FOR INFORMATIONAL PURPOSES ONLY - DO NOT USE FOR BIDDING

THIS PAGE SHALL BE COMPLETED BY CONTRACTOR SUBMITTING A BID ON GENERAL CONSTRUCTION CONTRACT NO. S35100-07G1						
ITEM NO.	APPROXIMATE QUANTITIES	ITEMS WITH UNIT PRICE WRITTEN IN WORDS				
1	Lump Sum	Base Bid for furnishing all labor, materials, equipment, and incidentals required for all work for the described in the Technical Specifications and not included in Item No. 2, unit costs, and allowances listed below. _____	N/A	N/A		
2	Lump Sum	Lump sum for furnishing all labor, materials, equipment, and incidentals required to design and install a temporary groundwater dewatering system to maintain required groundwater levels in the vicinity of dewatered digesters during cleaning and rehabilitation. (Section 31 23 19) _____	N/A	N/A		

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CONTRACT NO. S35100-07G1

ITEM NO.	APPROXIMATE QUANTITIES	ITEMS WITH UNIT PRICE WRITTEN IN WORDS				
3	3,900,000 Gallons of Digester Contents	All contract work associated with the removal, dewatering, hauling, and disposal of digester contents from three anaerobic digester, including but not limited to operation of the tank pump out system, odor control system, and sludge dewatering system. _____ Per Gallon of Digester Contents Removed				
4	355 Weekdays	All contract work associated with the continuous operation and maintenance of the groundwater dewatering system. _____ Per Weekday				
5	155 Weekend Days or Holidays	All contract work associated with the continuous operation and maintenance of the groundwater dewatering system. _____ Per Weekend Day or Holiday				

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ITEM NO.	APPROXIMATE QUANTITIES	ITEMS WITH UNIT PRICE WRITTEN IN WORDS				
6	15 Each	All contract work associated with the removal and replacement of 6-inch digester sludge plug valves including required fittings and all other incidentals. _____ Each				
7	4 Each	All contract work associated with the removal and replacement of 8-inch digester sludge plug valves including required fittings and all other incidentals. _____ Each				
8	1 Each	All contract work associated with the removal and replacement of 10-inch digester sludge plug valves including required fittings and all other incidentals. _____ Each				

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ITEM NO.	APPROXIMATE QUANTITIES	ITEMS WITH UNIT PRICE WRITTEN IN WORDS				
9	3 Each	All contract work associated with the removal and replacement of 4-inch digester gas plug valves including required fittings and all other incidentals. _____ Each				
10	5 Each	All contract work associated with the removal and replacement of 6-inch digester gas plug valves including required fittings and all other incidentals. _____ Each				
11	9 Each	All contract work associated with the removal and replacement of 8-inch digester gas plug valves including required fittings and all other incidentals. _____ Each				

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ITEM NO.	APPROXIMATE QUANTITIES	ITEMS WITH UNIT PRICE WRITTEN IN WORDS				
12	9 Each	All contract work associated with the removal and replacement of 10-inch digester gas plug valves including required fittings and all other incidentals. _____ **Each**				
13	6 C.F.	Concrete Corbel Spall Repair _____ Per Cubic Foot				
14	3,000 L.F.	Type I Epoxy Cementitious Crack Repair _____ Per Linear Foot				
15	225 L.F.	Type II Epoxy Injection Crack Repair _____ Per Linear Foot				

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ITEM NO.	APPROXIMATE QUANTITIES	ITEMS WITH UNIT PRICE WRITTEN IN WORDS				
16	300 L.F.	Type III Waterproof Injection Grout Crack Repair _____ Per Linear Foot				
17	60 C.F.	Surface Spall Repair _____ Per Cubic Foot				
18	150 C.F.	Formed Spall Repair _____ Per Cubic Foot				
19	4,200 S.F.	Cement Based Textured Coating _____ Per Square Foot				

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ITEM NO.	APPROXIMATE QUANTITIES	ITEMS WITH UNIT PRICE WRITTEN IN WORDS				
20	15 Each	Steel Pipe Support Bracket Replacement _____ Each				
21	Allowance	For costs associated with unforeseen hazardous materials remediation. One Hundred Thousand Dollars and No Cents _____	N/A	N/A	$100,000	00
22	Allowance	For miscellaneous structural repair work as directed by the County regarding three anaerobic digesters / storage tanks. Fifty Thousand Dollars and No Cents _____	N/A	N/A	$50,000	00

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ITEM NO.	APPROXIMATE QUANTITIES	ITEMS WITH UNIT PRICE WRITTEN IN WORDS				
23	Allowance	For miscellaneous digester gas and sludge pipe inspection and replacement including pipe supports and incidentals. Two Hundred and Fifty Thousand Dollars and No Cents _____	N/A	N/A	$250,000	00
24	Allowance	For miscellaneous equipment repairs and replacement work as directed by the County regarding three anaerobic digesters, including but not limited to heat exchangers, gas recirculation compressors, groundwater relief valves, groundwater monitoring wells, digester sludge and gas piping, valves, and appurtenances, and all other associated equipment. Fifty Thousand Dollars and No Cents _____	N/A	N/A	$50,000	00

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ITEM NO.	APPROXIMATE QUANTITIES	ITEMS WITH UNIT PRICE WRITTEN IN WORDS				
25	Allowance	For all labor, materials, cables, conduit, and equipment required to provide additional power as required by the Contractor's temporary systems. Seven Hundred Thousand Dollars and No Cents _____	N/A	N/A	$700,000	00

GENERAL CONSTRUCTION

ALLOWANCES. It is expressly understood and agreed that the total Bid presented in this Proposal is the basis for establishing the amount of the Bid Security and includes the following allowances:

1. Item No. 21.: An Allowance of One Hundred Thousand dollars ($100,000) for unforeseen hazardous material remediation as described above.
2. Item No. 22.: An Allowance of Fifty Thousand dollars ($50,000) for miscellaneous structural repair work as directed by the County regarding nine anaerobic digesters / storage tanks.
3. Item No. 23.: An Allowance of Two Hundred and Fifty Thousand dollars ($250,000) for miscellaneous digester sludge and gas piping inspection and replacement including pipe supports and incidentals.
4. Item No. 24: An Allowance of Fifty Thousand dollars ($50,000) for miscellaneous equipment repairs and replacement work as directed by the County regarding three anaerobic digesters, including but not limited to heat exchangers, gas recirculation compressors, groundwater relief valves, groundwater monitoring wells, and all other associated equipment.
5. Item No. 25.: An Allowance of Seven Hundred Thousand dollars ($700,000) for all labor, materials, cables, conduit, and equipment required to provide additional power as required by the Contractor's temporary systems.

All in accordance with the requirements of Division 1, Special Conditions; Section 01 11 00, Summary of Work; and Section 01 20 00, Measurement and Payment.

Final Contract Payment for allowance items shall be based upon actual payments, and not on the approximate amounts cited herein.

DETERMINATION OF LOW BID. Determination of low Bid will be made by comparing the total Bid which shall include the lump sum Base Bid price, unit price totals and allowances, minus the Deduct Alternate(s), taken in order, or none of them, whichever amount(s) shall be judged by the Commissioner of Public Works to be in the best interest of the County.

MAJOR EQUIPMENT ITEMS. The Bidder shall fill in the names and addresses of the proposed manufacturers and/or suppliers for the major equipment items tabulated hereinafter. It is expressly understood that the furnishing of this information will not relieve the Bidder of any requirements of the Contract Documents and failure to fill out properly is grounds for rejection.

Specification Number	Description	Manufacturer and/or Supplier
46 73 16	Dual-Deck Truss-Type Floating Digester Covers	

CEDAR CREEK WATER POLLUTION CONTROL PLANT

DIGESTER REHABILITATION AND CLEANING PROJECT – PHASE 1

CONTRACT NO. S35100-07G1

TABLE OF CONTENTS

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NO TEXT ON THIS PAGE

SECTION 01 11 00

SUMMARY OF WORK

PART 1 – GENERAL

1.01 SUMMARY

A. The Work to be done under this Contract and in accordance with these Specifications consists of the furnishing of equipment, superintendence, labor, skill, material, and all other items necessary for the cleaning of the existing digesters and storage tanks, heat exchangers, associated piping and repair work, and replacement of the existing digester covers as ordered by the County at the Cedar Creek Water Pollution Control Plant – Contract No. S35100-07G1.

B. The words "Contractor", "General Contractor", "Structures and Equipment Contractor", "HVAC Contractor" and "Electrical Contractor" when specified in the Contract Documents shall refer to the one single contractor for the work under Contract S35100-07G1 specified herein.

C. The Cedar Creek Water Pollution Control Plant serves the eastern area of Nassau County and is located on Merrick Road in Wantagh, New York. The Contractor shall perform all Work required for cleaning and repair in accordance with the Contract Documents and subject to the terms and conditions of the Contract, complete and ready for use.

D. The existing plant will be maintained in continuous operation by the County during the entire construction period of the contract. Work under each Contract shall be so scheduled and conducted by each Contractor that such Work will not impede any treatment process, reduce the quality of the plant effluent or cause odor or other nuisance. In performing the Work shown and specified, the Contractor shall plan and schedule his Work to meet the plant operating requirements.

E. The construction sequence, as described in Division 1, General Requirements, Section 01 14 00 - Coordination with Owner's Operations, must be maintained so that the County will meet the appropriate State Pollutant Discharge Elimination System Permit.

F. As highlighted in the Instruction to Bidders (ITB) Section of the Contract, many of the Contractor's work activities will be affected by mandatory adherence to the terms and conditions of a plant site storm water pollution prevention plan to be administered by the County and their duly authorized representatives. As explained in the ITB Section of this Contract, implementation of this plan fulfills Federal and State regulations for storm water pollution prevention. The pollution prevention plan generally requires site workers, such as contractors and subcontractors, to employ best practical management practices during performance of their work to prevent storm water pollution. Representatives of the Contractor will receive some instruction in such management practices. Additional details concerning storm water permit compliance and pollution prevention plans can be found in the Federal Regulations 40 CFR 122 & 123.

G. Before bidding, the Contractor shall visit the site of the work. The Contractor shall obtain all necessary information, and make their own determinations of any and all conditions which may affect in any way the performance of their work and their bid prices under the Contract. All pertinent data and dimensions with regard to existing construction shall be verified by the Contractor.

H. Where articles of the Instructions to Bidders, Agreement and General Conditions are repeated in the Sections of Division 1, General Requirements, it is intended to elaborate or qualify such articles. It is not intended that other articles of the above documents shall be omitted or that additional requirements set forth in the above documents and noted herein shall be excluded from Contract requirements unless specially noted as such hereinafter.

I. Where the words "Contract" and "Contractor" are used in Sections of Division 1, Special Conditions, they shall apply equally to all parties entering into agreements with the County to perform Work specified herein and to all Contracts derived from said agreements. Should any particular requirement be limited to one Contractor only, it will be so stated.

1.02 DESCRIPTION OF WORK

A. The cleaning, repair and replacement work under this contract will require work to be executed for General discipline. The description of work below is intended to help clarify and organize this contract, but is not intended to describe every detail or component in the scope of the work. Work under this Contract includes, but is not limited to, the following:

1. Cleaning of three digesters inclusive of three (3) primary digesters, associated digester piping, gas diffusers and gas diffuser piping.

a. Following the turnover of each digester from the County, testing of gas and sludge piping and valves required for proper isolation of digesters.

1) Making repairs as necessary to completely isolate each digester tank.

b. Measuring digester content quantities for each digester.

c. Tank cleaning shall include:

1) Removing the contents (sludge, tank solids and wash water) from the digesters, conveying the contents to the Contractor's temporary dewatering system, conveying the dewatered digester contents to the Contractor's sludge handling contractor's vehicle, and hauling and disposing of dewatered sludge at the Contractor's disposal facility

2) Complete washing down of the tanks walls, covers/ceilings, floor, supports, piping and other appurtenances.

d. Providing, setting up, and testing a portable activated carbon canister type odor control system.

1) Operating odor control system continuously from the point in time when the hatches are opened until the entire contents of the digester have been removed and the interior becomes dry and odor free.

e. Cleaning and inspecting existing groundwater monitoring wells which are to be used during construction to ensure groundwater is at an acceptable level prior to removing contents from a digester or storage tank to prevent tank damage.

1) Repairing, as necessary, existing groundwater monitoring wells.

f. Cleaning and inspecting existing groundwater relief valves in all tanks.

1) Repairing, as necessary, the groundwater relief valves in all tanks.

g. Installing a groundwater dewatering system designed to maintain groundwater levels in the vicinity at an acceptable level to allow safe tank cleaning and rehabilitation activities.

1) Operating groundwater dewatering system as necessary during the cleaning and rehabilitation of the digesters.

h. Providing pumps, strainers, adaptors or other appurtenances and piping to deliver screened effluent water required for cleaning activities from the screen effluent piping to the Contractor's equipment.

i. Providing tanks, pumps, piping, and other appurtenances to discharge the wastewater (seal waters, wash waters, filtrate etc.) into the Filtrate Wet Well.

j. Providing a flush truck and other equipment for conveying the potable water from the hydrants to his equipment.

k. Flushing of the piping using sludge recirculation pumps by partially filling the cleaned digester with effluent water.

1) Video inspection of sludge digester piping .

2) Replacing, as necessary, sludge digester piping

l. Preparing surface and applying coating to all sludge piping within digesters.

m. Preparing surface and applying coating to all sludge piping wall brackets.

2. Demolishing and removing of three (3) digester dual-deck floating digester covers and cover appurtenances including but not limited to gas domes, entrance hatches, manholes,

cover rollers and spring shoes, anti-rotation devices, pressure/vacuum relief valves, access ladders and concrete ballasting.

a. Providing lead-based paint removal and abatement on and disposal of associated construction waste for demolition and removal of digester covers.

3. Installing three (3) dual-deck floating digester covers and cover appurtenances including but not limited to gas domes, entrance hatches, manholes, cover rollers and spring shoes, anti-rotation devices, pressure/vacuum relief valves, access stairs and stairways, and concrete ballasting.

4. Removal of existing Heat Exchanger #3 and associated piping and equipment and installation of one (1) new replacement heat exchanger and associated piping and equipment.

5. Cleaning of two (2) existing heat exchangers, Heat Exchanger No. 1 and No. 2.

   a. Coordinating with the heat exchanger manufacturer to provide an inspection and identify necessary repairs.

   b. Repairing heat exchangers as necessary.

6. Start-up and commissioning of Recirculation Gas Compressors No. 4, 5, 9 and 10.

   a. Inspecting associated digester gas piping, valves, and appurtenances necessary to perform said start-up and commissioning including video inspection of digester gas piping.

   b. Cleaning/repairing associated gas piping, valves, and appurtenances necessary to perform said start-up and commissioning.

7. Removal of existing Flow Element FE 84058 and Flow Indicating Transmitter FIT 84058 and replacement with new 4” Venturi Flow Meter and Differential Pressure Indicating Transmitter.

8. Inspecting and replacing as necessary numerous mechanical items as shown on the drawings and listed, but not limited to, the items below:

   a. Sludge valves identified for replacement

   b. Gas valves identified for inspection and replacement

9. Obtaining all the necessary permits for performing the work (air discharge, 360 for landfill, potable water, dewatering)

10. Miscellaneous repair work including concrete, welding, expansion joint, seal patching, and all other valve replacement as authorized by the County and subject to actual inspection after the cleaning of tanks.

1.03 PRIME CONTRACTS

A. The Project is not subdivided into separate Prime Contracts due to the type of work involved. The Work under this Contract shall be the responsibility of a single Prime Contractor skilled in the installation of the systems as described. The Prime Contractor may subcontract such Work as it requires mechanics other than those he normally employs, but the entire responsibility for complete performance of the respective Prime Contract shall remain with the Prime Contractor referred to above.

For additional Subcontractor requirements, see the Agreement, Article XV, "Limitations and Consent", and Article XVI, "Responsibility".

B. The Technical Specifications of the Contract Documents include descriptions of all classifications of Work under this Project. Wherever used in a section of Division 02 through Division 46, the term "Contractor" shall refer to the Prime Contractor who is assigned the major work of that Section (unless specifically referred to otherwise).

C. The Prime Contractor shall cooperate and coordinate his Work with the Work of any other Contractor, utility service company or County personnel as more fully set forth in the General Conditions, Article GC-7, "Coordination with other Contractors" and Article GC-14, "Contractor Submissions", Paragraph B.3., Coordination Drawings.

1.04 CONTRACT DOCUMENTS

A. The Work to be done is shown on the set of Contract Documents entitled "Cedar Creek Water Pollution Control Digester Rehabilitation and Cleaning – Phase 1".

B. The Contract Documents consist of the Notice and Instructions to Bidders, Proposal, Agreement, General Conditions, the Technical Specifications, and the Contract Drawings.

1.05 DOCUMENTS FOR INFORMATION ONLY

A. The following documents are available for inspection:

1. Lead-Based Paint Survey Report for: Digester Tanks Rehabilitation & Cleaning, Precision Project No. 2108-15-0001, Prevision Environmental Inc., June 2015

2. Lead-Based Paint Survey Report for: Digester Tanks Rehabilitation & Cleaning, Precision Project No. 2108-15-0001, Prevision Environmental Inc., November 2015

3. Digester Facility Hazardous Materials Survey, Bidwell Environmental, 2022

4. Submittal D-11481-001-B “Sludge Heat Exchanger”, Contract S35100-02G, Hazen and Sawyer, August 2015

5. Submittal D-11481-002-B “Sludge Heat Exchanger Accessories”, Contract S35100-02G, Hazen and Sawyer, August 2015

6. Submittal D-11485-001-C “Digester Gas Recirculation Compressors”, Contract S35100-02G, Hazen and Sawyer, February 2016

7. Submittal D-11485-005-1 “Resubmittal of Compressor 9 & 10 Layout”, Contract S35100-02G, Hazen and Sawyer, November 2017

8. Submittal D-11485-010-0 “Compressor 4 & 5 Layout”, Contract S35100-02G, Hazen and Sawyer, December 2017

9. Geotechnical Data Report, Cedar Creek WPCP Expansion, Wantagh, New York, Malcolm Pirnie, Inc., Mueser Rutledge Consulting Engineers, April 1985.

10. Contract 1002-3P-1, 2, 3& 4 Sewage Disposal District No. 3 Water Pollution Control Plant, As Built Drawings, Consoer, Townsend & Associates, Dec 1971 (selected drawings only).

11. Contract S3C052G, – Cedar Creek Water Pollution Control Plant Improvements, As Built Drawings, Malcolm Pirnie Inc., March 1994 (selected drawings only).

12. Contract S3C042G, – Cedar Creek Water Pollution Control Plant Digester Rehabilitation, As Built Drawings, Malcolm Pirnie Inc., March 1988 (selected drawings only).

1.06 CONSTRUCTION CONTRACTS, OTHER PROJECTS

A. The following Contracts will be in progress at the start of this Contract:

1. The Contractor's attention is specifically directed to the fact that because of the work on other contracts within and adjacent to the limits of this Contract he may not have exclusive occupancy of the territory within or adjacent to the limits of this Contract.

2. The Contractor will be required to cooperate with all other Contractors and the owners of the various utilities and to coordinate and arrange the sequence of his work in such a manner that all work, proposed or in progress within or adjacent to the limits of the Contract, can be accessed with as little interference as possible.

3. In case of interference between the operations of a Contractor and/or utility owners and/or other Contractors, the Commissioner shall be the sole judge of the rights of each party and of the sequence for work necessary to expedite the completion of all the work progressed or about to be progressed within or adjacent to the Contract limits.

B. The direction of the Commissioner on the order and sequence of the work shall not in itself constitute a basis for extra compensation or an Extension of Time.

1.07 WORK BY OWNER AND OTHERS

A. During the sludge and solids removal process for each Digesters, the Owner shall be responsible for the first stage – lowering of the sludge level. See Section 46 73 72 – Cleaning of Digesters and Storage Tanks.

B. Owner will perform the following in connection with the Work: Operate all existing valves, gates, pumps, equipment, and appurtenances that will affect Owner's operation, unless otherwise specified or indicated.

1.08 OWNER-FURNISHED EQUIPMENT AND MATERIALS

A. Items of equipment and material to be furnished by Owner:

1. Replacement heat exchanger for Heat Exchanger #3 and associated equipment

2. Gas Recirculation Compressors #4, #5, #9, and #10

B. Owner's Responsibilities:

1. Heat Exchanger #3

a. Owner shall cease operation and shutdown equipment upon notification from the Contractor that Contractor is ready to proceed with the work.

2. Gas Recirculation Compressors #4, #5, #9, and #10

a. Owner shall cease operation and shutdown equipment upon notification from the Contractor that Contractor is ready to proceed with the work.

C. Contractor's Responsibilities:

1. Heat Exchanger #3

a. Coordinate with Owner and Engineer prior to removal of existing equipment from service.

b. Remove existing Heat Exchanger #3 and associated piping and equipment during scheduled shutdown.

c. Install replacement heat exchanger, furnish, and install required piping to connect to the sludge transfer system. Coordinate with heat exchanger manufacturer to start up and commission new equipment.

2. Gas Recirculation Compressors #4, #5, #9, and #10

a. Coordinate with Owner and Engineer prior to start up and commissioning of gas recirculation compressors.

b. Inspect upstream gas piping from the Digesters to the gas recirculation compressors as directed by the Owner and Engineer, and make repairs as necessary.

c. Coordinate with gas recirculation compressor manufacturer to start up and commission gas recirculation compressors.

1.09 GENERAL ARRANGEMENT

A. The Contract Drawings indicate the extent and general arrangement of the Work. The specific equipment proposed for use by the Contractor on the Project may require changes in the construction detailed on the Contract Drawings, and all such changes shall be performed in accordance with the requirements of the General Conditions, Article GC-17, "Materials and Equipment, Approvals, Substitutions and Deviations", and shall be made without additional cost to the County and shall include the increase in costs of the other Contracts.

B. In preparation of the revised plans, clearance, access, walkway widths, stairways, headroom and other building and equipment layout features shall be equal to those shown on the original Plans. All materials involved in the redesign shall conform to the applicable provisions of the Detailed Specifications.

1.10 PIPING, CONDUIT AND DUCT LAYOUT

A. In accordance with the requirements of the Agreement, Article XII, "Coordination of Work", and the General Conditions, Article GC-14, "Contractor Submissions", paragraphs D, E, J, the K Layout and Installation Drawings, the Coordination Drawings, the piping, conduit, duct, and support layout shall be coordinated by all Prime Contractors.

B. In setting all types of hangers and supports, each Prime Contractor shall line up the Work properly, and particular care shall be used to obtain the most orderly, systematic, and compact piping, conduit, and duct layout possible. The Prime Contractors shall cooperate with each other so that piping, conduit, and ducts installed, by whichever Contractor, are supported or hung on the same or similar hangers as conditions permit and that all other details of the entire installation of exposed piping, conduit and ducts are jointly planned so that a completely unified piping, conduit and duct installation, without duplication of hangers, shall result. All piping, conduit and ducts shall not be hung or supported by existing pipe hangers unless otherwise noted. All piping installed overhead is required to have a minimum clearance from finished floor of 7'-6".

1.11 AREA CLASSIFICATIONS

A. Materials and equipment shall conform to the area classification(s) shown, specified, and required.

1. All areas of work under this Contract shall be considered Class 1 Div 1, Group D unless otherwise approved by the County.

1.12 SEQUENCE AND PROGRESS OF WORK

A. Requirements for sequencing and coordinating with Owner's operations, including maintenance of plant operations during construction, and requirements for tie-ins and shutdowns, are in Section 01 14 00 - Coordination with Owner's Operations.

1.13 TIME OF WORK

A. Overtime work by each Contractor is necessary to comply with the requirements of the Contract Documents and shall be considered as normal procedure under this Contract, and the Contractor shall make no claims for extra compensation as a result thereof. The Contractor shall be prepared to work around-the-clock and supply multiple work crews as necessary to complete the work including testing and acceptance as specified, within the specified time frame and the time of completion set forth in the Contract Documents.

B. If it shall become imperative to perform Work at night, the County shall be informed a reasonable time in advance of the beginning of such Work. Temporary lighting and all other necessary facilities for performing and inspecting the Work shall be provided as required and as specified in Division 1, Section 01 51 00 - Temporary Facilities.

C. Unless otherwise specifically permitted, all Work that would be subject to damage shall be stopped during inclement, stormy, or freezing weather. Only such work that will not cause injury to workmanship or materials will be permitted. The Contractor shall carefully protect his Work against damage or injury from the weather, and when Work is permitted during freezing weather, he/she shall provide and maintain approved facilities for heating the materials and for protecting the finished Work.

D. The Contractor shall request permission, in writing, to perform contractual work outside the regular County working hours of 7:00 AM to 3:30 PM, Monday through Friday, (except for dewatering operations), or on Official County Holidays or on weekends. This written request should be received by the County 24 hours in advance of beginning the work. The Contractor is responsible for coordination with the County Engineer and/or his duly authorized representative prior to the start of the work to determine the dates of observance of the Official County Holidays that may occur during the course of this Contract. The Official County Holidays are:

New Years Day

Martin Luther King, Jr. Day

Lincoln's Birthday

Washington's Birthday

Memorial Day

Independence Day

Labor Day

Columbus Day

Election Day

Veteran's Day

Thanksgiving Day

Friday after Thanksgiving Day

Christmas Day

Failure of the Contractor to consider Official County Holidays during the preparation of their work plans and schedules shall not be cause for a delay claim against the County.

Should circumstances arise, during the course of the Contract, (except for dewatering operations), where the Contractor requests approval to work outside the County's working hours (7:00 AM to 3:30 PM) or on Official County Holidays or on weekends, testing, or work deemed necessary by the County to have County personnel present and it is granted, the Contractor will reimburse the County for the cost of providing inspection or plant assistance. Furthermore, failure of the Contractor to have considered such contingency cost in his Bid price shall not be cause for extra work claims to the County at a later date.

1.14 CONTRACTOR'S USE OF SITE

A. Contractors' use of the Site shall be confined to the areas shown. Contractors shall share use of the Site with other contractors and others specified in this Section.

B. Contractor shall move stored products that interfere with operations of Owner, other contractors, or others performing work for Owner.

1.15 NOTICES TO OWNERS AND AUTHORITIES OF PROPERTIES ADJACENT TO THE WORK

A. Notify owners of adjacent property and utilities when execution of the Work may affect their property, facilities, or use of property.

B. When it is necessary to temporarily obstruct access to property, or when utility service connection will be interrupted, provide notices sufficiently in advance to enable affected persons to provide for their needs. Conform notices to Laws and Regulations and, whether delivered orally or in

writing, include appropriate information concerning the interruption and instructions on how to limit inconvenience caused.

C. Notify utility owners and other concerned entities at least 48 hours prior to cutting or closing streets or other traffic areas or excavating near Underground Facilities or exposed utilities.

1.16 REGULATORY AGENCY ACCESS TO CONSTRUCTION SITE

A. Whenever construction work is in progress or preparation, the Contractor shall permit access and inspection and shall provide proper and necessary facilities to the representatives of the County, Engineer and Regulatory Agencies including, but not limited to, the New York State Department of Environmental Conservation and the New York State Environmental Facilities Corporation.

1.17 SITE INSPECTIONS

A. In order to arrange for an inspection of the site, the bidder shall contact Ms. Karen Fay, project manager from the County's Water and Wastewater Engineering Unit, telephone (516) 571-7512 or via email at Kfay@nassaucountyny.gov. For further details regarding "Bidder Responsibility" refer to the "Instruction to Bidders" Section of these Specifications.

1.18 CONTRACTOR'S RESPONSIBILITY FOR TEMPORARY HEATING

A. Temporary Heating shall be furnished and maintained by the General Contractor as specified in Section 01 51 00 – Temporary Facilities.

1.19 RESPONSIBILITY FOR TEMPORARY LIGHTING

A. Temporary lighting shall be furnished and maintained by the Contractor as specified in Section 01 51 00 – Temporary Facilities.

1.20 WORKSITE SECURITY – CONTRACTOR'S OBLIGATIONS

A. All Contractors must participate in a security program designed to safeguard sewage (conveyance, treatment, etc.) facilities/sites, as well as all the site workers and the neighboring public. Each site visitor/worker employed (directly or indirectly) by the prime contractor (subcontractors, equipment manufacturer representatives, apprentices, delivery people, etc.) will be required to provide appropriate photographic identification to obtain the necessary authorization for logged entry into the site. In most cases, the only acceptable photographic identification will be a valid driver's license or passport. Thereafter, the worker/visitor will be issued a pass or badge that allows them certain predetermined access within the site. This badge/pass must be worn on the worker's/visitor's outermost garment and be visible at all times. The Prime Contractors must notify the County, in advance, all personnel expected to be at a project site of the aforementioned requirements for entry. At the end of a worker's/employee's worksite employment, issued passes must be returned.

B. Site Security Program Requirements will be reviewed for all prime contractors at the Pre-Construction Meeting and subsequent project meetings. Failure to adhere to the security program will be viewed as a "contractual obligation failure" and will be subject to remedial actions by the County as stipulated in the Contract(s). The security program may be revised as necessary program improvements are incorporated. The Contractor(s) will receive advanced notification of any new program changes and will be expected to comply.

1.21 WORKING MEETING

A. One working meeting will be held after award of Contract, but prior to starting work at the site to review all details, delivery of submittals, training, and planning of work for completion in time. This meeting is in addition to all other meetings specified elsewhere in this Contract.

1.22 PARTIAL UTILIZATION BY OWNER

A. Owner reserves the right to enter and use portions of the Work prior to Certificate of Substantial Completion is issued by Engineer.

B. Owner shall be responsible to prevent premature connections by private and public parties, persons, or groups of persons, before Engineer issues Certificate of Substantial Completion for the portion of Work being partially utilized by Owner.

C. Contractor shall cooperate with Owner, Owner's agents, and Engineer to accelerate completion of Work designed for partial utilization by Owner in accordance with Contractor's progress schedule.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 14 00

COORDINATION WITH OWNER'S OPERATIONS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Requirements for coordinating with Owner's operations during the Work and included requirements for tie-ins and shutdowns necessary to complete the Work without impact on Owner's operations except as allowed in this Section.

2. Contractor shall provide labor, materials, tools, equipment, and incidentals shown, specified, and required to coordinate with Owner's operations during the Work.

B. General Requirements:

1. The intent of this section is to have the Contractor perform the Work in such a manner that continuous, uninterrupted treatment and all essential services and facilities are maintained operational throughout the construction period.

2. All work described herein shall be performed by the Contractor unless otherwise noted.

3. Except for shutdowns specified in this Section, perform the Work such that Owner's facility remains in continuous satisfactory operation during the Project. Schedule and conduct the Work such that the Work does not: impede Owner's production or processes, create potential hazards to operating equipment and personnel, reduce the quality of the facility's products or effluent, or cause odors or other nuisances.

4. Work not specifically covered in this Section or in referenced Sections may, in general, be completed at any time during regular working hours in accordance with the General Conditions and Supplementary Conditions, subject to the requirements in this Section.

5. Contractor has the option of providing additional temporary facilities that can eliminate or mitigate a constraint without additional cost to Owner, provided such additional temporary facilities: do not present hazards to the public, personnel, structures, and equipment; that such additional temporary facilities do not adversely affect Owner's ability to comply with Laws and Regulations, permits, and operating requirements; that such temporary facilities do not generate or foster the generation of odors and other nuisances; and that requirements of the Contract Documents are fulfilled.

6. Coordinate shutdowns with Owner and Engineer. When possible, combine multiple tie-ins into a single shutdown to minimize impacts on Owner's operations and processes.

7. Do not shut off or disconnect existing operating systems, unless accepted by Engineer in writing. Operation of existing equipment will be by Owner unless otherwise specified or indicated. Owner does not guarantee that the existing equipment will be free of leaks. Where necessary for the Work, Contractor shall seal or bulkhead Owner-operated gates and valves to prevent leakage that may affect the Work, Owner's operations, or both. Provide temporary watertight plugs, bulkheads, and line stops as required. After completing the Work, remove seals, plugs, bulkhead, and line stops to satisfaction of Engineer.

8. Any Contractor's activities (except dewatering operation) during the period 3:30 PM to 7:00 AM, Monday through Friday or on Official Owner Holidays or on weekends, must have prior approval of the Owner. A written request should be received by the Owner 24 hours in advance of beginning the work. The Contractor is responsible for coordination with the Owner's Engineer and/or their duly authorized representative prior to start of the work to determine the dates of observance of the Official Owner Holidays that may occur during the course of this Contract. Failure of the Contractor to consider Official Owner Holidays during the preparation of their work plans and schedules shall not be cause for a delay claim against the Owner.

9. Should circumstances arise, during the course of the Contract, (except dewatering operation) where the Contractor requests approval to work outside the Owner's working hours (7:00 AM to 3:30 PM) or on Official Owner Holidays or on weekends, testing, or work deemed necessary by the Owner to have Owner personnel present and it is granted, the Contractor will reimburse the Owner for the cost of providing inspection or plant assistance. Furthermore, failure of the Contractor to have considered such contingency cost in their Bid price shall not be cause for an extra work claim to the Owner at a later date.

10. The Contractor and his employees shall observe all safety regulations in force at the Plant and shall not be permitted to enter or use Plant facilities unless specifically authorized to do so by the Owner.

11. Existing and new underground facilities such as electrical duct banks, pipelines, etc., in, under and crossing plant roads have been designed for a maximum wheel load in accordance with AASHTO H-20. Contractor shall not exceed this weight limit. Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressure that will endanger it. For all construction activities that require a crane, heavy machinery etc., the Contractor shall submit a safe structural loading analysis on the existing facilities. Approval of the analysis is required before any work can proceed. The analysis shall require a Professional Engineer's Certification for New York State as part of the submittal to the Engineer. Contractor shall take all provisions necessary to distribute concentrated loads due to cranes and heavy machinery.

12. As a minimum, construction areas, roadways, offices, shops, corridors, process areas, storage areas, etc. shall be lighted in conformance with OSHA (Electrical, Construction

Part 1926) to not less than the minimum illumination intensities (foot candles) listed in Table D.3 while any work is in progress. The Owner reserves the right to request additional lighting at no additional cost to the Owner.

13. The costs for all temporary facilities, maintenance of services, and all other work specified in these specifications shall be borne by the Contractor unless specifically stated otherwise. The costs for all the aforementioned work are deemed included in the lump sum bid price.

C. Continuous Treatment Provision:

1. Federal regulations prohibit bypassing of untreated or partially treated wastewater or sewage during construction Work.

2. Contractor shall provide labor, equipment, materials, and incidentals to provide continuous treatment to the level prior to construction Work.

3. Contractor shall be responsible for providing temporary pumping facilities, systems, piping, valve, appurtenances, equipment, materials, and temporary utilities necessary to complete the Work without treatment bypassing.

D. Related Sections:

1. Section 01 11 00 – Summary of Work

2. Section 01 25 00 – Substitution Procedures

3. Section 01 73 00 – Execution of Work

4. Section 31 23 19 – Groundwater Monitoring, Control, and Dewatering

5. Section 46 73 16 - Dual Deck Truss-Type Floating Digester Covers

6. Section 46 73 72 - Cleaning of Sludge Digesters and Storage Tanks

1.02 REFERENCES

A. Definitions:

1. A “shutdown” is when a portion of the normal operation of Owner’s facility, whether equipment, systems, piping, or conduit, has to be temporarily suspended or taken out of service to perform the Work.

2. All references to days in this Section are to be construed as consecutive calendar days (ccds), and all references to "continuous" in this section are to be construed as uninterrupted (24/7) until completed. For times noted in hours, the time is meant to be measured as consecutive hours and not in terms of normal daily working hours. Any and all premium or overtime costs to comply shall be included in the lump sum bid.

3. “Owner” is Veolia, Nassau County, or both.

4. “Engineer” is the Owner’s representative.

5. “Contractor” is the selected bidder who has been issued a Notice to Proceed from the Owner to complete the Work as described in the Contract Documents.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Review installation procedures under other Specification sections and coordinate Work that must be performed with or before the Work specified in this Section.

2. Notify other contractors in advance of Work requiring coordination with Owner’s operations, to provide other contractors sufficient time for work included in their contracts that must be installed with or before Work specified in this Section.

3. When possible, combine multiple tie-ins into a single shutdown to minimize impacts on Owner’s operations and processes.

B. Pre-Shutdown Meetings: Contractor shall schedule and conduct meeting with Owner and Engineer prior to scheduling shutdown and start of work at the site to determine the plan of work, schedule, submittal requirements, training, and the order of rehabilitation.

1. Ongoing MOPO Meetings – A working MOPO meeting with the Owner, Contractor, and Engineer will be held prior to the start of work on each digester to review the Contractor’s MOPO plan for the next tank/phase. Contractor is required to conduct a day meeting (working meeting) with the Owner and Engineer on the day of the Notice to Proceed. The Contractors will be required to present his means and methods and sequence of Work for executing the requirements of this Contract. Contractor shall be prepared with presentation materials and schedules to thoroughly address the project approach. Any problems or complexities that exist with the project approach should be identified and reviewed at this meeting.

C. Sequencing:

1. Perform the Work in the suggested sequence as shown on the Contract Drawings and herein. Certain phases or stages of the Work may require working 24-hour days or work during hours outside of regular working hours. Work may be accelerated from a later stage to an earlier stage if Owner’s operations are not adversely affected by proposed sequence change, with Engineer’s acceptance. Stages specified in this Section are sequential in performance of the Work.

1.04 SUBMITTALS

A. Action/Informational Submittals:

1. MOPO Plan Submittal: Contractor shall provide a MOPO Plan submittal explaining in detail the proposed sequence of construction and its effects, including staging, laydown areas, traffic control, and detailed schedule indicating anticipated shutdowns and completion dates. Submit in accordance with Section 01 25 00 – Substitution Procedures.

2. Shutdown Planning Submittal:

a. For each shutdown, submit an inventory of labor and materials required to perform the shutdown and tie-in tasks, an estimate of time required to accomplish the complete shutdown including time for Owner to take down and start up existing equipment, systems, or conduits, and written description of steps required to complete the Work associated with the shutdown.

b. Furnish submittal to Engineer at least thirty (30) days prior to proposed shutdown start date. Do not start shutdown until obtaining Engineer's acceptance of shutdown planning submittal.

3. Shutdown Notification: After acceptance of shutdown planning submittal and prior to starting the shutdown, provide written notification to Owner and Engineer of date and time each shutdown is to start. Provide notification at least fourteen (14) calendar days in advance of each shutdown.

1.05 SITE CONDITIONS

A. General Constraints: Specified in the Contract Documents are the sequence and shutdown durations, where applicable, for Owner's equipment, systems, and conduits that are to be taken out of service temporarily for the Work. New equipment, materials, and systems may be used by Owner after the specified field quality controls and testing are successfully completed and the materials or equipment are Substantially Complete.

B. The following constraints apply to coordination with Owner's operations:

1. Operational Access: Owner's personnel shall have access to equipment and areas that remain in operation.

2. Schedule and perform equipment and system start-ups for Monday through Thursday. Equipment and systems shall not be placed into operation on Friday, Saturday, and Sunday without prior approval of Owner.

3. When the connection of a new pipeline to an existing structure or pipeline requires a shutdown of the existing structure or pipeline the new pipeline, except for the final

connection, shall be tested prior to proceeding with the shutdown. When the final connection is completed, the new pipeline shall be tested again in its entirety. The Contractor shall provide all pumps, piping, valves, etc., as necessary to dewater all conduits, channels, and pipes.

4. The Contractor shall flush and clean all process channels, conduits, manholes, and tanks after they have been removed from service. The Contractor is advised that the pipes, conduits, channels, and tanks contain accumulations of putrescible materials which will remain on the walls and inverts. These materials emit noxious, odorous, and hazardous gases such as hydrogen sulfide and methane. The Contractor is advised to ventilate and test the air of all confined spaces prior to entry.

5. The Contractor is advised that existing valves, gates, and other devices shall be considered as inoperable and subject to leaking. The Contractor shall be responsible for designing, furnishing, installing, and removing all temporary devices, plugs or bulkheads necessary to isolate or dewater pipes, channels or conduits to perform his work. The Contractor shall install and maintain temporary drainage, where the existing drainage has been removed due to construction progress, until the permanent replacement drainage system has been installed. The Contractor shall install and maintain temporary drainage, where the existing drainage has been removed due to construction progress, until the permanent replacement drainage system has been installed. **The Contractor shall install an isolation plate or blind flange on all digester gas piping prior to performing any work on the associated digester.**

1.06 SUGGESTED SEQUENCE OF WORK

A. Perform the Work in the suggested sequence or as otherwise approved by Engineer. Certain phases or stages of the Work may require working 24-hour days or work during hours outside of regular working hours. Work may be accelerated from a later stage to an earlier stage if Owner's operations are not adversely affected by proposed sequence change, and with Engineer's acceptance. Stages suggested in this Section are sequence dependent.

1. Stage 1: Dewatering, Cleaning, and Evaluation of Digester No. 4

a. Before Work can begin, Contractor shall identify all valves that are to be replaced as indicated on Contract Drawings M-1 through M-6. Contractor shall then submit a Work Plan detailing how to isolate the digester utilizing the valves to be replaced. Contractor's submitted Work Plan shall include a schedule and description of all equipment required to perform the Work, and shall be Approved by the Engineer before Work can proceed.

b. Groundwater – Contractor shall design and implement a groundwater monitoring and dewatering system as described in Specification Section 31 23 19 – "Groundwater Monitoring, Control, and Dewatering". For tank clean out work, the Contractor must ensure the groundwater is at an acceptable level, through use of the

existing groundwater monitoring system and groundwater dewatering system, prior to lowering the liquid level in the digesters. The Owner reserves the right to alter the Contractor's tank cleaning schedule based on Plant needs. The Contractor is advised that the Plant may require significant time to prepare and deactivate the contents of the tank(s) prior to the scheduled clean out procedure.

Contractor must inspect condition of existing Groundwater Relief Valves and determine if they are suitable for reuse, or if it is recommended that they should be replaced. Details and replacement requirements can be found in specification Section 40 05 53 - “Valves 4-Inch and Larger”.

Contractor shall develop an emergency plan for groundwater management as required per Section 31 23 19 – “Groundwater Monitoring, Control, and Dewatering”.

c. Dewatering System – Once the digester has been isolated from all active process piping, and Owner lowered the sludge level inside the tank as far as possible and closed all valves and pumps, Contractor shall begin removal and dewatering of all sludge and residuals inside the digester. Contractor shall design a pumping and dewatering system such that all of the sludge is removed from the tank and dewatered. Contractor is responsible for the hauling of all dewatered sludge and shall ensure continuous availability of sludge hauling trucks. The Contractor shall ensure the dewatering equipment, associated pumps, and other system appurtenances are sized so that the complete removal and dewatering of all sludge inside the digester shall take no more than twenty (20) consecutive calendar days to complete, after the approval of submittals for cleaning the digester.

The cleaning of the digester tanks shall be performed on a continuous sixteen (16) hour a day basis (5:00 AM to 9:00 PM) for each consecutive workday until completion of each tank. The operation, however, must be properly coordinated with all parties involved as described in the Contract, most importantly with the Owner's Plant Operations group. The operation of the Contractor's sludge dewatering units should be coordinated with Contractor’s covered dewatered sludge hauling trucks. Failure to complete the dewatering Work in the given timeframe, and causes a delay to the Construction Schedule, will subject the Contractor to liquidated damages as described in the Contract Agreement and General Conditions.

The location for the dewatering system shall be as indicated on the Contract Drawings. Contractor’s dewatering system must have spare equipment installed on-site in the event that the primary equipment fails or needs repairs and/or maintenance. Odor control is required continuously throughout the full duration of dewatering activities Details on the requirements of the temporary odor control system can be found in Specification Section 46 73 72 A – “Cleaning of Digesters and Storage Tanks”. The Contractor shall setup and test the temporary odor control system without connecting the inlet duct work to the access manhole on top of the

digester cover. After successful testing of the odor control system, the inlet duct work can be connected to the access manhole and cleaning operation can commence. The odor control system must be operated continuously while the tanks are being pumped down, cleaned, and inspected.

Additionally, Contractor must ensure that the available power supply for the dewatering system is sufficient for continuous operation, and must include detailed power requirements as part of the initial submittal for the dewatering system. Existing metering equipment shall be replaced and utilized for the duration of the Work. If additional power is required, Contractor must notify the Engineer and Owner before Work begins.

d. Residuals – Immediately after removal from the tank, the Contractor shall treat and dispose of any residual material. After tank draining, the Contractor shall assume the chamber to contain sewage, sludge, grease, debris, grit, and other material, for bidding purposes. Any debris material from the tank shall be separated from the sludge and disposed of appropriately in a roll-off container, vactor truck, or other method approved by the Owner and Engineer.

e. Cleaning – Once all sludge has been removed and dewatered, Contractor shall begin cleaning of the tank walls and floor. Contractor shall power wash and steam vapor clean all floors, walls, etc. (all concrete surfaces) to remove all wet and dried sludge, grease, oil, residuals, etc., from the Work areas prior to removal of existing equipment. The Engineer shall inspect the digester and determine if all concrete surfaces are sufficiently clean and ready for removal of the cover.

In addition to cleaning of the Concrete surfaces, all existing piping shall be cleaned out and inspected for any damage that would require replacement. The Contractor shall retain the services of a TV inspection company to perform video inspection of the sludge and gas piping as directed by the Owner. Any damage discovered shall be reported to the Engineer immediately, who will provide direction for repair or replacement of damaged pipe(s) and appurtenances.

f. Spray Deodorant – Upon completion of cleaning, the Contractor shall evenly spray onto the concrete surfaces a suitable deodorant to prevent any foul odors that may linger and shall restore the Work area to the condition prior to the commencement of Work.

g. Protection While Cleaning – The Contractor shall not disturb or destroy any equipment or piping in the Work areas while cleaning. The Contractor shall be responsible for replacing and restoring any damaged equipment or piping as a result of his operations at no additional cost to the Owner.

h. The repairs on the digesters, aside from dewatering operations, shall be performed in the Owner’s normal operating hours. If approval is given by the Owner and

Engineer, the Contractor has the option to work longer hours to complete the Project on schedule. Any time extension to the term of this contract shall be as stipulated in the Agreement, Article XIII, “Extension of Time”. The Contractor is responsible for managing the work progress of any of his subcontractor(s).

i. Additional details on the procedure for the dewatering, cleaning, and evaluation of a digester can be found in Specification Section 46 73 72 A – Cleaning of Digesters and Storage Tanks.

2. Stage 2: Startup and Testing of Gas Recirculation Compressors Nos. 4, 5, 9, & 10

a. Concurrently with the dewatering and cleaning of the tanks, the Contractor can begin to inspect the condition of Gas Recirculation Compressors (GRC) Nos. 4, 5, 9, & 10. Work on the GRCs shall be performed so as to minimize required shutdowns of connected equipment or systems.

b. Contractor to remove existing flow element “FE 84058” and flow indicating transmitter “FIT 84058” and replace with new 4-inch venturi flow meter and differential pressure indicating transmitter. Design criteria for new equipment can be found in Specification Section 40 71 23.13 – Venturi Flow Meters, and Section

c. After any and all defective valves, piping, and appurtenances are repaired or replaced, Contractor shall then begin any Work required to repair the GRC equipment. Once repairs are complete, startup and testing procedures can begin as described in Specification Section 46 73 72 – “Digester Gas Recirculation Compressors”.

3. Stage 3: Installation of Heat Exchanger No. 3

a. Contractor shall first demolish the existing non-functional Heat Exchanger No. 3 and associated piping up to the existing isolation valves. Before commencing Work, Contractor shall confirm the associated piping is isolated, free of sludge and other residuals, and can be disconnected without spillage or other issue. Contractor shall inspect the associated valves and determine if they need to be replaced or can remain in service. Additionally, any existing piping or other equipment to be reused shall be inspected and be deemed acceptable for reuse.

b. Once the existing equipment and piping is demolished, Contractor will need to modify the existing equipment pad to support the new Heat Exchanger No. 3. Details for the modifications to the equipment pad can be found on Contract Drawings M-7 and M-8. The new heat exchanger’s associated piping will require modifications to the floor slab, also detailed in the Contract Drawings.

c. After the equipment pad has been modified and completely cured, the new Heat Exchanger No. 3, which is currently on-site, shall be installed and connected to the new piping system. Contractor shall inspect the new equipment to confirm that it has

not been damaged and will function properly once installed. Contractor shall then begin startup and testing procedures as described in Specification Section 46 73 41 – "Sludge Heat Exchangers (Tube-in-Tube)".

4. Stage 4: Inspection and Repair of Gas Lances

   a. Once the tank is cleaned and free of water and other residuals, Contractor shall inspect the existing gas lances and determine if they are suitable for reuse. If the lances are clogged or otherwise damaged, Contractor shall submit a plan for the cleaning and/or repair of the existing lances. If the existing lances are deemed unsalvageable, and their condition is confirmed by the Engineer, Contractor shall submit a plan for the replacement of the lances with new piping, valves, supports and other appurtenances as necessary.

5. Stage 5: Replacement of Select Gas, Sludge, and Knife Gate Valves

   a. Once the Contractor has identified which valves need replacement, as detailed in Stage 1, the Work can begin as detailed in the Work Plan submitted by the Contractor and approved by the Engineer.

   b. Contractor shall be sure not to cause process/service interruptions for any piping or equipment connected to the valves being replaced. Any unintended shutdowns resulting from damage to surrounding and/or associated Plant systems shall be the sole responsibility of the Contractor. Service and function of Plant systems shall be restored at no additional cost to the Owner.

6. Stage 6: Removal of Cover from Digester No. 4

   a. Removal of the existing cover requires hazardous material control measures due to the presence of lead-based paint. Contractor to submit a Hazardous Material Control Plan as detailed in Specification Section 01 35 45

   b. It is the responsibility of the Contractor to determine the best and safest method for removal of the existing cover, but the removal will require a crane to be positioned on-site. Staging and laydown area are designated on the Contract Drawings. Contractor must ensure there is adequate space to construct the proposed hazardous material control strategies, along with the hazardous material removed from the tank. If adequate space is not available, Contractor must notify the Engineer and Owner immediately. A new staging and laydown area will be coordinated with the Owner and Plant Operations.

7. Stage 7: Concrete Repairs of Digester No. 4

   a. Upon completion of cleaning and surface preparation, the existing concrete will be inspected and evaluated to determine the extent of the damaged concrete and necessary repairs for approval by the Engineer. Once approved by the Engineer,

concrete repairs shall begin inside the digester. Existing damaged concrete shall be removed and replaced.

8. Stage 8: Replacement of Cover for Digester No. 4

   a. Contractor shall replace digester tank cover utilizing the crane and staging/laydown as positioned during the removal of the cover in Stage 6.

   b. All associated piping, appurtenances, and stairs, that are attached or otherwise connected to the tank cover, shall be installed at this time. Details on the equipment to be replaced for the new dual-deck cover can be found in Specification Section 46 73 16 – "Dual-Deck Truss-Type Floating Digester Covers", and on the Contract Drawings.

9. Stage 9: Startup and Testing of Digester No. 4

   a. After the replacement of the tank cover, installation of new equipment, and concrete repairs are completed by the Contractor, the Contractor will transfer the tank back to the Owner for recommissioning. The Owner will seed the cleaned digester and place it into operation after forty (40) days. Contractor will receive the next digester tank after the current digester has been successfully placed back in operation.

The following Stages 10 through 25 shall follow the same related procedures as listed in Stages 1 through 9 above.

10. Stage 10: Dewatering, Cleaning, and Evaluation of Digester No. 1

11. Stage 11: Cleaning and Rehabilitation of Heat Exchanger No. 1

    a. See Specification Section 46 73 72 for details on cleaning and startup procedures.

12. Stage 12: Inspection and Repair of Gas Lances

13. Stage 13: Replacement of Select Gas, Sludge, and Knife Gate Valves

14. Stage 14: Removal of Cover from Digester No. 1

15. Stage 15: Concrete Repairs of Digester No. 1

16. Stage 16: Replacement of Cover for Digester No. 1

17. Stage 17: Startup and Testing of Digester No. 1

18. Stage 18: Dewatering, Cleaning, and Evaluation of Digester No. 3

19. Stage 19: Cleaning and Rehabilitation of Heat Exchanger No. 2

a. See Specification Section 46-73-72 for details on cleaning and startup procedures.

20. Stage 20: Inspection and Repair of Gas Lances

21. Stage 21: Replacement of Select Gas, Sludge, and Knife Gate Valves

22. Stage 22: Removal of Cover from Digester No. 3

23. Stage 23: Concrete Repairs of Digester No. 3

24. Stage 24: Replacement of Cover for Digester No. 3

25. Stage 25: Startup and Testing of Digester No. 3

1.07 TIE-INS

A. Contractor shall perform any tie-ins as required to complete the Work and obtain requirements for tie-ins from Engineer.

1.08 SHUTDOWNS

A. General:

1. Work that may interrupt normal operations shall be accomplished at times convenient to Owner.

2. Furnish at the Site, in close proximity to the shutdown and tie-in work areas, tools, equipment, spare parts and materials, both temporary and permanent, necessary to successfully complete the shutdown. Complete to the extent possible, prefabrication of piping and other assemblies prior to the associated shutdown. Demonstrate to Engineer's satisfaction that Contractor has complied with these requirements before commencing the shutdown.

3. If Contractor's operations cause an unscheduled interruption of Owner's operations, immediately re-establish satisfactory operation for Owner.

4. Unscheduled shutdowns or interruptions of continued safe and satisfactory operation of Owner's facilities that result in fines or penalties by authorities having jurisdiction shall be paid solely by Contractor if, in Engineer's opinion, Contractor did not conform to the requirements of the Contract Documents, or was negligent in the Work, or did not exercise proper precautions in conducting the Work.

5. Work requiring service interruptions for tie-ins shall be performed during scheduled shutdowns.

6. Requirements for temporary, short-term shutdowns of smaller piping, conduits, equipment, and systems shall be coordinated with Engineer and Owner.

B. Treatment Process Shutdown and Site Access Constraints:

1. Owner shall have the following unit processes and equipment operational at all times during the Project, unless specified herein:

a. Digester Facility

b. Primary Digesters: Four (minimum)

c. Secondary/Storage Digesters: Two (minimum)

2. An unobstructed traffic route on all roadways in the area of the Digester Facility must be maintained at all times. Vehicular access to all treatment units, and buildings must be maintained at all times. Any work requiring the temporary closing of a road to traffic must be coordinated with the Owner.

3. Except as otherwise permitted, vehicular access to all portions of the buildings and utilities must be maintained at all times.

4. Owner Personnel shall be afforded safe access to all areas remaining in operation throughout the construction period. Construction site and staging areas shall be maintained in a neat and workmanlike condition. This includes but is not limited to rubbish removal, cutting grass and removing weeds on a regular basis, grading to eliminate potholes, ponding, ruts, etc., as well as dust control and proper material and equipment storage.

C. Shutdowns of Electrical Systems: Comply with Laws and Regulations, including the National Electric Code. Contractor shall lock out and tag circuit breakers and switches operated by Owner and shall verify that affected cables and wires are de-energized to ground potential before shutdown Work is started. Upon completion of shutdown Work, remove the locks and tags and notify Engineer that facilities are available for use.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 GENERAL

A. In addition to requirements of this Section, conform to requirements of Section 01 73 00 – Execution of Work.

3.02 DETAILED SHUTDOWN REQUIREMENTS:

A. Prior to Typical Shutdown:

1. Obtain Engineer's acceptance of proposed shutdown planning submittal and shutdown notification submittal, thirty (30) calendar days prior to the start date of the shutdown.

2. Submittal and approval of all shop drawings required.

3. Coordinate with plant operations on timing of shutdown and provide required notice to Owner. Contractor shall notify the Owner and Engineer of the exact date that they wish to perform the work in writing seven (7) normal working days, excluding Saturdays, Sundays, and holidays, prior to the proposed date.

4. Bring necessary piping, couplings, valves, equipment, and appurtenances to the work areas.

5. Assist Owner in preparing to take equipment, tanks, basins, and conduits temporarily out of service.

6. Coordinate other tie-ins to be performed simultaneously.

7. Install and ensure functionality of temporary systems as applicable.

B. During Typical Shutdown:

1. Owner will pump down sludge in tanks and basins as far as possible. Contractor shall operate dewatering system as required during shutdown.

2. Remove existing equipment, piping, and accessories as required.

3. Verify operation of new equipment, materials, and systems.

4. Following approval from Engineer, return equipment and system to operation with Owner.

C. Following Typical Shutdown:

1. Verify functionality of equipment and system.

2. Verify operation of new equipment and systems, and verify that joints in piping are watertight or gastight as applicable.

3. Repair joints that are not watertight or gastight as applicable.

4. Remove temporary systems as applicable.

3.03 PROPOSED SHUTDOWN SEQUENCE (NOT USED)

END OF SECTION

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SECTION 01 20 00

MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Items listed in this Section refer to and are the same pay items listed in the Bid Form and constitute all pay items for completing the Work.

2. Compensation for all services, items, materials, and equipment shall be include in prices stipulated for lump sum and unit price pay items listed in this Section and included in the Contract Agreement.

3. No direct or separate payment will be made for providing miscellaneous temporary or accessory works, bonds, insurance, or other requirements of the General Conditions, Supplementary Conditions, General Requirements, and other requirements of the Contract Documents.

4. Each lump sum and unit bid price shall include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

B. Related Sections:

1. Payments to Contractor: Refer to General Conditions, Supplementary Conditions, and Agreement.

2. Changes to Contract Price: Refer to General Conditions.

3. Schedule of Values: Refer to General Conditions, Supplementary Conditions, and Section 01 29 73 - Schedule of Values.

1.02 ENGINEER'S ESTIMATE OF QUANTITIES

A. ENGINEER'S and OWNER's estimated quantities for unit price pay items, as listed in the Bid Form, are approximate only and are included solely for the purpose of comparison of Bids. Owner does not expressly or by implication agree that the nature of the materials encountered below the surface of the ground or the actual quantities of material encountered or required will correspond therewith and reserves the right to increase or decrease any quantity or to eliminate any quantity as Owner may deem necessary. Contractor will not be entitled to any adjustment in a unit bid price as a result of any change in an estimated quantity and agrees to accept the aforesaid

unit bid prices as complete and total compensation for any additions caused by changes or alterations in the Work ordered by Owner.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Contractor shall include all additional Work items, services, goods, resources, and manpower necessary for installation of the Work to provide a completely functional system in accordance with the Contract Documents. The contractor shall include these costs associated with providing a completely functional system within the listed items on the Bid Form and as specified herein.

B. Bid Items:

1. Bid Item No. 1 – Lump Sum: Base Bid

a. Measurement for payment of the Lump Sum Bid Item 1 shall be made in accordance with the Construction Agreement. The measurement shall be the percentage of work performed and in place as of the date of the payment request and shall be determined for each item included on the schedule of values. The measurement shall be documented by calculation of costs incurred, quantities in place, and invoices of materials and equipment supplied, as well as certification of the Contractor as to the accuracy of the measurement.

b. Payment for Bid Item No. 1 – Lump Sum shall be complete compensation for furnishing all labor, materials, equipment and incidentals required to complete all contract work as described below and detailed elsewhere in the Contract Documents, excluding work associated with the Bid Items 2-20:

1) Testing of gas and sludge piping and valves required for proper isolation of each digester.

2) Measurement of content quantities for each digester.

3) Site preparation of digester cleaning and dewatering area.

4) Installation of required systems including tank pump out system, sludge dewatering system and odor control system.

5) Complete washing down of the tanks walls, covers/ceilings, floor, supports, piping and other appurtenances.

6) Cleaning and inspecting existing groundwater monitoring wells.

7) Cleaning and inspecting existing groundwater relief valves in all digesters.

8) Providing pumps, strainers, adaptors or other appurtenances and piping to deliver screened effluent water required for cleaning activities from the screen effluent piping to the Contractor's equipment.

9) Providing tanks, pumps, piping, and other appurtenances to discharge the wastewater (seal waters, wash waters, filtrate etc.) into the Filtrate Wet Well.

10) Providing a flush truck and other equipment for conveying the potable water from the hydrants to his equipment.

11) Flushing of the digester sludge piping using sludge recirculation pumps by partially filling the cleaned digester with effluent water.

12) Preparing surface and applying coating to all digester sludge piping within digesters.

13) Preparing surface and applying coating to all digester sludge piping steel pipe support brackets within digesters.

14) Demolishing and removing of three (3) digester dual-deck floating digester covers and cover appurtenances including but not limited to gas domes, entrance hatches, manholes, cover rollers and spring shoes, anti-rotation devices, pressure/vacuum relief valves, access ladders and concrete ballasting.

    a) Providing lead-based paint removal and abatement on and disposal of associated construction waste for demolition and removal of digester covers.

15) Installing three (3) dual-deck floating digester covers and cover appurtenances including but not limited to gas domes, entrance hatches, manholes, cover rollers and spring shoes, anti-rotation devices, pressure/vacuum relief valves, access stairs and stairways, and concrete ballasting.

16) Removal of existing Heat Exchanger #3 and associated piping and equipment and installation of one (1) new replacement heat exchanger and associated piping and equipment.

17) Cleaning of two (2) existing heat exchangers, Heat Exchanger #1 and #2.

    a) Coordinating with the heat exchanger manufacturer to provide an inspection and identify necessary repairs.

18) Inspecting associated gas piping, valves, and appurtenances necessary to perform start-up and commissioning of Recirculation Gas Compressors No. 4, 5, 9 and 10.

19) Removal of existing Flow Element FE 84058 and Flow Indicating Transmitter FIT 84058 and replacement with new 4” Venturi Flow Meter and Differential Pressure Indicating Transmitter.

20) Obtaining all the necessary permits for performing the work (air discharge, 360 for landfill, potable water, dewatering)

2. Bid Item No. 2 – Lump Sum: Groundwater Dewatering System Design and Installation

a. Measurement for payment of the Bid Item 2 – Lump Sum shall be made in accordance with the Construction Agreement. The measurement shall be the percentage of work performed and in place as of the date of the payment request and shall be determined for each item included on the schedule of values. The measurement shall be documented by calculation of costs incurred, quantities in place, and invoices of materials and equipment supplied, as well as certification of the Contractor as to the accuracy of the measurement.

b. Payment for Bid Item No. 2 – Lump Sum shall be complete compensation for furnishing all labor, materials, equipment and incidentals required to design and install only a groundwater dewatering system to maintain necessary groundwater elevations in the vicinity of dewatered digester tanks as specified in Section 31 23 19 – Groundwater Monitoring, Control and Dewatering.

3. Bid Items No. 3 – No. 20 - Unit Price Items

a. Bid Item No. 3 – Unit Price

1) All contract work associated with the removal, dewatering, hauling, and disposal of digester contents from three anaerobic digester, including but not limited to the operation of the tank pump out system, operation of the odor control system, operation of the sludge dewatering system, and sludge hauling and disposal as specified in Section 46 73 72 – Cleaning of Digesters and Storage Tanks, Heat Exchangers, Gas Recirculation Compressors, and Miscellaneous Repair Work.

2) Bid Item No. 3 – Unit Price to be paid per Gallon of digester contents removed.

b. Bid Item No. 4 – Unit Price

1) All contract work associated with the continuous operation and maintenance of the groundwater dewatering system during normal working days as specified in Section 31 23 19 – Groundwater Monitoring, Control and Dewatering.

2) Bid Item No. 4 – Unit Price to be paid per Weekday that the groundwater dewatering system is operated.

c. Bid Item No. 5 – Unit Price

1) All contract work associated with the continuous operation and maintenance of the groundwater dewatering system during weekends and Holidays as specified in Section 31 23 19 – Groundwater Monitoring, Control and Dewatering.

2) Bid Item No. 5 – Unit Price to be paid per Weekend Day or Holiday that the groundwater dewatering system is operated.

d. Bid Item No. 6 – Unit Price

1) All contract work associated with the removal and replacement of 6-inch digester sludge plug valves including required fittings and all other incidentals.

2) Bid Item No. 6 - Unit Price to be paid per each 6-inch digester sludge plug valve replaced.

e. Bid Item No. 7 - Unit Price

1) All contract work associated with the removal and replacement of 8-inch digester sludge plug valves including required fittings and all other incidentals.

2) Bid Item No. 7 - Unit Price to be paid per each 8-inch digester sludge plug valve replaced.

f. Bid Item No. 8 – Unit Price

1) All contract work associated with the removal and replacement of 10-inch digester sludge plug valves including required fittings and all other incidentals.

2) Bid Item No. 7 - Unit Price to be paid per each 10-inch digester sludge plug valve replaced.

g. Bid Item No. 9 – Unit Price

1) All contract work associated with the removal and replacement of 4-inch digester gas plug valves including required fittings and all other incidentals.

2) Bid Item No. 9 – Unit Price to be paid per each 4-inch digester gas plug valve replaced.

h. Bid Item No. 10 – Unit Price

1) All contract work associated with the removal and replacement of 6-inch digester gas plug valves including required fittings and all other incidentals.

2) Bid Item No. 10 – Unit Price to be paid per each 6-inch digester gas plug valve replaced.

i. Bid Item No. 11 – Unit Price

1) All contract work associated with the removal and replacement of 8-inch digester gas plug valves including required fittings and all other incidentals.

2) Bid Item No. 11 – Unit Price to be paid per each 8-inch digester gas plug valve replaced.

j. Bid Item No. 12 – Unit Price

1) All contract work associated with the removal and replacement of 10-inch digester gas plug valves including required fittings and all other incidentals.

2) Bid Item No. 12 – Unit Price to be paid per each 10-inch digester gas plug valve replaced.

k. Bid Item No. 13 – Unit Price

1) All contract work associated with Concrete Corbel Spall Repairs.

2) Bid Item No. 13 – Unit Price to be paid per cubic foot of spall repair material

l. Bid Item No .14 – Unit Price

1) All contract work associated with Type I Cementitious Crack Repairs.

2) Bid Item No. 14 – Unit Price to be paid per linear foot of crack repair material.

m. Bid Item No. 15 – Unit Price

1) All contract work associated with Type II Epoxy Injection Crack Repairs.

2) Bid Item No. 15 – Unit Price to be paid per linear foot of crack repair material.

n. Bid Item No. 16 – Unit Price

1) All contract work associated with Type III Waterproof Injection Grout Crack Repairs.

2) Bid Item No. 16 – Unit Price to be paid per linear foot of crack repair material.

o. Bid Item No. 17 – Unit Price

1) All contract work associated with Concrete Surface Spall Repairs.

2) Bid Item No. 17 – Unit Price to be paid per cubic foot of surface spall repair material.

p. Bid Item No. 18 – Unit Price

1) All contract work associated with Concrete Formed Spall Repairs.

2) Bid Item No. 18 – Unit Price to be paid per cubic foot of formed spall repair material.

q. Bid Item No. 19 – Unit Price

1) All contract work associated with cement based textured coating repairs.

2) Bid Item No. 19 – Unit Price to be paid per square foot of coating repair material.

r. Bid Item No. 20 – Unit Price

1) All contract work associated with replacement of steel pipe support brackets.

2) Bid Item No. 20 – Unit Price to be paid per each steel pipe support bracket replaced.

1.04 ALLOWANCES

A. The allowances described below are to provide specific services, materials or work related to the Cedar Creek Water Pollution Control Plant Digester Rehabilitation and Cleaning – Phase 1 and related work included herein and shall be included in the Contractor's Bid. The use of the allowances by the Contractor shall only be by written authorization or instruction from the Engineer and Owner. Any amounts not expended at the completion of the work shall be subject to a credit change order. A change order will be processed to increase the allowance if the amount becomes insufficient to complete the work of the Contract.

B. Schedule of Allowances

1. Bid Items No. 21, No, 22, No. 23, No. 24 and No. 25 - Allowances

a. Item No. 21 – Unforeseen Hazardous Materials: An allowance of One Hundred Thousand dollars ($100,000).

b. Item No. 22 – Miscellaneous Structural Repairs: An allowance of Fifty Thousand dollars ($50,000). Miscellaneous Structural Repairs may include but are not limited to:

1) Repairs to concrete, concrete accessories, and structural steel not covered in Unit Price Items.

c. Item No. 23 – Miscellaneous Digester Piping: An allowance of Two Hundred and Fifty Thousand dollars ($250,000) for video inspection and replacement as necessary of digester sludge and gas piping, including pipe supports and incidentals.

d. Item No. 24 – Miscellaneous Equipment Repairs: An allowance of Fifty Thousand dollars ($50,000). Miscellaneous Equipment Repairs may include but are not limited to:

1) Repairs to the Heat Exchangers as directed by the Engineer and County following the inspection by the Heat Exchanger Manufacturer.

2) Repairs to digester gas appurtenances as directed by the Engineer and County following the video inspection of gas piping and appurtenances between the Gas Recirculation Compressors and the Digesters.

3) Repairs to digester groundwater relief valves as directed by the Engineer and County following inspection by the Contractor.

4) Repairs to the groundwater monitoring wells as directed by the Engineer and County following inspection by the Contractor.

5) Replacement of digester sludge piping as directed by the Engineer and County following inspection by the Contractor.

6) Replacement of digester gas piping as directed by the Engineer and County following inspection by the Contractor.

e. Item No. 25 Additional Temporary Power: An allowance of Seven Hundred Thousand dollars ($700,000) for all labor, materials, cables, conduit, and equipment required to provide additional power as required by the Contractor’s temporary systems.

C. Basis for Payment

1. General Construction Contract

a. The allowance for Unforeseen Hazardous Materials, Miscellaneous Structural Repairs and Miscellaneous Equipment Repairs as indicted in Paragraph 1.02A and as described in the Proposal shall be used to reimburse cost associated with these items. The remediation efforts, repairs and/or modifications shall be as directed or authorized by the County. The allowance shall cover the cost of labor, materials, and equipment plus overhead and profit, computed in accordance with the requirements of the Agreement, Article XXII, "Extra Work".

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Procedural requirements for product substitutions.

2. Procedural requirements for substitute construction methods or procedures when construction methods or procedures are specified.

B. Requests for substitutions of equipment and material shall conform to the requirements of the General Conditions and Supplemental Conditions.

C. Procedure for substitution requests and review including evaluation, reimbursement, acceptance, and determination shall be in accordance with General Conditions and Supplemental Conditions.

1.02 REFERENCES

A. Definitions: The following words or terms are not defined but, when used in this Section, have the following meaning:

1. "Acceptable Manufacturers" considered for substitution include Suppliers of equipment and material of proven reliability, and as manufactured by reputable manufacturers having experience in the production of specified equipment and material. Equipment furnished shall be designed, constructed, and installed in accordance with the industry accepted practices and shall operate satisfactorily when installed in accordance with the Contract Documents.

2. "Products" includes materials, equipment, machinery, components, fixtures, systems, and other goods incorporated in the Work. Products do not include machinery and equipment used for preparing, fabricating, conveying, erecting, or installing the Work. Products include Owner-furnished goods incorporated in the Work where use of such goods is specifically required in the Contract Documents.

1.03 ADMINSTRATIVE REQUIREMENTS

A. Contractor's Responsibilities: In submitting request for substitution, Contractor represents that:

1. Contractor has investigated proposed substitution and determined that it is equivalent to item, product, method, or procedure specified, as applicable.

2. Contractor will provide the same or better guarantees or warranties for proposed substitution as for the specified product, manufacturer, method, or procedure, as applicable.

3. Contractor waives all Claims for additional costs or extension of time related to proposed substitution that subsequently may become apparent.

4. Contractor shall submit a minimum of five (5) successful installations of the manufacturer's equipment of the same model, size, and type as specified in the Contract Documents.

5. All costs associated with incorporation of a substitution shall be borne by the Contractor, including but not limited to, the cost of redesign and construction provisions.

B. Engineer's Review: A proposed substitution will not be accepted for review if:

1. Approval would require changes in design concept or a substantial revision of the Contract Documents.

2. Approval would delay completion of the Work or the work of other contractors.

3. Substitution request is indicated or implied on a Shop Drawing or other submittal, or on a request for interpretation or clarification, and is not accompanied by Contractor's formal request for substitution.

4. If the substitution is not clearly substantiated by performance criteria as providing an equivalent or superior performing installation.

5. All costs associated with Engineer's review of a substitution shall be recorded by Engineer, submitted to Owner, and charged to Contractor.

C. If Engineer does not approve the proposed substitute, Contractor shall provide the specified product, manufacturer, method, or procedure, as applicable.

D. Approval of a substitution request will not relieve Contractor from requirement for submitting Shop Drawings as set forth in the Contract Documents.

E. Product Substitutions Procedure:

1. Requests for approval of substitute products or items will be considered for a period of 30 days after the Effective Date of the Agreement. After end of specified period, requests will be considered only in case of unavailability of a specified product or other conditions beyond Contractor's control.

2. Submit copies of request for substitution.

3. Submit separate request for each substitution.

4. In addition to requirements of the General Conditions and information required on substitution request forms, include with request the following:

    a. Product identification, including manufacturer's name and address.

    b. Manufacturer's literature with product description, performance and test data, and reference standards with which product complies.

    c. Samples, if appropriate.

    d. Name and address of similar projects on which product was used, and date of installation.

    e. Certified tests, where applicable, by an independent laboratory attesting the proposed substitution is equal.

    f. Cost information for the proposed substitution and the specified products.

    g. Lead time information for the proposed substitution and specified products.

    h. All other submittal requirements indicated in the individual Specification Sections associated with the specified equipment and material.

F. Construction Methods Substitutions Procedures:

1. Where construction methods or procedures are specified, for a period of 30 days after the Effective Date of the Agreement, Engineer will consider Contractor's written requests for substitute construction methods or procedures specified.

2. Submit copies of request for substitution.

3. Submit separate request for each substitution.

4. In addition to requirements of the General Conditions and information required on substitution request forms, include with request the following:

    a. Detailed description of proposed method or procedure.

    b. Itemized comparison of the proposed substitution with the specified method or procedure.

    c. Drawings illustrating method or procedure.

    d. Other data required by Engineer to establish that proposed substitution is equivalent to specified method or procedure.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 29 73

SCHEDULE OF VALUES

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. General requirements for preliminary and final Schedule of Values.

2. Schedule of Values and the Progress Schedule updates specified in Section 01 32 00 – Construction Progress Schedule, shall be basis for preparing each Application for Payment. Schedule of Values may be used as a basis for negotiating price of changes, if any, in the Work.

1.02 ADMINSTRATIVE REQUIREMENTS

A. General Requirements:

1. Schedule of Values shall include breakdown of costs for materials and equipment, installation, and other costs used in preparing the Bid by Contractor and each Subcontractor. List purchase and delivery costs for materials and equipment for which Contractor may apply for payment as stored materials.

2. Include separate amounts for each Specification Section in the Contract Documents by structure, building, and work area.

3. Identify each line item with number corresponding to the associated Specification Section number. List sub-items of major products or systems, as appropriate or when requested by Engineer.

4. Include in Schedule of Values unit price payment items with their associated quantity. Provide in the Schedule of Values detailed breakdown of unit prices when required by Engineer.

5. Include in Schedule of Values itemized list of Work for each major part of the Contract, for each payment item specified in Section 01 20 00 – Measurement and Payment.

6. Sum of individual values shown on the Schedule of Values shall equal the total of associated payment item. Sum of payment item totals in the Schedule of Values shall equal the Contract Price.

B. Specific Requirements:

1. Include in each line item a directly proportional amount of Contractor's overhead and profit. Do not include overhead and profit as separate item(s).

2. Include separate line item for each allowance, and for each unit price item

3. Include line item for bonds and insurance in amount not exceeding two percent of the Contract Price. This may be applied for in the first Application for Payment.

4. Include items for the General Conditions, permits (when applicable), construction Progress Schedule, and other items required by Engineer. Include such items in Applications for Payment on schedule accepted by Engineer

5. Line items for Site maintenance such as dust control, snow removal, compliance with storm water pollution prevention plans and permits, spill prevention control and countermeasures plans, and for construction photographic documentation; temporary utilities and temporary facilities, field offices, temporary controls, field engineering, and similar Work shall be included in the Schedule of Values and proportioned in Applications for Payment throughout duration of the Work.

6. Include separate line items under each appropriate payment item for mobilization and demobilization. Document for Engineer the activities included in mobilization and demobilization line items.

    a. Mobilization will be limited to two percent of the Contract Price, and will be paid in two payments, each of 50 percent of total amount for mobilization.

    b. Demobilization shall be at least one percent of the Contract Price and shall be included with the Application for Payment following Substantial Completion, or other schedule accepted by Engineer.

7. Costs for submittals, operations and maintenance manuals, field testing, and training of operations and maintenance personnel shall be as follows, unless otherwise accepted by Engineer:

    a. Up to three percent of total cost of each item (including overhead and profit), including materials and equipment, and installation, may be apportioned to testing and included in the Application for Payment following Engineer's acceptance of the associated written Site testing report(s).

C. Preliminary Schedule of Values: Submit preliminary Schedule of Values to Engineer for initial review. Contractor shall incorporate Engineer's comments into the Schedule of Values and resubmit to Engineer. Engineer may require corrections and re-submittals until Schedule of Values is acceptable.

D. Time Frame for Submittals:

1. Submit preliminary Schedule of Values within ten days of date that the Contract Times commence running in accordance with the Notice to Proceed.

2. Submittal of the Schedule of Values shall be in accordance with the General Conditions. Engineer will not accept Applications for Payment without an acceptable Schedule of Values.

3. When required by Engineer, promptly submit updated Schedule of Values to include cost breakdowns for changes in the Contract Price.

1.03 SUBMITTALS

A. Submit the following:

1. Electronic copies of preliminary Schedule of Values.

2. Electronic copies of Schedule of Values.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 29 76

PROGRESS PAYMENT PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. Administrative and procedural requirements for progress payment to the Contractor by the Owner.

B. Related Sections:

1. Section 01 77 19 – Closeout Requirements.

1.02 ADMINSTRATIVE REQUIREMENTS

A. General: Contractor's request for payment shall be in accordance with the Agreement, General Conditions and Supplementary Conditions, and the Specifications.

B. Procedure:

1. Review with Resident Project Representative (RPR) quantities and the Work proposed for inclusion in each progress payment. Application for Payment shall cover only the Work and quantities recommended by the RPR.

2. Submit to Engineer five originals of each complete Application for Payment and other documents to accompany the Application for Payment.

3. Engineer will act on request for payment in accordance with the General Conditions and Supplementary Conditions.

C. Requirements:

1. Completed Application for Payment form, including summary/signature page, progress estimate sheets, and stored materials summary. Progress estimate sheets shall have the same level of detail as the Schedule of Values.

2. For materials and equipment not incorporated in the Work but suitably stored, submit documentation in accordance with the General Conditions and Supplementary Conditions. Legibly indicate on invoice or bill of sale the specific materials or equipment included in the payment request and corresponding bid/payment item number for each.

3. Contractor's Affidavit is required for payment application and requests beginning with the second application for payment.

4. For payment requests that include payment for Work under an allowance, submit documentation acceptable to Owner of the authorization of allowance Work.

5. For payment requests (other than request for final payment) that include reduction or payment of retainage in an amount greater than that required in the Contract Documents, submit on form acceptable to Owner consent of surety to partial release or reduction of retainage.

D. Requirements for request for final payment are in the General Conditions, as modified by the Supplementary Conditions, and Section 01 77 19 – Closeout Requirements.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 19

PROJECT MEETINGS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Pre-Construction Meeting:

a. Purpose of conference is to designate responsible personnel, establish working relationships, discuss preliminary schedules submitted by Contractor, and review administrative and procedural requirements for the Project. Matters requiring coordination will be discussed and procedures for handling such matters will be established.

b. Date, Time and Location: Conference will be held after execution of the Contract and before Work starts at the Site. Engineer will establish the date, time, and location of conference and notify the interested and involved parties.

2. Progress Meetings:

a. Progress meetings will be held throughout the Project. Contractor shall attend each progress meeting prepared to discuss in detail all items on the agenda.

b. Engineer will preside at progress meetings and will prepare and distribute minutes of progress meetings to all meeting participants and others as requested.

c. Date, Time, and Location:

1) Regular Meetings: Every month on a day and time agreeable to Owner, Engineer, and Contractor.

2) Engineer's Field Office at the Site, Virtual Microsoft Teams Meeting, or other location mutually agreed upon by Owner, Contractor, and Engineer.

d. Additional meetings may be conducted as progress of Work requires at a mutually agreed date, time and location.

1.02 ADMINSTRATIVE REQUIREMENTS

A. Pre-Construction Meeting:

1. Contractor shall provide pre-construction meeting submittals with sufficient number of copies for each attendee:

2. Required Attendees:

    a. Contractor

        1) Project manager.

        2) Site superintendent.

        3) Safety representative.

        4) Major Subcontractors.

    b. Owner.

    c. Engineer.

    d. Resident Project Representative (RPR).

    e. Representatives of governmental or other regulatory agencies.

    f. Contractor shall prepare and submit a health and safety plan, including confined space entry plan, as specified in this Section prior to the pre-construction meeting.

3. Agenda, minimum:

    a. Procedural requirements:

        1) Designation of responsible personnel

        2) Use of Site and Owner's requirements, including general regards for community relations

        3) Delivery of materials and equipment to the Site

        4) Safety and first aid procedures

        5) Confined space entry plan

        6) Security procedures

        7) Housekeeping procedures

    b. Administrative requirements:

        1) Distribution of Contract Documents.

2) Shop Drawing submittal procedures.

3) Maintaining record documents at the Site.

4) Contract modification procedures

5) Processing of Payment Application

c. Site mobilization requirements:

1) Working hours, overtime, and holidays.

2) Field offices, trailers, and staging areas.

3) Temporary facilities and utilities, including usage and coordination.

4) Temporary controls, such as sediment and erosion control, noise, dust, storm water, and other measures.

5) Access to Site, access roads, and parking for construction vehicles.

6) Protection of traffic and existing property, including site barriers and temporary fencing.

7) Security

8) Storage of materials and equipment.

9) Reference points and benchmarks, surveys and layouts.

10) Site maintenance during the project, including cleaning and removal of trash and debris.

11) Site restoration.

d. Schedules

1) Preliminary construction schedule

2) Critical work sequencing

3) Preliminary Shop Drawing submittal schedule

4) Preliminary Schedule of Values

B. Progress Meetings:

1. Progress meetings frequency shall be conducted as specified in this Section, unless modified and agreed upon by Owner, Contractor, and Engineer. Additional meetings may be conducted as progress of Work requires.

2. Contractor shall provide submittals specified in this Section prior to each progress meeting.

3. Attendance:

    a. Contractor, including project manager, site superintendent, safety representative, and representatives of Subcontractors and Suppliers as required.

    b. Engineer, including project manager (or designated representative), Resident Project Representative (if any), others as required by Engineer.

    c. Owner, including Owner's Site Representative (if any).

    d. Subcontractors, only with Engineer's approval or request, as required in the agenda.

4. Agenda, minimum:

    a. Review, comment, and amendment (if required) of minutes of previous progress meeting.

    b. Review of progress since the previous progress meeting.

    c. Planned progress through next 30 – 60 days.

    d. Review of Progress Schedule

        1) Contract Times, including Milestones (if any)

        2) Critical path.

        3) Schedules for fabrication and delivery of materials and equipment.

        4) Corrective measures, if required.

    e. Submittals:

        1) Review of status of critical submittals.

        2) Review revisions to schedule of submittals.

    f. Contract Modifications:

        1) Requests for interpretation

2) Clarification notices

3) Field Orders

4) Proposal requests

5) Change Proposals

6) Work Change Directives.

7) Change Orders.

8) Claims.

g. Applications for progress payments.

h. Problems, conflicts, and observations.

i. Quality standards, testing, and inspections.

j. Coordination between parties.

k. Site management issues, including access, security, maintenance and protection of traffic, maintenance, cleaning, and other Site issues.

l. Safety.

m. Permits.

n. Record documents status.

o. Punch list status, as applicable.

p. Other business.

1.03 SUBMITTALS

A. Pre-Construction Meeting Submittals:

1. Prior to the conference, submit the following preliminary schedules in accordance with the General Conditions:

1) Progress schedule

2) Procurement schedule

3) Schedule of submittals

4) Schedule of values

2. Contractor's safety and first aid procedures.

3. Confined space entry plan.

4. List of emergency contact information

B. Progress Meeting Submittals:

1. List of Work accomplished since the previous progress meeting.

2. Up-to-date Progress Schedule.

3. Up-to-date Schedule of Submittals.

4. Detailed "look-ahead" schedule of Work planned through the next progress meeting, with specific starting and ending dates for each activity, including shutdowns, deliveries of important materials and equipment, Milestones (if any), and important activities affecting the Owner, Project, and Site.

5. When applicable, list of upcoming, planned time off (with dates) for personnel with significant roles on the Project, and the designated contact person in their absence.

6. When applicable, copies of Weekly Visual Leak Detection logs and emergency power generating equipment run time (in hours) for the month (See Section 01 14 00 – Coordination with Owner's Operations).

1.04 EMERGENCY CONTACT INFORMATION

A. Contractor shall provide list of emergency contact information for 24-hour use throughout the Project. Emergency contact information shall be updated and kept current throughout the Project. If personnel or contact information change, provide updated emergency contact information list at the next progress meeting.

B. Contractor's list of emergency contact information shall include:

1. Contractor's project manager's office, field office, cellular, and home telephone numbers.

2. Contractor's Site superintendent's office, field office, cellular, and home telephone numbers.

3. Contractor's foreman's field office, cellular (if available), and home telephone numbers.

4. Major Subcontractors' and Suppliers' office, cellular, and home telephone numbers of project manager and foreman (when applicable).

C. Additional Emergency Contact Information:

1. Owner's Project Manager: office, cellular, and home telephone numbers.

2. Owner's central 24-hour emergency telephone number.

3. Engineer's project engineer's office, cellular, and home telephone numbers.

4. Resident Project Representative's office, field office, cellular, and home telephone numbers.

5. Emergency telephone numbers, including: "Emergency: Dial 911", and seven-digit telephone numbers for the hospital, ambulance, police, and fire department nearest to the Site. Provide names of each of these institutions.

6. Other involved entities as applicable.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 32 00

CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work shall consist of preparing, submitting, and maintaining a computerized CPM (Critical Path Method) progress schedule using Primavera P6 software.

B. The purpose of the computerized CPM progress schedule is to ensure timely completion of the contract and to establish a standard methodology for time adjustment analysis based on the principles of the Critical Path Method of Scheduling.

C. For this specification, 'Engineer' means County authorized Construction Manager.

D. The Contractor shall ensure that any and all computer files submitted to the Engineer are in a format that can be imported directly using Primavera P6 software, version 16.2 or later.

E. The Contractor shall retain a CPM Consultant, approved by the Engineer, to assist in the development and preparation of the CPM schedule, and in subsequent schedule updating. The CPM Consultant shall have acceptable certifications such as AACE's Planning & Scheduling Professional (PSP), Project Management Institute's PMI-SP, or approved equal. The CPM Consultant is required to attend the Monthly Schedule Update Meetings. The Contractor is deemed to have included in the Bid price sufficient monies to pay all expenses required to develop the CPM Schedule and to guarantee its successful operation, implementation, and maintenance.

1.02 DETAILS

A. Pre Construction Schedule Meeting

1. The Engineer will schedule and conduct a Pre-construction Scheduling Meeting with the Contractor within ten (10) working days after the contract has been awarded. The requirements of this specification will be reviewed at this meeting. Additionally, the following topics will be discussed:

a. Specifics of any contract Time-Related Clauses.

b. The representation in the schedule of the Time Related work.

c. The calendar, activity coding, and resource definition requirements unique to and consistent with the contract.

d. The Contractor's schedule methodology employed, proposed work sequence and any proposed deviations of sequences from the contract plans.

e. The factors that the Contractor determines to control the completion of the project and any milestone completions contained therein.

f. Narrative content for Initial Baseline and Monthly Updates.

g. Schedule submission protocol for Initial Baseline and Monthly Updates.

2. The Contractor's attendance at the Pre-construction Scheduling Meeting is mandatory. No fieldwork will be allowed, with the exception of set up of the field office, until this meeting is held.

B. Initial Baseline CPM Construction Schedule

1. Within sixty (60) workdays following the Notice to Proceed, the Contractor shall prepare and submit to the Engineer the Initial Baseline CPM Construction Schedule for the entire project. This submission shall include the electronic Schedule file and paper reports as required and approved by the Engineer.

2. The Initial Baseline Schedule must be cost, and resource loaded and shall represent the Contractor's plan to construct the project. This schedule shall include all work and activities necessary to complete the project including but not limited to activities for the preparation, submittal, review, approval, fabrication, and delivery of all procurement related items. The Initial Baseline CPM Construction Schedule must be set up to conform to the staging/phasing and other requirements defined in or required by the contract.

3. The Initial Baseline Schedule shall meet all interim milestone dates and shall not extend beyond the contract completion date.

C. Schedule Requirements

1. The Contractor's Initial Baseline CPM Construction Schedule shall meet the following requirements:

a. CPM ACTIVITY NETWORK FORMAT - The schedule network shall use the Precedence Diagraming Method.

b. PROJECT DEFINITIONS - The following project specific properties within the schedule shall be defined:

1). CALENDAR - All calendars created shall encompass and account for the total duration of the contract time period. The standard calendar shall be 8-hour days, five days per week and shall account for holidays and non-working days as defined in the Contract

Documents. Additional calendars shall be created and included as required for:

a. Work week (5 or 6 day). (When or if the Contractor elects to utilize a 6-day work week he shall be responsible for the County's overtime costs as applicable by the Contract requirements).
b. Seasonal restrictions (asphalt, landscape, etc.).
c. Concrete curing/calendar days.
d. Shop drawing review.
e. Any project specifics as required by the Engineer.
f. Expected and contemplated weather conditions shall be accounted for in the schedule and described in the narrative.

2). ACTIVITY CODE- As a minimum, the following activity codes shall be established:

a. Responsibility - The party responsible for each activity. Only one party can be responsible for an activity. Include Values for "Nassau County Department of Public Works (NC)", "Prime Contractor" and third parties to the Contract as appropriate (utilities, etc.).
b. Phase- Phasing consistent with Contract plans where each activity is performed; Include Values for "None", and "Project Wide".
c. Location - Location of activity work by Stationing; Include Value for "None", and "Project Wide".
d. Type- The type of work for each activity; Include a Value for Administrative"
e. Added Work- Work added to the Contract and incorporated into the schedule with the Engineers Approval.
f. As Required by Project - Any coding unique to or as required by the Engineer to facilitate the use and analysis of the Schedule. This coding shall be established in consultation with the Engineer at the Pre-construction Scheduling Meeting.

3). RESOURCES - The Resource Dictionary shall be established as required by the Engineer. The Resource Dictionary shall be limited to Labor and Equipment. Labor may be represented by work crews. The composition of each crew must be detailed and included as an appendix to the Narrative Report. Sub-Contractors shall be represented as a labor crew(s).

4). COST LOADING – Basis of cost loading will be the approved Schedule of Values.

5). ACTIVITY DATA:

a. ACTIVITY IDENTIFICATION - Each activity shall have a unique identifier. The identifier may be alpha-numeric, but at a minimum must be a unique number.

b. ACTIVITY DESCRIPTION - Each activity shall be unambiguously described. Descriptions such as “construct 30% of Y” are unacceptable. Activities shall be discrete to the extent necessary to accurately schedule the work.

c. ACTIVITY DURATION - Durations of individual work activities shall not exceed twenty (20) working days. The minimum activity duration increment is one full day. Durations of individual shop drawing review activities may exceed fifteen working days and shall be consistent with Contract Requirements. Exceptions to this will be reviewed by the Engineer on an activity-by-activity basis. If requested by the Engineer, production rates or other supporting information shall be supplied justifying the reasonableness of any given activity time duration. A Method Statement including the labor, equipment, production rates and any additional information, required to achieve a given activity shall be supplied within 5 working days when requested by the Engineer.

d. ACTIVITY RELATIONSHIPS – Activity relationships shall be finish-to-start with no lags unless directed otherwise by the Engineer. Contractor requests for exemptions will be made on a case by case basis. Each activity with the exception of the required “Project Notice To Proceed” and “Completion” activities shall have a predecessor and a successor activity relationship.

e. ACTIVITY START and FINISH DATES - The earliest start date, earliest finish date, latest start date, and latest finish date shall be calculated for each activity.

f. ACTIVITY TOTAL FLOAT - The total float shall be calculated for each activity. Total float is the full amount of time by which the start on an activity may be delayed without causing the project to last longer.

g. ACTIVITY CALENDARS - The appropriate calendar assignment shall be made to each activity.

h. ACTIVITY CODES - Coding shall be assigned to each activity from the defined activity dictionary. Each code shall have a value assigned in a given activity.

i. ACTIVITY CONSTRAINTS - The start or completion of any activity shall not be constrained. Exceptions to this must receive prior approval in writing by the Engineer. A “Must-Finish-By” Date for the overall project is a constraint and must be pre-approved by the Engineer.

j. ACTIVITY RESOURCES- The schedule shall be “Resource” loaded as required by the Engineer. The resources required to accomplish each activity shall be assigned to that activity from the ‘Resource Dictionary”.

6). REQUIRED ACTIVITIES - The following activities shall be incorporated into the Schedule:

Activity ID	Activity Description	Activity Type	Logic Relationship
000010	Contract "Notice to Proceed"	Start Milestone	No Predecessors to this First Schedule Activity
999999	Completion	Finish Milestone	No Successors to this Last Schedule Activity

7). DATA DATE - The Data Date and Project Start Date in the Initial Baseline Schedule shall be the NOTICE TO PROCEED DATE. The Data Date for each Monthly Update shall be the first work day of the month.

D. Review and Acceptance of the Initial Baseline CPM Construction Schedule

1. The Contractor shall submit to the Engineer the following items to facilitate review of the Initial Baseline CPM Construction Schedule:

   a. Narrative- A statement explaining the general sequence of work in the Contractor's schedule, a detailed definition of the work on the Critical Path, a statement regarding the meeting of any Time Restrictive Clause dates, and the explanation of any other ambiguities in the schedule.

