of fire resistant neoprene coated impregnated canvas, thirty ounce weight. They are to be installed at all suction and discharge openings between housing and duct as shown on the drawings.

c. The longitudinal joints are to be Pittsburgh lock or inside groove. The transverse joints shall be hammered tight pocket slip. Bar slip may be used only where space does not permit hammering joint. All joints must be air tight.

d. Turning vanes shall be provided at each 90° turn. They shall be double thickness, three inch radius, spaced three and one-quarter inches with three inch radius heel vane.

e. Install suitable drain plugs at low points of outside air intake and exhaust ductwork.

f. Dampers are to be provided at the inlet and outlet to each blower for isolation. They will be manually operated. They shall be flanged and have steel damper blades that can be easily field serviced. Bearings shall be grease lubricated.

g. All duct insulation shall conform to fire and smoke ratings as tested by procedures ASTM E-84, NFPA 255 and UL 723 not exceeding flame spread 25 and smoke developed 50. Fiberglass insulation is acceptable with thermal conductivity of 0.24 btu/hr, square foot, degree F, inches at 75 degrees F mean temperature. Insulation will be attached to the ductwork using an approved adhesive after all hangers have been installed. Insulation shall not cover flexible connections or flange connections.

PART 3 - EXECUTION

3.01 Erection/Installation

a. The equipment shall be installed in accordance with the requirements of the Contract documents and the manufacturer's instruction and recommendations.

b. All work shall be performed by competent, trained workmen, skilled in the field to which they are executing the work.

c. All equipment shall be properly and securely installed such that undue stresses are not exerted on equipment and connections.

d. Horizontal ducts shall be supported with flat strap hangers not less than one inch by one-eighth inch. Rivet to the side of duct and extend hangers down side of duct at least nine inches. Space hangers not more than eight feet apart on centers. Install supports so as to ensure that the ductwork is completely free from vibration.

3.02 Testing and Inspections

a. Acceptance tests, after the equipment is completely installed, shall be performed by the Contractor to demonstrate performance requirements, as specified herein. The field tests will be governed by provisions of applicable industry and institute standards.

b. Refer to Section 01660 for additional testing requirements.

* * * * * *

Section 16050 - Basic Electrical Materials and Methods

PART 1 - GENERAL

a. This section covers the requirements for the functional design, performance, materials, construction features, testing quality and handling of all electrical equipment described herein.

b. The work shall consist of furnishing all materials, labor, supervision, drawings, erection, installation, testing and delivery of services as specified in this section and/or on the drawings for completion and proper operation as included in th Contract documents.

c. 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 Contractor to provide equipment and systems that have been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specific service.

d. The work generally includes supply, erection, complete installation and testing of the following:

1. Motor Control Center
2. Power and lighting distribution to equipment
3. Conduits and wiring
4. Electrical hook-up to existing service pole
5. Electrical Accessories

1.02 Related Sections

a. Related work and/or equipment that is specified in other sections of the contract documents include but is not limited to the following:

Section 01510 - Temporary Utilities
Section 13400 - Process Control Systems
Section 16500 - Lighting
Section 16850 - Electrical Resistance Heating

1.03 Submittals

a. Contractor shall submit, in the manner and within the time limit as set forth in the Contract documents, 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 under this section.

b. The contractor's drawings shall be direct reading reproducibles able to produce clear, sharp, and legible prints. Fabrication or installation of the equipment shall not be started until after the Contractor has received written drawing review approvals from the engineer.

c. Review of the drawings by the Engineer shall not relieve the Contractor of the entire responsibility for the engineering, design, workmanship and material under the Contractor documents.

d. The drawings shall include, but not be limited to, the following details:

1. Overall dimensions and details of the location of all connections, supports and accessories and a bill of materials.

2. The arrangement of the functional parts and construction of internal parts. Exact location of terminals and control shall be shown.

3. Electrical and instrumentation detail drawings containing sufficient details of characteristics and locations.

1.04 Quality Assurance

a. Contractor shall have a quality assurance program which will ensure that the equipment and services provided, will properly reflect the Owner's/Engineers requirements. The program shall cover, as a minimum, the following areas:

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

b. Contractor shall provide inspection and test personnel and facilities to maintain control of quality of materials, components and fabrication throughout design and construction.

1.05 Operating and Maintenance Instructions

a. Refer to Section 01730 for requirements.

PART 2 - PRODUCTS

2.01 Equipment

a. General

1. The motor control center shall be front accessible, NEMA Class 1, Type B with NEMA 12 gasketed enclosure consisting of one or more vertical sections joined together to form a rigid free standing structure designed to permit future additions. The vertical sections shall be designed to permit mounting of standardized modular units that can be regrouped and permit addition of future units and sections. The assembly shall not require access from the rear.