2. The following Activity Reports generated from the software shall be provided or as required and approved by the Engineer:

   a. Critical Path Activity Sort - The activities that comprise the projects Critical Path. The list shall start with the first activity in the path and then ascend by Early Start date to the final activity in the path.

   b. Time Related Activity Sort - For the activities necessary to complete the work within each specific Time Frame provision in the contract, shall be listed. The list shall start with the first milestone activity and then ascend by Early Start date to the final milestone activity in the network comprising each Time Frame period. Include a Critical Path activity sort for each specific Time Frame in the contract.

   c. Constraint Activity Sort - Listing of Constrained Activities and type of constraint.

   d. Listing of Calendars and Activity Coding incorporated in the Schedule.

3. Electronic copies of the Initial CPM Construction Schedule shall be provided in format approved by the Engineer.

4. The Engineer will review the Initial Baseline CPM Construction Schedule and forward any comments, revisions, or requests to the Contractor. Within ten (10) work days of the Engineer's reply, the Contractor shall make adjustment to the Initial Baseline CPM Construction Schedule in accordance with the Engineer's comments and resubmit copies for review consistent with the above directives.

5. Upon final revisions, the Contractor shall submit electronic file copies of the Initial Baseline CPM Construction Schedule to the Engineer. A sort of activities scheduled to start (ES) & finish (EF) in the next update period shall be included. The Logic Diagram shall be submitted as directed by the Engineer. The final submission shall be submitted for approval within five (5) work days of the Contractor's receipt of the final comments by the Engineer.

6. Approval of the Initial Baseline CPM Construction Schedule by the Engineer shall not be construed to imply approval of any particular method or sequence of construction or to relieve the Contractor of providing sufficient materials, equipment, and labor to guarantee completion of the project in accordance with the Contract proposal, plans, and specifications. Approval shall not be construed to modify or amend the completion date. Completion dates can only be modified or amended by standard contractual means.

7. Failure to include in the Initial Baseline CPM Construction Schedule any element of work required for the performance of the Contract shall not excuse the Contractor from completing all work required within the completion date(s) specified in the contract.

E. Schedule Updates

1. Monthly Progress Updates

a. The Contractor shall update the schedule monthly. The schedule shall be updated to include all work and progress up to and including the last working day of the month. This will establish the "Data Date". The Monthly update shall detail progress based on actual dates of activities started and completed, the percent of work completed to date on each activity started but not yet completed and the status of procurement of critical materials. The updated schedule data shall be submitted in an electronic file format acceptable to the Engineer.

2. A Narrative Report is required for each update and shall provide the following information:

a. Contractors transmittal letter to the Engineer stating the update period and schedule "Data Date".

b. Work started, completed and ongoing during the update period by activity with “Actual Dates”.

c. Description of current Critical Path and any change from previous Critical Path.

d. Any activities added or deleted and any proposed changes in Activity Logic (Engineer’s approval in writing is required).

e. Current Delays or Advancements

1) Delayed or Advanced Activities.

2) Proposed corrective action and schedule adjustments to address any Delays.

3) Impact of Delays or Advancement on other activities (duration, ES, EF, LS, LF), milestone and completion dates.

4) Impact of Delays or Advancement on the Critical Path.

f. Outstanding Items that effect the schedule and status thereof (including but not limited to):

1) Permits.

2) Shop Drawings.

3) Change Orders.

4) Reviews of submittals.

5) Approvals.

6) Fabrication and Delivery.

g. Scheduled Completion Date Status

1) Contract Completion.

2) Interim Milestones / Time Frame if any.

3. The following Activity Reports generated from the Software shall be provided:

a. Current Critical Path Activity Sort

b. Near Critical Activities Sort

c. Report of Activities scheduled to start (ES) & finish (EF) in the next Monthly update period.

d. Any other "Report" as directed by the Engineer and/or as discussed in the pre-construction scheduling meeting.

4. The Monthly Progress Updates shall be submitted to the Engineer within five (5) work days of the "Data Date". The Engineer shall prepare a written response within five (5) work days of receipt of the Monthly Update approving, approving with comments, or returning for resubmission within five (5) work days.

5. If the Contractor fails to comply with the Monthly Progress Update submission requirements the Commissioner reserves the right to withhold any or all Contract payments.

6. Monthly Schedule Meetings and Reports

a. Monthly, on a date established by the Engineer prior to the Data Date, a CPM Progress Meeting will be held, at which time the schedule update will be reviewed. The meeting shall be attended by the Engineer and representative(s) of the Contractor including the scheduling consultant. The Contractor representative(s) at the meetings shall have the competence and authority to make any necessary decisions and their statement shall commit the Contractor to the agreed procedures, sequencing of Work, coordination and time schedules.

b. Prior to the meeting, the CPM scheduling consultant shall obtain, through any required means including Site meetings, the necessary information to update the CPM schedule to reflect progress to date and to update/revise the schedule for the balance of the Project. The updated schedule and draft narrative report shall be furnished to the Engineer at least 48 hours prior to the meeting and be distributed by the Contractor in hard copy at the meeting for review. To update the CPM schedule, the Contractor shall:

1). Enter actual start and completion dates for those Activities started and/or completed during the previous reporting period.

2). For Activities in progress, indicate the Remaining Duration correlating to an accurate forecasted completion date and physical percentage complete to date (Percent Complete is to reflect the actual quantity of Work completed, and is separate from any actual or Remaining Duration calculation). Review, and revise as necessary, the network logic for the Remaining Duration of the Work from the update to the estimated completion date.

3). For Activities not yet started, review, and revise as required, the necessary Logic, the Durations of Work and the estimated start and completion dates.

4). Enter, for each applicable Activity, actual installed quantities information.

c. The total Duration to be initially added to any schedule update reflecting the Change Order Activities from identification to the approval of any specific change order shall be in approved by the Engineer and shall be incorporated into the monthly schedule update following the identification of the changed in Work. The forecasted construction Activities shall be logically tied to the appropriate predecessor and successor base Contract Activities and contain all of the required Logic, Duration, Coding and Resource/Cost Loading specified for the detailed CPM schedule activities.

d. In the event the Contractor begins performance in the field of Extra Work during the update period, the monthly progress schedule update shall reflect the actual start date of the Work, and any predecessor Logic ties or restraints shall be broken in order to accurately forecast completion of the identified Extra Work Activity. This will allow for accurate forecasting of the successor Work Activities and completion Milestones.

e. Default progress data provided from the scheduling system is not to be allowed. Actual start and finish dates and Remaining Durations of Activities shall not be automatically updated by default mechanisms that may be included in CPM scheduling software systems. Actual start and finish dates on the CPM schedule shall match those dates provided from the Contractor’s Daily Quality Control Reports. Failure of the Contractor to document the actual start and finish dates on the Contractor Daily Quality Control Report for every in-progress or completed Activity and ensure that the data contained on the Contractor Daily Quality Control Reports is the sole basis for schedule updating shall result in the disapproval of the Contractor's submittal.

f. Activities that have reported progress without predecessor Activities being completed (out-of-sequence progress) will not be allowed except on a case-by-case basis with the approval of the Engineer. A written explanation for each instance shall be included in the monthly submittal.

g. The Contractor shall not constrain the schedule with artificial Logic ties and/or constraint dates and/or any other scheduling techniques that may distort the Activity Float and Total Float associated with the critical path Activities and the schedule in general.

F. Total Float Ownership

1. Total Float belongs to the Contract and shall not be considered as available for the exclusive use or benefit of either the County or the Contractor. Total Float is the number of days an activity may be delayed without extending the completion of either the project or an interim milestone. Float is available on a first-come, first-served basis to all identified “Responsible” parties in the schedule.

G. Float Manipulation Not Permitted

1. The Schedule shall not sequester float through such strategies as calendar manipulation, resource/labor manipulation or the extension of activity durations to fill up available float time. The Initial Baseline CPM Construction Schedule shall not attribute negative float to any activity.

H. Changes To the Schedule

1. The Initial Baseline CPM Construction Schedule shall accurately reflect the manner in which the Contractor intends to proceed with the project. Changes to the schedule (the addition or deletion of activities, logic changes, and duration changes) shall be submitted in writing to the Engineer for approval and inclusion in the next Monthly Progress Update. The process of comparing the Schedule Update to Baseline shall be followed throughout the contract. Revision to any contract milestones, or contractually mandated schedule provisions will not be permitted without written authorization from the Engineer.

I. Critical Activities and Basis for Time Adjustments

1. The measure for Time Adjustments in the schedule shall be based on the criticality, and responsibility of the delay or advancement. Criticality is defined as the presence of the delayed or advanced activity on the projects Critical Path. The Critical Path is defined to be the longest continuous chain of activities through the schedule network that establishes the minimum overall duration in the absence of constraints in the program software. Time adjustment does not mean an extension of time for this Contract.

J. Changes To the Contract

1. In the event a notice of a change to the Contract is received the Contractor shall notify the Engineer in writing within 10 (ten) calendar days of the effect of such change to the schedule. Change to the Contract includes, but is not limited to, extra work, change orders, work suspensions, changed condition, Value Engineering Change Proposal, etc. The effect of the change to the Contract on the projects Critical Path shall be stated. Any proposed revisions to the Schedule to incorporate the change to the Contract shall be stated. No changes shall be made to the Schedule without prior written approval of the Engineer. The approved changes shall be incorporated in the next Monthly Progress Update.

1.03 TIME IMPACT ANALYSIS

A. This analysis will be performed by the Engineer (CM's scheduler) based on schedule updates as accepted in monthly schedule updates.

B. Events, actions, and progress that cause delays or gains to the Project Schedule will be analyzed solely by the "Contemporaneous Period Analysis" method. The Contemporaneous Period Analysis evaluates delays or gains in the period in which it occurred. The analysis period for the purpose of this Specification shall be the period covered in each Monthly update to the schedule.

C. Impact of delay will be evaluated at the completion of the project. However, an interim extension of time for payment purposes may only be granted by the Commissioner at his or her sole discretion at the end of contractual completion date.

1.04 RECOVERY SCHEDULES

A. General Provisions for Recovery Schedules:

1. When updated Progress Schedule indicates and the Engineer determines that the ability to comply with the Contract Times falls behind schedule due to delay attributed to the CONTRACTOR, the Contractor shall prepare and submit a Progress Schedule demonstrating responsible Contractor's plan to accelerate related work to achieve compliance with the Contract Times ("recovery schedule") for Engineer's acceptance.

2. Submit recovery schedule within 10 workdays after submittal of updated Progress Schedule where need for recovery schedule is indicated or include in next update as directed by the Engineer.

B. Implementation of Recovery Schedule:

1. At no additional cost to OWNER, do one or more of the following: furnish additional labor, provide additional construction equipment, provide suitable materials, employ additional work shifts, expedite procurement of materials and equipment to be incorporated into the Work, and other measures necessary to complete the Work within the Contract Times.

2. Item 1 above is also applicable when the Contractor is required to accelerate their Work to recover lost time.

3. Upon acceptance of recovery schedule by Engineer, incorporate recovery schedule into the next Progress Schedule update.

C. Lack of Action:

1. The Contractor's refusal, failure, or neglect to take appropriate recovery action, or the Contractor's refusal to submit a recovery schedule and take appropriate recovery action, shall constitute reasonable evidence that CONTRACTOR is not prosecuting the Work or separable part thereof with the diligence that will ensure completion within the Contract Times. Such lack of action shall constitute sufficient basis for OWNER to exercise remedies available to OWNER under the Contract Documents.

1.05 METHOD OF MEASUREMENT

A. The CPM (Critical Path Method) Progress Schedule will be measured for payment on a Lump Sum Basis.

1.06 BASIS OF PAYMENT

A. The lump sum price bid for the Critical Path Method Scheduling system shall include the cost of preparation and submission of the Initial Baseline Schedule and the preparation and submission of the monthly updates.

B. Payment will be made as follows:

a. Upon submission of the Initial Baseline CPM Construction Schedule: **20%**

b. Upon acceptance of the Baseline CPM Construction Schedule: **20%**

c. The balance will be paid in equal monthly payments distributed over the Contract. These payments will be contingent on the submission of acceptable monthly updates: **60%**

d. No additional payment over and above the lump sum price bid will be made for addition or deletion of work, delays, or any other reason whatsoever.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. This Section specifies the general methods and requirements of submissions applicable to Shop Drawings, Product Data, Samples, Mock-Ups, Construction Photographs, Construction or Submittal Schedules. Detailed submittal requirements are specified in the technical Sections.

2. Contractor shall provide submittals in accordance with the General Conditions as modified by the Supplementary Conditions, and this Section.

3. Contractor is responsible to confirm and correct dimensions at the Site, for information pertaining to the fabrication processes and to techniques of construction, and for coordinating the work of all trades. Contractor's signature of submittal's stamp and letter of transmittal shall be Contractor's representation that Contractor has met his obligations under the Contract Documents relative to that submittal.

4. All submittals shall be clearly identified by reference to Section Number, Paragraph, Drawing Number or Detail as applicable. Submittals shall be clear and legible and of sufficient size for presentation of data.

B. Related Sections:

1. Section 01 25 00 – Substitution Procedures.

2. Section 01 78 23 – Operation and Maintenance Data.

3. Section 01 78 39 – Project Record Documents.

4. Section 01 78 43 – Spare Parts and Extra Material.

5. Section 01 79 00 – Instruction of Owner's Personnel.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Types of Submittals: When type of submittal is not specified and is not specified in this Section, Engineer will determine type of submittal.

1. Action/Informational Submittals:

a. Shop Drawings.

b. Product data.

c. Delegated design submittals in accordance with the General Conditions and as modified by the Supplemental Conditions.

d. Samples.

e. Testing plans, procedures, and testing limitations.

f. Design data not sealed and signed by a design professional retained by Contractor, Subcontractor, or Supplier.

g. Pre-construction test and evaluation reports, such as reports on pilot testing, subsurface investigations, potentially Hazardous Environmental Conditions, and similar reports.

h. Supplier instructions, including installation data, and instructions for handling, start-up, and troubleshooting.

i. Sustainable design submittals (other than sustainable design closeout documentation).

j. Lesson plans for training and instruction of Owner's personnel.

2. Closeout Submittals:

a. Maintenance contracts.

b. Operations and maintenance data.

c. Bonds, such as maintenance bonds and bonds for a specific product or system.

d. Warranty documentation.

e. Record documentation.

f. Sustainable design closeout documentation.

g. Software.

3. Maintenance Material Submittals:

a. Maintenance materials schedule and checklist.

b. Spare parts.

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c. Extra stock materials.

d. Tools.

4. Quality Assurance Submittals:

a. Performance affidavits.

b. Certificates.

c. Source quality control submittals (other than testing plans, procedures, and testing limitations), including results of shop testing.

d. Field or Site quality control submittals (other than testing plans, procedures, and testing limitations), including results of operating and acceptability tests at the Site.

e. Supplier reports.

f. Special procedure submittals, including health and safety plans and other procedural submittals.

g. Qualifications statements.

B. Submittal Requirements:

1. Contractor shall submit electronic copy of submittals for Engineer's review via Procore Document Management, unless otherwise specified in individual Specification Sections. Acceptable electronic formats are Adobe PDF, Microsoft Word, Autodesk DWF and AutoCAD.

2. Submittals shall be furnished in PDF.

3. Submittal shall be accompanied by letter of transmittal containing date, project title, Contractor's name, number and title of submittal, list of relevant Specification Sections, notification of deviations from Contract Documents, and other material required for Engineer's review.

C. Scheduling:

1. Provide submittals well in advance of the Work following Engineer's approval or acceptance of the associated submittal. Work covered by a submittal will not be included in progress payments until approval or acceptance of related submittals has been obtained in accordance with the Contract Documents.

2. Submittals shall be provided by Contractor with at least thirty (30) working days for review and processing.

1.03 SCHEDULE OF SUBMITTALS

A. Schedule of Submittals, as specified in this Section:

1. Timing:

a. Provide submittal within time frames specified in the Contract Documents.

b. Provide updated Schedule of Submittals with each submittal of the updated Progress Schedule.

2. Content: In accordance with the General Conditions as modified by the Supplementary Conditions, and this Section. Requirements for content of preliminary Schedule of Submittals and subsequent submittals of the Schedule of Submittals are identical.

a. Identify submittals required in the Contract Documents. Updates of Schedule of Submittals shall show scheduled dates and actual dates for completed tasks. Indicate submittals that are on the Project's critical path.

b. Indicate the following for each submittal:

1) Date when submittals are requested and received from Supplier.

2) Date when certification is received from Supplier and when submitted to Engineer.

3) Date when submittals are submitted to Engineer and returned with disposition from Engineer.

4) Date when submittals are revised by Supplier and submitted to Engineer.

5) Date when submittals are returned with "Furnish as Submitted" (FAS) or "Furnish as Corrected" (FAC) disposition from Engineer.

6) Date when approved submittals are returned to Supplier.

7) Date of Supplier scheduled delivery of equipment and material.

8) Date of actual delivery of equipment and material.

9) Whether submittal will be for a substitution or "equal". Procedures for substitutions and "or equals" are specified in the General Conditions and the Section 01 25 00 – Substitution Procedures.

10) For submittals for materials or equipment, date by which material or equipment must be at the Site to avoid delaying the Work and to avoid delaying the work of other contractors.

3. Prepare Schedule of Submittals using same software, and in same format, specified for Progress Schedules.

4. Coordinate Schedule of Submittals with the Progress Schedule.

5. Schedule of Submittals that is not compatible with the Progress Schedule, or that does not indicate submittals on the Project's critical path, or that places extraordinary demands on Engineer for time and resources, is unacceptable. Do not include submittals not required by the Contract Documents.

6. In preparing Schedule of Submittals:

   a. Considering the nature and complexity of each submittal, allow sufficient time for review and revision.

   b. Reasonable time shall be allowed for: Engineer's review and processing of submittals, for submittals to be revised and resubmitted, and for returning submittals to Contractor.

   c. Identify and accordingly schedule submittals that are expected to have long anticipated review times.

1.04 ACTION/INFORMATIONAL SUBMITTALS

A. Provide the following Submittals in accordance with the individual Specification Sections, including, but not limited to, the following:

1. Product Data:

   a. Catalog cut-sheets

   b. Descriptive bulletins/brochures/specifications

   c. Material of construction data, including details on all components including applicable ASTM designations.

   d. Lifting, erection, installation, and adjustment instructions, and recommendations.

   e. Finish/treatment data, including interior and exterior shop coating systems.

   f. Equipment/material weight/loading data, including total uncrated weight of the equipment plus the approximate weight of shipped materials. Support locations and loads that will be transmitted to bases and foundations following installation. Size, placement, and embedment requirements of anchor bolts.

g. Complete information regarding location, type, size, and length of all field welds in accordance with "Standard Welding Symbols" AWS A2.0 of the American Welding Society. Special conditions shall be fully explained by notes and details.

h. Motor data including horsepower; enclosure type; voltage; insulation class; temperature rise and results of dielectric tests; service-rating; rotative speed; motor speed-torque relationship; efficiency and power factor at ½, ¾, and full load; slip at full load; running, full load, and locked rotor current values; safe running time-current curves; motor protective devices; and interconnection diagrams.

i. Engineering design data, calculations, and system analyses

j. Digital system documentation

k. Operating sequence descriptions

l. Software/programming documentation

m. Manufacturer’s instructions

2. Shop Drawings:

a. Equipment and material layout drawings, including panel layout drawings.

b. System schematics and diagrams including, but not limited to, piping systems; HVAC and ventilation systems; process equipment systems; electrical operating systems; wiring diagrams; controls, alarm, and communication systems.

c. Layout and installation drawings (interior and exterior) for all pipes, valves, fittings, sewers, drains, heating and ventilation ducts, all electrical, heating, ventilating and other conduits, plumbing lines, electrical cable trays, lighting fixture layouts, and circuiting, instrumentation, interconnection wiring diagrams, communications, power supply, alarm circuits, etc.

d. Layout and installation drawings shall show connections to structures, equipment, sleeves, valves, fittings, etc.

e. Drawings shall show the location and type of all supports, hangers, foundations, etc., and the required clearances to operate valves, equipment, etc.

f. Drawings for pipes, ducts, conduits, etc., shall show all 3 inch and larger electrical conduits and pressure piping, electrical cable trays, heating and ventilation ducts or pipes, structure, manholes or any other feature within four (4) feet (measured as the clear dimension) from the pipe duct, conduit, etc., for which the profile is drawn.

g. Equipment and material schedules.

3. Delegated design submittals, which include documents prepared, sealed, and signed by a design professional retained by Contractor, Subcontractor, or Supplier for materials and equipment to be incorporated into the completed Work. Delegated design submittals do not include submittals related to temporary construction unless specified otherwise in the related Specification Section. Delegated design submittals include: design drawings, design data including calculations, specifications, certifications, and other submittals prepared by such design professional.

B. Samples:

1. General Requirements:

a. Conform submittal of Samples to the General Conditions as modified by the Supplementary Conditions, this Section, and the Specification Section in which the Sample is specified.

b. Furnish at the same time Samples and submittals that are related to the same unit of Work or Specification Section. Engineer will not review submittals without associated Samples and will not review Samples without associated submittals.

c. Samples shall clearly illustrate functional characteristics of product, all related parts and attachments, and full range of color, texture, pattern, and material.

2. Submittal Requirements:

a. Securely label or tag Samples with submittal identification number. Label or tag shall not cover, conceal, or alter appearance or features of Sample. Label or tag shall not be separated from the Sample.

b. Submit number of Samples required in Specifications. If number of Samples is not specified in the associated Specification Section, provide at least one identical Samples of each item required for Engineer's approval. If Contractor requires Sample(s) for Contractor's use, notify Engineer in writing, and provide additional Sample(s). Contractor is responsible for furnishing, shipping, and transporting additional Samples.

c. Deliver one Sample to Engineer's field office at the Site. Deliver balance of Samples to location directed by Engineer.

1.05 CLOSEOUT SUBMITTALS

A. Provide the following Closeout Submittals in accordance with the individual Specification Sections, including, but not limited to, the following:

1. Maintenance contracts

2. Bonds for specific products or systems

3. Warranty documentation

4. Sustainable design closeout documentation.

5. Software programming and documentation.

B. On documents such as maintenance contracts and bonds, include on each document furnished original signature of entity issuing the document.

C. Operations and Maintenance Data: Submit in accordance with Section 01 78 23 – Operations and Maintenance Data.

D. Record Documentation: Submit in accordance with Section 01 78 39 – Project Record Documents.

E. Disposition: Dispositions and meanings are the same as specified for Informational Submittals.

1.06 MAINTENANCE MATERIAL SUBMITTALS

A. For spare parts, extra stock materials, and tools, submit quantity of items specified in associated Specification Section. Furnish in accordance with Section 01 78 43 – Spare Parts and Extra Materials.

B. Disposition: Dispositions and meanings are the same as specified for Informational Submittals.

1.07 CONTRACTOR’S RESPONSIBILITIES

A. Contractor shall review, coordinate, and verify submittals with Subcontractors, Manufacturers, and Suppliers, including field measurements at Site, in accordance with the General Conditions and as modified by Supplemental Conditions prior to submitting material for Engineer’s review.

B. Contractor shall provide Contractor’s stamp of approval certifying submittal material has been reviewed and conform to the Contract Documents prior to submitting material for Engineer’s review.

C. Contractor shall provide written notice of deviations or variations that submittal may have with the Contract Documents.

D. All submittals, including shop drawings prepared by or under the direction of the Contractor, shall be thoroughly checked by the Contractor for accuracy and conformance to the intent of the Contract Documents before being submitted to the Engineer and shall bear the Contractor’s certification with signature of approval certifying that they have been so checked. Each shop drawing, sample, and product data submitted by the Contractor shall have affixed to it the following Certification Statement including the Contractor's Company name and signed by the Contractor: "Certification Statement: by this submittal, I hereby represent that I have determined

and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements and they are hereby approved. The information contained herein has been coordinated with all involved Contractor's." Submittals without the Contractor's certification with signature of approval, will not be reviewed by the Engineer and will be returned to the Contractor stamped "Rejected." Before submitting them to the Engineer, all submittals shall be bound, properly labeled, and consecutively numbered and bear the certification statement, listed below, on the cover sheet for sheets 11" x 17" and smaller or in a clear space above the title block for drawings. Provide to the Resident Project Representative a copy of each transmittal sheet for shop drawings, product data and samples at the time of submittal to the Engineer.

E. The Contractor shall utilize an 11-character submittal identification numbering system in the following manner:

1. The first character shall be a D, S, P, M, or R, which represents Shop/Working Drawing and other Product Data (D), Sample (S), Preliminary Submittal (P), Operating/Maintenance Manual (M), or Request for Information (R).

2. The next six digits shall be the applicable Specification Section Number.

3. The next three digits shall be the number 001-999 to sequentially number each initial separate item or drawing submitted under each specific Section number.

4. The last character shall be a letter, A-Z, indicating the submission, or resubmission of the same Drawing, i.e., "A=1st submission, B=2nd submission, C=3rd submission, etc. A typical submittal number would be as follows:

S35100-07G_D-030000-008-B

D	=	Shop Drawing
030000	=	Specification Section for Concrete
008	=	The eighth initial submittal under this specification section.
B	=	The second submission (first resubmission) of that particular shop drawing.

F. Notify the Engineer in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.

G. The review and approval of shop drawings, samples or product data by the Engineer shall not relieve the Contractor from his/her responsibility with regard to the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the Contractor and the Engineer will have no responsibility therefor.

H. No portion of the Work requiring a shop drawing, sample, or product data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased, or on-site construction accomplished which does not conform to approved shop drawings and data shall be at the Contractor's risk. The Owner will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.

I. Project work, materials, fabrication, and installation shall conform with approved shop drawings, applicable samples, and product data.

J. Contractor shall perform the following after receiving Engineer's review disposition:

1. Order, fabricate, or ship equipment and materials included in the submittal (pending Engineer's review of source quality control submittals) with the following disposition:

a. "Furnish as Submitted" (FAS).

b. "Furnish as Corrected" (FAC).

c. "Furnish as Corrected – Confirm" (FACC), only portions of Work that do not require resubmittal for Engineer's review.

2. Resubmittal requirements:

a. Partial resubmittal of "Furnish as Corrected – Confirm" (FACC) returned dispositions, until Engineer's disposition is either "Furnish as Submitted" (FAS) or "Furnish as Corrected" (FAC).

b. Full resubmittal of material with Engineer's disposition of "Revise and Resubmit" (R&R), until Engineer's disposition is "Furnish as Submitted" (FAS), "Furnish as Corrected" (FAC), or "Furnish as Corrected – Confirm" (FACC) that requires a partial resubmittal.

c. Contractor shall be responsible for Engineer's charges to Owner if submittals are not approved within the number of specified submittals in accordance with the General Conditions. Engineer's charges shall include, but not limited to, additional review effort, meetings, and conference calls with Contractor, Subcontractor, or Supplier.

1.08 ENGINEER'S REVIEW

A. Engineer's review of the Contractor's submittal shall not relieve Contractor's responsibility under the Contract Document in accordance with the General Conditions and as modified in the Supplemental Conditions. An acceptance of a submittal shall be intended to mean the Engineer does not have specific objection to the submitted material, subject to conformance with the Contract Drawings and Specifications.

B. Engineer's review of Contractor's submittal shall be confined to general arrangement and compliance with the Contract Documents, and shall not be for the purpose of checking dimensions, weights, clearances, fittings, tolerances, interferences, coordination of Subcontractor work, etc.

C. Review Dispositions:

1. "Furnish as Submitted" (FAS) – No exceptions are taken.

2. "Furnish as Corrected" (FAC) – Minor corrections are noted for Contractor's correction.

3. "Furnish as Corrected – Confirm" (FACC) – Corrections are noted, and partial resubmittal shall be made as noted.

4. "Revise and Resubmit" (R&R) – Corrections are noted, and complete resubmittal shall be made. Submittal does not conform to applicable requirements of the Contract Documents and is not acceptable. Revise submittal and re-submit to indicate acceptability and conformance with the Contract Documents.

5. "Receipt Acknowledged" (RA) –

   a. Information included in submittal conforms to the applicable requirements of the Contract Documents and is acceptable. No further action by Contractor is required relative to this submittal, and the Work covered by the submittal may proceed, and products with submittals with this disposition may be shipped or operated, as applicable.

   b. Information included in submittal is for Project record purposes and does not require Engineer's review or approval.

6. "Rejected" (R) – Information included in submittal does not conform to the applicable requirements of the Contract Documents and is unacceptable. Contractor shall submit products and materials as specified in the Contract Documents or provide required information for substitution as specified in the Contract Documents for consideration by Engineer.

D. Electronic Submittal Return to Contractor: Electronic submittals shall be returned electronically with dispositions provided.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 35 27

ENVIRONMENTAL HEALTH AND SAFETY REQUIREMENTS

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Requirements for the Contractor to provide its employees its Subcontractors a safe and healthful work environment and for performing all Work in compliance with all applicable environmental health and safety (EHS) laws, rules, and regulations.

1. The EHS performance of the Contractor and its Subcontractors is the responsibility of the Contractor. Since effective on-site management is essential for EHS performance, the Contractor shall evaluate the performance of its on-site EHS team on a continuous basis. Where deficiencies are found, the Contractor shall take appropriate action including removal of its personnel or its Subcontractors' personnel.

2. The Contractor shall ensure that its employees and those of its Subcontractors working on a County project site under the Contract are clearly identifiable as a Project Contractor employee. This may include the use of labeled safety vests or hard hats or other acceptable means.

1.02 PAYMENT

A. There is no separate payment provision for this Section.

1.03 RELATED SECTIONS

A. Not Used

1.04 REFERENCES

A. "Competent Person" means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees or the environment, and who has authority to take prompt corrective measures to eliminate them. A Competent Person has stop work authority.

B. "EHS Resources" shall mean the Contractor's EHS Professional(s) and its EHS Site Representative (EHS Rep). This definition shall also apply to the Subcontractors' EHS Resources, where required. This definition also includes any consultant or other EHS personnel associated with the Project.

C. "Environmental Health & Safety Plan (EHASP)" shall mean the plan developed in accordance with all applicable EHS rules and regulations and these Specifications to identify and set forth policies and procedures to control the health and safety concerns and environmental impacts

known and unknown at the Site. This plan is not to be confused with the Health and Safety Plan that may be required under 29 CFR 1910.120 for Hazardous Waste Operations and Emergency Response (HAZWOPER).

D. "Job Hazard Analysis" (JHA) shall mean a tool used to document a process by which the steps required to accomplish a work activity are outlined, the actual or potential hazards for each step are identified, and measures for the elimination or control of those hazards are developed.

E. "Hazard Identification" shall mean an existing condition that has the potential to harm people, cause damage to property or the environment, or some combination of these.

F. "Incident" shall mean an undesired occurrence that resulted in injury, illness, environmental release, fire, explosion, motor vehicle event, property damage, equipment failure, non-compliance, and/or adverse impact to operations/work.

G. "Near Miss" shall mean an undesired event in which no property or environment was damaged and no personal injury (i.e., work related harm, damage or loss to a person, including first aid cases as well as recordable injuries) was sustained, but where, given a slight shift in time or position, damage or injury easily could have occurred.

H. "Observation" shall mean an opportunity to improve that does not entail an event included as a hazardous identification, near miss, or incident.

I. "Qualified Individual" shall mean one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his or her ability to solve or resolve problems relating to the subject matter, Work or Project.

1.05 DESCRIPTION

A. General

1. in compliance with all federal, state, and local environmental, health and safety laws, rules, and regulations.

2. The Contractor shall be responsible for the health and safety of its employees, Subcontractors, the public and all other persons at or around the Work Site. The Contractor shall be solely responsible for the adequacy of all construction methods, materials, equipment and the safe and environmentally compliant prosecution of the Work. Where possible, the Contractor shall implement Best Management Practices to reduce injuries, accidents and environmental impacts.

3. The Contractor shall perform and document its due diligence in determining whether the Subcontractors it hires to perform Work under the Contract are capable of performing to the EHS standards set forth in this Section. At a minimum, the Contractor is required to

perform an EHS evaluation of proposed Subcontractors prior to submitting them for County approval.

4. The Contractor shall implement an EHS Management Program which includes qualified Safety Professionals (SPs) and Environmental Professionals (EPs), collectively referred to as EHS Professionals, along with project management staff, with appropriate competencies to provide EHS direction, guidance, and oversight of all aspects of the performance of the Contract's detailed scope of Work.

5. The Contractor shall ensure that its EHS Resources have appropriate authority to execute their duties and responsibilities as set forth in this Section and under the Contractor's EHS Management Program.

6. The Contractor shall arrange for additional approved EHS Resources to be available during EHS staff absences. The Contractor must inform the Engineer, in writing, of anticipated absences.

7. Contractor EHS Resources:

    a. At a minimum, the Contractor shall provide the EHS Resources described below. The Contractor is required as part of its EHS Management Program to identify any EHS Resources necessary beyond the listed minimums.

    b. For all contracts that employ 100 or less employees on site at any time, the Contractor shall have at least one full-time site EHS Rep. The Contractor may submit a request in writing to the Engineer to waive the requirement of a separate EHS Rep at each site and permit other Contractor employees who are Qualified Individuals to monitor the EHS activities of the employees and to assume all of the responsibilities of the full-time site EHS Rep, if it can show that one EHS Rep can effectively manage multiple sites. The EHS Rep(s) shall have no other duties except those related to EHS on the Contract, and shall not be the project manager, engineer, superintendent or have any other title or project role other than EHS Rep.

    c. For all contracts that employ over 100 employees on site at any time, the Contractor shall have at least two full time EHS Reps. These EHS Reps shall have no other duties except those related to EHS on the Contract, and shall not be project managers, engineers, superintendents or have any other title or project role other than EHS Rep.

    d. The Contractor may submit a request in writing to the Engineer to waive the requirements of this Section and permit other Contractor employees who are Qualified Individuals to monitor the EHS activities of the employees on site and to assume all of the responsibilities of the full-time EHS Rep.

    e. The Contractor shall ensure that Subcontractors who consistently employ over 100 employees for more than two weeks at a time under the Contract shall have one full-

time site EHS Rep. This EHS Rep shall have no other duties except those related to EHS on the Contract and shall not be the Project Manager, Engineer, superintendent or have any other title or project role other than as the Subcontractor's EHS Rep.

f. If the Contract has more than one location, each location shall be treated as a separate contract for purposes of determining the number(s) of necessary EHS Reps in accordance with paragraphs 2 through 4 above.

g. The Contractor's EHS staff shall be provided an appropriate office on the Project Site to maintain and keep available EHS records, up-to-date copies of all pertinent EHS laws, rules, regulations and governing legislation, material safety data sheets, and the EHASP.

8. All site workers have the right to refuse unsafe work which is reasonably believed to present imminent danger to their own safety or the safety of others, the public or the environment, or to County property, without adverse consequences.

9. The Contractor and its Subcontractors shall stop Work and initiate immediate corrective action whenever a Work procedure or a condition at the work site is deemed unsafe by the EHS staff, County, Competent Persons, or the Engineer. All Contractor and Subcontractor employees working on site shall report any unsafe or noncompliant work condition(s) immediately to the EHS staff, Competent Persons, or the Engineer. If a stop Work order is issued to the Contractor by the Engineer for unsatisfactory EHS performance, the Contractor shall not make any claim against the County for any losses associated with the stop work order.

10. The Contractor and all Subcontractors are responsible for daily cleanup of their immediate Work areas. Construction scrap and debris shall be removed daily during the course of construction, alterations and repairs. Contractor refuse shall not be allowed to accumulate so as to create trip hazards or block access routes and pathways. The Contractor shall implement procedures to ensure a high standard of housekeeping. All waste shall be disposed of in accordance with the appropriate regulations and applicable Specifications.

11. The Contractor shall ensure that any sand, soil, plaster, cement, mortar or the like is not deposited or washed into any drain or sewer unless specifically authorized under required permits.

B. Environmental Health and Safety Plan (EHASP)

1. The Contractor shall have a written EHASP prepared and signed by the EHS Professional. The EHASP must be signed by a principal or senior manager of the company and project management staff. The EHASP shall be submitted to the County for review and approval prior to the start of any work. JHAs will be developed as the Work progresses and will supplement the Contractor's EHASP.

C. Emergency Action Plan

1. The Contractor shall work with the Construction Manager and Other Contractors to develop a single cohesive construction EAP.

    a. The Contractor is responsible for providing or supplementing the facility's existing, emergency alarm/siren/annunciation system to ensure that all Contractor personnel will be adequately notified of an alarm condition or required/test evacuation.

    b. The Contractor is responsible for evaluating and ensuring that all identified emergency resources are adequate and appropriate for the potential rescues/emergencies needed.

D. Spill Prevention Program (SPP)

1. The Contractor shall establish a Spill Prevention Program (SPP) for the prevention of releases of petroleum, hazardous substances or other pollutants. The SPP shall be included in the EHASP, and include awareness training for all personnel on measures designed to reduce, minimize and eliminate the potential for releases.

2. The Contractor shall establish sound work practices and implement appropriate measures to achieve release prevention and control of releases when they do occur.

3. At a minimum, the Contractor shall include within the SPP the following:

    a. Proper materials handling, labeling and container storage inspection practices for all products including hazardous and universal waste.

    b. All petroleum products, hazardous substances, or chemicals must be stored in designated areas and include secondary containment (with capacity to contain 110% of largest container) for all closed containers with a capacity greater than 5 gallons. Open containers of petroleum products, hazardous substances, or chemicals must be stored on secondary containment at all times.

    c. Follow manufacturer recommended preventive Maintenance Procedures (MPs) and where none exist, develop in-house equipment specific MPs.

    d. Inspection for and purging of residual materials in piping, tanks and other equipment prior to disassembly, demolition and disposal.

    e. Supervision of fuel and chemical deliveries. These deliveries shall only be permitted during normal Project work hours or as otherwise approved by the Engineer.

    f. The SPP shall include a detailed summary of anticipated petroleum and chemical storage. The information shall include capacity, contents, description and secondary containment provided.

E. The Contractor shall bear sole responsibility for all costs and delays resulting from any releases on the Project which occur as a result of the work activities.

1.06 QUALITY ASSURANCE

A. Qualifications

1. The Contractor shall ensure that, at all times, its employees and those of its Subcontractors have received OSHA 10-Hour Construction training or OSHA 30-Hour training within the last five (5) years.

2. The EHS Professional(s) shall possess a combination of safety and environmental skills as needed to manage the EHS hazards and issues presented by this Project. The EHS Professional may be one or more persons meeting the individual qualifications for Safety and Environmental Professionals as detailed below.

3. Safety Professional (SP): Persons recognized as a Safety Professional shall, at a minimum, possess the following education and experience:

a. Certification as a Certified Safety Professional granted by the Board of Certified Safety Professionals and five (5) years of documented professional construction EHS management experience; or

b. Certification as a Certified Industrial Hygienist granted by the American Board of Industrial Hygiene and five (5) years of documented professional construction EHS management experience; or

c. A Bachelor of Science degree in safety, industrial hygiene, occupational safety and health, environmental health and science, or related field and ten (10) years of documented professional construction EHS management experience.

d. All documented professional EHS management experience must be in the types of construction and conditions expected to be encountered on the site.

e. For projects that require hazardous waste remediation or response, the SP is also required to have successfully completed a forty-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course.

4. Environmental Professional (EP): Persons recognized as an Environmental Professional shall, at a minimum, possess the following education and experience:

a. A Bachelor’s degree in environmental science, environmental engineering or other related engineering or science field and ten (10) years of documented professional environmental field, management and/or engineering experience. All documented professional environmental experience must be in the types of construction and conditions expected to be encountered under this Contract.

b. The EP's knowledge and experience should include, but not be limited to, management and disposal of solid and hazardous waste, universal waste, hazardous materials management, chemical and petroleum bulk storage, used oil, chemical and petroleum spill control plans, lead/mercury/PCB and asbestos remediation and management, storm water and soil management, and environmental permit management.

c. Where required for soil sampling plans and determining soil classifications the EP shall meet the NYSDEC definition for a Qualified Environmental Professional (QEP).

5. EHS Rep: Qualifications of the EHS Rep(s) shall include a minimum of: ten years of relevant construction experience, five years of which were exclusively in construction EHS management and successful completion of the following training courses:

a. Thirty-hour OSHA construction safety and health training;

b. For projects that require hazardous waste remediation or response, forty-hour HAZWOPER training;

c. Permit- required confined space;

d. Control of hazardous energy sources (lockout/tagout);

1.07 SUBMITTALS

A. Environmental Health and Safety Plan (EHASP)

a. The Contractor shall submit the draft EHASP to the Engineer for review and approval within thirty business days from issuance of the Notice to Proceed. In no case shall Work be allowed to commence without an approved EHASP.

b. Initial submission of the EHASP shall be provided as one hard copy and one electronic copy (either Word or Acrobat format) to the Engineer.

c. The EHASP submittal shall be reviewed and comments shall be provided to the Contractor upon completion of the review.

1) The Contractor shall work with the Engineer to address all comments in order to obtain EHASP approval.

d. Upon receipt of final approval, the Contractor shall provide one hard copy and one electronic copy (either Word or Acrobat format) of the EHASP to the Engineer.

2. The EHASP shall be available to all of the Contractor's employees working on the Contract.

3. Review, acceptance and/or approval of the EHASP will not impose responsibility for the EHASP on any other party, nor will it relieve the Contractor from any of its EHS responsibilities.

4. The Contractor shall submit for approval, the names of the EHS Professional and EHS Rep(s) to be employed. The Contractor shall submit the resumes, copies of certifications, a signed certification of employee training, along with other qualifications of the EHS Professional and EHS Rep. The resumes shall include items such as: experience, education, EHS courses completed, safety and environmental conferences attended, and certifications achieved. Documentation and/or personal references confirming the qualifications may also be required.

5. The Contractor shall immediately notify the Engineer of all Incidents involving employee injury and illness, and any other work-related Incidents or Near Misses, damage to equipment and structures, releases or adverse impacts to the environment, or other conditions.

6. The Contractor must notify the Engineer immediately of any regulatory inspections, notices of citations and penalties, Notices of Violation (NOVs), or any other outside agency violations. In addition, the Contractor shall furnish to the Engineer a copy of all correspondence from OSHA, NYSDEC, or any other government regulatory agency, within one day of receipt, which may include, but are not limited to, employee complaints, notices of citations and penalties, environmental and NOVs. The Contractor must close out all NOVs and provide documentation to the Engineer that the NOV is closed/corrected as a condition precedent to obtaining final payment.

B. Risk Control Reports

1. The Contractor will forward to the Engineer any risk control reports generated by its insurance carrier or broker within one day of receipt.

C. Monthly Contractor EHS Report

1. The Contractor shall submit, on or before the 10th day of each month, a summary report of EHS activity for the prior month, including, but not limited to:

   a. Chemical Inventory with HTSL (Hazardous and Toxic Substance List) and Subpart Z List.

   b. Summary of audit data including trending and analysis along with root cause and corrective actions/training identified.

   c. Summary of the regulatory inspections, notices of citations and penalties, NOVs, or any other outside agency violations

d. Statement by the EHS Professional discussing their review of the monthly report and recommendations for improvement, as necessary.

2. The Engineer shall review the report to verify that the Contractor is effectively managing the EHS requirements under the Contract. If the Contractor has no, or limited Work in a given month, it shall inform the Engineer that no Work was performed or submit the required documentation for those days that Work was performed.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. EHS Equipment

1. The Contractor shall provide the proper EHS and rescue equipment for all employees, adequately maintained and readily available, for any foreseeable contingency or situation under the Contract during the performance of the Work.

2. All equipment shall be stored in protected areas and maintained and calibrated in accordance with the manufacturer's recommendations and as specified in the EHASP. Where equipment is required to be inspected and or calibrated, documentation shall be maintained and available for review.

B. Personal Protective Equipment

1. All personnel employed by the Contractor and any visitors entering the job site shall be required to wear appropriate personal protective equipment (PPE) required as specified in the EHASP. The Contractor shall continuously provide and maintain adequate PPE.

PART 3 – EXECUTION

3.01 EXAMINATION / PREPARATION

A. EHS Staff Duties

1. The Contractor's EHS staff is responsible for overseeing and managing the Contractor's safe and environmentally compliant performance of all Work.

2. EHS Professionals shall be required to initiate, review and implement measures to ensure the health and safety of all Contractor employees, and to protect property and the environment. Each EHS Professional is required to visit the Site and audit the Site conditions in accordance with the Contractor's EHS Management Program or as directed by the Engineer.

3. The EHS Professional will be held accountable to adjust his/her workload to enable proper performance of all of their EHS responsibilities in accordance with all requirements of this Section and all applicable regulations. The County may request that the Contractor remove the EHS Professional for not meeting the Contract requirements.

4. The EHS Professional shall visit the Site prior to developing the Contractor's EHASP. The EHS Professional will arrange a visit with the Engineer and perform an inspection of the Site to understand the full scope of Work to be performed under the Contract. Contract Documents relevant to writing the EHASP can be reviewed and obtained at this time. Facility/Site specific information must be provided, reviewed, and documented.

5. The EHS Professional shall visit all Work areas as frequently as necessary, but no less frequently than monthly, to verify that EHS compliance is being achieved. The EHS Professional shall review hazards, JHAs, and the foremen's and superintendent's preparation and communication of JHAs to workers. The EHS Professional shall review the Project team's compliance with and adherence to EHS requirements, as well as their proactive approach and planning for EHS.

6. The EHS Professional shall be available for consultation whenever necessary. Prior to and after each visit, the EHS Professional shall sign the visitors' log maintained at the Engineer's office.

7. The EHS Professional is expected to perform their inspections in concert with the EHS Rep, during which time the EHS Professional will not only inspect the Site, but shall also mentor and direct the EfHS Rep. During the inspection, the EHS Professional will evaluate the Contractor and each subcontractor working under the Contract and clearly identify findings and who they are assigned to, using the EHS Professional checklist provided in the EHASP. Any findings that cannot be resolved immediately will be assigned to the EHS Rep for follow-up. The EHS Professional is expected to communicate with the EHS Rep to ensure all identified findings are closed out. The EHS Professional's inspection shall include programmatic issues such as adhering to the Contractor's EHS program, including, but not limited to, preparing and communicating JHAs and proactively minimizing EHS risks.

8. The EHS Rep will coordinate with the EHS Professional when questions arise requiring the EHS Professional's expertise. After each visit, the EHS Professional shall prepare a report, including photographs (where necessary), acceptable to the Engineer, detailing the findings. The report shall include those hazards and violations discovered during the site visit and when and how they were or will be closed out. Any EHS items not covered or documented by the inspection checklist will be noted in the comments section of the checklist. The report shall be submitted to the Engineer within one business day of the Site visit.

9. The EHS Rep shall be at the job Site full time whenever work is in progress during all shifts.

10. The EHS Professional's and EHS Rep's responsibilities are as follows:

a. The EHS Professional is responsible for directing the Contractor's EHS program, ensuring implementation by the Contractor and all Subcontractors, and for directing and monitoring all activities of the EHS Rep. If the EHS Rep is not enforcing the EHASP, JHAs, or other elements of the EHS program, the EHS Professional shall either recommend retraining or removal of the EHS Rep from the Project by submitting a letter to the Engineer and the Contractor.

b. The EHS Rep must review JHAs to verify that the Work activity's EHS issues and hazards are accurately identified, addressed, and communicated. JHAs shall be regularly communicated to affected employees and must be made available in the areas where the affected employees are working. The EHS Professional is responsible for reviewing JHAs at least monthly to verify that they adequately reflect the recognized hazards and controls of the tasks being performed. JHAs shall be provided to the Engineer when requested.

c. Both the EHS Professional and the EHS Rep shall schedule and conduct EHS meetings and training programs as required. A specific schedule of these meetings and an outline of topics to be covered shall be provided with the EHASP. The Engineer shall be advised in advance of the time and place of such meetings, and County personnel shall be invited to attend the meetings.

d. All Contractor employees shall be instructed by the EHS Professional and the EHS Rep on the recognition of hazards, safe Work practices and environmental precautions, the contents of the EHASP, and the use of environmental, personal protective and emergency equipment. Such training shall be documented, recorded, and provided as part of the EHS monthly report(s). EHS Reps and EHS Professionals will attend regularly scheduled meetings held by the Engineer including, but not limited to, the EHS Pre-Construction Meeting.

e. Determine that operators of specific equipment are qualified by training, certification and/or experience before they are allowed to operate such equipment. Ensure documentation of licenses, certifications and training by the appropriate agencies (for example OSHA, etc.) are on site and current, prior to start of Work.

f. Develop an effective Site communication plan that includes, signage, and verbal and written communication of EHS issues and notices.

g. Post all appropriate notices regarding EHS regulations at Site location(s) which afford maximum exposure to all personnel at the job Site.

h. Post appropriate instructions and warning signs regarding all hazardous areas or conditions which cannot be eliminated. Identification of these areas shall be based on experience, site surveillance, and severity of hazard. Such signs shall not be used in place of appropriate workplace controls.

i. The EHS Rep is to conduct EHS inspections a minimum of twice per shift to ensure that all machines, tools and equipment are in a safe operating condition, and that all Work areas are free of safety and environmental hazards. The EHS Rep shall take necessary and immediate corrective actions, where feasible, to eliminate all unsafe acts and/or conditions, and submit to the Engineer each day a copy of the findings on the inspection check list report forms established in the EHASP. Detailed checklists will be tailored to the EHS hazards and conditions on the Site, and will include a comments section to include findings not specifically listed on the checklist.

j. Whenever the County and its agents perform both announced and unannounced inspections of the Contractor's EHS performance, a member of the Contractor's on-site EHS team shall be available during the inspections. The EHS Professional will coordinate inspections with the Engineer and County inspectors upon request. The Contractor shall take immediate corrective action, where feasible, to eliminate hazards identified by the Engineer, County inspectors, or any other entity. The Contractor, if requested, shall develop and implement a plan detailing corrective actions necessary to mitigate the presence of noncompliant conditions and actions following Incidents, citations, NOVs, or identification of patterns of noncompliant conditions and acts.

k. Notify the Engineer immediately of all inspections by regulatory agencies, and submit to the Engineer copies of all EHS reports, citations, and NOVs from regulatory agencies and insurance companies within one workday of receipt.

l. Implement an effective fire protection and prevention program at the Site throughout all phases of the construction. The Contractor will ensure the availability of fire protection and suppression equipment adequate to control the degree of fire hazard encountered during construction.

m. Provide and document appropriate Site-specific orientation to Contractor employees, visitors, and Subcontractors communicating recognized hazards present at and surrounding the Site(s).

n. Perform all tasks and responsibilities as identified in the EHASP.

3.02 FIELD TESTING / QUALITY CONTROL

A. EPCRA and Related Hazardous Material Regulations

1. The Contractor shall maintain a monthly inventory of hazardous substances or extremely hazardous substances used or stored on site. Documentation shall be maintained on Site and available for review.

2. The Contractor shall prepare and provide to the Engineer a Right to Know (RTK)/Emergency Planning and Community Right to Know Act (EPCRA) Annual

Chemical Inventory Form for all hazardous and extremely hazardous substances that the Contractor used or stored during the previous calendar year. This shall be provided by January 15th of each year.

3. In order to obtain Final Acceptance, the Contractor must satisfy all EPCRA reporting requirements for the final year of the Contract.

B. Temporary Protective Grounding Equipment

1. Temporary Protective Grounding Equipment (TPGE) shall be used at locations required by 29 CFR 1910.269. TPGE may be used at other locations, when specified in the EHASP.

2. TPGE shall not be used as a substitute for following lockout procedures.

C. Hot Work

1. The performance of Hot Work is prohibited unless performed under the issuance of a Hot Work permit from the Permit Authorizing Individual (PAI). The PAI shall be provided by the Engineer or the County.

2. The Contractor shall provide the Engineer with a JHA at least 48 hours prior to the performance of Hot Work. The JHA shall identify the following:

a. The locations where the Work is to performed;

b. Equipment to be used;

c. Gases or vapors within or adjacent to the location that have the potential to create a combustible atmosphere;

d. Controls required to mitigate or prevent the accumulation of gases or vapors in quantities that have the potential to create a combustible atmosphere; and

e. Controls or methods to promptly discontinue the use of and de-energize equipment when a combustible atmosphere is detected.

3. For Hot Work in hazardous (classified) locations, refer to the requirements of Section 01 35 27 – Working in Hazardous (Classified) Locations.

D. Electrical Equipment Lockout

1. Contractor is required to lock out all electrical equipment utilizing lockable disconnecting means that provide mechanical isolation followed by verification of no voltage, as according to OHSA 1910/1926 and NFPA 70E; equipment tag out is not sufficient. If a lockable disconnecting means is not available at the identified equipment due to equipment design or operational condition, the Lockout process will continue elevating to the next level of the system, electrical or otherwise, until a lockable disconnecting means is

available providing mechanical isolation. Complex electrical systems and network power distribution systems require lockable disconnecting means at all isolation points from the main power source through the downstream equipment loads (e.g. systems with A and B bus sources or other multiple power sources). The lock out requirement will be performed to the greatest extent possible in consideration of plant operational impacts. When the plant operational impacts are too significant to environmental compliance, an alternative method may be utilized know as an Energized Electrical Work Permit (EEWP). An EEWP is a document, defined by NFPA 70E, that clearly describes the following: the circuit, equipment, and location of the job/task at hand; the work that is to be done; justification of why the circuit or equipment cannot be de-energized or the work deferred until the next scheduled outage; performed by an Electrical Safety Worker (ESW); signatory authorization by the Plant Chief or Facility Manager.

3.03 STARTUP AND DEMONSTRATION

A. Visitors

1. Allowing visitors and members of the public to tour an active construction site is discouraged due to the potential exposures to hazardous conditions and materials associated with construction Work. However, where necessary, approved and authorized visitors of the Contractor, Subcontractors, or any other authorized agency, department, or other entity associated with the Contractor shall sign in at both the County/Contractor Security Booth and the Visitors' Log maintained at the Contractor's Site office. Visitors are required to receive Site orientation training, comply with all provisions of the EHASP, wear proper and appropriate PPE and be escorted at all times. All efforts should be made not to schedule site tours/visits at the time of the scheduled evacuation drills. Visitors must not be exposed to construction hazards without prior training with respect to those construction hazards.

END OF SECTION

SECTION 01 35 27

WORKING IN HAZARDOUS (CLASSIFIED) LOCATIONS

PART 1 – GENERAL

1.01 SUMMARY

A. Hazardous (Classified) Locations

B. Combustible Gas Detection

C. Qualifications of Combustible Gas Detection Employees

D. Task Hazard Analysis

E. Hot Work Permit

F. Air Monitoring Notices and Reports

1.02 PAYMENT

A. There is no separate payment provisions for this section.

1.03 RELATED SECTIONS

A. Section 01 35 45 – Environmental Health and Safety Requirements

1.04 REFERENCES

A. Combustible Gas Detection: Performed by use of a gas detector to detect the presence of flammable vapors and gases and to warn when concentrations in air approach the explosive range.

B. Hazardous (Classified) Locations: A location that is classified based on the properties of the flammable vapors, liquids, or gases, or combustible dusts or fibers, that might be present and the likelihood that a flammable or combustible concentration or quantity that is present.

C. Hot Work: Any work involving burning, welding, grinding, or similar operations that are capable of initiating fires or explosions.

D. Rated Equipment and Wiring:

1. Explosion Proof: Equipment and wiring that is enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor that may occur within it and of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks,

flashes, or explosion of the gas or vapor within, and that operates at such an external temperature that a surrounding flammable atmosphere will not be ignited thereby.

2. Intrinsically Safe: Equipment and wiring that are incapable of releasing sufficient electrical energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture.

3. Approved Industrial Truck: A truck that is listed or approved by a nationally recognized testing laboratory for fire safety purposes for the intended use and designated for the Hazardous (Classified) Location in accordance with the OSHA regulation at 29 CFR 1910.178(b).

E. Lower Explosive Limit (LEL): The concentration of a combustible material in air below which ignition will not occur.

F. Upper Explosive Limit (UEL): The highest concentration of a combustible substance in a gaseous oxidizer that will propagate a flame.

1.05 DESCRIPTION

A. Hazardous (Classified) Locations

1. The Contractor's attention is directed to the fact that certain Work areas where process equipment, tanks or piping systems exist above or below the ground may be configured such that they may be classified to be Hazardous (Classified) Locations as defined in this Section.

2. Hazardous (Classified) Locations at the Work Site include, but are not limited to, the following areas:

a. Digester and Storage Tank Interiors

3. The Contractor shall be aware of the classification of all work areas and understand that the introduction of certain equipment and materials may cause an area to be re-classified as a Hazardous (Classified) Location.

4. The Contractor shall prevent unauthorized work from taking place in any Hazardous (Classified) Location:

a. Before entering any Hazardous (Classified) Location, the Contractor shall ensure that a safe working atmosphere exists;

b. When working within the Hazardous (Classified) Locations, the Contractor shall take suitable precautions to ensure a safe working atmosphere;

c. The Contractor shall take all necessary protective measures to ensure the safe completion of the Work.

5. Atmospheric monitoring to ensure the protection of employee health and safety must comply with the requirements of the Contractor's Environmental Health and Safety Plan (EHASP) as per Detailed Specification 01 35 45 – Environmental Health and Safety Requirements.

B. Working in Hazardous (Classified) Locations:

1. All Hazardous (Classified) Locations and the extent of such locations shall be identified prior to the performance of Work in Hazardous (Classified) Locations.

2. Work in Hazardous (Classified) Locations shall be performed using only equipment and wiring rated and clearly marked for such use, unless approved Combustible Gas Detection equipment and qualified Combustible Gas Detection personnel are provided to ensure a safe working atmosphere for the duration of the time that employees are working in Hazardous (Classified) Locations.

3. The performance of Hot Work in Hazardous (Classified) Locations is prohibited unless performed under the issuance of a Hot Work permit from the Permit Authorizing Individual (PAI). The Engineer or County shall provide the PAI.

4. The Contractor shall provide the Engineer with a Job Hazard Analysis (JHA) at least 48 hours prior to the performance of Hot Work in a Hazardous (Classified) Location. The JHA shall identify the following:

a. The Hazardous (Classified) Locations where the Work is to be performed;

b. Equipment and wiring to be used in the Hazardous (Classified) Location;

c. Gases or vapors within or adjacent to the Hazardous (Classified) Location that have the potential to create a combustible atmosphere;

d. Controls required to mitigate or prevent the accumulation of gases or vapors in quantities that have the potential to create a combustible atmosphere;

e. Controls or methods to promptly discontinue the use of and de-energize non-rated equipment when a combustible atmosphere is detected.

5. The Contractor shall not use any non-rated equipment (e.g., powered industrial trucks not specifically rated for the areas to be used) in Hazardous (Classified) Locations without obtaining approval from the Engineer.

a. Where approval is provided the Contractor shall provide the Engineer with documentation that workers using non-rated equipment in the Hazardous

(Classified) Location have been provided training and information on the applicable JHA and emergency procedures prior to working with non-rated equipment.

C. Combustible Gas Detection:

1. The Contractor shall arrange for Combustible Gas Detection to be performed by qualified Combustible Gas Detection personnel, as identified within this Section, anytime Work is to be performed in Hazardous (Classified) Locations with equipment and wiring that is not rated for such use. The Contractor shall certify that all Work in Hazardous (Classified) Locations is being performed in a safe atmosphere.

2. Prior to commencing the Work for Combustible Gas Detection, the Contractor shall submit for the approval of the Engineer a communications protocol detailing the type and sequence of warning signals to be utilized, and describing the evacuation procedure to be employed, whenever a hazardous condition occurs .

3. The Contractor shall ensure that Combustible Gas Detection equipment, which is listed by Underwriters Laboratories (UL) and rated for use in Hazardous (Classified) Locations, is calibrated, tested and maintained prior to use in a Hazardous (Classified) Location by qualified persons in accordance with the requirements of the equipment's manufacturer.

4. Prior to the start of Combustible Gas Detection, the Contractor shall:

   a. Ensure the gas detection manager has performed an analysis of the work area to evaluate the combustible gas hazards of the location, determine the arrangement of Combustible Gas Detection equipment and implement any further controls necessary to mitigate or prevent the accumulation of a combustible atmosphere (i.e., ventilation controls, equipment positioning, etc.).

   b. Calibrate all Combustible Gas Detection equipment in accordance with the manufacturer's requirements, and perform any necessary test functions (e.g., "bump test") at a minimum daily to ensure appropriate use of the equipment in accordance with the manufacturer's requirements.

   c. Where the use of non-rated equipment is approved as described within this Section, Position Combustible Gas Detection equipment to establish monitoring results at least 15 minutes prior to the use of any non-rated equipment in a Hazardous (Classified) Location. The following conditions must be present to allow for the initial use of non-rated equipment:

      1) An oxygen level greater than 19.5 percent and less than 23.5 percent concentration;

      2) A LEL less than 5 percent concentration.

d. Ensure the JHA for performing Hot Work in a Hazardous (Classified) Location is prepared, reviewed and updated by the Contractor's gas detection manager prior to the start of Hot Work and any time:

1) The scope of Work changes to introduce hazards or a potential for combustible gases or vapors to be present was not previously identified;

2) The JHA's hazard evaluation does not adequately address the identified hazards;

3) Hazard controls of the JHA have changed or do not sufficiently mitigate or prevent the accumulation of a combustible atmosphere.

e. Provide written verification to the Engineer that all gas detection equipment has been properly calibrated and tested prior to the start of Work in any Hazardous (Classified) Location.

f. Provide written verification to the Engineer that all work areas where non-rated equipment and wiring being used is safe through the issuance of a Notice of Safe Atmosphere upon calibration and testing of gas detection equipment and prior to the use of non-rated equipment in a Hazardous (Classified) Location.

5. Continuously monitor the Hazardous (Classified) Location with documented readings every 15 minutes. Electronic data logging where gas detection equipment possesses such capabilities is adequate so long as readings are recorded at least every 15 minutes and results are capable of being provided to the Engineer as written documentation.

6. Combustible Gas Detection equipment shall be capable of providing a continuous digital output measuring:

a. Oxygen in percent concentration;

b. LEL in percent concentration.

7. A warning condition shall be declared to all affected persons in the area, and the Engineer, by radio, PA, or in person anytime the following condition exists:

a. LEL greater than 5 percent.

8. Work shall be immediately stopped and non-rated equipment de-energized when any hazardous atmosphere is measured by gas detection equipment. A hazardous atmosphere is determined by the presence of any of the following:

a. Oxygen levels less than 19.5 percent or greater than 23.5 percent concentration;

b. LEL greater than 10 percent.

9. When a hazardous atmosphere is present, a hazardous condition shall be declared and the gas detection technicians shall immediately implement the following actions:

    a. Sound a portable air horn to warn all personnel that a hazardous atmosphere exists;

    b. Notify the Contractor and the Engineer by radio communication, PA, or in person that a hazardous condition has been declared;

    c. Notify all persons in the potentially affected areas to immediately evacuate the area and discontinue use of non-rated equipment in Hazardous (Classified) Locations until the Engineer determines the conditions leading to the presence of a hazardous atmosphere, identified corrective actions to mitigate or prevent a re-accumulation of an unsafe atmosphere, and the atmosphere of the Hazardous (Classified) Location has returned to levels that personnel can safely resume operations in the area;

    d. Issue a Notice of Unsafe Atmosphere to the Engineer and ensure access is precluded by the Contractor's personnel in areas where a hazardous atmosphere is present;

    e. The Contractor shall make combustible gas detection equipment available to the Engineer during the investigation and corrective/preventative action review.

10. When the Contractor determines that a hazardous atmosphere no longer exists, Work may resume upon issuance of a Notice of Safe Atmosphere in accordance with the procedures identified in this Section.

11. Provide all required Combustible Gas Detection equipment in sufficient quantities, with backups.

    a. The number of required equipment shall be determined by the gas detection manager and shall consider the size of work area, work to be performed, location of personnel, and configuration. Gas detection shall be adequate to identify potentially hazardous conditions in any area which could present a hazard to personnel.

1.06 QUALITY ASSURANCE

A. Qualification of Combustible Gas Detection Employees:

1. The Contractor shall ensure the following qualified personnel are available when performing Combustible Gas Detection:

    a. A gas detection manager who meets at least one (1) of the following and has been approved by County:

        1) Certified Industrial Hygienist (CIH) by the American Board of Industrial Hygienists (ABIH) with at least five (5) years of documented professional industrial hygiene and air monitoring management experience.

2) Certified Safety Professional (CSP) by the Board of Certified Safety Professionals (BCSP) with at least five (5) years of documented professional industrial hygiene and air monitoring management experience.

3) Bachelor of Science degree in industrial hygiene, occupational safety and health, or environmental health and science and ten (10) years of documented professional industrial hygiene and air monitoring management experience.

b. Gas detection technicians shall be present as necessary to ensure the continuous monitoring for the presence of combustible gases and shall have no other responsibilities than those of a combustible gas detection technician. Technicians shall meet the following prior to operating Combustible Gas Detection equipment:

1) Trained in the calibration, testing, maintenance and operation of the Combustible Gas Detection equipment being used;

2) Have a minimum of six (6) months' experience in the monitoring of combustible gases and vapors;

3) Where confined spaces are involved, possess confined space training to include the responsibilities of the confined space entrant, attendant and entry supervisor.

c. The Engineer shall have the right to interview and review the qualifications of all personnel performing Combustible Gas Detection.

1.07 SUBMITTALS

A. At a minimum, submittals shall include:

1. Prior to the commencement of any Work of this Section, the following items shall be submitted to the Engineer:

a. Qualifications of the Combustible Gas Detection employees.

2. In addition, during the performance of Work, the Contractor shall submit the following items as required in this Section:

a. JHA;

b. Communications protocol;

c. Written verification of equipment calibration;

d. Written review and verification of conditions;

B. Air Monitoring Notices and Reports

1. The Contractor shall prepare and submit the following air monitoring notices and reports to the Engineer:

   a. Notice of Safe Atmosphere:

      1) When a previously determined hazardous atmosphere has been eliminated, and immediately after completing the procedures required above, the Contractor shall prepare and deliver a Notice of Safe Atmosphere to the Engineer;

      2) If the Notice of Safe Atmosphere is issued to rescind a Notice of Unsafe Atmosphere, it shall identify the contributing factors leading to the unsafe atmosphere and the necessary corrective actions to prevent reoccurrence.

   b. Notice of Unsafe Atmosphere:

      1) This notice shall be prepared on site when a hazardous condition is detected and immediately after all notifications required above within this Section have been completed. The Notice of Unsafe Atmosphere shall specify the type(s) and concentration(s) of gas(es) detected, the nature of the gas hazard and the location where, and the time when the hazard has been detected;

      2) This notice shall be presented to the Engineer immediately upon completion.

C. Daily Log Report

1. The daily log report shall be provided to the Engineer daily and provide the Combustible Gas Detection equipment's readings in 15 minute intervals. Location and other task specific information shall be included in the daily report.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

10/01/18

SECTION 01 35 45

HAZARDOUS MATERIALS CONTROL

PART 1 – GENERAL

1.01 SUMMARY

A. Known Hazardous Materials

B. Unforeseen Hazardous Materials

C. Hazardous Materials Investigation and Remediation

D. Hazardous Waste Management and Regulatory Compliance

1.02 PAYMENT

A. Payment for unforeseen hazardous material remediation and the related costs of hazardous waste management and regulatory compliance will be made from the allowance(s) as specified in Section 01 27 00 – Measurement and Payment.

B. Except for the allowance specified herein, no separate payment will be made for performing any other Work required under this Section and the Contractor shall include all costs thereof in its prices bid.

1.03 RELATED SECTIONS

A. Section 01 27 00 – Measurement and Payment

B. Section 01 35 27 – Environmental, Health and Safety Requirements

C. Section 02 82 05 – Asbestos Management

D. Section 02 83 05 – Lead Management

E. Section 02 84 05 – PCBs Management

1.04 REFERENCES

A. Competent Person: One who is capable of identifying existing and predictable hazards in the work area or unsanitary, hazardous, or dangerous working conditions, and who has authority to take prompt corrective measures (29 CFR 1926.32(f)).

B. Large Quantity Generator (LQG): A facility that generates (in a calendar month) ≥1,000 kg of total hazardous waste or >1 kg of acute hazardous waste or >100 kg of acute hazardous waste

spill residue or soil, or at any time stores hazardous and acute hazardous wastes in greater quantities (at any time) than 6,000 kg of hazardous waste, 1 kg acute hazardous waste, or 100 kg of acute hazardous waste spill residue or soil.

1.05 DESCRIPTION

A. Known Hazardous Materials

1. There are materials present within the designated work areas that will require special handling and other safeguard measures in order to minimize chemical exposure hazards to site workers and to prevent environmental impacts to offsite areas. As applicable to its Work, the Contractor shall incorporate these minimum requirements into its Environmental, Health and Safety Plan (EHASP) or other applicable submittal to ensure a safe and healthful working environment. The Health and Safety Plan shall be designed in accordance with Section 01 35 27 – Environmental, Health and Safety Requirements.

   a. Upon completion of any additional material sampling at the project/work site(s), the Contractor's EHASP shall be updated as needed to incorporate new data generated by analysis of the samples.

   b. These materials include lead-containing paints, non-TSCA regulated PCBs (< 50 mg/kg) in paints and tar, asbestos-containing materials (tar, caulk, gaskets), and inaccessible suspect materials requiring further investigation during construction, as summarized in Tables 1 through 5, provided at the end of this Specification.

   c. Additional details pertaining to the hazardous materials investigation, including sample locations are provided and are available for review in the Hazardous Materials Investigation Report for the Cedar Creek WPCP, January 2023. All hazardous material remediation shall be performed by the Contractor.

2. The Contractor shall not initiate or proceed with any Work in areas associated with the contaminated, potentially hazardous, or hazardous materials until these materials have been removed from these areas or managed in accordance with the following Specifications:

   a. Asbestos-containing material shall be handled in accordance with Section 02 82 05 – Asbestos Management

   b. Lead-containing paint shall be handled in accordance with Detailed Section 02 83 05 – Lead Management

   c. PCB-containing material shall be handled in accordance with Section 02 84 05 – PCBs Management

3. The Contractor shall attend an initial site inspection, a coordination conference, and any other meetings to review hazardous materials control issues in connection with the progress of the Work. The initial site inspection and coordination conference shall be as

described below. Other meetings to monitor hazardous materials control issues associated with the Work, including any briefing of County personnel, including, but not limited to, facility managers and supervisors, shall be scheduled as necessary.

a. Initial Site Inspection: Within five (5) business days after work commencement date in the Notice to Proceed, or an agreed upon timeframe, the Contractor, the Engineer, and applicable County personnel shall perform an initial site inspection to review all the work areas that will be affected by contaminated, potentially hazardous and hazardous materials.

    1) Initial site inspection shall be organized by the Contractor who shall contact the County, and the Engineer to determine the representatives that should attend.

    2) A minimum of one representative from each party shall be present for the inspection.

    3) Competent Persons shall lead the site inspection.

    4) Wipe sampling or sampling outside of the Work to be performed may not be performed without County approval.

    5) A site inspection report shall be distributed by the Contractor at the beginning of the site inspection. The site inspection report shall include drawing(s) and associated text that describes the work in sufficient detail to aid in the site inspection.

    6) The Contractor shall note in the site inspection report any special requirements that they have to perform their work during the inspection.

    7) The Contractor shall prepare and distribute a summary of the site inspection and any comments noted during the inspection to all parties present at the site inspection.

    8) In the event that the initial site inspection does not satisfactorily identify the contaminated, potentially hazardous, and hazardous materials potentially affecting the Work, follow-up inspection(s) shall be organized and held as required.

b. Coordination Conference: Within five (5) business days after receipt of the submittals from the initial site inspection, the Engineer will direct the Contractor to schedule and organize a coordination conference. The coordination conference shall be held at the Engineer's field office, and shall include County facility managers and supervisors as relevant.

    1) The coordination conference shall be led by the Contractor.

2) The Contractor shall prepare and distribute a summary of the conference and any comments noted during the conference to all parties present at the conference.

c. Coordination Plan: Within 14 business days after the coordination conference, the Contractor shall submit a coordination plan for work affected by contaminated, potentially hazardous, and hazardous materials, incorporating all the Engineer's comments, for the Engineer's approval.

d. Follow-up Conferences: Within 14 business days of receiving the coordination plan, the Engineer will review and notify the Contractor of the approval of the coordination plan or of required changes. In the event that the plan is not approved, follow-up conference(s) shall be organized and held as required to receive approval.

1) The follow-up conference dates shall be as directed by the Engineer.

B. Unforeseen Hazardous Material

1. The project/work sites may contain unforeseen hazardous materials. When a potentially hazardous material that was previously unforeseen is discovered or an upgrade of its Environmental, Health and Safety Plan is necessary for managing unforeseen hazardous material, the Engineer will direct the Contractor to engage the services of a hazardous materials specialist to perform the necessary investigation, develop a remediation plan, and perform the remediation work. Additionally, the Engineer will direct the Contractor to update its EHASP as necessary.

2. The Contractor shall be responsible for identifying previously unknown and suspect hazardous materials as they are encountered using approved techniques and analytical methodologies. The Contractor shall submit a sampling plan to the Engineer for acceptance prior to sample collection. Indication of the presence of hazardous materials, including but not limited to odorous or stained soils, sediment or liquids, mercury sources and suspect asbestos-containing materials must be immediately reported to the Engineer. All work in the area shall stop until otherwise directed by the Engineer.

3. In the event that hazardous material is detected, the Engineer will provide the Contractor with a scope of work for the remediation services and direct the Contractor to obtain cost proposals for such work from at least three (3) hazardous material specialists unless otherwise required by the County depending upon the magnitude and timing of the work. The Contractor shall submit the proposals, indicating which hazardous material specialist the Contractor proposes to engage, to the Engineer within ten (10) business days of receiving the scope of remediation work. The Engineer shall review the proposals and approve such selection or direct the Contractor to submit an alternative selection or obtain additional proposals. Remediation work shall not commence until the Contractor receives written notice from the Engineer to proceed with the work. As directed by the Engineer,

pre-remediation inspections and coordination may also be required, in a manner similar to the procedures for known hazardous materials.

4. The Contractor shall not initiate or proceed with any other Work in areas associated with contaminated, potentially hazardous, or hazardous materials until these materials have been removed from these areas or managed, "in accordance with the following detailed specifications:

   a. Asbestos-containing material shall be handled in accordance with Section 02 82 05 – Asbestos Management

   b. Lead-containing paint shall be handled in accordance with Detailed Section 02 83 05 – Lead Management

   c. PCB-containing material shall be handled in accordance with Section 02 84 05 – PCBs Management

5. Some of the remediation work may be critical to maintaining construction schedules. When this occurs, the Engineer will establish a time for completion.

C. Hazardous Waste Management and Regulatory Compliance

1. Hazardous Waste Contingency Plan and Hazardous Waste Minimization Plan

   a. If the location of the project is on a site which has a Large Quantity Generator (LQG) status or subsequently obtains LQG status during the course of the Work, then the Contractor shall conform to the requirements of the Hazardous Waste Contingency Plan and Hazardous Waste Minimization Plan for that site.

2. Hazardous Waste Storage Compliance

   a. The Contractor shall maintain compliance with hazardous waste storage requirements at the worksite. Storage areas and inspections of storage areas must comply with the hazardous waste regulations detailed within 6 NYCRR Parts 370 through 375.

3. Waste Management Records

   a. Disposal of wastes generated by remediation Work will be based on the results of testing and shall be at a site permitted to accept such waste by the U.S. Environmental Protection Agency (EPA) or an authorized state or local government agency. The Contractor shall provide remediation waste profiles for County signature as generator, permit documentation required for the selected Treatment, Storage, or Disposal Facility (TSDF) to receive these wastes, and the transporter's Part 364 Waste Transporter Permit(s) required to transport wastes to the TSDF. The Contractor will conduct due diligence of the TSDF, including a list of violations

received. The Contractor shall also provide advance copies of the waste manifest(s) for the Engineer's review and approval. The Contractor will keep and update a Hazardous Waste Inventory Log and will document weekly inspections by a Competent Person in the management of hazardous waste.

b. The Contractor shall submit written evidence that selected TSDF's will accept or have accepted the wastes generated during remediation. The Contractor shall also submit copies of the completed manifest, signed and dated by the initial transporter, in accordance with federal and state requirements and with associated documentation (e.g., Waste Profile and Hazardous Waste Land Disposal Restrictions (LDR) Notification and Certification Form). Copies of completed and signed waste manifests from TSDF's shall be provided to the Engineer as soon as possible but no later than thirty (30) within seven (7) days of waste shipment offsite.

4. Changes to Hazardous Waste Generator Status

a. The Contractor shall be aware that work activities may result in a change to the worksite's hazardous waste generator status. Compliance with the revised generator status is required.

5. Hazardous Waste Regulatory Program Fees and Taxes

a. The Contractor may be directed to pay the New York State Department of Taxation and Finance for special assessments on hazardous waste generated at the project site or the NYSDEC regulatory program fees charged to the facility operating at the site. When directed by the Engineer, the Contractor shall pay the amount indicated within 48 hours of notification. The Contractor will be reimbursed for the amount paid, with no provision for overhead and profit, from the allowance provided for unforeseen hazardous materials remediation as specified in Section 01 27 00 – Measurement and Payment.

1.06 QUALITY ASSURANCE

A. Remediation plans for unforeseen hazardous materials shall comply with all applicable requirements of federal, state, and local hazardous waste regulations and shall include, but not be limited to the following:

1. Identification of hazardous and regulated/non-hazardous wastes associated with the Work.

2. Estimated quantities of wastes to be generated and disposed of.

3. Names and qualifications of each subcontractor that will be testing, transporting, storing, and disposing of wastes. Include the facility location and a 24-hour telephone contact number and applicable transporter and TSDF permits, EPA Identification Numbers, and insurance certificates.

4. Names and qualifications (experience and training) of personnel who will be responsible for on-site management of hazardous wastes.

5. Detailed description of the containment and removal procedures.

6. List of waste handling equipment to be used in performing the remediation work, to include cleaning, volume reduction, and transport equipment.

7. Spill prevention and cleanup contingency measures to be implemented.

8. Work plan for waste management, on-site storage, removal and disposal.

9. Detailed schedule indicating the beginning and completion dates for each activity and each work area, including time for clean-up, inspection, and monitoring activities.

1.07 SUBMITTALS

A. Following items shall be submitted as described above for the Engineer's approval:

1. Site Inspection Report

2. Coordination Plan for Known Hazardous Materials. Also for Unknown Hazardous Materials, when required.

3. Remediation Plan for Unforeseen Hazardous Materials, when required.

4. Three (3) cost proposals from hazardous materials specialists for remedial action work, when required.

5. Written evidence of disposal of hazardous and non-hazardous waste at an approved facility in accordance with the requirements of this Section.

6. EHASP upgrades as needed in accordance with Section 01 35 45 – Environmental, Health and Safety Requirements.

B. The Contractor, when requested by the Engineer, shall provide additional copies of all reports and related materials as may be needed for conferences with the Commissioner and other agencies having jurisdiction.

PART 2 – PRODUCTS

2.01 NOT USED

PART 3 – EXECUTION

3.01 NOT USED

END OF SECTION

10/01/18

Table 1
Summary of Lead and PCB Paint Analysis
Cedar Creek WPCP

Sample ID	Location	Sample Description	Substrate	Color	Result (mg/kg)*	
					Lead	PCBs
1[a]	Digester Tank #1	Cover	Metal	Grey	43,600	NA
2[a]	Digester Tank #1	Cover	Metal	Light blue	24,100	NA
3[a]	Digester Tank #3	Cover	Metal	Light blue	37,900	NA
4[a]	Digester Tank #4	Cover	Metal	Light blue	90,500	NA
9[a]	Digester Tank #6	Cover	Metal	Grey	16,000	NA
10[a]	Digester Tank #6	Stair steps	Metal	Grey	ND	NA
12[a]	Digester Tank #9	Cover	Metal	Grey	9,800	NA
13[a]	Digester Tank #9	Stair steps	Metal	Grey	ND	NA
7[a]	Digester Tank #1	Cover	Metal	Grey	-0.1 mg/cm^2	NA
8[a]	Digester Tank #1	Cover	Metal	Light blue	1.7 mg/cm^2	NA
9[a]	Digester Tank #1	Cover	Metal	Light blue	1.0 mg/cm^2	NA
10[a]	Digester Tank #1	Wall mounted ladder	Metal	Brown	0.0 mg/cm^2	NA
11[a]	Digester Tank #1	Wall mounted ladder	Metal	Brown	0.2 mg/cm^2	NA
12[a]	Digester Tank #1	Lamp post and base	Metal	Light blue	0.7 mg/cm^2	NA
13[a]	Digester Tank #1	Level indicator pipe	Metal	Light blue	0.8 mg/cm^2	NA
14[a]	Digester Tank #3	Cover	Metal	Light blue	6.2 mg/cm^2	NA
15[a]	Digester Tank #3	Cover	Metal	Light blue	2.7 mg/cm^2	NA
16[a]	Digester Tank #3	Wall mounted ladder	Metal	Brown	-0.3 mg/cm^2	NA
17[a]	Digester Tank #3	Wall mounted ladder	Metal	Brown	0.3 mg/cm^2	NA
18[a]	Digester Tank #3	Lamp post and base	Metal	Light blue	0.6 mg/cm^2	NA
19[a]	Digester Tank #3	Level indicator pipe	Metal	Light blue	0.6 mg/cm^2	NA
20[a]	Digester Tank #4	Cover	Metal	Light blue	2.1 mg/cm^2	NA
21[a]	Digester Tank #4	Cover	Metal	Light blue	3.2 mg/cm^2	NA

Table 1
Summary of Lead and PCB Paint Analysis
Cedar Creek WPCP

Sample ID	Location	Sample Description	Substrate	Color	Result (mg/kg)* Lead	PCBs
22[a]	Digester Tank #4	Wall mounted ladder	Metal	Brown	0.7 mg/cm^2	NA
23[a]	Digester Tank #4	Lamp post and base	Metal	Light blue	0.6 mg/cm^2	NA
24[a]	Digester Tank #4	Level indicator pipe	Metal	Light blue	0.3 mg/cm^2	NA
28[a]	Digester Tank #5	Cover	Metal	Light blue	-0.1 mg/cm^2	NA
29[a]	Digester Tank #5	Cover	Metal	Grey	1.0 mg/cm^2	NA
30[a]	Digester Tank #5	Cover	Metal	Grey	2.1 mg/cm^2	NA
31[a]	Digester Tank #5	Stair steps	Metal	Grey	0.8 mg/cm^2	NA
32[a]	Digester Tank #5	Ladder stringer	Metal	Grey	0.4 mg/cm^2	NA
39[a]	Digester Tank #6	Cover	Metal	Grey	2.4 mg/cm^2	NA
40[a]	Digester Tank #6	Cover	Metal	Grey	2.3 mg/cm^2	NA
41[a]	Digester Tank #6	Cover patch	Metal	Light blue	-0.2 mg/cm^2	NA
42[a]	Digester Tank #6	Stair steps	Metal	Grey	1.0 mg/cm^2	NA
43[a]	Digester Tank #6	Stair stringer	Metal	Grey	0.4 mg/cm^2	NA
44[a]	Digester Tank #6	Gas pipe line	Metal	Light blue	-0.3 mg/cm^2	NA
51[a]	Digester Tank #9	Cover	Metal	Grey	1.0 mg/cm^2	NA
52[a]	Digester Tank #9	Cover	Metal	Grey	2.1 mg/cm^2	NA
53[a]	Digester Tank #9	Gas pipe line	Metal	Light blue	-0.3 mg/cm^2	NA
54[a]	Digester Tank #9	Stair steps	Metal	Grey	1.0 mg/cm^2	NA
55[a]	Digester Tank #9	Stair stringer	Metal	Grey	0.1 mg/cm^2	NA
2[b]	Digester Tank #1	Attic space	Unknown	Grey	200	NA
3[b]	Digester Tank #3	Attic space	Unknown	Grey	8,800	NA
4[b]	Digester Tank #4	Attic space	Unknown	Black	17,100	NA
5[b]	Digester Tank #6	Attic space	Unknown	Grey	1,000	NA
8[b]	Digester Tank #9	Attic space	Unknown	Grey	900	NA
15[b]	Digester Tank #5	Stairs	Metal	Grey	0.6 mg/cm^2	NA

Table 1
Summary of Lead and PCB Paint Analysis
Cedar Creek WPCP

Sample ID	Location	Sample Description	Substrate	Color	Result (mg/kg)*	
					Lead	PCBs
16[b]	Digester Tank #5	Cover	Metal	Light blue	0.1 mg/cm^2	NA
17[b]	Digester Tank #5	Cover	Metal	Primer	1.4 mg/cm^2	NA
18[b]	Digester Tank #5	Attic ceiling	Metal	Light blue	2.7 mg/cm^2	NA
19[b]	Digester Tank #5	Trusses	Metal	Light blue	0.7 mg/cm^2	NA
20[b]	Digester Tank #5	Beams	Metal	Light blue	0.5 mg/cm^2	NA
21[b]	Digester Tank #5	Foam floor	Foam	Yellow	0.1 mg/cm^2	NA
22[b]	Digester Tank #5	Attic ceiling	Metal	Primer	2.9 mg/cm^2	NA
23[b]	Digester Tank #5	Attic column	Metal	Light blue	1.7 mg/cm^2	NA
CC-PC-01	Digester Tank #1	Ladder	Metal	Red	NA	ND
CC-PC-02	Digester Tank #1	Piping	Metal	Blue over red	NA	11
CC-PC-03	Digester Tank #3	Ladder	Metal	Red	NA	ND
CC-PC-04	Digester Tank #3	Piping	Metal	Blue over red	NA	5.6
CC-PC-05	Digester Tank #4	Ladder	Metal	Red	NA	ND
CC-PC-06	Digester Tank #4	Lightpost	Metal	Blue over red	NA	1.4
CC-PC-07	Digester Tank #5	Sliding Stair	Metal	Grey over red	NA	ND
CC-PC-08	Digester Tank #5	Relief valve	Metal	Blue	150	ND
CC-PC-09	Digester Tank #5	Tank cover	Metal	Grey over red	NA	ND
CC-PC-10	Digester Tank #5	Tank cover	Metal	Light blue over grey over red	NA	ND
CC-PC-11	Digester Tank #6	Sliding Stair	Metal	Grey over red	NA	ND
CC-PC-12	Digester Tank #6	Tank cover	Metal	Light blue over grey over red	NA	ND
CC-PC-13	Digester Tank #6	Piping	Metal	Light blue over blue	21	ND
CC-PC-14	Digester Tank #6	Tank cover	Metal	Grey over red	NA	ND
CC-PC-15	Digester Tank #9	Sliding Stair	Metal	Grey	NA	ND

Table 1
Summary of Lead and PCB Paint Analysis
Cedar Creek WPCP

Sample ID	Location	Sample Description	Substrate	Color	Result (mg/kg)*	
					Lead	PCBs
CC-PC-16	Sludge Heater Room	Digester sludge piping	Metal	Brown over grey	170	3.1
CC-PC-17	Digester Tank #9	Gas piping	Metal	Grey	460	ND
CC-PC-18	Digester Tank #9	Tank cover	Metal	Grey	NA	ND
CC-PC-19	Sludge Heater Room	Pipe	Fiberglass	Grey	36	5
CC-PC-20	Sludge Heater Room	Heat Exchanger #3	Metal	Grey	110	5.2
CC-PC-21	Sludge Heater Room	Heat Exchanger #3	Metal	Grey	8.1	ND
CC-PC-22	Digester #1-4 Basement	Gas valve	Metal	Orange	8.9	ND
CC-PC-23	Digester #1-4 Basement	Sludge piping	Metal	Brown	1,100	47
CC-PC-24	Gas Compressor Room	Gas Valve	Metal	Orange	480	4.6
CC-PC-25	Digester Tank #4	Tank cover	Metal	Light blue	NA	3.6
CC-PC-26	Digester Tank #3	Tank cover	Metal	Light blue	NA	2.1
CC-PC-27	Digester Tank #1	Tank cover	Metal	Light blue	NA	2.1
CC-PC-28	Exterior	Groundwater well	Metal	Orange	110	ND

Notes:
(1) Samples collected by Bidwell Environmental in December 2022, unless otherwise noted.
(2) The DEP and HUD action level used to define lead based paints is 5,000 mg/kg or 0.5%. The regulatory limit for defining TSCA-regulated PCBs is 50 mg/kg. However, any detected concentration of lead or PCBs in paint has the potential to affect worker health and safety during certain construction activities and shall be addressed in the Contractor's health and safety protocol for the affected work.
* - Unless otherwise noted
[a] - Sample collected by Precision Environmental Inc. in June, 2015.
[b] - Sample collected by Precision Environmental Inc. in October and November, 2015.
ND - Not detected
NA - Not analyzed

SECTION 01 42 00

REFERENCES

PART 1 – GENERAL

1.01 SUMMARY

A. Definitions and terminology applicable to all the Contract Documents are included in the General Conditions and Supplementary Conditions.

1.02 REFERENCES

A. Abbreviations and Acronyms: Common abbreviations that may be found in the Contract Documents are listed below:

alternating current	a-c
ampere	A
Architectural Barriers Act	ABA
Americans with Disabilities Act	ADA
Americans with Disabilities Act Accessibility Guidelines	ADAAG
ante meridian	a.m.
average	avg
biochemical oxygen demand	BOD
brake horsepower	bhp
British thermal unit	Btu
Centigrade (or Celsius)	C
chlorinated polyvinyl chloride	CPVC
Code of Federal Regulations	CFR
cubic inch	cu in
cubic foot	cu ft
cubic yard	cdu yd, or CY
cubic feet per minute	cfm
cubic feet per second	cfs

degree Centigrade (or Celsius)	degrees C or ºC
degrees Fahrenheit	degrees F or ºF
diameter	dia
direct current	d-c
dollars	$
each	ea
efficiency	eff
Fahrenheit	F
feet	ft
feet per hour	fph
feet per minute	fpm
feet per second	fps
figure	Fig
flange	flg
foot-pound	ft-lb
gallon	gal
gallons per hour	gph
gallons per minute	gpm
gallons per second	gps
gram	g
grams per liter	g/L
Hertz	Hz
horsepower	hp or HP
hour	hr
human-machine interface	HMI
inch	in.
inches water gage	in. w.g.
inch-pound	in.-lb

inside diameter	ID
iron pipe size	IPS
thousand pounds	kips
thousand pounds per square inch	ksi
kilovolt-ampere	kva
kilowatt	kw
linear foot	lin ft or LF
liter	L
maximum	max
mercury	Hg
milligram	mg
milligrams per liter	mg/l or mg/L
milliliter	ml
millimeter	mm
million gallons per day	mgd or MGD
million gallons	MG
minimum	min
national pipe threads	NPT
net positive suction head	NPSH
net positive suction head available	NPSHA
net positive suction head required	NPSHR
nominal pipe size	NPS
number	no.
operator interface terminal	OIT
ounce	oz
ounce-force	ozf
outside diameter	OD
parts per hundred	pph

parts per million	ppm
parts per billion	ppb
polyvinyl chloride	PVC
post meridian	p.m.
pound	lb
pounds per square inch	psi
pounds per square inch absolute	psia
pounds per square inch gauge	psig
pounds per square foot	psf
process control system	PCS
programmable logic controller	PLC
revolutions per minute	rpm
second	sec
specific gravity	sp gr or SG
square	sq
square foot	sq ft or sf
square inch	sq in.
square yard	sq yd or SY
standard	std
standard cubic feet per minute	scfm
total dynamic head	TDH

B. Definitions: Terminology used in the Specifications includes:

1. “Indicated” refers to graphic representations, notes, or schedules on the Drawings, or to other paragraphs or schedules in the Specifications and similar locations in the Contract Documents.

2. “Shown”, “noted”, “scheduled”, and “specified” are used to help the user locate the reference without limitation on the location.

3. “Installer”, “applicator”, or “erector” is Contractor or another entity engaged by Contractor, either as an employee or subcontractor, to perform a particular construction activity, including installation, erection, application or similar Work. Installers shall be experienced in the Work that installer is engaged to perform.

4. “Experienced”, when used with the term “installer” means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; being familiar with Laws and Regulations; and having complied with requirements of authorities having jurisdiction, and complying with requirements of the Supplier of the material or equipment being installed.

5. Trades: Use of a term such as “carpentry” does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “carpenter”, unless otherwise indicated in the Contract Documents or required by Laws or Regulations. Such terminology also does not imply that specified requirements apply exclusively to trade personnel of the corresponding generic name.

6. “Assigned specialists” and similar terms: Certain Sections of the Specifications require that specific construction activities be performed by specialists recognized as experts in those operations. Engage said specialists for those activities, and their engagement is a requirement over which Contractor has no option. These requirements do not conflict with enforcement of building codes and other Laws and Regulations. Also, such requirements are not intended to interfere with local trade union jurisdictional settlements and similar conventions. Such assignments shall not relieve Contractor of responsibility for complying with the requirements of the Contract Documents.

C. Reference Standards:

1. Refer to General Conditions, as may be modified by the Supplementary Conditions, relative to reference standards and resolving discrepancies between reference standards and the Contract Documents. Provisions of reference standards are in effect in accordance with the Specifications.

2. Copies of Standards: Each entity engaged in the Work shall be familiar with reference standards applicable to its construction activity. Copies of applicable reference standards are not bound with the Contract Documents. Where reference standards are needed for a construction activity, obtain copies of standards from the publication source.

3. Abbreviations and Names: Where reference standards, specifications, codes, manuals, Laws or Regulations, or other published data of international, national, regional or local organizations are referred to in the Contract Documents, the organization issuing the standard may be referred to by their acronym or abbreviation only.

4. Following acronyms or abbreviations that may appear in the Contract Documents shall have the meanings indicated below. Listing is alphabetical by acronym.