2. MCC's shall be 20" deep construction or approved alternate.

3. The vertical section shall be fabricated from (minimum) No. 14 gage steel sheets, welded to reinforcing channels or from No. 16 gage steel sheets folded and riveted to form a rigid structure. The sections shall be joined together to be self-supporting when bolted to floor.

4. The construction shall permit control and power cable conduit entry at both the top and bottom of the structure.

5. Both end sections shall have removable end plates which can be removed for the addition of future units. Removable blank doors shall cover all unused spaces.

6. Removable lifting angles or eyes shall be provided for shipping the section(s).

7. Channel sills, running the entire length of each shipping section shall be provided to facilitate installation without special floor steel or inserts other than anchors for foundation bolts.

b. Buses and Bus Barriers

1. The horizontal and vertical buses shall be copper with bolted, silver-plated joints.

2. Horizontal and vertical buses shall be supported by non-tracking insulators suitable for the service conditions. The buses shall be braced to withstand the maximum available short circuit current.

3. Horizontal and vertical bus barriers shall be furnished to prevent accidental contact. In addition, the vertical bus barriers shall isolate the bus from incoming power and control cables.

4. A copper ground bus at least 1/4 inch by 1 inch running the entire length of each shipping section shall be provided. Burndy Type YA or alternate compression type terminals, shall be provided at each end of the ground bus for connection to ground cable.

c. Plug-In Units

1. Standardized plug-in type circuit breaker and combination starter units shall be designed to occupy multiples of a fixed modular dimension. Each unit shall have pressure type, free-floating, self-aligning, line disconnecting stabs through dead front openings to the vertical bus. Stab contact surface shall be silver plated. The contact design shall provide increased contact pressure under load or short circuit conditions.

2. NEMA Size 4 and smaller combination starter units shall be removable to a disconnected or tilted out position. Positive stops in both the inserted and withdrawn starter position shall be provided.

3. All associated equipment such as control transformers, auxiliary relays, etc., shall be located in the respective unit and shall not extend into the bus compartment, wiring troughs or be mounted on the rear of the plug-in unit.

d. Molded Case Circuit Breakers

1. Circuit breakers shall be in accordance with NEMA AB-1 and UL 489 and shall be manually operated trip free with thermal-magnetic or adjustable magnetic (only) trip elements calibrated on the basis of 40°C.

2. Thermal magnetic breakers shall be used in feeder tap units. The breakers shall afford both overcurrent and short circuit protection for the cables.

3. Thermal-magnetic or adjustable magnetic (only) breakers shall be used in combination starter units. The breaker shall be rated to the corresponding NEMA starter size rating so that the continuous current rating of the breaker will be at

least 115% of the full load current rating of the motor. Breaker trip setting shall be capable of meeting the requirements of NEC Article 430-52. The breaker's interrupting capacity must be greater than the maximum available fault current at the load terminal of the combination starter including motor contribution. The breaker's interrupting capacity is based on the total impedance of the breaker, contactor and maximum overload relay combination.

4. Breaker operating handles shall clearly indicate whether the breaker is in the open, closed or tripped position with the door closed and shall be operable from the outside of the unit door.

5. Breaker operating handles shall have means to padlock in both the open and closed positions. This feature shall not interfere with the trip free action of the breaker.

6. Circuit breakers used for electric air duct heaters shall be provided with 115 VAC shunt trip devices.

e. Magnetic Starters

1. Magnetic starters (contactor and thermal overload elements) in combination with circuit breakers shall act as a motor controller, disconnecting means and branch circuit overcurrent protection and shall be in accordance with the following standards; NEMA ICS 2 and UL 508. The overcurrnet protection shall be provided for motors operating within the range of 90 to 110 percent of the motor control center rated voltage and under abnormal conditions as specified. The motors shall be full voltage across-the-line starting, squirrel cage induction motors unless otherwise specified. In the absence of specific data the following motor characteristics shall be assumed:

a - Full load current: NEMA ICS 2-321.21
b - Locked rotor current: NEMA ICS 2-327.22
c - Acceleration time: not more than 10 seconds

The magnetic starters shall be operated (directly or by means of interposing relays) by a control circuit powered from the nominal 120 volt control transformer.

2. The starter operating coil shall be rated 115 volts for starters NEMA Sizes 0 through 4. Starters NEMA Size 5 and above shall have their operating coils rated system line to line voltage.

3. Sellers shall provide a coordinated control transformer and contactor. The contactor coil minimum pick-up and maximum drop-out voltages shall meet or exceed those specified in NEMA ICS 2-110.41, so that the contactor shall successfully pick-up and seal-in when the motor control center bus voltage is at 90 percent of its rated values (432V for 480V MCC's and 188V for 208V MCC's) and the closing signal is from a remotely located switching device.