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACIFS	American Cast Iron Flange Standards
ACS	American Chemical Society
ADC	Air Diffusion Council
ADSC	International Association of Foundation Drilling.
AEIC	Association of Edison Illuminating Companies
AF&PA	American Forest and Paper Association
ABMA	American Bearing Manufacturers Association (formerly Anti- Friction Bearing Manufacturers Association (ABMA))
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AHDGA	American Hot Dip Galvanizers Association
AI	Asphalt Institute
AIA	American Institute of Architects
AIChE	American Institute of Chemical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALSC	American Lumber Standards Committee
AMA	Acoustical Materials Association
AMCA	Air Movement and Control Association
AMP	National Association of Architectural Metal Manufacturers, Architectural Metal Products Division
ANSI	American National Standards Institute
APA	The Engineered Wood Association

API	American Petroleum Institute
APHA	American Public Health Association
AREA	American Railway Engineering Association
ARI	Air Conditioning and Refrigeration Institute
ASA	American Standards Association
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASNT	American Society for Non-Destructive Testing
ASQ	American Society for Quality
ASSE	American Society of Safety Engineers
ASTM	American Society for Testing and Materials
AWCI	Association of the Wall and Ceiling Industry
AWI	Architectural Woodwork Institute
AWPA	American Wood Protection Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BAAQMD	Bay Area Air Quality Management District
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association
BOCA	Building Officials and Code Administrators
CBMA	Certified Ballast Manufacturers Association
CDA	Copper Development Association
CEMA	Conveyor Equipment Manufacturers Association
CGA	Compressed Gas Association
CISCA	Ceilings and Interior Systems Construction Association

CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CMAA	Crane Manufacturers Association of America
CPSC	Consumer Product Safety Commission
CRSI	Concrete Reinforcing Steel Institute
CSI	Construction Specifications Institute
DIN	Deutsches Institut fur Normung eV (German Institute for Standardization)
DIPRA	Ductile Iron Pipe Research Association
EJCDC	Engineers Joint Contract Documents Committee
EJMA	Expansion Joint Manufacturers Association, Inc.
ETL	Intertek Testing Services, Inc. (formerly ETL Testing Laboratories, Inc.)
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FM	Factory Mutual (FM Global)
FRPI	Fiberglass Reinforced Plastics Institute
FS	Federal Specification
GA	Gypsum Association
GANA	Glass Association of North America
HEW	United States Department of Health, Education and Welfare
HI	Hydraulic Institute
HMI	Hoist Manufacturers Institute
HUD	United States Department of Housing and Urban Development
IBC	International Building Code
ICC	International Code Council
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers

IESNA	Illuminating Engineering Society of North America
IFI	Industrial Fasteners Institute
IFCEA	Insulated Power Cable Engineers Association
IRI	Industrial Risk Insurers
ISA	Instrumentation, Systems, and Automation Society (formerly Instrument Society of America)
ISO	Insurance Services Office
IOS	International Organization for Standardization
LPI	Lightning Protection Institute
MIA	Marble Institute of America
ML/SFA	Metal Lath/Steel Framing Association
MS	Military Specifications
MSS	Manufacturers' Standardization Society
MMA	Monorail Manufacturers Association
NAAMM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineers
NAPF	National Association of Pipe Fabricators, Inc.
NARUC	National Association of Regulatory Utilities Commissioners
NBHA	National Builders Hardware Association
NBS	United States Department of Commerce, National Bureau of Standards
NCMA	National Concrete Masonry Association
NEC	National Electric Code
NELMA	Northeastern Lumber Manufacturers' Association
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NETA	International Electrical Testing Association
NFPA	National Fire Protection Association
NFRC	National Fenestration Rating Council

NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NHPMA	Northern Hardwood and Pine Manufacturers Association
NIST	United States Department of Commerce, National Institute of Standards and Technology
NLGA	National Lumber Grades Authority
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	National Sanitation Foundation
NSSGA	National Stone, Sand, and Gravel Association
NTMA	National Terrazzo and Mosaic Association
NYSDOT	New York State Department of Transportation
NYSDEC	New York State Department of Environmental Conservation
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PEI	Porcelain Enamel Institute
PFI	Pipe Fabrication Institute
PPI	Plastics Pipe Institute
PGMC	Primary Glass Manufacturers Council
PS	Product Standards Section, United States Department of Commerce
RCSC	Research Council on Structural Connections (part of AISC)
RMA	Rubber Manufacturers Association
SAE	Society of Automotive Engineers
SBCCI	Southern Building Code Congress International, Inc.
SCAQMD	Southern California Air Quality Management District
SCPRF	Structural Clay Products Research Foundation
SCTE	Society of Cable Telecommunications Engineers
SDI	Steel Deck Institute

SDI	Steel Door Institute
SIGMA	Sealed Insulating Glass Manufacturing Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
SPI	Society of the Plastics Industry
SPIB	Southern Pine Inspection Bureau
SSPC	Society for Protective Coatings
SWI	Steel Window Institute
TCNA	Tile Council of North America
TEMA	Tubular Exchanger Manufacturers Association
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.
USAB	United States Access Board
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
USGBC	United States Green Building Council
USGS	United States Geological Survey
USPHS	United States Public Health Service
WCLIB	West Coast Lumber Inspection Bureau
WCMA	Window Covering Manufacturers Association
WCMA	Wood Component Manufacturers Association
MDMA	Window and Door Manufacturers Association
WWEMA	Water and Wastewater Equipment Manufacturers Association
WWPA	Western Wood Products Association

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 45 23

TESTING SERVICES FURNISHED BY CONTRACTOR

PART 1 – GENERAL

1.01 SUMMARY

A. This specification addresses requirements for testing services specifically required to be provided by the Contractor. This section does not apply to any testing required to be provided by the Owner or Owner's representative.

B. This section does not apply to any Special Inspections as required by Section 01 45 33. Special Inspections cannot be provided by the Contractor in accordance with the Governing Building Code.

C. Contractor shall employ and pay for independent testing entity to perform specified services covered by this specification. Entity selected shall be subject to approval by Engineer.

D. Inspection, sampling, and testing shall be as specified in the individual Specification Sections.

E. Related Sections, but not limited to, the following:

1. Section 03 01 30 – Concrete Repairs

2. Section 07 13 50 – Waterproofing

3. Section 31 00 01 – Earthwork

4. Section 31 05 16 – Aggregate Materials

1.02 ADMINISTRATIVE REQUIREMENTS

A. Contractor's Responsibilities:

1. Provide to laboratory representative samples of materials to be tested, in required quantities.

2. Provide labor and facilities:

a. To provide access to the Work to be tested, and where required, to Suppliers' operations.

b. To obtain and handle samples at the Site.

c. To facilitate inspections and tests.

d. For testing entity's exclusive use for storage and curing of test samples.

e. Forms for preparing concrete test beams and cylinders.

3. Notify testing entity and Engineer sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests.

4. Arrange with testing entity and pay for additional services, sampling, and testing required for Contractor's convenience.

5. Provide to testing entity the preliminary design mix proposed for concrete, and other material mixes that require testing by the testing laboratory.

B. Testing Entity's Responsibilities:

1. Cooperate with Contractor and Engineer and provide qualified personnel promptly when notified.

2. Perform specified inspections, sampling, and testing of materials and methods of construction; comply with applicable standards; ascertain compliance with requirements of the Contract Documents.

3. Promptly notify Engineer and Contractor of irregularities or deficiencies in the Work observed during performance of services.

4. Submit specified quantity of report copies of inspections and tests to Contractor and Engineer.

5. Perform additional tests and services as required to ensure compliance with the Contract Documents.

C. Report Requirements:

1. Electronic Submittal of testing reports.

2. Include the following information:

a. Date issued.

b. Project title, number, and name of the Site.

c. Testing laboratory name and address.

d. Name and signature of inspector or person obtaining samples.

e. Date of inspection or sampling.

f. Record of temperature and weather.

g. Date of test.

h. Identification of material or product tested and associated Specification Section.

i. Location in the Project.

j. Type of inspection or test.

k. Results of tests and observations regarding compliance with the Contract Documents.

1.03 SUBMITTALS

A. Submit copies of material and product test reports where required by the Contract Documents and as requested by Engineer.

B. Quality Assurance Submittals:

1. Qualifications statement indicating experience and facilities for tests required under the Contract Documents.

2. Copy of report of inspection of facilities during most recent NIST inspection tour. Include memorandum of remedies of deficiencies reported during inspection.

3. Copy of certificate of calibration for each instrument or measuring device proposed for use, by accredited calibration agency.

1.04 QUALIFICATIONS

A. Comply with applicable requirements of ASTM E329, Specification for Agencies Engaged in Construction Inspection and/or Testing.

B. Laboratory shall be authorized to operate in the same State or Commonwealth as the Site. Where applicable, laboratory shall be certified by the authority having jurisdiction for the types of testing required.

C. Testing equipment used by laboratory will be calibrated at maximum twelve month intervals by devices of accuracy traceable to either NIST's Standard Reference Materials (SRM), ISO 17025, General Requirements for the Competence of Testing and Calibration Laboratories, or certified by State, Commonwealth, or local bureau of weights and measures, or values of natural physical constants generally accepted in the engineering and scientific community.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 51 00

TEMPORARY UTILITIES

PART 1 – GENERAL

1.01 SUMMARY

A. Contractor shall provide temporary utilities required for the Project and to complete the Work.

1. Make arrangements with utility service companies for temporary services and obtain and pay for all required permits and approvals for temporary utilities.

2. Pay utility service costs, including connection fees, required for the Work as needed.

3. Continuously maintain adequate utilities for all purposes during the Project, until removal of temporary utilities and temporary facilities. At minimum, provide and maintain temporary utilities through Substantial Completion and removal of temporary field offices and sheds.

4. Should Owner occupy part of the Project prior to Substantial Completion of the entire Work, cost of utilities consumed via temporary utilities serving the portion occupied by Owner will be shared proportionately between Owner and Contractor as mutually agreed to by the parties.

5. Maintain, including cleaning, temporary utilities and continuously provide consumables as required.

6. Temporary utilities and temporary facilities shall be adequate for personnel using the Site and requirements of Project.

7. Provide temporary utilities and temporary facilities in compliance with Laws and Regulations and, when applicable, requirements of utility owners.

B. Provide the following temporary utilities:

1. Electricity and lighting.

2. Telephone and communications.

3. Heating, cooling, and ventilation.

4. Sanitary facilities.

5. Water service.

6. First-aid facilities.

7. Fire protection.

8. Weather protection.

9. Parking.

1.02 ADMINSTRATIVE REQUIREMENTS

A. Use of Owner's System:

1. Existing Utility Systems: Do not use systems in existing buildings or structures for temporary utilities without Owner's written permission and mutually acceptable basis agreed upon by the parties for proportionate sharing of costs between Owner and Contractor.

2. Use of Permanent Utility Systems Provided Under the Project:

a. Permanent lighting, water, heating, ventilating, and fire protection systems and first-aid facilities may be used to provide temporary utilities and temporary facilities if the following are met:

1) Obtain Owner's written permission to use permanent systems.

2) Permanent systems to be used for temporary utilities or temporary facilities shall have achieved Substantial Completion, including complete functionality of all controls.

3) Contractor shall pay all costs while using permanent system, including operation, maintenance, replacement of consumables, and provide replacement parts.

b. Do not use the following permanent facilities:

1) Telephone and communication facilities.

2) Sanitary facilities.

1.03 SYSTEM DESCRIPTION

A. Temporary Electrical Facilities

1. The Contractor shall furnish and install temporary electrical facilities to provide power to temporary systems required in this Contract which shall consist of the existing temporary electric service point, a new temporary demand meter, a temporary general lighting system,

a security lighting system, a safety lighting system, and service to each Prime Contractor's field offices. The Contractor shall inspect the site and assess the existing conditions.

a. The cost for designing and installing a temporary electrical system shall be included in the lump sum price.

b. If additional power is required beyond the capacity of the existing temporary electric service, the cost for all labor, materials, cables, conduit, and equipment required to provide additional power shall be paid by allowance.

2. The Contractor shall furnish and install an automatic "Emergency Generator" in the event of a power failure or related circumstances to operate the odor control system and groundwater dewatering system. Further, they shall furnish the labor, equipment, materials, etc. required for operation, connection, and disconnection as required by the National Electrical Code. The contractor shall determine the rating of the generator, and all the associated equipment.

3. The Contractor shall submit a drawing showing the proposed temporary electrical facilities system layout for approval by the County prior to installation.

a. Work included: The temporary work shall include the following:

1) Furnish and pay for all labor, material and equipment for the installation of the temporary electrical services facility system. The installation shall comply with all applicable requirements of the National Electric Code and any other codes or bodies having jurisdiction.

2) Furnish and pay for all labor material and equipment for the maintenance of the temporary electrical facilities system.

3) Furnish and pay for labor, materials and equipment for removing all temporary facilities.

4. Requirements: The temporary electrical facilities system shall be as herein specified, and shall be provided no later than ten (10) days after the date of Notice to Proceed.

5. Temporary Electric Service Point:

a. The County shall provide a primary connection point for the Contractors electrical power requirements. This primary connection receptacle or take-off point shall be as shown on the Contract Drawings. Available electric power from this area would be up to 480 volts, 600 Amps, 3-phase, service. From this power connection point the Contractor shall establish his temporary power system distribution for his facilities and/or equipment. The Contractor shall make the appropriate connections. Temporary power distribution system shall not obstruct traffic or be run on grade exposed. The Contractor is advised that the Odor Control System, Sludge

Dewatering System and possibly the Temporary Power Facilities System shall be relocated for performing work on the other tank(s). Cost for relocating the Power System will be borne by the Contractor.

b. Distribution circuit breakers or fused switches shall be provided for disconnection and over current protection of the temporary electrical facilities including the temporary ground dewatering system, the temporary general lighting system, the security lighting system, the safety lighting system and the services to the Contractors' field offices.

c. Separate circuit breakers or fused switches shall also be provided at the service point. It is the responsibility of each contractor to furnish, install, connect, maintain and remove any temporary power facilities desired for his own use beyond the circuit breaker or fused switch provided for him at the service point. The power facilities shall not be used for temporary heating.

d. All conductors shall be 600 volt, enclosed in properly sized raceways or be routed aerially using Type AC, MC or TC cable.

e. Conductors shall be provided for all devices, suitably sized for the intended purpose. Conductors installed in raceways shall be single conductor type THHN/THWN or equal to be approved by the Engineer. Armored cable, Type AC, metal-clad cable, Type MC or power and control tray cable, Type TC shall also be permitted.

f. Raceways where used shall be suitably sized for the conductors.

g. Aerially routed cables shall be messenger supported from solid wood poles or other recognized means. Messenger shall be high strength galvanized steel.

h. Poles shall have a class suitable for the installation in accordance with the National Electrical Safety Code and shall be 30 feet length, minimum. Poles shall be guyed at angle or corner runs and when eccentrically loaded.

i. The temporary power distribution system shall be effectively grounded.

B. Temporary Demand Meter

1. The Contractor shall furnish and install a 3-Phase KWH / Demand Meter to record the total load of the temporary electrical system. The demand meter shall be installed at the existing temporary main panel at the existing temporary service point.

2. The Demand option shall display kW/Demand and kW Peak date and time (15 minute, 30 minute or 60 minute intervals).

3. The Demand Meter shall be UL listed, and shall be in a NEMA 4X enclosure

4. All equipment and conduit connections shall be raintight. All work shall comply with National Electric Code, and standards of the authorities having jurisdiction.

C. Temporary General Lighting System

1. The Contractor shall furnish, install, and maintain a temporary general lighting system. The system shall conform to the applicable Federal and State codes and shall meet the approval of the County.

2. The temporary general lighting system shall provide 120 volt receptacles and lighting for access to and egress from the work and for safe and expeditious construction within designated enclosed areas of the structure or structures.

3. The temporary general lighting system shall consist of wiring, switches, necessary insulated supports, poles, fixtures, receptacles, 100-watt lamps, guards, cutouts and fuses as specified shown or required.

4. The Contractor shall furnish lamps, fuses, receptacles and cords for the temporary general lighting system and shall replace broken and burned-out lamps and blown fuses for the system.

5. The temporary general lighting system shall be installed progressively in structures as the designated areas are enclosed or as lighting becomes necessary because of partial enclosure. The individual Contractor shall provide the necessary power for his work in an unenclosed area.

6. The Contractor shall provide a temporary general lighting system in buildings only after the form-work has been removed from the underside of floor slabs. The Contractor shall provide and pay for installation and removal of temporary lights and power system under formed decks until stripping.

7. The Contractor shall maintain the temporary general lighting system in safe working order.

8. The temporary general lighting system shall include, as a minimum, four hundred lamps and one hundred and fifty 120 volt receptacles. Each lamp shall be 100 watts.

9. The Contractor shall arrange and install the lamps in a manner so as to provide an even distribution of illumination over the work areas, or at the direction of the Engineer at no additional cost to the County.

10. The Contractor shall install the receptacles in such a manner as to reach any point in the work areas with an extension cord not to exceed 40 feet in length.

11. The temporary general lighting system shall be used for small power purposes only.

12. Hand tools, such as drills, hammers and grinders, may be connected to the temporary general lighting system providing that they are suitable for 120 volt, single phase, 60 hertz operation and do not have a power requirement exceeding 1,500 volt amperes. Only one unit may be connected to a single receptacle and shall not be connected to lighting outlets. Cords of tools shall not exceed 40 feet in length.

13. No contractor will be permitted to proceed with any portion of his work which in the opinion of the Engineer, is not adequately illuminated. If any work by any other contractor requires special lighting other than what is provided, respective contractor shall arrange for same.

14. The Contractor shall keep the temporary general lighting system in service each working day, from Monday through Friday inclusive, by energizing the system at 7:00 AM and de-energizing the system at 4:30 PM.

15. Any Contractor requiring the use of a temporary general lighting system other than during the times set forth in the preceding paragraph from Monday through Friday, or at any time on Saturdays, Sundays or holidays, shall pay the costs of energizing or de-energizing the system and for keeping the system in operation.

16. The temporary general lighting system shall be removed in its entirety at the completion of the project.

D. Security Lighting System

1. The Contractor shall furnish, install and maintain a security lighting system as herein specified.

2. The security lighting system shall provide lighting to illuminate the site outside the buildings.

3. The security lighting system shall consist of floodlights equal to Crouse-Hinds Cat. No. MVD-4HCW-O-PC-DF-AF-VS-AF 400 watt mercury vapor lamp, Cat No. ML2590 photocell, Cat No. ML5547 vandal shield and Cat No. 105-N11 bracket for wood pole mounting. Two or three floodlights shall be mounted on each pole approximately 30 feet above the ground

4. Each floodlight shall be complete with a constant wattage, high power factor ballast in a cast aluminum housing, a flat clear lens of heat and impact resistant glass, photo-control, lamp and suitable mounting hardware.

5. The photometric performance shall be equal to that of the above specified unit with a beam spread of approximately 150 degrees horizontal to 80 degrees vertical and with a beam efficiency of not less than 55 percent.

6. The poles shall be 35 foot, Class F wood and shall be securely set a minimum of five feet in the ground.

7. The system will require a sufficient number of poles and floodlights to provide adequate illumination as determined by the County.

8. Wiring for the security lighting system shall be installed underground. The security lighting system shall be properly maintained and energized at all times with each floodlight controlled by a photocell installed on the floodlight. The photocells shall be adjusted so that all floodlights are energized at approximately the same time. Broken and burned-out lamps shall be replaced at no cost to the County.

9. The security lighting system shall be installed and made operative within 10 days after the date of the Notice to Proceed.

10. The security lighting system shall be removed in its entirety at the completion of the project.

E. Safety Lighting

1. The Contractor shall provide, install, and maintain sufficient interim lighting fixtures in the Digester area, to ensure that the present lighting levels (measured in lumens) are maintained 24 hours per day, seven days per week. This lighting is required for County Plant Operating Personnel and is not intended for construction purposes.

2. In new and existing buildings the Contractor shall provide, install and maintain sufficient lighting fixtures to provide adequate light to ensure safe access to, egress from, and passage through the construction areas between the hours of 3:30 PM and 7:00 AM, Monday through Friday and 24 hours per day for Saturdays, Sundays, and holidays. The lighting system shall be operated by a time clock. The fixtures shall be 100 watt and shall be provided, as a minimum at every landing of every stairway and every 50 feet along passageways. The safety lighting system shall be installed progressively in structures as the designated areas are enclosed or as lighting becomes necessary because of partial enclosure. This lighting is not intended for construction purposes.

F. Telephone and Communications: Contractor shall provide temporary telephone and communications required for its operations at the Site and for summoning emergency medical assistance.

G. Heating, Cooling, and Ventilation:

1. Temporary odor control requirements during digester content removal and cleaning shall be as specified in Section 46 73 72 – Cleaning of Digester and Storage Tanks.

2. Once the digester and/or storage tank has been emptied/ cleaned and the odor control system has been disconnected, the Contractor shall provide temporary heating, cooling,

and ventilation coverings and enclosures necessary to protect the Work and materials against wetness and temperature damage, to dry out the Work, and to facilitate the Work in structures. Ventilation air for cleaned digesters shall be provided as required to maintain a safe working environment within the digesters for proper compliance with Federal, State and local regulations for confined space entry.

3. Equipment, fuel, materials, personnel, and methods used shall be adequate to maintain critical installation temperatures and ventilation of Work at all times in areas where necessary to perform the Work.

4. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity and to prevent hazardous accumulations of dust, fumes, vapors or gases. Ventilating systems shall be complete with fans, motors, inlets, outlets, ductwork, heaters, controls or any other equipment necessary, all furnished and installed by the Contractor responsible for the Work involved. The following additional requirements shall apply:

   a. All temporary ventilation methods proposed by each Contractor shall be submitted to the County for approval and must comply with all federal, state and county rules and regulations. System components shall be explosion proof to comply with this type of code classified area in/around digester tanks.

   b. The County will supply and designate a primary electric power connection point to enable the Contractor to operate his temporary ventilation system as specified above in Temporary Electrical Facilities. The Contractor will be responsible for providing all other electrical accessories and make necessary connections to the designated power receptacle as per County approval.

5. Provide all heat as may be necessary for thawing out and heating the ground, materials, form work for concrete cure and for proper execution, protection and drying out of the Work.

6. Enclosed structures shall have a minimum temperature of 50°F, unless otherwise specified, where Work is performed. Portable heaters shall be standard approved units complete with controls.

7. Contractor shall provide sufficient heat to maintain a minimum temperature of 65°F before and during application of interior finishing, painting, coating, etc.

8. Contractor shall replace any Work damaged by dampness or insufficient/abnormal heating at no cost to the Owner.

H. Sanitary facilities:

1. Contractor shall provide suitably-enclosed chemical or self-contained toilets for Contractor’s employees and visitors to the Site. Location of temporary toilets shall be acceptable to Owner and screened from public observation.

2. Facilities shall be maintained and provided in accordance with State or Commonwealth Labor Regulations and local ordinances. Contents shall be removed and disposed in accordance with local and state or commonwealth regulations as required.

3. Use of Owner's existing toilet facilities outside of the Contractor Staging Area is prohibited.

4. Contractor shall be prohibited from committing nuisances within, on, or in the vicinity of the Site.

I. Water service:

1. Potable water is available through the hydrants located outside of the plant entrance at no cost to the Contractor. The Contractor shall provide a flush truck and other equipment required for his potable water requirements.

2. In the event that any Contractor requires more potable water than is available through the hydrants, then the Contractor shall pay all costs for obtaining and providing the additional water from the local water company. The Contractor is responsible for his bottled water needs.

3. Unless otherwise directed by the County Engineer, the Contractor shall use screened plant effluent water during cleaning activities such as water blasting/jetting, adding dilution water, etc. to suspend digester tank contents for removal. The Contractor shall provide pumps, strainers and piping to deliver water from the screened effluent piping located in the basement of the digester building to his equipment. The Contractor shall be responsible to make the connection providing adaptors or other appurtenances as required to insure a reliable operation. Furthermore, the Contractor will be responsible for the safety/protection of his employees and others while utilizing effluent water in his cleaning operation.

4. The Contractor shall not tie into any of the Plant's screened effluent water hydrants unless otherwise directed by the County.

5. The General Construction Contractor shall protect the temporary screened effluent water pipe system and temporary filtrate and wash water piping from freezing by heat-tracing above ground piping and installing buried pipes (if any) at a minimum depth of four (4) feet. The system shall be extended and relocated as necessary to meet construction procedures and temporary water requirements.

6. The Contractor shall discharge all wastewater (seal waters, wash waters, dewatering process water etc.) into the Filtrate Wetwell located to the west of the Sludge Thickening Building and as shown on the drawings. All piping shall be ductile iron.

J. First-aid facilities:

1. Contractor shall provide temporary first-aid stations at or immediately adjacent to the Site's major work areas. Contractor shall provide temporary first-aid stations inside its temporary field office. Locations of first-aid stations shall be determined by Contractor's safety representative.

2. Contractor shall provide list of emergency telephone numbers and post in the Contractor's and RPR's trailer at the Site. List shall be in accordance with the list of emergency contact information required in Section 01 31 19 – Project Meetings.

K. Fire protection:

1. Contractor shall comply with NFPA 241, Safeguarding Building Construction, Alteration, and Demolition Operations, and requirements of fire marshals and authorities having jurisdiction at the Site.

2. Contractor shall provide the following: temporary fire exits; two (2) portable 20 lb. fire extinguishers, rated ABC in accordance with NFPA Standard No. 10, Portable Fire Extinguishers; hoses; and safety devices as required by authorities having jurisdiction.

3. Contractor shall notify Engineer, Owner, and fire marshals in the event of fire at the Site including, but not limited to, fuel tanks and similar hazardous utilities and devices. Contractor shall cooperate with Owner of fuel tank and utilities to prevent occurrence of fire or explosion.

4. Contractor shall perform safety precautions and comply with fire marshal's instructions in the event of fire.

5. Prohibit smoking in Sludge Digester and Sludge Storage Tank and/or in hazardous areas. Post suitable warning signs in addition to those currently in place to warn of hazardous conditions in and around the aforementioned areas.

6. Use metal safety containers for storage and handling of flammable and combustible liquids.

7. Do not store flammable or combustible liquids in or near stairways or exits.

8. Maintain clear exits from all points in the Work.

9. The Contractor(s) shall use only non-sparking tools and explosion proof tools/equipment.

10. ***Be aware*** that some or any digester process piping may contain an iron sulfide scale (pyrophoric iron) residue. ***Spontaneous Combustion*** will occur should the material be left in direct sunlight or near heat.

L. Weather Protection

1. Furnish, install, and maintain temporary heat and enclosures to provide adequate working areas for Contractor's and subcontractor's personnel during the months of November through March.

2. Temporary heating units shall have been tested and labeled by UL, FM, or other recognized association related to the type of fuel being used.

1.04 PARKING

A. The Contractor office staff working out of the onsite construction trailers shall be allowed to park at the construction trailers on a daily basis.

B. The Contractor shall be provided with a maximum of ten (10) parking spaces near the Contractor’s staging area for their field staff. If additional parking is necessary, Contractor shall arrange for offsite parking and transportation to the site for workers.

C. Any Contractor field employees who are provided company vehicles shall be allowed to park them in the vicinity of the construction work provided they are used for personal transportation on a daily basis to and from the project site.

D. Contractor shall be responsible for transporting workers from the Contractor staging area or remote parking area to the location of the work on the project site.

1.05 REMOVAL

A. Completely remove all temporary materials and equipment when their use is no longer required.

B. Clean and repair damage caused by temporary installations or use of temporary facilities.

C. Remove contents of containers provided by Contractor. The containers and furniture provided by Owner shall remain property of Owner.

D. Restore permanent facilities used for temporary services to specified condition.

PART 2 – PRODUCTS

2.01 EQUIPMENT

A. Materials and equipment for temporary systems may be new or used but shall be adequate for purposes intended and shall not create unsafe conditions and shall comply with Laws and Regulations.

B. Provide required materials, equipment, and facilities, including piping, wiring, and controls.

C. Electrical system requirements: System shall consist of wiring, switches, insulated supports, poles, fixtures, sockets, receptacles, lamps, guards, cutouts and fuses as required for completion of the Work.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install temporary facilities in neat, orderly, manner, and make structurally, mechanically, and electrically sound throughout.

B. Location of Temporary Utilities and Temporary Facilities:

1. Locate temporary systems for proper function and service.

2. Temporary systems shall not interfere with or provide hazards or nuisances to: the Work under this and other contracts, movement of personnel, traffic areas, materials handling, hoisting systems, storage areas, finishes, and work of utility companies.

3. Do not install temporary utilities on the ground, with the exception of temporary extension cords, hoses, and similar systems in place for short durations.

C. Modify and extend temporary systems as required by progress of the Work.

3.02 MAINTENANCE

A. Maintain temporary systems to provide safe, continuous service as required.

B. Properly supervise operation of temporary systems:

1. Enforce compliance with Laws and Regulations.

2. Enforce safe practices.

3. Prevent abuse of services.

4. Prevent nuisances and hazards caused by temporary systems and their use.

5. Prevent damage to finishes.

6. Ensure that temporary systems and equipment do not interrupt continuous progress of construction.

C. At end of each work day, check temporary systems and verify that sufficient consumables are available to maintain operation until work is resumed at the Site. Provide additional consumables if the supply on hand is insufficient.

D. Contractor shall replace broken and burned out lamps, blown fuses, and damaged wiring and appurtenances as required to maintain adequate and safe operating conditions.

E. Contractor shall permit subcontractors and others at a mutually agreed arrangement to use temporary electrical system that meet the following requirements:

1. Equipment are suitable for 120 V, single phase, 60 Hz operation.

2. Operating input does not exceed 1,500 volt-amperes.

3. Single piece of equipment connected to one outlet.

4. Contractor shall restrict use of equipment as required to prevent overloading circuits.

3.03 CLOSEOUT ACTIVITES

A. Completely remove temporary utilities, facilities, equipment, and materials when no longer required. Repair damage caused by temporary systems and their removal and restore the Site to condition required by the Contract Documents; if restoration of damaged areas is not specified, restore to preconstruction condition.

B. Contractor is responsible for and shall return to original condition those portions of permanent electric system used in completing the Work.

C. Where temporary utilities are disconnected from existing utility, provide suitable, watertight or gastight (as applicable) cap or blind flange, as applicable, on service line, in accordance with requirements of utility owner.

D. When permanent utilities and systems that were used for temporary utilities, upon Substantial Completion replace all consumables such as filters and light bulbs and parts used during the Work.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 52 00

CONSTRUCTION FACILITIES

PART 1 – GENERAL

1.01 SUMMARY

A. Contractor shall provide construction facilities for performance of the Work, including the following:

1. Contractor's field office, sheds, and storage containers that shall be erected within 30 days of Notice to Proceed on the Project.

2. Engineer's field office provided with specified temporary utility services that shall be erected within 30 days of Notice to Proceed on the Project.

3. Project sign and panel that shall be erected within 21 days of Notice to Proceed on the Project.

1.02 FACILITY DESCRIPTION

A. Contractor's Field Office, Sheds, and Storage:

1. Contractor shall provide and maintain a field office at the Site, including temporary utility services specified.

2. Size and Furnishings: As required by Contractor

3. Features: Exterior Contractor identification sign, night lighting for security, and temporary utilities specified in Section 01 51 00 – Temporary Utilities.

4. Location: As shown on the Contract Documents.

5. Contractor shall provide and maintain one set of Contract Documents, latest approved Shop Drawings, Field Orders, request for interpretations, clarification notices, Work Change Directives, proposal requests, Change Proposals, Change Orders, and other pertinent Project related correspondence.

B. Engineer's Field Office:

1. Contractor shall provide Engineer's field office for Resident Project Representative (RPR).

2. Requirements:

a. Separate structure with a minimum of 720 sq ft of floor area.

b. Separate covered porch with a minimum of 72 sq ft of floor area at main entrance to structure. Cover shall have separate roof and rainproof seal to main structure.

c. Doors and windows provided with locking devices and hardware to prevent unauthorized entry. Door keys shall be provided to Engineer for the duration of the Project. Door keys will be returned to Contractor following completion of Project.

d. Functional, totally enclosed restroom and mirror shall be provided.

e. Minimum temporary utilities requirements:

1) Heating: Maintain 68°F in winter.

2) Cooling: Maintain 75°F in summer.

3) Interior electrical outlets: Minimum one outlet per wall of structure

4) Electrical service: Adequate temporary electrical service for fully functional field office

5) Individual, direct line telephone service with equipment for up to four persons.

6) Individual, direct high-speed internet service (DSL or cable), at minimum 50 Mbps up and down Internet speed, with hardwired networking up to four persons and Wi-Fi for exclusive use by the Engineer.

7) Potable water service to water closet and lavatory.

8) Interior and exterior lighting: Conforms to Section 01 51 00 – Temporary Utilities and as specified in this Section.

3. Furnishing:

2	Flat top desk, 2-1/2 x 5 feet, with drawers at each end
1	Plywood drawing table, 3 x 6 feet tilt top with drafting stool
12	Straight chairs
2	Four-drawer, legal size steel filing cabinets with lock and key (HON 210P Series full-suspension files)
1	23-gallon metal or heavy-duty plastic waste baskets with lids
3	28-quart metal or heavy-duty plastic waste baskets
1	Hanging drawing racks with appurtenances

2	Wall-mounted UL rated fire extinguishers
1	Bookcase with 4 shelves, 3 feet wide
3	Metal/plastic office folding tables, 30 x 60 inches (minimum)
1	Metal/plastic office folding table, 30 x 96 inches (minimum)
1	Steel storage cabinets (72” H x 36” W x 24” D) with four adjustable shelves and locks
1	First aid cabinet (conforms with OSHA requirements for construction site of up to five people)
2	Tilt/swivel type desk chairs
1	4 cu ft capacity refrigerator
1	1.4 cu. ft. countertop microwave with double-oven cart
1	Laser copying/printing/scanner/facsimile machine with local service contract (printing/scanning in full color up to 11” x 17” paper size)
1	Office hard drive (1 TB minimum) and router networked for up to 4 personnel with high speed internet and 4-in-1 printer

4. Exterior Engineer identification sign: 24” x 36” plywood sign painted white with blue, centered 3-inch high lettering with the following inscription:

   Field Office

   Hazen and Sawyer

   498 Seventh Avenue, 11th Floor, New York, NY 10018

5. Location: Attached on the entrance side of the Engineer’s trailer.

6. Consumables: Contractor shall provide consumables and supplies for the Engineer’s Field Office including, but not limited to, waste basket heavy-duty liners, floor entry mats, mud-cleaning brushes, paper towels, toilet paper, printer ink, copying machine paper (all sizes), etc., for the duration of the Contract.

7. Cleaning services: Contractor shall provide qualified, professional cleaning services to clean Engineer’s field office a minimum of two times per week for the duration of the Project.

8. Contractor shall respond and address maintenance issues that occur at the Engineer’s field office with 24 hours notification.

1.03 SUBMITTALS

A. Action/Informational Submittals: Project identification sign layout, details, and materials of construction.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 57 00

TEMPORARY CONTROLS

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Contractor shall provide and maintain methods, equipment, and temporary construction as required to control environmental conditions at the Site and adjacent areas.

B. Maintain controls until no longer required.

C. Temporary controls include, but are not limited to, the following:

1. Dust control.

2. Noise controls.

3. Pest and rodent control.

4. Pollution control.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 DUST CONTROL

A. Contractor shall take measures to control dust from Contractor's operations and prevent spillage of excavated materials on public roads.

B. Contractor shall remove spillage of excavated materials, debris and dust from public roads by methods approved by Engineer.

C. Contractor shall provide temporary dust-proof partitions where required to protect unaltered portions of existing structures and facilities and as directed by Engineer or Owner. Temporary partitions shall be provided where demolition Work is required, to protect equipment and material, and shall consist of the following:

1. Wood studs with plywood on both sides and extend from floor to ceiling.

2. Closure plate at floor and ceiling.

3. One door (minimum) with hardware.

D. Contractor shall refer to applicable sections of local and state/commonwealth regulations on dust control for additional guidance.

1. Contractor shall apply water at locations, quantities, and frequencies required by Engineer to control dust for nuisance prevention to Owner, Engineer, and properties in the vicinity of the Site.

2. Dust control and cleaning measures shall be provided at no additional cost to the Owner.

3.02 NOISE CONTROL

A. Contractor's vehicles and equipment shall minimize noise emissions to greatest degree practicable. Provide mufflers, silencers, and sound barriers when necessary.

B. Noise levels shall comply with Laws and Regulations, including OSHA requirements and local ordinances.

C. Noise emissions shall not interfere with the work of Owner or others.

3.03 PEST AND RODENT CONTROL

A. Provide rodent and pest control as required to prevent infestation of the Site and storage areas.

B. Employ methods and use materials that do not adversely affect conditions at the Site or on adjoining properties.

C. In accordance with laws and regulations, promptly and properly dispose of pests and rodents trapped or otherwise controlled.

3.04 POLLUTION CONTROL

A. General:

1. Provide means, methods, and facilities required to prevent contamination of soil, water, and atmosphere caused by discharge of noxious substances from construction operations.

2. Equipment used during construction shall comply with Laws and Regulations.

B. Spills and Contamination:

1. Provide equipment and personnel to perform emergency measures required to contain spills and to remove contaminated soils and liquids.

2. Excavate contaminated material and properly dispose of off-site and replace with suitable compacted fill and topsoil.

C. Protection of Surface Waters: Implement special measures to prevent harmful substances from entering surface waters. Prevent disposal of wastes, effluents, chemicals, and other such substances in or adjacent to surface waters and open drainage routes, in sanitary sewers, or in storm sewers.

D. Atmospheric Pollutants:

1. Provide systems for controlling atmospheric pollutants related to the Work.

2. Prevent toxic concentrations of chemicals and vapors.

3. Prevent harmful dispersal of pollutants into atmosphere.

E. Solid Waste:

1. Provide systems for controlling and managing solid waste related to the Work.

2. Prevent solid waste from becoming airborne, and from discharging to surface waters and drainage routes.

3. Properly handle and dispose of solid waste.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 61 00

PRODUCT REQUIREMENTS AND OPTIONS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Common requirements for products.

2. Contractor's options for selecting products.

3. Requirements for consideration of "or equal" products.

4. Warranty requirements of products.

1.02 REFERENCES

A. Definitions:

1. "Products" includes materials, equipment, machinery, components, fixtures, systems, and other goods incorporated in the Work. Products do not include machinery and equipment used for preparing, fabricating, conveying, erecting, or installing the Work. Products include Owner-furnished goods incorporated in the Work where use of such goods is specifically required in the Contract Documents.

2. "Special Warranties" includes additions or modifications to standard warranty requirements specified in the Contract Documents.

1.03 SUBMITTALS

A. Warranty Log Book:

1. Submit warranty log book prepared specifically for this Project. Submittal shall include a summary listing of all equipment and material warranties furnished in the Contract, date received, and start/end date of warranty period. Individual warranty documentation shall be provided in the submittal.

2. Submit prior to submittal of final application for payment.

B. Patent Documentation: Submit licensing arrangement and agreement documentation.

1.04 REQUIREMENT

A. Common Products:

1. Provide products that have not been previously incorporated into another project or facility unless otherwise indicated in the Contract Documents.

2. Provide products of the same generic kind from a single source.

3. Provide products complete with accessories, trim, finish, fasteners, and other items shown, indicated, or required for a complete installation for the indicated use and performance.

4. Standard Products: When available, and unless custom or nonstandard options are specified or indicated, provide standard products of types that have been produced and used successfully in similar situations on other projects.

5. Visual Matching: Where required in the Contract Documents, provide products that match referenced existing construction, approved mock-ups, or approved Sample, as determined by Engineer.

6. Where the Contract Documents include the phrase “as selected” for product color, finish pattern, option, or similar phrase, provide products selected by Engineer as follows:

a. Standard Range: Where the Contract Documents include the phrase “standard range of colors, patterns, textures” or similar phrase, provide color, pattern, density, or texture selected by Engineer from manufacturer’s product line that does not include premium items.

b. Full Range: Where the Contract Documents include the phrase “full range of colors, patterns, textures” or similar phrase, Engineer will select color, pattern, density, or texture from manufacturer’s entire product line, including standard and premium items.

B. Product Compatibility:

1. Similar products by the same Supplier shall be compatible with each other, unless otherwise indicated in the Contract Documents.

2. Provide products compatible with products previously selected or installed on the Project.

C. Product Options:

1. For products specified only by reference standard or description, without reference to Supplier, provide products meeting that standard, by a Supplier or from a source that complies with the Contract Documents.

2. For products specified by naming one or more products or Suppliers, provide the named products that comply with the Contract Documents, unless an “or equal” or substitute product is approved by Engineer.

3. For products specified by naming one or more products or Suppliers and the term, “or equal”, when Contractor proposes a product or Supplier as an “or equal”, submit to Engineer a request for approval of an “or equal” product or Supplier.

4. For products specified by naming only one product or manufacturer and followed by words indicating that no substitution is allowed, there is no option and no substitution will be allowed.

D. Concerning Patents:

1. Owner shall be provided a guarantee by Contractor and equipment Supplier that equipment and material furnished in accordance with the Contract Documents is not the subject of patent litigation.

2. Patent litigation or controversy shall include, but not limited to, the following:

a. Actual furnished equipment and material is subject or could be subject to patent litigation or is known to infringe on a patent.

b. Furnished equipment and material that may result in use of equipment and material in a manner that infringes upon or violates a patent.

3. When patent infringement may occur, Contractor and Supplier shall submit license arrangements among parties, including Contractor, Supplier, and patent owner (controller of patent) at a minimum, which shall permit use of equipment and material as specified in the Contract Documents.

4. Supplier shall indemnify and hold harmless Owner and Engineer against all claims, costs, losses, and damages arising out of or relating to any infringement or patent rights or copyrights incident to the use of equipment and material specified in the Contract Documents and as required in General Conditions and as modified in the Supplemental Conditions.

E. “Or Equal” Products:

1. For proposed products not named in the Contract Documents and considered as an “or equal” as defined in the General Conditions, Contractor shall request in writing Engineer’s approval of the “or equal”. Request for approval of an “or equal” product shall accompany the Shop Drawing or product data submittal for the proposed product and shall include:

a. Contractor's request that the proposed product be considered as an "or equal" in accordance with the General Conditions, accompanied by Contractor's certifications required in the General Conditions.

b. Documentation adequate to demonstrate that proposed product does not require revisions to the Contract Documents, that proposed product is consistent with the Contract Documents, and that proposed product will produce results and performance required in the Contract Documents, and that proposed product is compatible with other portions of the Work.

c. Detailed comparison of significant qualities of proposed product with the products and manufacturers named in the Contract Documents. Significant qualities include attributes such as performance, weight, size, durability, visual effect, performance and specific features and requirements shown or indicated.

d. Evidence that proposed product manufacturer will furnish warranty equal to or better than specified, if any.

e. List of similar installations for completed projects with project names and physical addresses of installation along with the names, telephone numbers, email addresses and physical address of design professionals and owners associated with the referenced installation, if requested.

f. Samples, if requested.

g. Other information requested by Engineer.

1.05 WARRANTY

A. Warranties specified for products shall be in addition to, and run concurrent with, Contractor's general warranty and guarantee and requirements for the required correction period. Disclaimers and limitations in specific product warranties do not limit Contractor's general warranty and guarantee.

1. Product manufacturer's warranty is preprinted written warranty published by product manufacturer and specifically endorsed by product manufacturer to Owner.

2. Equipment and material shall be guaranteed to be free from defects in workmanship, design, and/or materials for a period of one (1) year unless otherwise specified in the individual Specification Section for a Special Warranty.

3. Warranty period shall start on the date of the particular equipment and material is substantially complete, which includes requirements specified in Section 01 75 00 – Checkout and Startup Procedures for start-up certification and specified elsewhere in the Contract Documents.

4. Warranty requirements may be added to or modified in the individual Specification Sections. Special warranty is written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by product manufacturer's warranty or to provide increased rights to Owner.

5. Special warranty information, if any, will be located in the Specification Section for that product.

B. Requirements for Special Warranties: Provide written special warranty document that contains appropriate terms and identification, ready for execution by product manufacturer and Owner. Submit draft warranty with submittals required for product.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed by product manufacturer and other parties as appropriate.

2. Specified Form: When specified forms are included in the Contract Documents, prepare written document, properly executed by product manufacturer and Owner, using appropriate form.

3. Refer to Specifications for content and requirements for submitting special warranties.

C. Submit product manufacturer's warranties and special warranties as submittals in accordance with Schedule of Submittals accepted by Engineer.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 65 00

PRODUCT DELIVERY REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. General requirements for preparing for shipping, delivering, and handling materials and equipment.

2. Contractor shall make all arrangements for transporting, delivering, and handling of materials and equipment required for prosecution and completion of the Work.

1.02 SUBMITTALS

A. Refer to individual Specification Sections for submittal requirements relative to delivery and handling materials and equipment.

1.03 SHIPMENT REQUIREMENTS

A. When practical, factory-assemble materials and equipment. Match mark or tag separate parts and assemblies to facilitate field assembly. Cover machined and unpainted parts that may be damaged by the elements with strippable, protective coating.

B. Package materials and equipment to facilitate handling, and protect materials and equipment from damage during shipping, handling, and storage. Mark or tag outside of each package or crate to indicate the associated purchase order number, bill of lading number, contents by name, Owner's contract name and number, Contractor name, equipment number, and approximate weight. Include complete packing lists and bills of materials with each shipment.

C. Protect materials and equipment from exposure to the elements and keep thoroughly dry and dust-free at all times. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Lubricate bearings and other items requiring lubrication in accordance with manufacturer's instructions.

D. Advance Notice of Shipments:

1. Keep Engineer informed of delivery of all materials and equipment to be incorporated in the Work.

E. Do not ship materials and equipment until:

1. Related Shop Drawings, Samples, and other submittals have been approved or accepted (as applicable) by Engineer, including, but not necessarily limited to, Submittals associated with the materials and equipment being delivered.

2. Manufacturer's instructions for handling, storing, and installing the associated materials and equipment have been submitted to and accepted by Engineer in accordance with the Specifications.

3. Results of source quality control testing (factory testing), when required by the Contract Documents for the associated materials or equipment, have been reviewed and accepted by Engineer.

4. Facilities required for handling materials and equipment in accordance with manufacturer's instructions are in place and available.

5. Required storage facilities have been provided.

1.04 DELIVERY REQUIREMENTS

A. Scheduling and Timing of Deliveries:

1. Arrange deliveries of materials and equipment in accordance with the accepted Progress Schedule and in ample time to facilitate inspection prior to installation.

a. Equipment and material shall not be delivered to the Site prior to 30 days in advance of scheduled installation.

b. Partial payment requests will not be processed for materials delivered prior to 30 days before installation or for materials that are improperly stored.

2. Schedule deliveries to minimize space required for and duration of storage of materials and equipment at the Site or delivery location, as applicable.

3. Coordinate deliveries to avoid conflicting with the Work and conditions at Site, and to accommodate the following:

a. Work of other contractors and Owner.

b. Owner's operations and maintenance.

c. Storage space limitations.

d. Availability of equipment and personnel for handling materials and equipment.

e. Owner's use of premises.

4. Deliver materials and equipment to the Site during regular working hours.

5. Deliver materials and equipment to avoid delaying the Work and the Project, including work of other contractors, as applicable. Deliver anchor system materials, including anchor bolts to be embedded in concrete or masonry, in ample time to avoid delaying the Work.

B. Deliveries:

1. Shipments shall be delivered with Contractor's name, Subcontractor's name (if applicable), Site name, Project name, and contract designation clearly marked.

2. Site may be listed as the "ship to" or "delivery" address; but Owner shall not be listed as recipient of shipment unless otherwise directed in writing by Engineer.

3. Provide Contractor's telephone number to shipper; do not provide Owner's telephone number.

4. Arrange for deliveries while Contractor's personnel are at the Site. Contractor shall receive and coordinate shipments upon delivery. Shipments delivered to the Site when Contractor is not present will be refused by Owner, and Contractor shall be responsible for the associated delays and additional costs, if incurred.

C. Containers and Marking:

1. Have materials and equipment delivered in manufacturer's original, unopened, labeled containers or other packing systems, complete with instructions for handling, storing, unpacking, protecting and installing.

2. Clearly mark partial deliveries of component parts of materials and equipment to identify materials and equipment, to allow easy accumulation of parts, and to facilitate assembly.

D. Inspection of Deliveries:

1. Immediately upon delivery, Contractor shall inspect shipment to verify that:

a. Materials and equipment comply with the Contract Documents and approved or accepted (as applicable) submittals.

b. Quantities are correct.

c. Materials and equipment are undamaged.

d. Containers and packages are intact and labels are legible.

e. Materials and equipment are properly protected.

2. Promptly remove damaged materials and equipment from the Site and expedite delivery of new, undamaged materials and equipment, and remedy incomplete or lost materials and

equipment to furnish materials and equipment in accordance with the Contract Documents, to avoid delaying progress of the Work.

3. Advise Engineer in writing when damaged, incomplete, or defective materials and equipment are delivered, and advise Engineer of the associated impact on the Progress Schedule.

1.05 HANDLING REQUIREMENTS

A. Provide equipment and personnel necessary to handle materials and equipment, including those furnished by Owner, by methods that prevent soiling or damaging materials and equipment and packaging.

B. Provide additional protection during handling as necessary to prevent scraping, marring, and otherwise damaging materials and equipment and surrounding surfaces.

C. Handle materials and equipment by methods that prevent bending and overstressing.

D. Lift heavy components only at designated lifting points.

E. Handle materials and equipment in safe manner and as recommended by the manufacturer to prevent damage. Do not drop, roll, or skid materials and equipment off delivery vehicles or at other times during handling. Hand-carry or use suitable handling equipment.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 66 00

PRODUCT STORAGE AND PROTECTION REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. General requirements of storing and protecting equipment and materials.

1.02 STORAGE

A. Store and protect materials and equipment in accordance with manufacturer's recommendations and the Contract Documents.

B. Contractor shall make all arrangements and provisions necessary for, and pay all costs for, storing materials and equipment. Construction equipment, and materials and equipment to be incorporated into the Work shall be placed to avoid injuring the Work and existing facilities and property, and so that free access is maintained at all times to all parts of the Work and to public utility installations in vicinity of the Work. Store materials and equipment neatly and compactly in locations that cause minimum inconvenience to Owner, other contractors, public travel, and owners, tenants, and occupants of adjoining property. Arrange storage in manner to allow easy access for inspection.

C. Areas available at the Site for storing materials and equipment are shown or indicated in the Contract Documents, or as approved by Engineer.

D. Store materials and equipment to become Owner's property to facilitate their inspection and ensure preservation of quality and fitness of the Work, including proper protection against damage by freezing, moisture, and high ambient temperatures. Store in indoor, climate-controlled storage areas all materials and equipment subject to damage by moisture, humidity, heat, cold, and other elements, unless otherwise acceptable to Owner.

E. Contractor shall be fully responsible for loss or damage (including theft) to stored materials and equipment.

F. Do not open manufacturer's containers until time of installation, unless recommended by the manufacturer, directed by Engineer or otherwise specified in the Contract Documents.

G. Do not store materials or equipment in structures being constructed unless approved by Engineer in writing.

H. Do not use lawns or other private property for storage without written permission of the owner or other person in possession or control of such premises.

I. Contractor shall not store unnecessary equipment and materials at the Site.

J. Contractor shall prevent structures from being loaded with a weight that endanger its security and/or safety of persons.

K. Stored equipment and materials shall not be placed within 10 feet of fire hydrants.

L. Gutters, drainage channels and inlets shall be kept unobstructed at all times.

M. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

N. Cement and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural, miscellaneous, and reinforcing steel shall be stored off the ground or otherwise to prevent accumulations of dirt or grease and in a position to prevent accumulations of standing water and to minimize rusting. Beams shall be stored with the webs vertical. Precast concrete shall be handled and stored in a manner to prevent accumulations of dirt, standing water, staining, chipping, or cracking. Brick, block, and similar masonry products shall be handled and stored in a manner to reduce breakage, cracking and spalling to a minimum.

O. All mechanical and electrical equipment and instruments subject to corrosive damage by the atmosphere if stored outdoors (even though covered by canvas) shall be stored in a weathertight building to prevent injury. The building may be a temporary structure on the site or elsewhere, but it must be satisfactory to the Engineer. Building shall be provided with adequate ventilation to prevent condensation. Maintain temperature and humidity within range required by manufacturer.

1. All equipment shall be stored fully lubricated with oil, grease and other lubricants unless otherwise instructed by the manufacturer.

2. Moving parts shall be rotated a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, the Contractor shall start the equipment, at least half load, once weekly for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.

3. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment at the time of acceptance.

4. Prior to acceptance of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested, and accepted in a minimum time period. As such, the manufacturer will guaranty the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the Contractor's expense.

1.03 PROTECTION

A. Contractor shall provide temporary storage containers/facilities, if required, to protect equipment and materials at the Site.

B. Equipment to be incorporated into the Work shall be boxed, crated, or otherwise completely enclosed and protected during shipping, handling, and storage, in accordance with Section 01 65 00 – Product Delivery Requirements.

C. Store all materials and equipment off the ground (or floor) on raised supports such as skids or pallets.

D. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Painted equipment surfaces that are damaged or marred shall be repainted in their entirety in accordance with equipment manufacturer and paint manufacturer requirements, to the satisfaction of Engineer.

1.04 SPECIFIC STORAGE REQUIREMENTS

A. Uncovered:

1. The following types of materials may be stored outdoors without cover on supports so there is no contact with the ground:

a. Piping, except polyvinyl chloride (PVC) or chlorinated PVC (CPVC) pipe.

B. Covered:

1. The following materials and equipment may be stored outdoors on supports and completely covered with covering impervious to water:

a. Grout and mortar materials.

b. Rough lumber.

c. PVC and CPVC pipe.

2. Tie down covers with rope, and slope covering to prevent accumulation of water.

C. Fully Protected:

1. All materials and equipment not named as uncovered or covered in this Section, shall be stored on supports in buildings or trailers that have concrete or wooden flooring, roof, and fully closed walls on all sides. Covering with plastic sheeting or similar material in space without floor, roof, and walls is not acceptable. Comply with the following:

a. Provide heated storage for materials and equipment that could be damaged by low temperatures or freezing.

b. Provide air-conditioned storage for materials and equipment that could be damaged by high temperatures.

c. Protect mechanical and electrical equipment from being contaminated by dust, dirt, and moisture.

d. Maintain humidity at levels recommended by manufacturers of electrical and electronic equipment.

e. Energize space heaters fore electrical equipment and material.

D. Maintenance of Storage: On scheduled basis, periodically inspect stored materials and equipment to ensure that:

1. Condition and status of storage facilities is adequate to provide required storage conditions.

2. Required environmental conditions are maintained on continuing basis.

3. Materials and equipment exposed to elements are not adversely affected.

1.05 RECORDS

A. Keep up-to-date account of materials and equipment in storage to facilitate preparation of Applications for Payment, if the Contract Documents provide for payment for materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 71 33

PROTECTION OF WORK AND PROPERTY

PART 1 – GENERAL

1.01 SUMMARY

A. Section lncludes:

1. Protection of existing utilities and structures.

2. Protection of installed equipment and materials.

3. Protection during inclement weather.

4. Reporting of accidents.

5. Barricades and warning signals.

B. Contractor shall be responsible for taking all precautions, providing all programs, and taking all actions necessary to protect the Work and all public and private property and facilities from damage, as specified in the General Conditions, Supplementary Conditions, and this Section.

C. To prevent damage, injury, or loss, Contractor's actions shall include the following:

1. Storing apparatus, materials, supplies, and equipment in an orderly, safe manner that does not unduly interfere with progress of the Work or work of other contractors or utility companies.

2. Providing suitable storage facilities for equipment and materials subject to damage or degradation by exposure to weather, theft, breakage, or other cause.

3. Placing upon the Work or any part thereof only loads consistent with the safety and integrity of that portion of the Work and existing construction.

4. Frequently removing and disposing of refuse, rubbish, scrap materials, and debris caused by Contractor's operations so that, at all times, the Site is safe, orderly, and workmanlike in appearance.

D. Contractor has full responsibility for preserving public and private property and facilities on and adjacent to the Site. Direct or indirect damage done by, or on account of, any act, omission, neglect, or misconduct by Contractor in executing the Work, shall be restored by Contractor, at his expense to condition equal to that existing before damage was done.

E. Contractor shall comply with safety regulations required by Owner or authorities having jurisdiction. Contractor shall comply with and correct unsafe conditions created or caused by Contractor's personnel. In the event Contractor fails to comply, Owner receives the right to take necessary measures to correct conditions or practices for reimbursement by Contractor.

1.02 REFERENCES

A. Definitions:

1. "Existing utilities" shall refer to both publicly-owned and privately-owned utilities such as, but are not limited to, electric power and lighting, telephone, water, gas, storm drains, process lines, sanitary sewers and all appurtenant structures.

2. "Surface structures" are existing buildings, structures, and other facilities at or above ground surface, including their foundations or any extension below ground surface. Surface structures include, but are not limited to, buildings, tanks, walls, channels, open drainage, exposed piping and utilities, poles, exposed wires, posts, signs, markers, curbs, walks, fencing, and other facilities visible at or above ground surface.

1.03 SITE CONDITIONS

A. Location of Existing Utilities and Structures:

1. Contractor shall confirm and verify location of existing utilities and structures at the Site prior to commencing the Work.

2. Contractor shall notify and obtain approval from authority having jurisdiction prior to performing the Work in the vicinity of the existing utilities and structures.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 PROTECTION OF EXISTING UTILITIES AND STRUCTURES

A. General:

1. Contractor shall satisfy Engineer that methods and procedures for protection have been approved by authorities having jurisdiction prior to proceeding with the Work.

2. Contractor shall provide temporary support and protection, as required, to existing utilities and structures during the Work, including excavation.

a. Temporary support and protection of existing utilities shall be provided in accordance with requirements of the authority having jurisdiction.

b. Provide barricades and guard rails around openings, for scaffolding, for temporary stairs and ramps, around excavations, elevated walkways and other dangerous areas as deemed necessary by the Engineer. Provide ramps over all hoses and temporary ground level piping where they cross roads and/or walkways, so that hoses or piping are protected from damage due to traffic and for the safety of the pedestrians.

3. Workers shall use spark (explosion) proof tools in all Class I, Division I, Group D, locations as per the National Electric Code.

4. Contractor shall be responsible for costs incurred for temporary support or protection provided by a third-party or authority having jurisdiction to insure safety of the existing utility, Owner, and public and private parties.

5. Each Contractor shall protect trees, shrubbery and other natural features or structures from being cut, trimmed or injured in his areas of Work. Trees adjacent to the site of Work shall be protected and temporary supports provided for long branches. Stored materials and equipment shall be in cleared spaces, away from all trees and shrubs, and confined to areas as directed by the Engineer.

   a. Temporary fences or barricades shall be installed to protect trees and plants in areas subject to traffic.

   b. No fires shall be permitted at the Plant.

   c. Within the limits of the Work, water trees and plants that are to remain, in order to maintain their health during construction operations

   d. Cover all exposed roots with burlap that shall be kept continuously wet. Cover all exposed roots with earth as soon as possible. Protect root systems from mechanical damage and damage by erosion, flooding, run-off or noxious materials in solution.

   e. If branches or trunks are damaged, prune branches immediately and protect the cut or damaged areas with emulsified asphalt compounded specifically for horticultural use in a manner approved by the Engineer.

   f. All damaged trees and plants that die or suffer permanent injury shall be removed when ordered by the Engineer and replaced by a specimen of equal or better quality.

   g. Coordinate Work in this Section with requirements of Division 2.

6. All Work and materials shall be protected in accordance with the requirements of the Agreement, Article VI, “Protection”; General Conditions, Articles GC-17, “Materials and Equipment, Approvals Substitutions and Deviations”, GC-21, “Protection Requirements”, and GC-24, “Barricades”, Warning Signs and Lights”.

B. Existing Buried Utilities:

1. Buried utilities are defined to include, but not be limited to, all sewer, water, gas, and other piping and manholes, chambers, electrical and signal conduits, tunnels and other existing subsurface work located within or adjacent to the limits of the Work.

2. Contractor shall perform field investigate to identify conflicts or interferences between existing utilities and utility Work prior to excavation Work.

    a. Investigation of conflicts and interferences shall be performed on Site locations, elevations, slopes, etc. of the existing utilities determined during the field investigations.

    b. Contractor shall notify Engineer and Owner in writing of identified conflicts or interferences. Contractor shall not proceed with the Work until written authorization is provided by the Engineer.

    c. Identified conflicts and interferences shall be handled in accordance with the Contract Documents and Agreement.

3. Contractor shall perform the Work to prevent disruption of existing service and damage to existing utilities.

    a. Temporary connections shall be provided, as required, to provide un-interrupted service of existing utilities.

    b. Contractor shall repair damage to existing utilities as directed by the Engineer or the authority having jurisdiction at Contractor's own expense.

    c. Contractor shall be responsible for damages and repair costs to the authority having jurisdiction if third-party or authority having jurisdiction personnel repair damaged existing utilities.

C. Protection of Existing Structures:

1. Contractor shall sustain existing surface structures in existing place and protect from direct or indirect injury located within or adjacent to the limits of the Work. Such sustaining and supporting shall be done carefully and as required by the party owning or controlling such structure or facility.

2. Contractor shall bear all risks attending the presence or proximity of all surface structures within or adjacent to limits of the Work, in accordance with the Contract Documents.

3. Contractor shall be responsible for damage and expense for direct or indirect injury caused by his Work to structures and facilities.

4. Contractor shall repair immediately damage caused by his Work, to the satisfaction of owner of damaged structure or facility at no cost to the Owner.

5. Contractor shall provide temporary weather protection for existing structures and buildings where exterior walls or roofs are modified or disturbed in the Work. Contractor shall be responsible for damages due to inadequate protection of existing structures and building.

6. Contractor shall protect floors, roofs and stairs from overloads, dirt and damage during entire construction period. In areas subject to foot traffic, secure heavy paper, sheet goods or other materials in place. For storage of products, lay tight wood sheathing in place.

7. Proper protective covering shall be used when moving heavy equipment, when handling materials or other loads, when painting, when handling mortar and grout and when cleaning walls and ceilings.

8. Use metal pans to collect all oil and cuttings from pipe, conduit, or rod threading machines and under all metal cutting machines.

9. Roof slabs and digester covers shall not be loaded without written permission of the Engineer. Prohibit use of finished roofing surfaces for traffic of any kind, and for storage of any products. When activity must take place in order to carry out the Work, obtain recommendations of installer for protection of surface. Install recommended protection and remove on completion of that activity. Restrict use of adjacent unprotected areas.

10. Contractor shall restrict access to roofs and keep clear of existing roofs except as required by the new Work.

11. If access to roofs is required, roofing, parapets, openings and all other construction on or adjacent to roof shall be protected with suitable plywood or other approved means.

D. Relocation of Surface Structures: Existing surface facilities, including but not limited to guard rails, posts, guard cables, signs, poles, markers, curbs, and fencing, that are temporarily removed to facilitate the Work shall be replaced and restored to their original condition at Contractor's expense.

3.02 PROTECTION OF INSTALLED EQUIPMENT AND MATERIALS

A. Contractor shall protect installed equipment and materials equipment to prevent damage, injury or loss from subsequent operations. Remove protection facilities when no longer needed prior to completion of the Work.

B. Control traffic to prevent damage to equipment, materials, and surfaces.

C. Coverings: Provide coverings to protect materials and equipment from damage.

3.03 PROTECTION DURING INCLEMENT WEATHER

A. Contractor shall not perform Work during inclement or unsuitable weather that will affect the quality of the completed Work.

B. Contractor shall take necessary precautions in the event of impending inclement weather to protect equipment, materials and Work from damage or deterioration due to floods, driving rain, wind, or snow storms.

1. Owner reserves the right to require additional protection measures beyond Contractor's proposed protection measures to protect the Work.

2. Contractor shall not claim additional compensation for additional protection measures required by Owner nor for damages to equipment, material, or Work due to the inclement weather.

C. When directed by Engineer, Contractor shall stop Work and protect new Work by protective covering during rain storms for, but not limited to, the following:

1. Concrete mixing and placement.

2. Paving placement.

3. Masonry installation.

4. Buried piping, valve and appurtenance installation.

5. Additional inclement weather requirements and limitations are specified in individual Specification Sections.

3.04 TEMPORARY CONSTRUCTION FENCING

A. The Work areas of the Project Site shall be enclosed at all times by temporary fencing to ensure security.

B. Temporary fencing shall not be less than six feet in height. Fabric shall be ten gauge minimum, electrically welded wire forming a rectangular mesh with openings two by four inches and three rows of double barb ten gage wire on angle brackets measuring two feet vertically. Fabric shall be mounted on heavy duty steel tee spaced at intervals not exceeding ten feet.

C. The General Contractor shall furnish, erect, relocate and maintain all temporary fencing. Upon completion of the Project, all temporary fencing shall be removed and disposed of.

D. All work in connection with the temporary fencing shall be done at no additional cost to the County and included in the Contractor's lump sum bid.

E. Security measures taken by the Contractor shall be at least equal to those usually provided by County to protect his existing facilities.

3.05 ACCESS ROADS

A. Access roads will be provided by the Contractor in accordance with the requirements of the General Conditions, Article GC-22, “Access Roads and Parking Areas”, the Contract Drawings and the applicable Technical Specifications

B. Each Contractor shall take all necessary precautions to protect traffic, including, but not limited to, complying with the requirements of the General Conditions, Articles GC-23, “Traffic Regulations” and GC-24, “Barricades, Warning Signs and Lights”.

C. The Construction Contractor shall post speed limit signs to be adhered to at all times in the vicinity of the staging and work areas.

D. Repair and maintenance of all access roads will be the responsibility of the General Contractor.

E. Protection of Piping at Road Crossings: The Contractor shall provide Temporary Road Ramps as manufactured by Godwin Pumps or approved equal for all hoses and temporary ground level piping where they cross roads. Road surface shall be restored to original condition if pipe trench is utilized.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 73 00

DEMOLITION AND EXECUTION OF WORK

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Contractor shall provide labor, materials, tools, equipment, and incidentals shown, specified, and required for execution of the Work as specified in this Section, including the following:

a. Construction Electronic Documentation

b. Demolition

c. Cutting and Coring

d. Patching

e. Installation

2. Requirements for demolition, removal and disposal of existing buildings, structures, pavement, curbs, and sidewalks and electrical, plumbing, heating and ventilation equipment and materials as indicated in the Contract Documents for demolition.

3. General requirements for installation of equipment and material. Additional installation requirements are included in the individual Specification Sections.

4. General requirements for connections to existing facilities. Requirements for tie-ins and shutdowns necessary to complete the Work are included in Section 01 14 00 - Coordination with Owner's Operations.

a. To extent possible, materials, equipment, systems, piping, and appurtenances that will be placed into service upon completion of connection to existing facilities shall be checked, successfully tested, and in condition for operation prior to making connections to existing facilities, if valves, gates, or similar watertight and gastight isolation devices are not provided at the connection point.

5. Requirements for cutting and coring, and rough and finish patching of holes and openings in existing construction. Provide cutting, coring, fitting, and patching, including attendant excavation and fill, required to complete the Work, and to:

a. Remove and replace defective Work.

b. Remove samples of installed Work as specified or required for testing.

c. Remove construction required to perform required alterations or additions to existing work.

d. Connect to completed Work not performed in proper sequence.

e. Remove or relocate existing utilities and pipes that obstruct the Work in locations where connections must be made.

f. Make connections or alterations to existing or new facilities.

B. Related Sections:

1. Section 01 14 00 - Coordination with Owner's Operations

2. Section 01 51 00 - Temporary Utilities

3. Section 01 57 00 - Temporary Controls

4. Section 01 61 00 - Product Requirements and Options

5. Section 01 66 00 - Product Storage and Protection Requirements

6. Section 01 74 00 - Cleaning and Waste Management

7. Section 01 79 00 - Instruction of Owner's Personnel

8. Section 02 41 00 – Site Demolition

1.02 REFERENCES

A. Definitions:

1. "Manufacturer's installation instructions" includes manufacturer's written instructions; drawings; illustrative, wiring, and schematic diagrams; diagrams identifying external connections; and other such information pertaining to installation of equipment and materials. Installation instructions are printed instructions, including those attached to the equipment and materials, all inclusive.

2. "Salvage" items are equipment and materials shown on the Contract Documents for selective removal by the Contractor to furnish to the Owner. Contractor shall be responsible for removal, handling, and depositing of equipment and material to location designated by Owner.

B. Reference Standards:

1. 29 CFR 1910, OSHA.

2. ANSI A10.2, Safety Code for Building Construction

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Review installation procedures under other Sections and coordinate Work that must be performed with or before the Work specified in this Section.

2. Notify other contractors in advance of Work for connections to existing facilities to prevent delay of the Work.

3. Remove and dispose of equipment and materials indicated for demolition on the Contract Documents, unless indicated as salvage items for the Owner. Contractor shall obtain ownership of removed equipment and materials following Engineer and Owner approval. Disposal of equipment and materials shall be in accordance with the Contract Documents

B. Sequencing:

1. Contractor shall remove and demolish equipment and materials in sequence described in Contractor's approved submitted Maintenance of Plant operations Plan, as described in Section 01 14 00 - Coordination with Owner's Operation, and following approval by Engineer and Owner.

2. Contractor shall replace equipment and materials removed without proper authorization from Engineer, which are necessary for the operation of the existing facilities. Re-installation of equipment and materials shall be to the satisfaction of the Engineer at no cost to the Owner

C. Title to Equipment and Materials:

1. Equipment and materials indicated for demolition and removal in the Contract Documents, and not designated as Owner's salvaged items, shall become the Contractor's property following removal from the Site. Contractor shall be responsible for legally disposing of the equipment and material.

2. Contractor shall have no right or title to any of the equipment, materials, or other items to be removed until the elements have been removed from the Site.

3. Contractor shall not sell or assign or attempt to sell or assign any interest in the equipment, materials, or other items until removal from Site.

4. Contractor shall have no claim against the Owner because of the absence of equipment, fixtures, and materials.

D. Salvage Equipment and Materials:

1. Contract Documents indicate equipment and materials that shall be retained by Owner. Owner has the right to request any demolished equipment and materials be retained at their discretion.

2. Contractor shall move salvaged equipment and materials to storage areas located at the Site as instructed by Owner.

3. Architectural equipment and materials may be salvaged for incorporation into the Work when approved by Engineer.

E. Use of Explosives: Contractor shall not use explosives or blasting equipment and material in the Work in accordance with the Contract Documents.

1.04 SUBMITTALS

A. Action/Informational Submittals:

1. Construction electronic documentation as specified in this Section.

2. Demolition Plan: Submit detailed description of methods, equipment, and sequence for demolition Work, including means of ensuring stability of structures during demolition activities.

3. Cutting and Patching Request:

a. Submit written request to Engineer, well in advance of executing cutting or alteration that affects one or more of the following:

1) Design function or intent of Project.

2) Work of Owner or other contractors.

3) Structural value or integrity of an element of the Project.

4) Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.

5) Efficiency, operational life, maintenance, or safety of operational elements.

6) Visual qualities of sight-exposed elements.

b. Request shall include:

1) Identification of Project and contract name and number.

2) Description of affected Work of Contractor and work of others (if any).

3) Necessity for cutting.

4) Effect on work of Owner, other contractors (if any), and on structural or weatherproof integrity of Project.

5) Description of proposed Work, including scope of cutting and patching; trades who will be executing the Work; products proposed to be used; extent of refinishing; schedule of operations; alternatives to cutting and patching, if any.

6) Designation of entity responsible for cost of cutting and patching, when applicable.

7) Written permission of other contractors (if any) whose work will be impacted.

4. Recommendation Regarding Cutting and Patching:

a. Should conditions of work, or schedule, indicate a change of materials or methods, submit written recommendation to Engineer including:

1) Conditions indicating change.

2) Recommendations for alternative materials or methods.

3) Items required with substitution request, in accordance with the substitution request requirements of the Contract Documents and Section 01 61 00 - Product Requirements and Options.

5. Product Data: Submit manufacturer's product data for the protective compound to be applied to core-drilled surfaces and cut concrete surfaces, as well as means of protecting exposed reinforcement or other metal embedments.

6. Informational Submittal: Submit written indication designating the day and time that the construction associated with cutting and patching will be uncovered, to allow observation. Do not begin cutting or patching operations until submittal is accepted by Engineer.

7. Comply with submittal requirements of individual Specification Sections for patching materials.

1.05 SITE CONDITIONS

A. Owner does not assume responsibility for the actual condition of structures and equipment to be demolished and removed.

B. Existing Site conditions shall be maintained to the greatest extent possible by the Owner to the time of Notice to Proceed.

C. Contractor shall perform investigations, explorations, and probes as necessary at the Site prior to initiating demolition Work to ascertain any required protective measures before proceeding with demolition and removal. Contractor shall give particular attention to shoring and bracing requirements to prevent damage to the Work and existing structures.

D. Contractor shall verify measurements, dimensions and other conditions of each existing structure, system, equipment, and material indicated in the Contract Documents for new Work prior to ordering equipment and materials.

PART 2 – PRODUCTS

2.01 MATERIALS

A. General:

1. Provide materials and products in accordance with the individual Specification Sections and the Contract Documents.

2. Provide materials and products that visually match existing adjacent surfaces to fullest extent possible for exposed surfaces.

3. If not indicated in the Contract Documents, provide materials and products that are identical to existing materials and products affected by the Work.

4. If identical materials and products are unavailable, provide materials and products that shall equal or exceed performance requirements of existing materials and products.

B. Protective Coating Applied to Core-Drilled Surfaces and Cut Concrete Surfaces:

1. All concrete surfaces exposed due to cutting or core drilling shall be coated with an epoxy resin coating such as Sikagard 62 by Sika Corporation, Durakote 240 by Tamms Industries or approved equal.

2. Reinforcement or other metal embedment exposed by concrete cutting or core drilling shall be burned back a minimum of ½ inch below surface and resulting void shall be filled with an epoxy resin binder.

PART 3 – EXECUTION

3.01 CONSTRUCTION ELECTRONIC DOCUMENTATION

A. Pre-Construction Documentation

1. Contractor shall take photographic and video documentation of the Site where Work is being performed. Engineer and Owner reserve the right to be present during documentation.

2. Contractor shall provide both photographic and video documentation at grade-level and aerial of the Site prior to commence Work.

3. Contractor shall submit pre-construction documentation to Engineer and Owner for review. Contractor, Engineer, and Owner shall visit Site to field verify electronic documentation prior to commencing the Work. Site visit verification shall establish existing conditions prior to commencing Work.

B. Construction Progress Documentation

1. Contractor shall document Work progress at locations and construction as directed by Engineer, at a minimum.

2. Contractor shall provide electronic documentation prior to and following any shutdown, switchover, demolition, de-commissioning, cutting, patching, repair, etc. Engineer and Owner reserve the right to be present during documentation.

3. Contractor shall document following exposure of buried utilities, piping, valve, appurtenances, and other underground elements.

4. Engineer reserves the right to provide construction progress documentation to confirm Contractor electronic documentation.

C. Post-Construction Documentation

1. Contractor shall take photographic and video documentation of the Site where Work has been completed and prior to Substantial Completion or partial utilization by Owner. Engineer and Owner reserve the right to be present during documentation.

2. Contractor shall provide both photographic and video documentation at grade-level and aerial of the Site following completion of the Work.

D. Submittal Requirements:

1. Documentation shall be time stamped for verification, including date and time.

2. Documentation shall be organized in a logical manner, such as by structure, building, physical site location, etc. for easy of comparison.

3. Photographic documentation shall be high resolution electronic versions.

4. Documentation shall be submitted to Engineer for review and approval prior to commence Work and at completion of the Work.

3.02 DEMOLITION

A. General:

1. Demolition Work shall comply with the applicable provisions and recommendation of ANSI A10.2, Safety Code for Building Construction, all governing codes, and as specified in this Section.

2. Contractor shall furnish competent and experienced personnel for the various type of demolition and removal Work. Demolition and removal Work shall be performed with regard to the safety of Owner employees, individuals at the Site, and the public.

3. Contractor shall remove temporary work, such as enclosures, signs, guards, etc. when such temporary Work is no longer required or when directed at the completion of the Work.

4. Contractor shall perform patching, restoration, and Work in accordance with individual Specification Sections and details shown on Contract drawings.

5. Contractor shall be responsible for damage caused by demolition Work to existing structures, equipment and materials indicated for reuse or to remain at no additional cost to Owner.

6. Contractor shall maintain a clean working environment during the demolition Work in accordance with Section 01 74 00 - Cleaning and Waste Management.

7. Contractor shall proceed with the demolition work in a sequence designed to maintain the plant in operation in accordance with Section 01 14 00 – Coordination with Owner's Operations.

8. Excavation caused by demolition shall be backfilled with fill free from rubbish and debris. Select fill or structural fill shall be used where specifically required on Contract Drawings.

9. All debris resulting from the demolition and removal work shall be disposed of by the Contractor at a properly permitted facility as part of the work of this Contract. All regulations covering material handling and disposal shall be followed. Material designated by the Engineer to be salvaged shall be stored on the construction site as directed. All other material shall be disposed of off-site by the Contractor at his expense. Burning of any debris resulting from the demolition will not be permitted at the site.

B. Protection during Demolition:

1. The Contractor shall make such investigations, explorations, and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal. The Contractor shall give particular attention to shoring and bracing requirements to prevent any damage to new or existing construction.

2. Contractor shall provide, erect, and maintain catch platforms, lights, barriers, weather protection, warning signs and other items as required for proper protection of the public, occupants of the building, personnel engaged in demolition Work, and adjacent construction.

3. Contractor shall provide and maintain weather protection at exterior openings to fully protect the interior premises against damage from the elements until such openings are closed by the Work.

4. Contractor shall provide and maintain temporary protection of the existing structure designated to remain where demolition, removal and Work is being done, connections made, materials handled, or equipment moved. Temporary protection shall be provided in accordance with Section 01 71 33 - Protection of Work and Property.

5. Contractor shall take necessary precautions to prevent dust from rising by wetting demolished masonry, concrete, plaster, and similar debris. Unaltered portions of the existing buildings affected by the operations in the Contract Documents shall be protected by dust proof partitions and other adequate means. Dust control shall be provided in accordance with Section 01 57 00 - Temporary Controls.

6. Contractor shall provide adequate fire protection in accordance with Section 01 51 00 - Temporary Utilities and authorities having jurisdiction.

7. Contractor shall perform the demolition Work with minimum traffic interference. Contractor shall not close or obstruct walkways, passageways, or stairways. Contractor shall not store or place materials in passageways, stairs, or other means of egress.

8. Contractor shall minimize disturbances to exterior walls and roofs to small sections that are readily repaired and patched to maintain watertight conditions in existing structures and buildings.

C. Performance of Demolition:

1. The Contractor shall execute the work in a careful and orderly manner, with the least possible disturbance to the public and to the occupants of the building.

2. Equipment, piping, valves, and appurtenances:

a. Contractor shall drain equipment, piping, valves, and appurtenances prior to demolition Work. Contractor shall be responsible for collection, transport, and disposal of drained contents at no additional cost to the Owner.

b. Contractor shall provide line stops, plugs, blind flanges, etc. for equipment, piping, valves, and appurtenance required to remain in service during the Project. Contractor shall provide temporary or permanent supports in accordance with the Contract Documents.

c. Supports, pedestals and anchors shall be removed with the equipment and piping unless otherwise noted in the Contract Documents.

d. Concrete bases, anchor bolts and other supports shall be removed to approximately 1 inch below the surrounding finished area and the recesses shall be filled with epoxy resin binder.

e. Wall and roof openings shall be closed, and damaged surfaces shall be patched to match the adjacent areas, in accordance with the Contract Documents and as directed by the Engineer.

f. Wall sleeves, wall pipes, and wall castings shall be plugged or blanked off in accordance with the Contract Documents and as directed by the Engineer.

g. Openings in concrete shall be closed in accordance with the Contract Documents and as directed by the Engineer.

3. Electrical components and equipment:

a. Contractor shall de-energize panelboards, lighting fixtures, switches, circuit breakers, electrical conduits, motors, limit switches, pressure switches, instrumentation such as flow, level and/or other meters, wiring, and similar electrical equipment prior to removal.

b. Contractor shall relocate or isolate electrical equipment and materials that serve equipment, piping, valves, and appurtenance that are to remain in service during the Project. Relocation or isolation Work shall be sequenced and scheduled in accordance with Section 01 14 00 - Coordination with Owner's Operations.

4. Reused and relocated equipment:

a. Contractor shall receive approval from Engineer prior to removal and relocation of equipment and material. Equipment and materials removed by Contractor prior to Engineer's approval that is required for Owner's operation of the facility shall be reinstalled at no cost to the Owner.

b. Prior to removal and relocation Work, equipment and materials indicated for reuse and relocation shall be operated by Owner with Contractor and Engineer present to witness existing functionality and operation.

c. Contractor shall provide personnel responsible for reinstallation of equipment and material for the removal Work.

d. Contractor shall be responsible and provide storage and protection of equipment and materials in accordance with Section 01 66 00 - Product Storage and Protection Requirements until relocation and reinstallation Work is performed.

e. Contractor shall provide replacement equipment and material that is damaged during the removal Work at new cost to the Owner. Contractor shall be responsible to provide same type, model, electrical components, etc. equipment and material as approved by Engineer and Owner.

5. Structural removal:

a. Contractor shall provide and install temporary shoring, struts, and bracing required for the demolition Work to ensure stability during entire demolition process.

b. Contractor shall cut and remove structural material at the interface of demolition Work and the existing structural element. Cutting and removal shall occur in small sections, including masonry units, to prevent instability of structural elements.

c. Contractor shall patch, repair, and refinish adjacent surfaces that remain following demolition Work.

1) Adjacent surfaces shall be repaired and refinished to the condition prior to the demolition Work and in accordance with the Contract Documents.

2) Adjacent surfaces shall be cleaned of dirt, grease, loose paint, etc., prior to refinishing.

d. Contractor shall limit cutting of existing roof areas designated to remain to the limits required for the proper installation of the Work.

1) Cut and remove insulation, joists, flashing, membranes, shingles, and metals, etc. in accordance with the Contract Documents and as directed by the Engineer for installation of the Work.

2) Provide temporary weather tight protection as required until new roofing and flashings are installed.

6. Architectural repairs and removal Work, not specifically shown on the Drawings, may include, but not limited to, the following:

a. Brickwork: Re-pointing; removing and replacing broken, cracked, disintegrating and missing materials.

b. Windows: Removing cracked or disintegrating sealant material; replacing missing or broken glass; re-caulking and sealing frames; glazing sealants.

c. Re-finishing: Removing rust, sealing, or peeling paint from surfaces by scraping, sanding or wire brushing; priming and repainting surfaces.

d. Roofing: Patching and repairing membrane or built-up roofing; metal flashing repair; correcting roof pitch to eliminate ponding; cleaning and/or replacing roof drains.

e. Masonry: Cutting and installing new expansion and control joints.

f. Parapets: Removing and construction of new walls and copings; clean and patching of copings; replacing copings where broken.

g. Concrete surfaces: Patching, cleaning, sealing and resurfacing floors, walls, lintels, sills, and trim. Replace lintels where broken. Patching or replacing broken, spalled, cracked and disintegrating concrete encased steel columns and piers.

h. Openings: Cutting and modifying as required for new Work. Provide new lintels, doors, and frames.

i. Doors: Patching and refinishing doors and frames.

j. Ceilings: Patching, refinishing, and replacing.

k. Guards, handrails, and appurtenances: Cleaning and repainting steel materials. Replacing steel material with new aluminum material.

l. Demolished Exterior Openings: Remove window sash, frame, sill, stool, and trim at exterior doors indicated for enclosure and sealing. Provide brick and/or masonry block for closure and sealing.

D. Maintenance during Demolition:

1. Contractor shall maintain the buildings, structures, and public properties free from accumulations of waste, debris, and rubbish, generated by the demolition Work.

2. The Contractor shall provide on site dump containers for collection of waste materials, debris, and rubbish, and shall wet down dry materials to lay down and prevent blowing dust.

3. At reasonable intervals during the progress of the demolition and removal work or as directed by the Engineer, the Contractor shall clean the site and properties, and dispose of waste materials, debris, and rubbish.

4. Contractor shall provide cleaning and waste management of demolition equipment and materials in accordance with Section 01 74 00 - Cleaning and Waste Management.

3.03 CUTTING AND CORING

A. General:

1. All cutting and coring shall be performed by the Prime Contractor requiring the opening. Finish patching shall be the responsibility of the Contractor and shall be performed by the trade associated with the application of the particular finish.

2. Contractor shall notify Engineer in writing and receiving Engineer's approval prior to cutting load bearing walls (concrete or masonry) and structural concrete floors.

3. Perform cutting and coring to limit extent of patching required.

4. Structural Elements: Do not cut or core structural elements in manner that would change structural element's load-carrying capacity or load deflection ratio.

5. Operating Elements: Do not cut or core operating elements in manner that would reduce capacity to perform as intended. Do not cut or core operating elements or related components in manner that would increase maintenance requirements or decrease operational life or safety.

6. Replace, patch, and repair materials and surfaces cut or damaged during cutting and coring Work. Contractor shall use methods that do not void required or existing warranties.

7. Provide temporary or permanent bypass provisions prior to cutting existing pipe, conduit, ductwork, or other utilities serving facilities scheduled to be removed or relocated in accordance with the Contract Documents.

8. Inspection: Examine and prepare surfaces prior to commencing Work. Contractor shall report unsatisfactory or questionable conditions to Engineer in writing. Contractor shall not proceed with the Work until unsatisfactory conditions are corrected.

9. Preparation:

    a. Provide temporary support required to maintain structural integrity, to protect adjacent Work from damage, and to support the element(s) to be cut or cored.

    b. Protection of Existing Construction During Cutting and Coring:

        1) Protect existing structures, equipment, and materials during cutting and coring to prevent damage.

        2) Provide protection from adverse weather conditions that will be exposed during cutting and coring Work.

        3) Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

10. Restoration:

a. Clean equipment, materials, piping systems, valves, conduit, and appurtenances that were damaged due to the Work prior to applying paint or other finishing materials.

b. Restore damaged pipe coverings, including insulation, to original condition.

B. Cutting:

1. General:

a. Cut existing structures and appurtenances that provide surfaces for installation or repair of the Work. Cut existing construction using methods to minimize damage and disturbance to retained and adjoining construction elements.

b. Cutting equipment used shall be hand or small power tools suitable for sawing or grinding. Avoid using hammering or chopping equipment for cutting Work.

c. Cut holes and slots as small as possible and to size required for incorporation of the Work and in accordance with the Contract Documents.

d. Cut or drill from exposed or finished side to concealed side to avoid marring finished surfaces.

e. Provide adequate bracing of area to be cut prior to cutting.

f. Provide equipment and material to remove cut spoils.

g. Provide temporary protection for cut openings where and when Work is not being performed.

2. Concrete and Masonry:

a. Cut through concrete and masonry using concrete wall saw with diamond saw blades.

b. Provide control for slurry generated during sawing on both sides of element being cut.

c. After cutting concrete and before installing new Work on or through the opening, coat exposed concrete and steel with protective coating material specified in this Section. Apply protective coating in accordance with manufacturer's instructions.

C. Coring:

1. Core-drill holes through concrete and masonry walls, slabs, or arches, in accordance with the Contract Documents, unless written authorization is furnished by Engineer.

2. Protection: Protect existing structures, equipment, materials, utilities, and adjacent areas from water and other damage by core-drilling Work.

3. Coring:

   a. Perform coring with non-impact rotary tool using diamond core-drills.

   b. If holes are cored through floor slabs they shall be drilled from below.

   c. Size holes for pipe, conduit, sleeves, equipment, or mechanical seals, as required, to be installed through the penetration and in accordance with the Contract Documents.

   d. After core-drilling and before installing equipment and material through the penetration, coat exposed concrete and steel with protective coating material specified in this Section. Apply protective coating in accordance with manufacturer's instructions.

4. Cleaning: Vacuum or otherwise remove slurry and tailings from the work area following core-drilling.

3.04 PATCHING

A. General:

1. All patching shall be performed by the Prime Contractor requiring the opening. Finish patching shall be the responsibility of the Contractor and shall be performed by the trade associated with the application of the particular finish.

2. Construction shall be patched by filling, repairing, refinishing, closing-up, and similar methods at completion of the Work.

3. Provide equipment and materials in accordance with the Contract Documents for patching Work. Comply with manufacturer's installation instructions.

4. Provide airtight connections to pipes, sleeves, ducts, conduit, and other penetrations through surfaces when patching the Work. Provide durable patching seams that minimize visual appearance.

5. Patched areas shall be tested to demonstrate integrity of installation as directed by the Engineer. Contractor shall provide testing equipment, material, and services for patch testing.

B. Restoration:

1. Restore exposed finishes of patched areas to minimize evidence of patching and refinishing.

2. Contractor shall extend refinishing and restoration into adjoining areas to blend patched areas with existing adjacent areas.

   a. Refinish to nearest intersection for continuous surfaces.

   b. Refinish the entire assembly and system for equipment and materials.

   c. Repair and rehang existing ceilings to provide an even-plane surface of uniform appearance.

   d. Apply plaster and finishes to match adjacent interior walls and partition areas for openings sealed with brick and/or masonry block.

3.05 INSTALLATION

A. Install equipment and materials in accordance with the Contract Documents, approved Shop Drawings, and manufacturer's installation instructions. When manufacturer's installation instructions conflict with the Contract Documents, obtain interpretation or clarification from Engineer before proceeding.

B. Preparation of surfaces shall be performed prior to installation of equipment and material.

   1. New floor finishes: Repair and patch with concrete, asphalt latex type emulsion and underlayment as required for existing surfaces or new flooring surfaces.

   2. Ceramic tile flooring or bases installed over concrete floors: Grind away cove, if present, for installation of new Work.

C. Concrete surfaces shall achieve compression strength in accordance with the Contract Documents prior to installation of equipment and materials.

   1. Anchor bolts and templates shall be provided by Contractor and as specified in the individual Specification Sections.

   2. Concrete foundations shall be treated with sealer to prevent oil from seeping into concrete as specified in the individual Specification Sections.

D. Maintain the work area in a broom-clean condition while installing materials and equipment.

E. Contractor shall be responsible for equipment for hoisting, lifting, moving, rigging, etc. for installation of equipment and materials.

   1. Contractor shall be responsible for design of temporary installation system used for the installation Work, unless otherwise indicated in the Contract Documents.

   2. Contractor shall be responsible for damage to existing structure, equipment, and material caused prior, during, and following installation of the Work with the Contractor furnished

temporary installation system at no cost to Owner. Repairs shall be in accordance with the Contract Documents, shall return to condition prior to installation Work, and as directed by the Engineer.

3. Owner's hoists, monorails, bridge cranes, rigging, etc. shall not be used by the Contractor unless written authorization is provided by Owner.

F. Alteration or repair of new equipment and materials shall not be permitted without written authorization from Engineer.

G. Field welding or burning of new equipment and materials shall not be permitted unless indicated in the Contract Documents or without written authorization from Engineer.

H. Contractors shall install temporary shoring and bracing where necessary during installation of the Work where required:

1. System shall be provided in accordance with the Contract Documents and code requirements.

2. Temporary system shall consist of adjustable sound timbers or rolled shapes easily removable following installation of the Work.

3. Contractor shall be responsible for damage to existing structures and new Work during installation, utilization, and removal of the temporary system at new additional cost to the Owner.

I. Manufacturer's Installation Services: Provide competent, qualified manufacturer's representatives of equipment and material for services specified in the individual Specification Sections, including, but not limited to:

1. Supervising installation

2. Checking the completed installation

3. Adjusting and testing of equipment and materials

4. Instructing Owner's operations and maintenance in accordance with Section 01 79 00 - Instruction of Owner's Personnel.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 74 00

CLEANING AND WASTE MANAGEMENT

PART 1 – GENERAL

1.01 SUMMARY

A. Administrative and procedural requirements for progress and closeout cleaning at the Site.

1. Contractor shall execute cleaning during the Project, at completion of the Work, and as required by the General Conditions and this Section.

2. Maintain in a clean manner the Site, the Work, and areas adjacent to or affected by the Work.

B. Administrative and procedural requirements for disposing of non-hazardous excavation and construction waste.

1. Contractor shall comply with the requirements and procedures for construction waste management and disposal, including developing and implementing a plan for construction waste management and disposal.

2. Extent of required construction waste management and disposal includes within the Project limits, as shown or indicated.

1.02 REFERENCES

A. Definitions:

1. "Waste Management Coordinator" is the person responsible for implementing, monitoring, and reporting the status of the Waste Management Plan. Although available for other assignments, the Waste Management Coordinator shall be present at the Site full time for the duration of the Work.

2. "Construction waste" is building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

3. "Demolition waste" is building and site improvement materials resulting from demolition or selective demolition operations.

4. "Disposal" is removal to an off-Site location of demolition and construction waste and subsequent sale, recycling, reuse, or disposal in a landfill or incinerator conforming to Laws and Regulations and acceptable to authorities having jurisdiction.

B. Reference Standards: NFPA 241, Safeguarding Construction, Alteration, and Demolition Operations

1.03 ADMINSTRATIVE REQUIREMENTS

A. Waste Management Plan:

1. General: Develop preliminary plan consisting of waste identification. Indicate quantities by weight or volume. Use the same units of measure throughout waste management plan.

2. Waste Identification: Indicate anticipated types and quantities of excavation waste generated by the Work.

3. Waste Reduction Work Plan: List each type of waste and whether waste will be disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

a. Salvaged Materials for Reuse: For materials that will be salvaged and reused in the Work, describe methods for preparing salvaged materials before incorporating them into the Work.

b. Disposed Materials: Provide information on how and where materials will be disposed. Include name, address, and telephone number of each landfill and incinerator facility that will be used.

c. Handling and Transportation Procedures: Provide information on the method(s) that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location at the Site where materials separation will be located.

B. Failure of Contractor to Maintain Clean Site and Waste Management Plan:

1. Owner will provide written notification to Contractor for failure to maintain a clean Site and waste management plan.

2. Written notification shall provide five (5) days for Contractor to remedy Site cleaning and waste management to the Engineer's and Owner's satisfaction.

3. Following the five (5) day remedy period, Owner shall without prejudice to any other rights provide services to clean Site to the satisfaction of Owner and Engineer. Contractor shall be responsible for reimbursement of Owner's costs and expenses for the cleaning work.

1.04 SUBMITTALS

A. Action/Informational Submittals:

1. Preliminary Waste Management Plan: Prepare in accordance with this Section and submit within 14 days of the Notice to Proceed and prior to removing waste from the Site.

2. Final Waste Management Plan: Submit within 14 days of receiving Engineer's comments on the preliminary waste management plan.

B. Closeout Submittals:

1. Landfill and Incinerator Disposal Records: Provide copy of receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Submit manifests, weight tickets, receipts, and invoices.