4. One thermal overload device in each phase conductor of motor feeders shall be provided. The thermal overload device shall be ambient or non-ambient compensated as specified, and of the manual reset type. The reset device shall be operable without opening the unit door. Contractor shall select the thermal overload devices based on the motor data and Contractor shall coordinate them with the magnetic breaker trip setting.

f. Wiring

1. Terminal boards shall be rated for not less than 25 amperes, 600 volts, provided with barriers, marking strips and terminal screws as required.

2. Control wiring shall be 600 volt, 14 AWG minimum, 7 strand, copper wire with heat, moisture and flame resistant cross-linked polyethylene insulation in accordance with ICEA S-66-524 or alternate. Wiring shall be free of abrasions and tool marks. All wiring shall be adequately supported to prevent sagging and breakage caused by vibration in transit.

3. Seller's wiring shall be terminated on terminal boards or equipment with flanged spade, or indented spade type insulation-gripping insulated terminals equivalent to Aircraft-Marine Products preinsulated Diamond grip of Thomas and Betts self-insulated Sta-kon with insulation grip. Ring type terminals acceptable may be used. Wire markers shall be on both ends of a wire if the wire is not traceable visually or color coded. No solder or "push-on" or "quick" type connectors shall be used in connection with any wiring.

4. Power wiring within each starter unit and between equipment within the control center such as lighting transformers and lighting panels shall be 600 volts, stranded copper wire with heat, moisture and flame resistant cross-linked polyethylene insulation in accordance with ICEA S-66-524 or equivalent. The wiring shall be able to pass the flame test conducted in accordance with UL 44, Section 85.

g. Wireways and Wiring Troughs

1. A continuous horizontal wiring trough shall be provided for the entire length of the structure at both top and bottom. The wiring trough shall be completely isolated from the horizontal bus.

2. Each vertical section shall have a vertical wireway extending from the top horizontal wiring trough to the bottom horizontal wiring trough.

3. Vertical wireways shall be covered by hinged doors for safe and easy access to wiring without disturbing the starter units.

h. Pushbuttons

1. Pushbuttons, when furnished, shall be in accordance with ICS 2-216 and be the oil-tight, heavy-duty type. The pushbuttons shall be the guarded construction type having recessed or shrouded pushbuttons.

i. Indicating Lights

1. Indicating lamps shall be in accordance with ICS 2-216 and be low burden type with interchangeable color caps. The lamps shall be standard, low voltage bulbs with external resistors. Looking at compartment doors, green lens shall be on the left and red lens on the right, alternatively; red lens on top and green lens on the bottom.

j. Distribution Transformers

1. A distribution transformer for purposes of supplying panelboard circuits shall be provided where specified. All transformers shall be dry-type distribution transformers and construction shall be of NEMA and UL design.

2. Transformers shall be three phase, four wire, 60 Hz.

3. Transformers shall be self-cooled dry type with fully insulated non-hygroscopic vacuum impregnated thermosetting insulation or non-hygroscopic open dipped process insulation over continous wire cole construction. All transformers are to have a copper winding, or approved alternate.

4. Transformer winding shall have a 220°C UL component recognized insulation system and be designed not to exceed 115°C rise above 40°C ambient under full load conditions.

5. Transformer shall have two 2-1/2 percent full capacity taps above and below the rated primary voltage. Transformer shall have a minimum impedance of 2.8 percent. Voltage regulations shall not exceed 2.5 percent at unity power factor.

6. 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.

2.02 Materials

a. Conduit

1. Rigid steel conduit shall be used for all service entrance conduits and main feeders and all other branch circuits and raceways unless especially expected on the drawings and in the specifications. Rigid steel conduits shall be low carbon, hot-dipped galvanized both inside and outside, with threaded joints. Other finishes may be substituted only with the approval of the Engineer. All conduit shall be UL approved.

Fitting: Cast metals, screwed fittings; inch and larger mogul type.

Standards: ANSI C80.1, ANSI C80.4.

2. Polyvinyl Chloride Conduit

Material: Schedule 40, polyvinyl chloride, rigid conduit.

Fittings: Coupling type.

Joints: Connections shall be made solvent welding.

3. Liquid-Tight Flexible Metallic Conduit

Flexible galvanized steel core with continuous copper ground in the convolutions covered with extruded polyvinyl chloride.

Connectors: Nylon-insulated screw-in ground-core type connectors constructed of malleable iron, Thomas & Betts liquid-tight fittings or an 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, etc.

1. Conductor for feeders and subfeeders size #1/0 and larger shall be type RHW moisture- and heat-resistant rubber insulated.

2. Branch circuits within all electric heater elements such as electric duct coils, baseboard radiation, and cabinet unit heaters shall be type THN heat resistant, thermoplastic insulated, maximum operating temperature 90°C (194°F).

3. Underground feeder and branch circuit wire for direct burial in earth or in conduit shall be Type UF for use in wet or dry locations.

4. For any specific use not covered here above, comply with the NEC in conductor use.

5. Conductors shall be soft drawn copper, ASTM B3 for solid wire, ASTM B8 for stranded conductors. conductor wire sizes shall be American Wire Gauge (AWG), No. 6 and larger of stranded construction, No. 8 and smaller of solid construction.

6. Wire and cable shall be factory color coded with a separate color for each phase and neutral used consistently throughout the system. Color codings shall be as required by the NEC.

7. All conductors shall be rated 600 volts, unless otherwise specified or shown on the drawings, or for electronic or communication use.

8. Insulation type shall be NEC type THW.

9. Minimum size No. 12 AWG.

c. Wire Connections and Devices

1. Joints on branch circuits shall occur only where circuits divide as indicated on plans 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 or T & B 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 type.

3. Conductors No. 10 and smaller terminated and spliced with Buchanan "B-Cap" or 3M-Scotchlok self-insulated, screw-on connectors; Bakelite wirenuts are not acceptable.

4. Connect conductors to panelboards and apparatus by means of approved lugs or connectors as by Gorilla Grip, Thomas and Betts, or an approved equal.

d. 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 ganged, 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.

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-offs, 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.

e. Pull and Junction Boxes

1. The Contractor shall furnish and install junction boxes and pull boxes where indicated on the drawings or 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 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 shall be furnished without knockouts for field drilling.

4. If pull of 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 Engineer.

f. 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.

2. Wireways hall be used where indicated on the drawings and for mounting groups of switches and/or starters. Wireways shall be the standard manufactured product of a company regularly producing wireway and shall not be a local shop assembled unit. Wireway shall be of the hinged cover type, UL listed, and of sizes indicated or as required by NEC. Finish shall be medium light gray enamel over rust inhibitor. Wireways shall be of rain-tight construction where required.

g. Switches and Receptacles

1. The wiring devices specified shall be UL approved.

2. 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: Duplex 20A, 125V.

The contractor shall furnish and install wall plates of appropriate type and size for all wiring and control devices, signal, and telephone outlets.

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.

h. Overcurrent Protective Devices

1. The Contractor shall furnish and install where indicated on the drawings or as required by the NEC molded-case circuit breakers in a NEMA type enclosure. Breakers shall be manually operated, trip-free, and designed so that all poles open simultaneously. Tripping mechanism shall be (thermally, magnetically) operated, shall open instantaneously on short circuits and have time delay on overloads, and have effective sealing against tampering. Breakers shall be as called for on the drawings or in the panel-board schedule.

2. Plug-in breakers shall be used. Breakers shall be limited to one pole per bus stab location. No tandem or half-size breakers will be allowed. Interrupting capacity: 10,000 RMS symmetrical amperes.

3. Branch circuit breakers feeding convenience outlets shall have instantaneous sensitive trip setting of not more than ten times rating of breaker.

4. Fuses, unless indicated otherwise, shall be UL approved dual element, time-lag, cartridge type. Fuses for motor circuits shall be sized in accordance with the NEC. Labels indicating the size and type of replacement fuses shall be glued to inside of door on all fusible switches and panelboards.

5. All fuses shall be of the current and voltage rating as required or indicated.

i. Lighting

1. Provide materials and accessories, whether or not specifically described of best grade of commercial manufacturer.

2. Unless otherwise specified, the housing of each fluorescent lighting fixture shall be provided with a separate, factory installed grounding device. The grounding device is to be used for connecting a separate grounding conductor to the fixture housing, and not for other purposes. For housings thinner than No. 18 USS gauge, the grounding device shall be a 10/32 machine screw threaded stud and nut, with a flat washer. The stud shall be of either the welded or pressure fastened type. For No. 18 USS gauge and heavier housings, the grounding device shall be either the above stud,

etc., or a 10/32 round head machine screw, with flat grounding device that shall meet all applicable grounding requirements of the NEC.

3. Steel reflectors and other surfaces for which baked-on white enamel finish is required shall be made of steel of the thickness specified or noted and given a suitable primer and white color coat or coats properly applied. Reflectors shall be completely formed before application or primer or enamel color coat or coats.

4. Each basic fluorescent fixture shall be equipped with the necessary number and type of ballasts to operate only the lamps with the particular basic unit. Single lamp fixtures shall contain one single lamp ballast; two lamp fixtures shall contain one two-lamp ballasts. Basic fluorescent fixtures containing three or four lamps shall be internally wired to have the two outer lamps operated by a common ballast and the center lamp or lamps operated by the remaining ballast.