1.05 DELIVERY, STORAGE AND HANDLING

A. Replace loaded containers with empty containers as demand requires.

B. Deposit recyclable materials in containers free from debris.

C. Transport and deposit waste in containers to minimize dust. Close container covers immediately after materials are deposited.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 PROGRESS CLEANING

A. General: Clean the Site, work areas, and other areas occupied by Contractor at least weekly. Dispose of materials in accordance with the General Conditions and the following:

1. Comply with NFPA 241 for removing combustible waste materials and debris.

2. Do not hold non-combustible materials at the Site more than three days if the temperature is expected to rise above 80 degrees F. When temperature is less than 80 degrees F, dispose of non-combustible materials within seven days of their generation.

3. Provide suitable containers for storage of waste materials and debris.

4. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately.

B. Work Areas:

1. Clean areas where the Work is in progress to level of cleanliness necessary for proper execution of the Work.

2. Remove liquid spills promptly and immediately report spills to Owner, Engineer, and authorities having jurisdiction.

3. Where dust would impair proper execution of the Work, broom-clean or vacuum entire work area, as appropriate.

4. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

C. Installed Work: Keep installed Work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of material or equipment installed, using only cleaning agents and methods specifically recommended by material or equipment manufacturer. If manufacturer does not recommend specific cleaning agents or methods, use cleaning agents and methods that are not hazardous to health and property and that will not damage exposed surfaces.

D. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration until Substantial Completion.

E. Cutting and Patching:

1. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

2. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

F. During handling and installation of materials and equipment, clean and protect construction in progress and adjoining materials and equipment already in place. Apply protective covering where required for protection from damage or deterioration, until Substantial Completion.

G. Clean completed construction as frequently as necessary throughout the construction period.

3.02 EXCAVATION WORK NEAR PUBLIC OR PRIVATE PROPERTY

A. Contractor shall provide cleaning and either temporary or permanent restoration where Work is located in or near streets, right of ways, easements, or private property.

B. Contractor shall backfill, compact, grade, and restore excavation or disturbed area to functional condition to permit pedestrian or vehicular traffic and original use of the area as the Work progresses.

C. Temporary storage of excavation spoils, including earth, stones, boulders, and debris, shall be removed from the Site or area of disturbance.

3.03 CLOSEOUT CLEANING

A. Complete the following prior to requesting inspection for Substantial Completion:

1. Clean and remove from the Site rubbish, waste material, debris, and other foreign substances.

2. Sweep paved areas broom-clean. Remove petrochemical spills, stains, and other foreign deposits.

3. Hose-clean sidewalks and loading areas.

4. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

5. Repair pavement, roads, sod, and other areas affected by construction operations and restore to specified condition; if condition is not specified, restore to pre-construction condition.

6. Clean exposed exterior and interior hard-surfaced finishes to dirt-free condition, free of spatter, grease, stains, fingerprints, films, and similar foreign substances.

7. Leave the Site clean, and in neat, orderly condition, satisfactory to Owner and Engineer.

3.04 WASTE MANAGEMENT IMPLEMENTATION

A. General: Implement the waste management plan approved by Engineer. Provide handling, containers, storage, signage, transportation, and other items required to implement the waste management pan during the Project.

B. Training: Train all installers, Subcontractors, and Suppliers as required on proper waste management procedures required for the Work.

1. Distribute the waste management plan as required within three days of Engineer's approval.

2. Distribute the waste management plan to Contractor's personnel, Subcontractors, and Suppliers prior to these entities starting the Work. Review with installers, Subcontractors, and Suppliers the waste management plan's procedures and locations established for salvage, recycling, and disposal.

C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent facilities. Designate and label specific areas of the Site necessary for separating materials to be disposed.

3.05 WASTE DISPOSAL

A. General: Except for items or materials to be recycled, or otherwise reused, remove waste materials from the Site and properly dispose of waste in facility such as permitted landfill or incinerator or other method acceptable to authorities having jurisdiction.

1. Except as otherwise specified, remove from the Site all waste and debris from the Work as it accumulates. Upon completion of the Work, remove materials, equipment, waste, and debris and leave the Site clean, neat, and orderly. Comply with the Contract Documents regarding cleaning and removal of trash, debris, and waste.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3. Properly dispose of waste materials, surplus materials, debris, and rubbish off the Site.

4. Do not discharge volatile or hazardous substances, such as mineral spirits, oil, or paint thinner, into storm sewers or sanitary sewers.

5. Do not discharge wastes into surface waters or drainage routes.

B. Burying: Do not bury rubbish and waste materials at the Site.

C. Burning: Do not burn waste materials at the Site.

D. Disposal: Transport waste materials to proper location at site other than Owner's property for disposal in accordance with Laws and Regulations. Contractor shall be solely responsible for complying with Laws and Regulations regarding storing, transporting, and disposing of waste.

END OF SECTION

SECTION 01 75 00

CHECKOUT AND STARTUP PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Checkout of products and equipment.

2. Startup procedures of products and equipment

B. Contractor shall initially start up and place equipment installed under the Contract into successful operation, in accordance with the equipment manufacturer's written instructions and as instructed by Supplier at the Site.

C. Provide all material, labor, tools, and equipment required to complete equipment checkout and start-up.

D. Provide chemicals, lubricants, and other required operating fluids.

E. General activities include:

1. Cleaning, as required under other provisions of the Contract Documents.

2. Removing temporary protective coatings.

3. Checking and correcting (if necessary) leveling plates, grout, bearing plates, anchorage devices, fasteners, and alignment of piping, conduits, and ducts that may place stress on the connected equipment.

4. All adjustments required.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Definitions:

1. Displacement, as used herein, shall mean total peak-to-peak movement of vibrating equipment, in mils; velocity or speed of the vibration cycle, measured in distance per time, velocity and acceleration of the vibration cycle. Displacement, velocity and acceleration shall be measured by instruments/equipment equal to IRD Mechanalysis, Bentley, Nevada.

B. Coordination:

1. Coordinate checkout and start-up with other contractors performing Work at the Site.

2. Do not start up system or subsystem for continuous operation until all components of that system or subsystem, including instrumentation and controls, have been tested to the extent practicable and proven to be operable as intended by the Contract Documents.

3. Responsibility for proper operation is by Contractor.

4. Supplier shall be present during checkout, start-up, and initial operation, except as otherwise specified.

5. Do not start up system, unit process, or equipment without submitting acceptable preliminary operations and maintenance manuals by Contractor, in accordance with Section 01 78 23 – Operations and Maintenance Data.

C. Contractor's Requirements Prior to Owner's Responsibility:

1. Owner will assume responsibility for the equipment upon Substantial Completion.

2. Prior to turning over to Owner responsibility for operating and maintaining system or equipment shall be in accordance with this Section and the following requirements:

a. Submit acceptable final operations and maintenance manuals in accordance with Section 01 78 23 – Operations and Maintenance Data.

b. Provide training of operations and maintenance personnel in accordance with Section 01 79 00 – Instruction of Owner's Personnel.

c. Complete system field quality control testing in accordance with the Contract Documents including, but not limited to, the following:

1) Start-up certification shall be performed and completed by the equipment Supplier for the equipment and material prior to be placed into intended use by Owner as specified in the Contract Documents.

2) Equipment and material shall be operated for a minimum 30-day operational period to verify performance. In addition to specific requirements specified in the individual specification sections, process data that is recorded in the PLC shall be submitted to the Engineer in tabular format showing hourly process performance data. A log of all alarms shall also be submitted, along with notes describing corrective measures applied in response to alarm condition.

3) If equipment and material does not perform satisfactorily during the 30-day operational period, then the warranty period start shall be delayed until satisfactorily performance is verified.

a) Contractor shall repair or replace equipment and material that does not perform satisfactorily at no cost to Owner.

b) Contractor shall furnish all equipment and material, labor, and incidentals necessary to provide equipment and material to the performance level required by the Contract Documents.

d. Obtain from Engineer final certificate of Substantial Completion for either entire Work or the portion being turned over to Owner.

1.03 SUBMITTALS

A. Startup Schedule: Detailed summary of schedule, duration, manpower requirement, and Contractor's means and methods for startup.

B. Closeout Submittals: Manufacturer's certification of installation in accordance with this Section.

C. Startup testing and operational demonstration performance data.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 PRELIMINARY REQUIREMENTS

A. Prior to the start-up of the facilities, Contractor shall have prepared and tested all equipment, subsystems and systems in accordance with the requirements of the individual Specification Section to check its ability for sustained operation, including inspections and adjustments by Manufacturer's representative.

B. Contractor shall develop and submit schedule in accordance with this Section.

C. After the facilities are sufficiently complete to permit start-up, Contractor shall furnish a licensed operator to start-up the facilities. Contractor will be responsible for startup of all facilities constructed under this Contract. During the initial start-up period the Contractor shall check and provide for mechanical operation in accordance with the Contract Documents.

3.02 FIELD QUALITY CONTROL

A. Manufacturers' Field Services:

1. When specified, furnish services of factory trained representatives of material and equipment manufacturers as specified, including supervising installation, adjusting, checkout, start-up, and testing of materials and equipment.

2. Certification:

   a. When services by manufacturer are required at the Site, within 14 days after first test operation of equipment, submit to Engineer a letter from manufacturer, on manufacturer's letterhead, stating that materials and equipment are installed in accordance with manufacturer's requirements and installation instructions, and in accordance with the Contract Documents.

   b. Include in the final operations and maintenance manual for the associated equipment a copy of the letter or completed form, as applicable.

3. Manufacturer shall bring any discrepancies to the immediate attention of the Contractor for correction. Contractor shall promptly correct any discrepancies noted by the Manufacturer. Manufacturer shall coordinate correction of discrepancies with the Contractor. Discrepancies and their correction shall be noted in inspection records and in all required reports. Any corrections that result in changes to the work as shown on the Contract Documents shall be approved by the Engineer prior to their execution.

3.03 SYSTEM START-UP

A. Equipment and materials shall be provided in conformance with the manufacturer's installation instructions and in accordance with the Contract Documents.

B. Provide start-up services as specified in the individual Specification Sections.

C. Contractor shall furnish consumables required for startup including, but not limited to, electricity, water, chemicals and lubrication. Contractor shall provide a plan for disposal of water used for testing unless otherwise specified in the Contract Documents.

D. General system requirements:

1. Start-up of the plant by Contractor shall include all mechanical systems, including but not limited to, pumps, compressors, and like equipment, and the ventilating, air conditioning (or heating), plumbing, and electrical systems. Start-up of either the heating or air conditioning systems is dependent upon the time of year that the plant start up is initiated. Contractor will be required to return at the beginning of the next heating or air conditioning season (whichever is applicable) to start the appropriate system.

2. Cleaning as required under provisions of the Contract Documents.

3. Remove temporary protective coatings.

4. Flushing and replacing greases and lubricants as required by Manufacturer

5. Lubrication.

6. Verify the following:

    a. Shaft and coupling alignments and reset where needed.

    b. Set motor, pump and other equipment rotation, safety interlocks, and belt tensions.

    c. Leveling plates, grout, bearing plates, anchor bolts, fasteners, and alignment of piping, conduits and ducts that may apply stress on equipment.

7. Valves:

    a. Tighten packing glands to ensure no leakage but allow valve stems to operate without galling.

    b. Replace packing in valves to retain maximum adjustment after system is determined to be complete.

    c. Replace packing on valves that continue to leak.

    d. Remove and repair bonnets that leak.

    e. After cleaning, coat packing gland threads and valve stems with surface preparation of “Molycote” or “Fel-Pro”.

8. Verify that control valve seats are free of foreign matter and are properly positioned for intended service.

9. Tighten flanges and other pipe joints after system has been placed in operation.

10. Replace gaskets that show signs of leakage after tightening.

11. Inspect all joints for leakage:

    a. Promptly remake each joint that appears to be faulty; do not wait for rust other corrosion to form.

    b. Clean threads on both parts and apply compound and remake joints.

12. After system has been placed in operation, clean valve seats and headers in fluid system to ensure freedom from foreign matter.

13. Remove rust, scale, and foreign matter from equipment and renew defaced surfaces.

14. Repair damaged insulation.

END OF SECTION

SECTION 01 77 19

CLOSEOUT REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Substantial Completion.

2. Final inspection.

3. Request for final payment.

1.02 REFERENCES

A. Definitions:

1. Substantial completion procedures for requesting and documenting are in the General Conditions, as modified by Supplemental Conditions.

2. Final inspection procedures for requesting and documenting are in the General Conditions, as modified by Supplemental Conditions.

1.03 ADMINSTRATIVE REQUIREMENTS

A. Request for Final Payment:

1. Procedure: Submit request for final payment in accordance with the Agreement and General Conditions, as may be modified by the Supplementary Conditions.

B. Request for final payment shall include:

1. Documents required for progress payments in Section 01 29 76 – Progress Payment Procedures.

2. Documents required in the General Conditions, as may be modified by the Supplementary Conditions.

3. Releases or Waivers of Lien Rights:

a. Provide a final release or waiver by Contractor and each Subcontractor and Supplier that provided Contractor with labor, material, or equipment totaling $10,000 or more.

b. Provide list of Subcontractors and Suppliers for which release or waiver of Lien is required.

c. Each release or waiver of Lien shall be signed by an authorized representative of the entity submitting release or waiver to Contractor, and shall include Subcontractor's or Supplier's corporate seal, when applicable.

d. Release or waiver of Lien may be conditional upon receipt of final payment.

e. Manufacturer's Affidavit of Release of Liens – furnish a separate, completed form from the manufacturer.

4. Consent of Surety Company to Final Payment.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for operation and maintenance data, manuals, and documentation.

1. Submit operation and maintenance data, in accordance with this Section and in accordance with requirements elsewhere in the Contract Documents, as instructional and reference manuals by operations and maintenance personnel at the Site.

2. Required operation and maintenance data groupings are listed in this Section. At minimum, submit operation and maintenance data for:

a. All equipment and systems

b. Valves, gates, actuators, and related accessories

c. Instrumentation and control devices

d. Electrical gear

3. For each operation and maintenance manual, submit the following:

a. Preliminary Submittal: Printed and bound copy of entire operation and maintenance manual or electronic copy, except for test data and service reports by Supplier.

b. Final Submittal: Printed and bound copy of complete operations and maintenance manual and electronic copy, including test data and service reports by Supplier.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Quantity Required and Timing of Submittals:

1. Preliminary Submittal:

a. Printed Copies: One copy, exclusive of copies required by Contractor.

b. Electronic Copies: One copy.

c. Submit to Engineer:

1) Preliminary manuals shall be submitted in electronic format with form attached to this section prior to the date of shipment of the equipment. The Contractor is to provide information and initial each item on check list. The Engineer will initial form as part of the review. Manuals not accompanied by this form will be returned without being reviewed. These preliminary copies must be submitted no later than **fifteen (15) days** following approval of the shop drawings for each piece of equipment or system and three (3) final approved hard copies of complete manuals prior to Engineer's tests and acceptance for beneficial use.

2) When the O&M manuals are reviewed "Revise & Resubmit", the corrections shall be made as instructed by the Engineer, and corrected manuals resubmitted to the Engineer.

3) Not more than forty percent (40%) of the cost of the equipment, installed in place, (based on the Contractor's lump sum breakdown) will be paid until the preliminary copies of the operation and maintenance manuals have been approved by the Engineer.

4) Where existing systems or equipment are being modified, Contractor shall furnish such information needed to fully update and revise the existing manufacturer's manuals. The information shall be in such form as to be easily inserted in the existing manufacturer's manuals. Where electrical or control modifications are being made, Contractor shall furnish as-built electrical power, control, and ladder diagram drawings for all work performed.

d. Furnish preliminary operation and maintenance data submittal in acceptable form and content, as determined by Engineer, before associated materials and equipment will be eligible for payment.

2. Preliminary Submittal shall be reviewed by Engineer. One printed or electronic copy shall be returned to Contractor with required revisions noted.

3. Final Submittal: Provide 14 days prior to checkout and startup procedures specified in Section 01 75 00 – Checkout and Startup Procedures unless Submittal is specified as required prior to an interim Milestone.

a. Printed Copies: Two copies.

b. Electronic Copies: One copy.

B. Format of Printed Copies:

1. Binding and Cover:

a. Bind each operation and maintenance manual in durable, permanent, stiff-cover binder(s), comprising one or more volumes per copy as required. Binders shall be minimum one-inch wide and maximum of three-inch wide. Binders for each copy of each volume shall be identical.

b. Provide the following information on cover of each volume:

1) Title: “OPERATING AND MAINTENANCE INSTRUCTIONS”.

2) Name or type of material or equipment covered in the manual.

3) Volume number, if more than one volume is required, listed as “Volume __ of __”, with appropriate volume-designating numbers filled in.

4) Name of Project and, if applicable, Contract name and number.

5) Name of building or structure, as applicable.

c. Provide the following information on spine of each volume:

1) Title: “OPERATING AND MAINTENANCE INSTRUCTIONS”.

2) Name or type of material or equipment covered in the manual.

3) Volume number, if more than one volume is required, listed as “Volume __ of __”, with appropriate volume-designating numbers filled in.

4) Project name and building or structure name.

2. Drawings:

a. Bind into the manual drawings, diagrams, and illustrations up to and including 11 inches by 17 inches in size, with reinforcing.

b. Documents larger than 11 inches by 17 inches shall be folded and inserted into clear plastic pockets bound into the manual. Mark pockets with printed text indicating content and drawing numbers. Include no more than three drawing sheets per pocket.

3. Copy Quality and Document Clarity:

a. Contents shall be original-quality copies. Documents in the manual shall be either original manufacturer-printed documents or first-generation photocopies indistinguishable from originals. If original is in color, copies shall be in color.

b. Clearly mark in ink to indicate all components of materials and equipment on catalog pages for ease of identification. In standard or pre-printed documents, indicate options furnished or cross out inapplicable content.

4. Organization:

a. Provide table of contents in each volume for each chapter or section.

b. Use dividers and indexed tabs between major categories of information, such as operating instructions, preventive maintenance instructions, and other major subdivisions of data in each manual.

C. Format of Electronic Copies:

1. Each electronic copy shall include all information included in the corresponding printed copy.

2. Submit electronic copy via transferable method and format acceptable to Engineer.

3. File Format:

a. Acceptable formats include Adobe PDF, Microsoft Word, Autodesk DWF, and AutoCAD.

b. Files shall be electronically searchable.

c. Submit separate file for each separate document in the printed copy.

d. Within each file, provide bookmarks for the following:

1) Each chapter and subsection listed in the corresponding printed copy document's table of contents

2) Each figure

3) Each table

4) Each appendix

4. Submit drawings and figures in one of the following formats: ".bmp", ".tif", ".jpg", ".gif", "dwf", or "dwg".

D. General Content Requirements:

1. Prepare each operations and maintenance manual specifically for the Project. Include in each manual all pertinent instructions, as-built drawings as applicable, bills of materials, technical bulletins, installation and handling requirements, maintenance and repair

instructions, and other information required for complete, accurate, and comprehensive data for safe and proper operation, maintenance, and repair of materials and equipment furnished for the Project. Include in manuals specific information required in the Specification Section for the material or equipment, data required by Laws and Regulations, and data required by authorities having jurisdiction.

2. Submit complete, detailed written operating instructions for each material or equipment item including: function; operating characteristics; limiting conditions; operating instructions for start-up, normal and emergency conditions; regulation and control; operational troubleshooting; and shutdown. Also include, as applicable, written descriptions of alarms generated by equipment and proper responses to such alarm conditions.

3. Submit written explanations of all safety considerations relating to operation and maintenance procedures.

4. Submit complete, detailed, written preventive maintenance instructions including all information and instructions to keep materials, equipment, and systems properly lubricated, adjusted, and maintained so that materials, equipment, and systems function economically throughout their expected service life. Instructions shall include:

    a. Written explanations with illustrations for each preventive maintenance task such as inspection, adjustment, lubrication, calibration, and cleaning. Include pre-startup checklists for each equipment item and maintenance requirements for long-term shutdowns.

    b. Recommended schedule for each preventive maintenance task.

    c. Lubrication charts indicating recommended types of lubricants, frequency of application or change, and where each lubricant is to be used or applied.

    d. Table of alternative lubricants.

    e. Troubleshooting instructions.

    f. List of required maintenance tools and equipment.

5. Submit complete bills of material or parts lists for materials and equipment furnished. Lists or bills of material may be furnished on a per-drawing or per-equipment assembly basis. Bills of material shall indicate:

    a. Manufacturer’s name, address, telephone number, fax number, and Internet website address.

b. Manufacturer's local service representative's or local parts supplier's name, address, telephone number, fax number, Internet website address, and e-mail addresses, when applicable.

c. Manufacturer's shop order and serial number(s) for materials, equipment or assembly furnished.

d. For each part or piece include the following information:

1) Parts cross-reference number. Cross-reference number shall be used to identify the part on assembly drawings, Shop Drawings, or other type of graphic illustration where the part is clearly shown or indicated.

2) Part name or description.

3) Manufacturer's part number.

4) Quantity of each part used in each assembly.

5) Current unit price of the part at the time the operations and maintenance manual is submitted. Price list shall be dated.

6. Submit complete instructions for ordering replaceable parts, including reference numbers (such as shop order number or serial number).

7. Submit manufacturer's recommended inventory levels for spare parts, extra stock materials, and consumable supplies for the initial two years of operation. Consumable supplies are items consumed or worn by operation of materials or equipment, and items used in maintaining the operation of material or equipment, including items such as lubricants, seals, reagents, and testing chemicals used for calibrating or operating the equipment. Include estimated delivery times, shelf life limitations, and special storage requirements.

8. Submit manufacturer's installation and operation bulletins, diagrams, schematics, and equipment cutaways. Where materials pertain to multiple models or types, mark the literature to indicate specific material or equipment supplied. Marking may be in the form of checking, arrows, or underlining to indicate pertinent information, or by crossing out or other means of obliterating information that does not apply to the materials and equipment furnished.

9. Submit original-quality copies of each approved and accepted Shop Drawing, product data, and other submittal, updated to indicate as-installed condition. Reduced drawings are acceptable only if reduction is to not less than one-half original size and all lines, dimensions, lettering, and text are completely legible on the reduction.

10. Submit complete electrical schematics and wiring diagrams, including complete point-to-point wiring and wiring numbers or colors between all terminal points.

11. Submit copy of warranty bond and service contract as applicable.

12. When copyrighted material is used in operations and maintenance manuals, obtain copyright holder's written permission to use such material in the operation and maintenance manual.

1.03 SUBMITTALS

A. Action/Informational Submittals: Submit preliminary schedule (listing) of operations and maintenance data for Engineer's review. Preliminary operations and maintenance data shall be grouped as major equipment and material systems and divided into sub-systems as required for clarity, subject to Engineer's approval.

B. Closeout Submittals:

1. Operation and maintenance data: Submit the operations and maintenance data indicated in the Contract Documents, grouped into submittals as approved by Engineer.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Requirements for recording changes to record documents.

2. Requirements for electronic files furnished by Engineer.

B. Contractor shall maintain and submit to Engineer record documents in accordance with the Specifications, General Conditions, and Supplementary Conditions.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Maintenance of Record Documents:

1. The following record documents shall be maintained in the Contractor's field office:

a. Drawings, Specifications, and Addenda.

b. Shop Drawings, Samples, and other Contractor submittals, including records of test results, approved, or accepted as applicable, by Engineer.

c. Change Orders, Work Change Directives, Field Orders, photographic documentation, survey data, and all other documents pertinent to the Work.

2. Update record documents on a monthly basis, minimum.

3. Provide files and racks for proper storage and easy access to record documents.

4. Make record documents available for inspection upon request of Engineer or Owner.

5. Do not use record documents for purpose other than serving as Project record. Do not remove record documents from Contractor's field office without Engineer's approval.

B. Submittal of Record Documents:

1. Submit to Engineer the following record documents: Drawings.

2. Prior to readiness for final payment, submit to Engineer one copy of final record documents. Submit complete record documents; do not make partial submittals.

3. Submit record documents with transmittal letter on contractor letterhead complying with letter of transmittal requirements in Section 01 33 00 – Submittal Procedures.

4. Record documents submittal shall include certification, with original signature of official authorized to execute legal agreements on behalf of Contractor.

C. Electronic Files Furnished by Engineer:

1. CADD files will be furnished by Engineer upon the following conditions:

a. Contractor shall submit to Engineer a letter on Contractor letterhead requesting CADD files and providing specific definition(s) or description(s) of how files will be used, and specific description of benefits to Owner (including credit proposal, if applicable) if the request is granted.

b. Contractor shall execute Engineer's standard agreement for release of electronic files and shall abide by all provisions of the agreement for release of electronic files.

c. Layering system incorporated in CADD files shall be maintained as transmitted by Engineer. CADD files transmitted by Engineer containing cross-referenced files shall not be bound by Contractor. Drawing cross-references and paths shall be maintained. If Contractor alters layers or cross-reference files, Contractor shall restore all layers and cross-references prior to submitting record documents to Engineer.

d. Contractor shall submit record drawings to Engineer in same CADD format that files were furnished to Contractor.

1.03 SUBMITTALS

A. Closeout Submittals: Provide record documentation as specified in this Section.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 GENERAL REQUIREMENTS:

A. At the start of the Project, label each record document to be submitted as, "PROJECT RECORD" using legible, printed letters. Letters on record copy of the Drawings shall be two inches high.

B. Keep record documents current. Make entries on record documents within two working days of receipt of information required to record the change.

C. Do not permanently conceal the Work until required information has been recorded.

D. Accuracy of record documents shall be such that future searches for items shown on the record documents may rely reasonably on information obtained from Engineer-accepted record documents.

E. Marking of Entries:

1. Use erasable, colored pencils (not ink or indelible pencil) for marking changes, revisions, additions, and deletions to record documents.

2. Clearly describe the change by graphic line and make notations as required. Use straight-edge to mark straight lines. Writing shall be legible and sufficiently dark to allow scanning of record documents into legible electronic files.

3. Date all entries on record documents.

4. Call attention to changes by drawing a “cloud” around the change(s) indicated.

5. Mark initial revisions in red. In the event of overlapping changes, use different colors for subsequent changes.

3.02 RECORDING CHANGES TO DRAWINGS:

A. Record changes on copy of the Drawings. Submittal of Contractor-originated or -produced drawings as a substitute for recording changes on the Drawings is unacceptable.

B. Record changes on plans, sections, schematics, and details as required for clarity, making reference dimensions and elevations (to Project datum) for complete record documentation.

C. Record actual construction including:

1. Depths of various elements of foundation relative to Project datum.

2. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.

3. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.

4. Field changes of dimensions, arrangements, and details.

5. Changes made in accordance with Change Orders, Work Change Directives, and Field Orders.

6. Changes in details on the Drawings. Submit additional details prepared by Contractor when required to document changes.

3.03 RECORDING CHANGES FOR SCHEMATIC LAYOUTS:

A. In some cases, on the Drawings, arrangements of conduits, circuits, piping, ducts, and similar items are shown schematically and are not intended to portray physical layout. For such cases, the final physical arrangement shall be determined by Contractor subject to acceptance by Engineer.

B. Record on record documents all revisions to schematics on Drawings, including: piping schematics, ducting schematics, process and instrumentation diagrams, control and circuitry diagrams, electrical one-line diagrams, motor control center layouts, and other schematics when included in the Contract. Record actual locations of equipment, lighting fixtures, in-place grounding system, and other pertinent data.

C. When dimensioned plans and dimensioned sections on the Drawings show the Work schematically, indicate on the record documents, by dimensions accurate to within one inch in the field, centerline location of items of Work such as conduit, piping, ducts, and similar items

1. Clearly identify the Work item by accurate notations such as “cast iron drain”, “rigid electrical conduit”, “copper waterline”, and similar descriptions.

2. Show by symbol or note the vertical location of Work item; for example, “embedded in slab”, “under slab”, “in ceiling plenum”, “exposed”, and similar designations. For piping not embedded, also provide elevation dimension relative to Project datum.

3. Descriptions shall be sufficiently detailed to be related to Specifications.

D. Engineer may furnish written waiver of requirements relative to schematic layouts shown on plans and sections when, in Engineer’s judgment, dimensioned layouts of Work shown schematically will serve no useful purpose. Do not rely on waiver(s) being issued.

3.04 REQUIREMENTS FOR SUPPLEMENTAL DRAWINGS:

A. In some cases, drawings produced during construction by Engineer or Contractor supplement the Drawings and shall be included with record documents submitted by Contractor. Supplemental record drawings shall include drawings provided with Change Orders, Work Change Directives, and Field Orders and that cannot be incorporated into the Drawings due to space limitations.

B. Supplemental drawings provided with record drawings shall be integrated with the Drawings and include necessary cross-references between drawings. Supplemental record drawings shall be on sheets the same size as the Drawings.

C. When supplemental drawings developed by Contractor using computer-aided drafting/design (CADD) software are to be included in record drawings, submit electronic files for such drawings in AutoCAD (latest version) as part of record drawing submittal.

3.05 RECORDING CHANGES TO SPECIFICATIONS AND ADDENDA:

A. Mark each Section to record:

1. Manufacturer, trade name, catalog number, and Supplier of each product and item of equipment actually provided.

2. Changes made by Addendum, Change Orders, Work Change Directives, and Field Orders.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 78 43

SPARE PARTS AND EXTRA MATERIAL

PART 1 – GENERAL

1.01 SUMMARY

A. Contractor shall furnish spare parts data and extra materials for materials and equipment in accordance with the Contract Documents.

B. Spare Parts and Extra Materials:

1. Provide spare parts, extra stock materials, maintenance supplies, and special tools required for maintenance ("spare parts and extra materials") for one year of operation (unless otherwise specified in the individual Specification Section).

a. Provide Supplier recommended lubricating oil and grease in accordance with this Section and the Contract Documents.

2. Provide list of Supplier recommended spare parts and extra material.

a. Include list of four standard lubricants, minimum, that shall be interchangeable for each type of lubricant required in the Contract Documents.

b. Include unit prices in current United States funds

c. Source(s) of supply for each.

C. Packaging and Labeling:

1. Furnish spare parts and extra materials in manufacturer's unopened cartons, boxes, crates, or other original, protective covering suitable for preventing corrosion and deterioration for maximum length of storage normally anticipated by manufacturer.

2. Packaging of spare parts and extra materials shall be clearly marked and identified with name of manufacturer, applicable equipment, part number, part description, and part location in the equipment.

3. Protect and package spare parts and extra materials for maximum shelf life normally anticipated by manufacturer.

D. Finishes: Spare parts and extra material shall have painting, protective coating, and finishes identical to original installed equipment and material. Where painting, protective coating, or finishes are not specified, suitable provisions shall be furnished to protect from corrosion.

E. Special Tools: Contractor shall provide special tools necessary to operate, disassemble, service, repair, and adjust equipment and material in accordance with the manufacturer's operation and maintenance manual. Special tool requirements shall be the same as spare parts and extra material specified in this Section.

F. Storage Prior to Delivery to Owner: Prior to furnishing spare parts and extra materials to Owner, store spare parts and extra materials in accordance with the Contract Documents and manufacturers' recommendations.

G. Delivery Time and Eligibility for Payment:

1. Deliver to Owner spare parts and extra materials prior to date of Substantial Completion for equipment or system associated with the spare parts and extra materials. Do not deliver spare parts and extra materials before commencing start-up for associated equipment or system.

2. Spare parts and extra materials are not eligible for payment until delivered to Owner and Contractor's receipt of Owner's countersignature on letter of transmittal.

H. Procedure for Delivery to Owner:

1. Deliver spare parts and extra materials to Owner's permanent storage rooms at the Site or area(s) at the Site designated by Owner.

2. When spare parts and extra materials are delivered, Engineer and Owner will mutually inventory the spare parts and extra materials delivered to verify compliance with the Contract Documents regarding quantity and part numbers.

3. Additional procedures for delivering spare parts and extra materials to Owner, if required, will be developed by Engineer, and complied with by Contractor.

I. Transfer Documentation:

1. Furnish on Contractor letterhead a letter of transmittal for spare parts and extra materials furnished under each Specification Section. Letter of transmittal shall accompany spare parts and extra materials. Do not furnish letter of transmittal separate from associated spare parts and extra materials.

2. Furnish three original, identical, signed letters of transmittal for each Specification Section. Upon delivery of specified quantities and types of spare parts and extra materials to Owner, designated person from Owner will countersign each original letter of transmittal indicating Owner's receipt of spare parts and extra materials.

a. Owner will retain one fully signed original.

b. Contractor shall submit one fully signed original to Engineer.

c. Contractor shall retain one fully signed original for Contractor's file.

3. Letter of transmittal shall include the following:

a. Information required for letters of transmittal in Section 01 33 00 - Submittal Procedures.

b. Transmittal shall list spare parts and extra materials furnished under each Specification Section. List each individual part or product and quantity furnished.

c. Provide space for countersignature by Owner as follows: space for signature, space for printed name, and date.

J. Contractor shall be fully responsible for loss or damage to spare parts and extra materials until spare parts and extra materials are received by Owner.

1.02 SUBMITTALS

A. Action/Informational Submittals: Individual Specification Sections that require spare parts, extra material, or tools, Contractor shall submit inventory checklist for each individual Specification Section that includes the following information:

1. Specification Section number and title.

2. Name of spare parts, extra material, or tools.

3. Manufacturer, part number and description.

4. Quantity specified and furnished.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 79 00

INSTRUCTION OF OWNER'S PERSONNEL

PART 1 – GENERAL

1.01 SUMMARY

A. Contractor shall furnish services of operation and maintenance training specialists to instruct Owner's personnel in recommended operation and maintenance procedures for materials and equipment furnished, in accordance with the Contract Documents.

B. Contractor shall provide a combination of classroom and field training at the Site, unless otherwise required elsewhere in the Contract Documents.

C. Owner reserves the right to record training sessions on video for Owner's later use in instructing Owner's personnel.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Definitions:

1. Training -Manufacturer's verbal, visual, and written presentation of materials to Owner's staff to ensure that any Owner personnel undergoing training understand the Manufacturer's recommended procedures to properly operate and maintain the equipment and systems for the expected service life.

B. Qualifications:

1. Contractor's instructors shall be factory-trained by manufacturer of material or equipment.

2. Contractor's instructors shall be proficient and experienced in conducting training of type required.

3. Qualifications of instructors are subject to acceptance by Engineer. If Engineer does not accept qualifications of proposed instructor, furnish services of replacement instructor with acceptable qualifications.

C. Scheduling:

1. General:

a. Contractor shall coordinate training services with start-up and initial operation of materials and equipment on days and times, and in manner, acceptable to Owner, in accordance with the Contract Documents.

b. Training may be required outside of normal business hours to accommodate schedules of operations and maintenance personnel. Furnish training services at the required days and times at no additional cost to Owner.

c. Prerequisites to Training: Training of Owner's personnel shall commence after acceptable preliminary operation and maintenance data has been submitted and work required in Section 01 75 00 – Checkout and Startup Procedures is complete.

2. Training Schedule Submittal:

a. Training Schedule Required: Contractor shall prepare and submit proposed training schedule for review and acceptance by Engineer and Owner. Proposed training schedule shall show all training required in the Contract Documents and shall demonstrate compliance with specified training requirements relative to number of hours of training, number of training sessions, and scheduling.

b. Timing of Training Schedule Submittal: Submit initial training schedule at least thirty days before scheduled start of first training session. Submit final training schedule, incorporating revisions in accordance with Engineer's comments, no later than seven days prior to starting the first training session.

c. Owner reserved the right to modify personnel availability for training in accordance with process or emergency needs at the Site.

D. Video Recording

1. Contractor shall provide a training specialist for a minimum of three (3) days, for each item of equipment specified, to meet with the Engineer to prepare training scripts and to participate in video recording of training. Video recorded training sessions shall be conducted separately from training sessions held for the Owner's personnel.

2. Manufacturer shall be the ownership rights to one unedited and one edited copy of the video recorded training.

3. As an alternative to video recording training at the Site, the Manufacturer may submit pre-recorded digital media covering the equipment supplied for approval. Submitted pre-recorded digital media shall meet the intent of this Section for approval consideration. If approved, Owner shall have the right to permanent ownership and use of at least one complete copy.

1.03 TRAINING REQUIREMENTS

A. General Lesson Plan Requirements:

1. Contractor's lesson plan shall describe specific instruction topics, system components for which training will be furnished, and training procedures. Handouts, if any, to be used in training shall be included with the lesson plan. Describe in lesson plan "hands-on" demonstrations planned for training sessions.

2. Submit acceptable lesson plan 30 days prior to starting associated training.

3. Lesson plan shall include estimated duration of each training segment.

B. Specific Lesson Plans Requirements:

1. Equipment overview shall cover the following:

a. Equipment's operating (process) function, performance objectives, and fundamental operating principles.

b. Equipment's mechanical, electrical, and electronic components, and features. Group related components into subsystems and describe function of subsystem and subsystem's interaction with other subsystems.

c. Support equipment and appurtenances.

d. Safety and potential hazards.

e. Safety and control interlocks.

2. Operations personnel training shall cover the following:

a. Equipment overview: As described in this Section.

b. Operation:

1) Principles, operating, start-up, and shutdown procedures.

2) Abnormal or emergency start-up, operating, and shutdown procedures.

3) Alarm conditions and responses.

4) Monitoring and recordkeeping.

5) Housekeeping.

c. Troubleshooting: Required corrective maintenance or an operating parameter adjustment.

3. Maintenance personnel training:

a. Equipment overview: As described in this Section.

b. Equipment preventive maintenance:

1) Inspection procedures:

a) Operation.

b) Trouble symptoms and anticipate breakdowns.

c) Predictive maintenance.

2) Preventative maintenance intervals.

3) Lubricant and replacement parts.

4) Cleaning practices and intervals.

5) Special tools required.

6) Removal, installation, and disassembly and assembly procedures.

7) “Hands-on” demonstrations of preventive maintenance procedures.

8) Measuring instruments and procedures

9) Torquing, mounting, calibrating, and aligning procedures and settings requirements.

10) Check and test equipment following corrective maintenance.

4. Equipment Troubleshooting:

a. Systematic troubleshooting procedures.

b. Checklists.

c. Testing and diagnostic procedures.

d. Corrective maintenance procedures with “hands on” demonstrations.

C. Training Aids:

1. Contractor’s instructor shall incorporate training aids as appropriate to assist in the instruction. Provide handouts of text, tables, graphs, and illustrations as required. Other appropriate training aids include:

a. Audio-visual aids

b. Equipment cutaways and samples

c. Tools, including special tools

2. Podium presentation aids: Presentation shall cover equipment, products and materials provided. Provide electronic version of presentation material to Engineer.

a. Electronic version of presentation aids shall be Microsoft PowerPoint or equivalent format.

b. Presentation shall include the following sections:

1) Complete system overview including, but not limited to, related and associated equipment specific to the system.

2) Specific equipment requirements and how equipment functions within the overall system.

3) Site specific system and equipment requirements.

c. Hardcopy handouts of the electronic presentation aids shall be provided prior to each training section for review during podium presentation.

d. As an alternative to the Electronic presentation, Manufacturer may submit, for approval by the Engineer and the Owner, prerecorded DVD(s) or digital media covering the equipment supplied. Approval of such DVD(s) or digital media shall be contingent upon their content meeting the lesson plan requirement of this Section. If prerecorded DVD(s) or digital media are approved by the Engineer and the Owner, the Owner shall have the right to permanent ownership and use.

3. Handouts:

a. Contractor's instructor shall distribute and use descriptive handouts during training.

b. Handouts should be coordinated with the instruction

c. Provide at least ten copies of handouts for each training session

4. Audio-visual Equipment: Training provider shall provide audio-visual equipment required for training sessions.

1.04 SUBMITTALS

A. Action/Informational Submittals:

1. Training Schedule: Detailed schedule of training sessions, demonstrating compliance with number of training sessions, hours required in the Contract Documents, and complying

with the Contract Times. Submit training schedule submittals in accordance with timeframes specified in this Section.

2. Lesson Plan: Acceptable lesson plan for training on each material or equipment item, in accordance with the Contract Documents. Lesson plan shall comply with requirements of this Section. Include with lesson plan copy of handouts that will be used during training sessions. Provide lesson plan submittals in accordance with timeframes specified in this Section.

3. Podium presentation material, electronic version.

4. Qualifications: Credentials of Contractor's proposed operations and maintenance instructor(s). Credentials shall demonstrate compliance with requirements of this Section and shall include brief resume and specific details of instructor's operating, maintenance, and training experience relative to the specific material and equipment for which instructor will provide training.

B. Closeout Submittals:

1. Trainee sign-in sheet for each training session. Submit to Owner's training coordinator.

C. Quality Assurance Submittals:

1. Qualifications: Credentials of Contractor's proposed operations and maintenance instructor(s). Credentials shall demonstrate compliance with requirements of this Section and shall include brief resume' and specific details of instructor's operating, maintenance, and training experience relative to the specific material and equipment for which instructor will provide training.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 "HANDS-ON" DEMONSTRATIONS

A. Contractor's instructor shall provide "hands-on" demonstration of operations and maintenance of equipment and materials for each training session.

B. Contractor shall furnish tools and appurtenances required for demonstrations.

3.02 SCHEDULE

A. Contractor shall furnish the hours of training and number of sessions indicated, at a minimum. Travel time and expenses are the responsibility of the manufacturer and are excluded from required training time indicated in the Contract Documents.

B. Owner's operations at the Site occur 24 hours per day, divided into three shifts. Training shall be scheduled during day shift, normal working hours unless otherwise approved by Engineer.

C. Training shall be provided for a minimum of two identical sessions, unless otherwise specified, with each session scheduled for different weeks.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 02 41 00

SITE DEMOLITION

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish all labor, materials, and equipment in accordance with the requirements of applicable sections of Divisions 1 and 2.

B. In addition, the Contractor shall demolish and remove all concrete and asphalt paving, curbs, sidewalk, and miscellaneous yard piping, utilities, and structures as required and shown on the Contract Drawings during the construction work.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01 14 00 – Coordination with Owner's Operations

B. Section 01 42 00 – References

C. Section 01 73 00 – Demolition and Execution of Work

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. References shall be in accordance with reference standards, codes, and specifications as set forth herein and in Section 31 10 00 – Clearing, Grubbing, and Site Preparation.

1.04 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01 33 00 – Submittal Procedures, the Contractor shall submit the following:

1. Copies of all photographs and other records from the joint existing conditions surveys.

PART 2 – EXECUTION

2.01 DEMOLITION

A. Existing concrete and asphalt paving, curbs, sidewalk and miscellaneous yard piping, utilities, and structures within the areas designated for new construction work shall be completely demolished and all debris removed from the site.

B. Excavation caused by demolition shall be backfilled with fill free from rubbish and debris. Select fill or structural fill shall be used where specifically required on Contract Drawings.

C. Work shall be performed in such manner as not to endanger the safety of the workmen or the public or cause damage to nearby structures.

D. Provide all barriers and precautionary measures in accordance with Owner's requirements and other authorities having jurisdiction.

E. Where parts of existing pavements or structures are to remain in service, demolish the portions to be removed, repair damage, and leave the pavement or structure in proper condition for the intended use. Remove asphalt or concrete pavement, concrete, and masonry to the lines designated by saw-cutting, drilling, chipping, or other suitable methods. Leave the resulting surfaces reasonably true and even, with sharp straight corners that will result in neat joints with new construction and be satisfactory for the purpose intended. Where existing reinforcement extends into new construction, remove the concrete so that the reinforcing is clean and undamaged. Cut off other reinforcing 1/2-inch below the surface and fill with epoxy resin binder flush with the surface.

F. Prior to the execution of the work, the Contractor, Owner and Engineer shall jointly survey the condition of the adjoining and/or nearby pavements and structures. Photographs and records shall be made of any prior settlement or cracking of structures, pavements, and the like, that may become the subject of possible damage claims. Contractor shall provide Owner a copy of all records of the joint survey of conditions before demolition activities may begin. Contractor shall provide copies of the existing conditions survey report to the Owner and Engineer before any demolition or construction activities begin.

2.02 DISPOSAL OF MATERIAL

A. All debris resulting from the demolition and removal work shall be disposed of by the Contractor at a properly permitted facility as part of the work of this Contract. All regulations covering material handling and disposal shall be followed. Material designated by the Engineer to be salvaged shall be stored on the construction site as directed. All other material shall be disposed of off-site by the Contractor at his expense.

B. Burning of any debris resulting from the demolition will not be permitted at the site.

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 02 82 05

ASBESTOS MANAGEMENT

PART 1 – GENERAL

1.01 SUMMARY

A. This Section details the requirements for construction and demolition activities affecting Asbestos-Containing Materials (ACM), trace asbestos materials (i.e., Building Materials containing 1% or less of asbestos), and Asbestos-Containing Waste Materials, as shown in the following report and summarized in Tables 3, 4, and 5 attached to Section 01 35 45 – Hazardous Materials Control, specified herein, or required to complete the Work, including all ACM identified and impacted by the Work. All Work under this Section shall be performed using methods, tools, and equipment that have demonstrated effectiveness in preventing asbestos fibers from migrating outside of the Regulated Abatement Work Area and are in compliance with all applicable rules and regulations.

1. Hazardous Materials Investigation Report for the Cedar Creek WPCP, January 2023.

B. In the absence of analytical testing results for certain materials, the material shall be classified as material containing both asbestos and polychlorinated biphenyls (PCBs) pending the analytical results. The Disturbance, Abatement/Removal, construction/ demolition, and disposal of materials containing both asbestos and PCBs shall be in accordance with the pertinent federal, state, and local regulations. For activities affecting materials and structures coated with PCB-containing bitumastic coatings, refer to Section 02 84 05 - PCBs Management for specific training, handling, and disposal requirements that must be implemented by the Contractor in addition to the requirements of this Section.

C. All Work under this Section shall be performed to minimize the creation of airborne emissions; minimize the quantity of waste generated; protect the health and safety of all personnel and welfare of the public; and avoid adverse environmental impacts.

D. Unless otherwise specified, the Work of this Section shall also be performed in accordance with the most current applicable federal, state, and local regulations. Asbestos projects are subject to the requirements of 12 NYCRR 56.

E. All independent third party air monitoring and bulk sampling for suspect material characterization shall be outside this contract and performed by others.

F. The Contractor shall perform all Work under this Section without damaging or contaminating non-regulated areas. Where such areas are damaged or contaminated, as determined by the County, the Contractor shall restore the areas to their original condition at no additional cost to the County.

G. The Contractor shall provide for sampling and analysis of presumed asbestos-containing materials identified in Table 5, attached to Section 01 35 45 – Hazardous Materials Control.

1.02 PAYMENT

A. Except for abatement and disposal of unforeseen/suspect ACM and related Work payable under the allowance, as described in Section 01 35 45 – Hazardous Materials Control, no separate payment will be made for performing any Work required under this Section and the Contractor shall include all costs thereof in prices bid for the Contract.

B. At the completion of abatement activities, the Contractor is responsible for submitting all of the documentation required herein. Payment to abate and dispose of ACM and resulting Asbestos-Containing Waste Materials produced by this Work will not be made until all required documentation, including the following is provided to the County:

1. Copies of all NYSDOL-approved Asbestos Project notifications, work permits, Variances, Work Place Safety Plans, and any applicable documentation filed or received from the NYSDOL, including Notices of Violations (NOV);

2. Copies of the Asbestos Abatement Contractor's Handling license;

3. Copies of NYSDOL Asbestos Handler Supervisor and Asbestos Handler certificates, where applicable, for all workers engaged in the project;

4. A copy of the Asbestos Abatement Contractor's daily Isolation Barrier book (bound notebook). Copies of laboratory reports and Chain-of-Custody (COC) documents for Exposure Monitoring conducted by the Asbestos Abatement Contractor, including the name, address, and New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) registration number of the laboratory used for air sample analysis;

5. All data related to bulk sampling, including the results of any asbestos surveys performed by a County-certified Asbestos Investigator and NYSDOL-certified Asbestos Inspector, where applicable;

6. The Asbestos Work Plan submitted and implemented in accordance with the requirements of this Section;

7. The total quantity of ACM abated;

8. The start and completion dates of the Asbestos Project(s);

9. A signed copy of the manifest from the asbestos-permitted landfill with complete COC documentation, certifying the amount of asbestos waste delivered;

10. The name and address of the asbestos waste transporter.

1.03 RELATED SECTIONS

A. Section 01 35 27 - Environmental Health and Safety Requirements

B. Section 01 35 45 - Hazardous Materials Control

C. Section 02 84 05 - PCBs Management

1.04 REFERENCES

A. Definitions

1. Abatement: Any and all procedures physically taken to control fiber releases from ACM. This includes Removal, Encapsulation, enclosure, cleanup, and Repair.

2. Adequately Wet: Defined by the EPA (40 CFR 61.141) as a material sufficiently mixed or penetrated with amended water to prevent the release of Visible Emissions. If Visible Emissions are observed coming from an ACM or asbestos waste, then the material has not been "Adequately Wetted." However, the absence of Visible Emissions is not evidence of being Adequately Wet. ACM must be fully penetrated with the wetting agent to be Adequately Wet. If the ACM being abated is resistant to amended water penetration, the wetting agent shall be applied to the material prior to and during Abatement as necessary to minimize the potential for fiber releases.

3. Aggressive Air Sampling: A method of sampling within a Negative Pressurized Enclosure (NPE) in which mechanical equipment is used before and during the sampling period to stir up settled dust/asbestos fibers. Mechanical equipment includes 20-inch fans and forced air equipment (e.g., a one-horsepower leaf blower).

4. Air Sampling Technician: A person who performs Asbestos Project air sampling and possesses a valid Air Sampling Technician certificate issued by the NYSDOL.

5. Ambient Air Monitoring: The measurement or determination of airborne asbestos fiber concentrations outside but in the general vicinity of the work site, performed in accordance with NIOSH or EPA sampling methodologies.

6. Asbestos Abatement Contractor: A Subcontractor licensed by the NYSDOL who performs Abatement during an Asbestos Project, or employs persons performing such Abatement.

7. ACM: Any material containing greater than one percent asbestos.

8. Asbestos Handler: An individual certified by the County and/or NYSDOL who disturbs, removes, encapsulates, repairs, or encloses ACM. Asbestos Handlers working on projects shall possess NYSDOL certifications.

9. Asbestos Handler Supervisor: An individual certified by the County and/or NYSDOL who supervises the asbestos handlers during an Asbestos Project, and ensures that proper asbestos Abatement procedures as well as individual safety procedures are being adhered to. Asbestos Handler Supervisors working on projects shall possess NYSDOL certifications.

10. Asbestos Project: Any Work performed in connection with the alteration, renovation, modification, or demolition of a building or structure, or in connection with the replacement or repair of equipment, pipes, or electrical equipment not located in a building or structure, which will involve the Abatement, Disturbance, or cleanup of friable or Non-Friable Asbestos. Asbestos Projects are classified as either Large Asbestos Projects, Small Asbestos Projects, or Minor Asbestos Projects in New York State and New York City, and each type of project involves several phases, which can include: background air monitoring, mobilization, pre-abatement/Containment construction, Abatement, cleaning/re-cleaning, final Clearance Air Monitoring, Containment breakdown, and demobilization.

11. Asbestos-Containing Waste Material: ACM or asbestos-contaminated objects requiring disposal.

12. Building Materials: Any and all materials listed in 12 NYCRR 56-5.1(f)(1), including but not limited to interior and exterior finished, equipment, plaster, roofing, flooring, caulking, sealants, tiles, insulation, and mortar and refractory bricks used in the construction of boilers.

13. Clean Room: An uncontaminated area or room that is part of the Personal Decontamination Enclosure System, with provisions for the storage and changing of “street clothes” into clean Personal Protective Equipment (PPE).

14. Clearance Air Monitoring: Area air monitoring performed inside the Restricted Area and Regulated Abatement Work Area after the completion of the final cleaning, final waiting period, and Final Visual Inspection by the Asbestos Handler Supervisor and Project Monitor. Aggressive Air Sampling shall be performed as part of the Clearance Air Monitoring activities inside of the Containment.

15. Containment: The NPE within the Restricted Area, which establishes the Regulated Abatement Work Area, and surrounds the location where the asbestos Abatement is actually taking place.

16. Critical Barrier: A term used by the NYSDOL to define barriers that seal-off all openings to or within the defined Regulated Abatement Work Area, including but not limited to operable windows, skylights, doorways, ducts, grills, diffusers, and any other penetrations to surfaces adjacent to or within the Regulated Abatement Work Area.

17. Disturbance: Any activities that disrupt the matrix of ACM, or Asbestos-Containing Waste Materials. This includes activities that generate dust, debris, Visible Emissions, or airborne

asbestos fibers, including moving friable ACM or Asbestos-Containing Waste Materials from one place to another.

18. Encapsulation: The coating or spraying of ACM, or the bare substrate surface that is exposed after an Abatement, with a pigmented (i.e., non-transparent) liquid sealant that creates a membrane over the surface of the material (bridging encapsulant) or penetrates into the material and binds its components together (penetrating encapsulant).

19. Excursion Limit: Defined in the OSHA Asbestos Standard for the Construction Industry (29 CFR 1926.1101) as individual exposure, without regard to the use of respirators, to an airborne concentration of asbestos fibers of 1.0 fiber per cubic centimeter of air (1.0 f/cc) averaged over a 30-minute sampling period. No employee of the Contractor shall at any time be exposed to concentrations of asbestos fibers above the Excursion Limit.

20. Exposure Monitoring: Personal air sampling performed outside the respirator within the breathing zone of individuals that are representative of the 8-hour TWA and 30-minute short-term exposures of each employee, for the purpose of determining compliance with OSHA's Asbestos Standard for the Construction Industry (29 CFR 1926.1101). Analytical results from Exposure Monitoring will be used to select appropriate respiratory protection and PPE for individuals within a Restricted Area and Regulated Asbestos Work Area. For the purpose of this Section, Exposure Monitoring samples shall be collected from individuals who are representative of each task being conducted by the Contractor, and all Exposure Monitoring shall follow pertinent NIOSH or EPA sampling methodologies.

21. Final Visual Inspection: An inspection performed by the Project Monitor and Asbestos Handler Supervisor at the completion of the final waiting period on an Asbestos Project (but prior to Clearance Air Monitoring). The inspection is performed in accordance with ASTM E1368 to determine the completeness of Abatement and cleanup.

22. Friable Asbestos: A term used by the NYSDOL to define any ACM or asbestos waste that can be crumbled, pulverized or reduced to powder when dry, by hand pressure.

23. Glovebag: A manufactured, impervious, bag-like enclosure with two (2) inward-projecting long sleeve gloves, one (2) inward-projecting waterwand sleeve, an internal tool pouch, and an attached, labeled receptacle for asbestos waste. The Glovebag is constructed and installed to surround an object or area to be abated, and contain all asbestos fibers released during the Abatement process.

24. High-Efficiency Particulate Air (HEPA) Filter: A filter designed to remove 99.97% of all particles greater than 0.3 micrometers (μm) in diameter. For the purpose of this Section, HEPA vacuum and Negative Air Pressure Equipment (i.e., Microtraps) used by the Contractor shall meet the Standard for Safety High-Efficiency, Particulate, Air Filter Units (UL 586) developed by Underwriters Laboratories.

25. Holding Area: A room or area in the Waste Decontamination Enclosure System utilized for the temporary (i.e., no longer than the current work shift) storage of containerized asbestos

waste, prior to its transfer to a final on-site storage container (i.e., dumpster, trailer, or roll-off) or a licensed asbestos waste transport vehicle. The Holding Area is located between the washroom and an uncontaminated area.

26. Independent Third Party Monitor: A NYSDOL-licensed asbestos contractor who will be contracted by the Engineer or the County, and is completely independent of the Asbestos Abatement Contractor involved with the Asbestos Project. The independent third party who conducts ambient and clearance air monitoring or Project Monitoring on an Asbestos Project shall not have any business, personal, or other relationship with the Asbestos Abatement Contractor.

27. Isolation Barrier: A term used to define the construction of partitions, the placement of solid materials, and the plasticizing of apertures to seal off the Regulated Abatement Work Area from surrounding areas and contain asbestos fibers.

28. Large Asbestos Project: An Asbestos Project involving the Removal, enclosure, Encapsulation, Repair, Disturbance, cleanup, or handling of 260 linear feet or more of ACM, or 160 square feet or more of ACM.

29. Log: An official record, maintained by the Asbestos Abatement Contractor, of all activities that occurred during the Asbestos Project. The Log shall be in the form of a bound notebook, and at a minimum, identify the following information: (a) the building owner, agent, contractor, and workers; (b) daily activities, cleanings, and waste transfers; (c) the names and certificate numbers of all Asbestos Handlers and Asbestos Handler Supervisors; (d) the results of inspections of decontamination systems, barriers, and negative pressure ventilation equipment; (e) summaries of all corrective actions and Repairs; (f) work stoppages with reasons for stoppages; (g) manometer readings at least twice per work shift; (h) daily checks of emergency and fire exits; (i) any unusual events.

30. Microtrap: (See definition of “Negative Air Pressure Equipment”).

31. Minor Asbestos Project: An Asbestos Project involving the Removal, enclosure, Encapsulation, Repair, Disturbance, cleanup, or handling of 25 linear feet or less of ACM, or 10 square feet or less of ACM.

32. Negative Air Pressure Equipment: A local exhaust system capable of maintaining air pressure within the Containment at a lower pressure than the air outside of the Containment. The Negative Air Pressure Equipment also provides for the HEPA filtration of all air exhausted from the Containment.

33. Non-Friable Asbestos: A term used by the NYSDOL to define any ACM or asbestos waste that cannot be crumbled, pulverized or reduced to powder when dry, by hand pressure.

34. Obstruction: The blocking of a means of egress with any temporary structure or barrier. Polyethylene sheeting shall not be considered an Obstruction when it is prominently marked with exit signage or paint, and cutting tools (i.e., a knife or razor blade) are

attached to the work area side of the sheeting for use in the event that the sheeting must be cut to permit egress. A corridor shall not be considered obstructed when there is a clear path measuring at least three feet wide.

35. OSHA Monitoring: (See definition of "Exposure Monitoring").

36. P-100 Filter: (See definition of: "HEPA").

37. Perimeter Monitoring: (See definition of "Area Monitoring").

38. Permissible Exposure Limit (PEL): Defined in the OSHA Asbestos Standard for the Construction Industry (29 CFR 1926.1101) as individual exposure, without regard to the use of respirators, to an airborne concentration of asbestos fibers of 0.1 fibers per cubic centimeter of air (f/cc) calculated as an 8-hour Time-Weighted Average (TWA). No employee of the Contractor shall at any time be exposed to concentrations of asbestos fibers above the PEL. See also Excursion Limit.

39. Personal Decontamination Enclosure System: A series of connected rooms designed to control the passage of Asbestos Handlers, and other authorized individuals into the Regulated Abatement Work Area from uncontaminated areas. The system consists of a Clean Room, a Shower Room, and an equipment room separated from each other and the Regulated Abatement Work Area by airlocks and curtained doorways.

40. Personal Monitoring: (See definition of "Exposure Monitoring").

41. Phase Contrast Microscopy (PCM): An analytical method (e.g., NIOSH 7400) used for determining the asbestos fiber concentration in an air sample.

42. Polarized Light Microscopy (PLM): An analytical method (e.g., 40 CFR 763, Subpart F, Appendix A or ELAP Item 198.1 or 198.6) used for determining the asbestos content in a bulk material.

43. Post Abatement Air Monitoring: (See definition of "Clearance Air Monitoring").

44. Presumed Asbestos-Containing Material (PACM): Thermal System Insulation (TSI) and surfacing material found in buildings constructed no later than 1980.

45. Project Designer: A person who performs Asbestos Project design functions and possesses a valid Project Designer certificate issued by the NYSDOL.

46. Project Monitor: A person who performs Asbestos Project Monitoring functions and possesses a valid Project Monitor certificate issued by the NYSDOL

47. Regulated Abatement Work Area: The portion of the Restricted Area where Abatement work actually occurs. This includes the interior of the Restricted Area Containment enclosure. For Glovebag operations, the areas contiguous to where the operation takes

place are Regulated Abatement Work Areas. For tents, the interior of each tent is a Regulated Abatement Work Area. For exterior, Non-Friable Asbestos Abatement conducted without the establishment of negative air ventilation systems or Containment enclosures, the entire Restricted Area surrounding the Abatement location is considered to be the Regulated Abatement Work Area.

48. Removal: The stripping of any ACM from surfaces or components of a building or structure.

49. Repair: A term used by the County to define a corrective action using specified work practices (e.g., Glovebags or tents) to minimize potential asbestos fiber releases from minimally damaged ACM.

50. Restricted Area: An area established and marked for the Abatement portion of an Asbestos Project. The area shall include, but not be limited to, Regulated Abatement Work Areas and any contiguous decontamination enclosure systems, adjoining staging areas where work materials, debris, or waste materials from such work may accumulate, and waste storage areas (e.g., dumpsters, trailers, or roll-offs).

51. Shower Room: A room between the Clean Room and the equipment room in the Personal Decontamination Enclosure System set up to prevent cross-contamination by ensuring the removal of potential asbestos contamination from the body that may have accumulated during Abatement operations. The Shower Room shall have hot and cold running water controllable at the tap, shall be arranged for complete showering during decontamination, and shall include clean, dry towels, soap, and shampoo in quantities sufficient to accommodate the personnel working on the Asbestos Project.

52. Small Asbestos Project: An Asbestos Project involving the Removal, enclosure, Encapsulation, Repair, Disturbance, cleanup, or handling of more than 25 linear feet but less than 260 linear feet of ACM, or more than 10 square feet but less than 160 square feet of ACM.

53. Suspect ACM: All friable and non-friable materials suspected of containing asbestos as determined by a certified NYSDOL Asbestos Inspector, which have not been sampled and analyzed for asbestos content. Suspect ACM includes PACM.

54. Tent: (See definition of “Containment”).

55. Transmission Electron Microscopy (TEM): An analytical method (e.g., 40 CFR 763, Subpart F, Appendix A or ELAP Item 198.4) used for determining the asbestos fiber concentration in an air sample, or for determining the asbestos content in a bulk material.

56. Trace Asbestos-Containing Material: A building material that contains less than or equal to 1% of asbestos.

57. Variance: Relief from specific requirements set forth in state or local asbestos regulations, which is granted in writing by the agency that enforces the regulations.

58. Visible Emission: Any emission containing particulate material that can be seen without the aid of instruments.

59. Waste Decontamination Enclosure System: A series of connected rooms designed to control the transfer of materials and equipment from the Regulated Abatement Work Area. The system consists of a washroom and a Holding Area separated from each other and the Regulated Abatement Work Area by airlocks and curtained doorways.

60. Wet Cleaning: The process of eliminating asbestos contamination from surfaces, equipment, or other objects by using cloths, mops, or other cleaning tools that have been saturated with amended water.

61. Worker Decontamination Enclosure System: (See definition of "Personal Decontamination Enclosure System").

62. Work Place Safety Plan: Construction documents prepared by a registered design professional and submitted for review to the County in order to obtain an Asbestos Abatement Permit. The plan shall include, but not be limited to, plans, sections, and details of the work area clearly showing the extent, sequence, and means and methods by which the work is to be performed.

B. Reference Standards:

1. The Contractor shall comply with all applicable regulations, standards, and guidelines of federal, state, and local environmental and occupational safety and health agencies regarding ACM, trace asbestos materials, and Asbestos-Containing Waste Materials. These regulations, standards, and guidelines include, but are not limited to the following:

a. ASTM International:

1) E1368 – Standard Practice for Visual Inspection of Asbestos Abatement Projects.

b. Department of Transportation (DOT):

1) 49 CFR 171 - General Information, Regulations, and Definitions;

2) 49 CFR 172 – Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response information, and Training Requirements;

3) 49 CFR 173 – Shippers: General Requirements for Shipments and Packagings;

4) 49 CFR 178 – Specifications for Packagings.

2. Environmental Protection Agency (EPA):

a. 40 CFR 61 - National Emission Standards for Hazardous Air Pollutants (NESHAP);

b. 40 CFR 268 – Land Disposal Restrictions;

c. 40 CFR 302 – Designation, Reportable Quantities, and Notification;

d. 40 CFR 763 - Asbestos Hazard Emergency Response Act (AHERA).

3. National Institute for Occupational Safety and Health (NIOSH):

a. Method 7400 – Asbestos and Other Fibers by PCM;

b. Method 7401 – Asbestos by TEM.

4. New York State Department of Environmental Conservation (NYSDEC):

a. 6 NYCRR 360 - Solid Waste Management Facilities;

b. 6 NYCRR 364 - Waste Transporter Permits;

c. 6 NYCRR 376 – Land Disposal Restrictions.

5. New York State Department of Health (NYSDOH):

a. 10 NYCRR 55-2 – Approval of Laboratories Performing Environmental Analysis.

6. New York State Department of Labor (NYSDOL):

a. 12 NYCRR 56 - Asbestos Rules and Regulations.

7. Occupational Safety and Health Administration (OSHA):

a. 29 CFR 1910 – Occupational Safety and Health Standards;

b. 29 CFR 1910.28 – Safety Requirements for Scaffolding;

c. 29 CFR 1926.65 – Hazardous Waste Operations and Emergency Response;

d. 29 CFR 1910.134 - Respiratory Protection Standard;

e. 29 CFR 1910.1001 - Asbestos Standard for General Industry;

f. 29 CFR 1910.1200 - Hazard Communication Standard;

g. 29 CFR 1926 - Safety and Health Regulations for Construction;

h. 29 CFR 1926.1101 - Asbestos Standard for the Construction Industry.

8. Underwriters Laboratories, Inc. (UL):

a. UL 586 – Standard for Safety High Efficiency, Particulate, Air Filter Units.

1.05 DESCRIPTION

A. Commencement of Work: 10 business days prior to the proposed start of work at each separate location, the Contractor shall notify the Engineer, the onsite safety staff, and building occupants. No work may proceed at any location until authorized by the Engineer.

B. The Contractor shall coordinate any required equipment shutdowns with the Engineer prior to starting the work.

C. Access Restrictions: The Contractor shall inform the Engineer of proposed access restrictions (i.e., areas or items of equipment which will not be accessible during the proposed Asbestos Project), and provide them estimated time frames (including specific dates) of such proposed access restrictions. The Contractor shall be aware that Other Contractors may be at the work site. As a result, the Contractor shall not have exclusive rights to the work site, and shall fully cooperate and coordinate the Work with the work of Other Contractors who may be on site. Therefore, the Contractor shall notify Other Contractors in advance of the abatement Work included herein, to provide them with sufficient time for coordination of interrelated items that are included in their contracts and that must be performed before, after, or in conjunction with the Work included under this Section.

1. The Contractor shall ensure that Personal and Waste Decontamination Enclosure Systems along with the restricted asbestos work areas are constructed of solid materials with lockable doors to prevent unauthorized entry during non-working hours.

D. Meetings: The Contractor shall visit and investigate the site and review the Contract Drawings, this Section, and become familiar with any conditions which may affect the work, as part of the pre-construction meeting and site walk-though. The Contractor shall hold all meetings with appropriate parties as scheduled and as otherwise necessary to accomplish the work of the Contract in accordance with its specific requirements and standards. In addition to the pre-construction meeting and site walk-through, other meetings may be required or may be requested by the Engineer, including briefings with Site Operations personnel. Written documentation (i.e., “minutes”) of all meetings shall be generated by the Contractor, and copies shall be provided to County within three (3) business days following each meeting.

1.06 QUALITY ASSURANCE

A. Permits and Notifications: The Contractor shall make all necessary notifications, secure any necessary permits and Variances, complete agency-required forms, and pay all fees in

conjunction with asbestos Abatement activities, waste transportation, and waste disposal in accordance with federal, state, and local asbestos regulations. Prior to the submittal of any notifications, permit/Variance applications, or forms to regulatory agencies, the Contractor shall provide them to the Engineer for review.

B. Scheduling: The Contractor shall coordinate and schedule all phases of the work to be performed under this Section with the County, subcontractors, material suppliers, and other parties as necessary to ensure the proper execution of the Work.

C. Compliance: In addition to the detailed requirements of this Section, the Contractor shall comply with all applicable regulations of federal, state, and local authorities pertaining to the Abatement, Disturbance, cleanup, handling, transportation, storage, and disposal of ACM, trace asbestos materials, and Asbestos-Containing Waste Materials. All matters regarding the interpretation of any regulations, standards, or policies shall be submitted to the Engineer for resolution before starting the Work. Where the requirements of this Section, and federal, state, or local regulations conflict or vary, the most stringent requirements or regulations shall apply.

D. Rejection of Non-Complying Items: the County reserves the right to reject items incorporated into the Work which fail to meet the specified minimum requirements. The County also reserves the right to reject Contractor submittal items that it deems inappropriate or unacceptable. Included in the category of non-complying items are proposed vendors, subcontractors or personnel with regulatory citations/violations. The County further reserves the right, and without prejudice to other recourse, to accept non-complying items subject to an adjustment in the Contract amount, as approved by the County.

E. Qualifications:

1. Asbestos Abatement Contractor: The Contractor shall possess a current NYSDOL asbestos license, and shall have successfully completed at least two (2) Asbestos Projects of comparable scope and methodologies to the work being performed under this Section within the past three (3) years. This experience shall be documented by identifying the following: (a) the name, address, and phone number of each facility where the work was performed; (b) the name of the individual representing the owner at each facility; (c) the types of facilities where the work was performed; (d) the volume and type of each material that was abated; (e) the specific methods of Abatement used at each facility (including the tools, technologies, and engineering controls employed);

2. Asbestos Handler Supervisor: The Contractor shall have on staff and assigned to this Contract an Asbestos Handler Supervisor. The Asbestos Handler Supervisor shall be currently certified by the NYSDOL (for all Asbestos Projects). In addition, the Asbestos Handler Supervisor shall have a minimum of two (2) years' experience on Asbestos Projects, and shall have served as the Asbestos Handler Supervisor on at least three (3) Asbestos Projects of comparable scope and methodologies to the work being performed under this Section.

3. Asbestos Handler: The Contractor shall have on staff and assigned to this Contract a sufficient number of experienced and properly trained Asbestos Handlers. Asbestos Handlers shall be currently certified by NYSDOL (for all Asbestos Projects), and shall have a minimum of one (1) year of experience on Asbestos Projects, and shall have worked on at least three (3) Asbestos Projects of comparable scope and methodologies to the work being performed under this Section.

1.07 SUBMITTALS

A. Thirty business days prior to commencement of the Work of this Section or as directed by the Engineer, the Contractor shall submit the following to the Engineer:

1. Asbestos Inspection and Sampling Plan: The Contractor shall provide an Asbestos Inspection and Sampling Plan to identify suspect asbestos-containing materials as shown on Table 5 attached to Section 01 35 45 – Hazardous Materials Control, and collect confirmatory samples, as appropriate during the inspection.

2. The Asbestos Inspection and Sampling Plan shall include at a minimum:

a. Credentials of the individual responsible for inspection and sampling. At a minimum, the inspection shall be performed by a certified NYSDOL Asbestos Inspector, who shall have current HAZWOPER training, OSHA 10-hour certification, and confined space entry training, as applicable to the location or work, and shall have performed similar inspection work on at least three (3) projects of comparable scope.

b. Credentials of the laboratory providing sample analysis. The credentials shall include current certification by the NYSDOH ELAP.

c. Sample collection, analysis and reporting protocol in accordance with 12 NYCRR Part 56, as applicable to the location or work.

d. Health and safety protocol (Job Hazard Analysis (JHA)) for all investigation activities.

3. Asbestos Inspection Report: The Contractor shall provide an Asbestos Inspection Report summarizing the results of all inspection activities, and as applicable, a sampling narrative, laboratory data packages and inventory of all identified suspect and confirmed asbestos-containing materials. All reporting shall be in accordance with NYCRR Part 56, as applicable to the location or work.

4. Asbestos Work Plan: Each Contractor that will disturb ACM during the course of Work to be performed under this Section shall submit a detailed, project-specific Asbestos Work Plan that addresses work procedures and equipment to be used during the disturbance, abatement, removal, handling, collection, cleanup, and disposal of ACM and Asbestos-Containing Waste Materials. The Asbestos Work Plan shall be prepared in accordance

with 12 NYCRR 56, and all other pertinent federal, state, and local regulations. The Asbestos Work Plan shall also be signed and dated by a NYSDOL-certified Project Designer meeting the definition in this Section. A copy of the Project Designer's current NYSDOL certification shall be attached to the Work Plan. The Asbestos Work Plan shall include the following elements:

a. Asbestos Control:

1) Drawings showing the location and details of the following: (a) each Regulated Asbestos Work Area; (b) the type, location, and number of negative air pressure machines that will be used, as well as all exhaust locations; (c) proposed electrical hookups and temporary electrical panels; (d) proposed water hookups; (e) each Restricted Area; (f) each Personal Decontamination Enclosure System; (g) each Waste Decontamination Enclosure System; (h) each waste storage area (e.g., dumpster, trailer, or roll-off); (i) restroom areas; (j) areas designated for eating and drinking.

2) A detailed discussion regarding the interfacing of trades (i.e., how the Contractor will coordinate the work with other contractors or County employees working at the site) and the sequencing of asbestos-related Work.

3) A detailed discussion regarding the collection, handling procedures, cleanup, and disposal of Asbestos-Containing Waste Materials (including the collection, filtering, and disposal of wastewater).

4) A detailed discussion regarding the procedures and methodologies that will be used to conduct Exposure Monitoring. Provide the name and qualifications (i.e., training and experience documentation) of the individual who will be responsible for conducting the Exposure Monitoring.

5) A detailed discussion regarding housekeeping procedures to be used for maintaining clean Regulated Abatement Work Areas, clean Restricted Areas, and clean decontamination enclosure systems.

6) A detailed discussion regarding the specific methods and procedures that will be used to control fiber releases, and ensure that as per 40 CFR Part 763, Subpart E, of the EPA Asbestos in Schools Rule measured by Phase Contrast Microscopy (PCM), fiber concentrations less than 0.01 f/cc; of air, or background levels (whichever is greater) are not exceeded outside of each Regulated Abatement Work Area.

7) A detailed task analysis for each Work activity that has the potential to disturb ACM or Asbestos-Containing Waste Materials. Each task analysis shall include, but is not limited to, the following information: (a) the type of work activity; (b) the tools/equipment that will be used; (c) operation and maintenance practices and procedures that will be used for the

tools/equipment; (d) the types of ACM that will be disturbed, or Asbestos-Containing Waste Materials that may be generated when performing the activity; (e) the engineering controls that will be used to control the spread of asbestos fibers during the activity; (f) the proposed crew size for the activity and individual employee responsibilities during the activity; (g) housekeeping procedures that will be used during the activity; (h) PPE and proposed respiratory protection that will be used for the activity.

8) Equipment and Supplies: Identify the materials and equipment that will be used to perform the Work, including materials and equipment designed to be non-combustible or fire retardant in accordance with the National Fire Protection Association (NFPA) Standards 701 and 255.

9) Rental Equipment Notification: If rental equipment is to be used during the Work, the Contractor shall notify the rental agency in writing concerning the intended use of the equipment, and shall develop and submit an equipment decontamination plan to the Engineer for review and approval prior to the start of work.

10) Safety Data Sheets (SDSs): Provide SDSs for all chemical products (including wetting agents and encapsulants) to be used for the Work.

b. Waste Management:

1) A description of the types of ACM and Asbestos-Containing Waste Materials associated with the Work (include details regarding whether the materials are friable or non-friable).

2) The estimated quantity of each waste stream that will be generated.

3) The name, address, phone number, and qualifications of each vendor and facility that will be transporting, storing (including transfer stations), or disposing of the wastes. The Contractor shall verify the permit status of the facility as well as check for outstanding violations and enforcement actions. Include a 24-hour phone contact for each vendor and facility.

4) Current permit documentation for the disposal facility indicating that the facility is approved by federal, state, and local regulatory agencies to receive Asbestos-Containing Waste Materials. The documentation shall include an "acceptance letter" from the facility indicating its ability to accept the specific asbestos waste streams that will be generated during this Contract Work.

5) Current 6 NYCRR 364 permit documentation for the waste transporter that will transport Asbestos-Containing Waste Materials from the work site to the disposal facility. The documentation shall clearly indicate the transporter's

ability to deliver the Asbestos-Containing Waste Materials to the chosen disposal facility.

6) Spill prevention, Containment, and cleanup contingency measures to be implemented during the Work, as well as procedures to be followed during a suspected fiber release or emergency situation. All measures and procedures shall be in accordance with the standards referenced in this Section.

7) A detailed discussion of the on-site handling, storage, Removal, cleanup, and disposal of waste materials. This discussion shall include, but is not limited to, the following: (a) the methods of demarcation that will be used to identify the waste storage areas and each waste bag/container; (b) the methods and procedures that will be used to collect and containerize wastes on a daily basis; (c) the types of bags/containers that will be used to containerize the wastes; (d) the submittal of weekly waste inspection records as required in this Section.

c. The name and qualifications (i.e., experience and training documentation) of the Asbestos Handler Supervisor who will be responsible for the oversight and execution of the Asbestos Control Plan during activities affecting ACM. At a minimum, the Asbestos Handler Supervisor shall satisfy the qualification requirements set forth in this Section, and shall be onsite during all activities affecting ACM.

d. Asbestos Abatement Project Notifications and Permits: Submit completed permits and notifications to the Engineer for review and approval prior to submittal to the applicable agencies. All Large Asbestos Projects require notification procedures per 12 NYCRR 56. Documents that may be required based upon the scope and location of the project include, but are not limited to, the following:

1) EPA Large Asbestos Project Notification;

2) NYSDOL Asbestos Project Notification;

3) NYSDOL Asbestos Variance Application.

e. A detailed schedule for the implementation of the Asbestos Work Plan elements. The schedule shall address the different phases of the Asbestos Project, including the projected start and completion dates for work area preparation, gross Removal and Abatement, cleanings, Clearance Air Monitoring, and demobilization activities.

f. Medical Surveillance: For all activities that take place within a Regulated Abatement Work Area, the Contractor shall provide a sufficient number of properly trained, experienced, and certified workers, each of whom shall: (a) have received a medical exam that included a Pulmonary Function Test (PFT) within the past year; (b) have received written medical clearance within the past year, by a licensed physician, to

wear a respirator; (c) have received a qualitative or quantitative respirator fit-test within the past year for the specific respirator the employee will be using for this work.

g. Employee Documentation: For all activities that take place within a Regulated Abatement Work Area, the Contractor shall provide a sufficient number of properly trained, experienced, and certified workers, each of whom shall: (a) have current NYSDOL-issued certificates shall be considered proof of training; (b) documentation for Asbestos Handlers and Asbestos Handler Supervisors that will be used for each Asbestos Project, indicating work experience as required in this Section; (c) dates and written proof of initial medical surveillance and all subsequent examinations by the Contractor or other employer within the past year, and proof that the employee is currently participating in the employer's ongoing medical surveillance program in accordance with this Section; (d) dates and written proof of respiratory clearance and a completed medical exam in accordance with this Section; (e) dates and written proof of a respirator fit-test in accordance with this Section.

h. A current (i.e., within the last month) signed and notarized statement disclosing all of the Contractor's OSHA, EPA, NYSDOL, and DOT citations/violations on Asbestos Projects within the past three (3) years. If the Contractor will be using a subcontractor, a current signed and notarized statement disclosing all of the subcontractor's OSHA, EPA, NYSDOL, and DOT citations/violations within the past three (3) years will also be required.

i. A current (i.e., within the last month) signed and notarized statement disclosing all of the Asbestos Handler Supervisor's NYSDOL citations/violations within the past three (3) years.

j. Analytical Laboratory Qualifications for Analyzing Air Samples: Submit the name, address, and telephone number of each analytical laboratory selected to perform the analyses of all air samples collected for Exposure Monitoring purposes. The analytical laboratory shall be currently accredited by the American Industrial Hygiene Association (AIHA) and NYSDOH ELAP. Provide copies of current AIHA and ELAP certificates along with dates of accreditation/reaccreditation. ELAP certificates should show evidence of certification for the specific analytical methods that will be used.

5. Documentation: Complete documentation of all Exposure Monitoring activities shall be in accordance with this Section.

6. The Contractor shall submit all Exposure Monitoring results to the County no later than 24-hours after the collection of the air samples.

B. Logs and Recordkeeping: During all Work performed under this Section, the Contractor shall maintain and provide the following documentation:

1. Exposure Monitoring Documentation: Exposure Monitoring Documentation shall be created and shall be made available to the County immediately upon request. All laboratory analytical results shall be accompanied by complete COC documentation.

    a. The Exposure Monitoring documentation shall be signed by the individual who generated the documentation. The content of the documentation shall include, but is not limited to, the following information: (a) sample "start" and "stop" times; (b) flow rates (initial and final) for each sample; (c) the total volume of air collected for each sample; (d) names of individuals being sampled along with the specific work task each individual is performing; (e) specific respiratory protection and PPE worn by each individual; (f) types (i.e., makes and models) of sampling equipment used; (g) types of sample media (i.e., filters and cassettes) used; (h) the most recent calibration dates, along with the calibration results, for the sampling equipment used; (i) name of the individual who conducted the Exposure Monitoring; (j) dates that the Exposure Monitoring was conducted; (k) work tasks being performed adjacent to the Restricted Area during the Exposure Monitoring; (l) unique sample numbers used to identify each sample; (m) the phase of the Asbestos Project being performed (i.e., background, pre-abatement, Abatement, cleaning, or clearance).

2. Waste Manifest Documentation: A Waste Profile for all asbestos waste shall be completed and submitted to the Engineer for review and approval prior to County signature. The Contractor shall submit a Letter of Acceptance form the selected asbestos-permitted landfill stating that the facility will accept the asbestos wastes generated during abatement. The Contractor shall also submit advance copies of the completed manifest for the Engineer's review and approval, prior to County signature on the date of disposal. Following disposal, completed and signed waste manifests from the approved, asbestos-permitted landfill, shall be provided to the County within 10 business days of disposal. In addition, on-site waste storage areas shall be inspected weekly by the Asbestos Handler Supervisor.

3. Waste Storage Area Inspection Documentation: Each weekly waste storage area inspection shall be documented in the Asbestos Abatement Contractor's bound Log. The Log shall be signed by the Asbestos Handler Supervisor, and shall be made available to the County immediately upon request. The content of this documentation shall include, but is not limited to, the following information: (a) the name of the individual that conducted the inspection; (b) descriptions of waste streams being stored; (c) types and quantities of waste containers being used; (d) the current disposal status (i.e., when the waste container is scheduled to be removed from the work site) and physical condition of each waste container; (e) the present condition of each waste storage area; (f) the presence/absence of proper labeling for each waste container in accordance with this Section and federal, state, and local regulations.; (g) the methods being used to secure/lock each waste storage area to prevent unauthorized entry.

4. Asbestos Project Inspection Documentation: Project Monitors and Restricted Areas shall be inspected daily by the Asbestos Handler Supervisor.

a. Each daily Asbestos Project inspection shall be documented in the Asbestos Abatement Contractor's bound Log. The Log shall be signed by the Asbestos Handler Supervisor, and shall be made available to the County immediately upon request. The content of the Log shall include, but is not limited to, the following information: (a) the type of Asbestos Project (i.e., Large Asbestos Project, Small Asbestos Project, or Minor Asbestos Project) being conducted; (b) the current phase of the Asbestos Project (i.e., mobilization, background pre-Abatement, abatement, cleaning, Clearance Air Monitoring, or Containment breakdown); (c) the names of the Asbestos Handlers, Asbestos Handler Supervisors, Project Monitors, and Air Sampling Technicians on site, as well as the name of the company each individual is representing; (d) the types of air monitoring (i.e., Exposure Monitoring or area monitoring) being conducted, and the number of samples being collected for each type of air monitoring activity; (e) the results of decontamination enclosure system, Critical Barrier, Isolation Barrier, and Negative Air Pressure Equipment inspections; (f) a summary of corrective actions and Repairs; (g) Work stoppages and the reasons for the work stoppage; (h) manometer readings (at least twice per work shift); (i) emergency and fire exit checks; (j) verification that functional fire extinguishers are present in the Restricted Areas; (k) any unusual events that occurred during the Work; (l) non-compliance issues observed (i.e., observations that conflict with the requirements of the Contractor's Asbestos Work Plan, this Section, or federal, state, and local regulations) along with the corrective actions that were taken to achieve compliance.

5. Contractor Project Record: The Asbestos Handler Supervisor shall maintain a project record in the regulated work area. The Contractor Project Record shall be made available to the Engineer or County for review at any time during the Asbestos Project, and shall be submitted to the County within 24- hours after the completion of the Asbestos Project.

a. At a minimum, the Contractor Project Record shall contain the following information: (a) copies of NYSDOL asbestos certificates/licenses for all individuals/companies working on the Asbestos Project; (b) copies of all notifications, amendments, permits, work safety plans, and Variances related to the Asbestos Project; (c) copies of all exposure and Ambient Air Monitoring results generated during the Asbestos Project; (d) documentation of all pressure differential readings for Regulated Abatement Work Areas; (e) copies of all available bulk sample analytical data as well as asbestos survey reports relating to the Asbestos Project; (f) copies of all daily sign-in sheets as defined in this Article; (g) a list of emergency phone numbers, including the local fire department, local police department, nearest hospital, as well as phone numbers for the Engineer and County personnel responsible for administering the Asbestos Project; (h) a copy of New York State's Asbestos Rules and Regulations (12 NYCRR 56); (i) a copy of EPA's asbestos regulations (40 CFR 61, Subparts A and M); (j) copies of all SDSs pertaining to all chemicals being used during the Asbestos Project; (k) a copy of this Section; (l) a copy of the Contractor's Asbestos Work Plan; (m) copies of all daily air monitoring reports as defined in this Article; (n) copies of all daily Asbestos

Project inspection reports as defined in this Article; (o) copies of all weekly waste storage area inspection reports as defined in this Article.

6. Daily Sign-In Documentation: The Contractor shall generate daily sign-in documentation for all individuals entering and exiting each Regulated Abatement Work Area and Restricted Area, for the duration of the Asbestos Project. The daily sign-in documentation shall be maintained in the Asbestos Abatement Contractor's bound Log. The daily sign-in documentation shall be made available to the Engineer or County for review at any time during the Asbestos Project.

   a. At a minimum, daily sign-in documentation shall include: (a) the individual's full name (printed); (b) the individual's signature; (c) the name of the company the individual is representing; (d) the times of entry and exit from the work areas; (e) verification by the Asbestos Handler Supervisor that the individual possesses current NYSDOL asbestos certifications if the individual intends to enter a Regulated Abatement Work Area.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. NOT USED

2.02 MATERIALS AND EQUIPMENT

A. Respirators: The Contractor shall select respirators approved by NIOSH for use in Regulated Abatement Work Areas where the Abatement or Disturbance of ACM or Asbestos-Containing Waste Materials will occur. If not included within the EHASP the Contractor shall submit their Respiratory Protection Program to County for review prior to abatement activities. At a minimum, the Contractor shall provide each individual within a Regulated Abatement Work Area with a half-face, negative pressure, air purifying respirator equipped with HEPA filter cartridges. The Contractor's Asbestos Handler Supervisor shall make all determinations regarding respiratory protection modifications that will be implemented for the Work. All modifications shall be in accordance with the OSHA Asbestos Standard for the Construction Industry (29 CFR 1926.1101) and the Contractor's Asbestos Work Plan. At no time during the Asbestos Project shall respiratory protection within a Regulated Abatement Work Area be downgraded to below the minimum requirement of a half-face, negative pressure, air purifying respirator equipped with HEPA filter cartridges.

B. PPE: The Contractor shall provide personnel who have a potential to be exposed to asbestos with appropriate PPE.

C. HEPA Filters: HEPA filters used in vacuuming equipment and Negative Air Pressure Equipment must meet or exceed any manufacturer's specifications and recommendations, as well as

specifications presented in the Standard for Safety High Efficiency, Particulate, Air Filter Units (UL 586).

D. Containment Materials: Plastic sheeting used in the construction of temporary enclosures shall be fire retardant in accordance with NFPA Standard 701. Wood or other materials used in the construction of temporary enclosures shall be non-combustible or fire-retardant in accordance with NFPA 255, ASTM D-2898, ASTM E84, and UL 723.

PART 3 – EXECUTION

3.01 EXAMINIATION AND PREPARATION

A. Safe Work Practices for Trace Asbestos materials

1. An exposure assessment shall be performed in accordance with 29 CFR 1926.1101(f) (2) (i) to determine if workers disturbing, handling, or performing cleanup activities involving trace asbestos materials, must wear PPE or respiratory protection.

2. Wetting agents or special work methods shall be utilized to control potential employee exposures to asbestos during the handling, mixing, removing, cutting, application, or cleanup, of trace asbestos materials, except if the use of these wetting agents/work methods is not feasible (e.g., using them may create electrical hazards or equipment malfunctions).

3. Asbestos-contaminated wastes and debris shall be cleaned-up promptly and disposed of in leak-tight containers. The handling, disposal, and transport of Trace Asbestos-Containing Material wastes is not regulated since the wastes are not ACM (i.e., they do not contain greater than 1% asbestos).

4. The use of high-speed abrasive saws that are not equipped with “point-of-cut” ventilators or enclosures with HEPA-filtered exhaust air shall be prohibited.

5. The use of compressed air to cleanup or remove trace asbestos materials is prohibited.

B. Preparation

1. Utilities: The temporary use of any on-site utilities shall be subject to the approval of the County. The Contractor shall furnish all water and hoses needed for the Asbestos Project, as well as any temporary hookups. Also, the Contractor shall supply all necessary heating equipment and water filtration devices needed for the Work. In addition, all temporary lighting and temporary electrical service to a Regulated Abatement Work Area or a Restricted Area shall be provided by the Contractor, and shall be in weather-proof enclosures and be ground fault protected.

2. Signs: The Contractor shall post conspicuous warning signs at all approaches to Regulated Abatement Work Areas, Restricted Areas, and waste storage areas. The signs shall be

located at such a distance so that personnel may read the sign and take necessary precautions before entering a Regulated Abatement Work Area, Restricted Area, or waste storage area. Signs shall comply with the requirements of federal, state, and local regulations. Once Clearance Air Monitoring results indicate that a Regulated Abatement Work Area is in compliance with the provisions for re-occupancy set forth in 12 NYCRR 56, the signs shall be removed. At a minimum, each sign shall bear the following information in English and the predominant language that is spoken by the Contractor's employees if English is not spoken:

DANGER
ASBESTOS CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING
ARE REQUIRED IN THIS AREA
NO SMOKING

C. Fire Extinguishers: The Contractor shall maintain at least two functional fire extinguishers in each Restricted Area. The fire extinguishers shall have a minimum rating of 2-A:10-B:C, and each fire extinguisher shall be checked daily by the Asbestos Handler Supervisor to ensure that it remains functional throughout the duration of the Asbestos Project.

3.02 INSTALLATION

A. NOT USED

3.03 FIELD TESTING AND QUALITY CONTROL

A. Air Monitoring

1. Exposure Monitoring: Air monitoring for airborne concentrations of asbestos fibers shall be conducted by the Asbestos Handler Supervisor (or by a qualified air monitoring firm) in accordance with OSHA.

a. The Contractor shall collect personal air samples from employees who are anticipated to have the greatest risk of exposure, as determined by the Contractor. Exposure Monitoring shall be conducted during each phase of the Asbestos Project (e.g., pre-abatement, Abatement, and cleanup) for one (1) work shift from at least one (1) employee that is representative of each type of work task that is being performed. Each personal air sample will "run" for the employee's entire work shift in order to ensure that enough volume (of air) is collected and an accurate 8-hour TWA can be calculated. Representative 30-minute short-term employee exposures shall also be conducted and shall be determined on the basis of one or more samples representing 30 minute exposures associated with operations that are most likely to produce exposures above the excursion limit for employees in each work area as per OSHA 1926.1101(f)(1)(iii). Documentation regarding the sample numbers, specific

shift when the sampling was conducted, the work tasks that were sampled, the dates of sampling, the employee hours that were worked during the shift, and the total sampling times, shall accompany each laboratory COC form.

b. Complete documentation of all Exposure Monitoring activities shall be in accordance with this Article.

c. The Contractor shall submit all Exposure Monitoring results (along with documentation regarding the type of respiratory protection that was worn during the Exposure Monitoring) to the County within 24- hours from when the air samples were collected.

d. If at any time, PCM analysis of any air sample (i.e., from Exposure Monitoring performed by the Contractor) in any phase of the Asbestos Project (i.e., pre-abatement, Abatement, cleanup, or clearance) indicates that the filter was "overloaded" and a fiber count cannot be obtained, the sample shall immediately undergo TEM analysis. All costs of the additional TEM analysis will be at the Contractor's expense.

2. Area Monitoring: Air monitoring for airborne concentrations of asbestos fibers shall be conducted by the County. The Contractor shall assume that area monitoring will be conducted on all Asbestos Projects (regardless of the project type, the project size, or any conflicting applicable Variance) unless the County makes a determination that area monitoring for a specific project is not necessary.

a. All Clearance Air Monitoring results shall meet or be below background ambient air levels or 0.01 f/cc of air (whichever is greater), prior to the breakdown of the Containment. If Clearance Air Monitoring results indicate a fiber count greater than background ambient air levels or 0.01 f/cc of air in any area, the Contractor will be required to re-clean that area. For projects conducted outside of the five boroughs, the clearance and action criteria is less than 0.01 f/cc; of air, or background levels (whichever is greater). Repeated cycles of cleaning and Clearance Air Monitoring will be performed until a fiber count is achieved that meets or is below background ambient air levels or 0.01 f/cc of air within the area. All costs of re-cleaning and additional Clearance Air Monitoring will be at the Contractor's expense.

3.04 STARTUP AND DEMONSTRATION

A. NOT USED

3.05 ADJUSTING, PROTECTION, AND CLEANUP

A. Bulk Removal

1. Protection of Existing Work to Remain: All Work involving the Abatement or Disturbance of ACM or Asbestos-Containing Waste Materials, must be conducted without damage to,

or contamination of equipment or surfaces within the Regulated Abatement Work Areas, Restricted Areas, or other areas adjacent to these areas. All such damage or contamination shall be immediately corrected and cleaned up by the Contractor at the Contractor's expense.

2. Containments and Negative Air Pressure Equipment: Pressure differential readings for each workday shall be obtained and reviewed by the Asbestos Handler Supervisor on a daily basis. All readings shall be documented and kept in the Contractor's Project Record, as required in this Section. The Asbestos Handler Supervisor shall notify the Engineer and the County immediately, if any variations in the pressure differential readings may have led to the migration of asbestos fibers outside of a Regulated Abatement Work Area. Corrective actions shall be implemented immediately to ensure that negative pressure is restored.

3. Personal Decontamination Enclosure System: The Contractor shall ensure that employees do not leave a Regulated Abatement Work Area wearing any potentially contaminated protective work clothing or PPE. Employees are required to shower prior to leaving the Regulated Abatement Work Area.

B. Clean-up and Disposal

1. Cleanup: All cleaning Work shall progress from the point most remote from the intakes of the Negative Air Pressure Equipment, towards the intakes of the equipment, as well as from the highest point of the surfaces to be cleaned towards the lowest point of the surfaces. The Contractor shall maintain all surfaces, including protective tarps, polyethylene sheeting, and coverings within each Regulated Abatement Work Area and each Restricted Area, free of accumulations of dusts, wastes, and debris. The Contractor shall perform housekeeping activities daily throughout each work shift and at the end of each work shift, in order to prevent any accumulation of dusts, wastes, and debris in these areas. Dry sweeping and using compressed air to cleanup a Regulated Abatement Work Area or a Restricted Area is strictly prohibited. HEPA-filtered vacuums and Wet Cleaning methods shall be used to ensure that these areas remain free of visible dust and debris. In addition, only cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the materials or as approved by the County, shall be used.

2. Collection, Containerization, and Filtration of Wastes: The Contractor shall collect and containerize asbestos waste (solid and liquid), debris, PPE, and Containment materials on a daily basis in accordance with the Asbestos Work Plan. Using chutes to move construction debris or waste (bagged or not bagged) will not be permitted at any time.

   a. Prior to containerizing Asbestos-Containing Waste Materials, the wastes shall be "Adequately Wetted," in accordance with this Section, and wrapped in 6-mil (0.006") polyethylene sheeting, or double-bagged in 6-mil polyethylene bags. The bags shall be "goose necked" and sealed air tight with duct tape, and each bag (or

wrapped item) shall be labeled in accordance with this Section before being placed in an appropriate container (i.e., dumpster, trailer, or roll-off) for disposal.

b. Corrugated cartons or drums may be used in conjunction with polyethylene bags and sheeting for the disposal of Asbestos-Containing Waste Materials that have sharp-edged components (e.g., nails, screws, or tin sheeting) which may tear the bags or sheeting. The waste within these drums or cartons must be wrapped or double-bagged in accordance with this Section. In addition, the cartons/drums must be labeled in accordance with this Section.

c. Wastewater derived from the Asbestos Project shall be collected and filtered through a system with at least a 5.0 micron particle size collection capability. A system containing a series of several filters with progressively smaller pore sizes shall be used to avoid the rapid clogging of the filtration system by large particles. Contaminated filters shall be disposed of as asbestos waste. Filtered wastewater shall be discharged in accordance with all applicable federal, state, and local regulations.

d. The Contractor shall store all bagged Asbestos-Containing Waste Materials in DOT-approved container systems (e.g., a roll-off or trailer). No container shall be filled in excess of the capacity marked on the container, and all containers shall be lined with 6-mil (0.006”) polyethylene sheeting, have a hard top, and shall be locking in addition to meeting any other federal, state, and local asbestos waste storage requirements. In addition, all containers shall have an intact and legible label affixed to it in accordance with this Section. No bagged asbestos waste shall be stored in a Regulated Abatement Work Area or decontamination enclosure system for longer than the current work shift that generated the waste.

e. Non Asbestos Waste: The Contractor shall store non Asbestos-Containing Waste Materials separately from Asbestos-Containing Waste Materials, shall provide all non-asbestos waste containers, and shall make all transportation and disposal arrangements for non-Asbestos-Containing Waste Materials in accordance with federal, state, and local regulations.

3. Labeling: The Contractor shall affix warning labels to all asbestos waste disposal bags, wrapped items, and containers (i.e., drums, dumpsters, trailers, or roll-offs). Labels shall comply with the requirements of federal, state, and local regulations. At a minimum, each label on disposal containers/bags/items shall bear the following information in English:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

[Generator Name, Address, and Telephone Number]

4. Final Visual Inspection and Clearance Air Monitoring: The Independent Third Party Monitor shall not conduct Clearance Air Monitoring until the Regulated Abatement Work Area has been inspected by the Asbestos Handler Supervisor and the Project Monitor has performed the Final Visual Inspection. During this inspection, the Asbestos Handler Supervisor and the Project Monitor shall determine if the following has been achieved: (a) all ACM and Asbestos-Containing Waste Materials have been abated and removed from the area; (b) the area is clean and dry; (c) Critical Barriers and Isolation Barriers are intact; (d) Negative Air Pressure Equipment is turned on and functioning. If any of these items have not been achieved, the Contractor shall perform the necessary corrective actions to achieve compliance before conducting the Clearance Air Monitoring.

5. Breakdown of the Regulated Abatement Work Area: Critical Barriers shall not be removed and Negative Air Pressure Equipment shall not be turned off until Clearance Air Monitoring results meet the criteria specified in this Section and 12 NYCRR 56.

6. Disposal of Wastes: The Contractor shall notify the County at least five business days prior to the removal of any waste containers, so that the County can inspect the containers and review and approve the advance copies of all waste manifests. Asbestos-Containing Waste Materials shall be disposed of to ensure that containers do not remain on the job site for longer than necessary. Containers that have reached their storage capacity shall not remain on site and transportation arrangements shall be made for their Removal.

7. Disposal Documentation: The Contractor shall submit written evidence that the landfill receiving Asbestos-Containing Waste Materials is approved by federal, state, and local regulatory agencies to receive the wastes. If regulated PCBs (as defined in Section 02 84 05 - PCBs Management) were detected in the wastes, the contractor will also ensure that the landfill is approved by federal, state, and local regulatory agencies to receive PCB-regulated wastes. On the date of disposal the Contractor shall submit one (1) copy of the completed manifest that has been signed and dated by the initial transporter in accordance with 6 NYCRR 372 and 40 CFR 262, to the County for signature as Generator. All manifests and Land Disposal Restrictions (LDRs) must be signed by a County employee per Section 01 35 44 - Hazardous Materials Control.

END OF SECTION

SECTION 02 83 05

LEAD MANAGEMENT

PART 1 – GENERAL

1.01 **THE REQUIREMENT**

A. This Section details the requirements for construction and demolition activities affecting materials and structures coated with or containing Lead or other heavy metals, and suspect lead-containing materials, as shown in Tables 1 and 5 attached to Section 01 35 45 – Hazardous Materials Control, documents referenced in Section 01 11 00 – Summary of Work, specified herein, or required to complete the Work, including all affected coatings identified and impacted by the Work. All Work to be performed under this Section shall be performed using methods, tools, and equipment that have demonstrated effectiveness in preventing airborne emissions from migrating outside of work areas.

1. Coated material and structures may contain other heavy metals in addition to Lead. Where Lead is discussed in this Section the Contractor shall consider other heavy metals (i.e., arsenic, cadmium, chromium, etc.)

B. All Work under this Section shall be performed to minimize the creation of airborne emissions; minimize the quantity of hazardous waste generated; protect the health and safety of all site personnel and the welfare of the public; and avoid adverse environmental impacts.

C. Unless otherwise specified, the Work of this Section shall also be performed in accordance with the most current applicable federal, state, and local regulations.

D. In the absence of analytical testing results for a specific painted/coated material, air monitoring and worker Personal Protective Equipment (PPE) requirements, including respiratory protection, shall address the potential presence of PCBs, Lead and heavy metals. Any unforeseen PCB or heavy metal-containing paints/coatings discovered during the Work to be performed under this Section shall be remediated as necessary to complete the Work in accordance with this Specification.

E. The Contractor shall perform all Work under this Section without damaging or contaminating adjacent areas to where the work is being performed. Where such areas are damaged or contaminated, as determined by the County, the Contractor shall restore the areas to their original condition at no additional cost to the County.

1.02 PAYMENT

A. Except for unforeseen lead-containing materials and related work eligible for payment under allowance, as described in Section 01 35 45– Hazardous Materials Control, no separate payment

will be made for performing any work required under this Section and the Contractor shall include all costs thereof in its prices bid for the Contract.

B. Payment for known lead or other heavy metal contaminated materials identified in the Pre-Demolition Survey (PDS) referenced in Section 01 11 00 – Summary of Work Paragraph 1.05 F will be payable as part of the lump sum Contract Items as specified in Section 01 20 00 – Measurement and Payment.

C. Payment for remediation of unforeseen lead-containing materials, including the removal and disposal of lead paint, will be made under allowance as specified in Section 01 20 00 – Measurement and Payment.

D. Payment for the disposal of lead wastes (with the exception of painted/coated scrap metal) will not be made until a signed copy of the manifest from the Treatment, Storage, and Disposal Facility (TSDF), certifying the amount of lead wastes delivered is returned with complete chain-of-custody (COC) documentation to the County.

1.03 RELATED SECTIONS

A. Section 01 20 00 -- Measurement and Payment

B. Section 01 35 27 -- Environmental Health and Safety Requirements

C. Section 01 35 44 -- Hazardous Materials Control

D. Section 01 74 00 -- Cleaning and Waste Management

1.04 REFERENCES

A. Definitions

1. Abatement: Defined by the EPA (40 CFR 745.223) as any measures or set of measures designed to permanently eliminate Lead Paint hazards. Abatement includes, but is not limited to, the removal of Lead Paint and dust, the permanent enclosure or encapsulation of Lead Paint, or the replacement of Lead-painted surfaces or fixtures. Abatement does not include renovation, remodeling, landscaping, or other activities, when such activities are not designed to permanently eliminate Lead Paint hazards, but instead, are designed to repair, restore, or remodel a given structure or dwelling, even though these activities may incidentally result in a reduction or elimination of Lead Paint hazards. Furthermore, Abatement does not include interim controls (e.g., the spot removal of Lead Paint on a surface in order to perform torch cutting at that location), operations and maintenance activities, or other measures and activities designed to temporarily, but not permanently, reduce Lead Paint hazards.

2. Action Level: Defined by OSHA as individual exposure, without regard to the use of respirators, to a specific airborne concentration of a contaminant expressed in micrograms

per cubic meter of air (µg/m^3) calculated as an 8-hour Time-Weighted Average (TWA). Once an Action Level is met or exceeded, the Contractor is responsible for meeting specific requirements outlined in the applicable OSHA standard, which may include additional worker Exposure Monitoring, the use of PPE including respiratory protection, the use of Hygiene Facilities, medical surveillance, or training for workers. The following Action Levels are pertinent to the disturbance, removal, construction/demolition, and disposal activities associated with painted/coated materials and structures: (a) cadmium – 2.5 µg/m^3 per 29 CFR 1926.1127; (b) hexavalent chromium - 2.5 µg/m^3 per 29 CFR 1926.1126; (c) inorganic arsenic - 5 µg/m^3 per 29 CFR 1926.1118; (d) Lead - 30 µg/m^3 per 29 CFR 1926.62.

3. Area Monitoring: Stationary air sampling outside of a Lead Control Area for the purpose of determining compliance with OSHA's Lead in Construction Standard (29 CFR 1926.62), and for the purpose of ensuring that airborne Lead concentrations remain below 30 ug/m^3 outside of the Lead Control Area during all work activities that have the potential to disturb Lead-Containing Materials or Lead Wastes. Area Monitoring for PCBs or other heavy metals will be required if Exposure Monitoring results exceed corresponding Action Levels, Permissible Exposure Limits (PELs), or Recommended Exposure Limits (RELs). All Area Monitoring shall follow pertinent NIOSH or ASTM sampling methodologies.

4. C-3/C-5 Supervisor Competent Person Training for Deleading of Industrial Structures: A training course administered by the SSPC or a company that has been approved by the SSPC as a "trainer," which includes discussions of the following: (a) background information on Lead and other toxic metals; (b) a legal and regulatory overview; (c) worker protection from Lead and other toxic metals; (d) compliance with air, soil, water, sediment, and dust regulations; (e) management of solid and hazardous wastes; (f) sources of Lead exposure; (g) control of environmental releases; (h) specifications and Site-specific compliance plans; (i) work Site preparation; (j) insurance and bonding issues; (k) other safety and health hazards.

5. Certified Industrial Hygienist (CIH): Refers to an individual employed by the Contractor who is currently certified by the American Board of Industrial Hygiene (ABIH).

6. Competent Person: Defined in the OSHA Lead in Construction Standard (29 CFR 1926.62) as one who is capable of identifying existing and predictable hazards in the surroundings or working conditions, and who has authorization to take prompt corrective measures to eliminate them. Duties of the Competent Person include the following: (a) determining prior to the performance of the Work, whether Lead, PCBs, or other heavy metals are present in the workplace; (b) establishing Lead Control Areas and assuring that access to and from those areas is limited to authorized personnel; (c) assuring the adequacy of any employee Exposure Monitoring required by OSHA; (d) assuring that all employees exposed to airborne contaminant levels above Action Levels, PELs, or RELs wear appropriate PPE, respiratory protection, and are trained in the use of appropriate methods of exposure control for all of the contaminants present; (e) assuring that proper Hygiene Facilities are provided and that workers are trained to use those facilities; (f) assuring that

engineering controls specific to the contaminants present are implemented, maintained in proper operating condition, and functioning properly.

7. Decontamination Area: Designated area within the Hygiene Facilities for removing gross contamination from PPE (using a HEPA vacuum), washing away contamination that has accumulated on the skin and hair (using soap and water), removing and disposing/washing of contaminated PPE, and donning clean clothing that will not potentially contaminate areas outside of a Lead Control Area's Physical Boundary.

8. DOT Hazardous Materials Transportation Training: Training that meets the criteria outlined in 49 CFR 172.704. This training shall include discussions of the following: (a) hazardous materials tables within 49 CFR 172; (b) material packaging and labeling; (c) shipping papers and placards; (d) material loading and segregation.

9. Exclusion Zone: (See definition of "Lead Control Area").

10. Exposure Monitoring: Personal air sampling performed outside the respirator within the breathing zone of individuals, for the purpose of determining compliance with OSHA's Limits for Air Contaminants Table (29 CFR 1910.1000, Table Z-1), OSHA's Cadmium in Construction Standard (29 CFR 1926.1127), Hexavalent Chromium in Construction Standard (29 CFR 1926.1126), Inorganic Arsenic in Construction Standard (29 CFR 1926.1118), and Lead in Construction Standard (29 CFR 1926.62). Analytical results obtained from Exposure Monitoring will be used to select appropriate respiratory protection and PPE for individuals within a work area. For the purpose of this Section, Exposure Monitoring samples shall be collected from individuals who are representative of each type work task being conducted by the Contractor, and all Exposure Monitoring shall follow pertinent NIOSH or ASTM sampling methodologies.

11. Hazardous Waste Operations (HAZWOPER) Training: Training that meets the criteria outlined in the OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120). A minimum of 24-hour HAZWOPER Training will be required for abatement work being performed under this Section. However, certain types of work may require 40-hour HAZWOPER Training. All decisions regarding the specific HAZWOPER Training that will be required for each work task shall be made by the Engineer.

12. High-Efficiency Particulate Air (HEPA) Filter: A filter designed to remove 99.97% of all particles greater than 0.3 micrometers (μm) in diameter. For the purpose of this Section, HEPA vacuum and local exhaust filtration equipment used by the Contractor shall meet the Standard for Safety High-Efficiency, Particulate, Air Filter Units (UL 586) developed by Underwriters Laboratories.

13. Homogenous Materials: Lead-Containing Materials which are similar in appearance, color, texture, and substrate type.

14. Hygiene Facilities: Facilities within the Physical Boundary of a work area that are set up to prevent cross contamination and are equipped with change areas and separate storage

facilities for PPE and clean clothing. Hygiene Facilities shall include adequately supplied hand washing station(s) (i.e., running water, soap, and clean towels) or shower(s) (hot and cold water that is controllable at the tap, soap, shampoo, and clean towels).

15. Lead: Defined in the OSHA Lead in Construction Standard (29 CFR 1926.62) as metallic Lead, all inorganic Lead compounds, and organic Lead soaps. Excluded from this definition are all other organic Lead compounds.

16. Lead Awareness Training: Training that meets the criteria outlined in the OSHA Lead in Construction Standard (29 CFR 1926.62) for individuals that have the potential to be exposed to Lead-Containing Materials or Lead Wastes. This training shall include discussions of the following: (a) current federal, state, and local regulations pertaining to Lead (including 29 CFR 1926.62) and other heavy metals that may be disturbed during the Work; (b) the health effects of Lead and other heavy metal exposure; (c) state-of-the-art work practices, engineering controls, and procedures for Abatement, removal, construction/demolition, materials handling, waste management, and housekeeping activities that involve Lead-Containing Materials and Lead Wastes; (d) the use and maintenance of PPE and the use and maintenance of respirators in accordance with 29 CFR 1910.134; (e) medical surveillance programs and the medical removal protection program; (f) requirements regarding warning signs, labeling, and Safety Data Sheets (SDSs) in accordance with 29 CFR 1910.1200; (g) responsibilities of the Competent Person.

17. Lead-Based Paint (LBP): A term used by Department of Housing and Urban Development (HUD) and the EPA to define paint or other surface coatings (e.g., glazes) with Lead levels equal to or exceeding 1.0 milligram per square centimeter (1.0 mg/cm2) or 0.5 % by dry weight. LBP is subject to the requirements set forth in the OSHA Lead in Construction Standard (29 CFR 1926.62). In the absence of analytical testing, LBP shall be considered PCB and heavy metal-containing.

18. Lead-Containing Material: Any material that contains, or is coated with, a detectable concentration of Lead. In the absence of analytical testing, a Lead-Containing Material shall be considered PCB and heavy metal-containing.

19. Lead-Containing Paint (LCP): A term used to define paint or other surface coatings (e.g., glazes) with any detectable amount of Lead less than 1.0 milligram per square centimeter (1.0 mg/cm2) or 0.5 % by dry weight. LCP is subject to the requirements set forth in the OSHA Lead in Construction Standard (29 CFR 1926.62). In the absence of analytical testing, LCP shall be considered PCB and heavy metal-containing.

20. Lead Control Area: The area within the Physical Boundary where worker Hygiene Facilities are located and where all Work activities take place that involve the disturbance of Lead-Containing Materials and Lead Wastes.

21. Lead Paint: A generic term that refers to both LBP and LCP.

22. Lead Waste: Non-specific liquid or solid waste generated during the Abatement, removal, construction/demolition, handling, or cleanup of a Lead-Containing Material.

23. Organic Vapor Cartridge: A NIOSH approved respirator filter typically containing 25 to 40 grams of sorption media such as activated charcoal.

24. OSHA Cadmium in Construction Standard (29 CFR 1926.1127): A federal standard that applies to all construction work where an employee may be occupationally exposed to cadmium. In this standard, "construction work" is defined as work involving construction, alteration, or repair, including, but not limited to, the following: (a) wrecking, demolition, or salvage of structures where cadmium or materials containing cadmium are present; (b) the use of cadmium-containing paints, and cutting, brazing, burning, grinding, or welding on surfaces that were painted with cadmium-containing paints; (c) construction, alteration, repair, maintenance, or renovation of structures, substrates, or portions thereof, that contain cadmium, or materials containing cadmium; (d) cadmium welding, cutting and welding cadmium-plated steel, brazing or welding with cadmium alloys; (e) the installation of products containing cadmium; (f) electrical grounding with cadmium welding, or electrical work using cadmium-coated conduit; (g) maintaining or retrofitting cadmium-coated equipment; (h) cadmium contamination/emergency cleanup; (i) transportation, disposal, storage, or containment of cadmium or materials containing cadmium on the site or location at which construction activities are performed.

25. OSHA Hexavalent Chromium in Construction Standard (29 CFR 1926.1126): A federal standard that applies to occupational exposures to chromium (VI) in all forms and compounds in construction except the following: (a) exposures that occur in the application of pesticides regulated by the EPA or another federal government agency (e.g., the treatment of wood with preservatives); (b) exposures to Portland cement; (c) exposures where the employer has objective data demonstrating that a material containing chromium or a specific process, operation, or activity involving chromium cannot release dusts, fumes, or mists of chromium (VI) in concentrations at or above the PEL of 5 $\mu g/m^3$ as an 8-hour TWA under any expected conditions of use.

26. OSHA Inorganic Arsenic in Construction Standard (29 CFR 1926.1118): A federal standard that applies to all occupational exposures to inorganic arsenic except the following: (a) employee exposures in agriculture; (b) exposures resulting from pesticide application; (c) exposures resulting from the treatment of wood with preservatives or the utilization of arsenic-preserved wood.

27. OSHA Lead in Construction Standard (29 CFR 1926.62): A federal standard that applies to all construction work where an employee may be occupationally exposed to Lead. In this standard, "construction work" is defined as work for construction, alteration, or repair, including painting and decorating. It also includes, but is not limited to, the following: (a) the demolition or salvage of structures where Lead or materials containing Lead are present; (b) the removal or encapsulation of materials containing Lead; (c) new construction, alteration, repair, or renovation of structures, substrates, or portions thereof,

that contain Lead, or materials containing Lead; (d) the installation of products containing Lead; (e) Lead contamination/emergency cleanup; (f) the transportation, disposal, storage, or containment of Lead or materials containing Lead on the site or location at which construction activities are performed; (g) maintenance operations associated with any of the construction activities described in this definition.

28. OSHA Monitoring: (See definition of "Exposure Monitoring").

29. P-100 Filter: (See definition of: "High-Efficiency Particulate Air (HEPA) Filter").

30. Perimeter Monitoring: (See definition of "Area Monitoring").

31. PEL: Defined by OSHA as employee exposure, without regard to the use of respirators, to a specific airborne concentration of a contaminant expressed in micrograms per cubic meter of air ($\mu g/m^3$) calculated as an 8-hour TWA. Once a PEL is met or exceeded for a particular contaminant, the Contractor is responsible for meeting specific requirements outlined in the applicable OSHA standard, which may include worker Exposure Monitoring, the use of PPE including respiratory protection, the use of Hygiene Facilities, medical surveillance, or training for workers. The following PELs are pertinent to removal, demolition, and disposal activities associated with Lead-Containing Materials and Lead Wastes: (a) cadmium – 5 $\mu g/m^3$ per 29 CFR 1926.1127; (b) hexavalent chromium - 5 $\mu g/m^3$ per 29 CFR 1926.1126; (c) inorganic arsenic - 10 $\mu g/m^3$ per 29 CFR 1926.1118; (d) Lead - 50 $\mu g/m^3$ per 29 CFR 1926.62.

32. Personal Monitoring: (See definition of "Exposure Monitoring").

33. Physical Boundary: A physical barrier designated with ropes, "caution tape," or a partition that surrounds a work area in order to limit the entry of unauthorized personnel and delineate "clean areas" from areas that may meet or exceed an Action Level, PEL, or REL.

34. Recommended Exposure Limit (REL): An exposure limit recommended by the NIOSH that can be expressed as a TWA, Ceiling Limit, or Short-Term Exposure Limit (STEL). Once an REL is met or exceeded for a particular contaminant, the Contractor is responsible for ensuring that workers receive appropriate Exposure Monitoring, PPE, including respiratory protection, Hygiene Facilities, medical surveillance, and training.

35. Regulated Area: (See definition of "Lead Control Area").

36. Resource Conservation and Recovery Act (RCRA) Training: Training that meets the criteria outlined in 40 CFR 265.16. This Training shall include Site-specific discussions of the following: (a) hazardous waste identification; (b) waste storage container use and labeling; (c) waste storage area management; (d) personal health and safety, including fire safety; (e) manifesting and the off-site transportation of wastes; (f) procedures for using, inspecting, repairing, and replacing emergency equipment and monitoring equipment; (g) procedures for communicating with other employees and outside emergency response

personnel; (h) responses to fires or explosions; (i) responses to leaks, spills, and potential groundwater contamination incidents ; (j) the shutdown of operations.

37. TWA: The average time over a given work period (e.g., an 8-hour workday) of a person's exposure to a chemical or agent. The average is determined by sampling for the chemical or agent throughout the time period.

38. Trigger Activities: Certain activities that involve a disturbance of Lead-Containing Materials or Lead Wastes. Depending upon whether the performance of these activities exceeds an Action Level, PEL, or REL, the requirements may include additional worker Exposure Monitoring, the use of PPE including respiratory protection, the use of Hygiene Facilities, medical surveillance, or training for workers. Examples of Trigger Activities include, but are not limited to, the following: abrasive blasting, welding, torch cutting/burning, heat gun usage, needle gunning/scaling, rivet busting, using a rotopeen, mechanical sanding/grinding, using mechanical shears, hand scraping/sanding, chemical stripping, and the manual demolition of Lead-Containing Materials.

39. X-Ray Fluorescence (XRF): An analytical method that can be used in the field for determining the Lead content of paints/coatings on a building component or material surface.

B. Reference Standards

1. The Contractor shall comply with all applicable regulations, standards, and guidelines of federal, state, and local environmental and occupational safety and health agencies regarding Lead-Containing Materials and Lead Wastes. These regulations, standards, and guidelines include, but are not limited to the following:

a. Department of Transportation (DOT):

1) 49 CFR 171 - General Information, Regulations, and Definitions;

2) 49 CFR 172 – Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements;

3) 49 CFR 173 – Shippers: General Requirements for Shipments and Packaging's;

4) 49 CFR 178 – Specifications for Packaging's.

b. Environmental Protection Agency (EPA):

1) 40 CFR 50 – National Primary and Secondary Ambient Air Quality Standards;

2) 40 CFR 116 – Designation of Hazardous Substances;

3) 40 CFR 117 – Determination of Reportable Quantities for Hazardous Substances;

4) 40 CFR 260 – Hazardous Waste Management Systems: General;

5) 40 CFR 261 – Identification and Listing of Hazardous Waste;

6) 40 CFR 262 – Standards Applicable to Generators of Hazardous Waste;

7) 40 CFR 263 – Standards Applicable to Transporters of Hazardous Waste;

8) 40 CFR 264 – Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities;

9) 40 CFR 265 – Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities;

10) 40 CFR 268 – Land Disposal Restrictions;

11) 40 CFR 302 – Designation, Reportable Quantities, and Notification;

12) 40 CFR 745 – Lead-Based Paint Poisoning Prevention in Certain Residential Structures.

c. National Institute for Occupational Safety and Health (NIOSH):

1) Method 5503 – Polychlorobiphenyls;

2) Method 7048 – Cadmium and Compounds, as Cd;

3) Method 7082 – Lead by FAAS;

4) Method 7105 – Lead by GFAAS;

5) Method 7300 – Elements by ICP;

6) Method 7600 – Chromium, Hexavalent;

7) Method 7604 – Chromium, Hexavalent;

8) Method 7900 – Arsenic and Compounds, as;

9) NIOSH Pocket Guide to Chemical Hazards.

d. New York State Department of Environmental Conservation (NYSDEC):

1) 6 NYCRR 364 – Waste Transporter Permits;

2) 6 NYCRR 370 – Hazardous Waste Management Regulations;

3) 6 NYCRR 371 – Identification and Listing of Hazardous Waste;

4) 6 NYCRR 372 – Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities;

5) 6 NYCRR 373 – Hazardous Waste Management Facilities;

6) 6 NYCRR 376 – Land Disposal Restrictions.

e. Occupational Safety and Health Administration (OSHA):

1) 29 CFR 1910 – Occupational Safety and Health Standards;

2) 29 CFR 1910.28 – Safety Requirements for Scaffolding;

3) 29 CFR 1910.120 – Hazardous Waste Operations and Emergency Response;

4) 29 CFR 1910.134 – Respiratory Protection Standard;

5) 29 CFR 1910.1200 - Hazard Communication Standard;

6) 29 CFR 1926 – Safety and Health Regulations for Construction;

7) 29 CFR 1926.62 – Lead in Construction Standard;

8) 29 CFR 1926.1118 – Inorganic Arsenic in Construction Standard;

9) 29 CFR 1926.1126– Hexavalent Chromium in Construction Standard

10) 29 CFR 1926.1127 – Cadmium in Construction Standard.

f. Society for Protective Coatings (SSPC):

1) SSPC-Guide 6, Guide for Containing Debris Generated During Paint Removal Operations;

2) SSPC-Guide 7, Guide for the Disposal of Lead-Contaminated Surface Preparation Debris;

3) SSPC-SP COM, Surface Preparation Commentary for Steel and Concrete Substrates;

4) SSPC-SP 1, Solvent Cleaning;

5) SSPC-SP 2, Hand Tool Cleaning;

6) SSPC-SP 3, Power Tool Cleaning;

7) SSPC-SP 11, Power Tool Cleaning to Bare Metal;

8) SSPC-SP 13/ NACE No.6, Surface Preparation of Concrete;

9) SSPC-SP 15, Commercial Grade Power Tool Cleaning.

g. Underwriters Laboratories, Inc. (UL):

1) UL 586 – Standard for Safety High Efficiency, Particulate, Air Filter Units.

1.05 QUALITY ASSURANCE

A. Scheduling: The Contractor shall coordinate and schedule all phases of the Work to be performed under this Section with the County, subcontractors, material suppliers, and other parties as necessary to ensure the proper execution of the Work.

B. Compliance: In addition to the detailed requirements of this Section, the Contractor shall comply with all applicable regulations of federal, state, and local authorities pertaining to the disturbance, Abatement, removal, construction/demolition, handling, storage, transportation, and disposal of Lead-Containing Materials and Lead Wastes. All matters regarding the interpretation of any regulations, standards, or policies shall be submitted to the Engineer for resolution before starting the Work. Where the requirements of this Section, or federal, state, or local regulations conflict or vary, the most stringent requirements or regulations shall apply.

C. Rejection of Non-Complying Items: The County reserves the right to reject items incorporated into the Work which fail to meet the specified minimum requirements. The County also reserves the right to reject Contractor submittal items that are deemed inappropriate or unacceptable by the Engineer or County. Submittal items that may be deemed inappropriate or unacceptable include proposed vendors or subcontractors with previous regulatory citations/violations. The County further reserves the right, and without prejudice to other recourse, to accept non-complying items subject to an adjustment in the Contract amount, as approved by the County.

D. Suspect Material Characterization: In order to classify a paint or coating as non-PCB or non-heavy metal containing, a paint chip/coating sample or an XRF reading must be collected. The bulk samples shall be sent to an analytical laboratory meeting the requirements of this Section.

1. Suspect PCB or Heavy Metal-Containing Paints: Although there are no certification requirements pertaining to an individual that collects paint chip/coating samples in an industrial or commercial setting, this Section requires paint chip/coating sampling to be performed by an individual who has successfully completed a PCB awareness course and HAZWOPER Training course (as defined in this Section) within the past year. In addition, the individual shall possess a current EPA Lead Inspector or EPA Risk Assessor

certification, or shall have successfully completed a Lead Awareness Training course (within the past year) as defined in this Section and have documented experience in collecting paint chip samples.

2. The qualifications of individuals who will collect paint chip/coating samples or XRF readings must be approved by the Engineer prior to sample/reading collection. Analytical results for paint chip/coating samples or XRF readings that are collected by individuals not approved by the Engineer will not be recognized or accepted as valid by the County.

E. Qualifications:

1. The Paint Removal Company shall have successfully completed at least two (2) projects of comparable scope and methodologies to the Work being performed under this Section within the past three (3) years. This experience shall be documented by identifying the following: (a) the name, address, and phone number of each facility where the Work was performed; (b) the name of the individual representing the owner who supervised the work at each facility; (c) the types of facilities where the work was performed; (d) the volume and type of each material that was abated/removed; (e) the specific methods of Abatement/removal used at each facility (including the tools, technologies, and engineering controls employed).

2. Competent Person: The Contractor shall have on staff and assigned to this Contract a Competent Person who has successfully completed DOT Hazardous Materials Transportation Training and RCRA Training courses as defined in this Section. In addition, the Competent Person shall have successfully completed both HAZWOPER Training and Lead Awareness Training courses as defined in this Section, or C-3/C-5 Supervisor Competent Person Training for Deleading of Industrial Structures as defined in this Section, or training as an EPA Lead Supervisor in accordance with 40 CFR 745.225 (b)(7)(vi). Each training course shall have been completed within the past year in the form of either an initial course or a refresher course. In addition, the Competent Person shall be able to fulfill the duties defined in this Section and have a minimum of two (2) years' experience on projects involving Lead, and has served as the Competent Person on at least three (3) projects of comparable scope and methodologies to the work being conducted under this Section.

3. Waste Manager: The Contractor shall have on staff and assigned to this Contract a waste manager who has successfully completed DOT Hazardous Materials Transportation Training, HAZWOPER Training, Lead Awareness Training, and RCRA Training courses as defined in this Section. Each training course shall have been completed within the past year in the form of either an initial course or a refresher course. In addition, the waste manager shall have a minimum of two (2) years' experience on projects involving hazardous wastes (including Lead). It is acceptable for an individual who meets the criteria of the Competent Person, to also serve as the waste manager for this Contract as long as the individual fulfills all of the requirements of this paragraph.

4. Lead Worker: The Contractor shall have on staff and assigned to this Contract a sufficient number of lead workers who have successfully completed DOT Hazardous Materials Transportation Training and Lead Awareness Training courses as defined in this Section. Each training course shall have been completed within the past year in the form of either an initial course or a refresher course. In addition, each lead worker shall have a minimum of one (1) year of experience on projects involving Lead, and have worked on at least three (3) projects of comparable scope and methodologies to the work being conducted under this Section.

5. Air Monitor: The Contractor shall have an air monitor assigned to this Contract who has successfully completed Lead Awareness Training course as defined in this Section. This training course shall have been completed within the past year in the form of either an initial course or a refresher course. In addition, the air monitor shall have a minimum of two (2) years' experience in conducting Area Monitoring and Exposure Monitoring on projects involving hazardous wastes (including Lead). It is acceptable for an individual who meets the criteria of the Competent Person (as defined in this Section) or waste manager (as defined in this Section), to also serve as the air monitor for this Contract as long as the individual satisfies all of the requirements of this paragraph.

1.06 SUBMITTALS

A. Thirty business days prior to the Work of this Section or as directed by the Engineer, the Contractor shall submit the following to the Engineer:

1. Lead Inspection and Sampling Plan: The Contractor shall provide a Lead Inspection and Sampling Plan to identify suspect lead-containing materials, as shown on Table 5, attached to Section 01 35 45 – Hazardous Materials Control, and collect confirmatory samples, as appropriate during the inspection. The Lead Inspection and Sampling Plan shall include at a minimum:

a. Credentials of the individual responsible for inspection and sampling. At a minimum, the inspection shall be performed by an Environmental Professional, as defined within this Specification, who has current HAZWOPER, Lead Awareness, OSHA 10-hour, and confined space trainings, as applicable to the location of the work, and has performed inspection work on at least three (3) projects of comparable scope.

b. Credentials of the laboratory providing sample analysis. The credentials shall include current certification by the New York State Department of Health's (NYSDOH) Environmental Laboratory Approval Program (ELAP).

c. Sample collection, analysis and reporting protocol.

d. Health and safety protocol (Job Hazard Analysis (JHA)) for all investigative activities.

2. Lead Inspection Report: The Contractor shall provide a Lead Inspection Report prepared by the Environmental Professional summarizing the results of all inspection activities, and as applicable, a sampling narrative, laboratory data packages and inventory of all identified suspect and confirmed lead-containing materials.

3. Lead Management Plan(s): Each Contractor that will disturb Lead or other heavy metals during the course of Work to be performed under this Section shall submit a detailed, project-specific Lead management plan that addresses work procedures and equipment to be used during the disturbance, removal, handling, collection, and disposal of Lead-Containing Materials and Lead Wastes. Work requiring a Lead management plan includes, but is not limited to, Abatement, spot removal, and construction/demolition activities. The Lead management plan shall be prepared in accordance with OSHA Construction Standards and all other pertinent federal, state, and local regulations. The Lead management plan shall also be signed and dated by a CIH meeting the definition in this Section.

   a. Lead Control:

      1) Drawings showing the location and details of the following: (a) each Lead Control Area; (b) each Hygiene Facility; (c) proposed electrical hookups; (d) proposed water hookups: (e) each waste storage area: (f) restroom areas; (g) areas designated for eating, drinking, and smoking;

      2) A detailed discussion regarding the interfacing of trades (i.e., how the Contractor will coordinate the Work with other contractors or County employees working at the Site) and the sequencing of Lead-related Work;

      3) A detailed discussion regarding the collection, handling procedures, and disposal of Lead-Containing Materials and Lead Wastes (including the collection, filtering, and disposal of wastewater);

      4) A detailed discussion regarding the procedures and methodologies that will be used to conduct Exposure Monitoring and Area Monitoring for particulates. Also, provide the name and qualifications (i.e., training and experience documentation) of the air monitor who will be responsible for conducting the air monitoring activities. The air monitor shall at a minimum, satisfy the qualification requirements set forth in this Section;

      5) A detailed discussion regarding housekeeping procedures to be used for maintaining clean work areas and clean Hygiene Facilities;

      6) A detailed discussion regarding the specific methods and procedures of emissions control that will be used to ensure that airborne contaminant levels do not meet or exceed an OSHA Action Level outside of each Lead Control Area. It should be noted that even after paint/coating removal, the County has found that demolition activities (e.g., torch-cutting abated steel) still have the

potential to generate elevated airborne levels of Lead. Therefore, the Contractor shall provide engineering controls to capture potential Lead dusts or fumes emitted during demolition work that involves the cutting or burning of steel structures that have already been abated;

7) A detailed task analysis for each Work activity that has the potential to disturb Lead-Containing Materials or Lead Wastes. Each task analysis shall include, but is not limited to, the following information: (a) the type of work activity; (b) the tools/equipment that will be used; (c) operation and maintenance practices and procedures that will be used for the tools/equipment; (d) the types of Lead-Containing Materials that may be disturbed or Lead Wastes that may be generated when performing the activity; (e) the engineering controls that will be used to control the spread of contamination during the activity; (f) the proposed crew size for the activity and individual employee responsibilities during the activity; (g) housekeeping procedures that will be used during the activity; (h) PPE and proposed respiratory protection that will be used for the activity;

8) Equipment and Supplies: Identify the equipment and supplies that will be used to perform the Work;

9) Rental Equipment Notification: If rental equipment is to be used during the Work, the Contractor shall notify the rental agency in writing concerning the intended use of the equipment. Rental equipment data demonstrating compliance with the performance requirements of this Section must be presented to and approved by the Engineer prior to use;

10) SDSs: Provide SDSs for all chemical products (including chemical stripping products) to be used for the Work;

11) The name and qualifications (i.e., experience and training documentation) of the Competent Person who will be responsible for the oversight and execution of the Lead Management Plan during all activities affecting Lead-Containing Materials and Lead Wastes. At a minimum, the Competent Person shall satisfy the qualification requirements set forth in this Section and be present whenever work of this Section is being performed.

b. Waste Management:

1) The identification of Lead-Containing Materials, Lead Wastes, and hazardous wastes (as defined in 40 CFR 261 and 6 NYCRR 371) associated with the Work;

2) The estimated quantity of each waste stream (regulated and non-regulated) that will be generated and disposed of/recycled;

3) The name, address, phone number, and qualifications for each vendor and facility that will be transporting, storing, testing, or disposing of the wastes. The Contractor shall verify the permit status of the facility as well as check for outstanding violations and enforcement actions. Include a 24-hour phone contact for each vendor and facility;

4) Current permit documentation for each recycling facility or TSDF indicating that the facility is approved by federal, state, and local regulatory agencies to receive Lead-Containing Materials and Lead Wastes. The documentation shall include an "acceptance letter" from each TSDF indicating its ability to accept the specific waste streams that will be generated during Work performed under this Section;

5) Current 6 NYCRR 364 permit documentation for the waste transporter that will transport Lead-Containing Materials and Lead Wastes from the work Site to the TSDF. The documentation shall clearly indicate the transporter's ability to deliver the Lead-Containing Materials and Lead Wastes to the chosen TSDF;

6) Spill prevention, containment, and cleanup contingency measures to be implemented during the Work, as well as procedures to be followed during a suspected Lead emissions/bulk material release or emergency situation. All measures and procedures shall be in accordance with the standards referenced in this Section;

7) A detailed discussion of the on-site handling, storage, removal, and disposal of waste materials. This discussion shall include, but is not limited to, the following: (a) specifications for a secondary containment system for each drum storage area; (b) the methods of demarcation that will be used to identify the waste storage areas and each waste container; (c) the methods and procedures that will be used to collect and containerize wastes on a daily basis; (d) the types of containers that will be used to containerize the wastes; (e) the submittal of weekly regulated waste inspection and inventory records as required in this Section;

8) The name and qualifications (i.e., experience and training documentation) of the waste manager who will be responsible for the oversight and execution of the Lead management plan during waste management activities involving Lead-Containing Materials and Lead Wastes. At a minimum, the waste manager shall satisfy the qualification requirements set forth in this Section.

c. A detailed schedule for the implementation of the Lead management plan elements. The schedule shall clearly indicate the starting and completion dates for the work, and shall allow adequate time for cleanup, inspections, and air monitoring activities.

d. Medical Surveillance: For all activities that result in airborne Lead concentrations equal to, or in excess of the Action Level (as defined in 29 CFR 1926.62), or for those activities that take place within a Lead Control Area, the Contractor shall submit for this Contract a sufficient number of properly trained and experienced workers, each of whom shall: (a) have completed initial blood testing (including Zinc Protoporphyrin (ZPP) testing), and have a Blood Lead Level (BLL) below 35 micrograms per deciliter (μg/dl)(if the worker's BLL is in excess of 35 μg/dl, the worker shall show medical approval for this Work); (b) have received a medical exam that included a Pulmonary Function Test (PFT) within the past year; (c) have received written medical clearance within the past year, by a licensed health care professional, to wear a respirator; (d) have received a qualitative or quantitative respirator fit-test for the specific respirator the employee will be using for this Work within the past year.

e. Employee Documentation: For all activities that result in airborne contaminant concentrations (i.e., heavy metals or PCBs) equal to, or in excess of an Action Level, PEL, or REL, or for those activities that take place within a Lead Control Area, the Contractor shall provide a sufficient number of properly trained and experienced workers, each of whom shall: (a) have written proof of training (e.g., certificates) in accordance with the qualification requirements of this Section for lead workers, Competent Persons, waste managers, and air monitors that will be used for the Work; (b) copies of resumes for lead workers, Competent Persons, waste managers, and air monitors that will be used for the Work, indicating work experience as required in this Section; (c) dates and written proof of initial medical surveillance by the Contractor or other employer within the past year, and proof that the employee is currently participating in the employer's ongoing medical surveillance program in accordance with this Section; (d) dates and written proof of respiratory clearance and a medical exam in accordance with this Section; (e) dates and written proof of a respirator fit-test in accordance with this Section.

f. A current (i.e., within the last month) signed and notarized statement disclosing all of the Contractor's OSHA, EPA, and DOT citations/violations on projects involving Lead within the past three (3) years. If the Contractor will be using a subcontractor, a current signed and notarized statement disclosing all of the subcontractor's OSHA, EPA, and DOT citations/violations on projects involving Lead within the past three (3) years will also be required.

4. Analytical Laboratory Qualifications for Analyzing Suspect Lead-Containing Materials and Wastes: Submit the name, address, and telephone number of each analytical laboratory selected to perform the analyses of waste samples (solid and liquid), air samples collected for Area Monitoring and Exposure Monitoring purposes, and paint/coating samples collected to classify building components. The analytical laboratory shall be currently accredited by the American Industrial Hygiene Association (AIHA) and the NYSDOH ELAP. Provide copies of current AIHA and ELAP certificates along with dates of accreditation/reaccreditation. ELAP certificates must show evidence of certification for

the specific analytical methods that will be used to analyze each type of sample that will be collected.

B. Field Reports and Recordkeeping: During all Work performed under this Section, the Contractor shall maintain and provide the following documentation:

1. Air Monitoring Documentation: All air monitoring results and daily air monitoring reports shall be provided to the County within 24-hours from the date the samples are collected. The results shall be signed by the laboratory employee who analyzed or supervised the analysis of the samples, as well as the air monitor that physically performed the air monitoring activities at the work Site. All laboratory analytical results shall be accompanied by complete COC documentation.

   a. Each daily air monitoring report shall be signed by the Contractor's employee who generated the report. The content of these reports shall include, but is not limited to, the following information: (a) sample "start" and "stop" times; (b) flow rates (initial and final) for each sample; (c) the total volume of air collected for each sample; (d) sample location descriptions/sample location drawings/names of individuals being sampled; (e) types (i.e., makes and models) of sampling equipment used; (f) types of sample media (i.e., filters and cassettes) used; (g) the most recent calibration dates, along with the calibration results, for the sampling equipment used; (h) the name of the air monitor that conducted the air monitoring; (i) dates that the air monitoring was conducted; (j) work tasks being performed during the air monitoring; (k) unique sample numbers used to identify each sample.

2. Waste Documentation: Completed and signed waste manifests from TSDFs shall be provided to the County as soon as possible but no later than 30 days of disposal. In addition, on-site waste storage areas shall be inspected weekly by the waste manager, who at a minimum shall satisfy the qualification requirements of this Section.

   a. Each waste storage area inspection shall be coordinated with the applicable Bureau EHS, documented in the form of a written report, and each report shall be signed by the Contractor's employee who generated the report. All reports shall be provided to the County within 24-hours of the date the inspection is completed. The content of these reports shall include, but is not limited to, the following information: (a) the name of the individual that conducted the inspection; (b) descriptions of waste streams being stored; (c) types and quantities of waste containers being used; (d) the current disposal status (i.e., when each waste container is scheduled to be removed from the work Site) and physical condition of each waste container; (e) the presence/absence of proper labeling for each waste container in accordance with this Section and federal, state, and local regulations; (f) secondary containment systems being used; (g) the methods being used to secure/lock each waste storage area to prevent any unauthorized entry; (h) the presence of any waste containers on site generated during the Work performed under this Section that violate RCRA generator storage time limitations, as defined in 40 CFR 262.

b. In addition to performing weekly waste storage area inspections, the waste manager shall also maintain an ongoing waste inventory. The waste inventory shall be coordinated with the applicable Bureau EHS, and the content of the inventory record shall include, but is not limited to, the following information: (a) specific dates that each waste container was added/removed from the waste storage area; (b) the full name (printed) and signature of the individual responsible for adding/removing each waste container from the waste storage area.

3. Lead Control Area Inspection Documentation: Lead Control Areas shall be inspected daily by the Competent Person.

   a. Each daily Lead Control Area inspection shall be documented in the form of a written report, and each report shall be signed by the Contractor's employee who generated the report. All reports shall be provided to the County no later than 24-hours after the inspection is completed. The content of these reports shall include, but is not limited to, the following information: (a) the types of work being performed; (b) the names of the lead workers, Competent Person, waste manager, and air monitor on site, as well as the name of the company each individual is representing; (c) the types of air monitoring (i.e., Exposure Monitoring or Area Monitoring) being conducted, and the number of samples being collected for each type of air monitoring activity; (d) any non-compliance issues observed (i.e., observations that conflict with the requirements of the Contractor's Lead management plan, this Section, or federal, state, and local regulations) along with the corrective actions that were taken to achieve compliance.

4. Contractor Project Record: The Contractor's Competent Person shall maintain a project record at the work Site. The Contractor project record shall be made available to the Engineer or County for review at any time during the Work, and shall be submitted to the County within 24-hours after the completion of the Work.

   a. At a minimum, the Contractor project record shall contain the following information: (a) copies of training certificates for all individuals involved with the work; (b) copies of all air monitoring results generated during the work; (c) copies of all available paint chip/coating sample analytical data and XRF analyzer data, as well as paint/coating survey reports related to the work; (d) copies of all daily sign-in sheets as required in this Article; (e) a list of emergency phone numbers, including the local fire department, local police department, nearest hospital, as well as phone numbers for the Engineer and County personnel responsible for administering the work; (f) a copy of the OSHA Lead in Construction Standard (29 CFR 1926.62); (g) copies of all SDSs pertaining to all chemicals being used during the work; (h) a copy of this Section and the related Drawings; (i) a copy of the Contractor's Lead Management Plan; (j) copies of all daily Lead Control Area inspection records; (k) copies of all weekly waste storage area inspection records; (l) a copy of the waste inventory; (m) copies of all EHS Policies and Procedures

referenced in this Section (n) a copy of the Contractor's Hazard Communication (HAZCOM) program.

b. If it is determined that arsenic, cadmium, or chromium is present in addition to Lead, the Contractor project record shall also include copies of each applicable OSHA Standard (i.e., Inorganic Arsenic in Construction Standard (29 CFR 1926.1118), Hexavalent Chromium in Construction Standard (29 CFR 1926.1126), or Cadmium in Construction Standard (29 CFR 1926.1127).

5. Daily Sign-In Sheets: The Contractor shall generate daily sign-in sheets for all individuals entering and exiting each Lead Control Area for the duration of the Work. The daily sign-in sheets shall be maintained by the Competent Person, and shall be made available to the Engineer or County for review at any time during the Work. All daily sign-in sheets shall be submitted to the County within 24-hours after the completion of the Work.

a. At a minimum, each daily sign-in sheet shall include: (a) the individual's full name (printed); (b) the individual's signature; (c) the name of the company the individual is representing; (d) the time of entry and exit from each Lead Control Area; and (e) verification by the Competent Person that the individual meets the applicable training requirements, if the individual intends to enter a Lead Control Area.

6. HAZCOM Program: The Contractor's HAZCOM program shall be made available to the Engineer or County for review at any time during the Work.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Not used.

2.02 MATERIALS / EQUIPMENT

A. Respirators: The Contractor shall select respirators approved by the NIOSH for use in areas where paints/coatings, dusts, materials, or wastes containing contaminants may be disturbed. At a minimum, the Contractor shall provide each individual with a half-face, negative pressure, air purifying respirator equipped with HEPA/P-100 Filter cartridges (and Organic Vapor Cartridges if PCBs are present), until Exposure Monitoring results indicate that respiratory protection can be modified. The Contractor's CIH shall make all determinations regarding respiratory protection modifications that will be implemented for the Work. All modifications shall be in accordance with the OSHA Lead in Construction Standard (29 CFR 1926.62), Inorganic Arsenic in Construction Standard (29 CFR 1926.1118), Hexavalent Chromium in Construction Standard (29 CFR 1926.1126), Cadmium in Construction Standard (29 CFR 1926.1127), and the Contractor's Lead Management Plan.

B. PPE: The Contractor shall provide personnel who have a potential to be exposed to materials or wastes containing contaminants, with appropriate PPE as prescribed by the Contractor's CIH.

C. HEPA Filters: HEPA/P-100 Filters used in vacuuming equipment, power tools, and local exhaust equipment must meet or exceed any manufacturer's specifications and recommendations, as well as specifications presented in the Standard for Safety High Efficiency, Particulate, Air Filter Units (UL 586).

D. Waste Containers: Containers for the storage of all wastes shall be DOT-approved, and shall be provided by the Contractor.

E. Abrasives: Mechanical paint/coating removal equipment shall not use any products containing crystalline silica, and the equipment shall not utilize any non-recoverable materials or any cutting materials which introduce toxic or hazardous materials into the environment.

F. Chemical Strippers: The Contractor shall utilize an environmentally safe chemical paint stripping system, with demonstrated suitability and efficiency in preparing cast-in-place concrete, cement, and plaster surfaces that are free of any visible residues of paints/coatings. The system shall include non-alkaline or alkaline strippers that provide the lowest possible level of toxicity consistent with the types of paints/coatings to be removed. Neutralization products and procedures shall be provided for all alkaline stripping systems, no stripping system shall contain methylene chloride, and the stripping system shall be low in volatile organic compounds (VOCs).

PART 3 – EXECUTION

3.01 EXECUTION / PREPARATION

A. Hygiene Facilities: The Contractor shall provide functional Hygiene Facilities as defined in this Section that are appropriate for the types of Work to be performed under this Section. The Contractor shall ensure that employees do not leave a Lead Control Area wearing any potentially contaminated PPE. Using compressed air to dislodge dust from clothing/PPE shall be strictly prohibited. The Contractor shall collect, test, and properly dispose of all wastewater generated from Hygiene Facilities.

1. Handwash Stations: The Contractor shall provide functioning handwash stations on all projects that disturb Lead-Containing Materials or Lead Wastes. Handwash stations shall have running water at the tap, clean towels, and soap per 29 CFR 1926.51. Substituting "hand wipes" in place of soap and running water will not be acceptable.

2. Showers: The Contractor shall provide shower facilities in accordance with 29 CFR 1926.62, for use by employees whose airborne exposure to Lead is above the PEL. When shower facilities are necessary, employees are required to shower at the end of the work shift each day prior to leaving the Lead Control Area that they are working in.

B. Utilities: The temporary use of any on-site utilities shall be subject to the approval of the County. The Contractor shall furnish all water and hoses needed for the Work, as well as any temporary hookups. Also, the Contractor shall supply all heating equipment and water filtration devices needed for the Work. In addition, all temporary lighting and temporary electrical service to a Lead Control Area shall be provided by the Contractor, and shall be in weather-proof enclosures and be ground fault protected.

C. Signs: The Contractor shall post conspicuous warning signs at all approaches to work areas and waste storage areas. The signs shall be located at such a distance so that personnel may read the sign and take the necessary precautions before entering a work area or waste storage area. Signs shall comply with federal, state, and local regulations, including the requirements of OSHA. Signs shall not be removed until all Abatement, removal, and construction/demolition activities have been completed. At a minimum, each sign shall bear the following information in English and the predominant language that is spoken by the Contractor's employees if English is not spoken:

DANGER

LEAD WORK AREA

MAY DAMAGE FERTILITY OR THE UNBORN CHILD

CAUSES DAMAGE TO THE CENTRAL NERVOUS SYSTEM

DO NOT EAT, DRINK OR SMOKE IN THIS AREA

D. Physical Boundary Delineation: The Contractor shall clearly delineate each work area and waste storage area with a Physical Boundary as defined in this Section.

E. Work Area Preparation: The Contractor shall utilize HEPA-filtered vacuums, and wet methods during the initial cleaning of each work area. Prior to removal from each work area, all movable objects and mounted objects that can be removed shall be pre-cleaned using HEPA-vacuums and wet methods. Fixed objects that must remain within each work area shall be pre-cleaned using HEPA vacuums and wet methods, and subsequently covered with 6-mil polyethylene sheeting.

3.02 IMPLEMENTATION

A. Special Requirements

1. Commencement of Work: Five (5) business days prior to the proposed start of the work required under this Section at each separate location, the Contractor shall notify the Engineer and the onsite safety staff. No Work may proceed at any location until authorized by the Engineer.

2. The Contractor shall coordinate any required equipment shutdowns with the Engineer prior to starting the Work.

3. Access Restrictions: The Contractor shall inform the Engineer of proposed access restrictions (i.e., areas or items of equipment which will not be accessible during the proposed work), and provide estimated time frames (including specific dates) of such proposed access restrictions. The Contractor shall be aware that other contractors may be at any of the work sites associated with this Contract. As a result, the Contractor shall not have exclusive rights to any work Site, and shall fully cooperate and coordinate this Work with the work of other contractors who may be on Site. Therefore, the Contractor shall notify other contractors in advance of the disturbance, Abatement, removal, construction/demolition, and disposal Work included herein, to provide them with sufficient time for coordination of interrelated items that are included in their contracts and that must be performed before, after, or in conjunction with the Work included under this Section.

4. Unexpected Entry into a Lead Control Area: In the event that County personnel must enter a Lead Control Area for reasons unrelated to the supervision or inspection of Work being performed under this Section (e.g., under emergency conditions), the Contractor shall immediately stop work and cleanup any loose debris, so as to permit the safe entry by County personnel. Any disturbance of paints/coatings, dusts, materials, or wastes that may potentially generate airborne concentrations of contaminants equal to or above an OSHA Action Level shall not proceed until all County personnel have exited from the Lead Control Area.

5. Meetings: The Contractor shall visit and investigate the Site, review the Drawings, review this Section, and become familiar with any conditions which may affect the Work, as part of the pre-construction meeting and Site walk-through. The Contractor shall hold all meetings with appropriate parties as scheduled and as otherwise necessary to accomplish the Work to be performed under this Section. In addition to the pre-construction meeting and Site walk-through, other meetings may be required or may be requested by the Engineer, including briefings with Site operations personnel. Written documentation (i.e., “minutes”) of all meetings shall be generated by the Contractor, and copies shall be provided to the County within three (3) business days following each meeting.

6. Payment for the disposal of Lead Wastes (with the exception of painted/coated scrap metal) will not be made until a signed copy of the manifest from the Treatment, Storage, and Disposal Facility (TSDF), certifying the amount of Lead Wastes delivered is returned with complete chain-of-custody (COC) documentation to the County.

B. Bulk Removal

1. Protection of Existing Work to Remain: All Work involving the disturbance of Lead-Containing Materials or Lead Wastes must be conducted without damage to, or contamination of equipment or surfaces within the work areas or other areas adjacent to the work areas. All such damage or contamination shall be immediately corrected and cleaned up by the Contractor at the Contractor's expense.

2. Prohibited Activities: Contractors shall not conduct activities that are prohibited by OSHA and EPA regulations. The following activities are prohibited, regardless of whether they are conducted subject to an exposure assessment and written compliance program: (a) burning-off paints/coatings; (b) using heat guns operating above 1100oF; (c) dry machine sanding, grinding, or blasting paint without a HEPA vacuum exhaust tool; (d) uncontained hydroblasting or high-pressure washing; (e) welding painted/coated surfaces unless the paint/coating is removed at least 4-inches from area of heat application (per 29 CFR 1926.345(c)(1)), and local exhaust ventilation is used.

3. Test Patches: Prior to choosing the paint removal method(s) for paints/coatings, the Contractor shall perform test patches on surfaces subject to Abatement, to determine if the method(s) meet the requirements of this Section.

4. Mechanical Removal Equipment: When removing paints/coatings from metal surfaces, the paints/coatings must be removed to the extent that only the bare metal remains (i.e., no mill scale remains). In the case of substrates other than metal (e.g., concrete, brick, and block), paints/coatings shall be removed from the surface of the substrate. Acceptance of the Work shall be contingent upon inspection of the substrate surfaces by the Engineer, and must demonstrate the absence of residual paint/coating layers that can be physically measured, pried loose, or peeled away using a scraping device. The Contractor may only use products and tools meeting the performance specifications outlined below:

    a. Contractor shall utilize a vacuum-assisted power tool system with demonstrated suitability and efficiency in preparing metal surfaces to the SSPC SP-11 standard, and with demonstrated effectiveness in maintaining Lead emissions below OSHA exposure limits during the disturbance of paints/coatings. Such systems may include dustless needle guns, dustless rotopeens, and dustless right angle grinders, all of which capture dust and debris at the cutting tool edge, and transport the material under vacuum conditions to an air-tight disposal container. Dustless needle guns shall only be utilized on metal surfaces.

    b. The vacuum-assisted power tool system shall also be designed to permit the removal and replacement of collection containers under negative pressure in order to prevent the release of dusts. The system shall be equipped with an automatic “shut-off” in the event of vacuum failure.

    c. Abrasive/recovery tools shall be monitored at all times by a device capable of determining recovery at the face of each tool, and capable of automatically disabling the tool in the event that recovery levels are insufficient. The monitor, at a minimum, shall have the following features: (a) a remote warning light; (b) an adjustable recovery set point; (c) automatic equipment disabling capabilities; (d) a sensing range of 0 5 pounds per square inch (psi); (e) solid state photohelic instrumentation; (f) remote sensing at the face of the tool.

d. The safe recovery point shall be calibrated each day before start-up, or each time a new tool or vacuum source is used. All manufacturer recommendations shall be followed with respect to the set up and use of the monitor, and the manufacturer's operations manual shall be kept on site at all times. A daily log shall be maintained by the Contractor, identifying all calibrations of recovery levels, as well as any “down time” as a result of insufficient recovery levels.

e. The cutting head of the vacuum-assisted power tool system that is used on flat surfaces shall be capable of cutting to within 1-1/2" of any inside corner, molding, or edge, and may include dustless rotopeens or dustless needle guns. Tools for corners and moldings shall be specifically designed for that purpose, and conform to all inside corners, outside corners, curved, flat, and angled surfaces that are to be abated under this Section. These tools shall also maintain vacuum control at the work surface/cutting head interface at all times. HEPA vacuum-shrouded needle guns may be used for non-flat surfaces in accordance with manufacturer recommendations. Vacuum-assisted finishing tools, such as right angle grinders, may be used to achieve the SSPC SP 11 standard, but may not be used for primary removal.

f. Vacuum-assisted power tool systems meeting all of the specifications outlined herein, may be used pending the submittal of all required performance documentation, and their acceptance by the Engineer. Any tools which do not meet all of the specifications outlined herein, shall be removed from the project Site immediately, and shall not be used for the Work to be performed under this Section.

5. Chemical Strippers: Acceptance of the Work shall be contingent upon inspection of the abated substrate surfaces by the Engineer, and must demonstrate the absence of residual paint/coating layers that can be physically measured, pried loose, or peeled away using a scraping device. The Contractor may only use products and paint stripping systems meeting the performance specifications outlined below:

a. The Contractor shall utilize a chemical paint stripping system with a demonstrated effectiveness in maintaining Lead emissions below OSHA exposure limits during the disturbance of paints/coatings. The Contractor shall utilize a mechanical ventilation system during the work that exhausts away from occupied areas. The application of all paint stripping systems shall be in accordance with manufacturer recommendations.

b. The Contractor should note that more than one product may be required to strip LCP/coatings. The use of multiple products shall be in accordance with Work practices approved by the individual manufacturer of each chemical paint stripping compound.

c. All chemical paint stripping products shall be presented to the Engineer for approval prior to the start of any Work to be performed under this Section. When presenting the products to the Engineer, they shall be in the manufacturer's unopened, original

containers bearing accurate information regarding the products. Also, the manufacturer's labels on each container shall be intact and legible.

d. Chemical paint stripping systems meeting all of the requirements outlined herein, may be used pending the submittal of all required performance documentation, and its acceptance by the Engineer. Any products which do not meet all of the specifications outlined herein, shall be removed from the project site immediately, and shall not be used for the Work to be performed under this Section.

3.03 FIELD TESTING / QUALITY CONTROL

A. Air Monitoring

1. Air monitoring for airborne concentrations of Lead and other heavy metals shall be conducted by the air monitor in accordance with OSHA and as defined in this Section.

a. Exposure Monitoring: For Work involving the disturbance of any detectable concentration of Lead or other heavy metals the Contractor shall collect personal air samples from employees who are anticipated to have the greatest risk of exposure, as determined by the Contractor's CIH or Competent Person. Personal air samples shall be collected during every work shift from at least one (1) employee that is representative of each type of work task that is being performed. Each personal air sample shall "run" for the employee's entire work shift in order to ensure that enough volume (of air) is collected and an accurate 8-hour TWA can be calculated. Documentation regarding the sample numbers, specific shift when the sampling was conducted, the work tasks that were sampled, the dates of sampling, the employee hours that were worked during the shift, and the total sampling times, shall accompany each laboratory COC form.

1) Exposure Monitoring for other heavy metals may be discontinued following a complete negative exposure assessment and approval from the Engineer and the Contractor's CIH. However, daily Exposure Monitoring for Lead shall remain, regardless of the negative exposure assessment results.

2. Area Monitoring: The Contractor shall collect a minimum of two (2) area air samples outside of each Lead Control Area on a daily basis for the duration of the Abatement, removal, or construction/demolition Work, as well as any other Work involving the disturbance of Lead-Containing Materials or Lead Wastes. During sampling activities, all air sample filter cassettes shall be positioned approximately five to six feet above the ground (in order to simulate an individual's breathing zone), and shall not be placed immediately adjacent to obstructions (e.g., walls or columns) which may restrict the flow of air to the filter cassettes. Each air sample shall be analyzed for all contaminants identified during the exposure assessment. If area air monitoring indicates an emission level in excess of an OSHA Action Level outside of a Lead Control Area, all Work in that area shall be stopped immediately. The Contractor shall then take immediate corrective

actions to reduce emission levels to below the Action Level(s), and the Contractor shall clean all adjacent areas that may have become contaminated due to the emissions. Documentation regarding the sample numbers, sample locations, the dates of sampling, the employee hours that were worked during the shift, and the total sampling times, shall accompany each laboratory COC form.

3. Documentation: Complete documentation of all air monitoring activities shall be in accordance with this Section.

4. The Contractor shall submit all air monitoring results to the County as soon as possible, but no later than five (5) days from when the air samples were collected.

3.04 STARTUP / DEMONSTRATION

A. Not Used

3.05 ADJUSTING / PROTECTION / CLEANUP

A. Cleanup: The Contractor shall maintain all surfaces, including protective coverings (polyethylene sheeting) within each work area, free of accumulations of paint chips/coating debris, dusts, and wastes. The Contractor shall perform housekeeping activities daily throughout each work shift and at the end of each work shift, in order to prevent any accumulation of paint chips/coating debris, dusts, and wastes in the work areas. Dry sweeping and using compressed air to cleanup a work area shall be strictly prohibited. HEPA-filtered vacuums and wet methods shall be used to ensure that each work area remains free of visible paint chips/coating debris, dusts, and wastes.

B. Sampling and Laboratory Analysis of Paint Removal Wastes: For hazardous waste characterization, the waste manager shall sample all potential heavy metal and PCB-containing waste streams in accordance with 40 CFR 261 and 6 NYCRR Part 371. All waste samples shall be collected in the presence of the Engineer using the following procedure:

1. One (1) composite waste sample shall be collected for laboratory analysis from each waste drum that is generated. Each composite sample shall be a mixture of four (4) grab samples. Each composite sample shall be labeled and submitted to a laboratory that satisfies the requirements of this Section. Each composite sample shall undergo Toxicity Characteristic Leaching Procedure (TCLP) analysis for the eight (8) RCRA metals.

2. The Contractor shall also direct the laboratory to analyze each sample for any additional parameters that are required by the specific TSDF being used. In addition, if the waste stream is associated with the use of a chemical paint stripping system, the Contractor shall have the laboratory analyze each sample for pH and any other RCRA characteristic that may fail due to the chemical composition of the waste. Furthermore, if the waste stream may contain PCB-containing paint/coating chips, the Contractor shall collect samples in accordance with Section 02 84 05 - PCBs Management. The Contractor shall ensure that the laboratory being used to satisfy the requirements of this Section is also capable of performing these additional analytical tests.

3. One (1) representative wastewater sample shall be collected for laboratory analysis from each drum that generated. Each sample shall be collected using appropriate field sampling equipment (e.g., a pipette or bailer), and shall be labeled and submitted to a laboratory that satisfies the requirements of this Section.

C. Sampling and Laboratory Analysis of Painted Demolition Debris: The Contractor shall collect representative bulk samples of demolition wastes to determine proper disposal. All bulk samples shall undergo TCLP analysis for the eight (8) RCRA metals. Furthermore, if the waste stream may contain PCB-containing paint/coating chips, the Contractor shall collect samples in accordance with Section 02 84 05 - PCBs Management.

1. Scrap Metal Exemption for Recycling: Under 6 NYCRR 371.1(c)(7), painted scrap metal can be sent to a recycling facility, rather than be discarded as hazardous waste. In order for the County to submit a "c7 notification" to the NYSDEC and claim the "scrap metal exemption," the Contractor must first submit notification to their recycling facility indicating that Lead is present on the scrap metal. If PCBs or other heavy metals are detected in the paints/coatings on the scrap metal, the Contractor shall also disclose this information to the recycling facility. The Contractor shall receive written permission from the recycling facility indicating that the facility will accept the Lead, heavy metal, and PCB paint/coated scrap metal generated during the Work to be performed under this Section. The Contractor shall submit this documentation to the Engineer for approval prior to disposal.

D. Collection, Separation, and Containerization of Wastes: The Contractor shall collect, separate (by waste stream/waste type), and containerize Lead Wastes (solid and liquid), debris, PPE, and containment materials on a daily basis in accordance with the lead management plan. Where the TCLP analysis for the eight (8) RCRA metals are below hazardous waste standards, all PPE, poly and paint/coating waste will be characterized as lead-containing non-hazardous, contaminated waste, and should not be managed as construction and demolition (C&D) debris.

1. The Contractor shall store all wastes in DOT-approved container systems. No drum/container shall be filled in excess of the capacity marked on the drum/container. All drums/containers shall be sealed and covered immediately after filling, and each drum/container shall have a label affixed to it in accordance with the requirements of this Section. All labels shall remain intact and legible at all times.

2. No water mixed with or contaminated by hazardous waste may be released onto the ground or into any drain or sewer. It should be noted that a discharge of more than 10 lb of Lead (this includes 10 lb of debris containing Lead) onto the ground or into the water within a 24-hour period, shall be considered a violation of the Clean Water Act and shall be treated as a "reportable quantity" in accordance with 40 CFR 117. Such a release shall be grounds for immediate termination of this Contract, and the Contractor shall be liable for any fines, penalties, or remediation costs.

3. The Contractor shall store non-hazardous wastes separately from hazardous wastes, shall provide all non-hazardous waste containers, and shall make all transportation and disposal arrangements for non-hazardous wastes in accordance with federal, state, and local regulations.

E. Storage of Wastes: The Contractor shall ensure that all drummed wastes are stored in a secondary containment system, and that each waste storage area is demarcated with a Physical Boundary. In addition, the Contractor shall post weekly waste inspections and waste inventories in the regulated waste storage area, as required in this Section, as well as the following emergency information: (a) the name and telephone number of the facility's Emergency Coordinator; (b) the location of fire extinguishers and fire alarms; (c) the location of spill control materials; (d) the telephone number for the fire department (unless the facility has a direct alarm).

F. Labeling: The Contractor shall affix warning labels to all hazardous waste drums/containers. Labels shall comply with the requirements of federal, state, and local regulations. At a minimum, all hazardous waste labels shall bear the following information in English:

HAZARDOUS WASTE
FEDERAL LAW PROHIBITS IMPROPER DISPOSAL
HANDLE WITH CARE
[Generator Name, Address, and Telephone Number]
[Specific Contents of Container]
[EPA-Issued Generator Identification Number]
[EPA Waste Identification Number]
[Accumulation Start Date]
[Accumulation End Date]

1. If waste classification is pending analysis, labels shall indicate "Hazardous Waste - Pending Analysis."

G. Disposal of Wastes: All hazardous waste profiles for containerized wastes must be reviewed by the Engineer and signed by the County as the generator of the waste streams. The Contractor shall notify the County at least 14 business days prior to the removal of any waste drums/containers, so that the County can inspect the drums/containers and the waste manifests. Wastes shall be disposed of to ensure that drums/containers do not remain on the job site for more than 90 calendar days from the initial "accumulation start date" on the label affixed to the drum/container. Containers that have reached their storage capacity shall not remain on site, and transportation arrangements shall be made for their immediate removal.

H. Disposal Documentation: The Contractor shall submit written evidence that the TSDF receiving lead-containing wastes is approved by federal, state, and local regulatory agencies to receive the wastes. If regulated PCBs (as defined in Section 02 84 05 - PCBs Management) were detected in the wastes, the Contractor shall also ensure that the TSDF is approved by federal, state, and local regulatory agencies to receive these wastes. Once all waste profiles have been completed, the Contractor shall provide the County a "Letter of Acceptance" issued from the TSDF indicating that the wastes will be accepted. On the date of disposal the Contractor shall submit one (1) copy

of the completed manifest that has been signed and dated by the initial transporter in accordance with 6 NYCRR 372 and 40 CFR 262, to the County for signature as Generator. All hazardous waste profiles, manifests, and Land Disposal Restrictions (LDRs) must be signed by a County employee per Section 01 35 27- Hazardous Materials Control. Non-hazardous waste manifests may be signed by a designated alternate.

END OF SECTION

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SECTION 02 84 05

PCB MANAGEMENT

PART 1 – GENERAL

1.01 SUMMARY

A. This Section details the requirements for construction and demolition activities affecting materials and structures coated with or containing polychlorinated biphenyls (PCBs), and suspect PCB-containing, as shown in the following report and summarized in Tables 1, 2 and 5 attached to Section 01 35 45 – Hazardous Materials Control, specified herein, or required to complete the Work, including all affected coatings identified and impacted by the Work. All Work to be performed under this Section shall be performed using methods, tools, and equipment that have demonstrated effectiveness in preventing airborne emissions from migrating outside of work areas.

1. Hazardous Materials Investigation Report for the Cedar Creek WPCP, January 2023 .

B. For construction and demolition activities affecting materials and structures that are also coated with heavy-metal-containing (i.e., arsenic, cadmium, chromium, or lead) paints or coatings, refer to Section 02 83 05 - Lead Management. For construction and demolition activities affecting materials and structures that are also coated with asbestos-containing materials (ACM), refer to Section 02 82 05 - Asbestos Management.

C. Small Capacitors and Fluorescent Light Ballasts manufactured prior to 1978 may contain PCBs in their capacitors or potting materials. Unless a Fluorescent Light Ballast is marked “No PCBs” by the manufacturer, it shall be assumed that the ballast contains PCBs. All PCB-containing light ballasts and Small Capacitors shall be removed, handled, packaged, and disposed of in accordance with this Section.

D. All Work under this Section shall be performed to minimize the creation of airborne emissions; minimize the quantity of hazardous waste generated; protect the health and safety of all site personnel and the welfare of the public; and avoid adverse environmental impacts.

E. Unless otherwise specified, the Work of this Section shall also be performed in accordance with the most current applicable federal, state, and local regulations.

F. In the absence of analytical testing results for a specific painted/bitumastic-coated material, the material shall be classified as PCB-containing and lead-containing. If the material is caulking or has a bitumastic coating, the material shall also be classified as asbestos containing. Any unforeseen PCB, asbestos, or lead-containing paints/bitumastic coatings discovered during the Work to be performed under this Section shall be remediated as necessary to complete the Work in accordance with this Section.

G. The Contractor shall perform all Work under this Section without damaging or contaminating adjacent areas to where the Work is being performed. Where such areas are damaged or contaminated, as determined by the County, the Contractor shall restore the areas to their original condition at no additional cost to the County.

1.02 PAYMENT

A. Except for unforeseen PCB-containing materials and related work eligible for payment under allowance, as described in Section 01 35 45 – Hazardous Materials Controls, no separate payment will be made for performing any work of this Section and the Contractor shall include all costs thereof in its lump sum price bid for the Contract, except as specified herein.

B. Payment for removal and disposal of unforeseen PCB-containing materials not described and/or not shown on the Contract Documents will be made as specified in Section 01 20 00 – Measurement and Payment.

C. Payment for the disposal of PCB Wastes will not be made until a signed copy of the manifest from the Treatment, Storage, and Disposal Facility (TSDF), certifying the amount of PCB Wastes delivered is returned with complete chain-of-custody (COC) documentation to the County.

1.03 RELATED SECTIONS

A. Section 01 20 00 - Measurement and Payment

B. Section 01 35 27 - Environmental Health and Safety Requirements

C. Section 01 35 45 - Hazardous Materials Control

D. Section 01 74 00 - Construction Waste Management

E. Section 02 41 10 - Demolition and Removals

F. Section 02 82 05 - Asbestos Management

G. Section 02 83 05 - Lead Management

1.04 REFERENCES

A. Definitions

1. Abatement: Any measures or set of measures designed to permanently eliminate PCB paint/bitumastic coating hazards. Abatement includes, but is not limited to, the removal of PCB paints/bitumastic coatings or the replacement of PCB-painted/bitumastic-coated surfaces or fixtures. Abatement also includes the removal of paints/bitumastic coatings (with a PCB concentration greater than or equal to 50 parts per million (ppm)) when the underlying substrate is to remain in place. Abatement does not include renovation, remodeling, landscaping, or other activities, when such activities are not designed to

permanently eliminate PCB hazards, but instead, are designed to repair, restore, or remodel a given structure or dwelling, even though these activities may incidentally result in a reduction or elimination of PCB hazards. Furthermore, Abatement does not include interim controls (e.g., the spot removal of a PCB paint/bitumastic coating on a surface in order to perform torch cutting at that location), operations and maintenance activities, or other measures and activities designed to temporarily, but not permanently, reduce PCB hazards.

2. Area Monitoring: Stationary air sampling outside of a PCB Control Area for the purpose of determining compliance with OSHA's Limits for Air Contaminants Table (29 CFR 1910.1000, Table Z-1), and for the purpose of ensuring that airborne PCB concentrations remain below 1.0 mg/m^3 (Aroclor 1242) and 0.5 mg/m^3 (Aroclor 1254) outside of the PCB Control Area during all Work activities that have the potential to disturb PCB-Containing Materials with PCB concentrations greater than or equal to 50 parts per million (ppm). Area Monitoring for heavy metals (i.e., arsenic, cadmium, chromium, lead, or mercury) will be required if Exposure Monitoring results exceed corresponding Action Levels, Permissible Exposure Limits (PELs), or Threshold Limit Values (TLVs). If asbestos is present, Area Monitoring shall also be conducted in accordance with NYSDOL (12 NYCRR 56) regulations. All Area Monitoring shall follow pertinent NIOSH or ASTM sampling methodologies.

3. Certified Industrial Hygienist (CIH): Refers to an individual employed by the Contractor who is currently certified by the American Board of Industrial Hygiene (ABIH).

4. Competent Person: Defined by OSHA as someone who is capable of identifying existing and predictable hazards in the surroundings or working conditions, and who has authorization to take prompt corrective measures to eliminate them. Duties of the Competent Person include the following: (a) determining prior to the performance of the Work, whether PCBs, asbestos, or other heavy metals (i.e., arsenic, cadmium, chromium, lead, or mercury) are present in the workplace; (b) establishing PCB Control Areas and assuring that access to and from those areas is limited to authorized personnel; (c) assuring the adequacy of any employee Exposure Monitoring required by OSHA; (d) assuring that all employees exposed to airborne contaminant levels above Action Levels, PELs, or TLVs wear appropriate Personal Protective Equipment (PPE), respiratory protection, and are trained in the use of appropriate methods of exposure control for all of the contaminants present; (e) assuring that proper Hygiene Facilities are provided and that workers are trained to use those facilities; (f) assuring that engineering controls specific to the contaminants present are implemented, maintained in proper operating condition, and functioning properly.

5. Decontamination Area: Designated area within the Hygiene Facilities for removing gross contamination from PPE (using a HEPA vacuum), washing away contamination that has accumulated on the skin and hair (using soap and water), removing and disposing/washing of contaminated PPE, and donning clean clothing that will not potentially contaminate areas outside of a PCB Control Area's Physical Boundary.

6. DOT Hazardous Materials Transportation Training: Training that meets the criteria outlined in 49 CFR 172.704. This training shall include discussions of the following: (a) hazardous materials tables within 49 CFR 172; (b) material packaging and labeling; (c) shipping papers and placards; (d) material loading and segregation.

7. Exclusion Zone: (See definition of "PCB Control Area").

8. Exposure Monitoring: Personal air sampling performed outside the respirator within the breathing zone of individuals, for the purpose of determining compliance with OSHA's Limits for Air Contaminants Table (29 CFR 1910.1000, Table Z-1). Analytical results obtained from Exposure Monitoring will be used to select appropriate respiratory protection and PPE for individuals within a work area. For the purpose of this Section, Exposure Monitoring samples shall be collected from individuals who are representative of each type work task being conducted by the Contractor, and all Exposure Monitoring shall follow pertinent NIOSH or ASTM sampling methodologies.

9. Fluorescent Light Ballast: A device that electrically controls fluorescent light fixtures and includes a capacitor containing 0.1 kilograms (kg) or less of dielectric fluid.

10. Hazardous Waste Operations (HAZWOPER) Training: Training that meets the criteria outlined in the OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120). A minimum of 24-hour HAZWOPER training will be required for Work being performed under this Section. However, certain types of Work may require 40-hour HAZWOPER Training. All decisions regarding the specific HAZWOPER Training that will be required for each Work task shall be made by the Engineer.

11. High-Efficiency Particulate Air (HEPA) Filter: A filter designed to remove 99.97% of all particles greater than 0.3 micrometers (μm) in diameter. For the purpose of this Section, HEPA vacuum and local exhaust filtration equipment used by the Contractor shall meet the Standard for Safety High-Efficiency, Particulate, Air Filter Units (UL 586) developed by Underwriters Laboratories.

12. Homogenous Materials: PCB-Containing Materials which are similar in appearance, color, texture, and substrate type.

13. Hygiene Facilities: Facilities within the Physical Boundary of a work area that are set up to prevent cross contamination and are equipped with change areas and separate storage facilities for PPE and clean clothing. Hygiene Facilities shall include adequately supplied hand washing station(s) (i.e., running water, soap, and clean towels) or shower(s) (hot and cold water that is controllable at the tap, soap, shampoo, and clean towels).

14. Organic Vapor Cartridge: A respirator filter typically containing 25 to 40 grams of sorption media such as activated charcoal.

15. OSHA Monitoring: (See definition of "Exposure Monitoring").

16. P-100 Filter: (See definition of: “High-Efficiency Particulate Air (HEPA) Filter”).

17. PCB Awareness Training: Training for individuals that have the potential to be exposed to PCB-Containing Materials or PCB Wastes. This training shall include discussions of the following: (a) sources of PCBs; (b) current federal, state, and local regulations pertaining to PCBs (including 40 CFR 761) and other contaminants that may be disturbed during the Work; (c) the health effects of PCBs and other contaminant exposures; (d) state-of-the-art work practices, engineering controls, and procedures for Abatement, removal, construction/demolition, materials handling, housekeeping, and waste management activities that involve PCB-Containing Materials and PCB Wastes; (e) the use and maintenance of PPE and the use and maintenance of respirators in accordance with 29 CFR 1910.134; (f) medical surveillance programs; (g) requirements regarding warning signs, labeling, and Safety Data Sheets (SDSs) in accordance with 29 CFR 1910.1200; (h) responsibilities of the Competent Person.

18. PCB Bulk Product Waste: Waste derived from manufactured products containing PCBs in a non-liquid state, at any concentration where the concentration at the time of designation for disposal is greater than or equal to 50 ppm of PCBs.

19. PCB-Containing Material: Any material that contains, or is coated with, a detectable concentration of PCBs.

20. PCB Control Area: The area within the Physical Boundary where worker Hygiene Facilities are located and where all Work activities take place that involve the disturbance of PCB-Containing Materials and PCB Wastes with a PCB concentration greater than or equal to 50 ppm.

21. PCB Hazardous Waste (per NYSDEC): All solid wastes containing PCB concentrations greater than or equal to 50 ppm. Refer to 6 NYCRR 371(e) for specific details and exceptions regarding the classification of PCB Wastes as “hazardous wastes” in New York State.

22. PCB Waste: Non-specific liquid or solid waste generated during the Abatement, removal, construction/demolition, handling, or cleanup of a PCB-Containing Material with a PCB concentration greater than or equal to 50 parts per million (ppm). PCB Waste also includes any waste (including remediation waste, polyethylene sheeting and PPE) that has been in contact with a material that has a PCB concentration greater than or equal to 50 ppm, regardless of whether the waste itself has a PCB concentration of less than 50 ppm. PCB Wastes are subject to the disposal requirements set forth in TSCA (40 CFR 761, Subpart D).

23. Perimeter Monitoring: (See definition of “Area Monitoring”).

24. PEL: Defined by OSHA as individual exposure, without regard to the use of respirators, to a specific airborne concentration of a contaminant expressed in milligrams per cubic meter of air (mg/m3) calculated as an 8-hour Time-Weighted Average (TWA). Once a PEL is

met or exceeded for a particular contaminant, the Contractor is responsible for meeting specific OSHA requirements, which may include worker Exposure Monitoring, the use of PPE including respiratory protection, the use of Hygiene Facilities, medical surveillance, or training for workers. The following PELs are pertinent to disturbance, removal, construction/demolition, and disposal activities associated with PCB-Containing Materials and PCB Wastes: (a) PCB Aroclor 1254 – 0.5 mg/m3 per 29 CFR 1910.1000, Table Z-1; (b) PCB Aroclor 1242 – 1.0 mg/m3 per 29 CFR 1910.1000, Table Z-1.

25. Personal Monitoring: (See definition of "Exposure Monitoring").

26. Physical Boundary: A physical barrier designated with ropes, "caution tape," or a partition that surrounds a work area in order to limit the entry of unauthorized personnel and delineate "clean areas" from areas that may meet or exceed an Action Level, PEL, or TLV.

27. PCBs: Any group of chlorinated isomers of biphenyl, formerly used in the form of a toxic, colorless, odorless, viscous liquid typically added to lubricants, heat-transfer fluids, and plasticizers.

28. Regulated Area: (See definition of "PCB Control Area").

29. Resource Conservation and Recovery Act (RCRA) Training: Training that meets the criteria outlined in 40 CFR 265.16. This training shall include site-specific discussions of the following: (a) hazardous waste identification; (b) waste storage container use and labeling; (c) waste storage area management; (d) personal health and safety, including fire safety; (e) manifesting and the off-site transportation of wastes; (f) procedures for using, inspecting, repairing, and replacing emergency equipment and monitoring equipment; (g) procedures for communicating with other employees and outside emergency response personnel; (h) responses to fires or explosions; (i) responses to leaks, spills, and potential groundwater contamination incidents ; (j) the shutdown of operations.

30. Small Capacitor: A device for accumulating and holding a charge of electricity, and consisting of conducting surfaces separated by a dielectric fluid in a quantity less than 1.36 kilograms (kg) or three pounds. If the weight of the dielectric fluid is unknown, it can be assumed that a Small Capacitor is a capacitor that has a total volume of less than 1,639 cubic centimeters (cm^3) or 100 cubic inches (in^3).

31. TWA: The average time over a given work period (e.g., an 8-hour workday) of a person's exposure to a chemical or agent. The average is determined by sampling for the chemical or agent throughout the time period.

32. Trigger Activities: Certain activities that involve a disturbance of PCB-Containing Materials or PCB Wastes. Depending upon whether the performance of these activities exceeds an Action Level, PEL or TLV, the requirements may include additional worker Exposure Monitoring, the use of PPE including respiratory protection, the use of Hygiene Facilities, medical surveillance, or training for workers. Examples of Trigger Activities include, but are not limited to, the following: abrasive blasting, welding, torch

cutting/burning, heat gun usage, needle gunning/scaling, rivet busting, using a rotopeen, mechanical sanding/grinding, using mechanical shears, hand scraping/sanding, chemical stripping, and the manual demolition of PCB-Containing Materials.

B. Reference Standards

1. The Contractor shall comply with all applicable regulations, standards, and guidelines of federal, state, and local environmental and occupational safety and health agencies regarding PCB-Containing Materials and PCB Wastes. These regulations, standards, and guidelines include, but are not limited to the following:

a. Department of Transportation (DOT):

1) 49 CFR 171 - General Information, Regulations, and Definitions

2) 49 CFR 172 – Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

3) 49 CFR 173 – Shippers: General Requirements for Shipments and Packaging's

4) 49 CFR 178 – Specifications for Packaging's

b. Environmental Protection Agency (EPA):

1) 40 CFR 116 – Designation of Hazardous Substances

2) 40 CFR 117 – Determination of Reportable Quantities for Hazardous Substances

3) 40 CFR 260 – Hazardous Waste Management Systems: General

4) 40 CFR 261 – Identification and Listing of Hazardous Waste

5) 40 CFR 262 – Standards Applicable to Generators of Hazardous Waste

6) 40 CFR 263 – Standards Applicable to Transporters of Hazardous Waste

7) 40 CFR 264 – Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

8) 40 CFR 265 – Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

9) 40 CFR 268 – Land Disposal Restrictions

10) 40 CFR 302 – Designation, Reportable Quantities, and Notification

11) 40 CFR 761 – Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions

12) Method 8082A (SW-846) – Polychlorinated Biphenyls (PCBs) by Gas Chromatography

c. National Institute for Occupational Safety and Health (NIOSH):

1) Method 5503 – Polychlorobiphenyls

d. New York State Department of Environmental Conservation (NYSDEC):

1) 6 NYCRR 364 – Waste Transporter Permits

2) 6 NYCRR 370 – Hazardous Waste Management Regulations

3) 6 NYCRR 371 – Identification and Listing of Hazardous Waste

4) 6 NYCRR 372 – Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities

5) 6 NYCRR 373 – Hazardous Waste Management Facilities

6) 6 NYCRR 376 – Land Disposal Restrictions

e. Occupational Safety and Health Administration (OSHA):

1) 29 CFR 1910 – Occupational Safety and Health Standards

2) 29 CFR 1910.28 – Safety Requirements for Scaffolding

3) 29 CFR 1910.120 – Hazardous Waste Operations and Emergency Response

4) 29 CFR 1910.134 – Respiratory Protection Standard

5) 29 CFR 1910.1200 - Hazard Communication Standard

6) 29 CFR 1926 – Safety and Health Regulations for Construction

7) 29 CFR 1926.62 – Lead in Construction Standard

f. Society for Protective Coatings (SSPC):

1) SSPC-Guide 6, Guide for Containing Debris Generated During Paint Removal Operations

2) SSPC-Guide 7, Guide for the Disposal of Lead-Contaminated Surface Preparation Debris

3) SSPC-SP COM, Surface Preparation Commentary for Steel and Concrete Substrates

4) SSPC-SP 1, Solvent Cleaning

5) SSPC-SP 2, Hand Tool Cleaning

6) SSPC-SP 3, Power Tool Cleaning

7) SSPC-SP 11, Power Tool Cleaning to Bare Metal

8) SSPC-SP 13/ NACE No.6, Surface Preparation of Concrete

9) SSPC-SP 15, Commercial Grade Power Tool Cleaning

g. Underwriters Laboratories, Inc. (UL):

1) UL 586 – Standard for Safety High Efficiency, Particulate, Air Filter Units.

1.05 DESCRIPTION

A. Commencement of Work: Five (5) business days prior to the proposed start of the work of this Section at each separate location, the Contractor shall notify the Engineer and the onsite safety staff. No Work may proceed at any location until authorized by the Engineer.

B. The Contractor shall coordinate any required equipment shutdowns with the Engineer prior to starting the Work.

C. Access Restrictions: The Contractor shall inform the Engineer of proposed access restrictions (i.e., areas or items of equipment which will not be accessible during the proposed Work), and give them estimated time frames (including specific dates) of such proposed access restrictions. The Contractor shall be aware that other contractors may be at any of the work sites associated with this Contract. As a result, the Contractor shall not have exclusive rights to any work site, and shall fully cooperate and coordinate this Work with the work of other contractors who may be on site. Therefore, the Contractor shall notify other contractors in advance of the disturbance, Abatement, removal, construction/demolition, and disposal Work included herein, to provide them with sufficient time for coordination of interrelated items that are included in their contracts and that must be performed before, after, or in conjunction with the Work included under this Section.

D. Unexpected Entry into a PCB Control Area: In the event that County personnel must enter a PCB Control Area for reasons unrelated to the supervision or inspection of Work being performed under this Section (e.g., under emergency conditions), the Contractor shall immediately stop

Work and cleanup any loose debris, so as to permit the safe entry by County personnel. Any disturbance of paints/bitumastic coatings, dusts, materials, or wastes that may potentially generate airborne concentrations of contaminants equal to or above an OSHA Action Level shall not proceed until all County personnel have exited from the PCB Control Area.

E. Meetings: The Contractor shall visit and investigate the site, review the Drawings, review this Section, and become familiar with any conditions which may affect the Work, as part of the pre-construction meeting and site walk-through. The Contractor shall hold all meetings with appropriate parties as scheduled and as otherwise necessary to accomplish the Work to be performed under this Section. In addition to the pre-construction meeting and site walk-through, other meetings may be required or may be requested by the Engineer, including briefings to Site Operations personnel. Written documentation (i.e., "minutes") of all meetings shall be generated by the Contractor, and copies shall be provided to the County within three (3) business days following each meeting.

1.06 QUALITY ASSURANCE

A. to be performed under this Section with the County, subcontractors, material suppliers, and other parties as necessary to ensure the proper execution of the Work.

B. Compliance: In addition to the detailed requirements of this Section, the Contractor shall comply with all applicable regulations of federal, state, and local authorities pertaining to the disturbance, Abatement, removal, construction/demolition, handling, storage, transportation, and disposal of PCB-Containing Materials and PCB Wastes. All matters regarding the interpretation of any regulations, standards, or policies shall be submitted to the Engineer for resolution before starting the Work. Where the requirements of this Section, or federal, state, or local regulations conflict or vary, the most stringent requirements or regulations shall apply.

C. Rejection of Non-Complying Items: The County reserves the right to reject items incorporated into the Work which fail to meet the specified minimum requirements. The County also reserves the right to reject Contractor submittal items that are deemed inappropriate or unacceptable by the Engineer or County. Submittal items that may be deemed inappropriate or unacceptable include proposed vendors or subcontractors with previous regulatory citations/violations.

D. Suspect Material Characterization: To classify caulking or a paint or bitumastic coating as non-PCB containing, a paint chip/coating sample must be collected as a grab sample from the source. The sample shall be sent to an analytical laboratory meeting the requirements of this Section.

1. Suspect PCB-Containing Paints/Coatings: Although there are no certification requirements pertaining to an individual that collects paint chip samples in an industrial or commercial setting, this Section requires paint chip sampling to be performed by an individual who has successfully completed HAZWOPER Training and PCB Awareness Training courses (within the past year) as defined in this Section. In addition, the individual shall possess a current EPA Lead Inspector or EPA Risk Assessor certification, or have documented experience in collecting paint chip samples.

2. Suspect ACM: All caulking and bitumastic coatings are considered suspect ACM. Therefore, if a sample will be collected, the sampling shall be performed by a certified NYSDOL Asbestos Inspector.

3. The qualifications of individuals who will collect samples must be approved by the Engineer prior to sample collection. Analytical results for samples that are collected by individuals not approved by the Engineer will not be recognized or accepted as valid by the County.

4. Estimate an approximate number of samples to adequately characterize painted/coated surfaces. Collect grab samples that include all layers of paint/coating from different areas randomly dispersed throughout the painted surface area. Grab samples are not to be composited.

5. PCB concentrations are based on the cumulative total of the nine (9) Aroclor cogeners (aka PCB compounds) analyzed by EPA methods as allowed within this Section.