5. Multiple section fluorescent lighting fixtures shall be internally wired and connected to accomplish the switching arrangement required by the electrical drawings. Wiring shall conform to the requirements of the latest issue of the NEC.

j. Ballasts and Accessories

1. Each ballast shall be designed to start and satisfactorily operate the type of fluorescent lamp required in the particular fixture and shall conform to the current practice and requirements of the "Certified Ballast Manufacturers," unless the lamps are of unusual types for which "certified" ballasts are not available commercially. Ballasts shall be US Class P of the high power factor type in sizes in which they are available of the series-sequence type. Multi-lamp ballasts for operating preheat and instant types of lamps shall be of the lead-lag type. Ballasts shall be securely fastened in place with mounting surface of ballast making as complete contact with surface of ballast mounting area of fixture as practical. Ballasts having four mounting holes shall be attached to the mounting surface of the fixture.

2. Ballast protectors shall be of the thermally actuated automatic-reset built-in type.

k. Poles and Standards

1. The Contractor shall furnish and install all poles and standards related to exterior lighting fixtures complete with base, hardware, etc., unless otherwise indicated.

2. The standards shall be of poles metal construction and be as indicated in the drawings and specified herein.

PART 3 - EXECUTION

3.01 Erection/Installation

a. General

1. The Contractor shall be responsible for all work included in this section and the delegation of work shall not relieve him of this responsibility.

2. The Contractor shall furnish and present shop drawings or brochures for all fixtures, equipment, and accessories to the Engineer for the Engineer's review. The Contractor shall furnish and present a schedule of manufacturers of all materials for which shop drawings or brochures are not presented. No equipment shall be ordered, purchased, or installed prior to approval of the shop drawings, brochures, and schedules. The Contractor is responsible for dimensions which shall be confirmed and correlated at the job site, fabrication processes and techniques of construction, coordination of his work with that of all other trades, and the satisfactory performance of his work.

3. The Contractor shall be responsible for all arrangements and costs for providing temporary electrical metering, main switches, and distribution panels at the site as required for construction purposes. The distribution panels shall be located at a central point designated by the Engineer. The Contractor shall indicate prior to installation whether three-phase or single-phase service is required.

4. The Contractor shall furnish and install power outlets, as indicated on the drawings, which shall be 15 or 20 amp, single-phase or three phase receptacles for either 120 or 208 volts.

5. The Contractor shall, without extra charge, make required changes in the layout as needed to prevent conflict with work of different trades or for proper execution of the work.

b. Codes

1. All materials and workmanship shall comply with all applicable codes, specifications, local ordinances, industry standards, utility company, and fire insurance carrier's requirements.

2. Noncompliance: Should the Contractor perform any work 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, he shall bear the cost arising in correcting any such deficiency.

c. Conduit

1. Conduit sizes shall be as indicated on the drawings, or minimum in accordance with the NEC, including provision for green equipment grounding conductor using three-quarter-inch minimum conduit.

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.

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.

8. Transitions between nonmetallic conduits and conduits of other materials shall be made with the manufacturer's standard adapters designed for such purpose.

9. Exposed conduits shall be securely fastened in place maximum three-foot intervals and hangers, supports, or fasteners shall be provided at each elbow and at the end of each straight run terminating at a box or cabinet.

10. The Contractor shall provide and install metallic supports not more than eight feet apart or as required for the proper installation of raceway systems and all other equipment installed under this division of the contract.

11. Conduit shall be supported on approved types of wall brackets, ceiling trapezes, strap hangers, or pipe supports and secured to toggle bolts in hollow masonry walls or units. Expansion bolts will be used in concrete or block machine screws on metal surfaces and wood screws on wood construction.

12. Conduit shall be securely fastened to all sheet metal outlets, junction and pull boxes with two galvanized locknuts and bushing and care being taken to see that the full number of threads project through to permit the bushing to be drawn tight against the end of the conduit, after which the locknuts shall be made tight sufficiently to draw them into firm electrical contact with the outlet box.

d. Boxes

Install boxes appropriately as indicated.

1. Set boxes true and flush and rigidly secure in position.

2. Use painted or galvanized iron hangers to support ceiling outlets.

3. 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 same except where conduit is exposed.

e. Safety Switches

The safety switches shall be securely mounted in accordance with the NEC. The Contractor shall provide all mounting materials and install fuses in the FSS. The fuses shall be dual element on motor circuits.

f. Wire Cable

1. Install conductors in all raceways as required, unless otherwise noted, in a neat and workmanlike manner. Telephone conduits and empty conduits as noted, shall have a No. 14 galvanized or nylon pull wire left in place for future use.

2. Conductors shall be color coded in accordance with the NEC. Mains, feeders, subfeeders shall be tagged in all pull, junction, and outlet boxes and in the gutter of panels with approved code type wire markers.

3. No lubricant other than powdered soapstone or approved pulling compound may be used to pull conductors.

4. At least eight inches of slack wire shall be left in every outlet box whether it be in use or left for future use.

5. All conductors and connections shall test free of grounds, shorts, and opens.

6. Pull boxes required in runs over 100 feet or when more than three 90 degree bends are used or as indicated on the drawings.