E. Qualifications:

1. The Contractor or their proposed PCB removal subcontractor shall have successfully completed at least two (2) projects of comparable scope and methodologies to the work being performed under this Section within the past three (3) years. This experience shall be documented by identifying the following: (a) the name, address, and phone number of each facility where the work was performed; (b) the name of the individual representing the owner who supervised the work at each facility; (c) the types of facilities where the work was performed; (d) the volume and type of each material that was abated/removed; (e) the specific methods of Abatement/removal used at each facility (including the tools, technologies, and engineering controls employed).

2. Competent Person: When disturbing materials and wastes with PCB concentrations greater than or equal to 50 ppm, the Contractor shall have on staff and assigned to this Contract a Competent Person who has successfully completed DOT Hazardous Materials Transportation Training, HAZWOPER Training, PCB Awareness Training, and RCRA Training courses as defined in this Section. Each training course shall have been completed within the past year in the form of either an initial course or a refresher course. In addition, the Competent Person shall be able to fulfill the duties defined in this Section, shall have a minimum of two (2) years' experience with work involving PCBs, and shall have served as the Competent Person on at least three (3) projects of comparable scope and methodologies to the work being performed under this Section. The Competent Person shall be on site during all PCB-related work activities. It should be noted that depending upon the specific contaminants present during the work, additional training for the Competent Person (as described in Section 02 83 05- Lead Management) may be required.

3. PCB Waste Manager: When disturbing materials and wastes with PCB concentrations greater than or equal to 50 ppm, the Contractor shall have on staff and assigned to this

Contract a PCB waste manager who has successfully completed DOT Hazardous Materials Transportation Training, HAZWOPER Training, PCB Awareness Training, and RCRA Training courses as defined in this Section. Each training course shall have been completed within the past year in the form of either an initial course or a refresher course. In addition, the PCB waste manager shall have a minimum of two (2) years' experience on projects involving PCB Wastes. It is acceptable for an individual who meets the criteria of the Competent Person, to also serve as the PCB waste manager for this Contract as long as the individual fulfills all of the requirements of this paragraph.

4. PCB Worker: When disturbing materials and wastes with PCB concentrations greater than or equal to 50 ppm, the Contractor shall have on staff and assigned to this Contract a sufficient number of PCB workers who have successfully completed DOT Hazardous Materials Transportation Training and PCB Awareness Training courses as defined in this Section. Each training course shall have been completed within the past year in the form of either an initial course or a refresher course. In addition, each PCB worker shall have a minimum of one (1) year of experience on projects involving PCBs, and shall have worked on at least three (3) projects of comparable scope and methodologies to the work being performed under this Section. It should be noted that depending upon the specific contaminants present during the work, additional training for PCB workers (as described in Section 02 83 05 - Lead Management) may be required.

5. Worker (low PCB concentrations): When disturbing materials and wastes with PCB concentrations less than 50 ppm, the Contractor shall have on staff and assigned to this Contract a sufficient number of workers who have successfully completed a PCB Awareness Training course as defined in this Section. Each training course shall have been completed within the past year in the form of either an initial course or a refresher course. It should be noted that until a negative exposure assessment has been established via Exposure Monitoring, workers must wear appropriate respiratory protection.

6. Air Monitor: When disturbing any detectable concentration of PCBs, the Contractor shall have an Air Monitor assigned to this Contract who has successfully completed a PCB Awareness Training course as defined in this Section. This training course shall have been completed within the past year in the form of either an initial course or a refresher course. In addition, the Air Monitor shall have a minimum of two (2) years' experience in conducting Area Monitoring and Exposure Monitoring on projects involving PCBs. It is acceptable for an individual who meets the qualification requirements for Competent Person or PCB waste manager to also serve as the Air Monitor for this Contract, as long as the individual satisfies all of the requirements of this paragraph.

1.07 SUBMITTALS

A. Within 30 business days of the "Notice to Proceed" or as directed by the Engineer, the Contractor shall submit the following to the Engineer:

1. PCB Inspection and Sampling Plan: The Contractor shall provide a PCB Inspection and Sampling Plan to identify suspect PCBs, as shown on Table 5, attached to Section 01 35 45 – Hazardous Materials Control, and collect confirmatory samples, as appropriate during the inspection. This plan shall include at a minimum:

    a. Credentials of the individual responsible for inspection and sampling. At a minimum, the inspection shall be performed by an Environmental Professional, as defined in this Contract, who shall have current HAZWOPER training, PCB awareness training, and OSHA 10-hr certification, and shall have performed similar inspection work on at least three (3) projects of similar scope.

    b. Credentials of the laboratory providing sample analysis. The credentials shall include current certification by the New York State Department of Health's Environmental Laboratory Approval Program (ELAP).

    c. Sample collection, analysis and reporting protocol.

    d. Health and safety protocol (Job Hazard Analysis (JHA)) for all investigation activities.

2. PCB Inspection Report: The Contractor shall provide a PCB Inspection Report prepared by the Environmental Professional summarizing the results of all inspection activities, and as applicable, a sampling narrative, laboratory data packages, and inventory of all identified suspect and confirmed PCB containing materials.

3. PCB Safe Work Practices: Each Contractor that will disturb PCB-Containing Materials (with a PCB concentration less than 50 ppm) during the course of Work to be performed under this Section shall submit detailed, project-specific PCB Safe Work Practices designed to protect their workers and control the spread of potential PCB contamination. Work requiring the development of PCB Safe Work Practices includes, but is not limited to, the mechanical disturbance of paints/coatings (e.g., drilling, sawing, or spot removal). The PCB Safe Work Practices shall be signed and dated by a CIH meeting the definition in this Section, and shall include the following elements:

    a. A detailed discussion regarding the procedures and methodologies that will be used to conduct Exposure Monitoring. Also, provide the name and qualifications (i.e., training and experience documentation) of the Air Monitor who will be responsible for conducting the Air Monitoring activities. The Air Monitor shall at a minimum, satisfy the qualification requirements set forth in this Section;

    b. A detailed discussion regarding housekeeping procedures to be used for maintaining clean work areas and clean Hygiene Facilities;

    c. A detailed task analysis for each Work activity that has the potential to disturb PCB-Containing Materials. Each task analysis shall include, but is not limited to, the following information: (a) the type of Work activity; (b) the tools/equipment that

will be used; (c) operation and maintenance practices and procedures that will be used for the tools/equipment; (d) the types of PCB-Containing Materials that may be disturbed when performing the activity; (e) the engineering controls that will be used to control the spread of contamination during the activity; (f) housekeeping procedures that will be used during the activity; (g) PPE and proposed respiratory protection that will be used for the activity;

d. Equipment and Supplies: Identify the equipment and supplies that will be used to perform the Work;

e. Rental Equipment Notification: If rental equipment is to be used during the Work, the Contractor shall notify the rental agency in writing concerning the intended use of the equipment. Rental equipment data demonstrating compliance with the performance requirements of this Section must be presented to and approved by the Engineer prior to use;

f. SDSs: Provide SDSs for all chemical products to be used for the Work;

g. Medical Clearance for Respiratory Protection: For all activities that disturb PCB-Containing Materials with a PCB concentration less than 50 ppm, the Contractor shall provide a sufficient number of properly trained and experienced workers, each of whom shall: (a) have received a medical exam that included a Pulmonary Function Test (PFT) within the past year; (b) have received written medical clearance within the past year, by a licensed physician, to wear a respirator; (c) have received a qualitative or quantitative respirator fit-test for the specific respirator the employee will be using for this Work within the past year;

h. Employee Documentation: For all activities that may disturb PCB-Containing Materials with a PCB concentration less than 50 ppm, the Contractor shall provide a sufficient number of properly trained and experienced workers, each of whom shall: (a) have written proof of training (e.g., certificates) in accordance with the qualification requirements of this Section for workers and Air Monitors that will be used for the Work; (b) dates and written proof of respiratory clearance and a medical exam in accordance with this Article; (c) dates and written proof of a respirator fit-test in accordance with this Article.

4. PCB Management Plan: Each Contractor that will disturb PCB-Containing Materials or PCB Wastes (with a PCB concentration greater than or equal to 50 ppm) during the course of Work to be performed under this Section shall submit a detailed, project-specific PCB management plan that addresses work procedures and equipment to be used during the disturbance, removal, handling, collection, and disposal of PCB-Containing Materials and PCB Wastes. Work requiring a PCB management plan includes, but is not limited to, Abatement, spot removal, and construction/demolition activities. The PCB management plan shall be prepared in accordance with OSHA Construction Standards and all other pertinent federal, state, and local regulations, including New York State Department of

Labor (NYSDOL) (12 NYCRR 56) asbestos regulations if asbestos is present. In addition, the PCB management plan shall be coordinated with the Engineer. The PCB management plan shall also be signed and dated by a CIH meeting the definition in this Section.

a. If the PCB-Containing Materials or PCB Wastes that will be disturbed also contain asbestos or heavy metals, it is acceptable to integrate the PCB management plan elements into the relevant Asbestos Work Plan (required under Section 02 82 05 - Asbestos Management) or Lead Management Plan (required under Section 02 83 05 - Lead Management). PCB Management Plan elements that are integrated into an Asbestos Work Plan or Lead Management Plan must still satisfy all of the requirements of this Section. The PCB management plan (or relevant Asbestos Work Plan or Lead Management Plan) shall include the following elements:

1) PCB Control:

a) Drawings showing the location and details of the following: (a) each PCB Control Area; (b) each hygiene facility; (c) proposed electrical hookups; (d) proposed water hookups: (e) each waste storage area: (f) restroom areas; (g) areas designated for eating, drinking, and smoking;

b) A detailed discussion regarding the interfacing of trades (i.e., how the Contractor will coordinate the Work with other contractors or County employees working at the site) and the sequencing of PCB-related Work;

c) A detailed discussion regarding the collection, handling procedures, and disposal of PCB-Containing Materials and PCB Wastes (including the collection, filtering, and disposal of wastewater). If reusable equipment used during the Work will be in contact with PCB-Containing Materials or PCB Wastes that have PCB concentrations greater than or equal to 50 ppm, the Contractor shall submit an equipment decontamination procedure using a Performance-based Decontamination Fluid (PODF) in accordance with 40 CFR 761;

d) A detailed discussion regarding the procedures and methodologies that will be used to conduct Exposure Monitoring and Area Monitoring. Also, provide the name and qualifications (i.e., training and experience documentation) of the Air Monitor who will be responsible for conducting the Air Monitoring activities. The Air Monitor shall at a minimum, satisfy the qualification requirements set forth in this Section;

e) A detailed discussion regarding housekeeping procedures to be used for maintaining clean work areas and clean Hygiene Facilities;

f) A detailed discussion regarding the specific methods and procedures of emissions control that will be used to ensure that airborne contaminant levels do not meet or exceed an OSHA PEL outside of each PCB Control Area;

g) Detailed task analysis for each Work activity that has the potential to disturb PCB-Containing Materials or PCB Wastes. Each task analysis shall include, but is not limited to, the following information: (a) the type of Work activity; (b) the tools/equipment that will be used; (c) operation and maintenance practices and procedures that will be used for the tools/equipment; (d) the types of PCB-Containing Materials that may be disturbed or PCB Wastes that may be generated when performing the activity; (e) the engineering controls that will be used to control the spread of contamination during the activity; (f) the proposed crew size for the activity and individual employee responsibilities during the activity; (g) housekeeping procedures that will be used during the activity; (h) PPE and proposed respiratory protection that will be used for the activity;

h) Equipment and Supplies: Identify the equipment and supplies that will be used to perform the Work;

i) Rental Equipment Notification: If rental equipment is to be used during the Work, the Contractor shall notify the rental agency in writing concerning the intended use of the equipment. Rental equipment data demonstrating compliance with the performance requirements of this Section must be presented to and approved by the Engineer prior to use;

j) MSDSs: Provide SDSs for all chemical products (including chemical stripping products and PODFs) to be used for the Work;

k) The name and qualifications (i.e., experience and training documentation) of the Competent Person who will be responsible for the oversight and execution of the PCB management plan during all activities affecting PCB-Containing Materials and PCB Wastes. At a minimum, the Competent Person shall satisfy the qualification requirements set forth in this Section.

2) Waste Management:

a) The identification of PCB-Containing Materials and PCB Wastes associated with the Work;

b) The estimated quantity of each waste stream (regulated and non-regulated) that will be generated and disposed of;

c) The name, address, phone number, and qualifications for each vendor and facility that will be transporting, storing, testing, or disposing of the wastes. The Contractor shall verify the permit status of the facility as well as check for outstanding violations and enforcement actions. Include a 24-hour phone contact for each vendor and facility;

d) Current permit documentation for each recycling and TSDF indicating that the facility is approved by federal, state, and local regulatory agencies to receive PCB-Containing Materials and PCB Wastes. The documentation shall include an "acceptance letter" from each TSDF indicating its ability to accept the specific waste streams that will be generated during Work performed under this Section;

e) Current 6 NYCRR 364 permit documentation for the waste transporter that will transport PCB-Containing Materials and PCB Wastes from the work site to the TSDF. The documentation shall clearly indicate the transporter's ability to deliver the PCB-Containing Materials and PCB Wastes to the chosen TSDF;

f) Spill prevention, containment, and cleanup contingency measures to be implemented during the Work, as well as procedures to be followed during a suspected PCB emissions/bulk material release or emergency situation. All measures and procedures shall be in accordance with the standards referenced in this Section;

g) A detailed discussion of the on-site handling, storage, removal, and disposal of waste materials. This discussion shall include, but is not limited to, the following: (a) specifications for a secondary containment system for each drum storage area; (b) the methods of demarcation that will be used to identify the waste storage areas and each waste container; (c) the methods and procedures that will be used to collect and containerize wastes on a daily basis; (d) the types of containers that will be used to containerize the wastes; (e) the submittal of weekly regulated waste inspection and inventory records as required in this Section;

h) The name and qualifications (i.e., experience and training documentation) of the PCB waste manager who will be responsible for the oversight and execution of the PCB management plan during waste management activities involving PCB-Containing Materials and PCB Wastes. At a minimum, the PCB waste manager shall satisfy the qualification requirements set forth in this Section.

b. A detailed schedule for the implementation of the PCB management plan elements. The schedule shall clearly indicate the starting and completion dates for the Work,

and shall allow adequate time for cleanup, inspections, and Air Monitoring activities.

c. Medical Surveillance: For all activities that disturb PCB concentrations that are greater than or equal to 50 ppm, the Contractor shall provide a sufficient number of properly trained and experienced workers, each of whom shall: (a) have completed initial blood testing for PCBs; (b) have received a medical exam that included a PFT within the past year; (c) have received written medical clearance within the past year, by a licensed physician, to wear a respirator; (d) have received a qualitative or quantitative respirator fit-test within the past year for the specific respirator the employee will be using for this Work.

d. Employee Documentation: For all activities that result in airborne contaminant concentrations (i.e., PCBs, asbestos, or heavy metals) equal to, or in excess of an Action Level, PEL, or TLV, or for those activities that take place within a PCB Control Area, the Contractor shall provide a sufficient number of properly trained and experienced workers, each of whom shall: (a) have written proof of training (e.g., certificates) in accordance with the qualification requirements of this Section for PCB workers, Competent Persons, PCB waste managers, and Air Monitors that will be used for the Work; (b) copies of resumes for PCB workers, Competent Persons, PCB waste managers, and Air Monitors that will be used for the Work, indicating work experience as required in this Section; (c) dates and written proof of initial medical surveillance by the Contractor or other employer within the past year, and proof that the employee is currently participating in the employer's ongoing medical surveillance program in accordance with this Section; (d) dates and written proof of respiratory clearance and a medical exam in accordance with this Section; (e) dates and written proof of a respirator fit-test in accordance with this Section.

e. A current (i.e., within the last month) signed and notarized statement disclosing all OSHA, EPA, and DOT citations/violations within the past three (3) years for the company performing the PCB abatement.

5. Analytical Laboratory Qualifications for Analyzing Suspect PCB-Containing Materials and Wastes: Submit the name, address, and telephone number of each analytical laboratory selected to perform the analyses of waste samples (solid and liquid), air samples collected for Area Monitoring and Exposure Monitoring purposes, and paint/bitumastic coating samples collected to classify painted/coated surfaces. The analytical laboratory shall be currently accredited by the American Industrial Hygiene Association (AIHA) and the New York State Department of Health's (NYSDOH's) Environmental Laboratory Approval Program (ELAP). Provide copies of current AIHA and ELAP certificates along with dates of accreditation/reaccreditation. ELAP certificates must show evidence of certification for the specific analytical methods that will be used to analyze each type of sample that will be collected.

B. Field Reports and Recordkeeping: During all Work performed under this Section, the Contractor shall maintain and provide the following documentation:

1. Air Monitoring Documentation: All PCB Air Monitoring results and daily Air Monitoring reports shall be provided to the County as soon as possible, but no later than seven (7) calendar days from the date the samples are collected. The results shall be signed by the laboratory employee who analyzed or supervised the analysis of the samples, as well as the Air Monitor that physically performed the Air Monitoring activities at the work site. All laboratory analytical results shall be accompanied by complete COC documentation.

    a. Each daily Air Monitoring report shall be signed by the Contractor's employee who generated the report. The content of these reports shall include, but is not limited to, the following information: (a) sample "start" and "stop" times; (b) flow rates (initial and final) for each sample; (c) the total volume of air collected for each sample; (d) sample location descriptions/sample location drawings/names of individuals being sampled; (e) types (i.e., makes and models) of sampling equipment used; (f) types of sample media (i.e., filters and cassettes) used; (g) the most recent calibration dates, along with the calibration results, for the sampling equipment used; (h) the name of the Air Monitor that conducted the Air Monitoring; (i) dates that the Air Monitoring was conducted; (j) work tasks being performed during the Air Monitoring; (k) unique sample numbers used to identify each sample; and, (l) highlighting of all PEL exceedances.

2. Waste Documentation: Completed and signed waste manifests from TSDFs shall be provided to the County as soon as possible but no later than thirty (30) calendar days of disposal. In addition, on-site waste storage areas shall be inspected weekly by the PCB waste manager, who at a minimum shall satisfy the qualification requirements set forth in this Section.

    a. Each waste storage area inspection shall be coordinated with the Engineer, documented in the form of a written report, and each report shall be signed by the Contractor's employee who generated the report. All reports shall be provided to the County within 24-hours of the date the inspection is completed. The content of these reports shall include, but is not limited to, the following information: (a) the name of the individual that conducted the inspection; (b) descriptions of waste streams being stored; (c) types and quantities of waste containers being used; (d) the current disposal status (i.e., when each waste container is scheduled to be removed from the work site) and physical condition of each waste container; (e) the presence/absence of proper labeling for each waste container in accordance with this Section and federal, state, and local regulations; (f) secondary containment systems being used; (g) the methods being used to secure/lock each waste storage area to prevent any unauthorized entry.

    b. In addition to performing weekly waste storage area inspections, the PCB waste manager shall also maintain an ongoing waste inventory. The waste inventory shall

be coordinated with the Engineer, and the content of the inventory record shall include, but is not limited to, the following information: (a) specific dates that each waste container was added/removed from the waste storage area; (b) the full name (printed) and signature of the individual responsible for adding/removing each waste container from the waste storage area.

3. PCB Control Area Inspection Documentation: PCB Control Areas shall be inspected daily by the Competent Person, who at a minimum shall satisfy the qualification requirements set forth in this Section.

   a. Each daily PCB Control Area inspection shall be documented in the form of a written report, and each report shall be signed by the Contractor's employee who generated the report. All reports shall be provided to the County no later than 24-hours after the inspection is completed. The content of these reports shall include, but is not limited to, the following information: (a) the types of work being performed; (b) the names of the PCB workers, Competent Person, PCB waste manager, and Monitor on site, as well as the name of the company each individual is representing; (c) the types of Air Monitoring (i.e., Exposure Monitoring or Area Monitoring) being conducted, and the number of samples being collected for each type of Air Monitoring activity; (d) any non-compliance issues observed (i.e., observations that conflict with the requirements of the Contractor's PCB management plan, this Section, or federal, state, and local regulations) along with the corrective actions that were taken to achieve compliance.

4. Contractor Project Record: The Contractor's Competent Person shall maintain a project record at the work site. The Contractor Project Record shall be made available to the Engineer or County for review at any time during the Work, and shall be submitted to the County within 24-hours after the completion of the Work.

   a. At a minimum, the Contractor Project Record shall contain the following information: (a) copies of training certificates for all individuals involved with the Work; (b) copies of all Air Monitoring results generated during the Work; (c) copies of all available caulking and paint chip/bitumastic coating sample analytical data and survey reports related to the Work; (d) copies of all daily sign-in sheets as required in this Article; (e) a list of emergency phone numbers, including the local fire department, local police department, nearest hospital, as well as phone numbers for the Engineer and County personnel responsible for administering the Work; (f) a copy of 40 CFR 761; (g) copies of all SDSs pertaining to all chemicals being used during the Work; (h) a copy of this Section and the related Drawings; (i) a copy of the Contractor's PCB management plan; (j) copies of all daily PCB Control Area inspection records; (k) copies of all weekly waste storage area inspection records; (l) a copy of the waste inventory; (m) a copy of the Contractor's Hazard Communication (HAZCOM) program.

5. Daily Sign-In Sheets: The Contractor shall generate daily sign-in sheets for all individuals entering and exiting each PCB Control Area for the duration of the Work. The daily sign-in sheets shall be maintained by the Competent Person, and shall be made available to the Engineer or County for review at any time during the Work. All daily sign-in sheets shall be submitted to the County within 24-hours after the completion of the Work.

    a. At a minimum, each daily sign-in sheet shall include: (a) the individual's full name (printed); (b) the individual's signature; (c) the name of the company the individual is representing; (d) the time of entry and exit from each PCB Control Area; and (e) verification by the Competent Person that the individual meets the applicable training requirements, if the individual intends to enter a PCB Control Area.

6. HAZCOM Program: The Contractor's HAZCOM program shall be made available to the Engineer or County for review at any time during the Work.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. NOT USED

2.02 MATERIALS AND EQUIPMENT

A. Respirators: The Contractor shall select respirators approved by the NIOSH for use in areas where paints/bitumastic coatings, dusts, materials, or wastes containing contaminants may be disturbed. At a minimum, the Contractor shall provide each individual with a half-face, negative pressure, air purifying respirator equipped with HEPA/P-100 Filter cartridges and Organic Vapor Cartridges, until Exposure Monitoring results indicate that respiratory protection can be modified. The Contractor's CIH shall make all determinations regarding respiratory protection modifications that will be implemented for the Work. All modifications shall be in accordance with OSHA requirements, the Contractor's PCB management plan, and any relevant Asbestos Work Plan or Lead Management Plan associated with the Work.

B. PPE: The Contractor shall provide personnel who have a potential to be exposed to materials or wastes containing contaminants, with appropriate PPE as prescribed by the Contractor's CIH.

C. HEPA Filters: HEPA/P-100 Filters used in vacuuming equipment, power tools, and local exhaust equipment must meet or exceed any manufacturer's specifications and recommendations, as well as specifications presented in the Standard for Safety High Efficiency, Particulate, Air Filter Units (UL 586).

D. Waste Containers: Containers for the storage of all PCB Wastes shall be DOT-approved, and shall be provided by the Contractor.

E. Abrasives: Mechanical paint/bitumastic coating removal equipment shall not use any products containing crystalline silica, and the equipment shall not utilize any non-recoverable materials or any cutting materials which introduce toxic or hazardous materials into the environment.

F. Chemical Strippers: The Contractor shall utilize an environmentally safe chemical paint stripping system, with demonstrated suitability and efficiency in preparing cast-in-place concrete, cement, and plaster surfaces that are free of any visible residues of paints/bitumastic coatings. The system shall include non-alkaline or alkaline strippers that provide the lowest possible level of toxicity consistent with the types of paints/bitumastic coatings to be removed. Neutralization products and procedures shall be provided for all alkaline stripping systems, no stripping system shall contain methylene chloride, and the stripping system shall be low in volatile organic compounds (VOCs).

PART 3 – EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Hygiene Facilities: The Contractor shall provide functional Hygiene Facilities as defined in this Section that are appropriate for the types of Work to be performed under this Section. The Contractor shall ensure that employees do not leave a PCB Control Area wearing any potentially contaminated PPE. Using compressed air to dislodge dust from clothing/PPE shall be strictly prohibited. The Contractor shall collect, test, and properly dispose of all wastewater generated from Hygiene Facilities.

1. Handwash Stations: The Contractor shall provide functioning handwash stations on all projects that disturb PCB-Containing Materials or PCB Wastes. Handwash stations shall have running water at the tap, clean towels, and soap per 29 CFR 1926.51. Substituting “hand wipes” in place of soap and running water will not be acceptable.

2. Showers: The Contractor shall provide shower facilities for use by employees whose airborne exposure to PCBs is above an OSHA PEL. When shower facilities are necessary, employees are required to shower at the end of the work shift each day prior to leaving the PCB Control Area that they are working in.

B. Utilities: The temporary use of any on-site utilities shall be subject to the approval of the County. The Contractor shall furnish all water and hoses needed for the Work, as well as any temporary hookups. Also, the Contractor shall supply all heating equipment and water filtration devices needed for the Work. In addition, all temporary lighting and temporary electrical service to a PCB Control Area shall be provided by the Contractor, and shall be in weather-proof enclosures and be ground fault protected.

C. Signs: The Contractor shall post conspicuous warning signs at all approaches to work areas and waste storage areas. The signs shall be located at such a distance so that personnel may read the sign and take the necessary precautions before entering a work area or waste storage area. Signs shall comply with federal, state, and local regulations, including the requirements of OSHA. Signs shall not be removed until all Abatement, removal, and construction/demolition activities

have been completed. At a minimum, each sign shall bear the following information in English and the predominant language that is spoken by the Contractor's employees if English is not spoken:

WARNING

PCB WORK AREA

POISON

NO SMOKING OR EATING

1. Each sign shall be appropriately modified to include additional warnings for other contaminants that are identified during Exposure Monitoring.

D. Physical Boundary Delineation: The Contractor shall clearly delineate each work area and waste storage area with a Physical Boundary as defined in this Section.

E. Work Area Preparation: The Contractor shall utilize HEPA-filtered vacuums, and wet methods during the initial cleaning of each work area. Prior to removal from each work area, all movable objects and mounted objects that can be removed shall be pre-cleaned using HEPA-vacuums and wet methods. Fixed objects that must remain within each work area shall be pre-cleaned using HEPA vacuums and wet methods, and subsequently covered with 6-mil polyethylene sheeting.

3.02 IMPLEMENTATION

A. Bulk Removal

1. Protection of Existing Work to Remain: All Work involving the disturbance of PCB-Containing Materials or PCB Wastes must be conducted without damage to, or contamination of equipment or surfaces within the work areas or other areas adjacent to the work areas. All such damage or contamination shall be immediately corrected and cleaned up by the Contractor at the Contractor's expense.

2. Prohibited Activities: Contractors shall not conduct activities that are prohibited by OSHA and EPA regulations. The following activities are prohibited, regardless of whether they are conducted subject to an exposure assessment and written compliance program: (a) burning-off paints/bitumastic coatings; (b) using heat guns operating above 1100 oF; (c) dry machine sanding, grinding, or blasting paint without a HEPA vacuum exhaust tool; (d) uncontained hydroblasting or high-pressure washing; (e) welding painted/coated surfaces unless the paint/coating is removed at least 4-inches from area of heat application (per 29 CFR 1926.345(c)(1)), and local exhaust ventilation is used.

3. Test Patches: Prior to choosing the paint removal method(s) for paints/bitumastic coatings, the Contractor shall perform test patches on surfaces subject to Abatement or spot removal, to determine if the method(s) meet the requirements of this Section

4. Mechanical Removal Equipment: The use of mechanical equipment to remove asbestos-containing caulking or bitumastic coatings will require compliance with NYSDOL (12 NYCRR 56) asbestos regulations, including the use of a full containment enclosure under negative air pressure.

   a. When removing paints/bitumastic coatings from metal surfaces, the paints/bitumastic coatings must be removed to the extent that only the bare metal remains (i.e., no mill scale remains). In the case of substrates other than metal (e.g., concrete, brick, and block), paints/bitumastic coatings shall be removed from the surface of the substrate to the extent that flaking and peeling will not occur subsequent to the performance of the Work. Acceptance of the Work shall be contingent upon inspection of the substrate surfaces by the Engineer, and must demonstrate the absence of residual paint/coating layers that can be physically measured, pried loose, or peeled away using a scraping device. The Contractor may only use products and tools meeting the performance specifications outlined below:

      1) The Contractor shall utilize a vacuum-assisted power tool system with demonstrated suitability and efficiency in preparing metal surfaces to the SSPC SP-11 standard, and with demonstrated effectiveness in maintaining PCB emissions below OSHA exposure limits during the disturbance of paints/bitumastic coatings. Such systems may include dustless needle guns, dustless rotopeens, and dustless right angle grinders, all of which capture dust and debris at the cutting tool edge, and transport the material under vacuum conditions to an air-tight disposal container. Dustless needle guns shall only be utilized on metal surfaces.

      2) The vacuum-assisted power tool system shall also be designed to permit the removal and replacement of collection containers under negative pressure in order to prevent the release of dusts. The system shall be equipped with an automatic “shut-off” in the event of vacuum failure.

      3) Abrasive/recovery tools shall be monitored at all times by a device capable of determining recovery at the face of each tool, and capable of automatically disabling the tool in the event that recovery levels are insufficient. The monitor, at a minimum, shall have the following features: (a) a remote warning light; (b) an adjustable recovery set point; (c) automatic equipment disabling capabilities; (d) a sensing range of 0 5 pounds per square inch (psi); (e) solid state photohelic instrumentation; (f) remote sensing at the face of the tool.

      4) The safe recovery point shall be calibrated each day before start-up, or each time a new tool or vacuum source is used. All manufacturer recommendations shall be followed with respect to the set up and use of the monitor, and the manufacturer's operations manual shall be kept on site at all times. A daily log shall be maintained by the Contractor, identifying all calibrations of

recovery levels, as well as any “down time” as a result of insufficient recovery levels.

5) The cutting head of the vacuum-assisted power tool system that is used on flat surfaces shall be capable of cutting to within 1-1/2" of any inside corner, molding, or edge, and may include dustless rotopeens or dustless needle guns. Tools for corners and moldings shall be specifically designed for that purpose, and conform to all inside corners, outside corners, curved, flat, and angled surfaces that are to be abated under this Section. These tools shall also maintain vacuum control at the Work surface/cutting head interface at all times. HEPA vacuum-shrouded needle guns may be used for non-flat surfaces in accordance with manufacturer recommendations. Vacuum-assisted finishing tools, such as right angle grinders, may be used to achieve the SSPC SP 11 standard, but may not be used for primary removal.

6) Vacuum-assisted power tool systems meeting all of the specifications outlined herein, may be used pending the submittal of all required performance documentation, and their acceptance by the Engineer. Any tools which do not meet all of the specifications outlined herein, shall be removed from the project site immediately, and shall not be used for the Work to be performed under this Section.

5. Chemical Strippers: Acceptance of the Work shall be contingent upon inspection of the abated substrate surfaces by the Engineer, and must demonstrate the absence of residual paint/bitumastic coating layers that can be physically measured, pried loose, or peeled away using a scraping device. The Contractor may only use products and paint stripping systems meeting the performance sections outlined below:

a. The Contractor shall utilize a chemical paint stripping system with a demonstrated effectiveness in maintaining PCB emissions below OSHA exposure limits during the disturbance of paints/bitumastic coatings. The Contractor shall utilize a mechanical ventilation system during the Work that exhausts away from occupied areas. The application of all paint stripping systems shall be in accordance with manufacturer recommendations.

b. The Contractor should note that more than one (1) product may be required to strip PCB-containing paints/bitumastic coatings. The use of multiple products shall be in accordance with work practices approved by the individual manufacturer of each chemical paint stripping compound.

c. All chemical paint stripping products shall be presented to the Engineer for approval prior to the start of any Work to be performed under this Section. When presenting the products to the Engineer, they shall be in the manufacturer's unopened, original containers bearing accurate information regarding the products. Also, the manufacturer’s labels on each container shall be intact and legible.

B. Chemical paint stripping systems meeting all of the requirements outlined herein, may be used pending the submittal of all required performance documentation, and its acceptance by the Engineer. Any products which do not meet all of the specifications outlined herein, shall be removed from the project site immediately, and shall not be used for the Work to be performed under this Section.

3.03 FIELD TESTING AND QUALITY CONTROL

A. Air Monitoring

1. Exposure Monitoring: For Work involving the disturbance of any detectable concentration of PCBs, the Contractor shall collect personal air samples from employees who are anticipated to have the greatest risk of exposure, as determined by the Contractor's CIH or Competent Person. Personal air samples shall be collected during every work shift from at least one (1) employee that is representative of each type of work task that is being performed. Each personal air sample shall "run" for the employee's entire work shift in order to ensure that enough volume (of air) is collected and an accurate 8-hour TWA can be calculated. Documentation regarding the sample numbers, specific shift when the sampling was conducted, the work tasks that were sampled, the dates of sampling, the employee hours that were worked during the shift, and the total sampling times, shall accompany each laboratory COC form.

   a. If PCB concentrations being disturbed are less than 50 ppm, Exposure Monitoring may be discontinued following a complete negative exposure assessment and approval from the Engineer and the Contractor's CIH. A negative exposure assessment is defined as current initial exposure monitoring using breathing zone air samples representing the 8-hour TWA exposure for each individual who are representative of each task being conducted. Following discontinuation of exposure monitoring, if there is a change to work practices, exposure monitoring shall again be performed until a second negative exposure assessment is conducted and analyzed.

2. Area Monitoring: If PCB concentrations being disturbed are greater than or equal to 50 ppm, the Contractor shall collect a minimum of two (2) area air samples outside of each PCB Control Area on a daily basis for the duration of the Abatement, removal, or construction/demolition Work, as well as any other Work involving the disturbance of PCB-Containing Materials or PCB Wastes. During sampling activities, all air sample filter cassettes shall be positioned approximately five to six feet above the ground (in order to simulate an individual's breathing zone), and shall not be placed immediately adjacent to obstructions (e.g., walls or columns) which may restrict the flow of air to the filter cassettes. Each air sample shall be analyzed for all contaminants identified during the exposure assessment. If area Air Monitoring indicates an emission level in excess of an OSHA PEL outside of a PCB Control Area, all Work in that area shall be stopped immediately. The Contractor shall then take immediate corrective actions to reduce emission levels to below the OSHA PEL(s), and the Contractor shall clean all adjacent

areas that may have become contaminated due to the emissions. Documentation regarding the sample numbers, sample locations, the dates of sampling, the employee hours that were worked during the shift, and the total sampling times, shall accompany each laboratory COC form.

3. Documentation: Complete documentation of all Air Monitoring activities shall be in accordance with this Section.

4. The Contractor shall submit all Air Monitoring results to the County as soon as possible, but no later than seven (7) calendar days from when the air samples were collected.

3.04 STARTUP AND DEMONSTRATION

A. NOT USED

3.05 ADJUSTING, PROTECTION, AND CLEANUP

A. Cleanup and Disposal

1. Cleanup: The Contractor shall maintain all surfaces, including protective coverings (polyethylene sheeting) within each work area, free of accumulations of paint chips/coating debris, dusts, and wastes. The Contractor shall perform housekeeping activities daily throughout each work shift and at the end of each work shift, in order to prevent any accumulation of paint chips/coating debris, dusts, and wastes in the work areas. Dry sweeping and using compressed air to cleanup a work area shall be strictly prohibited. HEPA-filtered vacuums and wet methods shall be used to ensure that each work area remains free of visible paint chips/coating debris, dusts, and wastes.

2. Equipment Decontamination: All reusable equipment (e.g., hand tools and power tools) that has been in contact with materials that have a PCB concentration greater than or equal to 50 ppm, shall be thoroughly decontaminated prior to being removed from the PCB Control Area in accordance with 40 CFR 761.79(c)(2)(i), which permits “swabbing surfaces that have contacted PCBs with a solvent.” The solvent shall be a PODF as defined in 40 CFR 761.79(c)(3)(iv)(C) or (D). Used decontamination materials (e.g., rags used to swab equipment) shall be collected, stored, and disposed of in accordance with this Article.

3. Sampling and Laboratory Analysis of PCB-Containing Wastes: For PCB Waste characterization, the PCB waste manager shall sample all potential PCB-containing waste streams in accordance with the Toxic Substances Control Act (TSCA) (40 CFR 761). According to the EPA, characterizing PCB-containing waste streams (i.e., determining whether wastes are regulated or non-regulated under TSCA) shall be made based upon the total PCB concentration at the “source” (e.g., the paint/bitumastic coating) prior to any disturbance that may be initiated through Abatement, removal, or construction/demolition activities. Unlike hazardous waste determinations that are made under the RCRA, sampling to determine whether a waste is PCB-regulated shall not be made based on the sampling and analysis of mixed bulk waste materials/debris generated as a result of Abatement,

removal, or construction/demolition activities. Instead, source materials for PCBs must be collected as grab samples and must not be composited during collection or analysis as that may reduce the concentration of PCBs detected. Rather, individual source samples shall be submitted for analysis to determine the highest concentration of PCBs contained in the source material or wastes.

a. PCB concentrations are based on the cumulative total of the nine (9) Aroclor congeners (aka PCB compounds) analyzed by EPA methods identified within this Section.

b. If PCB concentrations in paint/coatings are present greater than or equal to 50 ppm, all PCB-containing waste generated in the designated sampling area will be classified as TSCA-regulated waste. If PCB concentrations in paint and coatings are less than 50 ppm, all PCB-containing waste generated in the area will be classified as non-TSCA PCB-containing waste.

c. Waste materials/debris generated during Abatement, removal, or construction/demolition activities may be classified as NYSDEC hazardous waste (6 NYCRR 371(e)) in addition to being PCB-regulated. Therefore, wastes/debris must still be sampled and characterized prior to disposal. All waste samples shall be collected in the presence of the Engineer using the following procedure:

1) Sampling of drummed waste will be biased for the highest result and will be based on inspection of drum contents. For drums with paint chips, with or without stripper waste, collect one grab sample for every quarter of the drum, from any hot spots (i.e., paint chips). As an example, if the drum is full, collect four grab samples, if the drum is half-full, collect two grab samples, and if the drum is one-tenth full, collect one sample. Grab samples shall be composited into one (1) bulk composite sample. For drums with PPE, polyethylene sheeting, rags and towels, collect up to four (4) grab samples with positive bias for paint chips or paint-related staining. As such, samples are likely to be collected from dust or chips at the bottom of the drum. Each grab sample shall be composited into one (1) bulk composite sample, labeled and submitted to a laboratory that satisfies the requirements set for in this Section. Composite samples shall undergo Toxicity Characteristic Leaching Procedure (TCLP) analysis for the eight (8) RCRA metals.

2) If it cannot be confirmed that the specific source is non-TSCA regulated, four (4) biased worse-case grab samples shall be collected, composited, and sampled for analysis of Total PCBs.

3) The Contractor shall also direct the laboratory to analyze each sample for any additional parameters that are required by the specific TSDF being used. Furthermore, if the waste stream is associated with the use of a chemical paint stripping system, the Contractor shall have the laboratory analyze each sample

for pH and any other RCRA characteristic that may fail due to the chemical composition of the waste. The Contractor shall ensure that the laboratory being used to satisfy the requirements of this Section is also capable of performing these additional analytical tests.

4) One (1) representative wastewater sample shall be collected for laboratory analysis from each drum that generated. Each sample shall be collected using appropriate field sampling equipment (e.g., a pipette or bailer), and shall be labeled and submitted to a laboratory that satisfies the requirements of this Section.

4. Sampling and Laboratory Analysis of PCB-Containing Demolition Debris: The Contractor shall collect representative bulk samples of anticipated demolition wastes to determine proper disposal. In addition to a total PCB analysis of the source materials (e.g., paints/bitumastic coatings), representative bulk samples shall be collected from painted/bitumastic-coated building materials for TCLP analysis for the eight (8) RCRA metals.

a. Scrap Metal Exemption for Recycling: Under 6 NYCRR 371.1(c)(7), painted scrap metal can be sent to a recycling facility, rather than be discarded as hazardous waste. In order for the County to submit a “c7 notification” to the NYSDEC and claim the “scrap metal exemption,” the Contractor must first submit notification to their recycling facility indicating that PCBs are present on the scrap metal in concentrations less than 50 ppm (if concentrations are greater than or equal to 50 ppm, the scrap metal cannot be recycled and instead must be disposed of as a PCB-regulated waste). If asbestos or heavy metals are detected in the paints/bitumastic coatings on the scrap metal, the Contractor shall also disclose this information to the recycling facility. The Contractor shall receive written permission from the recycling facility indicating that the facility will accept the PCB paint/bitumastic coated scrap metal generated during the Work to be performed under this Section. The Contractor shall submit this documentation to the Engineer for approval prior to disposal.

b. Bulk demolition debris (e.g., painted concrete) that is sampled and determined to be non-RCRA and non-TSCA waste may be disposed of as construction and demolition (C&D) debris.

5. Collection, Separation, and Containerization of Wastes: The Contractor shall collect, separate (by waste stream/waste type), and containerize PCB Wastes (solid and liquid), debris, PPE, and containment materials on a daily basis in accordance with the PCB management plan.

a. If any source sample from a specific work area indicates that PCBs in paints/coatings are greater than or equal to 50 ppm, then all waste from that area will be characterized as TSCA-regulated waste. All waste streams must be segregated into separate drums and labeled with PCB waste labels, including out of service date

(when PCB waste is first place in the drum) in addition to RCRA hazardous waste labels (pending analysis). This may include one or more drums for paint chops, chemical stripper waste, and HEPA filters associated with HEPA vacuums. Other waste such as PPE, rags and polyethylene sheeting from a specific work area may be comingled in drums separate from the drums containing paint chips, stripper waste and HEPA filters.

b. If any source samples from a specific work area indicate that PCBs in paints/coatings are less than 50 ppm, then all PPE, poly and paint/coating waste from that area will be characterized as PCB-containing non-hazardous, contaminated waste, and should not be managed as C&D debris. All waste streams shall be segregated into separate drums. Paint chips and HEPA filters shall be drummed as one waste stream from each work area, and polyethylene sheeting, rags, paper towels and PPE from each work area will be drummed as a separate waste stream.

c. The Contractor shall store all wastes in DOT-approved container systems. No drum/container shall be filled in excess of the capacity marked on the drum/container. All drums/containers shall be sealed and covered immediately after filling, and each drum/container shall have a label affixed to it in accordance with the requirements of this Section. All labels shall remain intact and legible at all times.

d. No water mixed with or contaminated by hazardous waste may be released onto the ground or into any drain or sewer. It should be noted that a discharge of more than 1 lb. of PCBs onto the ground or into the water within a 24-hour period, shall be considered a violation of the Clean Water Act and shall be treated as a “reportable quantity” in accordance with 40 CFR 117. Such a release shall be grounds for immediate termination of this Contract, and the Contractor shall be liable for any fines, penalties, or remediation costs.

e. The Contractor shall store non-hazardous wastes separately from hazardous wastes and PCB-regulated wastes, shall provide all non-hazardous waste containers, and shall make all transportation and disposal arrangements for non-hazardous wastes in accordance with federal, state, and local regulations. PCB waste must be disposed within 180 days subject to the requirements of 40 CFR 761.65, in addition to any RCRA hazardous waste storage requirements, as applicable.

6. Storage of Wastes: The Contractor shall ensure that all drummed wastes are stored in a secondary containment system, and that each waste storage area is demarcated with a Physical Boundary. In addition, the Contractor shall post weekly waste inspections and waste inventories in the regulated waste storage area, as required in this Section, as well as the following emergency information: (a) the name and telephone number of the facility’s Emergency Coordinator; (b) the location of fire extinguishers and fire alarms; (c) the location of spill control materials; (d) the telephone number for the fire department (unless the facility has a direct alarm).

7. Labeling: The Contractor shall affix warning labels to all PCB Waste and hazardous waste drums/containers. Labels must be filled out completely at the point of generation when waste is first containerized. Labels shall comply with the requirements of federal, state, and local regulations. PCB labels shall be used to designate PCB waste, including out-of-service date, in addition to RCRA hazardous waste labels. At a minimum, all PCB and hazardous waste labels shall bear the following information in English:

CAUTION

CONTAINS PCBs

A toxic environmental contaminant requiring

special handling and disposal in accordance with

U.S. Environmental Protection Agency Regulations

40 CFR 761 – For Disposal Information contact

the nearest U.S.EPA Office

[Out-of-Service Date – when PCB waste is first placed in drum]

HAZARDOUS WASTE

FEDERAL LAW PROHIBITS IMPROPER DISPOSAL

HANDLE WITH CARE

[Generator Name, Address, and Telephone Number]

[Specific Contents of Container]

[EPA-Issued Generator Identification Number]

[EPA Waste Identification Number]

[Accumulation Start Date]

[Accumulation End Date]

a. If waste classification is pending analysis, labels shall indicate “PCB/Hazardous Waste - Pending Analysis.”

8. Disposal of Wastes: All waste profiles for containerized wastes must be reviewed by the Engineer and signed by the County as the generator of the waste streams. The Contractor shall notify the County at least 14 business days prior to the removal of any waste drums/containers, so that the County can inspect the drums/containers and the waste manifests. Wastes shall be disposed of to ensure that drums/containers do not remain on the job site for more than 90 calendar days from the initial "accumulation start date" on the label affixed to the drum/container. Containers that have reached their storage capacity shall not remain on site, and transportation arrangements shall be made for their immediate removal.

   a. Small Capacitors and Fluorescent Light Ballasts: Small Capacitors and Fluorescent Light Ballasts are not classified as hazardous wastes under NYSDEC regulations (6 NYCRR 371.3(e)). However, these items are assumed to contain PCBs, and therefore must be disposed of as PCB Bulk Product Wastes unless marked "No PCBs" by the manufacturer. Small Capacitors and Fluorescent Light Ballasts that are not marked "No PCBs" or are leaking (regardless of PCB concentration), must be managed at one of the following facilities in accordance with 40 CFR 761.62(a): (a) in facilities using a TSCA-approved incinerator; (b) at a TSCA/RCRA-permitted landfill; (c) in facilities using an approved alternate method of destroying PCBs; (d) at a facility using an approved method of removing/decontaminating PCBs; (e) using a TSCA PCB Coordinated Approval issued by the EPA Regional Administrator.

9. Disposal Documentation: The Contractor shall submit written evidence that the TSDF receiving PCB Wastes is approved by federal, state, and local regulatory agencies to receive the wastes. If asbestos or heavy metals (as defined in Section 02 82 05 - Asbestos Management and Section 02 83 05 - Lead Management) were detected in the wastes, the Contractor shall also ensure that the TSDF is approved by federal, state, and local regulatory agencies to receive these wastes. Once all waste profiles have been completed, the Contractor shall provide the County a "Letter of Approval" issued from the TSDF indicating that the wastes will be accepted. The Contractor shall submit one (1) copy of the completed manifest that has been signed and dated by the initial transporter and TSDF in accordance with 6 NYCRR 372 and 40 CFR 262, to the County. All waste profiles, manifests, and Land Disposal Restrictions (LDRs) must be signed by a County employee per Section 01 35 44 - Hazardous Materials Control.

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SECTION 03 01 30

CONCRETE REPAIRS

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish all materials, labor, equipment, tools, etc., required for the repair, renovation, and replacement of concrete and/or reinforcing steel as indicated on the Drawings, specified herein, and determined by field survey.

B. The Contractor, in conjunction with the Engineer, shall determine the extent of cracked or deteriorated concrete to be rehabilitated and/or resurfaced. A summary of the work to be performed shall be submitted to the Engineer for review, and such summary shall be approved by the Engineer prior to commencement of the Work.

C. Concrete repairs include the following:

1. Corbel and Pilaster repairs within the digester tanks.

2. Digester tank interior wall surface paste erosion.

3. Digester tank interior wall cracks and spalls.

4. Digester tank bottom slab cracks and spalls.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Division 01 – General Requirements

B. Section 01 20 00 – Measurement and Payment

C. Division 03 – Concrete

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Shall be as specified in Section 01 42 00 – References.

B. ICRI CSP – International Concrete Repair Institute Concrete Surface Profile.

1.04 SUBCONTRACTOR/APPLICATOR QUALIFICATIONS

A. The Contractor shall furnish the name of all subcontractors/applicators which he proposes to use for this work, including necessary evidence and/or experience records to ascertain their qualifications in the application of epoxy, urethane, and polymer-modified repair materials.

B. Approved applicator qualifications shall include a minimum of 5 years of experience in applying epoxy, urethane, and polymer-modified and cement-based repair materials like those materials specified in this Section.

C. A letter from the manufacturer of the specified materials, on the manufacturer's letterhead, signed by an officer of the company, stating that the subcontractor/applicator has been trained in the proper techniques for applying the product, including surface preparation and mixing, placing, curing, and caring for the manufacturer's products shall be submitted. This letter shall further state that the subcontractor/applicator is on the manufacturer's approved list of contractors.

1.05 SUBMITTALS

A. Material certifications and technical data sheets on all grouts, mortars, epoxy resins, aggregates and repair products specified in this Section.

B. Subcontractor/Applicator qualifications as specified in Section 1.04.

C. Shop Drawings detailing any planned deviation from the proposed construction sequence and/or method of repair.

D. The Contractor, based on their experience in their profession, and/or recommendation from product manufacturers, may submit to the Engineer for approval, alternative materials and/or methods of work to assure the durability and watertight integrity of the repair work performed.

E. Detailed repair procedures for each repair type.

F. Letter from repair material manufacturer(s) certifying that all repair materials to be used to create single repairs are compatible for use together

1.06 ADDITIONAL GUARANTEE

A. The Contractor shall guarantee all repair work performed under this Contract against defects in workmanship resulting in leakage and/or failure of concrete bond for a period of three (3) years from the date of the Certificate of Substantial Completion.

PART 2 – MATERIALS

2.01 GENERAL

A. All concrete repair materials, when used in combination to create a single repair, shall be compatible.

2.02 WATER

A. The water used for mixing concrete repair products shall be clear, potable, and free of deleterious substances.

2.03 AGGREGATE

A. All aggregate shall conform to ASTM C-33. The aggregate supplier shall submit to the Engineer documentation that the proposed aggregates comply with ASTM C-33 and the requirements listed below:

B. Pea Gravel - Pea gravel shall meet the gradation and material requirements of Standard Size 14 as defined by ASTM C-33. Pea gravel shall be clean and free from deleterious matter and shall contain no limestone.

2.04 EPOXY BONDING AGENT

A. Epoxy bonding agent shall conform to ASTM C-881 Type I, II, IV or V; Grade 2 for epoxy resin adhesives, depending on the application. The class of epoxy bonding agent shall be suitable for all ambient and substrate temperatures. The epoxy resin shall be "Sikadur Hi-Mod Series" as manufactured by the Sika Corp, Lyndhurst, NJ, "Duralbond" as manufactured by Euclid Chemical Company, Cleveland, OH, "Euco #452 Series" by the Euclid Chemical Company, or "MasterEmaco ADH series" by Master Builders Solutions.

2.05 ANTI-CORROSION REBAR COATING

A. Anti-corrosive coating shall be a two-component, polymer-modified cementitious material such as "Sika Armatec 110 EpoCem " manufactured by Sika Corp., Lyndhurst, NJ, Atlanta, GA, "Duralprep A.C." by the Euclid Chemical Company, or "MasterEmaco P 124" by Master Builders Solutions.

2.06 TYPE I CRACK REPAIR - CEMENTITIOUS SURFACE SEAL

A. Type I Crack Repair - Cementitious Surface Seal shall be a one- or two-component, polymer-modified or silica fume enhanced trowel grade cementitious mortar. Type I Crack Repair material shall be "Sikatop 123 Plus" manufactured by Sika Corp., Lyndhurst, NJ, "Verticoat" or "Verticoat Supreme" by Euclid Chemical Company; or "Emaco S88 CI" or by Master Builders Solutions.

2.07 TYPE II CRACK REPAIR – EPOXY INJECTION CRACK REPAIR

A. Type II Crack Repair – Epoxy Injection Crack Repair shall be a two-component, 100% solids, high-modulus, low viscosity, moisture insensitive epoxy adhesive designed for structural repair. The epoxy adhesive shall be "Sikadur 52" manufactured by Sika Corp., Lyndhurst, NJ, "Duralcrete LV" manufactured by Euclid Chemical Company, Cleveland, OH, "Eucopoxy Injection Resin" by the Euclid Chemical Company, or "MasterInject 1500" by Master Builders Solutions.

2.08 TYPE III CRACK REPAIR - WATERPROOF INJECTION GROUT

A. Type III Crack Repair - Waterproof Injection Grout shall be a one-component, water-activated, extra-low viscosity polyurethane or methacrylic acrylate hydrophilic/hydrophobic injection grout capable of 400% expansion. Injection grout shall form a tough flexible/rigid foam seal that is impenetrable to water. Hydrophilic injection grout shall be “MasterInject 1210” manufactured by Master Builders Solutions, "Prime Flex 900 XLV" manufactured by Prime Resins, Conyers, GA, "AV-333 Injectaflex" manufactured by Avanti International, Webster, TX, or "DeNeef Sealfoam PURe" or “Gelacryl Superflex” manufactured by Grace Construction Products/GCP Applied Technologies or “SikaFix HH Hydrophilic” manufactured by Sika Corp., Lyndhurst, NJ,. Hydrophobic injection grout shall be “MasterInject 1230” manufactured by Master Builders Solutions, "Prime Flex 940" manufactured by Prime Resins, Conyers, GA, "Sikafix HHLV or “Sikafix HH+” manufactured by Sika Corp., Lyndhurst, NJ, "AV-248-LV Flexseal LV" manufactured by Avanti International, Webster, TX, or "DeNeef Flex SLV one or PURe" manufactured by Grace Construction Products.

2.09 SPALL REPAIR PATCHING MATERIAL

A. All spall repairs not requiring formwork shall be repaired using a two-component, polymer-modified cementitious mortar and shall have a minimum 28-day compressive strength of 7,000 psi. Spall repair mortar for use in horizontal applications shall be "Sikatop 122 Plus" manufactured by Sika Corp., Lyndhurst, NJ, “Eucocrete Supreme” or “Duraltop Flowable Mortar” by the Euclid Chemical Company, or “MasterEmaco T-302” or “MasterEmaco T310CI” by Master Builders Solutions. Spall repair mortar for use in vertical and overhead applications shall be "Sikatop 123 Plus" manufactured by Sika Corp., Lyndhurst, NJ, “Verticoat or Verticoat Supreme” by the Euclid Chemical Company, or “MasterEmaco N 425” or “MasterEmaco N 400” by Master Builders Solutions.

B. All spall repairs requiring formwork shall be repaired using a two-component, polymer-modified cementitious mortar/pea gravel mixture and shall have a minimum 28-day compressive strength of 7,000 psi. Spall repair mortar shall be "SikaTop 111 PLUS" manufactured by Sika Corp., Lyndhurst, NJ, "Eucocrete Supreme” manufactured by Euclid Chemical Company, Cleveland, OH, or “MasterEmaco T 310 CI” by Master Builders Solutions.

2.10 EXPANSION JOINT MEMBRANE REPAIR SYSTEM

A. Expansion joint repair system shall be a flexible rubber sealing strip secured to the concrete substrate with an epoxy adhesive. System shall be provided by a single manufacturer, installed per manufacturer's recommendations and shall be "Sikadur Combiflex" manufactured by Sika Corp., Lyndhurst, NJ or Engineer approved equal. Minimum width of waterproof membrane patch shall be twelve (12) inches unless shown otherwise on Contract Drawings.

2.11 WATERSTOP REPAIR SYSTEM

A. Waterstop repair system shall consist of a continuous, watertight, structural sealing compression joint system capable of withstanding 25% tension, 50% compression and 2-inches total

movement while functioning as a watertight seal between concrete substrate headers. Waterstop Repair System shall be provided by a single manufacturer and shall be either:

1. Preformed, impermeable, closed cell, low-density, UV stable foam sealing strip system secured to concrete with a bonding agent. System shall be “CEVA 100 System” as manufactured by Chase Construction Products, “Wabo Evazote System”, or approved equal. Foam sealing strip and epoxy bonding agent shall be provided by the same manufacturer as a system and shall consist of “Phyzite 380” foam sealing strip with either “EVA-POX BONDER #1”, “EVA-POX UNDERWATER BONDER #47”, or “EVA-POX COLD CURE #41” bonding agent, or Evazote UV foam sealing strip with “Wabo Evazote Bonder” or “Wabo Evazote Cold Cure Bonder. Bonding agent shall be as recommended by the manufacturer based on substrate conditions at the time of installation.

2. Preformed flexible neoprene profile system secured to concrete with a bonding agent. System shall be “JP-Series Profile” by D.S. Brown Company, “Jeene Bridge Series Seal” or “Wabo Compression Seal” by Watson Bowman Acme/BASF.

2.12 CEMENT BASED TEXTURED COATING

A. Cement based textured coating shall be "SikaTop 144" manufactured by Sika Corp., Lyndhurst, NJ, “MasterSeal 581” manufactured by Master Builders Solutions, "Duraltop Coating" manufactured by Euclid Chemical Company, Cleveland, OH, “Eucoseal or Tamoseal” by the Euclid Chemical Company. Cement based textured coating shall have a minimum durability of 10 years and be able to seal cracks with a width up to 1/8 inch.

2.13 OTHER MATERIALS

A. OAKUM ROPE – Oakum rope shall be dry type oakum or jute intended for use with polyurethane grouts for sealing cracks and gaps in concrete and shall be “DeNeef Dry Oakum” as manufactured by Grace Construction Products/GCP Technologies, or approved equal.

2.14 STORAGE OF MATERIALS

A. The Contractor shall provide an area for repair material storage free from exposure to moisture in any form, before, during, and after delivery to the site. Manufactured materials shall be delivered in unbroken containers labeled with the manufacturer's name and product type. All mortar products shall be stored on raised platforms. Materials susceptible to damage by freezing shall be stored in a dry, heated, insulated area. Any material that has hardened, partially set, become caked and/or has been contaminated or deteriorated shall be rejected. All aggregates shall be stored in clean bins, scows or platforms.

PART 3 – INSTALLATION

3.01 GENERAL REQUIREMENTS

A. No repair work shall be undertaken when ambient temperatures are below manufacturer's safe recommendations. No admixtures, except those required by the manufacturer, shall be used in the repairs specified herein.

B. All products shall be applied in strict accordance with manufacturer's recommendations. The Contractor shall furnish and install safe scaffolding and ladders for the Engineer's prework inspection, the repair work activities, and the Engineer's final inspection.

C. Sandblast or waterblast (3000-5000 psi waterjet) or use low impact hand chipping tools to clean deteriorated areas to remove all loose concrete, existing coatings, unsound material, debris, and laitance. All surfaces shall be clean, free of dirt, grease, loose particles, and deleterious substances and shall be prepared according to manufacturer's requirements.

3.02 EPOXY BONDING AGENT

A. An epoxy bonding agent shall be used when applying fresh concrete to previously placed concrete unless otherwise recommended by the manufacturer.

B. Existing concrete surfaces shall be roughened (1/16” or CSP 5 minimum profile) unless otherwise recommended by the manufacturer prior to application of bonding agent. Concrete surface shall be clean and sound, free of all foreign particles and laitance. Repair material shall be placed while bonding agent is still tacky. If bonding agent cures prior to placement of repair material, bonding agent shall be reapplied.

C. Repairing concrete with epoxy mortars shall conform to all the requirements of ACI 503.4 "Standard Specification for Repairing Concrete with Epoxy Mortars" (latest edition), except as modified herein.

3.03 ANTI-CORROSION REBAR COATING

A. Reinforcing steel cut or exposed during demolition and/or repair operations shall be sandblasted and cleaned prior to coating with an anti-corrosive coating. Anti-corrosive coating shall be applied as soon as the reinforcement is exposed and cleaned. Coating shall thoroughly cover all exposed parts of the steel and shall be applied according to manufacturer's recommendations.

3.04 TYPE I CRACK REPAIR – CEMENTITIOUS SURFACE SEAL

A. Where indicated on the Drawings, or as directed by the Engineer, existing nonstructural cracks 1/16" and wider in vertical and overhead surfaces or existing cracks between 1/16" and 1/4" wide in horizontal surfaces shall be repaired with Type I Crack Repair Material. Rout crack to 3/4" wide by 3/4" deep V-notch to expose sound concrete. Provide a 3/8” high vertical shoulder at the top of notch on each side. Where rebar has deteriorated, or where deteriorated concrete extends

below the top of rebar, crack shall be routed to expose 3/4" all around rebar. The resulting void in concrete shall be patched flush with the existing concrete surface using Type I Crack Repair material.

3.05 TYPE II CRACK REPAIR – EPOXY INJECTION

A. Vertical and Overhead Surfaces

1. Where indicated on the Drawings, or as directed by the Engineer, existing structural cracks 1/4" wide or narrower shall be repaired by pressure injecting Type II Crack Repair material into the prepared crack. Seal crack surface using epoxy resin binder and install injection ports per manufacturer's recommendations. Holes drilled for injection ports shall not cut rebar. If rebar is encountered during drilling, the hole shall be abandoned and relocated, and the abandoned hole shall be patched immediately with non-shrink grout flush with the surface of the existing concrete. Once the surface sealing material has fully cured, inject crack with Type II Crack Repair material using standard pressure injection equipment as directed by the manufacturer.

B. Horizontal Surfaces

1. Where indicated on the Drawings, or as directed by the Engineer, existing structural cracks 1/4" wide or narrower shall be repaired using Type II Crack Repair by pressure injecting Type II Crack Repair material into the prepared crack. Seal crack surface using epoxy resin binder and install injection ports per manufacturer's recommendations. Holes drilled for injection ports shall not cut rebar. If rebar is encountered during drilling, the hole shall be abandoned and relocated, and the abandoned hole shall be patched immediately with non-shrink grout flush with the surface of the existing concrete. Once the surface sealing material has fully cured, inject crack with Type II Crack Repair material using standard pressure injection equipment as directed by the manufacturer.

2. Where indicated on the Drawings, or as directed by the Engineer, existing structural cracks wider than 1/4" shall be repaired by gravity feeding Type II Crack Repair material into the prepared crack. First rout the concrete surface to form a 1/4" wide by 1/4" deep v-notch and clean the crack to remove all loose and foreign particles. Fill the crack with clean, dry sand and then pour structural crack repair binder into V-notch, completely filling crack. As binder penetrates crack, additional binder shall be applied to the V-notch.

3.06 TYPE III CRACK REPAIR – WATERPROOF INJECTION GROUT

A. Existing, leaking cracks 1/4" or smaller, identified as nonstructural by the Engineer, shall be repaired by pressure injecting a Type III Crack Repair material into the prepared crack. Seal crack surface with epoxy binder and install injection ports per manufacturer's recommendations. Holes drilled for injection ports shall not cut rebar. If rebar is encountered during drilling, the hole shall be abandoned and relocated, and the abandoned hole shall be patched immediately with non-shrink grout flush with the surface of the existing concrete. Once the surface sealing material has cured, clean, potable water shall be injected into the ports to flush the crack and provide the water

necessary for chemical reaction of the grout. Immediately following injection of water, inject the crack with Type III Crack Repair material using standard pressure injection equipment as directed by the manufacturer.

B. All existing, leaking cracks larger than 1/4", not identified as structural by the Engineer, shall be repaired by first soaking oakum rope or open cell backer rod in waterproof injection grout, and then tightly packing the soaked oakum into the crack so as to completely fill the crack.

3.07 SPALL REPAIR PATCHING MATERIAL

A. All voids or spalled areas to be repaired shall be chipped back to sound concrete a minimum 1/8" deep, with a minimum surface profile of CSP-5, cleaned and repaired with spall repair patching material according to manufacturer's recommendations. All patching shall provide a final finished surface which is flat, level and even with the existing concrete surface. Repair mortar shall not be feathered to meet existing concrete surface. Prior to commencing repair surface preparation, saw cut or grind a 1/2" deep groove around the perimeter around the repair area, perpendicular to the finished concrete surface to provide a square shoulder to the repair area. Repair areas shall be formed using clean, straight rectangular edges where possible. Final patching on horizontal surfaces shall receive a broom finish consistent with the finish on the existing structure.

3.08 EXPANSION JOINT REPAIR SYSTEM

A. Thoroughly clean the concrete substrate and apply Expansion Joint Repair System according to the manufacturer's recommendations.

3.09 WATERSTOP REPAIR SYSTEM

A. Remove all existing expansion joint sealant, backer rod, and expansion joint filler material as required to install the waterstop repair system.

B. Prepare existing concrete surfaces as required by the manufacturer.

C. Apply bonding agent to existing concrete and foam sealing strip or neoprene profile, and insert into expansion joint, as required by the manufacturer.

3.10 CEMENT BASED TEXTURED COATING

A. Thoroughly clean the concrete substrate and apply cement based textured coating according to manufacturer's recommendations. All necessary concrete repairs as detailed on the Contract Drawings shall be completed prior to applying coating.

3.11 CURING

A. All repair products shall be cured in strict accordance with manufacturer recommendations. Wet curing is preferred where possible.

3.12 WORK IN CONFINED SPACES

A. The Contractor shall provide and maintain safe working conditions for all employees and subcontractors. Fresh air shall be supplied continuously to confined spaces through the combined use of existing openings, forced-draft fans and temporary ducts to the outside, or by direct air supply to individual workers. Fumes shall be exhausted to the outside from the lowest level of the confined space. Electrical fan motors shall be explosion-proof if in contact with fumes. No smoking or open fires shall be permitted in or near areas where volatile fumes may accumulate.

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SECTION 03 11 00

CONCRETE FORMWORK

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Provide materials, labor, and equipment required for the design and construction of all concrete formwork, bracing, shoring and supports in accordance with the provisions of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 21 00 – Reinforcing Steel

B. Section 03 15 00 – Concrete Accessories

C. Section 03 15 16 – Joints in Concrete

D. Section 03 30 00 – Cast-in-Place Concrete

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Building Code for the State or Commonwealth in which the project is located.

2. ACI 318 – Building Code Requirements for Structural Concrete

3. ACI 301 – Specifications for Structural Concrete

4. ACI 347 – Recommended Practice for Concrete Formwork

5. U.S. Product Standard for Concrete Forms, Class I, PS 1

6. ACI 117 – Specification for Tolerances for Concrete Construction and Materials and Commentary

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Manufacturer's data on proposed form release agent

2. Manufacturer's data on proposed formwork system including form ties

1.05 QUALITY ASSURANCE

A. Concrete formwork shall be in accordance with ACI 301, ACI 318, and ACI 347.

PART 2 – PRODUCTS

2.01 FORMS AND FALSEWORK

A. All forms shall be smooth surface forms unless otherwise specified.

B. Wood materials for concrete forms and falsework shall conform to the following requirements:

1. Lumber for bracing, shoring, or supporting forms shall be Douglas Fir or Southern Pine, construction grade or better, in conformance with U.S. Product Standard PS20. All lumber used for forms, shoring or bracing shall be new material.

2. Plywood for concrete formwork shall be new, waterproof, synthetic resin bonded, exterior type Douglas Fir or Southern Pine high density overlaid (HDO) plywood manufactured especially for concrete formwork and shall conform to the requirements of PS1 for Concrete Forms, Class I, and shall be edge sealed. Thickness shall be as required to support concrete at the rate it is placed, but not less than 5/8-inch thick.

C. Other form materials such as metal, fiberglass, or other acceptable material that will not adversely affect the concrete and will facilitate placement of concrete to the shape, form, line and grade indicated may be submitted to the Engineer for approval, but only materials that will produce a smooth form finish equal or better than the wood materials specified will be considered.

2.02 FORMWORK ACCESSORIES

A. Form ties shall be provided with a plastic cone or other suitable means for forming a conical hole to ensure that the form tie may be broken off back of the face of the concrete. The maximum diameter of removable cones for rod ties, or of other removable form-tie fasteners having a circular cross-section, shall not exceed 7/8-inch, and all such fasteners shall be such as to leave holes of regular shape for reaming.

B. Form ties for water-retaining structures shall have integral waterstops. Removable taper ties may be used when acceptable to the Engineer. A preformed mechanical EPDM rubber plug shall be used to seal the hole left after the removal of the taper tie. Plug shall be X-Plug by the Sika Corporation or approved equal. Friction fit plugs shall not be used.

C. Form release agent shall be a blend of natural and synthetic chemicals that employs a chemical reaction to provide quick, easy and clean release of concrete from forms. It shall not stain the

concrete and shall leave the concrete with a paintable surface. Formulation of the form release agent shall be such that it would minimize formation of "bug holes" in cast-in-place concrete.

PART 3 – EXECUTION

3.01 FORM DESIGN

A. Forms and falsework shall be designed for total dead load, plus all construction live load as outlined in ACI 347. Design and engineering of formwork and safety considerations during construction shall be the responsibility of the Contractor.

B. Forms shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete. The maximum deflection of facing materials reflected in concrete surfaces exposed to view shall be 1/240 of the span between structural members.

C. All forms shall be designed for predetermined placing rates per hour, considering expected air temperatures and setting rates.

3.02 CONSTRUCTION

A. The type, size, quality, and strength of all materials from which forms are made shall be subject to the approval of the Engineer. No falsework or forms shall be used which are not clean and suitable. Deformed, broken or defective falsework and forms shall be removed from the work.

B. Forms shall be smooth and free from surface irregularities. Suitable and effective means shall be provided on all forms for holding adjacent edges and ends of panels and sections tightly together and in accurate alignment so as to prevent the formation of ridges, fins, offsets, or similar surface defects in the finished concrete. Joints between the forms shall be sealed to eliminate any irregularities. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to a practical minimum.

C. Forms shall be true to line and grade and shall be sufficiently rigid to prevent displacement and sagging between supports. Curved forms shall be used for curved and circular structures. Straight panels joined at angles will not be acceptable for forming curved structures. Forms shall be properly braced or tied together to maintain their position and shape under a load of freshly placed concrete. Facing material shall be supported with studs or other backing which shall prevent both visible deflection marks in the concrete and deflections beyond the tolerances specified.

D. Forms shall be mortar tight to prevent the loss of water, cement and fines during placing and vibrating of the concrete. Specifically, the bottom of wall forms that rest on concrete footings or slabs shall be provided with a gasket to prevent loss of fines and paste during placement and vibration of concrete. Such gasket may be a 1 to 1-1/2-inch diameter polyethylene rod held in position to the underside of the wall form.

E. All vertical surfaces of concrete members shall be formed, and side forms shall be provided for all footings, slab edges and grade beams, except where placement of the concrete against the ground is called for on the Drawings. Not less than 1-inch of concrete shall be added to the thickness of the concrete member as shown where concrete is permitted to be placed against trimmed ground in lieu of forms. Such permission will be granted only for members of comparatively limited height and where the character of the ground is such that it can be trimmed to the required lines and will stand securely without caving or sloughing until the concrete has been placed.

F. All forms shall be constructed in such a manner that they can be removed without hammering or prying against the concrete. Wood forms shall be constructed for wall openings to facilitate loosening and to counteract swelling of the forms.

G. Adequate clean-out holes shall be provided at the bottom of each lift of forms. Temporary openings shall be provided at the base of column forms and wall forms and at other points to facilitate cleaning and observation immediately before the concrete is deposited. The size, number and location of such clean-outs shall be as acceptable to the Engineer.

H. Construction joints shall not be permitted at locations other than those shown or specified, except as may be acceptable to the Engineer. When a second lift is placed on hardened concrete, special precautions shall be taken in the way of the number, location and tightening of ties at the top of the old lift and bottom of the new to prevent any unsatisfactory effect whatsoever on the concrete. For flush surfaces at construction joints exposed to view, the contact surface of the form sheathing over the hardened concrete in the previous placement shall be lapped by not more than 1 inch. Forms shall be held against hardened concrete to prevent offset or loss of mortar at construction joints and to maintain a true surface.

I. The formwork shall be cambered to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete and due to construction loads. Set forms and intermediate screed strips for slabs accurately to produce the designated elevations and contours of the finished surface. Ensure that edge forms and screed strips are sufficiently strong to support vibrating screeds or roller pipe screeds if the nature of the finish specified requires the use of such equipment. When formwork is cambered, set screeds to a like camber to maintain the proper concrete thickness.

J. Positive means of adjustment (wedges or jacks) for shores and struts shall be provided and all settlement shall be taken up during concrete placing operation. Shores and struts shall be securely braced against lateral deflections. Wedges shall be fastened firmly in place after final adjustment of forms prior to concrete placement. Formwork shall be anchored to shores or other supporting surfaces or members to prevent upward or lateral movement of any part of the formwork system during concrete placement. If adequate foundation for shores cannot be secured, trussed supports shall be provided.

K. Runways shall be provided for moving equipment with struts or legs. Runways shall be supported directly on the formwork or structural member without resting on the reinforcing steel.

3.03 TOLERANCES

A. Unless otherwise indicated in the Contract Documents, formwork shall be constructed so that the concrete surfaces will conform to the tolerance limits listed in ACI 117.

B. Structural framing of reinforced concrete around elevators and stairways shall be accurately plumbed and located within 1/4 in. tolerance from established dimensions.

C. The Contractor shall establish and maintain in an undisturbed condition and until final completion and acceptance of the project, sufficient control points and benchmarks to be used for reference purposes to check tolerances. Plumb and string lines shall be installed before concrete placement and shall be maintained during placement. Such lines shall be used by Contractor's personnel and by the Engineer and shall be in sufficient number and properly installed. During concrete placement, the Contractor shall continually monitor plumb and string line form positions and immediately correct deficiencies.

D. Regardless of the tolerances specified, no portion of the structure shall extend beyond the legal boundary of the structure.

3.04 FORM ACCESSORIES

A. Suitable moldings shall be placed to bevel or round all exposed corners and edges of beams, columns, walls, slabs, and equipment pads. Chamfers shall be 3/4 inch unless otherwise noted.

B. Form ties shall be so constructed that the ends, or end fasteners, can be removed without causing appreciable spalling at the faces of the concrete. After ends, or end fasteners of form ties have been removed, the embedded portion of the ties shall terminate not less than 2 inches from the formed face of the concrete that is exposed to water or enclosed surfaces above the water surface, and not less than 1 inch from the formed face of all other concrete. Holes left by the removal of form tie cones shall be reamed with suitable toothed reamers to leave the surface of the holes clean and rough before being filled with mortar as specified in Section 03 35 00 – Concrete Finishes. No form-tying device or part thereof, other than metal, shall be left embedded in the concrete. Ties shall not be removed in such manner as to leave a hole extending through the interior of the concrete member. The use of snap-ties which cause spalling of the concrete upon form stripping or tie removal will not be permitted. No snap ties shall be broken off until the concrete is at least three days old. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form in order to prevent loss of cement paste.

3.05 APPLICATION – FORM RELEASE AGENT

A. Forms for concrete surfaces that will not be subsequently waterproofed shall be coated with a form release agent. Form release agent shall be applied on formwork in accordance with manufacturer's recommendations.

3.06 INSERTS AND EMBEDDED ITEMS

A. Sleeves, pipe stubs, inserts, anchors, expansion joint material, waterstops, and other embedded items shall be positioned accurately and supported against displacement prior to concreting. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable material to prevent the entry of concrete into the voids.

3.07 FORM CLEANING AND REUSE

A. The inner faces of all forms shall be thoroughly cleaned prior to concreting. Forms may be reused only if in good condition and only if acceptable to the Engineer. Light sanding between uses will be required wherever necessary to obtain uniform surface texture. Unused tie rod holes in forms shall be covered with metal caps or shall be filled by other methods acceptable to the Engineer.

3.08 FORM REMOVAL AND SHORING

A. Forms shall not be disturbed until the concrete has attained sufficient strength. Sufficient strength shall be demonstrated by structural analysis considering proposed loads, strength of forming and shoring system, and concrete strength data. Shoring shall not be removed until the supported member has acquired sufficient strength to support its weight and the load upon it. Members subject to additional loads during construction shall be adequately shored to sustain all resulting stresses. Forms shall be removed in such manner as not to impair safety and serviceability of the structure. All concrete to be exposed by form removal shall have sufficient strength not to be damaged thereby.

B. Provided the strength requirements specified above have been met and subject to the Engineer's approval, forms may be removed at the following minimum times. The Contractor shall assume full responsibility for the strength of all such components from which forms are removed prior to the concrete attaining its full design compressive strength. Shoring may be required at the option of the Engineer beyond these periods.

Ambient Temperature (°F.) During Concrete Placement

	Over 95°	70°-95°	60°-70°	50°-60°	Below 50°
Walls	5 days	2 days	2 days	3 days	Do not remove until directed by Engineer (7 days minimum)
Columns	7 days	2 days	3 days	4 days	
Beam Soffits	10 days	7 days	7 days	7 days	
Elevated Slabs	12 days	7 days	7 days	7 days	

C. When, in the opinion of the Engineer, conditions of the work or weather justify, forms may be required to remain in place for longer periods of time.

D. An accurate record shall be maintained by the Contractor of the dates of concrete placings and the exact location thereof and the dates of removal of forms. These records shall always be available for inspection at the site, and two copies shall be furnished the Engineer upon completion of the concrete work.

3.09 RESHORING

A. When reshoring is permitted or required the operations shall be planned and subjected to approval by the Engineer.

B. Reshores shall be placed after stripping operations are complete but in no case later than the end of the working day on which stripping occurs.

C. Reshoring for the purpose of early form removal shall be performed so that at no time will large areas of new construction be required to support their own weight. While reshoring is under way, no construction or live loads shall be permitted on the new construction. Reshores shall be tightened to carry their required loads but they shall not be overtightened so that the new construction is overstressed. Reshores shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified.

D. For floors supporting shores under newly placed concrete, the original supporting shores shall remain in place or reshores shall be placed. The shoring or reshoring system shall have a capacity sufficient to resist the anticipated loads and, in all cases, shall have a capacity equal to at least one-half of the capacity of the shoring system above. Reshores shall be located directly under a reshore position above unless other locations are permitted.

E. In multi-story buildings, reshoring shall extend over a sufficient number of stories to distribute the weight of newly placed concrete, forms, and construction live loads so the design superimposed loads of the floors supporting shores are not exceeded.

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SECTION 03 15 00

CONCRETE ACCESSORIES

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Furnish all materials, labor and equipment required to provide all concrete accessories including waterstops, expansion joint material, joint sealants, expansion joint seals, crack inducing joint inserts, epoxy bonding agent, and neoprene bearing pads.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 11 00 – Concrete Formwork

B. Section 03 15 16 – Joints in Concrete

C. Section 03 30 00 – Cast-in-Place Concrete

D. Section 07 90 00 – Joint Fillers, Sealants, and Caulking

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ASTM C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete

2. ASTM D412 – Standard Tests for Rubber Properties in Tension

3. ASTM D 624 – Standard Test method for Rubber Property - Tear Resistance

4. ASTM D 638 – Standard Test Method for Tensile Properties of Plastics

5. ASTM D1751 – Standard Specifications for Preformed Expansion Joint fillers for Concrete Paving and Structural Construction (non-extruding and resilient bituminous types)

6. ASTM D 1752 – Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

7. ASTM D 1171 – Standard Test Method for Ozone Resistance at 500 pphm

8. ASTM D 471 – Standard Test Method for Rubber Properties

9. ASTM D 2240 – Standard Test for Rubber Property – Durometer Hardness

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Manufacturer's literature on all products specified herein including material certifications.

2. Proposed system for supporting PVC waterstops in position during concrete placement.

3. Samples of products if requested by the Engineer.

PART 2 – PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) WATERSTOPS

A. PVC waterstops for construction joints shall be flat ribbed type, 6 inches wide with a minimum thickness at any point of 3/8 inches.

B. Waterstops for expansion joints shall be ribbed with a center bulb. They shall be 9 inches wide with a minimum thickness at any point of 3/8 inch unless shown or specified otherwise. The center bulb shall have a minimum outside diameter of 1 inch and a minimum inside diameter of 1/2 inch.

C. The waterstops shall be manufactured from virgin polyvinyl chloride plastic compound and shall not contain any scrap or reclaimed material or pigment whatsoever. The properties of the polyvinyl chloride compound used, as well as the physical properties of the waterstops, shall exceed the requirements of the U.S. Army Corps. of Engineers' Specification CRD-C572. The waterstop material shall have an off-white, milky color.

D. The required minimum physical characteristics for this material are:

1. Tensile strength – 1,750 psi (ASTM D-638).

2. Ultimate elongation – not less than 280% (ASTM D-638).

E. No reclaimed PVC shall be used for the manufacturing of the waterstops. The Contractor shall furnish certification that the proposed waterstops meet the above requirements.

F. PVC waterstops shall be as manufactured by BoMetals, Inc., DuraJoint Concrete Accessories, or Sika Greenstreak.

G. All waterstop intersections, both vertical and horizontal, shall be made from factory fabricated corners and transitions. Only straight butt joint splices shall be made in field.

2.02 RETROFIT WATERSTOPS

A. Retrofit waterstops shall be used where specifically shown on Drawings for sealing joints between existing concrete construction and new construction.

B. Retrofit waterstops shall be PVC waterstops fabricated from material as described in Section 2.01 of this Specification.

C. Retrofit waterstop shall be attached to existing concrete surface as shown on Drawings.

D. Use of split waterstop in lieu of specially fabricated retrofit waterstop will not be acceptable.

E. E. Retrofit Waterstop manufacturer must provide a complete system including all Waterstop, stainless steel anchoring hardware, and epoxy for installation.

F. For construction joints, retrofit waterstop shall be style number 609 by Sika Greenstreak, RF-638 by BoMetals, Inc., or approved equal. For expansion joints, retrofit waterstop shall be style number 667 by Sika Greenstreak, RF-912 by BoMetals, Inc., Type 36RT Retrofit Kit by DuraJoint Concrete Accessories, or approved equal.

2.03 CHEMICAL RESISTANT WATERSTOPS

A. Where specifically noted on Contract Drawings, chemical resistant waterstops shall be used instead of PVC waterstops.

B. Chemical resistant waterstops for construction joints shall be ribbed with a center bulb. They shall be 6 inches wide with a minimum thickness at any point of 3/16 inches.

C. Chemical resistant waterstops for expansion joints shall be ribbed tear web. They shall be 9 inches wide with a tear web designed to accommodate 1 inch of free movement minimum.

D. Chemical resistant retrofit waterstop shall be a minimum of 2½” wide along the ribbed side and a minimum 5” wide along the side attached to the existing concrete surface. Retrofit waterstop shall include a center bulb and shall have a minimum thickness of 3/16”. Retrofit waterstop manufacturer shall provide a complete system including waterstop, stainless steel anchoring hardware and epoxy for installation.

E. Chemical resistant waterstops shall be manufactured from a fully crosslinked thermoplastic vulcanizate rubber.

F. Waterstops shall be TPER by BoMetals, Inc., Earth Shield TPV/TPE-R by JP Specialties, Inc., Westec TPER by Westec Barrier Technologies, or TPE-R by DuraJoint Concrete Accessories.

2.04 WATERPROOF MEMBRANE PATCH

A. Waterproof membrane patch shall be Sikadur Combiflex by Sika Corporation or approved equal. Minimum width of waterstop material shall be twelve (12) inches unless shown otherwise on Contract Drawings.

2.05 HYDROPHILIC WATERSTOPS

A. Hydrophilic waterstops shall be designed to expand under hydrostatic conditions. For hydrostatic head pressure greater than 25 feet, waterstops shall be Adeka Ultra Seal MC-2010MN by Adeka Ultra Seal/OCM, Inc., or Hydrotite CJ-1020-2K by Sika Greenstreak. For hydrostatic head pressure 25 feet or less, Adeka Ultra Seal KBA-1510FP or Hydrotite CJ-1020-2K shall be used. Concrete cover and confinement requirements shall be in accordance with the manufacturer's recommendations.

B. Waterstops shall be fabricated from a chemically modified natural rubber product with a hydrophilic agent. Use of bentonite based waterstop material will not be allowed.

C. Waterstops shall either contain an interior stainless-steel mesh or an interior coextrusion of non-hydrophilic rubber to ensure expansion occurs along the width and thickness of the waterstop thereby restricting the expansion in the longitudinal direction.

2.06 WATERSTOP ADHESIVE

A. Adhesive between waterstops and existing concrete shall be Neoprene Adhesive 77-198 by JGF Adhesives, Sikadur 31 Hi-Mod Gel by Sika Corporation, DP-605 NS Urethane Adhesive by 3M Adhesive Systems.

B. Hydrophilic, non-bentonite water swelling elastic sealant shall be used to bond hydrophilic waterstops to rough surfaces. Hydrophilic elastic sealant shall be P-201 by Adeka Ultra Seal/OCM, Inc., Leakmaster LV-Z by Sika Greenstreak, or approved equal.

2.07 JOINT SEALANTS

A. Joint sealants shall comply with Section 07 90 00 – Joint Fillers, Sealants, and Caulking.

2.08 EXPANSION JOINT MATERIAL

A. Preformed expansion joint material shall be non-extruding, and shall be of the following types:

1. Type I – Sponge rubber, conforming to ASTM D1752, Type I.

2. Type II – Cork, conforming to ASTM D1752, Type II.

3. Type III – Self-expanding cork, conforming to ASTM D1752, Type III.

4. Type IV – Bituminous fiber, conforming to ASTM Designation D1751.

2.09 EXPANSION JOINT SEAL

A. Expansion Joint Seal System shall consist of a preformed neoprene profile, installed using the same dimensions as the joint gap, bonded with a two-component epoxy adhesive, and pressurized during the adhesive cure time.

B. The expansion joint system shall be Hydrozo/Jeene Structural Sealing joint system by Hydrozo/Jeene, Inc.

2.10 CRACK INDUCING JOINT INSERTS

A. Crack inducing joint inserts shall be Zip-Cap by Greenstreak Plastic Products, Zip-Joint by BoMetals, Inc.

2.11 EPOXY BONDING AGENT

A. Epoxy bonding agent shall conform to ASTM C881 and shall be Sikadur 32 Hi-Mod, Sika Corporation, Lyndhurst, N.J.; Euco #452 Epoxy System, Euclid Chemical Company, Cleveland, OH, MasterEmaco ADH Series by Master Builders Solutions.

2.12 EPOXY RESIN BINDER

A. Epoxy resin binder shall conform to the requirements of ASTM C-881, Type III, Grade 3, Class B and C for epoxy resin binder and shall be Sikadur 23, Low-Mod-Gel, manufactured by the Sika Corporation, Lyndhurst, N.J., Flexocrete Gel manufactured by DuraJoint Concrete Accessories or Euco #352 Gel, Euclid Chemical Company, MasterEmaco ADH 327 or 327 RS by Master Builders Solutions.

2.13 BEARING PADS

A. Neoprene bearing pads shall conform to requirements of A4-F3-T.063-B2, Grade 2, Method B, in accordance with the RMA Rubber Handbook. Pads shall be nonlaminated pads having a nominal Shore A durometer hardness of 70 in accordance with ASTM D2240. Adhesive for use with neoprene pads shall be an epoxy-resin compound compatible with the neoprene having a sufficient shear strength to prevent slippage between pads and adjacent bearing surfaces. Adhesive shall be 20+F Contact Cement by Miracle Adhesives Corporation, Neoprene Adhesive 77-198 by IGI Adhesives, Sikadur 31, Hi-Mod Gel by Sika Corporation, or DP-605 NS Urethane Adhesive by 3M Adhesive Systems.

PART 3 – EXECUTION

3.01 PVC AND CHEMICAL RESISTANT WATERSTOPS

A. PVC and chemical resistant waterstops shall be provided in all construction and expansion joints in water bearing structures and at other such locations as required by the Drawings.

B. Waterstops shall be carefully positioned so that they are embedded to an equal depth in concrete on both sides of the joint. They shall be kept free from oil, grease, mortar or other foreign matter. To ensure proper placement, all waterstops shall be secured in correct position at 12" on center along the length of the waterstop on each side, prior to placing concrete. Such method of support shall be submitted to the Engineer for review and approval. Grommets or small pre-punched holes as close to the edges as possible will be acceptable for securing waterstops.

C. Splices in PVC waterstops and chemical resistant waterstops shall be made with a thermostatically controlled heating element. Only straight butt joint splices will be allowed in the field. Factory fabricated corners and transitions shall be used at all intersections. Splices shall be made in strict accordance with the manufacturer's recommended instructions and procedures. At least three satisfactory sample splices shall be made on the site. The Engineer may require tests on these splices by an approved laboratory. The splices shall exhibit not less than 80 percent of the strength of the unspliced material.

D. All splices in waterstops will be subject to rigid review for misalignment, bubbles, inadequate bond, porosity, cracks, offsets, discoloration, charring, and other defects which would reduce the potential resistance of the material to water pressure at any point. All defective joints shall be replaced with material which will pass said review and all faulty material shall be removed from the site and disposed of by the Contractor at no additional cost to the Owner.

E. Retrofit waterstops shall be installed as shown on Contract Drawings using approved waterstop adhesive and Type 316 stainless steel batten bars and expansion anchors.

F. Waterstop installation and splicing defects which are unacceptable include, but are not limited to the following:

1. Tensile strength less than 80 percent of parent material.

2. Overlapped (not spliced) Waterstop.

3. Misalignment of waterstop geometry at any point greater than 1/16 inch.

4. Visible porosity or charred or burnt material in weld area.

5. Visible signs of splice separation when splice (24 hours or greater) is bent by hand at sharp angle.

3.02 WATERPROOF MEMBRANE PATCH AND HYDROPHILIC WATERSTOPS

A. Patches and waterstops shall be installed only where shown on the Drawings.

B. Patches and waterstops shall be installed in strict accordance with manufacturer's recommendations.

3.03 WATERSTOP ADHESIVE

A. Adhesive shall be applied to both contact surfaces in strict accordance with manufacturer's recommendations.

B. Adhesive shall be used where waterstops are attached to existing concrete surfaces.

3.04 INSTALLATION OF EXPANSION JOINT MATERIAL AND SEALANTS

A. Type I, II, or III shall be used in all expansion joints in structures and concrete pavements unless specifically shown otherwise on the Drawings. Type IV shall be used in sidewalk and curbing and other locations specifically shown on the Drawings.

B. All expansion joints exposed in the finish work, exterior and interior, shall be sealed with the specified joint sealant. Expansion joint material and sealants shall be installed in accordance with manufacturer's recommended procedures and as shown on the Drawings.

C. Expansion joint material that will be exposed after removal of forms shall be cut and trimmed to ensure a neat appearance and shall completely fill the joint except for the space required for the sealant. The material shall be held securely in place and no concrete shall be allowed to enter the joint or the space for the sealant and destroy the proper functions of the joint.

D. A bond breaker shall be used between expansion joint material and sealant. The joint shall be thoroughly clean and free from dirt and debris before the primer and the sealant are applied. Where the finished joint will be visible, masking of the adjoining surfaces shall be carried out to avoid their discoloration. The sealant shall be neatly tooled into place and its finished surfaces shall present a clean and even appearance.

E. Type 1 joint sealant shall be used in all expansion and crack inducing joints in concrete, except where other specific types are required as stated below, and wherever else specified or shown on the Drawings. Sealant shall be furnished in pour grade or gun grade depending on installation requirements. Primers shall be used as required by the manufacturer. The sealant shall be furnished in colors as directed by the Engineer.

3.05 EXPANSION JOINT SEAL

A. The expansion joint seal system shall be installed as shown on the Drawings in strict accordance with the manufacturer's recommendations.

3.06 CRACK INDUCING JOINT INSERTS

A. For joints in slabs, inserts shall be floated in fresh concrete during finishing.

B. For joints in walls, inserts shall be secured in place prior to casting wall.

C. Inserts shall be installed true to line at the locations of all joints as shown on the Drawings.

D. Inserts shall extend into concrete sufficient depth as indicated on the Drawings or specified in Section 03 15 16 – Joints in Concrete.

E. Inserts shall not be removed from concrete until concrete has cured sufficiently to prevent chipping or spalling of joint edges due to inadequate concrete strength.

3.07 EPOXY BONDING AGENT

A. The Contractor shall use an epoxy bonding agent for bonding fresh concrete to existing concrete as shown on the Drawings.

B. Bonding surface shall be clean, sound, and free of all dust, laitance, grease, form release agents, curing compounds, and any other foreign particles.

C. Application of bonding agent shall be in strict accordance with manufacturer's recommendations.

D. Fresh concrete shall not be placed against existing concrete if epoxy bonding agent has lost its tackiness.

3.08 EPOXY RESIN BINDER

A. Epoxy resin binder shall be used to seal all existing rebar cut and burned off during demolition operations. Exposed rebar shall be burned back 1/2-inch minimum into existing concrete and the resulting void filled with epoxy resin binder.

3.09 BEARING PADS

A. Care shall be taken in fabricating pads and related metal parts so effects detrimental to the proper performance of the pads, such as uneven bearing and excessive bulging, will not occur.

END OF SECTION

SECTION 03 15 16

JOINTS IN CONCRETE

PART 1 – GENERAL

1.01 THE REQUIREMENTS

A. Provide all materials, labor and equipment required for the construction of all joints in concrete specified herein and shown on the Drawings.

B. Types of joints in concrete shall be defined as follows:

1. Construction Joints – Intentionally created formed joints between adjacent concrete placements with 100% of reinforcement continuous through joint.

2. Expansion Joints – Formed joints in concrete which separate adjacent sections to allow movement due to dimensional increases and reduction of adjacent sections (temperature and shrinkage). Reinforcement terminates within concrete on each side of joint. Expansion joints may also be considered isolation joints.

3. Contraction Joints – Formed joints in concrete to create interface between concrete placements to allow movement due to dimensional reduction of adjacent sections (shrinkage).

a. Full Contraction Joints – Formed contraction joints with no bonded reinforcement passing through the joint.

b. Partial Contraction Joints – Formed contraction joints with no more than 50% of bonded reinforcement passing through the joint.

4. Crack Inducing Joints – Joints formed, tooled, or sawcut in a monolithic placement to create a weakened plane to regulate the location of crack formation due to dimensional reduction of adjacent sections (shrinkage).

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 11 00 – Concrete Formwork

B. Section 03 15 00 – Concrete Accessories

C. Section 03 30 00 – Cast-in-Place Concrete

D. Section 07 90 00 – Joint Fillers, Sealants and Caulking

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ACI 301 – Specifications for Structural Concrete for Buildings

2. ACI 318 – Building Code Requirements for Structural Concrete

3. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures

4. ACI 224.3 – Joints in Concrete Construction

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Layout drawings showing location and type of all joints to be placed in each structure.

2. Details of proposed joints in each structure.

3. For sawcut crack-inducing joints, submit documentation indicating the following:

a. Proposed method of sawcutting indicating early entry or conventional sawing.

b. Description of how work is to be performed including equipment to be utilized, size of crew performing the work and curing methods.

c. Description of alternate method in case of time constraint issues or failure of equipment.

PART 2 – MATERIALS

2.01 MATERIALS

A. All materials required for joint construction shall comply with Section 03 15 00 - Concrete Accessories and Section 07 90 00 – Joint Fillers, Sealants and Caulking.

PART 3 – EXECUTION

3.01 CONSTRUCTION JOINTS

A. Construction joints shall be as shown on the Drawings. Otherwise, Contractor shall submit description of the joint and proposed location to Engineer for approval. All joints shall be

construction joints or expansion joints unless otherwise specified on the Drawings or approved by the Engineer on the joint plan submittal.

B. Unless noted otherwise on the Drawings, construction joints shall be located near the middle of the spans of slabs, beams, and girders unless a beam intersects a girder at this point. In this case, the joints in the girders shall be offset a distance equal to twice the width of the beam. Joints in walls and columns shall be at the underside of floors, slabs, beams, or girders and the top of footings or floor slabs unless noted otherwise on Drawings. Beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at the same time as slabs. Joints shall be perpendicular to the main reinforcement.

C. Maximum distance between horizontal joints in slabs and vertical joints in walls shall be 50’-0”. For exposed walls with fluid or earth on the opposite side, the spacing between vertical and horizontal joints shall be a maximum of 25’-0”.

D. All corners shall be part of a continuous placement, and should a construction joint be required, the joint shall not be located closer than five feet from a corner.

E. All reinforcing steel and welded wire fabric shall be continued across construction joints. Keys and inclined dowels shall be provided as shown on the Drawings or as directed by the Engineer. Longitudinal keys shall be provided in all joints in walls and between walls and slabs or footings, except as specifically noted otherwise on the Drawings. Size of keys shall be as shown on the Drawings.

F. All joints in water bearing structures shall have a waterstop. All joints below grade in walls or slabs which enclose an accessible area shall have a waterstop.

G. Joint plan of walls and slabs shall consider aspect ratio to create placement of sections as close to square as possible. Aspect ratio is defined as the ratio of plan dimensions for slab sections and length to height placement of wall sections. Aspect ratios shall be between 0.65 and 1.5.

3.02 EXPANSION JOINTS

A. Size and location of expansion joints shall be as shown on the Drawings. All joints shall be construction joints or expansion joints unless otherwise specified on the Drawings or approved by the Engineer on the joint plan submittal.

B. All expansion joints in water-bearing structures shall have a center-bulb type waterstop. All expansion joints below grade in walls or slabs which enclose an accessible area shall have a center-bulb type waterstop. Waterstop shall be as shown on Drawings and specified in Section 03 15 00 – Concrete Accessories.

3.03 CONTRACTION JOINTS

A. Contraction joints shall be located as shown on the Drawings or otherwise approved by the Engineer on the joint plan submittal. Contractor shall submit proposed locations and details of all

contraction joints concurrent or prior to submission of reinforcement drawings. Use of contraction joints at locations not specifically detailed on the Drawings requires Engineer approval and will only be considered if meeting the stipulations herein.

B. Full contraction joints may be considered where the structural behavior of the element allows termination of all reinforcement through joint without compromise of structural integrity of element.

C. Partial contraction joints may be considered where the structural behavior of the element requires partial continuation of reinforcement through joint to ensure structural integrity.

D. Where full contraction joints are allowed, maximum distance between horizontal contraction joints in slab and vertical contraction joints in walls shall be 50’-0”. For exposed walls with fluid or earth on the opposite side, spacing between vertical and horizontal contraction joints shall be a maximum of 25’-0”.

E. Bond breaker shall be provided between sections for all contraction joints.

F. Joint plan of walls and slabs shall consider aspect ratio to create placement of sections as close to square as possible. Aspect ratio is defined as the ratio of plan dimensions for slab sections and length to height placement of wall sections. Aspect ratios shall be between 0.65 and 1.5.

3.04 CRACK INDUCING JOINTS

A. Location of crack inducing joints shall be as shown on the Drawings or submitted by Contractor and approved by Engineer.

B. Crack inducing joints shall be formed either by saw cutting, tooling, or use of approved inserts as specified in Section 03 15 00 – Concrete Accessories.

C. If approved by the Engineer, saw cutting of contraction joints in lieu of forming or tooling shall conform to the following requirements:

1. Joints shall be sawed as soon as the concrete can support foot traffic without leaving any impression, normally the same day as concrete is placed and in no case longer than 24 hours after concrete is placed.

2. Curing shall be performed using wet curing methods as indicated in Section 03 39 00 – Concrete Curing. Curing mats, fabrics or sheeting materials shall remain in place to the extent possible while cutting of joint is being performed. Curing materials shall only be removed as required and shall be immediately reinstalled once cutting of the joint has been completed.

3. Depth of joint shall be as shown on the drawings or noted in these specifications. At locations where the joint cannot be installed to full depth due to curbs or other stopping points hand tools shall be used to complete joints.

4. Saw cut joints shall meet the requirements of ACI 224.3, Section 2.8, Jointing Practice.

D. Unless noted otherwise on Drawings, depth of crack inducing joints shall be 1-1/2 inches in reinforced concrete and 1/3 of concrete thickness in unreinforced concrete.

3.05 JOINT PREPARATION

A. No concrete shall be allowed to enter the joint or the space for the sealant and destroy the proper functions of the joint.

B. The surface of the concrete at all joints shall be thoroughly cleaned and all laitance removed by wire brushing, air or light sand blasting.

C. The joint shall be thoroughly clean and free from dirt and debris before the primer and the sealant are applied. Where the finished joint will be visible, masking of the adjoining surfaces shall be carried out to avoid their discoloration. The sealant shall be neatly tooled into place and its finished surface shall present a clean and even appearance.

D. All joints shall be sealed as shown on the Drawings and specified in Section 03 15 00 – Concrete Accessories.

END OF SECTION

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SECTION 03 21 00

REINFORCING STEEL

PART 1 – GENERAL

1.01 THE REQUIREMENTS

A. Provide all concrete reinforcing including all cutting, bending, fastening and any special work necessary to hold the reinforcing steel in place and protect it from injury and corrosion in accordance with the requirements of this section.

B. Provide deformed reinforcing bars to be grouted into reinforced concrete masonry walls.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 11 00 – Concrete Formwork

B. Section 03 15 00 – Concrete Accessories

C. Section 03 30 00 – Cast-in-Place Concrete

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Building Code for the State or Commonwealth in which the project is located.

2. CRSI - Concrete Reinforcing Institute Manual of Standard Practice

3. ACI SP66 - ACI Detailing Manual

4. ACI 315 - Details and Detailing of Concrete Reinforcing

5. ACI 318 - Building Code Requirements for Structural Concrete

6. ICC-ES AC193 - Acceptance Criteria for Expansion and Screw Anchors (Concrete)

7. WRI - Manual of Standard Practice for Welded Wire Fabric

8. ASTM A 615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

9. ASTM A 1064 - Standard Specification for Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

10. ASTM E 3121 – Standard Test Methods for Field Testing of Anchors in Concrete or Masonry

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Detailed placing and shop fabricating drawings, prepared in accordance with ACI 315 and ACI Detailing Manual - (SP66), shall be furnished for all concrete reinforcing. These drawings shall be made to such a scale as to clearly show joint locations, openings, and the arrangement, spacing and splicing of the bars.

2. Detailed placing and shop fabricating drawings, prepared in accordance with ACI 315 and ACI Detailing Manual - (SP66), shall be furnished for all deformed bar reinforcing used in masonry. These drawings shall be made to such a scale as to clearly show joint locations, openings, and the arrangement, locations, spacing and splicing of the bars.

3. Mill test certificates - 3 copies of each.

4. Description of the reinforcing steel manufacturer's marking pattern.

5. Requests to relocate any bars that cause interferences or that cause placing tolerances to be violated.

6. Proposed supports for each type of reinforcing.

7. Request to use splices not shown on the Drawings.

8. Request to use mechanical couplers along with manufacturer's literature on mechanical couplers with instructions for installation, and certified test reports on the couplers' capacity.

9. Request for placement of column dowels without the use of templates.

10. Request and procedure to field bend or straighten partially embedded reinforcing.

11. International Code Council–Evaluation Services Report (ICC-ES ESR) for dowel adhesives.

12. Certification that all installers of dowel adhesive systems in horizontal to vertically overhead applications are certified as Adhesive Anchor Installers in accordance with the ACI-CRSI Anchor Installer Certification Program.

13. Adhesive dowel testing plan.

1.05 QUALITY ASSURANCE

A. If requested by the Engineer, the Contractor shall provide samples from each load of reinforcing steel delivered in a quantity adequate for testing. Costs of initial tests will be paid by the Owner. Costs of additional tests due to material failing initial tests shall be paid by the Contractor.

B. Provide a list of names of all installers who are trained by the Manufacturer's Field Representative on this jobsite prior to installation of products. Record must include the installer name, date of training, products included in the training and trainer name and contact information.

C. Provide a copy of the current ACI/CRSI "Adhesive Anchor Installer" certification cards for all installers who will be installing adhesive anchors in the horizontal to vertically overhead orientation.

D. Special inspections for adhesive dowels shall be conducted in accordance with the manufacturer's instructions and Specification Section 01 45 33 – Special Inspections. Downward installations require periodic inspection and horizontal and overhead installations require continuous inspection.

PART 2 – PRODUCTS

2.01 REINFORCING STEEL

A. Bar reinforcing shall conform to the requirements of ASTM A 615 for Grade 60 deformed billet-steel reinforcing. All reinforcing steel shall be from domestic mills and shall have the manufacturer's mill marking rolled into the bar which shall indicate the producer, size, type, and grade. All reinforcing bars shall be deformed bars. Smooth reinforcing bars shall not be used unless specifically called for on Drawings.

B. Welded wire fabric reinforcing shall conform to the requirements of ASTM A 1064 and the details shown on the Drawings.

C. A certified copy of the mill test on each load of reinforcing steel delivered showing physical and chemical analysis shall be provided, prior to shipment. The Engineer reserves the right to require the Contractor to obtain separate test results from an independent testing laboratory in the event of any questionable steel. When such tests are necessary because of failure to comply with this Specification, such as improper identification, the cost of such tests shall be borne by the Contractor.

D. Field welding of reinforcing steel will not be allowed.

E. Use of coiled reinforcing steel will not be allowed.

2.02 ACCESSORIES

A. Accessories shall include all necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers, and other devices to position reinforcing during concrete placement. Wire bar supports shall be plastic protected (CRSI Class 1). Slab bolsters shall have grey plastic-coated legs.

B. Concrete blocks (dobies), used to support and position bottom reinforcing steel, shall have the same or higher compressive strength as specified for the concrete in which it is located.

2.03 MECHANICAL COUPLERS

A. Mechanical couplers shall develop a tensile strength which exceeds 100 percent of the ultimate tensile strength and 125 percent of the yield strength of the reinforcing bars being spliced. The reinforcing steel and coupler used shall be compatible for obtaining the required strength of the connection.

B. Where the type of coupler used is composed of more than one component, all components required for a complete splice shall be supplied.

C. Hot forged sleeve type couplers shall not be used. Acceptable mechanical couplers are Dayton Superior Dowel Bar Splicer System by Dayton Superior, Dayton, Ohio, or approved equal. Mechanical couplers shall only be used where shown on the Drawings or where specifically approved by the Engineer.

D. Where the threaded rebar to be inserted into the coupler reduces the diameter of the bar, the threaded rebar piece shall be provided by the coupler manufacturer.

2.04 DOWEL ADHESIVE SYSTEM

A. Where shown on the Drawings, reinforcing bars anchored into hardened concrete with a dowel adhesive system shall use a two-component adhesive mix which shall be injected with a static mixing nozzle following manufacturer's instructions.

B. All holes shall be drilled in accordance with the manufacturer’s instructions except that core drilled holes shall not be permitted unless specifically allowed by the Engineer. Cored holes, if allowed by the manufacturer and approved by the Engineer, shall be roughened in accordance with manufacturer’s requirements.

C. Thoroughly clean drill holes of all debris, drill dust, and water in accordance with manufacturer’s instructions prior to installation of adhesive and reinforcing bar.

D. Degree of hole dampness shall be in strict accordance with manufacturer recommendations. Installation conditions shall be dry, or water saturated unless otherwise permitted by the engineer. If water saturated installation is approved, appropriate reduction factors in accordance with

manufacturer's design requirements should be considered. Water filled or submerged holes shall not be permitted unless specifically approved by the Engineer.

E. Injection of adhesive into the hole shall be performed in a manner to minimize the formation of air pockets in accordance with the manufacturer's instructions.

F. Embedment Depth:

1. The embedment depth of the bar shall be as shown on the Drawings. Although all manufacturers listed below are permitted, the embedment depth shown on the Drawings is based on "Hilti HIT-RE 500 V3" by Hilti ESR 3814 issued 3/2021. If the Contractor submits one of the other named dowel adhesives from the list below, the Engineer shall evaluate the required embedment and the Contractor shall provide the required embedment depth stipulated by the Engineer specific to the approved dowel adhesive.

2. Where the embedment depth is not shown on the Drawings, the embedment depth shall be determined to provide the minimum allowable bond strength equal to the tensile strength of the rebar according to the manufacturer's ICC-ES ESR.

3. The embedment depth shall be determined using design parameters listed below. In no case shall the embedment depth be less than the minimum, or more than the maximum, embedment depths stated in the manufacturer's ICC-ES ESR.

4. Design of adhesive anchor system shall be based on the following parameters:

a. Cracked concrete state.

b. Dry or water saturated condition for installation.

c. Base material temperature between 40- and 104-degrees Fahrenheit.

d. Installation with either a hammer drill with carbide bit or hollow-drill bit system drilling methods.

e. Minimum age of concrete 21 days at time of installation.

G. Engineer's approval is required for use of this system in locations other than those shown on the Drawings.

H. The adhesive system shall be IBC compliant for use in both cracked and uncracked concrete in all Seismic Design Categories and shall be "HIT-RE 500 V3 Adhesive Anchoring System" as manufactured by Hilti, Inc. "SET-3G Epoxy Adhesive Anchors" as manufactured by Simpson Strong-Tie Co. or "Pure 110+ Epoxy Adhesive Anchor System" by DeWalt. Fast-set epoxy formulations shall not be acceptable. No or equal products will be considered, unless pre-qualified and approved.

I. All individuals installing dowel adhesive systems in horizontal to vertically overhead applications shall be certified as an Adhesive Anchor Installer in accordance with the ACI-CRSI Anchor Installation Certification Program.

PART 3 – EXECUTION

3.01 TEMPERATURE REINFORCING

A. Unless otherwise shown on the Drawings or in the absence of the concrete reinforcing being shown, the minimum cross sectional area of horizontal and vertical concrete reinforcing in walls shall be 0.0033 times the gross concrete area and the minimum cross sectional area of reinforcing perpendicular to the principal reinforcing in slabs shall be 0.0020 times the gross concrete area. Temperature reinforcing shall not be spaced further apart than five times the slab or wall thickness, nor more than 18 inches.

3.02 FABRICATION

A. Reinforcing steel shall be accurately formed to the dimensions and shapes shown on the Drawings and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318, except as modified by the Drawings.

B. The Contractor shall fabricate reinforcing bars for structures in accordance with the bending diagrams, placing lists and placing Drawings.

C. No fabrication shall commence until approval of Shop Drawings has been obtained. All reinforcing bars shall be shop fabricated unless approved to be bent in the field. Reinforcing bars shall not be straightened or bent in a manner that will injure the material. Heating of bars will not be permitted.

D. Welded wire fabric with longitudinal wire of W9.5 size or smaller shall be either furnished in flat sheets or in rolls with a core diameter of not less than 10 inches. Welded wire fabric with longitudinal wires larger than W9.5 size shall be furnished in flat sheets only.

3.03 DELIVERY, STORAGE AND HANDLING

A. All reinforcing shall be neatly bundled and tagged for placement when delivered to the job site. Bundles shall be properly identified for coordination with mill test reports.

B. Reinforcing steel shall be stored above ground on platforms or other supports and shall always be protected from the weather by suitable covering. Reinforcing steel shall be stored in an orderly manner and plainly marked to facilitate identification.

C. Reinforcing steel shall always be protected from conditions conducive to corrosion until concrete is placed around it.

D. The surfaces of all reinforcing steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar and other foreign substances immediately before the concrete is placed. Where delay in depositing concrete occurs, reinforcing shall be inspected again and if necessary recleaned.

3.04 PLACING

A. Reinforcing steel shall be accurately positioned as shown on the Drawings and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. All reinforcing steel shall be supported by concrete, plastic or plastic protected (CRSI Class 1) metal supports, spacers or metal hangers which are strong and rigid enough to prevent any displacement of the reinforcing steel. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used in sufficient numbers to support the reinforcing bars without settlement. In no case shall concrete block supports be continuous.

B. The portions of all accessories in contact with the formwork shall be made of plastic or steel coated with a 1/8-inch minimum thickness of plastic which extends at least 1/2 inch from the concrete surface. Plastic shall be gray in color.

C. Tie wires shall be bent away from the forms to provide the specified concrete coverage.

D. Reinforcing bars additional to those shown on the Drawings, which may be found necessary or desirable by the Contractor for the purpose of securing reinforcing in position, shall be provided by the Contractor at no additional cost to the Owner.

E. Reinforcing placing, spacing, and protection tolerances shall be within the limits specified in ACI 318 except where in conflict with the Building Code, unless otherwise specified.

F. Reinforcing bars may be moved within one bar diameter as necessary to avoid interference with other concrete reinforcing, conduits, or embedded items. If bars are moved more than one bar diameter, or enough to exceed placing tolerances, the resulting arrangement of bars shall be as acceptable to the Engineer.

G. Welded wire fabric shall be supported on slab bolsters spaced not less than 30 inches on centers, extending continuously across the entire width of the reinforcing mat and supporting the reinforcing mat in the plane shown on the Drawings.

H. Reinforcing shall not be straightened or bent unless specifically shown on the drawings. Bars with kinks or bends not shown on the Drawings shall not be used. Coiled reinforcement shall not be used.

I. Dowel Adhesive System shall be installed in strict conformance with the manufacturer's recommendations and as required in Article 2.04 above. A representative of the manufacturer must be on site prior to adhesive dowel installation to provide instruction on proper installation procedures for all adhesive dowel installers. Testing of adhesive dowels shall be as indicated below. If the dowels have a hook at the end to be embedded in subsequent work, an approved

mechanical coupler shall be provided at a convenient distance from the face of existing concrete to facilitate adhesive dowel testing while maintaining required hook embedment in subsequent work.

J. All adhesive dowel installations in the horizontal or overhead orientation shall be conducted by a certified Adhesive Anchor Installer as certified by ACI/CSRI per ACI 318-11 9.2.2. Current AAI Certificated must be submitted to the Engineer for approval prior to commencement of any adhesive anchor installations.

K. Adhesive Dowel Testing

1. At all locations where adhesive dowels are shown on the Drawings, at least 10 percent of all adhesive dowels installed shall be tested to 80% of the yield load of the reinforcing bar, with a minimum of one tested dowel per group.

2. Contractor shall submit a plan and schedule indicating locations of dowels to be tested, load test values, and proposed dowel testing procedure (including a diagram of the testing equipment proposed for use) prior to conducting any testing. Proof testing procedures shall be in accordance with ASTM E 3121.

3. Where Contract Documents indicate adhesive dowel design is the Contractor's responsibility, the Contractor shall submit a plan and schedule indicating locations of dowels to be tested and load test values, sealed by a Professional Engineer currently registered in the State or Commonwealth in which the project is located. The Contractor shall also submit documentation indicating the Contractor's testing procedures have been reviewed and the proposed procedures are acceptable.

4. Adhesive Dowel shall have no visible indications of displacement or damage during or after the load test. Dowels exhibiting damage shall be removed and replaced. If more than 5 percent of tested dowels fail, then 100 percent of dowels shall be load tested.

5. Load testing of adhesive dowels shall be performed by an independent testing laboratory hired directly by the Contractor. The Contractor shall be responsible for costs of all testing, including additional testing required due to previously failed tests.

3.05 SPLICING

A. Reinforcing bar splices shall only be used at locations shown on the Drawings. When necessary to splice reinforcing at points other than where shown, the splice shall be as acceptable to the Engineer.

B. The length of lap for reinforcing bars, unless otherwise shown on the Drawings shall be in accordance with ACI 318 for a class B splice.

C. Laps of welded wire fabric shall be in accordance with ACI 318. Adjoining sheets shall be securely tied together with No. 14 tie wire, one tie for each 2 running feet. Wires shall be staggered and tied in such a manner that they cannot slip.

D. Mechanical splices shall be used only where shown on the drawings or when approved by the Engineer.

E. Couplers which are located at a joint face shall be a type which can be set either flush or recessed from the face as shown on the Drawings. The couplers shall be sealed during concrete placement to eliminate concrete, or cement paste from entering. After the concrete is placed, couplers intended for future connections shall be plugged and sealed to prevent any contact with water or other corrosive materials. Threaded couplers shall be plugged with plastic plugs which have an O-ring seal.

3.06 INSPECTION

A. The Contractor shall advise the Engineer of his intentions to place concrete and shall allow him adequate time to inspect all reinforcing steel before concrete is placed.

B. The Contractor shall advise the Engineer of his intentions to place grout in masonry walls and shall allow him adequate time to inspect all reinforcing steel before grout is placed.

3.07 CUTTING OF EMBEDDED REBAR

A. The Contractor shall not cut embedded rebar cast into structural concrete without prior approval.

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SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Provide all labor, equipment, materials, and services necessary for the manufacture, transportation, and placement of all plain and reinforced concrete work, as shown on the Drawings or as required by the Engineer.

B. The requirements in this section shall apply to the following types of concrete:

1. Class A Concrete: Normal weight structural concrete.

2. Class B Concrete: Normal weight structural concrete used for duct bank encasements, catch basins, fence and guard post embedment, concrete fill, and other areas where specifically noted on Contract Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 11 00 – Concrete Formwork

B. Section 03 21 00 – Reinforcing Steel

C. Section 03 15 00 – Concrete Accessories

D. Section 03 15 16 – Joints in Concrete

E. Section 03 35 00 – Concrete Finishes

F. Section 03 39 00 – Concrete Curing

G. Section 03 60 00 – Grout

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the Specifications, all work herein shall conform to or exceed the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Building Code of New York State

2. ACI 214 – Guide to Evaluation of Strength Test Results of Concrete

3. ACI 301 – Specifications for Structural Concrete

4. ACI 304 – Guide for Measuring, Mixing, Transporting, and Placing Concrete

5. ACI 305.1 – Specification for Hot Weather Concreting

6. ACI 306.1 – Standard Specification for Cold Weather Concreting

7. ACI 309 – Guide for Consolidation of Concrete

8. ACI 318 – Building Code Requirements for Structural Concrete and Commentary

9. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures

10. ASTM C 31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field

11. ASTM C 33 – Standard Specification for Concrete Aggregates

12. ASTM C 39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

13. ASTM C42 – Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

14. ASTM C 88 – Standard Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate

15. ASTM C 94 – Standard Specification for Ready-Mixed Concrete

16. ASTM C 114 – Standard Test Method for Chemical Analysis of Hydraulic Cement

17. ASTM C 136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

18. ASTM C 138 – Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete

19. ASTM C 143 – Standard Test Method for Slump of Hydraulic Cement Concrete

20. ASTM C 150 – Standard Specification for Portland Cement

21. C157: Standard Test Method for Length Change of Hardened Hydraulic Cement, Mortar and Concrete

22. ASTM C 172 – Standard Practice for Sampling Freshly Mixed Concrete

23. ASTM C 192 – Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory

24. ASTM C 231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

25. ASTM C 260 – Standard Specification for Air-Entraining Admixtures for Concrete

26. ASTM C 295 – Standard Guide for Petrographic Examination of Aggregates for Concrete

27. ASTM C 457 – Standard Test Method for Microscopical Determination of the Air-Void System in Hardened Concrete

28. ASTM C 494 – Standard Specification for Chemical Admixtures for Concrete

29. ASTM C 595 – Standard Specification for Blended Hydraulic Cements

30. ASTM C 618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

31. ASTM C 989 – Standard Specification for Slag Cement for Use in Concrete and Mortars

32. ASTM C 1077 – Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation

33. ASTM C 1260 – Test Method for Potential Alkali Reactivity of Aggregates (Mortar Bar Method)

34. ASTM C 1567 – Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)

35. ASTM C 1579 – Standard Test Method for Evaluating Plastic Shrinkage Cracking of Restrained Fiber Reinforced Concrete (Using a Steel Form Insert)

36. ASTM C 1602 – Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete

37. ASTM C 1609 – Standard Test Method for Flexural Performance of Fiber Reinforced Concrete (Using Beam with Third-Point Loading)

38. ASTM C 1778 – Standard Guide for Reducing the Risk of Deleterious Alkali – Aggregate Reaction in Concrete

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Sources of all materials and certifications of compliance with specifications for all materials.

2. Certified current (less than 1 year old) chemical analysis (mill test report) of the Portland Cement or Blended Cement to be used. The chemical analysis must include the equivalent alkali content of the Portland Cement or Blended Cement.

3. Certified current (less than 1 year old) chemical analysis of fly ash or slag cement to be used.

4. Aggregate test results showing compliance with required standards, i.e., sieve analysis, potential reactivity, aggregate soundness tests, petrographic analysis, mortar bar expansion testing, etc.

5. Manufacturer's data on all admixtures stating compliance with required standards.

6. Concrete mix design for each class of concrete specified herein.

7. Field experience records and/or trial mix data for the proposed concrete mixes for each class of concrete specified herein.

8. Drying shrinkage test results from trial concrete mixes.

1.05 QUALITY ASSURANCE

A. Tests on materials used in the production of concrete shall be required as specified in Part 2 – Products. These tests shall be performed by an independent testing laboratory approved by the Engineer at no additional cost to the Owner.

B. Trial concrete mixes shall be tested when required in accordance with Article 3.01 at no additional cost to the Owner.

C. Field quality control tests, as specified in Article 3.10, unless otherwise stated, will be performed by a materials testing consultant employed by the Owner. However, the Contractor shall be charged for the cost of any additional tests and investigation on work performed which does not meet the Specifications. Any individual who samples and tests concrete to determine if the concrete is being produced in accordance with this Specification shall be certified as a Concrete Field-Testing Technician, Grade I, in accordance with ACI CP-2. Testing laboratory shall conform to requirements of ASTM C-1077.

PART 2 – PRODUCTS

2.01 HYDRAULIC CEMENT

A. Portland Cement

1. Portland Cement shall be Type II conforming to ASTM C 150. Type I cement may be used provided either fly ash or slag cement is also included in the mix in accordance with Articles 2.02 or 2.03, respectively.

2. The proposed Portland Cement shall not contain more than 8% tricalcium aluminate and more than 12% tetracalcium aluminoferrite.

B. Blended Cement

1. Blended cements shall be Type IP (Portland Fly Ash Cement), Type IS (Portland Slag Cement), or Type IL (Portland Limestone Cement) conforming to ASTM C 595.

2. Type IP cement shall be an inter-ground blend of Portland Cement and fly ash in which the fly ash constituent is between 15% and 25% of the weight of the total blend.

3. Type IS cement shall be an inter-ground blend of Portland Cement and slag cement in which the slag cement constituent is between 30% and 40% of the weight of the total blend.

4. Type IL cement shall be an inter-ground blend of Portland Cement and limestone in which the limestone constituent is between 5% and 15% of the weight of the total blend.

5. Fly ash, slag cement, and limestone used in the production of blended cements shall meet the requirements of Articles 2.02, 2.03, and 2.04 respectively.

C. Different types of cement shall not be mixed, nor shall they be used alternately except when authorized in writing by the Engineer. Different brands of cement or the same brand from different mills may be used alternately. A resubmittal will be required if different cements are proposed during the Project.

D. Cement shall be stored in a suitable weather-tight building to prevent deterioration or contamination. Cement which has become caked, partially hydrated, or otherwise damaged will be rejected.

2.02 FLY ASH

A. Fly ash shall meet the requirements of ASTM C 618 for Class F, except that the loss on ignition shall not exceed 4%. Fly ash shall also meet the optional physical requirements for uniformity as shown in Table 3 of ASTM C 618. Fly ash shall be considered as a supplemental cementitious material.

B. For fly ash to be used in the production of Type IP cement, the Pozzolan Activity Index shall be greater than 75% as specified in Table 3 of ASTM C 595.

C. Where reactive aggregates as defined in Article 2.07 are used in the concrete mix, the fly ash constituent shall be as needed to satisfy the concrete alkali loading requirements stipulated in Section 2.05. The percentage of fly ash shall also be set to meet the mean mortar bar expansion requirements in provisions of Article 2.07.G.2. Where fly ash is used, the minimum fly ash content shall be 15%.

D. For Type A1 concrete as required for use in environmental concrete structures, i.e., process structures or fluid containing structures, inclusion of fly ash or slag cement in the concrete mix, is mandatory.

E. Additional fly ash shall not be included in concrete mixed with Type IS or IP cement.

2.03 SLAG CEMENT

A. Slag cement shall meet the requirements of ASTM C 989 including tests for effectiveness of slag in preventing excessive expansion due to alkali-aggregate reactivity as described in Appendix X-3 of ASTM C 989.

B. Where reactive aggregates as defined in Article 2.07 are used in concrete mix, the slag cement constituent shall be as needed to satisfy the concrete alkali loading requirements stipulated in Section 2.05. The percentage of slag cement shall also be set to meet the mean mortar bar expansion requirements in provisions of Article 2.07.G.2. Where Slag Cement is used, the minimum Slag Cement content shall be 30%, and the maximum Slag Cement content shall be 40%.

C. For Type A1 concrete as required for use in environmental concrete structures, i.e., process structures or fluid containing structures, inclusion of fly ash or slag cement in the concrete mix, is mandatory.

D. Additional slag cement shall not be included in concrete mixed with Type IS or IP cement.

2.04 LIMESTONE

A. Limestone used for blended cement Type IL shall meet the requirements of ASTM C 33.

B. Type IL cement shall not be used as an equal for Type II cement. Requirements for Type I cement shall also apply for Type IL cement.

C. Fly ash or slag cement shall be used with Type IL cement to meet requirements for durability, ASR resistance, sulfate resistance, and use for environmental structures, as specified herein.

2.05 CONCRETE ALKALI LOADING

A. All concrete mixes containing potentially reactive aggregates shall have a maximum alkali loading of the concrete of 3.0 pounds per cubic yard.

B. The alkali loading of concrete is the Portland Cement equivalent alkali content multiplied by the Portland Cement content of the mix in pounds per cubic yard divided by 100. The Portland Cement equivalent alkali content shall be included in the certified chemical analysis of the Portland Cement.

C. Means of evaluating alkali loading of concrete and proportioning constituents of concrete to minimize alkali loading of content shall also conform to the guidelines of ASTM C1778.

2.06 WATER

A. Water used for mixing concrete shall be clear, potable, and free from deleterious substances such as objectionable quantities of silty organic matter, alkali, salts, and other impurities.

B. Water shall not contain more than 100 PPM chloride.

C. Water shall not contain more than 500 PPM dissolved solids.

D. Water shall have a pH in the range of 4.5 to 8.5.

E. Water shall meet requirements of ASTM C 1602.

2.07 AGGREGATES

A. All aggregates used in normal weight concrete shall conform to ASTM C 33.

B. Fine Aggregate (Sand) in the various concrete mixes shall consist of natural or manufactured siliceous sand, clean and free from deleterious substances, and graded within the limits of ASTM C 33.

C. Coarse aggregates shall consist of hard, clean, durable gravel, crushed gravel, or crushed rock. Coarse aggregate shall be size #57 or #67 as graded within the limits given in ASTM C 33 unless otherwise specified.

D. For Class A4 concrete, coarse aggregate shall be Size #8 in accordance with ASTM C33.

E. Aggregates shall be tested for gradation by sieve analysis tests in conformance with ASTM C 136.

F. Aggregates shall be tested for soundness in accordance with ASTM C 88. The loss resulting after five cycles shall not exceed 10 percent for fine or coarse aggregate when using either magnesium sulfate or sodium sulfate.

G. All aggregates shall be evaluated in accordance with ASTM C 1778 to determine potential reactivity. All aggregates shall be considered reactive unless they meet the requirements below for non-reactive aggregates. Aggregates with a lithology similar to sources in the same region found to be reactive in service shall be considered reactive regardless of the results of the tests above.

1. Non-reactive aggregates shall meet the following requirements:

a. A petrographic analysis in accordance with ASTM C295 shall be performed to identify the constituents of the fine and coarse aggregate. Non-reactive aggregates shall meet the following limitations:

1) Optically strained, micro-fractured, or microcrystalline quartz, 5.0%, maximum.

2) Chert or chalcedony, 3.0%, maximum.

3) Tridymite or cristobalite, 1.0%, maximum.

4) Opal, 0.5%, maximum.

5) Natural volcanic glass in volcanic rocks, 3.0%, maximum.

2. Concrete mixed with reactive aggregates shall meet the following requirements:

a. If aggregates are deemed potentially reactive as per ASTM C1778 and fly ash or slag cement is included in proposed concrete mix design, proposed concrete mix including proposed aggregates shall be evaluated by ASTM C-1567. Mean mortar bar expansions at 16 days shall be less than 0.08%. Tests shall be made using exact proportion of all materials proposed for use on the job in design mix submitted.

b. If aggregates are deemed potentially reactive as per ASTM C-1778 and a straight cement mix without fly ash or slag cement is proposed for concrete mix design, aggregates shall be evaluated by ASTM C-1260. Mean mortar bar expansions at 16 days shall be less than 0.08%.

c. If the proposed aggregates are deemed potentially reactive, the concrete mix shall be evaluated and confirmed to meet the requirements for concrete alkali loading as stipulated in Section 2.05.

H. Contractor shall submit a new trial mix to the Engineer for approval whenever a different aggregate or gradation is proposed.

2.08 SYNTHETIC FIBERS

A. Micro-synthetic fibers shall meet requirements of ASTM C 1116 and shall provide a minimum cracking reduction ratio (CRR) of 40 percent when texted in accordance with ASTM C 1579. Acceptable products are MasterFiber F Series or M Series by Master Builders Solutions, or equal.

B. Macro-synthetic fibers shall meet the requirements of ASTM C 1116 and shall have a minimum equivalent flexural strength ratio of 25 percent when tested in accordance with ASTM C 1609. Acceptable products are MasterFiber MAC Series by Master Builders Solutions, Tuf Strand SF by the Euclid Chemical Company, Strux 90/40 by W.R. Grace, or equal.

C. Fibers shall be used only where specifically required on Contract Drawings or where specifically approved by Engineer.

2.09 ADMIXTURES

A. Admixtures containing intentionally added chlorides shall not be used.

B. Admixtures containing 1,4 Dioxane shall not be used in Projects located in a State or Commonwealth where 1,4 Dioxane limits are required.

C. Air entraining admixture shall be added to all concrete unless noted otherwise. The air entraining admixture shall conform to ASTM C 260. The admixture proposed shall be selected in advance so that adequate samples may be collected, and the required tests made. Air content of concrete, when placed, shall be within the ranges given in the concrete mix design.

D. The following admixtures are required or used for water reduction, slump increase, and/or adjustment of initial set, and enhancing durability. Admixtures permitted shall confirm to the requirements of ASTM C 494. Admixtures shall be non-toxic after 30 days and shall be compatible with and made by the same manufacturer as the air-entraining admixtures.

1. Water reducing admixture shall conform to ASTM C 494, Type A and shall contain no more than 0.05% chloride ions. Acceptable products are “Eucon Series” by the Euclid Chemical Company, “Master Pozzolith Series or Master Polyheed Series” by Master Builders Solutions, and “Plastocrete Series” by Sika Corporation.

2. High range water reducer shall conform to ASTM C 494, Type F or G. The high range water reducer shall be added to the concrete at the batch plant and may be used in conjunction with a water reducing admixture. The high range water reducer shall be accurately measured, and pressure injected into the mixer as a single dose by an experienced technician. A standby system shall be provided and tested prior to each day’s operation of the job site system. Concrete shall be mixed at mixing speed for a minimum of 100 mixer revolutions after the addition of the high range water reducer. Acceptable products are “Eucon 37” or Plastol 5000 by the Euclid Chemical Company, “Master Rheobuild 1000 or Master Glenium Series” by Master Builders Solutions, and “Daracem 100 or Advaflow Series” by W.R. Grace.

3. A non-chloride, non-corrosive accelerating admixture may be used where specifically approved by the Engineer. The admixture shall conform to ASTM C 494, Type C or E. The admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory (of at least a year’s duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures. Acceptable products are “MasterSet AC 534 or MasterSet FP 20” by Master Builders Solutions, “Accelguard 80/90 or NCA” by the Euclid Chemical Company and “Daraset” by W.R. Grace.

4. A retarding admixture may be used where specifically approved by the Engineer. The admixture shall conform to ASTM C494, Type B or D. Acceptable products are “Eucon

NR or Eucon Retarder 100” by the Euclid Chemical Company, “MasterSet R Series or MasterSet DELVO Series” by Master Builders Solutions, and “Plastiment” by Sika Corporation.

5. Workability Retaining Admixture shall conform to ASTM C 494, Type S. The admixture shall retain concrete workability without affecting time of setting or early-age strength development. Acceptable products are “MasterSure Z 60” by Master Builders Solutions, or equal.

E. Admixtures containing calcium chloride, thiocyanate or more than 0.05 percent chloride ions are not permitted. The addition of admixtures to prevent freezing is not permitted.

F. The Contractor shall submit manufacturer's data including the chloride ion content of each admixture and certification from the admixture manufacturer that all admixtures utilized in the design mix are compatible with one another and properly proportioned prior to mix design review.

2.10 CONCRETE MIX DESIGN

A. The proportions of cement, aggregates, admixtures, and water used in the concrete mixes shall be based on the results laboratory trial mixes in conformance with "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318 and ACI 350. When trial mixes are used, they shall also conform to Article 3.01 of this Section of the Specifications. Trial mix data used as the basis for the proposed concrete mix design shall be submitted to the Engineer along with the proposed mix.

B. Structural concrete shall conform to the following requirements. Cementitious materials refers to the total combined weight of all cement, fly ash, and slag cement contained in the mix.

1. Compressive Strength (28-Day)

Concrete Class A1, A5	4,500 psi (minimum)
Concrete Class A2, A3, A4	4,000 psi (minimum)
Concrete Class B	3,000 psi (minimum)

2. Water/cementitious materials ratio, by weight

	Maximum	**Minimum**
Concrete Class A1, A5	0.42	0.39
Concrete Class A2, A3, A4	0.45	0.39
Concrete Class B	0.50	0.39

3. Slump range

a. 4" nominal unless high range water reducing admixture is used

b. 8” max if high range water reducing admixture is used.

4. Air Content

Concrete Class A1, A2, A4, A5	6% ±1.5%
Concrete Class A3, B	3% Max (non-air-entrained)

PART 3 – EXECUTION

3.01 TRIAL MIXES

A. Trial mixes shall be used to confirm the quality of a proposed concrete mix in accordance with "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318 and ACI 350. An independent qualified testing laboratory designated and retained by the Contractor shall test a trial batch of each of the preliminary concrete mixes submitted by the Contractor. The trial batches shall be prepared using the aggregates, cement, supplementary cementitious materials, and admixtures proposed for the project. The trial batch materials shall be of a quantity such that the testing laboratory can obtain enough samples to satisfy requirements stated below. Tests on individual materials stated in PRODUCTS should already be performed before any trial mix is done. The cost of laboratory trial batch tests for each specified concrete mix will be borne by the Contractor and the Contractor shall furnish and deliver the materials to the testing laboratory at no cost to the Owner.

B. The independent testing laboratory shall prepare a minimum of fifteen (15) standard test cylinders in accordance with ASTM C 31 in addition to conducting slump (ASTM C 143), air content (C 231) and density (C 138) tests. Compressive strength test on the cylinders shall subsequently be performed by the same laboratory in accordance with ASTM C 39 as follows: Test 3 cylinders at age 7 days; test 3 cylinders at age 21 days; test 3 cylinders at age 28 days and test 3 cylinders at 56 days. The cylinders shall be carefully identified as "Trial Mix, Contract No. “. If the average 28-day compressive strength of the trial mix is less than that specified, or if any single cylinder falls below the required strength by more than 500 psi, the mix shall be corrected, another trial batch prepared, test cylinders taken, and new tests performed as before. Any such additional trial batch testing required shall be performed at no additional cost to the Owner. Adjustments to the mix shall be considered refinements to the mix design and shall not be the basis for extra compensation to the Contractor.

3.02 SHRINKAGE TESTS

A. Concurrent with the trial batch requirements stated in Article 3.01, the testing laboratory shall perform drying shrinkage tests for the trial batches as specified herein.

B. Fabricate, cure, dry, and measure specimens in accordance with ASTM C157 modified as follows.

1. Remove specimens from molds at an age of 23 hours ± 1 hour after trial batching.

2. Place specimens immediately in water at 70 ºF ± 3 ºF for at least 30 minutes.

3. Measure within 30 minutes thereafter to determine original length, then submerge in saturated lime water at 73 ºF ± 3 ºF.

4. At age seven days, measure to determine expansion, expressed as a percentage of original length. This length at age seven days shall be the base length for drying shrinkage calculations (zero days' drying age).

5. Store specimens immediately in a humidity-controlled room maintained at 73 ºF ± 3 ºF and 50 percent ± 4 percent relative humidity for the remainder of the test.

6. Make and report separately measurements to determine shrinkage expressed as base length percentage for 7, 14, 21, and 28 days of drying after 7 days of moist curing.

C. Compute the drying shrinkage deformation for each specimen as the difference between the base length (at zero days' drying age) and the length after drying at each test age. Compute the average drying shrinkage deformation for the specimens to the nearest 0.0001 inch at each test age. If the drying shrinkage for any specimen departs from the average test age for that test by more than 0.0004 inch, disregard the results obtained from that specimen. Report results from the shrinkage test to the nearest 0.001 percent of shrinkage. Take compression test specimens in each case from the same concrete used for preparing drying shrinkage specimens. These tests shall be considered part of the normal compression tests for the project.

D. The maximum concrete shrinkage for specimens cast in the laboratory from the trial batch, as measured at 21-day drying age or at 28-day drying age, shall be 0.036 or 0.042 percent, respectively. Use a mix design for construction that has first met the trial batch shrinkage requirements.

E. If the trial batch specimens do not meet both the strength and shrinkage requirements, revise the mix designs and/or materials and retest.

3.03 PRODUCTION OF CONCRETE

A. All concrete shall be machine mixed. Hand mixing of concrete will not be permitted. The Contractor may supply concrete from a ready-mix concrete plant or from a site mixed plant. In selecting the source for concrete production, the Contractor shall carefully consider its capability for providing quality concrete at a rate commensurate with the requirements of the placements so that well bonded, homogenous concrete, free of cold joints, is assured.

B. Ready-Mixed Concrete

1. At the Contractor's option, ready-mixed concrete may be used meeting the requirements for materials, batching, mixing, transporting, and placing as specified herein and in accordance with ASTM C 94.

2. Truck mixers shall be equipped with electrically actuated counters by which the number of revolutions of the drum or blades may be readily verified. The counter shall be of the resettable, recording type, and shall be mounted in the driver's cab. The counters shall be actuated at the time of starting mixers at mixing speeds.

3. Each batch of concrete shall be mixed in a truck mixer for not less than 100 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of equipment. Additional mixing, if any, shall be at the speed designated by the manufacturer of the equipment as agitating speed. All materials including mixing water shall be in the mixer drum before actuating the revolution counter for determining the number of revolutions of mixing.

4. Truck mixers and their operation shall be such that the concrete throughout the mixed batch, as discharged, is within acceptable limits of uniformity with respect to consistency, mix and grading. If slump tests taken at approximately the 1/4 and 3/4 points of the load during discharge give slumps differing by more than one inch when the specified slump is 3 inches or less, or if they differ by more than 2 inches when the specified slump is more than 3 inches, the mixer shall not be used on the work unless the causing condition is corrected and satisfactory performance is verified by additional slump tests. All mechanical details of the mixer, such as water measuring and discharge apparatus, condition of the blades, speed of rotation, general mechanical condition of the unit and clearance of the drum, shall be checked before a further attempt to use the unit will be permitted.

5. Ready-mixed concrete shall be delivered to the site for the work and discharge shall be completed within the time requirements stated in Article 3.03 of this Section.

6. Every concrete delivery shall be accompanied by a delivery ticket containing at least the following information:

    a. Date and truck number

    b. Ticket number

    c. Mix designation of concrete

    d. Cubic yards of concrete

    e. Cement brand, type, and weight in pounds

    f. Weight in pounds of fine aggregate (sand)

    g. Weight in pounds of coarse aggregate (stone)

h. Air entraining agent, brand, and weight in pounds and ounces

i. Other admixtures, brand, and weight in pounds and ounces

j. Water, in gallons, stored in attached tank

k. Water, in gallons, maximum that can be added without exceeding design water/cementitious materials ratio

l. Water, in gallons, used (by truck driver)

m. Time of loading

n. Time of delivery to job (by truck driver)

7. Any truck delivering concrete to the job site, which is not accompanied by a delivery ticket showing the above information will be rejected and such truck shall immediately depart from the job site.

8. The use of non-agitating equipment for transporting ready-mixed concrete will not be permitted. Combination truck and trailer equipment for transporting ready-mixed concrete will not be permitted. The quality and quantity of materials used in ready-mixed concrete and in batch aggregates shall be subject to inspection at the batching plant by the Engineer.

C. Site Mixed Concrete

1. Scales for weighing concrete ingredients shall be accurate when in use within ±0.4 percent of their total capacities. Standard test weights shall be available to permit checking scale accuracy.

2. Operation of batching equipment shall be such that the concrete ingredients are consistently measured within the following tolerances:

a.	Cement, fly ash, or slag cement	± 1 percent
b.	Water	± 1 percent
c.	Aggregates	± 2 percent
d.	Admixtures	± 3 percent

3. Each batch shall be so charged into the mixer that some water will enter in advance of the cement and aggregates. Water shall continue for a period which may extend to the end of the first 25 percent of the specified mixing time. Controls shall be provided to prevent batched ingredients from entering the mixer before the previous batch has been completely discharged.

4. The concrete shall be mixed in a batch mixer capable of thoroughly combining the aggregates, cement, and water into a uniform mass within the specified mixing time, and of discharging the concrete without harmful segregation. The mixer shall bear a manufacturer's rating plate indicating the rate capacity and the recommended revolutions per minute and shall be operated in accordance therewith.

5. Mixers with a rated capacity of one cubic yard or larger shall conform to the requirements of the Plant Mixer Manufacturers' Division of the Concrete Plant Manufacturers' Bureau.

6. Except as provided below, batches of one cubic yard or less shall be mixed for not less than one minute. The mixing time shall be increased 15 seconds for each cubic yard or fraction thereof of additional capacity.

7. Shorter mixing time may be permitted provided performance tests made in accordance with of ASTM C 94 indicate that the time is sufficient to produce uniform concrete.

8. Controls shall be provided to ensure that the batch cannot be discharged until the required mixing time has elapsed. At least three-quarters of the required mixing time shall take place after the last of the mixing water has been added.

9. The interior of the mixer shall be free of accumulations that will interfere with mixing action. Mixer blades shall be replaced when they have lost 10 percent of their original height.

10. Air-entraining admixtures and other chemical admixtures shall be charged into the mixer as solutions and shall be measured by means of an approved mechanical dispensing device. The liquid shall be considered a part of the mixing water. Admixtures that cannot be added in solution may be weighed or may be measured by volume if recommended by the manufacturer.

11. If two or more admixtures are used in the concrete, they shall be added separately to avoid possible interaction that might interfere with the efficiency of either admixture or adversely affect the concrete.

12. Addition of retarding admixtures shall be completed within one minute after addition of water to the cement has been completed, or prior to the beginning of the last three-quarters of the required mixing, whichever occurs first. Retarding admixtures shall not be used unless approved by the Engineer.

13. Concrete shall be mixed only in quantities for immediate use and within the time and mixing requirements of ASTM C 94.

3.04 CONCRETE PLACEMENT

A. No concrete shall be placed prior to approval of the concrete mix design. Concrete placement shall conform to the recommendations of ACI 304.

B. Prior to concrete placement, all reinforcement shall be securely and properly fastened in its correct position. Formwork shall be clean, oiled and form ties at construction joints shall be retightened. All bucks, sleeves, castings, hangers, pipe, conduits, bolts, anchors, wire, and any other fixtures required to be embedded therein shall be in place. Forms for openings to be left in the concrete shall be in place and anchored by the Contractor. All loose debris in bottoms of forms or in keyways shall be removed and all debris, water, snow, ice, and foreign matter shall be removed from the space to be occupied by the concrete. The Contractor shall notify the Engineer in advance of placement, allowing sufficient time for a concurrent inspection and for any corrective measures required.

C. On horizontal joints where concrete is to be placed on hardened concrete, flowing concrete containing a high range water reducing admixture or cement grout shall be placed with a slump not less than 8 inches for the initial placement at the base of the wall. Concrete or cement grout shall meet all strength and service requirements specified herein for applicable class of concrete. This concrete shall be worked well into the irregularities of the hard surface.

D. All concrete shall be placed during the daylight hours except with the consent of the Engineer. If special permission is obtained to carry on work during the night, adequate lighting must be provided.

E. When concrete arrives at the project with slump below that suitable for placing, as indicated by the Specifications, water may be added to bring the concrete within the specified slump range provided the design water-cementitious materials ratio is not exceeded. The water shall be incorporated by additional mixing equal to at least half of the total mixing required. Water may be added only to full trucks. On-site tempering shall not relieve the Contractor from furnishing a concrete mix meeting all specified requirements.

F. Concrete shall be conveyed as rapidly as practical to the point of deposit by methods which prevent the separation or loss of the ingredients. The concrete shall be deposited so that additional handling will be unnecessary. Discharge of the concrete to its point of deposit shall be completed within 90 minutes after the addition of the cement to the aggregates unless workability-retaining admixtures are included and approved by the Engineer. In hot weather, or under conditions contributing to quick stiffening of the concrete, the time between the introduction of the cement to the aggregates and discharge shall not exceed the requirements stated in Article 3.10 of this Section.

G. Where concrete is conveyed to position by chutes, a continuous flow in the chute shall be maintained. The angle and discharge arrangement of the chute shall be such to prevent segregation of the concrete ingredients. The delivery end of the chute shall be as close as possible to the point of deposit and in no case shall the free pour from the delivery end of the chute exceed five feet, unless approved otherwise.

H. Special care must be exercised to prevent splashing of forms or reinforcement with concrete, and any such splashes or accumulations of hardened or partially hardened concrete on the forms or

reinforcement above the general level of the concrete already in place must be removed before the work proceeds.

I. Placing of concrete shall be regulated so the pressure caused by the wet concrete shall not exceed that used in the design of the forms.

J. All concrete for walls shall be placed through openings in the form spaced at frequent intervals or through tremies (heavy duct canvas, rubber, etc.), equipped with suitable hopper heads. Tremies shall be of variable lengths so the free fall shall not exceed five (5) feet, and enough tremies shall be placed in the form to ensure the concrete remains level.

K. When placing concrete which will be exposed, sufficient illumination shall be provided in the interior of the forms so the concrete, at places of deposit, is visible from deck and runways.

L. Concrete shall be placed to thoroughly embed all reinforcement, inserts, and fixtures.

M. When forms are removed, surfaces shall be even and dense, free from aggregate pockets or honeycomb. Concrete shall be consolidated using mechanical vibration, supplemented by forking and spading by hand in the corners and angle of forms and along form surfaces while the concrete is plastic under the vibratory action. Consolidation shall conform to ACI 309.

N. Mechanical vibration shall be applied directly to the concrete, unless otherwise approved by the Engineer. The bottom of vibrators used on floor slabs must not be permitted to ride the form supporting the slab. Vibration shall be applied at the point of deposit and in freshly placed concrete by a vertical penetration of the vibrator. Vibrators shall not be used to move concrete laterally within the forms.

O. The intensity of vibration shall be sufficient to cause settlement of the concrete into place and to produce monolithic joining with the preceding layer. Vibration shall be of sufficient duration to accomplish thorough compaction and complete embedment of reinforcement and fixtures with a vibrator transmitting not less than 7,500 impulses per minute. Since the duration of vibration per square foot of surface is dependent on the frequency (impulses per minute), size of vibrator, and slump of concrete, the length of time must therefore be determined in the field. Vibration shall not be continued in any one location to the extent that pools of grout are formed.

P. Care shall be taken to prevent cold joints when placing concrete in any portion of the work. The concrete placing rate shall ensure that each layer is placed while the previous layer is soft or plastic, so the two layers can be made monolithic by penetration of the vibrators. Maximum thickness of concrete layers shall be 18 inches. The surface of the concrete shall be level whenever a run of concrete is stopped.

Q. To prevent featheredges, construction joints located at the tops of horizontal lifts near sloping exposed concrete surfaces shall be inclined near the exposed surface, so the angle between such inclined surface and the exposed concrete surface will be not less than 50°.

R. In placing unformed concrete on slopes, the concrete shall be placed ahead of a non-vibrated slip-form screed extending approximately 2-1/2 feet back from its leading edge. The method of placement shall provide a uniform finished surface with the deviation from the straight line less than 1/8 inch in any concrete placement. Concrete ahead of the slip-form screed shall be consolidated by internal vibrators to ensure complete filling under the slip-form. Prior to placement of concrete on sloped walls or slabs, the Contractor shall submit a plan specifically detailing methods and sequence of placements, proposed concrete screed equipment, location of construction joints and water stops, and/or any proposed deviations from the stated requirements to the Engineer for review and approval.

S. Concrete shall not be placed during rains sufficiently heavy or prolonged to prevent washing of mortar from coarse aggregate on the forward slopes of the placement. Once placement of concrete has commenced in a block, placement shall not be interrupted by diverting the placing equipment to other uses.

3.05 PLACING FLOOR SLABS ON GROUND

A. The subgrade for slabs on ground shall be well drained and of adequate and uniform loadbearing nature. The in-place density of the subgrade soils shall be at least the minimum required by the specifications. No foundation, slab, or pavement concrete shall be placed until the depth and character of the foundation soils have been inspected and approved by the materials testing consultant.

B. The subgrade shall be free of frost before concrete placing begins. If the temperature inside a building where concrete is to be placed is below freezing, the temperature shall be raised and maintained above 50° long enough to remove all frost from the subgrade.

C. The subgrade shall be moist at the time of concreting. If necessary, the subgrade shall be dampened with water in advance of concreting, but no free water shall remain standing on the subgrade nor any muddy or soft spots when the concrete is placed.

D. Thirty-pound felt-paper shall be provided between edges of slabs-on-ground and vertical and horizontal concrete surfaces, unless otherwise indicated on the Drawings.

E. Contraction joints shall be provided in slabs-on-ground at locations indicated on the Drawings. Contraction joints shall be installed as per Section 03 15 16 – Joints in Concrete.

F. Floor slabs shall be screeded level or pitched to drain as indicated on the Drawings. Finishes shall conform with requirements of Section 03 35 00 – Concrete Finishes. Interior floor slabs shall be placed with non-air-entrained concrete (Class A3) if a steel troweled or hardened finish is required.

3.06 PLACING CONCRETE UNDERWATER (CLASS A5 CONCRETE)

A. Placing concrete underwater (tremie concrete) will be permitted only when shown on the Drawings. Concrete deposited under water shall be carefully placed in a compacted mass in final

position by means of a tremie, a closed bottom dump bucket or other approved method. Care must be exercised to maintain still water at the point of deposit. Concrete shall not be placed in running water. Underwater formwork shall be watertight. The consistency of the concrete shall be regulated to prevent segregation of materials. The method of depositing concrete shall be regulated such that the concrete enters the mass of the previously placed concrete from within, displacing water with a minimum disturbance to the surface of the concrete.

B. Tremie shall consist of a tube having a diameter of not less than 10 inches and constructed in sections having flanged couplings fitted with gaskets. The tremie shall be supported to permit free movement of the discharge and over the entire top surface of the work and shall permit rapid lowering when necessary to choke off or retard the flow. The discharge end shall be sealed, and the tremie tube kept full to the bottom of the hopper. When a batch is dumped into the hopper, the tremie shall be slightly raised, but not out of the concrete at the bottom, until the batch discharges to the bottom of the hopper. The flow shall then be stopped by lowering the tremie. The flow shall be continuous until the placement has been completed.

3.07 PLACING CONCRETE UNDER PRESSURE

A. Where concrete is conveyed and placed by mechanically applied pressure, the equipment shall have the capacity for the operation. The operation of the pump shall produce a continuous stream of concrete without air pockets. To obtain the least line resistance, the layout of the pipeline system shall contain a minimum number of bends with no change in pipe size. If two sizes of pipe must be used, the smaller diameter should be used at the pump end and the larger at the discharge end. When pumping is completed, the concrete remaining in the pipelines shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients.

B. Priming of the concrete pumping equipment shall be with cement grout only. Use of specialty mix pump primers or pumping aids will not be allowed.

C. No aluminum parts shall be in contact with the concrete during the placing of concrete under pressure.

D. Prior to placing concrete under pressure, the Contractor shall submit the concrete mix design together with test results from a material’s testing consultant proving the proposed mix meets all requirements. In addition, an actual pumping test under field conditions is required prior to acceptance of the mix. This test requires a duplication of anticipated site conditions from beginning to end. The batching and truck mixing shall be the same as will be used during construction, and the pipe and pipe layouts will reflect the maximum height and distance contemplated. All submissions shall be subject to approval by the Engineer.

E. If the pumped concrete does not produce satisfactory end results, the Contractor shall discontinue the pumping operation and proceed with the placing of concrete using conventional methods.

F. The pumping equipment must have two cylinders and be designed to operate with one cylinder only in case the other one is not functioning. In lieu of this requirement, the Contractor may have a standby pump on the site during pumping.

G. The minimum diameter of the hose (conduits) shall be four inches.

H. Pumping equipment and hoses (conduits) that are not functioning properly shall be replaced.

I. Concrete samples for quality control in accordance with Article 3.11 will be taken at the placement (discharge) end of the line.

3.08 ORDER OF PLACING CONCRETE

A. To minimize the effects of shrinkage, the concrete shall be placed in units as bounded by construction joints shown on the Drawings and maximum lengths as indicated on Drawings. Where required on the Drawings and wherever else practical, the placing of such units shall be done in a strip pattern in accordance with ACI 302.1. A minimum of 72 hours shall pass prior to placing concrete directly adjacent to previously placed concrete.

3.09 CONCRETE WORK IN COLD WEATHER

A. Cold weather concreting procedures shall conform to the requirements of ACI 306.1.

B. The Engineer may prohibit the placing of concrete at any time when air temperature is 40°F. or lower. If concrete work is permitted, the concrete shall have a minimum temperature, as placed, of 55°F. for placements less than 12" thick, 50°F. for placements 12" to 36" thick, and 45°F. for placements greater than 36" thick. The temperature of the concrete as placed shall not exceed these minimum values by more than 20°F, unless otherwise approved by the Engineer.

C. All aggregate and water shall be preheated. Precautions shall be taken to avoid the possibility of flash set when aggregate or water are heated to a temperature greater than 100°F. in order to meet concrete temperature requirements. The addition of admixtures to the concrete to prevent freezing is not permitted. All reinforcement, forms, and concrete accessories shall be defrosted by an approved method. No concrete shall be placed on frozen ground.

3.10 CONCRETE WORK IN HOT WEATHER

A. Hot weather concreting procedures shall conform to the requirements of ACI 305.1.

B. When air temperatures exceed 85°F., or when extremely dry or high wind conditions exist even at lower temperatures, the Contractor and his concrete supplier shall exercise special and precautionary measures in preparing, delivering, placing, finishing, curing and protecting the concrete mix. The Contractor shall consult with the Engineer regarding such measures prior to each day's placing operation, and the Engineer reserves the right to modify the proposed measures consistent with the requirements herein. All necessary materials and equipment shall be in place prior to each placing operation.

C. Preparatory work at the job site shall include thorough wetting of all forms, reinforcing steel and, in the case of slab pours on ground or subgrade, spraying the ground surface on the preceding

evening and again just prior to placing. No standing puddles of water shall be permitted in those areas which are to receive the concrete.

D. The temperature of the concrete mix when placed shall not exceed 95°F.

E. Temperature of mixing water and aggregates shall be carefully controlled and monitored at the supplier's plant, with haul distance to the job site being considered. Stockpiled aggregates shall be shaded from the sun and sprinkled intermittently with water. If ice is used in the mixing water for cooling purposes, the ice must be entirely melted prior to addition of the water to the dry mix.

F. Delivery schedules shall be carefully considered in advance to ensure concrete is placed as soon as practical after mixing. For hot weather concrete work (air temperature greater than 85°F), discharge of the concrete to its point of deposit shall be completed within 60 minutes from the time the concrete is batched, unless workability-retaining admixtures are included and approved by the Engineer.

G. The Contractor shall arrange for an ample work force to be on hand to accomplish transporting, vibrating, finishing, and covering of the fresh concrete as rapidly as possible.

3.11 QUALITY CONTROL

A. Field Testing of Concrete

1. The Contractor shall coordinate with the Engineer's project representative the on-site scheduling of the materials testing consultant personnel as required for concrete testing.

2. Concrete for testing shall be supplied by the Contractor at no additional cost to the Owner, and the Contractor shall assist the materials testing consultant in obtaining samples. The Contractor shall dispose of and clean up all excess material.

B. Consistency

1. The consistency of the concrete will be checked by the materials testing consultant by standard slump cone tests. The Contractor shall make any necessary adjustments in the mix as the Engineer and/or the materials testing consultant may direct and shall upon written order suspend all placing operations in the event the consistency does not meet the intent of the specifications. No payment shall be made for any delays, material, or labor costs due to such occurrences.

2. Slump tests shall be made in accordance with ASTM C 143. Slump tests will be performed as deemed necessary by the materials testing consultant and each time compressive strength samples are taken.

3. Concrete with a specified nominal slump shall be placed having a slump within 1” (higher or lower) of the specified slump. Concrete with a specified maximum slump shall be placed having a slump less than the specified slump.

C. Density

1. Samples of freshly mixed concrete shall be tested for density by the materials testing consultant in accordance with ASTM C 138.

2. Density tests will be performed as deemed necessary by the Engineer and each time compressive strength samples are taken.

D. Air Content

1. Samples of freshly mixed concrete will be tested for entrained air content by the materials testing consultant in accordance with ASTM C 231.

2. Air content tests will be performed as deemed necessary by the materials testing consultant and each time compressive strength samples are taken.

3. In the event test results are outside the limits specified, additional testing shall occur. Admixture quantity adjustments shall be made immediately upon discovery of incorrect air entrainment.

E. Compressive Strength

1. Samples of freshly mixed concrete will be taken by the materials testing consultant and tested for compressive strength in accordance with ASTM C 172, C 31, and C 39, except as modified herein.

2. In general, one sampling shall be taken for each placement in excess of five (5) cubic yards, with a minimum of one (1) sampling for each day of concrete placement operations, or for each one hundred (100) cubic yards of concrete, or for each 5,000 square feet of surface area for slabs or walls, whichever is greater.

3. Each sampling shall consist of at least five (5) 6x12 cylinders or (8) 4x8 cylinders. Each cylinder shall be identified by a tag, which shall be hooked or wired to the side of the container. The materials testing consultant will fill out the required information on the tag, and the Contractor shall satisfy himself that such information shown is correct.

4. The Contractor shall be required to furnish labor to the Owner for assisting in preparing test cylinders. The Contractor shall provide approved curing boxes for storage of cylinders on site. The insulated curing box shall be of sufficient size and strength to contain all the cylinders made in any four consecutive working days and to protect the specimens from falling over, being jarred or otherwise disturbed during the period of initial curing. The box shall be erected, furnished, and maintained by the Contractor. Such box shall be equipped to provide the moisture and to regulate the temperature necessary to maintain the proper curing conditions required by ASTM C 31. The curing box shall be placed in an area free from vibration such as pile driving and traffic of all kinds and such that all cylinders are shielded from direct sunlight and/or radiant heating sources. No concrete requiring testing

shall be delivered to the site until such storage curing box has been provided. Cylinders shall remain undisturbed in the curing box until ready for delivery to the testing laboratory, but not less than sixteen hours.

5. The Contractor shall be responsible for maintaining the temperatures of the curing box during the initial curing of cylinders with the temperature preserved between 60°F and 80°F as measured by a maximum-minimum thermometer. The Contractor shall maintain a written record of curing box temperatures for each day the curing box contains cylinders. Temperature shall be recorded a minimum of three times a day with one recording at the start of the day and one recording at the end of the day.

6. When transported, the cylinders shall not be thrown, dropped, allowed to roll, or be damaged in any way.

7. Compression tests shall be performed in accordance with ASTM C 39. For 6x12 cylinders, two test cylinders will be tested at seven days and two at 28 days. For 4x8 cylinders, three test cylinders will be tested at seven days, three at 28 days. The remaining cylinders will be held to verify test results, if needed.

F. Evaluation and Acceptance of Concrete

1. Evaluation and acceptance of the compressive strength of concrete shall be according to the requirements of ACI 214, ACI 318, and ACI 350.

2. The strength level of concrete will be considered satisfactory if the following conditions are satisfied.

   a. Every arithmetic average of any three consecutive strength tests equals or exceeds the minimum specified 28-day compressive strength for the mix (see Article 2.10).

   b. No individual compressive strength test result falls below the minimum specified strength by more than 500 psi.

3. If any of the conditions listed above are not met, the mix proportions shall be corrected for the next concrete placing operation.

4. If condition 2B is not met, additional tests in accordance with Article 3.11, Paragraph H shall be performed.

5. When a ratio between 7-day and 28-day strengths has been established by these tests, the 7-day strengths shall subsequently be taken as a preliminary indication of the 28-day strengths. Should the 7-day test strength from any sampling be more than 10% below the established minimum strength, the Contractor shall:

   a. Immediately provide additional periods of curing in the affected area from which the deficient test cylinders were taken.

b. Maintain or add temporary structural support as required.

c. Correct the mix for the next concrete placement operation, if required to remedy the situation.

6. All concrete which fails to meet the ACI requirements and these specifications is subject to removal and replacement at no additional cost to the Owner.

G. When non-compliant concrete is identified, test reports shall be sent immediately to the Engineer for review.

H. Additional Tests

1. When ordered by the Engineer, additional tests on in-place concrete shall be provided and paid for by the Contractor.

2. If the 28-day test cylinders fail to meet the minimum strength requirements as outlined in Article 3.11, Paragraph F, the Contractor shall have concrete core specimens obtained and tested from the affected area immediately.

a. Three cores shall be taken for each sample in which the strength requirements were not met.

b. The drilled cores shall be obtained and tested in conformance with ASTM C 42. The tests shall be conducted by a materials testing consultant approved by the Engineer.

c. The location from which each core is taken shall be approved by the Engineer. Each core specimen shall be located, when possible, so its axis is perpendicular to the concrete surface and not near formed joints or obvious edges of a unit of deposit.

d. The core specimens shall be taken, if possible, so no reinforcing steel is within the confines of the core.

e. The diameter of core specimens should be at least 3 times the maximum nominal size of the coarse aggregate used in the concrete but must be at least 2-inches in diameter.

f. The length of specimen, when capped, shall be at least twice the diameter of the specimen.

g. The core specimens shall be taken to the laboratory and when transported, shall not be thrown, dropped, allowed to roll, or damaged in any way.

h. Two (2) copies of test results shall be mailed directly to the Engineer. The concrete in question will be considered acceptable if the average compressive strength of a minimum of three test core specimens taken from a given area equal or exceed 85%

of the specified 28-day strength and if the lowest core strength is greater than 75% of the specified 28-day strength.

3. If the concrete placed by the Contractor is suspected of not having proper air content, the Contractor shall engage a materials testing consultant approved by the Engineer, to obtain and test samples for air content in accordance with ASTM Specification C 457.

3.12 CARE AND REPAIR OF CONCRETE

A. The Contractor shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the Owner. Care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Care shall be exercised to avoid jarring forms or placing any strain on the ends of projecting reinforcing bars. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at no additional cost to the Owner.

B. Areas of honeycomb shall be chipped back to sound concrete and repaired as directed.

C. Concrete formwork blowouts or unacceptable deviations in tolerances for formed surfaces due to improperly constructed or misaligned formwork shall be repaired as directed. Bulging or protruding areas, which result from slipping or deflecting forms shall be ground flush or chipped out and redressed as directed.

D. Areas of concrete in which cracking, spalling, or other signs of deterioration develop prior to final acceptance shall be removed and replaced or repaired as directed. This stipulation includes concrete that has experienced cracking due to drying or thermal shrinkage of the concrete. Structural cracks shall be repaired using an approved epoxy injection system. Non-structural cracks shall be repaired using an approved hydrophilic resin pressure injected grout system unless other means of repair are deemed necessary and approved. All repair work shall be performed at no additional cost to the Owner.

E. Concrete which fails to meet the strength requirements as outlined in Article 3.11, Paragraph F, will be analyzed as to its adequacy based upon loading conditions, resultant stresses, and exposure conditions for the area of concrete in question. If the concrete in question is found unacceptable based upon this analysis, that portion of the structure shall be strengthened or replaced by the Contractor at no additional cost to the Owner. The method of strengthening or extent of replacement shall be as directed by the Engineer.

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SECTION 03 35 00

CONCRETE FINISHES

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Furnish all materials, labor, and equipment required to provide finishes of all concrete surfaces specified herein and shown on the Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 11 00 – Concrete Formwork

B. Section 03 30 00 – Cast-in-Place Concrete

C. Section 03 60 00 – Grout

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ACI 301 – Specifications for Structural Concrete for Buildings

2. ACI 318 – Building Code Requirements for Structural Concrete

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Manufacturer's literature on all products specified herein.

PART 2 – PRODUCTS

2.01 CONCRETE FLOOR SEALER

A. Floor sealer shall be Diamond Clear VOX or Super Diamond Clear VOX by the Euclid Chemical Company, MasterKure CC 300 SB by Master Builders Solutions.

2.02 CONCRETE LIQUID DENSIFIER AND SEALANT

A. Concrete liquid densifier and sealant shall be a high performance, deeply penetrating concrete densifier and sealant. Product shall be odorless, colorless, VOC-compliant, non-yellowing

siliconate based solution designed to harden, dustproof, and protect concrete floors subjected to heavy vehicular traffic and to resist black rubber tire marks on concrete surfaces. The product must contain a minimum solids content of 20% of which 50% is siliconate. Acceptable products are Diamond Hard by the Euclid Chemical Company, and Seal Hard by L&M Construction Chemicals, and Masterkure HD 200 WB by Master Builders Solutions.

2.03 NON-METALLIC FLOOR HARDENER

A. The specified non-metallic mineral aggregate hardener shall be formulated, processed, and packaged under stringent quality control at the manufacturer's owned and controlled factory. The hardener shall be a factory-blended mixture of specifically processed graded mineral aggregate, selected Portland cement, and necessary plasticizing agents. Acceptable products shall be "Surflex" by the Euclid Chemical Company, and MasterTop 100 and MasterTop 110ABR by Master Builders Solutions.

2.04 NON-OXIDIZING HEAVY DUTY METALLIC FLOOR HARDENER

A. Non-oxidizing heavy-duty metallic floor hardener shall be formulated, processed, and packaged under stringent quality control at the manufacturer's owned and controlled factory. The hardener shall be a mixture of specifically processed non-rusting aggregate, selected Portland cement, and necessary plasticizing agents. Product shall be "Diamond-Plate" by the Euclid Chemical Company, or MasterTop 200 by Master Builders Solutions.

2.05 NON-SLIP FLOORING ADDITIVE

A. Non-slip flooring additives for slip resistant floors shall be non-metallic. Non-slip flooring additives shall be MasterTop 120SR by Master Builders Solutions, A-H Alox by Anti-Hydro, or Euco Grip by the Euclid Chemical Company.

PART 3 – EXECUTION

3.01 FINISHES ON FORMED CONCRETE SURFACES

A. After removal of forms, the finishes described below shall be applied in accordance with Article 3.06 - Concrete Finish Schedule. Unless the finish schedule specifies otherwise, all surfaces shall receive at least a Type I finish. See Article 3.05 for surfaces to receive paint or protective coatings. The Engineer shall be the sole judge of acceptability of all concrete finish work.

1. Type I - Rough: All fins, burrs, offsets, marks, and all other projections left by the forms shall be removed. Projections, depressions, etc. below finished grade required to be removed will only be those greater than ¼-inch. All holes left by removal of ends of ties, and all other holes, depressions, bug holes, air/blow holes or voids shall be filled solid with cement grout after first being thoroughly wetted and then struck off flush. The only holes below grade to be filled will be tie holes and any other holes larger than ¼-inch in any dimension. Honeycombs shall be chipped back to solid concrete and repaired as directed

by the Engineer. All holes shall be filled with tools, such as sponge floats and trowels, that will permit packing the hole solidly with cement grout. Cement grout shall consist of one-part cement to three parts sand, epoxy bonding agent (for tie holes only) and the amount of mixing water shall be as little as consistent with the requirements of handling and placing. Color of cement grout shall match the adjacent wall surface.

2. Type II - Grout Cleaned: Where this finish is required, it shall be applied after completion of Type I finish. After the concrete has been pre-dampened over an extended amount of time to reach the condition of saturated surface dry (SSD), a slurry consisting of one part cement (including an appropriate quantity of white cement to produce a color matching the surrounding concrete) and 1-1/2 parts sand passing the No. 16 sieve, by damp loose volume, shall be spread over the surface with clean burlap pads or sponge rubber floats. Mix proportions shall be submitted to the Engineer after a sample of the work is established and accepted. Any surplus shall be removed by scraping and then rubbing with clean burlap.

3. Type III - Smooth Rubbed: Where this finish is required, it shall be applied after the completion of the Type II finish. No rubbing shall be done before the concrete is thoroughly hardened and the mortar used for patching is firmly set. A smooth, uniform surface shall be obtained by wetting the surface and rubbing with a carborundum stone to eliminate irregularities. Unless the nature of the irregularities requires it, the general surface of the concrete shall not be cut into. Corners and edges shall be slightly rounded using a carborundum stone. Brush finishing or painting with grout or neat cement will not be permitted. A 100 square foot example shall be established at the beginning of the project to establish acceptability.

3.02 SLAB AND FLOOR FINISHES

A. The finishes described below shall be applied to floors, slabs, flow channels and top of walls in accordance with Article 3.05 - Concrete Finish Schedule. The Engineer shall be the sole judge of acceptability of all such finish work.

1. Type "A" - Screeded: This finish shall be obtained by placing screeds at frequent intervals and striking off to the surface elevation required. When a Type "F" finish is subsequently to be applied, the surface of the screeded concrete shall be roughened with a concrete rake to 1/2” minimum deep grooves prior to final set.

2. Type "B" - Wood or Magnesium Floated: This finish shall be obtained after completion of a Type "A" finish by working a previously screeded surface with a wood or magnesium float or until the desired texture is reached. Floating shall begin when the water sheen has disappeared and when the concrete has sufficiently hardened so that a person's foot leaves only a slight imprint. If wet spots occur, water shall be removed with a squeegee. Care shall be taken to prevent the formation of laitance and excess water on the finished surface. All edges shall be edged with an 1/8-inch tool as directed by the Engineer. The finished surface shall be true, even, and free from blemishes and any other irregularities.

3. Type "C" - Cork Floated: This finish shall be similar to Type "B" but slightly smoother than the finish obtained with a wood float. The finish shall be obtained by power or band floating with cork floats.

4. Type "D" - Steel Troweled: This finish shall be obtained after completion of a Type "B" finish. When the concrete has hardened sufficiently to prevent excess fine material from working to the surface, the surface shall be compacted and smoothed with not less than two thorough and complete steel troweling operations. In areas which are to receive a floor covering such as tile, resilient flooring, or carpeting, the applicable Specification Sections and Contract Drawings shall be reviewed for the required finishes and degree of flatness. In areas that are intermittently wet such as pump rooms, only one troweling operation is required to provide some trowel marks for slip resistance. All edges shall be edged with an 1/8-inch tool as directed by the Engineer. The finish shall be brought to a smooth, dense surface, free from defects and blemishes.

5. Type "E" - Broom or Belt: This finish shall provide the surface with a transverse scored texture by drawing a broom or burlap belt across the surface immediately after completion of a Type "B" finish. All edges shall be edged with an 1/8-inch tool as directed by the Engineer.

6. Type "F" - Swept in Grout Topping: This finish shall be applied after a completion of a Type "A" finish. The concrete surface shall be properly cleaned, washed, and coated with a mixture of water and Portland Cement. Cement grout in accordance with Section 03 60 00 – Grout shall be plowed and swept into neat conformance with the blades or arms of the apparatus by turning or rotating the previously positioned mechanical equipment. Special attention shall be paid to true grades, shapes and tolerances as specified by the manufacturer of the equipment. Before beginning this finish, the Contractor shall notify the Engineer and the equipment manufacturer of the details of the operation and obtain approval and recommendations.

7. Type “G” Hardened Finish: This finish shall be applied after completion of a Type “B” or Type “C” finish and prior to application of a Type “D” finish. Hardeners shall be applied in strict accordance with the manufacturer’s requirements. Hardeners shall be applied using a mechanical spreader. The hardener shall be applied in two shakes with the first shake comprising 2/3 of the total amount. Type “D” finish shall be applied following completion of application of the hardener.

    a. Non-metallic floor hardener shall be applied where specifically required on the Contract Drawings at the rate of 1.0 pounds/ft.2.

    b. Non-oxidizing, heavy-duty metallic floor hardener shall be applied at the loading docks and where specifically required on the Contract Drawings or specified herein at the rate of 1.5 pounds/ft.2.

8. Type "H" - Non-Slip Finish: This finish shall be provided by applying a non-slip flooring additive concurrently with the application of a Type "D" finish and/or installation of floor sealants. Application procedure shall be in accordance with manufacturer's instructions. Finish shall be applied where specifically required on the Contract Drawings or specified herein.

9. Type "J" - Raked Finish: This finish shall be provided by raking the surface as soon as the condition of the concrete permits by making depressions of ±1/4 inch.

3.03 CONCRETE SEALERS

A. Concrete sealers shall be applied where specifically required on the Contract Drawings or specified herein. Concrete sealers and densifiers shall not be used as concrete curing compounds. Curing compounds, when allowed, shall be in accordance with Section 03 39 00 – Concrete Curing.

B. Sealers shall be applied after installation of all equipment, piping, etc. and after completion of any other related construction activities. Application of sealers shall be in strict accordance with manufacturer’s requirements.

C. Sealers shall be applied to all floor slabs not painted and not intended to be immersed.

D. Floor slabs subjected to vehicular traffic shall be sealed with the concrete liquid densifier and sealer.

E. All other floor slabs to receive sealer shall be sealed with concrete floor sealer.

3.04 FINISHES ON EQUIPMENT PADS

A. Formed surfaces of equipment pads shall receive a Type III finish.

B. Top surfaces of equipment pads, except those surfaces subsequently required to receive grout and support equipment bases, shall receive a Type "D" finish, unless otherwise noted. Surfaces which will later receive grout shall, before the concrete takes its final set, be made rough by removing the sand and cement that accumulates on the top to the extent that the aggregate will be exposed with irregular indentations in the surface up to 1/2 inch deep.

3.05 FINISHES FOR SURFACES TO RECEIVE PAINT OR COATINGS

A. Surfaces indicated or specified to receive paint or special coatings shall be prepared per specifications in Division 09. All products applied to the concrete surfaces during the placement, finishing, and curing process shall be compatible with the painting or coating system as required by the manufacturer.

3.06 CONCRETE FINISH SCHEDULE

Item	Type of Finish
Concrete surfaces indicated to receive textured coating (as noted on Drawings and in Section 09 97 00 – Special Coatings)	I
Inner face of walls of tanks, flow channels, wet wells, perimeter walls, and miscellaneous concrete structures:	
From 1 feet below water surface to bottom of wall	I
From top of wall to 1 feet below water surface	II
Exterior concrete walls below grade	I
Exterior exposed concrete walls, ceilings, beams, manholes, hand holes, miscellaneous structures and columns (including top of wall) to one foot below grade. All other exposed concrete surfaces not specified elsewhere	II
All interior exposed concrete walls and vertical surfaces	III
Interior exposed ceiling, including beams	III
Floors of process equipment tanks or basins, wetwells, flow channels and slabs to receive roofing material or waterproof membranes	B
All interior finish floors of buildings and structures and walking surfaces which will be continuously or intermittently wet	D or E *PM/Engineer to discuss with Client.
All interior finish floors of buildings and structures which are not continuously or intermittently wet	D
Floors to receive tile, resilient flooring, or carpeting	D
Exterior concrete sidewalks, steps, ramps, decks, slabs on grade and landings exposed to weather	E
Floors of process equipment tanks indicated on Drawings to receive grout topping	F
Garage, storage area floors, and loading docks	G
Precast concrete form panels, hollow core planks, double tees	J

END OF SECTION

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SECTION 03 39 00

CONCRETE CURING

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Protect all freshly deposited concrete from premature drying and from the weather elements. The concrete shall be maintained with minimal moisture loss at a relatively constant temperature for a period necessary for the hydration of the cement and proper hardening of the concrete in accordance with the requirements specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 11 00 – Concrete Formwork

B. Section 03 30 00 – Cast-In-Place Concrete

C. Section 03 35 00 – Concrete Finishes

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ACI 301 – Specifications for Structural Concrete

2. ACI 304 – Guide for Measuring, Mixing, Transporting, and Placing Concrete

3. ACI 305.1 – Specification for Hot Weather Concreting

4. ACI 306.1 – Standard Specification for Cold Weather Concreting

5. ACI 308.1 – Specification for Curing Concrete

6. ASTM C171 – Standard Specifications for Sheet Materials for Curing Concrete

7. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

8. ASTM C1315 – Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Proposed procedures for protection of concrete under wet weather placement conditions.

2. Proposed normal procedures for protection and curing of concrete.

3. Proposed special procedures for protection and curing of concrete under hot and cold weather conditions.

4. Proposed method of measuring concrete surface temperature changes.

5. Manufacturer's literature and material certification for proposed curing compounds.

PART 2 – PRODUCTS

2.01 LIQUID MEMBRANE-FORMING CURING COMPOUND

A. Clear curing and sealing compound shall be a clear styrene acrylate type complying with ASTM C 1315, Type 1, Class A with a minimum solids content of 30%. Moisture loss shall not be greater than 0.40 kg/m2 when applied at manufacturer’s recommended volume for square feet of area. Manufacturer’s certification is required. Acceptable products are Super Diamond Clear VOX by the Euclid Chemical Company.

B. Where specifically approved by Engineer, on slabs to receive subsequent applied finishes, compound shall conform to ASTM C 309. Acceptable products are “Kurez DR VOX” or “Kurez W VOX” by the Euclid Chemical Company. Install in strict accordance with manufacturer’s requirements.

2.02 EVAPORATION REDUCER

A. Evaporation reducer shall be "MasterKure ER 50” by Master Builders Solutions, or "Euco-Bar" by Euclid Chemical Company.

PART 3 – EXECUTION

3.01 PROTECTION AND CURING

A. All freshly placed concrete shall be protected from the elements, flowing water and from defacement of any nature during construction operations.

B. As soon as the concrete has been placed and horizontal top surfaces have received their required finish, provisions shall be made for maintaining the concrete in a moist condition for at least a 7-day period thereafter, except for high early strength concrete, for which the period shall be at least the first three days after placement. Horizontal surfaces shall be kept covered, and intermittent, and localized drying will not be permitted.

C. Walls that will be exposed on one side with either fluid or earth backfill on the opposite side shall be continuously wet cured for a minimum of seven days. Use of a curing compound will not be acceptable for applications of this type.

D. The Contractor shall use one of the following methods to ensure that the concrete remains in a moist condition for the minimum period stated above.

1. Ponding or continuous fogging or sprinkling.

2. Application of mats or fabric kept continuously wet.

3. Continuous application of steam (under 150°F).

4. Application of sheet materials conforming to ASTM C171.

5. If approved by the Engineer, application of a curing compound in accordance with Article 3.04.

E. The Contractor shall keep absorbent wood forms wet until they are removed. After form removal, the concrete shall be cured by one of the methods in paragraph D.

F. Any of the curing procedures used in Paragraph 3.01-D may be replaced by one of the other curing procedures listed in Paragraph 3.01-D after the concrete is one-day old. However, the concrete surface shall not be permitted to become dry at any time.

3.02 CURING CONCRETE UNDER COLD WEATHER CONDITIONS

A. Suitable means shall be provided for a minimum of 72 hours after placing concrete to maintain it at or above the minimum as placed temperatures specified in Section 03 30 00 – Cast-In-Place Concrete, for concrete work in cold weather. During the 72-hour period, the concrete surface shall not be exposed to air more than 20°F above the minimum as placed temperatures.

B. Stripping time for forms and supports shall be increased as necessary to allow for retardation in concrete strength caused by colder temperatures. This retardation is magnified when using concrete made with blended cements or containing fly ash or slag cement. Therefore, curing times and stripping times shall be further increased as necessary when using these types of concrete.

C. The methods of protecting the concrete shall be approved by the Engineer and shall be such as will prevent local drying. Equipment and materials approved for this purpose shall be on the site in sufficient quantity before the work begins. The Contractor shall assist the Engineer by

providing holes in the forms and the concrete in which thermometers can be placed to determine the adequacy of heating and protection. All such thermometers shall be furnished by the Contractor in quantity and type which the Engineer directs.

D. Curing procedures during cold weather conditions shall conform to the requirements of ACI 306.

3.03 CURING CONCRETE UNDER HOT WEATHER CONDITIONS

A. When air temperatures exceed 85°F, the Contractor shall take extra care in placing and finishing techniques to avoid formation of cold joints and plastic shrinkage cracking. If ordered by the Engineer, temporary sunshades and/or windbreakers shall be erected to guard against such developments, including generous use of wet burlap coverings and fog sprays to prevent drying out of the exposed concrete surfaces.

B. Immediately after screeding, horizontal surfaces shall receive an application of evaporation reducer. Apply in accordance with manufacturer's instructions. Final finish work shall begin as soon as the mix has stiffened sufficiently to support the workmen.

C. Curing and protection of the concrete shall begin immediately after completion of the finishing operation. Continuous moist-curing consisting of method 1 or 2 listed in paragraph 3.01D is mandatory for at least the first 24 hours. Method 2 may be used only if the finished surface is not marred or blemished during contact with the coverings.

D. At the end of the initial 24-hour period, curing and protection of the concrete shall continue for at least six (6) additional days using one of the methods listed in paragraph 3.01D.

E. Curing procedures during hot weather conditions shall conform to the requirements of ACI 305.

3.04 USE OF CURING COMPOUND

A. Curing compound shall be used only where specifically approved by the Engineer. Curing compound shall never be used for curing exposed walls with fluid or earth backfill on the opposite side. A continuous wet cure for a minimum of seven days is required for these applications. Curing compound shall not be used on surfaces exposed to water in potable water storage tanks and treatment plants unless curing compound is certified in accordance with ANSI/NSF Standard 61.

B. When permitted, the curing compound shall maintain the concrete in a moist condition for the required time, and the subsequent appearance of the concrete surface shall not be affected.

C. The compound shall be applied in strict accordance with the manufacturer's recommendations after water sheen has disappeared from the concrete surface and after finishing operations. Coverage rates for the curing and sealing compound shall be in strict accordance with manufacturer’s requirements for the specific type of finish required. For rough surfaces, apply in two directions at right angles to each other.

END OF SECTION

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SECTION 03 60 00

GROUT

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Furnish all materials, labor, and equipment required to provide all grout used in concrete work and as bearing surfaces for base plates, in accordance with the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Requirements of related work are included in Division 01 and Division 02 of these Specifications.

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. CRD-C 621 – Corps of Engineers Specification for Non-shrink Grout

2. ASTM C 33 – Standard Specification for Concrete Aggregates

3. ASTM C 109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inch or 50 mm cube Specimens)

4. ASTM C 531 – Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts and Monolithic Surfacings

5. ASTM C 579 – Test Method for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfacings

6. ASTM C 827 – Standard Test Method for Early Volume Change of Cementitious Mixtures

7. ASTM C 1107 – Standard Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink)

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Certified test results verifying the compressive strength and shrinkage and expansion requirements specified herein.

2. Manufacturer's literature containing instructions and recommendations on the mixing, handling, placement, and appropriate uses for each type of grout used in the work.

1.05 QUALITY ASSURANCE

A. Field Tests

1. Compression test specimens will be taken during construction from the first placement of each type of grout and at intervals thereafter as selected by the Engineer to ensure continued compliance with these Specifications. The specimens will be made by the Engineer or its representative.

a. Compression tests and fabrication of specimens for cement grout and non-shrink grout will be performed as specified in ASTM C 109 at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at seven days, 28 days, and any additional times as appropriate.

b. Compression tests and fabrication of specimens for epoxy grout will be performed as specified in ASTM C 579, Method B, at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at seven days and any other time as appropriate.

2. The cost of all laboratory tests on grout will be borne by the Owner, but the Contractor shall assist the Engineer in obtaining specimens for testing. The Contractor shall be charged for the cost of any additional tests and investigation on work performed which does not meet the specifications. The Contractor shall supply all materials necessary for fabricating the test specimens, at no additional cost to the Owner.

3. All grout, already placed, which fails to meet the requirements of these Specifications, is subject to removal and replacement at no additional cost to the Owner.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Cement Grout

1. Cement grout shall be composed of Portland Cement and sand in the proportion specified in the Contract Documents and the minimum amount of water necessary to obtain the desired consistency. If no proportion is indicated, cement grout shall consist of one-part Portland Cement to three parts sand. Water amount shall be as required to achieve desired consistency without compromising strength requirements. White Portland Cement shall be mixed with the Portland Cement as required to match color of adjacent concrete.

2. The minimum compressive strength at 28 days shall be 4000 psi.

3. For beds thicker than 1-1/2 inch and/or where free passage of grout will not be obstructed by coarse aggregate, 1-1/2 parts of coarse aggregate having a top size of 3/8 inch should be added. This stipulation does not apply for grout being swept in by a mechanism. These applications shall use a plain cement grout without coarse aggregate regardless of bed thickness.

4. Sand shall conform to the requirements of ASTM C33.

B. Non-Shrink Grout

1. Non-shrink grout shall conform to CRD-C 621 and ASTM C 1107, Grade B or C when tested at a max. fluid consistency of 30 seconds per CDC 611/ASTM C939 at temperature extremes of 45°F and 90°F and an extended working time of 15 minutes. Grout shall have a min. 28-day strength of 7,000 psi. Non-shrink grout shall be, "Euco N-S" by the Euclid Chemical Company, "Sikagrout 212" by Sika Corporation, “Conspec 100 Non-Shrink Non-Metallic Grout” by Conspec, “MasterFlow 928” by Master Builders Solutions.

C. Epoxy Grout

1. Epoxy grout shall be "Sikadur 32 Hi-Mod" by Sika Corporation, "Duralcrete LV" by Tamms Industries, or "Euco #452 Series" by Euclid Chemical, “MasterEmaco ADH 1090 RS” by Master Builders Solutions.

2. Epoxy grout shall be modified as required for each application with aggregate per manufacturer's instructions.

D. Epoxy Base Plate Grout

1. Epoxy base plate grout shall be “Sikadur 42, Grout-Pak” by Sika Corporation, or “MasterFlow 648” by Master Builders Solutions.

2.02 CURING MATERIALS

A. Curing materials shall be as specified in Section 03 39 00 – Concrete Curing for cement grout and as recommended by the manufacturer for prepackaged grouts.

PART 3 – EXECUTION

3.01 GENERAL

A. The different types of grout shall be used for the applications stated below unless noted otherwise in the Contract Documents. Where grout is called for in the Contract Documents which does not fall under any of the applications stated below, non-shrink grout shall be used unless another type is specifically referenced.

1. Cement grout shall be used for grout toppings and for patching of fresh concrete.

2. Non-shrink grout shall be used for grouting beneath base plates of structural metal framing.

3. Epoxy grout shall be used for bonding new concrete to hardened concrete.

4. Epoxy base plate grout shall be used for precision seating of base plates including base plates for all equipment such as engines, mixers, pumps, vibratory and heavy impact machinery, etc.

B. New concrete surfaces to receive cement grout shall be as specified in Section 03 35 00 – Concrete Finishes, and shall be cleaned of all dirt, grease, and oil-like films. Existing concrete surfaces shall likewise be cleaned of all similar contamination and debris, including chipping, or roughening the surface if a laitance or poor concrete is evident. The finish of the grout surface shall match that of the adjacent concrete. Curing and protection of cement grout shall be as specified in Section 03 39 00 – Concrete Curing.

C. All mixing, surface preparation, handling, placing, consolidation, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.

D. The Contractor, through the manufacturer of a non-shrink grout and epoxy grout, shall provide on-site technical assistance upon request, at no additional cost to the Owner.

3.02 CONSISTENCY

A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the application. Dry pack consistency is such that the grout is plastic and moldable but will not flow.

3.03 MEASUREMENT OF INGREDIENTS

A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurement shall not be allowed.

B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

3.04 GROUT INSTALLATION

A. Grout shall be placed quickly and continuously, shall completely fill the space to be grouted and be thoroughly compacted and free of air pockets. The grout may be poured in place, pressure grouted by gravity, or pumped. The use of pneumatic pressure or dry-packed grouting requires approval of the Engineer. For grouting beneath base plates, grout shall be placed from one side only and allowed to flow across to the open side to avoid air-entrapment.

END OF SECTION

SECTION 05 05 13

GALVANIZING

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Where galvanizing is called for in the Contract Documents, the galvanizing shall be performed in accordance with the provisions of this Section unless otherwise noted.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Further requirements for galvanizing specific items may be included in other Sections of the Specifications. See section for the specific item in question.