7. Feeders are to be run above ground to all power panels and lighting panels unless indicated otherwise on drawings.

8. Conduit terminating inside of prestressed concrete panel voids shall be provided with necessary bushings to prevent damage to wiring run in voids.

g. Handling and Storage

Wire and cable shall be suitably protected from weather and other damage during storage and handling and shall be in first class condition after installation.

h. Wiring

All wiring shall be in strict accordance with the NEC, NFPA Codes 70 and 72, and all local electrical codes applying. Size and number of wires shall be in accordance with the wiring diagram furnished by the manufacturer or as shown on the drawings.

Splices and Tapes:

1. Splice only in accessible pull, junction, or outlet boxes.

2. Use mechanical wire splices and joints.

3. Insulate joint to at least double the thickness of wire insulation.

4. No underground splices are permitted.

5. Where motors have conduit terminal boxes, feeders shall be connected to same by flexible means.

6. All motors with sliding base mounting shall have not less than eighteen inches nor more than six feet of conduit connecting rigid conduit feed to motor terminal box.

7. Conductor splices shall be made only in junction boxes, terminal boxes, or pull boxes.

i. Grounding

1. Ground neutral leg of service and all noncurrent-carrying metallic parts of electric systems to water service pipe at entrance. Provide all wiring, grounding conductors, ten-foot by three-quarter-inch driven ground rods, and grounding devices required to comply with NEC and power company. Reference NEC 1978 Section 250-81.

2. Metallic parts to be grounded shall include cabinets, panelboards, outlet boxes, and fixtures.

3. Bond with suitable ground clamps.

j. Concrete Pads

The Contractor shall be responsible for all concrete pads, supports, piers, bases, foundations, and encasement required for the electrical equipment and conduit. The concrete pads for electrical equipment shall be six inches larger all around than the base of the equipment unless specifically indicated otherwise.

k. Lighting

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 specifications.

1. Lighting Fixture Installation:

   (a) Install level, plumb, and square.

   (b) Fasten rigidly in place.

2. Wiring between fluorescent lampholders and associated operating and starting equipment shall be of sizes not smaller than the sizes of the leads furnished with the approved types of ballasts 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. Unless otherwise specified or shown on drawings, all wiring in conjunction with incandescent fixture shall also conform to the requirements of the latest issue of the NEC and shall not be less than No. 16 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.

3. Joints in wiring within lighting fixtures shall be so spliced that they will be mechanically and electrically secure and then soldered and taped to provide insulation equal to that of the conductors being joined. In lieu of solder and tape, approved types of adequately insulated solderless pressure crimped type connectors may be furnished provided sizes used, method of application, and tools employed are in accordance with the particular manufacturere's recommendations. The use of the screwed-on type of solderless connector will not be approved for making connections in the wiring within lighting fixtures.

l. Accessories

The Contractor shall furnish and install, with no additional cost to the owner all accessories as noted or required to install and make workable all electrical and related items contained under this section of the specification.

m. Low Voltage Control Wiring

All remote-control wiring components shall be installed in accordance with the direction of the manufacturer.

3.02 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. Acceptance tests, after the equipment is completely installed, may be performed by the Owner's Engineer to demonstrate performance requirements, as specified herein. The field tests will be governed by provisions of applicable industry and institute standards.

c. Refer to Section 01660 for additional testing requirements.

d. As soon as electric power is available, all local inspections have been completed, power has been connected to serve the equipment in the building and everything is ready for final testing and placing in service, a complete operational test shall be made. The Contractor shall furnish all necessary instruments and equipment and make all tests, adjustments, and trial operations required to place the system in balanced and satisfactory operating condition and shall also furnish all necessary assistance and instructions to properly instruct the Engineer's authorized personnel in the operation and care of the system.

e. Prior to testing the system, the feeders and branch circuits shall be continuous from main feeders to main panels, to subpanels, to outlets, with all breakers and fuses in place. The system shall be tested free from shorts and grounds. Such tests shall be made in the presence of the Engineer.

f. No circuits shall be energized without the Engineer's approval.

g. The right is reserved to inspect and test any portion of the equipment and/or materials during the progress of its erection. The Contractor shall further test all wiring and connections for continuity and grounds before connecting any fixtures or equipment.

h. The Contractor shall test the entire system in the presence of the Engineer when the work is finally completed to insure that all portions are free from short circuits or ground faults.

i. The Contractor shall provide the Engineer with certification of the inspection and approval of an active member of the International Association of Electrical Inspectors of all work completed and included in the section if required. This Contractor shall be responsible for notifying the Inspector when work reaches inspection stage.

j. The Contract shall be responsible for notifying and paying the local authority having jurisdiction in order that local inspection may be carried out at the proper stage.

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Section 16500 - Lighting

PART 1 - GENERAL

1.01 Summary

a. The Contractor shall supply and provide all materials, fabrication, drawings, installation, testing and delivery of services as specified in this section and/or on the drawings for completion and proper operation of lighting equipment.

b. This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the equipment or systems described herein.

c. 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 Contractor to provide equipment and systems that have been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

d. The work includes supply, erection, complete installation and testing of the following:

1. Interior Building Lights

2. Exterior Building Light

1.02 Related Sections

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

Section 16050 - Basic Electrical Materials and Methods
Section 13120 - Pre-Engineered Structures

1.03 System Description

The lighting equipment includes interior and exterior lighting for the building. Interior lighting is switch controlled and used on an as required basis. The exterior light is controlled by a photoelectric eye that turns the light on at dusk and off at sunrise. The lights will all operate on 120 VAC electrical service.

1.04 Submittals

a. Contractor shall submit, in the manner and within the time limit as set forth in the Contract documents, 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.

b. Review of the drawings by the Engineer shall not relieve the Contractor of the entire responsibility for the engineering, design, workmanship and material under the Contract documents.

c. The drawings shall include, but will not be limited to, the following details:

1 - Overall dimensions and details of the location of all connections, supports and accessories and a bill of materials.

1.05 Quality Assurance

a. Contractor shall have a quality assurance program which will ensure that the equipment and services provided, will properly reflect the Owner's/Engineer's requirements. The program shall cover, as a minimum, the following areas:

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

PART 2 - PRODUCTS

2.01 Equipment

a. Contractor shall provide a fluorescent light fixture for interior use with two forty (40) watt bulbs each, for every 50 square feet of building floor space or as shown on the drawings.

b. Each interior light fixture shall run on 120 VAC electrical supply.

c. Building lights shall be arranged as shown on the drawings.

d. Provide brackets, supports, anchors, frames fast starters and ballasts required for a complete, operable system.

f. The Contractor shall provide all rapid start, cool white fluorescent lamps for all fixtures.

g. All lighting materials shall conform to the requirements of the NBFU and shall have appropriate Underwriters' Laboratories acceptance.

h. Contractor shall provide one 100 watt exterior, quartz, halogen or mercury vapor flood light to be installed as shown on the drawings. Light shall operate on 120 VAC.

i. Outdoor light shall be automatically controlled by a photo-electric eye so that it turns on at dusk and off at sunrise.

j. Exterior light shall be waterproof and suitable for extreme weather service.

2.02 Materials

a. All materials and equipment shall be suitably grounded and conform with National Electrical Code Standards.

b. Light fixtures and accessories shall be painted, galvanized, white metal, or treated to ensure a service life of ten years.

PART 3 - EXECUTION

3.01 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 the work.

c. All equipment shall be properly and securely installed such that undue stresses are not exerted on equipment and connections.

d. All work shall conform to the National Electrical Code standards.

3.02 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. Acceptance tests, after the equipment is completely installed, shall be performed by the Contractor to demonstrate performance requirements, as specified herein. The field tests will be governed by provisions of applicable industry and institute standards.

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Section 16700 - Communications

PART 1 - GENERAL

1.01 Summary

a. The Contractor shall supply and provide all materials, drawings, installation, testing and delivery of services as specified in this section and/or on the drawings for completion and proper operation of telephone services and alarm signal telemetering.

b. This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the equipment or systems described herein.

c. 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 Contractor to provide equipment and systems that have been designed, installed and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

d. The work includes supply, and complete installation and testing of the following:

1. Telephone Conduit
2. Alarm Panel and Signal Telemetering
3. Telephone Service

1.02 Related Sections

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

Section 16050 - Basic Electrical Materials and Methods

1.03 System Description

a. The communications will consist of telephone service in the building and alarm signal telemetering to the Brewster Sheriff's office. The connection of the telephone line will be performed by the local telephone company and will be at no additional cost to the Owner.

b. All relays, switches, hook-up costs, fees, conduits and accessories required for a complete, operable system will be at the Contractor's cost. Monthly line usage charges will be paid by others.

1.04 Submittals

a. Contractor shall submit, in the manner and within the time limit as set forth in the Contract documents, shop drawings showing connection details, anchorage details, arrangement of functional parts, and parts lists if applicable, for all equipment and materials furnished under this section.

b. The drawings shall include, but will not be limited to, the following details:

1. Overall dimensions and details of the location of all connections, supports and accessories and a bill of materials.

2. The arrangement of the functional parts and construction of internal parts. Exact location of terminals and controls shall be shown.

3. Electrical and instrumentation detail drawings containing sufficient detail of characteristics and locations.

1.06 Quality Assurance

a. Contractor shall have a quality assurance program which will ensure that the equipment and services provided, will properly reflect the Owner's/Engineer's requirements. The program shall cover, as a minimum, the following areas:

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

PART 2 - PRODUCTS

2.01 Equipment

a. Contractor shall provide an empty underground conduit, as shown on the drawings, to the nearest utility pole with telephone service.

b. The empty conduit shall conform to the New York Telephone Company standards and shall have a full length snake or drag line installed inside to allow for cable pulling by the Telephone Company.

c. Contractor shall provide a 24 volt dc alarm annunciator panel in the building to indicate system malfunctions and alarms.

d. The annunciator shall be suitable to transmit an alarm signal via New York Telephone Lines to the local Sheriff's office in Carmel, New York.

e. The alarms to be indicated are as follows:

1. Load Center Loss of Power
2. Clearwell Hi-Hi Level
3. System Shutdown
4. Waste Sump High Level
5. Spare
6. Spare

f. The annunciator panel shall include the following features:

1. Reset switch
2. Maintenance override switch
3. Back-up battery power supply with automatic switchover and recharging
4. Normally open and normally closed relay contacts for connection to the telephone line.
5. Detector Trip Indicator Lights.

(Provide, if applicable, statements describing the function, operation and other specific requirements of the equipment.)

g. The alarm panel shall operate on a 120 VAC power feed.

PART 3 - EXECUTION

3.01 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 the work.

c. All equipment shall be properly and securely installed such that undue stresses are not exerted on equipment and connections.

3.02 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. Acceptance tests, after the equipment is completely installed, shall be performed by the Contractor to demonstrate performance requirements, as specified herein. The field tests will be governed by provisions of applicable industry and institute standards.

c. Refer to Section 01660 for additional testing requirements.

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Section 16850 - Electrical Resistance Heating

PART 1 - GENERAL

1.01 Summary

a. This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the electric unit heater and electric duct heater described herein.

b. The work shall include supply of all materials, fabrication, drawings, installation, testing and delivery of services as specified in this section and/or on the drawings for completion and proper operation of this equipment as included in the Contract documents.

c. 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 Contractor 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.

d. The work includes supply, erection, complete installation and testing of the following:

1. One electric unit heater

2. One electric duct heater

1.02 Related Sections

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

Section 13120 - Pre-Engineered Structures
Section 15890 - Ductwork
Section 16050 - Basic Electrical Materials and Methods

1.03 System Description

a. The electrical unit heater will be hung in the building to help protect the pipes and other equipment from freezing during the cold months, and also to maintain a comfortable working temperature for maintenance operations.

b. The duct heater will be installed in the air blower intake duct to warm the stripping air to the tower. The warmer air will provide better mass transfer for removing the organics from the process water.

1.04 Design/Performance Requirements

The unit heater will be required to maintain an indoor temperature of 50° F. The duct heater shall provide warmed air at a minimum temperature of 40° F to the packed tower.

1.05 Submittals

a. Contractor 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 lists if applicable, for all equipment and materials furnished under this section.

Also see Section 01300 - Submittals

1.06 Quality Assurance

a. Contractor shall have a quality assurance program which will ensure that the equipment and services provided, will properly reflect the Owner's/Engineer's requirements. The program shall cover, as a minimum, the following areas:

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

1.07 Maintenance

a. See Section 01730 for specific details and correct procedures for compilation of the Operation and Maintenance manual.

b. A set of manufacturer recommended spare parts and supplies 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 unit heater and the duct heater.

PART 2 - PRODUCTS

2.01 Equipment

a. The electric unit heater shall be rated 3KW and designed to operate on single phase, 208V, 60HZ AC service. The unit will include a fan and motor.

b. Thermostatic control of the unit heater is provided by a unit-mounted, heavy-duty industrial type thermostat. Unit heaters are also furnished with manual reset thermal overload protection. The motor and the element circuits are disconnected if safe operating temperatures are exceeded. Thermostat shall have a temperature range of 40 to 80 degrees F. A thermometer shall also be supplied to indicate interior temperature.

c. The electric duct heater shall be rated 5KW and designed to operate on single phase, 240V, 60HZ AC service. Thermal overload protection will be provided with manual reset at the control panel. This heater will be sized to fit in the duct work specified in Section 15890.

PART 3 - EXECUTION

3.01 Erection/Installation

a. The equipment shall be installed 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 the work.

c. All equipment shall be properly and securely installed such that undue stresses are not exerted on equipment and connections.

3.02 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. Acceptance tests, after the equipment is completely installed, shall be performed by the Contractor to demonstrate performance requirements, as specified herein. The field tests will be governed by provisions of applicable industry and institute standards.

c. Refer to Section 01660 for additional testing requirements.

d. The unit heater for motor shall be given factory Routine Test or Manufacturer's Initial Short Commercial Test as necessary to determine that it is free from electrical and mechanical defects and to establish that the design and construction of the motor are satisfactory. Tests shall include rotation, megger and high potential tests.