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. New York State Building Code

2. ASTM A123 – Standard Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip

3. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

4. ASTM A653 – Standard Specification for Steel Sheet, Zinc Coated (Galvanized), or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

5. ASTM A924 – Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

6. ASTM A780 – Standard Practice of Repair of Damaged Hot-Dip Galvanized Coatings

7. ASTM F2329 – Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Certification that the item(s) are galvanized in accordance with the applicable ASTM standards specified herein. This certification may be included as part of any material certification that may be required by other Sections of the Specifications.

PART 2 – PRODUCTS

2.01 GALVANIC COATING

A. Material composition of the galvanic coating shall be in accordance with the applicable ASTM standards specified herein.

PART 3 – EXECUTION

3.01 FABRICATED PRODUCTS

A. Products fabricated from rolled, pressed, and forged steel shapes, plates, bars, and strips, 1/8 inch thick and heavier which are to be galvanized shall be galvanized in accordance with ASTM A123. Products shall be fabricated into the largest unit which is practicable to galvanize before the galvanizing is done. Fabrication shall include all operations necessary to complete the unit such as shearing, cutting, punching, forming, drilling, milling, bending, and welding. Components of bolted or riveted assemblies shall be galvanized separately before assembly. When it is necessary to straighten any sections after galvanizing, such work shall be performed without damage to the zinc coating. The galvanizer shall be a member of American Galvanizers Association.

B. Components with partial surface finishes shall be commercial blast cleaned prior to pickling.

C. Sampling and testing of each lot shall be performed prior to shipment from the galvanizer's facility per ASTM A123.

3.02 HARDWARE

A. Iron and steel hardware which is to be galvanized shall be galvanized in accordance with ASTM A153 and ASTM F2329.

3.03 ASSEMBLED PRODUCTS

A. Assembled steel products which are to be galvanized shall be galvanized in accordance with ASTM A123. All edges of tightly contacting surfaces shall be completely sealed by welding before galvanizing.

B. Assemblies shall be provided with vent and drain holes as required by the fabricator. Vent and drain hole sizes and locations shall be included in the structural steel shop drawings required in Section 05 12 00 – Structural Steel for approval. All vent and drain holes shall be plugged and finished to be flush with and blend in with the surrounding surface. Where water intrusion can

occur, the plug shall be carefully melted into the surrounding zinc coating using an appropriate fluxing agent.

3.04 METAL DECK

A. Unless noted otherwise, metal deck shall be galvanized in accordance with ASTM A653 G60 minimum. In moist environments or as indicated on the Contract Drawings, galvanizing shall meet the requirements of ASTM A653 G90.

B. Galvanized metal deck shall meet the requirements of ASTM A924.

3.05 REPAIR OF GALVANIZING

A. Galvanized surfaces that are abraded or damaged at any time after the application of zinc coating shall be repaired by thoroughly wire brushing the damaged areas and removing all loose and cracked coating, after which the cleaned areas shall be painted with 2 coats of zinc rich paint meeting the requirements of Federal Specification DOD-P-21035A and shall be thoroughly mixed prior to application. Zinc rich paint shall not be tinted. The total thickness of the 2 coats shall not be less than 6 mils. In lieu of repairing by painting with zinc rich paint, other methods of repairing galvanized surfaces in accordance with ASTM A780 may be used provided the proposed method is acceptable to the Engineer.

END OF SECTION

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SECTION 05 05 23

METAL FASTENING

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Furnish all materials, labor, and equipment required to provide all metal welds and fasteners not otherwise specified, in accordance with the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 05 10 00 – Metal Materials

B. Section 05 05 13 – Galvanizing

C. Section 05 12 00 – Structural Steel

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. New York State Building Code

2. AC 193 – Acceptance Criteria for Mechanical Anchors in Concrete Elements

3. AC 308 – Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements

4. ACI 318 – Building Code Requirements for Structural Concrete

5. ACI 355.2 – Qualifications of Post-Installed Mechanical Anchors in Concrete

6. ACI 355.4 – Qualifications of Post-Installed Adhesive Anchors in Concrete

7. AISC – RCSC Specification for Structural Joints Using High Strength Bolts

8. AISC – Code of Standard Practice

9. AWS D1.1 – Structural Welding Code – Steel

10. AWS D1.2 – Structural Welding Code – Aluminum

11. AWS D1.6 – Structural Welding Code – Stainless Steel

12. Aluminum Association – Specifications for Aluminum Structures

13. ASTM A572/A572M-94C – Standard Specification for High Strength Low-Alloy Columbium-Vanadium Structural Steel Grade 50

14. ASTM A36 – Standard Specification for Carbon Structural Steel

15. ASTM A489 – Standard Specification for Eyebolts

16. ASTM A563 – Standard Specifications for Carbon and Alloy Steel Nuts

17. ASTM D1785 – Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe

18. ASTM E3121 – Standard Test Methods for Field Testing of Anchors in Concrete or Masonry

19. ASTM F436 – Standard Specification for Hardened Steel Washers

20. ASTM F467 – Standard Specification for Nonferrous Nuts for General Use

21. ASTM F593 – Standard Specification for Stainless Steel Bolts; Hex Cap Screws, and Studs

22. ASTM F594 – Standard Specification for Stainless Steel Nuts

23. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

24. ASTM F3125 – Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength, Inch and Metric Dimension

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Shop Drawings providing the fastener's manufacturer and type and certification of the fastener's material and capacity.

2. Anchor design calculations sealed by a Professional Engineer currently registered in the State or Commonwealth in which the project is located. Only required if design not shown on Contract Drawings.

3. A current Evaluation Report shall be submitted for all anchors that will be considered for use on this project.

4. Manufacturer’s installation instructions.

5. Copy of valid certification for each person who is to perform field welding.

6. Certified weld inspection reports, when required.

7. Welding procedures.

8. Installer qualifications.

9. Certification of Installer Training.

10. Inspection Reports.

11. Results of Anchor Proof Testing.

12. Manufacturer's Literature for Resistance of Adhesive to Appropriate Chemical Exposure, where deemed necessary.

1.05 QUALITY ASSURANCE

A. Fasteners not manufactured in the United States shall be tested and certification provided with respect to specified quality and strength standards. Certifications of origin shall be submitted for all U.S. fasteners supplied on the project.

B. Evaluation Report: A current Evaluation Report from an independent testing and evaluation agency (ITEA) shall be submitted for all anchors that will be used on this project. The ITEA producing the evaluation report shall be accredited in accordance with the requirements for ITEA's in ACI 355.2 (for mechanical anchors) or 355.4 (for adhesive anchors). Acceptable ITEA's include but are not necessarily limited to the International Code Council Evaluation Service (ICC-ES) and the International Association of Plumbing and Mechanical Officials Uniform Evaluation Service (IAPMO-UES).

C. Installer Qualifications: All concrete anchors shall be installed by an Installer with at least three years of experience performing similar installations. Concrete adhesive anchor installers for anchor installations in horizontal to vertically overhead applications shall be certified as an Adhesive Anchor Installer in accordance with ACI-CRSI Adhesive Anchor Installation Certification Program.

D. Installer Training: For concrete anchors, conduct a thorough training with the manufacturer or the manufacturer's representative for the Installer on the project. Training shall consist of a review of the complete installation process to include but not be limited to the following:

1. Hole drilling procedure.

2. Hole preparation and cleaning technique.

3. Adhesive injection technique and dispenser training/maintenance.

4. Concrete adhesive anchor preparation and installation.

5. Proof loading/torquing.

6. Provide a list of names of all installers who are trained by the Manufacturer's Field Representative on this jobsite prior to installation of products. Record must include the installer name, date of training, products included in the training and trainer name and contact information.

7. Provide a copy of the current ACI/CRSI "Adhesive Anchor Installer" certification cards for all installers who will be installing adhesive anchors in the horizontal to vertically overhead orientation.

E. All steel welding shall be performed by welders certified in accordance with AWS D1.1. All aluminum welding shall be performed by welders certified in accordance with AWS D1.2. All stainless-steel welding shall be performed by welders certified in accordance with AWS D1.6. Certifications of field welders shall be submitted prior to performing any field welds.

F. Welds and high strength bolts used in connections of structural steel will be visually inspected in accordance with Article 3.04.

G. The Owner may engage an independent testing agency to perform testing of welded connections and to prepare test reports in accordance with AWS. Inadequate welds shall be corrected or redone and retested to the satisfaction of the Engineer and/or an acceptable independent testing laboratory, at no additional cost to the Owner.

H. Provide a welding procedure for each type and thickness of weld. For welds that are not prequalified, include a Performance Qualification Report. The welding procedure shall be given to each welder performing the weld. The welding procedure shall follow the format in Annex E of AWS D1.1 with relevant information presented.

I. Special inspections for concrete adhesive anchors shall be conducted in accordance with the manufacturer's instructions and Section 01 45 33 – Special Inspections. Downward installations require periodic inspection and horizontal and overhead installations require continuous inspection.

PART 2 – PRODUCTS

2.01 ANCHOR RODS

A. Anchor rods shall conform to ASTM F1554 Grade 55 except where stainless steel or other approved anchor rods are shown on the Drawings or stated herein. Anchor rods shall have hexagonal heads and shall be supplied with hexagonal nuts meeting the requirements of ASTM A563 Grade A. Washers shall meet the requirements of ASTM A436.

B. All anchors into concrete shall be cast-in-place anchors unless specifically referenced otherwise on Drawings.

C. Where anchor rods are used to anchor galvanized steel or are otherwise specified to be galvanized, anchor rods and nuts shall be hot dipped galvanized in accordance with ASTM F1554.

D. Where pipe sleeves around anchor rods are shown on the Drawings, pipe sleeves shall be cut from Schedule 40 PVC plastic piping meeting the requirements of ASTM D1785.

2.02 HIGH STRENGTH BOLTS

A. High strength bolts and associated nuts and washers shall be in accordance with ASTM F3125, Grade A325 Type 1 or Grade F1852 Type 1. Bolts, nuts, and washers shall meet the requirements of RCSC "Specification for Structural Joints Using High Strength Bolts".

B. Where high strength bolts are used to connect galvanized steel or are otherwise specified to be galvanized, bolts, nuts, and washers shall be hot dipped galvanized in accordance with ASTM A325.

2.03 STAINLESS STEEL BOLTS

A. Stainless steel bolts shall conform to ASTM F-593 for alloy groups 1 and 2, Condition CW1, or ASTM F-3125. All underwater fasteners, fasteners in confined areas containing fluid, and fasteners in corrosive environments shall be Type 316 stainless steel unless noted otherwise. Fasteners for aluminum and stainless-steel members not subject to the above conditions shall be Type 304 stainless steel unless otherwise noted.

B. Stainless steel bolts shall have hexagonal heads with a raised letter or symbol on the bolts indicating the manufacturer and shall be supplied with hexagonal nuts meeting the requirements of ASTM F594. Nuts, washers, and lock washers shall be of the same alloy as the bolts.

2.04 CONCRETE ANCHORS

A. General

1. Where concrete anchors are called for on the Drawings, one of the types listed below shall be used; except, where one of the types listed below is specifically called for on the Drawings, only that type shall be used. If no specific type is indicated on the Drawings, the concrete anchor shall be a cast-in-place anchor. The determination of anchors equivalent to those listed below shall be based on test data performed by an approved independent testing laboratory. Two types of anchors shall be used:

a. Mechanical anchors include any of the following anchors:

1) Expansion anchors shall be mechanical anchors of the wedge, sleeve, or drop-in type that are set by expanding against the sides of the drilled hole.

2) Screw anchors are mechanical anchors that derive tensile holding strength by the mechanical interlock provided by threads cutting into the concrete during installation. Screw anchors shall be one-piece, heavy duty screw anchors with a finished head.

b. Adhesive anchors shall consist of threaded rods or bolts anchored with an adhesive system into hardened concrete. Adhesive anchors shall be two-part injection type using the manufacturer's static mixing nozzle and shall be supplied as an entire system.

2. Adhesive anchors shall conform to the requirements of ACI 355.4 or alternately to AC 308. Mechanical anchors shall conform to the requirements of ACI 355.2 or alternately to AC 193. Anchors in Seismic Design Categories C through F shall conform to the International Building Code and ACI 318 Appendix D requirements as applicable, including seismic test requirements.

3. Fire Resistance: All anchors installed within fire resistant construction shall either be enclosed in a fire-resistant envelope, be protected by approved fire-resistive materials, be used to resist wind and earthquake loads only, or anchor non-structural elements.

4. Engineer's approval is required for use of concrete anchors in locations other than those shown on the Drawings.

B. Wedge Anchors:

a. Do not use when subjected to vibration.

b. Do not use in exterior locations or locations subjected to freezing.

c. Do not use in submerged, intermittently submerged, or buried locations.

d. Suitable for use in overhead applications.

C. Screw Anchors:

a. Do not use when subjected to vibration.

b. Do not use in exterior locations or locations subjected to freezing.

c. Do not use in submerged, intermittently submerged, or buried locations.

d. Do not use in overhead applications.

D. Sleeve Anchors:

a. Do not use when subjected to vibration.

b. Do not use in exterior locations or locations subjected to freezing.

c. Do not use in submerged, intermittently submerged, or buried locations.

d. Suitable for use in overhead applications.

E. Undercut Anchors:

a. Suitable for use where subjected to vibration.

b. Do not use in exterior locations or locations subjected to freezing.

c. Do not use in submerged, intermittently submerged, or buried locations.

d. Suitable for use in overhead applications.

F. Adhesive Anchors in Concrete:

a. Suitable for use where subjected to vibration.

b. Suitable for use in exterior locations or locations subjected to freezing.

c. Suitable for use in submerged, intermittently submerged, or buried locations.

d. Do not use in overhead applications, unless otherwise shown or approved by Engineer.

e. Suitable for use in chemical areas provided manufacturer's literature confirms appropriate chemical resistance.

f. Do not use for pipe hangers, unless otherwise shown or approved by Engineer.

G. Adhesive Anchors in Masonry

a. Suitable for use where subjected to vibration.

b. Suitable for use in exterior locations or locations subjected to freezing.

c. Do not use for pipe hangers, unless otherwise shown or approved by Engineer.

d. Suitable for use in precast hollow core planks.

H. Concrete Anchor Design:

1. Basis of design shall include the following design parameters:

a. Cracked concrete conditions.

b. Dry or water saturated installation conditions.

c. Base material temperature between 40- and 104-degrees Fahrenheit.

d. Installation with hammer drill or hollow-drill bit system drilling methods.

e. Installation not prior to 21-day minimum age of concrete.

2. An anchor design consists of specifying anchor size, quantity, spacing, edge distance and embedment to resist all applicable loads. Where an anchor design is indicated on the Drawings, the anchors shall be installed to the prescribed size, spacing, embedment depth, and edge distance. If all parts of an anchor design are provided on the Drawings except embedment depth, the Contractor shall provide the embedment depth as indicated in Paragraph B.3 unless otherwise directed by the Engineer. Where an anchor design is not indicated on the Drawings, the Contractor shall provide the anchor design per the requirements listed below.

a. The Contractor shall submit design with signed and sealed calculations and drawings performed by an Engineer currently registered in the State or Commonwealth in which the project is located. Anchors shall be of a type recommended by the anchor manufacturer for use in cracked concrete and shall be designed by the Contractor in accordance with ACI 318, Chapter 17.

b. Embedment Depth

1) Minimum anchor embedment shall be as indicated on the Drawings unless anchor design is stipulated to be by Contractor or equipment provider. In these cases, embedment depth shall be determined by the Contractor's design. Although all manufacturers listed are permitted, the embedment depth indicated on the Drawings is based on "Hilti HIT-RE 500 V3 by Hilti ESR 3814 issued 3/2021. If the contractor submits one of the other concrete adhesive anchors listed, the Engineer shall evaluate the required embedment and the Contractor shall provide the required embedment depth stipulated by the Engineer specific to the approved dowel adhesive.

2) Where the embedment depth is not shown on the Drawings, concrete anchors shall be embedded no less than the manufacturer's standard embedment (expansion or mechanical anchors) or to provide a minimum allowable bond strength equal to the allowable yield capacity of the rod according to the manufacturer (adhesive anchors).

3) The embedment depth shall be determined using the actual concrete compressive strength, a cracked concrete state, maximum long-term temperature of 110 degrees F, and maximum short-term temperature of 140

degrees F. In no case shall the embedment depth be less than the minimum or more than the maximum stated in the manufacturer's literature.

I. Anchors:

1. Mechanical Anchors:

a. Wedge Anchors: Wedge anchors shall be "Kwik Bolt TZ" by Hilti, Inc., "Strong-Bolt 2" by Simpson Strong-Tie Co. or "Power-Stud+SD1" or "Power-Stud+ SD-2" by DeWalt.

b. Screw Anchors: Screw anchors shall be "KWIK HUS-EZ", "KWIK HUS-EZ-I", or "KWIK HUS-EZ CRC" by Hilti, Inc., "Titen HD" or "Stainless Steel Titen HD" by Simpson Strong-Tie Co., or "Screw-Bolt+" by DeWalt.

c. Sleeve Anchors: Sleeve anchors shall be "HSL-3 Heavy Duty Sleeve Anchor" by Hilti, Inc. or "Power-Bolt +" by DeWalt.

d. Shallow Embedment Internally Threaded Insert (3/4" max embedment): "Mini-Undercut +Anchor" by DeWalt, "HDI-P-TZ" by Hilti, Inc. or approved equal.

e. Concrete Undercut Anchors: Concrete undercut anchors shall be "HDA Undercut Anchors" by Hilti, Inc, "DUC Ductile Undercut Anchor", by USP Structural Connectors, or approved equal.

f. Mechanical anchor systems shall comply with ACI 355.2 or alternatively the latest revision of AC 193 and shall have a valid evaluation report in accordance with the applicable building code.

2. Adhesive Anchors:

a. Adhesive anchors shall be "HIT-RE 500 V3 Adhesive Anchoring System" by Hilti, Inc., "SET-3G Epoxy Adhesive Anchors" by Simpson Strong-Tie Co., or "Pure 110+ Epoxy Adhesive Anchor System" by DeWalt.

b. Adhesive anchor systems shall be IBC compliant and capable of resisting short term wind and seismic loads (Seismic Design Categories A through F) as well as long term and short term sustained static loads in both cracked and uncracked concrete in all Seismic Design Categories. Adhesive anchor systems shall comply with ACI 355.4 or alternatively the latest revision of AC308 and shall have a valid evaluation report in accordance with the applicable building code. **No or equal products will be considered unless prequalified and approved by the Engineer and Owner**.

J. Concrete Anchor Materials:

1. Concrete anchors used to anchor structural steel shall be a threaded steel rod per manufacturer's recommendations for proposed adhesive system but shall not have a yield strength (fy) less than 58 ksi nor an ultimate strength (fu) less than 72.5 ksi, unless noted otherwise. Where steel to be anchored is galvanized, concrete anchors shall also be galvanized unless otherwise indicated on the Drawings.

2. Concrete anchors used to anchor aluminum, FRP, or stainless steel shall be manufactured from stainless steel unless noted otherwise. All underwater fasteners, fasteners in confined areas containing fluid, and fasteners in corrosive environments shall be Type 316 stainless steel unless noted otherwise. Fasteners for aluminum and stainless-steel members not subject to the above conditions shall be Type 304 stainless steel unless otherwise noted.

3. Nuts, washers, lock washers and other hardware shall be of a material to match the anchors.

2.05 MASONRY ANCHORS

A. Anchors for fastening to solid or grout-filled masonry shall be adhesive anchors consisting of threaded rods or bolts anchored with an adhesive system. The adhesive system shall be "HIT HY-270 System" as manufactured by Hilti, Inc., "AC100+ Acrylic Adhesive" by DeWalt, or "SET-XP" as manufactured by Simpson Strong-Tie Co.

B. Anchors for fastening to hollow masonry or brick shall be adhesive anchors consisting of threaded rods or bolts anchored with an adhesive system dispensed into a screen tube inserted into the masonry. The adhesive system shall use a two-component adhesive mix and shall inject into the screen tube with a static mixing nozzle. Thoroughly clean drill holes of all debris and drill dust prior to installation of adhesive and anchor. Contractor shall follow manufacturer's installation instructions. The adhesive system shall be "HIT HY-270 System" as manufactured by Hilti, Inc., "AC100+ Acrylic Adhesive" by DeWalt, or "SET-XP" as manufactured by Simpson Strong-Tie Co.

C. Masonry anchors used to anchor steel shall be a threaded steel rod per manufacturer's recommendations for proposed adhesive system but shall not have a yield strength (fy) less than 58 ksi nor an ultimate strength (fu) less than 72.5 ksi, unless noted otherwise. Where steel to be anchored is galvanized, masonry anchors shall also be galvanized.

D. Masonry anchors used to anchor aluminum, FRP, or stainless steel shall be manufactured from stainless steel unless noted otherwise. All underwater fasteners, fasteners in confined areas containing fluid, and fasteners in corrosive environments shall be Type 316 stainless steel unless noted otherwise. Fasteners for aluminum and stainless-steel members not subject to the above conditions shall be Type 304 stainless steel unless otherwise noted.

E. Nuts, washers, lock washers and other hardware shall be of a material to match the anchors.

F. Although all manufacturers listed are permitted, the masonry anchor design is based on "SET-XP by Simpson Strong-Tie ER 265 Revised 1-31-2017. If the contractor submits one of the other

concrete adhesive anchors listed, the Engineer shall evaluate the proposed product and the Contractor shall provide the conditions stipulated by the Engineer specific to the approved adhesive anchor.

2.06 WELDS

A. Electrodes for welding structural steel and all ferrous steel shall comply with AWS Code, using E70 series electrodes for shielded metal arc welding (SMAW), or F7 series electrodes for submerged arc welding (SAW).

B. Electrodes for welding aluminum shall comply with the Aluminum Association Specifications and AWS D1.2.

C. Electrodes for welding stainless steel and other metals shall comply with AWS D1.6.

2.07 WELDED STUD CONNECTORS

A. Welded stud connectors shall conform to the requirements of AWS D1.1 Type C.

2.08 EYEBOLTS

A. Eyebolts shall conform to ASTM A489 unless noted otherwise.

2.09 HASTELLOY FASTENERS

A. Hastelloy fasteners and nuts shall be constructed of Hastelloy C-276. Hastelloy fasteners shall be used for fasteners located in chemical areas containing Hydrochloric Acid (Muriatic Acid), Hydrofluosilicic Acid (Fluoride), or Sulfuric Acid.

2.10 TITANIUM FASTENERS

A. Titanium fasteners, washers, and nuts shall conform to ASTM B348, Grade 2. Titanium fasteners shall be used for fasteners located in chemical areas containing Ferric Chloride or Sodium Hypochlorite.

2.11 ANTISEIZE LUBRICANT

A. Antiseize lubricant shall be C5-A Anti-Seize by Loctite Corporation, Molykote P-37 Anti-Seize Paste by Dow Corning, 3M Anti-Seize by 3M, or equal.

PART 3 – EXECUTION

3.01 MEASUREMENTS

A. The Contractor shall verify all dimensions and review the Drawings and shall report any discrepancies to the Engineer for clarification prior to starting fabrication.

3.02 FASTENER INSTALLATION

A. Anchor Rods, Concrete Anchors, and Masonry Anchors

1. Anchor rods shall be installed in accordance with AISC "Code of Standard Practice" by setting in concrete while it is being placed and positioned by means of a rigidly held template. Overhead adhesive anchors, and base plates or elements they are anchoring, shall be shored as required and securely held in place during anchor setting to prevent movement during anchor installation. Movement of anchors during curing is prohibited.

2. The Contractor shall verify that all concrete and masonry anchors have been installed in accordance with the manufacturer's recommendations and that the capacity of the installed anchor meets or exceeds the specified safe holding capacity.

3. Concrete anchors shall not be used in place of anchor rods without Engineer's approval.

4. All stainless-steel threads shall be coated with anti-seize lubricant.

B. High Strength Bolts

1. All bolted connections for structural steel shall use high strength bolts. High strength bolts shall be installed in accordance with RCSC “Specification for Structural Joints Using High Strength Bolts”. All bolted joints shall be Type N, snug-tight, bearing connections in accordance with AISC Specifications unless noted otherwise on the Drawings.

C. Stainless Steel Bolts

1. Where connections indicate the use of stainless-steel bolts, the bolts shall be installed to the snug tight condition. Connections shall include stainless steel washers under both the bolt head and the nut head. Lock washers shall be utilized for all connections and shall be placed under the nut head.

D. Concrete Anchors

1. Concrete at time of anchor installation shall be a minimum age of 21 days, have a minimum compressive strength of 2500 psi, and shall be at least 50 degrees F.

2. Concrete Anchor Testing:

a. At all locations, at least 10 percent of all concrete anchors installed shall be proof tested to 80% of the yield strength of the anchor rod, with a minimum of one tested anchor per anchor group.

b. Contractor shall submit a plan and schedule indicating locations of anchors to be proof tested, load test values and proposed anchor testing procedure (including a

diagram of the testing equipment proposed for use) to the Engineer for review prior to conducting any testing. Proof testing of anchors shall be in accordance with ASTM E3121 for the static tension test. If additional tests are required, inclusion of these tests shall be as stipulated on Contract Drawings.

c. Where Contract Documents indicate anchor design to be the Contractor's responsibility, the Contractor shall submit a plan and schedule indicating locations of anchors to be proof tested and load test values, sealed by a Professional Engineer currently registered in the State or Commonwealth in which the project is located. Documentation shall also be submitted indicating the Contractor's proof testing procedures have been reviewed and the proposed procedures are acceptable. Proof testing procedures shall be in accordance with ASTM E3121.

d. Concrete Anchors shall have no visible indications of displacement or damage during or after the proof test. Concrete cracking in the vicinity of the anchor after loading shall be considered a failure. Anchors exhibiting damage shall be removed and replaced. If more than 5 percent of tested anchors fail, then 100 percent of anchors shall be proof tested.

e. Proof testing of concrete anchors shall be performed by an independent testing laboratory hired directly by the Contractor and approved by the Engineer. The Contractor shall be responsible for costs of all proof testing, including additional testing required due to previously failed tests.

3. All concrete anchors shall be installed in strict conformance with the manufacturer's printed installation instructions. A representative of the manufacturer shall be on site when required by the Engineer.

4. All holes shall be drilled in accordance with the manufacturer's instructions except that cored holes shall not be allowed unless specifically approved by the Engineer. If cored holes are allowed, cored holes shall be roughened in accordance with manufacturer requirements. Thoroughly clean drill holes of all debris, drill dust, and water in accordance with the manufacturer's instructions prior to installation of adhesive and threaded rod unless otherwise recommended by the manufacturer. Degree of hole dampness shall be in strict accordance with manufacturer recommendations. Installation conditions shall be either dry or water saturated. Water filled or submerged holes shall not be permitted unless specifically approved by the Engineer. Injection of adhesive into the hole shall be performed to minimize the formation of air pockets in accordance with the manufacturer's instructions. Wipe rod free from oil that may be present from shipping or handling.

5. All adhesive anchor installations in the horizontal to vertically overhead orientation shall be conducted by a certified Adhesive Anchor Installer as certified by ACI/CSRI per ACI 318-14 17.8.2.2. Current AAI Certificate must be submitted to the Engineer of Record prior to commencement of any adhesive anchor installations**.**

E. Other Bolts

1. All dissimilar metal shall be connected with appropriate fasteners and shall be isolated via an approved dielectric.

2. All stainless-steel bolts shall be coated with anti-seize lubricant.

3.03 WELDING

A. All welding shall comply with AWS Code for procedures, appearance, quality of welds, qualifications of welders and methods used in correcting welded work.

B. Welded stud connectors shall be installed in accordance with AWS D1.1.

C. Welds shown on the Drawings with a field weld symbol shall be field welded. All other welds shall be shop welded unless specifically approved by the Engineer.

3.04 INSPECTION

A. High strength bolting will be visually inspected in accordance with RCSC “Specification for Structural Joints Using High Strength Bolts”. Rejected bolts shall be either replaced or retightened as required.

B. Field welds will be visually inspected in accordance with AWS Codes. Inadequate welds shall be corrected or redone as required in accordance with AWS Codes.

C. Post-installed concrete anchors shall be inspected as required by ACI 318.

3.05 CUTTING OF EMBEDDED REBAR

A. The Contractor shall not cut embedded rebar cast into structural concrete during installation of post-installed fasteners without prior approval of the Engineer.

END OF SECTION

SECTION 05 10 00

METAL MATERIALS

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Metal materials not otherwise specified shall conform to the requirements of this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Materials for fasteners are included in Section 05 05 23 – Metal Fastening.

B. Requirements for specific products made from the materials specified herein are included in other sections of the Specifications. See the section for the specific item in question.

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. ASTM A36 – Standard Specification for Structural Steel

B. ASTM A47 – Standard Specification for Malleable Iron Castings

C. ASTM A48 – Standard Specification for Gray Iron Castings

D. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

E. ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

F. ASTM A276 – Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes

G. ASTM A307 – Standard Specification for Carbon Steel Externally Threaded Standard Fasteners

H. ASTM A446 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) quality

I. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

J. ASTM A501 – Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

K. ASTM A529 – Standard Specification for Structural Steel with 42 000 psi (290 Mpa) Minimum Yield Point (1/2 in. (12.7 mm) Maximum Thickness)

L. ASTM A536 – Standard Specification for Ductile Iron Castings

M. ASTM A570 – Standard Specification for Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality

N. ASTM A572 – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel

O. ASTM A992 – Standard Specification for Structural Steel Shapes

P. ASTM A666 – Standard Specification for Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar for Structural Applications

Q. ASTM A1085 – Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS)

R. ASTM B26 – Standard Specification for Aluminum-Alloy Sand Castings

S. ASTM B85 – Standard Specification for Aluminum-Alloy Die Castings

T. ASTM B108 – Standard Specification for Aluminum-Alloy Permanent Mold Castings

U. ASTM B138 – Standard Specification for Manganese Bronze Rod, Bar, and Shapes

V. ASTM B209 – Standard Specification for Aluminum-Alloy Sheet and Plate

W. ASTM B221 – Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

X. ASTM B308 – Standard Specification for Aluminum-Alloy Standard Structural Shapes, Rolled or Extruded

Y. ASTM B574 – Standard Specification for Nickel-Molybdenum-Chromium Alloy Rod

Z. ASTM F468 - Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use

AA. ASTM F593 – Standard Specification for Stainless Steel Fasteners

1.04 SUBMITTALS

A. Material certifications shall be submitted along with any shop drawings for metal products and fabrications required by other sections of the Specifications.

1.05 QUALITY ASSURANCE

A. Owner may engage the services of a testing agency to test any metal materials for conformance with the material requirements herein. If the material is found to be in conformance with Specifications the cost of testing will be borne by the Owner. If the material does not conform to the Specifications, the cost of testing shall be paid by the Contractor and all materials not in conformance as determined by the Engineer shall be replaced by the Contractor at no additional cost to the Owner. In lieu of replacing materials, the Contractor may request further testing to determine conformance, but any such testing shall be paid for by the Contractor regardless of outcome of such testing.

PART 2 – PRODUCTS

2.01 CARBON AND LOW ALLOY STEEL

A. Material types and ASTM designations shall be as listed below:

Steel W, C, and MC Shapes	A992
Steel HP Shapes	A572 Grade 50
Steel M and S shapes and Angles, Bars, and Plates	A36
Rods	F 1554 Grade 36
Pipe - Structural Use	A53 Grade B
Hollow Structural Sections	A500 Grade C or A1085 Grade A
Cold-Formed Steel Framing	A 653

2.02 STAINLESS STEEL

A. All stainless steel fabrications exposed to underwater service shall be Type 316. All other stainless steel fabrications shall be Type 304, unless noted otherwise.

B. Material types and ASTM designations are listed below:

Plates and Sheets	ASTM A167 or A666 Grade A
Structural Shapes	ASTM A276
Fasteners (Bolts, etc.)	ASTM F593

2.03 ALUMINUM

A. All aluminum shall be alloy 6061-T6, unless otherwise noted or specified herein.

B. Material types and ASTM designations are listed below:

Structural Shapes	ASTM B308
Castings	ASTM B26, B85, or B108
Extruded Bars	ASTM B221 - Alloy 6061
Extruded Rods, Shapes and Tubes	ASTM B221 - Alloy 6063
Plates	ASTM B209 - Alloy 6061
Sheets	ASTM B221 - Alloy 3003

C. All aluminum shall be provided with mill finish unless otherwise noted.

D. Where bolted connections are indicated, aluminum shall be fastened with stainless steel bolts.

2.04 CAST IRON

A. Material types and ASTM designations are listed below:

Gray	ASTM A48 Class 30B
Malleable	ASTM A47
Ductile	ASTM A536 Grade 60-40-18

2.05 BRONZE

A. Material types and ASTM designations are listed below:

Rods, Bars and Sheets	ASTM B138 - Alloy B Soft

2.06 HASTELLOY

A. All Hastelloy shall be Alloy C-276.

2.07 DISSIMILAR METALS

A. Dielectric isolation shall be installed wherever dissimilar metals are connected according to the following table.

	Zinc	Galvanized Steel	Aluminum	Cast Iron	Ductile Iron	Mild Steel/ Carbon Steel	Copper	Brass	Stainless Steel
Zinc			●	●	●	●	●	●	●
Galvanized Steel			●	●	●	●	●	●	●
Aluminum	●	●		●	●	●	●	●	●
Cast Iron	●	●	●				●	●	●
Ductile Iron	●	●	●				●	●	●
Mild Steel/ Carbon Steel	●	●	●				●	●	●
Copper	●	●	●	●	●	●			●
Brass	●	●	●	●	●	●			●
Stainless Steel	●	●	●	●	●	●	●	●	

1. "●" signifies dielectric isolation is required between the two materials noted.
2. Consult Engineer for items not listed in table.

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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SECTION 05 12 00

STRUCTURAL STEEL

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Furnish all equipment, labor, materials, and services required to provide all structural steel work in accordance with the Contract Documents. The term "structural steel" shall include items as defined in the AISC "Code of Standard Practice".

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 05 10 00 – Metal Materials

B. Section 05 05 13 – Galvanizing

C. Section 05 05 23 – Metal Fastening

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the Specifications, all work specified herein shall conform to the applicable requirements of the following documents.

1. New York State Building Code

2. AISC – "Code of Standard Practice"

3. AISC – "Specification for Structural Steel Buildings"

4. AISC – RCSC “Specification for Structural Joints Using High Strength Bolts”

5. AWS – "Structural Welding Code"

6. ASTM A786 – Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

1. Certified Mill Test Reports

2. Affidavit of Compliance with grade specified

3. Shop Drawings which include the following:

a. Layout drawings indicating all structural shapes, sizes, and dimensions.

b. Beam and column schedules.

c. Detailed drawings indicating jointing, anchoring and connection details and vent and drain holes where required.

1.05 QUALITY ASSURANCE

A. Shop inspection may be required by the Owner at his own expense. The Contractor shall give ample notice to the Engineer prior to the beginning of any fabrication work so that inspection may be provided. The Contractor shall furnish all facilities for the inspection of materials and workmanship in the shop, and the inspectors shall be allowed free access to the necessary parts of the work. Inspectors shall have the authority to reject any materials or work which do not meet the requirements of these Specifications. Inspection at the shop is intended as a means of facilitating the work and avoiding errors, but is expressly understood that it will in no way relieve the Contractor from his responsibility for furnishing proper materials or workmanship under this Specification.

B. The erector shall be a qualified installer who participates in the AISC Certification program and is designated an AISC Certified Erector, Category ACSE.

C. The fabricator shall be a qualified fabricator who participates in the AISC Certification program and is designated an AISC Certified Plant, Category STD.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Structural Steel

1. Structural steel for W, C, and MC shapes shall conform to ASTM A992 unless otherwise indicated.

2. Structural steel for HP shapes shall conform to ASTM A572 Grade 50 unless otherwise indicated.

3. Structural steel for S and M shapes and angles and plates shall conform to ASTM A36 unless otherwise indicated.

4. Steel pipe shall be ASTM A53, Grade B.

5. HSS shall be ASTM A500, Grade C or ASTM A1085. All members shall be furnished full length without splices unless otherwise noted or accepted by the Engineer.

6. All unidentified steel will be rejected and shall be removed from the site and replaced by the Contractor, all at the expense of the Contractor.

7. Fasteners for structural steel shall be in accordance with Section 05 05 23 – Metal Fastening.

B. Welds

1. Electrodes for welding shall be in accordance with Section 05 05 23 – Metal Fastening.

PART 3 – EXECUTION

3.01 MEASUREMENT

A. The Contractor shall verify all dimensions and shall make any field measurements necessary and shall be fully responsible for accuracy and layout of work. The Contractor shall review the Drawings and any discrepancies shall be reported to the Engineer for clarification prior to starting fabrication.

3.02 FABRICATION

A. Fabrication shall be in accordance with the AISC "Specification for Structural Steel Buildings and AISC "Code of Standard Practice". Fabrication shall begin only after Shop Drawing approval.

B. Except where otherwise noted on the Drawings or in this Specification, all shop connections shall be welded.

C. All holes in structural steel members required for anchors, anchor rods, bolts, sag rods, vent and drain holes or other members or for attachment of other work shall be provided by the fabricator and detailed on the Shop Drawings.

D. All materials shall be properly worked and match-marked for field assembly.

E. Where galvanizing of structural steel is required, galvanizing shall be done in accordance with Section 05 05 13 – Galvanizing.

F. Checkered floor plate shall meet the requirements of ASTM A786.

3.03 DELIVERY, STORAGE AND HANDLING

A. Structural members shall be loaded in such a manner that they may be transported and unloaded without being over-stressed, deformed or otherwise damaged.

B. Structural steel members and packaged materials shall be protected from corrosion and deterioration. Material shall be stored in a dry area and shall not be placed in direct contact with

the ground. Materials shall not be placed on the structure in a manner that might cause distortion or damage to the members or the supporting structures. The Contractor shall repair or replace damaged materials or structures as directed.

3.04 ERECTION

A. The erection of all structural steel shall conform to the applicable requirements of the AISC "Specification for Structural Steel Buildings" and AISC "Code of Standard Practice". All temporary bracing, guys and bolts as may be necessary to ensure the safety of the structure until the permanent connections have been made shall be provided by the Contractor.

B. Structural members shall be set accurately to the lines and elevations indicated. The various members shall be aligned and adjusted to form a part of a complete frame or structure before permanently fastened.

C. No cutting of structural steel members in the field will be allowed except by the written approval of the Engineer.

D. Bearing surfaces and other surfaces which will be in permanent contact shall be cleaned before assembly.

E. Field welding shall not be permitted unless specifically indicated in the Drawings or approved in writing by the Engineer. All field welding shall comply with Section 05 05 23 – Metal Fastening.

F. All bolted connections shall use high strength bolts in accordance with Section 05 05 23 – Metal Fastening. High strength bolts shall be installed in accordance with RCSC “Specification for Structural Joints Using High Strength Bolts”. Bolts specified or noted on the Drawings to be a tension or slip critical “SC” type connection shall be fully pretensioned with proper preparation of the faying surfaces. All other bolts shall be snug tightened unless otherwise noted on the Drawings.

G. All field connections shall be accurately fitted up before being bolted. Drifting shall be only such as will bring the parts into position and shall not be sufficient to enlarge the holes or to distort the metal. All unfair holes shall be drilled or reamed.

H. Misfits at Bolted Connections

1. Where misfits in erection bolting are encountered, the Engineer shall be immediately notified. The Contractor shall submit a method to remedy the misfit for review by the Engineer. The Engineer will determine whether the remedy is acceptable or if the member must be refabricated.

2. Incorrectly sized or misaligned holes in members shall not be enlarged by burning or by the use of drift pins. The Contractor shall notify the Engineer immediately and shall submit a proposed method of remedy for review by the Engineer.

3. Where misalignment between anchor rods and rod holes in steel members are encountered, the Engineer shall be immediately notified. The Contractor shall submit a method to remedy the misalignment for review by the Engineer.

I. Grouting of Base Plates and Bearing Plates

1. The bottom surface of the plates shall be cleaned of all foreign materials, and concrete or masonry bearing surface shall be cleaned of all foreign materials and roughened to improve bonding.

2. Accurately set all base and bearing plates to designated levels with steel wedges or leveling plates.

3. Baseplates shall be grouted with non-shrink grout to assure full uniform bearing. Grouting shall be done prior to placing loads on the structure. Non-shrink grout shall conform to Section 03 60 00 – Grout.

4. Anchor rods shall be tightened after the supported members have been positioned and plumbed and the non-shrink grout has attained its specified strength.

J. Where finishing is required, assembly shall be completed including bolting and welding of units before start of finishing operations.

3.05 PAINTING

A. Painting shall be performed according to Section 09 90 00 – Painting and the following additional requirements.

1. Concrete Encased Steel: Steel members which will be encased in concrete shall be cleaned but not painted prior to encasement.

2. Contact Surfaces: Contact surfaces such as at field connections, shall be cleaned and primed but not painted.

3. Finished Surfaces: Machine finished surfaces shall be protected against corrosion by a rust-inhibiting coating which is easily removed prior to erection or which has characteristics that make removal unnecessary prior to erection.

4. Surfaces Adjacent to Field Welds: Surfaces within 2 inches of any field weld location shall be free of materials that would prevent proper welding or produce objectionable fumes while welding is being done.

END OF SECTION

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SECTION 07 21 00

BUILDING INSULATION

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Furnish labor, materials, equipment and appliances required for complete execution of Work as shown on Drawings and specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 30 00 – Cast-in-Place Concrete

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of these specifications Work shall conform to applicable requirements of the following documents:

1. ASTM C726 – Insulation Board, Thermal (Mineral Fiber)

2. ASTM C 578 – Specification for Preformed, Block Type Cellular Polystyrene Thermal Insulation

3. ASTM C 665 – Specification for Mineral fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing

1.04 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01 33 00 – Submittal Procedures, submit the following:

1. Manufacturer's literature, specifications, installation instructions, technical data, and general recommendations.

2. Samples of each type of insulation specified.

3. Shop drawing for tapered insulation.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in unopened, undamaged original packaging with bearing the manufacturer's name.

B. Store materials in clean, dry, protected areas. Do not leave materials exposed to the weather or sunlight, except to the extent necessary to perform the work.

C. Protect against ignition.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the requirements, provide products as manufactured by the following:

1. Manufacturers of Extruded Polystyrene Board Insulation

   a. Amoco Foam Products Company

   b. Dow Chemical U.S.A.

   c. UC Industries

2. Manufacturers of Glass Fiber Insulation

   a. CertainTeed Corporation

   b. Manville Corporation

   c. Owens-Corning Fiberglass Corporation

3. Manufacturers of Polyisocyanurate Foam Insulation

   a. RMax.

   b. Atlas Energy Products.

   c. Johns Manville.

4. Manufacturers of Sprayed Polyurethane Foam

   a. Demilec LLC

   b. BASF

   c. NCFI Polyurethanes

   d. Icynene

5. Manufacturers of Sprayed Polyurethane Foam (Gap Sealant)

a. The Dow Company

b. Or approved equal

2.02 MATERIALS

A. Thermal Batt Insulation: Aluminum foil faced, 3-1/2 inch thick R-11 for walls, 6 inch thick R-19 for ceilings or as indicated on the Drawings. Provide batts conforming to ASTM C665 Type-III. Where insulation is exposed to interior spaces provide material with a flame spread of 25 and smoke development of less than 100 and approved for use without a covering.

B. Under Slab and Foundation Wall Insulation: Expanded polystyrene extruded into 2 inch thick boards for under slabs and over foundation waterproofing, or as indicated on Drawings. Provide insulation conforming to the requirements of ASTM C 578, Type IV; with a 5 year aged R-value of 5.

C. Unit Masonry Insulation: Fill ungrouted cells of masonry with foamed in place two component thermal insulation. Insulation shall be a Class A material with an R value of 4.9 per inch. Provide masonry insulation as manufactured by CORE-FILL 500 as manufactured by Tailored Chemical Products, Hickory, NC, or acceptable equal.

D. Cavity Wall Insulation: Extruded polystyrene insulation boards meeting or exceeding the requirements of ASTM C578, Type IV, and with a "K" factor of 0.20 or less when tested in accordance with ASTM C 518. Provide insulation 1-1/2 inches thick unless otherwise shown.

E. Roof Insulation: Provide polyisocyanurate insulation or as shown on Drawings and achieve energy code compliance. Provide a minimum of two staggered layers, unless otherwise indicated. Provide tapered insulation where roof structure does not slope. Roof insulation shall be approved by roofing manufacturer in accordance with the requirements of the roofing warranty. Roof insulation shall meet the requirements of roof manufacturer. Insulation shall have a minimum aged R-value of 5 per inch. Secure insulation as required by the roofing manufacturer to resist wind. Install ½” glass faced gypsum board where insulation is installed over metal deck.

F. Mineral Wool Batt Insulation: Semi-rigid boards for use as fire stop. Materials shall conform to requirements of UL penetration systems. Mineral wool material shall meet the requirements of ASTM E-136.

G. Sprayed Polyurethane Foam: Apply by factory trained or certified installers. Foam blowing agent shall have zero ozone depleting potential, no VOC’s and be formaldehyde free. Foam shall be a closed cell with a 2 lb. density and provide a minimum R value of 5 per inch. Foam shall be Class I product in accordance with ASTM E84. Exposed surfaces shall be sprayed with an approved 15 minute intumescent barrier or approved thermal barrier.

H. Spray-Applied Slag/Rock-Wool-Fiber Insulation: Self-Supported, Spray-Applied Slag/Rock-Wool-Fiber Insulation: ASTM C764, Type I (materials applied with liquid adhesive; suitable for either exposed or enclosed applications), and Type II (materials containing a dry adhesive

activated by water during installation; intended only for enclosed or covered applications). Insulation shall have postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent. Insulation shall have maximum flame-spread and smoke-developed indexes of 5 and 0, respectively, per ASTM E 84 and rated as non-combustible as defined by NFPA 220 when tested in accordance with ASTM E 136. Provide K-13 Cellulose Spray-Applied Insulation manufactured by International Cellulose Corporation, Houston, TX, or acceptable equal.

I. Adhesive and Fasteners: Type compatible with insulation, masonry, concrete, or other substrate and as recommended or produced by the insulation manufacturer.

J. Sealer and Tape: Type recommended by insulation manufacturer and having perm rating and fire resistance characteristics similar to that of the insulation.

K. Gap Sealant: General Purpose Type: single-component polyurethane sealant. Gun-applied and Straw-applied products, Thermal Value R3.5 per inch. Provide GREATSTUFF PRO™ Gaps & Cracks Insulating Foam Sealant as manufactured by The Dow Chemical Company or approved equal. Provide Substrate Cleaner as recommended by foam sealer manufacturer.

PART 3 – EXECUTION

3.01 GENERAL

A. Insulation shall be provided in walls, slabs and roofs and where shown on Drawings.

3.02 INSTALLATION OF INSULATION

A. Install in accordance with the manufacturer's printed installation instructions to provide maximum sound and thermal benefits for material specified. Install to fill or cover voids. Cut neatly to snugly fit angles, corners and irregular areas and carefully wrapped around pipes, conduits, outlets, switches, beams, etc., to maintain continuity of insulation. Avoid gaps or bridges.

B. Foundation and Under-Slab Insulation

1. On vertical surfaces, set units in adhesive applied in accordance with manufacturer's instructions. Stagger vertical joints, except ends over line of expansion joints.

2. On horizontal surfaces, set units level, unless otherwise noted.

C. Cavity Wall Insulation

1. On vertical surfaces of masonry adhere to inner wythe of block.

2. Joints between insulation board units shall coincide with masonry joint reinforcing.

D. Block Insulation: Install foamed in place two component thermal insulation in all ungrouted cells of masonry in exterior walls and interior walls shown on Drawings.

E. Thermal Batt Insulation: Friction fit, with vapor barrier on the warm side, during Winter, of wall between conditioned and unconditioned rooms or spaces. Follow manufacturer's recommendations and instructions.

F. Roofing Insulation: Install roofing insulation in accordance with insulation and roofing manufacturer printed instructions and recommendations.

G. Mineral Wool Batt Insulation: Install insulation in accordance with UL design requirements and in accordance with manufacturer's recommendations.

H. Sprayed Polyurethane Foam: Install in strict accordance with manufacturer’s recommendations. Separate final installation with code approved thermal barrier.

I. Spray-Applied Slag/Rock-Wool-Fiber Insulation: Install in strict accordance with manufacturer’s recommendations.

J. Gap Sealant: Seal all gaps at perimeter of walls and penetrations and openings. Install in strict accordance with manufacturer’s recommendations. Remove excess gap sealant to finish flush with the adjacent materials where visible or required to allow installation of finish materials.

3.03 ADJUSTMENT AND CLEANING

A. Adequately protect Work from damage resulting from subsequent construction operations. Replace damaged or soiled Work.

END OF SECTION

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SECTION 07 90 00

JOINT FILLERS, SEALANTS AND CAULKING

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Furnish labor, materials, equipment and appliances required for the complete execution of Work shown on the Drawings and specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 15 00 – Concrete Accessories

B. Section 03 15 16 – Joints in Concrete

C. Section 08 80 00 – Glass and Glazing

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ASTM C-920 – Elastomeric Joint Sealants

2. ASTM D-1056 – Flexible Cellular Materials – Sponge or Expanded Rubber

3. SWRI – Sealant and Caulking Guide Specification

1.04 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01 33 00 – Submittal Procedures, submit the following:

1. Manufacturers literature and installation instructions. Label each product submitted with Type as indicated in paragraph 2.01 A.

2. Color samples of each type of sealant.

1.05 QUALITY ASSURANCE

A. Applicator shall be a company specializing in the installation of sealants with a minimum of five years of experience.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in unopened labeled packages.

B. Store materials in location protected from freezing or damages.

C. Reject and remove from the site materials within broken or damaged packaging.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Sealants

1. Type 1: Multi-component, non-sag, low-modulus polyurethane rubber sealant meeting ASTM C-920, Type M, Grade NS, Class 25, use NT, M, A, and O. Capable of withstanding 50% in extension or compression such as Sikaflex-2C NS/SL, Sika Corporation, or Sonolastic NP-2, Sonneborn, or DynaTrol II by Pecora Corporation.

2. Type 2: Single component polyurethane sealant meeting ASTM C-920, Type S, Grade NS, Class 25, Use NT, M, A, and O. Capable of withstanding 25% in extension or compression such as Sikaflex 1A by Sika Corporation, DynaTrol 1-XL by Pecora Corporation, or Sonolastic NP-1 by Master Builders Solutions.

3. Type 3: Single component, low-modulus moisture curing silicone meeting ASTM C-920, Type S, Grade NS, Class 25, Use NT, M, G, and A. Capable of withstanding 50% extension and compression. Pecora 890 by Pecora Corporation, Sonolastic Omni Seal by Master Builders Solutions.

4. Type 4: Single component, mildew resistant, moisture-curing silicone meeting ASTM C-920, Type S, Grade NS, Class 25, Use NT, M, G, and A. Pecora 898 by Pecora Corporation, Sonolastic Omni Plus by Master Builders Solutions.

5. Type 5: Single component, acrylic latex meeting ASTM C-834. AC-20+ Silicone by Pecora Corporation, Sonneborn Sonolac by Master Builders Solutions.

6. Type 6: High grade butyl sealant meeting Federal Specification TT-S-00-1657. BC-158 by Pecora Corporation or equal.

7. Type 7: Multi-component chemical resistant polysulfide sealant conforming to ASTM C-920, Type M, Grade NS, Class 25 such as Deck-O-Seal by W.R. Meadows, Tammsflex by DuraJoint Concrete Accessories, or Synthacalk GC2+ by Pecora Corporation.

8. Type 8: Nonsag, Multi Component, traffic grade polyurethane sealant meeting ASTM C920, Type M, Grade NS, Class 25, use T, M, A, and O. DynaTread by Pecora Corporation, Sonolastic Ultra by Master Builders Solutions.

B. Primer: Non-staining primer recommended by sealant manufacturer for the substrates on this project.

C. Backer Rod: Closed cell foam, nonreactive with caulking materials, non-oily, and approved by the sealant manufacturer. Minimum density shall be 2.00 pounds per cubic foot. Use no asphalt or bitumen-impregnated fiber with sealants.

D. Joint Cleaner: Recommended by sealant or caulking compound manufacturer.

E. Bond breaker: Either polyethylene film or plastic tape as recommended by the sealant manufacturer.

F. Color: Where manufacturer's standard colors do not closely match materials being sealed, provide a custom color.

PART 3 – EXECUTION

3.01 QUALITY CONTROL

A. Coordinate work with details shown on approved shop drawings prepared by other trades.

B. Verify conditions in the field.

C. Schedule work to follow closely the installation of other trades.

D. Apply sealants and related items in temperatures and dry conditions recommended by the manufacturers.

E. Do not paint sealant, unless recommended by sealant and paint manufacturer.

3.02 PREPARATION

A. Protect finished surfaces adjoining by using masking tape or other suitable materials.

B. Clean and prime joints before starting any caulking or sealing work.

C. Thoroughly clean joints and spaces of mortar and other foreign materials. Cleaning agent shall be Xylol or similar non-contaminating solvent to remove any film from metal surfaces. Masonry or concrete surfaces shall be brushed or air jet cleaned.

D. Joint Requirements

1. All joints and spaces to be sealed in exterior work shall be less than ½-inch deep and not less than 1/4 inch wide. If joints in masonry are less than that specified herein, the mortar shall be cut out to the required width and depth. All joints and spaces to receive sealant shall be completely prepared and thoroughly dry before installation of sealant.

2. Unless otherwise specified, joints and spaces which are open to a depth of 1/2 inch or greater shall be solidly filled with back-up material to within 1/4 inch of the surface. Back-up material shall be packed tightly and made continuous throughout the length of the joints. Bond breaker shall be applied as required. If joints are less than ¼-inch deep, the back-up material may be omitted, a bond breaker substituted and the joint completely filled with sealant. The back-up material shall not project beyond the ¼-inch depth of the open space in any joint. The following width-to-depth ratio table shall be adhered to, unless otherwise recommended by manufacturer.

	Sealant Depth	
Joint Width	Minimum	Maximum
¼ inch	1/4 inch	1/4 inch
Over 1/4 inch to 1/2 inch	1/4 inch	Equal to width
Over 1/2 inch to 1 inch	1/2 inch	Equal to width
Over 1 inch to 2 inches	1/2 inch	1/2 of width

3.03 APPLICATION

A. Exercise care before, during, and after installation so as not to damage any material by tearing or puncturing. All finished work shall be approved before covering with any other material or construction.

B. Apply sealant by an approved type of gun except where the use of a gun is not practicable, suitable hand tools shall be used. Avoid applying the compound to any surface outside of the joints or spaces to be sealed. Mask areas where required to prevent overlapping of sealant.

C. All joints shall be waterproof and weathertight.

D. Point sealed joints to make a slightly concave joint, the edges of which are flush with the surrounding surfaces. Exposed joints in the interior side of the door and other frames shall be neatly pointed flush or to match adjacent jointing work.

E. Adjacent materials which have been soiled shall be cleaned immediately and the work left in neat and clean condition.

F. Comply with sealant manufacturer's written instructions except where more stringent requirements are shown or specified and except where manufacturer's technical representative directs otherwise.

3.04 ADJUSTMENT AND CLEANING

A. Remove misplaced sealant compounds promptly using methods and materials recommended by the manufacturer, as the work progresses.

B. Allow sealants to cure and remove protective edging, of doors, louvers, saddles windows etc. as directed by the Engineer.

3.05 SCHEDULE

Schedule of Sealants

Application	Sealant	Color
Vertical and horizontal expansion and construction joints in concrete structures unless noted otherwise herein or on Drawings.	Type 1	To closely match adjacent surfaces or mortar and as selected by the Owner.
Vertical and horizontal joints bordered on both sides by masonry, precast concrete, natural stone or other porous building material, unless noted otherwise herein or on Drawings.	Type 2	To closely match adjacent surfaces or mortar and as selected by the Owner.
Vertical and horizontal joints bordered on both sides by painted metals, anodized aluminum, mill finished aluminum, PVC, glass or other non-porous building material.	Type 3	To closely match adjacent surfaces and as selected by the Owner.
Masonry expansion and control joints less than 1¼" wide.	Type 2	To closely match adjacent surfaces and as selected by the Owner.
Masonry expansion and control joints equal or greater than 1¼ inches wide and not to exceed 2”.	Type 1	To closely match adjacent surfaces and as selected by the Owner.
Interior – wood trim and finish joints.	Type 5	Color to be selected by Owner
Sanitary areas, joints in ceramic tile, around plumbing fixtures, countertops, and back splashes.[1]	Type 4	To closely match adjacent surfaces and as selected by the Owner.
Perimeter sealing of doors, windows, louvers, piping, ducts, and electrical conduit.[2]	Type 2 OR Type 3	To closely match adjacent surfaces and as selected by the Owner.
Below thresholds.	Type 6	Manufacturer's standard
Submerged in liquids.[3,4]	Type 1	Manufacturer's standard
Submerged in liquids with high concentration of chlorine (> 2 ppm) or wastewater.	Type 7	Manufacturer’s standard
Horizontal Joints exposed to vehicular or pedestrian traffic.	Type 8	To closely match adjacent surfaces.
Other joints indicated on the drawings or customarily sealed but not listed.	Type recommended by manufacturer	To closely match adjacent surfaces and as selected by the Owner.

[1] Sealant for Laboratory Countertop shall be as recommended by countertop manufacturer.
[2] Provide UL approved sealants for penetrations thru fire-rated walls.
[3] Sealants which will come in contact with potable water shall meet the requirements of NSF 61.
[4] Where sealant will be immersed in liquid chemicals verify compatibility prior to installation of sealant.

END OF SECTION

SECTION 09 90 00

PAINTING

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Furnish labor, materials, equipment, and appliances required for complete execution of Work shown on Drawings and Specified herein.

B. Section Includes:

1. Protective Lining / Painting Materials

2. Shop Painting

3. Field Coating / Painting

a. Surface Preparation

b. Piping and Equipment Identification

c. Schedule of Colors

d. Work in Confined Spaces

e. OSHA Safety Colors

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittal Procedures

B. Section 40 05 97 - Piping and Equipment Identification Systems

C. Section 07 90 00 – Joint Fillers, Sealants, and Caulking

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of these specifications, the Work shall conform to the applicable requirements of the following documents:

1. SSPC – The Society for Protective Coatings Standards

a. SSPC-Vis 1 – Pictorial Surface Preparation Standards for Painting Steel Structures

b. SSPC-SP2 – Hand Tool Cleaning

c. SSPC-SP3 – Power Tool Cleaning

d. SSPC-SP5/NACE 1 – White Metal Blast Cleaning

e. SSPC-SP6/NACE 3 – Commercial Blast Cleaning

f. SSPC-SP7/NACE 4 – Brush-off Blast Cleaning

g. SSPC-SP10/NACE 2 – Near-White Metal Blast

h. SSPC-SP11 – Power Tool Cleaning to Bare Metal

i. SSPC-SP13/NACE6 – Surface Preparation of Concrete

2. ICRI – International Concrete Repair Institute

3. NACE – National Association of Corrosion Engineers

4. NAFP – The National Association of Pipe Fabricators

5. ASTM D1737 – Test Method for Elongation of Attached Organic Coatings with Cylindrical Mandrel Apparatus

6. ASTM B117 – Method of Salt Spray (Fog) Testing

7. ASTM D4060 – Test Method for Abrasion Resistance of Organic Coating by the Taber Abraser

8. ASTM D3359 – Method for Measuring Adhesion by Tape Test

1.04 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01 33 00 – Submittal Procedures, submit the following:

1. Manufacturer's literature and Material Safety Data Sheets for each product.

2. Coating / painting schedule identifying surface preparation and protective lining / painting systems proposed. Cross reference with Tables 1 and 2. Provide the name of the coating / painting manufacturer, and name, address, and telephone number of manufacturer's representative who will inspect the work. Submit schedule for approval as soon as possible following the Award of Contract, so approved schedule may be used to identify colors and specify shop paint systems for fabricated items. Manufacturer shall substitute paint system with equal performance where required for VOC compliance.

3. Contractor shall submit Quality Control Inspection Plan describing all tests and inspections task to be performed. Include copy of daily log showing environmental conditions measurements and frequency. Copy of completed log shall be provided at completion of work.

1.05 SYSTEM DESCRIPTION

A. Work shall include surface preparation, protective liner / paint application, inspection of coated / painted surfaces and corrective action required, protection of adjacent surfaces, cleanup and appurtenant work required for the proper coating / painting of all surfaces to be coated / painted. Surfaces to be coated / painted are designated within the Painting Schedule and may include new and existing piping, miscellaneous metals, equipment, buildings, exterior fiberglass, exposed electrical conduit and appurtenances.

B. Perform Work in strict accordance with manufacturer's published recommendations and instructions, unless the Engineer stipulates that deviations will be for the benefit of the project.

C. Paint surfaces which are customarily painted, whether indicated to be painted or not, with painting system applied to similar surfaces, areas and environments, and as approved by Engineer.

D. Piping and equipment shall receive color coding and identification. Equipment shall be the same color as the piping system.

1.06 QUALITY ASSURANCE (PAINTING)

A. Painting operations shall be accomplished by skilled craftsman and licensed by New York State to perform painting work.

B. Provide a letter indicating that the painting applicator has five years of experience, and 5 references which show previously successful application of the specified or comparable painting systems. Include the name, address, and the telephone number for the Owner of each installation for which the painting applicator provided services.

C. Contractor shall coordinate quality controlled inspections.

D. Notify Owner and Engineer at completion of surface preparation, priming application and final cure to allow inspection by Owner and Engineer or their Third-Party Inspector.

1.07 QUALITY ASSURANCE (CORROSION PROTECTION LINING)

A. Applicator Qualifications:

1. Contractor shall be a qualified Applicator by the corrosion protection lining manufacturer prior to bid date. Submit proof of acceptability of Applicator by manufacturer to Engineer.

2. Installation equipment shall be acceptable to the protective lining manufacturer.

3. Applicator to establish quality control procedures and practices to monitor phases of surface preparation, storage, mixing, application, and inspection throughout the duration of the project. Contractor to provide a fulltime, on-site person whose dedicated responsibilities will include quality control of the corrosion protection linings.

4. Quality control procedures and practices must include the following items:
   a. Training of personnel in the proper surface preparation requirements.
   b. Training of personnel in the proper storing, mixing, and application of the linings.

B. Mock-Ups:

1. Prior to the installation of the corrosion protection lining, but after Engineer's approval of the Samples and Shop Drawings, install 150 square foot stepped-back mock-ups of the systems showing each system component in an area selected by Engineer to show representative installation of the Work.

2. Obtain Engineer's acceptance of visual qualities of the mock-ups before start of Work. Retain and protect mock-ups during construction as one standard for judging completed corrosion protection lining Work. Do not alter mock-ups after approval by Engineer.
   a. Finished Work, in compliance with visual qualities of mock-ups, that fails other on-Site quality control testing procedures shall be replaced by Contractor with new materials at no charge to the Owner.

3. Build as many mock-ups as required to achieve Engineer's acceptance of the corrosion protection lining.

4. Adhesion testing shall be conducted on the mock up as noted below in this specification. Approved results of the adhesion testing shall be used as a base line for the remainder of the lining work.

5. Accepted mock-up shall be considered the acceptable minimum standard of quality.

6. Corrosion protection lining Work that proceeds without approved mock-ups shall be stopped, and mock-ups prepared for approval.

C. Source Quality Control: Provide each component of protective lining produced by a single manufacturer, including recommended repair mortar, repair overlay (resurfacer), base coat and top coat materials.

1.08 STORAGE AND DELIVERY

A. Bring materials to the job site in the original sealed and labeled containers.

B. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Store paint materials at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

PART 2 – MATERIALS

2.01 GENERAL INFORMATION

A. The term "paint" is defined as both paints and coatings including emulsions, enamels, stains, varnishes, sealers, and other coatings whether organic or inorganic and whether used as prime, intermediate, or finish coats.

B. Purchase paint from an approved manufacturer. Manufacturer shall assign a representative to inspect application of their product both in the shop and field. The manufacturer's representative shall submit a report to the Engineer at the completion the Work identifying products used and verifying that surfaces were properly prepared, products were properly applied, and the paint systems were proper for the exposure and service.

C. Provide primers and intermediate coats produced by same manufacturer as finish coat. Use only thinners approved by paint manufacturer, and only within manufacturer's recommended limits.

D. Ensure compatibility of total paint system for each substrate. Test shop primed equipment delivered to the site for compatibility with final paint system. Provide an acceptable barrier coat or totally remove shop applied paint system when incompatible with system specified, and repaint with specified paint system.

E. Use painting materials suitable for the intended use and recommended by paint manufacturer for the intended use.

F. Require that personnel perform work in strict accordance with the latest requirements of OSHA Safety and Health Standards for construction. Meet or exceed requirements of regulatory agencies having jurisdiction and the manufacturer's published instructions and recommendations. Maintain a copy of all Material Safety Data Sheets at the job site of each product being used prior to commencement of work. Provide and require that personnel use protective and safety equipment in or about the project site. Provide respiratory devices, eye and face protection, ventilation, ear protection, illumination and other safety devices required to provide a safe work environment.

2.02 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Specifications, provide products from one of the following manufacturers:

1. Tnemec Company Inc.

2. PPG

3. CARBOLINE

4. Sherwin-Williams

5. International Paints (Akzo Nobel)

PART 3 – EXECUTION

3.01 SHOP PAINTING

A. Shop prime fabricated steel and equipment with at least one shop coat of prime paint compatible with finish paint system specified. Prepare surface to be shop painted in strict accordance with paint manufacturer's recommendations and as specified. Finish coats may be shop applied, if approved by the Engineer. Package, store and protect shop painted items until they are incorporated into Work. Repair painted surfaces damaged during handling, transporting, storage, or installation to provide a painting system equal to the original painting received at the shop.

B. Identify surface preparation and shop paints on Shop Drawings. Verify compatibility with field applied paints.

C. Coordinate shop painting and field coating to ensure item is delivered and field coating occurs within recoat window of shop painted system requirements.

3.02 SURFACE PREPARATION

A. General

1. Surfaces to be painted shall be clean and dry, and free of dust, rust, scale, and foreign matter. No solvent cleaning, power or hand tool cleaning shall be permitted unless approved by the Engineer.

2. Concrete surfaces to receive protective coatings shall be washed, abrasive blasted, water jetted, grinded, patched, filled, and prepared by the Applicator in accordance with the Protective Coating Manufacturer’s recommendations.

3. Prior to start of protective coating systems application, pre-clean as required, and inspect the substrate in accordance with SSPC-SP13/NACE No. 6. Surface preparation procedures shall be in accordance with SSPC-SP13/NACE No. 6 and ICRI Guideline No. 310.2. Surface preparation shall expose aggregate and obtain a uniform surface texture resembling a concrete surface profile of an ICRI-CSP5-6.

4. Repaired Concrete Surfaces: Cleaning of repaired concrete surfaces, after proper cure of resurfacing mortars, must produce a minimum, uniform substrate anchor pattern or surface profile between CSP 4 and 5 in accordance with ICRI 310.2.

5. Protect or remove, during painting operations, hardware, accessories, machined surfaces, nameplates, lighting fixtures, and similar items not intended to be painted prior to cleaning and painting. Reposition items removed upon completion of painting operations.

6. Examine surfaces to be coated to determine that surfaces are suitable for specified surface preparation and painting. Report to Engineer surfaces found to be unsuitable in writing. Do not start surface preparation until unsuitable surfaces have been corrected. Starting surface preparation precludes subsequent claim that such surfaces were unsuitable for the specified surface preparation or painting.

7. Surface preparation shall be in accordance with specifications and manufacturer's recommendations. Provide additional surface preparation, and fill coats where manufacturer recommends additional surface preparation, in addition to requirements of specification.

8. Touch-up shop or field applied coatings damaged by surface preparation or any other activity, with the same shop or field applied coating; even to the extent of applying an entire coat when required to correct damage prior to application of the next coating. Touchup coats are in addition to the specified applied systems, and not considered a field coat.

9. Protect motors and other equipment during blasting operation to ensure blasting material is not blown into motors or other equipment. Inspect motors and other equipment after blasting operations and certify that no damage occurred, or where damage occurred, the proper remedial action was taken.

10. Field paint shop painted equipment in compliance with Color Coding and as approved by Engineer.

B. Metal Surface Preparation

1. Prepare all welds to a minimum NACE weld preparation level “C” per NACE Standard SP0178. Provide additional weld preparation where required by the coating manufacturer. Contractor shall provide NACE SP0178 weld mold visual aids on site for evaluation of all weld preparation.

2. Conform to current The Society for Protective Coatings Standards (SSPC) Specifications for metal surface preparation. Use SSPC-Vis-1 pictorial standards or NACE visual standards TM-01-70 or TM-01-75 to determine cleanliness of abrasive blast cleaned steel.

3. Perform blast cleaning operations for metal when following conditions exist:

   a. Moisture is not present on the surface.

   b. Relative humidity is below 80%.

   c. Ambient and surface temperatures are 5°F or greater than the dew point temperature.

   d. Painting or drying of paint is not being performed in the area.

   e. Equipment is in good operating condition.

   f. Proper ventilation, illumination, and other safety procedures and equipment are being provided and followed.

4. Abrasive blast ferrous metals to be shop primed, or component mechanical equipment in accordance with SSPC-SP5, White Metal Blast.

5. Abrasive blast field prepared ferrous metals in accordance with SSPC-SP10, Near White Metal Blast, where metal is to be submerged, in a corrosive environment, or in severe service. Provide a 3.0 mil minimum angular anchor profile unless recommended otherwise by the coating manufacturer in writing.

6. Abrasive blast field prepared ferrous metals in accordance with SSPC-SP6 Commercial Blast, where metal is to be used in mild or moderate service, or non-corrosive environment or weathering exposure. Provide a 1.5 mil minimum angular anchor profile unless recommended otherwise by the coating manufacturer in writing.

7. Clean nonferrous metals, copper, or galvanized metal surfaces in accordance to SSPC-SP1, Solvent Cleaning, or give one coat of metal passivator or metal conditioner compatible with the complete paint system. Galvanized metal shall be prepared in accordance with SSPC SP-16. Abrasive blast clean to increase mechanical adhesion in accordance with ASTM D6386, Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting when required by coating manufacturer. Provide a 1.5 mil minimum angular anchor profile unless recommended otherwise by the coating manufacturer in writing.

8. Abrasive blast clean internal and external ductile iron pipe surfaces prior to coating in accordance with NAPF 500-03-04, Surface Preparations Standard for Abrasive Blast Cleaning of Ductile Iron Pipe. Abrasive blast clean internal and external cast ductile iron and cast-iron fitting surfaces in accordance with NAPF-03-05.

9. Prime cleaned metals immediately after cleaning to prevent rusting.

10. Clean rusted metals down to bright metal by abrasive blasting and immediately field primed.

C. Concrete Surface Preparation

1. Cure concrete a minimum of 28 days at 75° F before surface preparation, and painting begins. Allow more time at lower temperatures if specified by paint manufacturer.

2. Test concrete for pH and salts using test methods recommended by the paint manufacturer. A minimum of one test per 1000 square feet of area to be coated shall be performed unless approved otherwise by Engineer. Do not begin surface preparation, or painting until acceptable to manufacturer.

3. Moisture content of concrete and masonry surfaces shall conform to manufacturer's recommended limits, and as listed in SSPC-SP13/NACE 6 Section 6 Acceptance Criteria Table 1. Floor surfaces to be coated shall be tested in accordance with ASTM F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride or as required by the coating manufacturer. Moisture vapor transmission shall not exceed three pounds per 1,000 square feet in a 24-hour period or less if specified by Coating Manufacturer. Vertical and horizontal overhead surfaces shall be tested in accordance with ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete using in situ Probes (relative humidity shall not exceed 80%

or as required by the coating manufacturer) or with ASTM D4263 – Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Test Method (test results shall be no moisture present). Engineer or Coating Manufacturer Representative shall specify all test locations. A minimum of one test per 1000 square feet of area to be coated shall be performed unless approved otherwise by Engineer.

4. Prepare concrete surfaces to receive coatings in accordance with NACE 6/SSPC-13 – Joint Surface Preparation Standards and ICRI Technical Guidelines. Remove contaminants, open bugholes, surface voids, air pockets, and other subsurface irregularities using abrasive blasting, shot blasting, water jetting or mechanical abrading. Use dry, oil-free air for blasting operations. Surface texture after blasting shall achieve profile as required by manufacturer or where not defined by manufacturer, profile shall be a minimum ICRI-CSP 5 surface profile. Remove residual abrasives, dust, and loose particles by vacuuming or other approved method.

5. Surface defects, such as hollow areas, bugholes, honeycombs, and voids shall be filled with polymeric or waterborne epoxy cementitious filler compatible with painting system. Complete fill coats may be used in addition to specified painting system and as approved by the Engineer. Fins, form marks, and all protrusions or rough edges shall be removed.

6. Repair existing concrete surfaces which are deteriorated to the point that surface preparation exposes aggregate with fill coats or patching mortar as recommended by paint manufacturer and as directed by the Engineer.

7. Clean concrete of all dust, form oils, curing compounds, oil, tar, laitance, efflorescence, loose mortar, and other foreign materials before paints are applied.

8. To ease coating around outside corners, provide ¾-inch chamfered edges on all new concrete outside corners and grind existing concrete outside corners to a minimum radius of ¾-inch.

9. Unless recommended otherwise by the coating manufacturer, provide ¼" deep by ¼" wide tool cut terminations at 1-inch maximum from all coating edges for anchorage. Provide terminations around all equipment, piping, openings, gates, top and bottom of walls, stop locations of each day's work and overlap onto previously completed work. Transition coating 3-inches onto interior lining of piping except where coating compatibility concerns are noted by coating manufacturer.

10. Apply epoxy or polymeric filler compatible with painting system to all inside corners of areas to be coated with a margin trowel to form a continuous 45-degree cant cove across corners with a minimum dimension of 1.5-inch. Roughen or prepare cured filler as recommended by coating manufacturer for proper coating adhesion.

11. All equipment grouting shall be installed and cured prior to starting coating work. Coating shall be applied over grout up to the edges of all equipment, gates and uninterrupted piping unless specifically noted otherwise.

D. Wood

1. Clean wood surfaces free of all foreign matter, with cracks and nail holes and other defects properly filled and smoothed. Remove sap and resin by scraping and wipe clean with rags dampened with mineral spirits.

2. Saturate end grain, cut wood, knots, and pitch pockets with an appropriate sealer before priming.

3. Prime and backprime wood trim before setting in place.

4. After prime coat has dried, fill nailholes, cracks, open joints, and other small holes with approved spackling putty. Lightly sand wood trim prior to applying second coat of paint.

E. Castings

1. Prepare castings for painting by applying a brush or a knife-applied filler. Fillers are not to be used to conceal cracks, gasholes, or excessive porosity.

2. Apply one coat of primer with a minimum thickness of 1.2 mils in addition to coats specified. Allow sufficient drying time before further handling.

F. Masonry

1. Cure for a minimum of 30 days prior to paint application.

2. Clean masonry surfaces free from all dust, dirt, oil, grease, loose mortar, chalky deposits, efflorescence, and other foreign materials.

3. Test masonry for moisture content. Use test method recommended by paint manufacturer. Do not begin painting until moisture content is acceptable to manufacturer.

G. Gypsum Drywall

1. Sand joint compound with sandpaper to provide a smooth flat surface. Avoid sanding of adjacent drywall paper.

2. Remove dust, dirt, and other contaminants.

H. Previously-Painted Surfaces

1. Totally remove existing paint when: surface is to be submerged in a severe environment, paint is less than 75% intact, brittle, eroded or has underfilm rusting.

2. Surfaces which are greater than 75% intact require removal of failed paints and then spot primed. Spot priming is in addition to coats specified.

3. Remove surface contamination such as oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, mortar, efflorescence, and sealers.

4. Clean and dull glossy surfaces prior to painting in accordance with the manufacturer's recommendations.

5. Check existing paints for compatibility with new paint system. If incompatible, totally remove existing paint system or apply a barrier coat recommended by the paint manufacturer. Remove existing paints of undetermined origin. Prepare a test patch of approximately 3 square feet over existing paint. Allow test patch to dry thoroughly and test for adhesion. If proper adhesion is not achieved remove existing paint and repaint.

3.03 APPLICATION OF PAINT

A. Apply paint by experienced painters with brushes or other applicators approved by the Engineer, and paint manufacturer.

B. Apply paint without runs, sags, thin spots, or unacceptable marks.

C. Apply at rate specified by the manufacturer to achieve at least the minimum dry mil thickness specified. Apply additional coats, if necessary, to obtain thickness.

D. Special attention shall be given to nuts, bolts, edges, angles, flanges, welds, etc., where insufficient film thicknesses are likely. Stripe paint outside corners and edges in accordance with SSPC PA Guide 11. Stripe painting shall be in addition to coats specified.

E. Perform thinning in strict accordance with the manufacturer's instructions, and with the full knowledge and approval of the Engineer and paint manufacturer.

F. Allow paint to dry a minimum of twenty-four hours between application of any two coats of paint on a particular surface, unless shorter time periods are a requirement by the manufacturer. Longer drying times may be required for abnormal conditions as defined by the Engineer and paint manufacturer. Do not exceed manufacturer's recommended drying time between coats.

G. Suspend painting when any of the following conditions exist:

1. Rainy or excessively damp weather.

2. Relative humidity exceeds 85%.

3. General air temperature cannot be maintained at 50°F or above through the drying period, except on approval by the Engineer and paint manufacturer.

4. Relative humidity will exceed 85% or air temperature will drop below 40°F within 18 hours after application of paint.

5. Surface temperature of item is within 5 degrees of dewpoint.

6. Dew or moisture condensation are anticipated.

7. Surface temperature exceeds the manufacturer's recommendations.

H. Where application of coating across concrete control joints or expansion joints has the potential to crack, turn coating into joints and caulk joints with a sealant compatible with coating rated for the intended service per Section 07 90 00 – Joint Fillers, Sealants, Caulking.

3.04 INSPECTION

A. Each field coat of paint will be inspected and approved by the Engineer or his authorized representative before succeeding coat is applied. Tint successive coats so that no two coats for a given surface are exactly the same color. Tick-mark surfaces to receive black paint in white between coats.

B. Use magnetic dry film thickness gauges and wet fiber thickness gauges for quality control. Furnish magnetic dry film thickness gauge for use by the Engineer.

C. Coatings shall pass a holiday detector test.

D. Determination of Film Thickness: Randomly selected areas, each of at least 107.5 contiguous square feet, totaling at least 5% of the entire control area shall be tested. Within this area, at least 5 squares, each of 7.75 square inches, shall be randomly selected. Three readings shall be taken in each square, from which the mean film thickness shall be calculated. No more than 20 percent of the mean film thickness measurements shall be below the specified thickness. No single measurement shall be below 80 percent of the specified film thickness. Total dry film thickness greater than twice the specified film thickness shall not be acceptable. Areas where the measured dry film thickness exceeds twice that specified shall be completely redone unless otherwise approved by the Engineer. When measured dry film thickness is less than that specified additional coats shall be applied as required.

E. Holiday Testing: Holiday test painted ferrous metal surfaces which will be submerged in water or other liquids, or surfaces which are enclosed in a vapor space in such structures. Mark areas which contain holidays. Repair or repaint in accordance with paint manufacturer's printed instructions and retest.

1. Dry Film Thickness Exceeding 20 Mils: For surfaces having a total dry film thickness exceeding 20 mils: Pulse-type holiday detector such as Tinker & Rasor Model AP-W, D.E. Stearns Co. Model 14/20, shall be used. The unit shall be adjusted to operate at the voltage required to cause a spark jump across an air gap equal to twice the specified coating thickness.

2. Dry Film Thickness of 20 Mils or Less: For surfaces having a total dry film thickness of 20 mils or less: Tinker & Rasor Model M1 non-destructive type holiday detector, K-D Bird Dog, shall be used. The unit shall operate at less than 75-volts. For thicknesses between 10 and 20 mils, a non-sudsing type wetting agent, such as Kodak Photo-Flow, shall be added to the water prior to wetting the detector sponge.

F. Paint manufacturer’s NACE certified representative shall provide their services as required by the Engineer. Services shall include, but not be limited to, inspecting existing paint, determination of best means of surface preparation, inspection of completed work, and final inspection of painted work 11 months after the job is completed.

3.05 PROTECTION OF ADJACENT PAINT AND FINISHED SURFACES

A. Use covers, masking tape, other method when protection is necessary, or requested by Owner or Engineer. Remove unwanted paint carefully without damage to finished paint or surface. If damage does occur, repair the entire surface adjacent to and including the damaged area without visible lapmarks and without additional cost to the Owner.

B. Take all necessary precautions to contain dispersion of abrasive blasting debris and paint to the limits of the work. Take into account the effect of wind and other factors which may cause dispersion of the abrasive blasting debris and paint. Suspend painting operations when abrasive blasting debris or paint cannot be properly confined. Assume all responsibilities and cost associated with damage to adjacent structures, vehicles, or surfaces caused by the surface preparation and painting operations.

3.06 PIPING AND EQUIPMENT IDENTIFICATION

A. Piping and equipment identification shall be in accordance with Section 40 05 97 – Piping and Equipment Identification Systems.

3.07 SCHEDULE OF COLORS

A. Match colors indicated. Piping and equipment colors are indicated in Section 40 05 97 – Piping and Equipment Identification Systems. Colors which are not indicated shall be selected from the manufacturer's full range of colors by the Engineer. No variation shall be made in colors without the Engineer's approval. Color names and numbers shall be identified according to the appropriate color chart issued by the manufacturer of the particular product in question.

3.08 WORK IN CONFINED SPACES

A. Provide and maintain safe working conditions for all employees. Supply fresh air continuously to confined spaces through the combined use of existing openings, forceddraft fans and temporary ducts to the outside, or direct air supply to individual workers. Exhaust paint fumes to the outside from the lowest level in the contained space. Provide explosionproof electrical fans, if in contact with fumes. No smoking or open fires will be permitted in, or near, confined spaces where painting is being done. Follow OSHA, New York State, and local regulations at all times.

3.09 OSHA SAFETY COLORS

A. Paint wall around wall-mounted breathing or fire apparatus with the appropriate safety red color; area not to exceed 2 feet wide by 3 feet high, unless apparatus covers the area. Fire apparatus include fire hoses, extinguisher, and hydrants.

B. Paint hazardous areas and objects in accordance with OSHA regulations.

3.10 VOC REGULATIONS

A. Provide paint systems in accordance with local, New York State, and federal regulations. Where paint systems shown in schedule do not comply substitute equal products with VOC limits which comply with local, New York State, and federal regulations.

Table 1: Painting Schedule

Surface	Application	Painting System and No. of Coats	Product Reference (Table 2)	Total Min. Dry Film Thickness (Mils)
Concrete and Masonry				
Interior masonry and concrete walls and ceilings	All new structures	1 coat sealer 2 coats acrylic epoxy	101 116	75-85 sq.ft./gal. 4-6/coat
Interior masonry and concrete walls in chemical rooms		1 coat sealer 2 coats epoxy polyamide	117 102	60-80 sq.ft./gal. 4-6/coat
Submerged water	Water retaining side of new wall surfaces where opposite side of wall is interior and dry and where indicated "epoxy waterproofing" on drawing	2 coats NSF approved epoxy polyamide Provide filler as required and recommended by manufacturer	105	4-6/coat
Submerged wastewater		2 coats high solids epoxy Provide filler as required and recommended by manufacturer	106	6-10/coat
Containment Liner[1]	Interior and exterior secondary containment floors, tank supports and walls	2 coats high solids epoxy coating	106	6-10/coat
Metals				
Interior and exterior nonsubmerged (gloss)	All new blowers, pumps, motors and mechanical equipment, piping, etc.	1 coat epoxy polyamide primer 1 coat epoxy polyamide 1 coat aliphatic polyurethane	104 102 115	4-6 4-6 3-5
Interior insulated		1 coat acrylic latex	103	4
Submerged water	All metal piping, and mechanical equipment, etc.	2 coats NSF approved epoxy polyamide	105	4-6/coat
Submerged Wastewater		2 coats high solids epoxy	119	8-10/coat
Steel doors, windows and door frames, steel stairs, monorails, structural steel, misc. metals (steel), galvanized lintels,		1 coat epoxy polyamide 1 coat aliphatic polyurethane	102 115	5-8 3-4
Aluminum surfaces in contact with concrete		2 coats coal tar	107	26
Shop Primed Structural Steel	Pre-Engineered Buildings	1 tie coat 1 coat epoxy 1 coat epoxy	113 114 120	2-3 3-4 3-4
Other				
Interior: Gypsum Wallboard	All new structures	2 coats acrylic latex matte or satin	103	2-3/coat
Interior: Tar-dipped piping where color is required		1 coats epoxy resin sealer 1 coats epoxy polyamide	112 102	2-3/coat 5-8/coat
PVC Piping		1 coat epoxy polyamide 1 coat aliphatic polyurethane	102 115	5-8 3-4

1 Painting manufacturer shall verify compatibility of containment liner and chemical to be contained. Where incompatible substitute a compatible coating system.

Table 2: Product Listing

Ref.	System	Purpose	Product			
			Tnemec Series	**PPG/AMERON**	**CARBOLINE**	**Sherwin-Williams**
101	Acrylic filler	Primer-sealer	130-6601	BLOXFIL 4000	Sanitile 100	Cement-Plex 875
102	Epoxy polyamide	Finish coat semi-gloss or gloss	N69	AMERLOCK 2	Carboguard 890	Macropoxy 646
103	Acrylic latex	Sealer	1028/1029	PITT TECH PLUS	Carbocrylic 3359DTM	DTM Acrylic Primer/Finish
104	Epoxy Polyamide – metal	Primer	66	AMERCOAT 385	Carboguard 893SG	Macropoxy 646
105	Epoxy	Primer/Finish	N140	AMERLOCK 2	Carboguard 61/891VOC	Macropoxy 646 PW
106	Coal tar epoxy	Finish high-coat build	46H-413	AMERCOAT 78HB	Bitumastic 300M	Hi-Mil Sher Tar Epoxy
107	Coal tar	Sealer	46-465	AMERCOAT 78HB	Bitumastic 300M	Hi-Mil Sher Tar Epoxy
108	Alkyd-medium oil	Finish coat	2H	DEVGUARD 4308	Carbocoat 8215	Industrial Enamel
109	Alkyd-long oil	Finish coat	1029	DEVGUARD 4308	Carbocoat 8215	Industrial Enamel
110	Epoxy polyamide	Primer	66-1211	AMERCOAT 385	Carboguard 893SG	Macropoxy 646
112	Epoxy polyamide	Sealer	66-1211	AMERCOAT 385	Carboguard 893SG	Macropoxy 920 Pre-Prime
113	Urethane	Barrier coat	530	AMERLOCK SEALER	Rustbond	-
114	Polyamine Epoxy	Intermediate coat	27	AMERLOCK 385	Carboguard 893SG	-
115	Aliphatic Polyurethane	Finish coat	1094 or 1095	AMERCOAT 450 HS	Carbothane 134HG	Acrolon 218HS
116	Acrylic epoxy	Finish coat	113 or 114	AQUAPON WB	Sanitile 255	Water-Based Catalyzed Epoxy
117	Epoxy block filler	Sealer	1254	AMERLOCK 114	Sanitile 500	Kem Cati-Coat HS Epoxy Filler
118	Catalyzed epoxy	Finish coat	84	AMERLOCK 2/400	Carboguard 890	Macropoxy 646
119	High solids epoxy	Finish coat	104	AMERLOCK 400	Carboguard 890	Dura-Plate 235
120	Epoxy	Top coat	N69	AMERLOCK 2/400	Carboguard 890	-

END OF SECTION

SECTION 26 05 00

BASIC ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish all labor, materials, tools, and equipment, and perform all work and services necessary for, or incidental, to the furnishing and installation of all electrical work as shown on the Drawings, and as specified in accordance with the provisions of the Contract Documents and completely coordinate with the work of other trades involved in the general construction. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation shall be furnished and installed as part of this work. All electrical work shall be complete and left in operating condition in accordance with the intent of the Drawings and the Specifications for the electrical work.

B. Where the word "Contractor" appears in these Technical Specifications it shall be construed to mean the Electrical Contractor.

C. The Contractor shall be responsible for all interconnecting devices, conduit, wire, and appurtenances not furnished by others but required for the operation of equipment as described in the functional descriptions whether specifically shown on the drawings or not.

D. All material and equipment must be the product of an established and reputable manufacturer; must be new and of first class construction; must be designed and guaranteed to perform the service required; and must bear the label of approval of the Underwriters Laboratories, Inc., where such approval is available for the product of the listed manufacturer as approved by the Engineer

E. When a specified or indicated item has been superseded or is no longer available, the manufacturer's latest equivalent type or model of material or equipment as approved by the Engineer shall be furnished and installed at no additional cost to the County.

F. Where the Contractor's selection of equipment of specified manufacturers or additionally approved manufacturers requires changes or additions to the system design, the Contractor shall be responsible in all respects for the modifications to all system designs, subject to approval of the Engineer. The Contractor 's bid shall include all costs for all work of the Contract for all trades made necessary by such changes, additions or modifications or resulting from any approved substitution.

1.02 SUBMITTALS

A. The Contractor shall submit to the Engineer Shop Drawings of all electrical materials, apparatus, appliances, equipment and miscellaneous devices shown or specified and shall be in accordance with the requirements of the General Conditions and Section 01 33 00, Submittals.

B. Shop Drawings shall be sufficiently complete in detail to enable the Engineer to determine compliance with Contract requirements. Details and information shown shall include but are not necessarily limited to the following:

1. Performance characteristics.

2. Physical sizes.

3. Material and equipment specifications, and construction and methods of fabrication details.

4. Compliance with standards (e.g. UL, NEMA), rules, regulations, and codes.

5. Accessories.

6. Complete product data sheets for all components of the specified equipment.

7. Electrical ratings (voltage, current, KVA, phase, etc.)

8. Weights of components parts and assembled unit weights.

9. Complete assembly, layout, and installation drawings with clearly marked dimensions.

C. Partial, incomplete or illegible submittals will be returned to the Contractor without review for resubmittal.

D. Shop Drawings will be approved only to the extent of the information shown. Approval of an item of equipment shall not be construed to mean approval for components of that item for which Contractor has provided no information.

E. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's specification section.

F. Each submittal shall be identified by the applicable specification section.

1.03 APPLICABLE CODES AND REQUIREMENTS

A. Nonconformance

1. The Contractor shall be held responsible for adherence to all rules, requirements and specifications as set forth above. Any additional work or material necessary for adherence will not be allowed as an extra, but shall be included in the Bid Price. Ignorance of any rule, requirement, or Specification shall not be allowed as an excuse for nonconformity. Acceptance by the Engineer does not relieve the Contractor from the expense involved for the correction of any errors which may exist in the drawings submitted, or in the satisfactory operation of any equipment.

1.04 TESTS

A. Upon completion of the installation, the Contractor shall perform tests for operation, load (Phase) balance overloads, and short circuits. Tests shall be made with and to the satisfaction of the County and Engineer.

B. The Contractor shall perform all field tests and shall provide all labor, equipment, and incidentals required for testing and shall pay for electric power required for the tests. All defective material and workmanship disclosed shall be corrected by the Contractor at no cost to the County. The Contractor shall show by demonstration in service that all circuits and devices are in good operating condition. Test shall be such that each item of control equipment will function not less than five (5) times.

1.05 DOCUMENTATION

A. Required Documentation

1. The Contractor shall submit to the Engineer test records and reports for all testing.

1.06 FIELD TESTING OF EQUIPMENT

A. The equipment to be tested shall include, but not be limited to, the following:

1. Related Motor Control Equipment

2. Conduit System

3. Cable and Wire

1.07 FINAL FIELD TEST OF SYSTEM

A. The Contractor shall complete the installation and testing of the electrical installation at least two (2) months prior to the start up and testing of all other equipment. During the period between the completion of electrical installation and the start up and testing of all other equipment, the Contractor shall make all components of the Work available as it is completed for their use in performing Preliminary and Final Field Tests.

1.08 PROTECTIVE DEVICE SETTING AND TESTING

A. The Contractor shall provide the services of a qualified testing company using N.E.T.A. certified technicians to adjust, set, calibrate and test all protective devices in the electrical system. The qualifications of the testing company and resumes of the technicians as well as all data forms to be used for the field testing shall be submitted.

B. All protective devices in the electrical equipment to be used shall be set, adjusted, calibrated and tested in accordance with the manufacturer's recommendations, and best industry practice.

C. Proper operation of all equipment associated with the device under test and its compartment shall be verified, as well as complete resistance, continuity and polarity tests of power, protective and metering circuits. Any minor adjustments, repairs and/or lubrication necessary to achieve proper operation shall be considered part of this Contract.

D. All solid state trip devices shall be checked and tested for setting and operation using manufacturers recommended test devices and procedures.

E. Circuit breakers and/or contactors associated with the above devices shall be tested for trip and close functions with their protective device.

F. When completed, the Contractor shall provide a comprehensive report on all equipment tested indicating condition, readings, faults and/or deficiencies in same. Inoperative or defective equipment shall be brought immediately to the attention of the Engineer.

G. Prior to placing any equipment in service, correct operation of all protective devices associated with this equipment shall be demonstrated by field testing under simulated load conditions.

1.09 SCHEDULE AND PLANT OPERATIONS

A. Since the testing required in 1.12 above shall require that certain pieces of equipment be taken out of service, all testing procedures and schedules must be submitted to the Engineer for review and approval one month prior to any work beginning. When testing has been scheduled, the Engineer must be notified forty eight hours prior to any work to allow time for load switching and/or alternation of equipment. In addition, all testing that requires temporary shutdown of plant equipment must be coordinated with the County/Engineer so as not to affect proper plant operations.

B. At the end of the workday, all equipment shall be back in place and ready for immediate use should a plant emergency arise. In addition, should an emergency condition occur during testing, at the request of the County, the equipment shall be placed back in service immediately and turned over to plant personnel.

C. In the event of accidental shutdown of plant equipment, the Contractor shall notify plant personnel immediately to allow for an orderly restart of affected equipment.

1.10 MATERIALS HANDLING

A. Materials arriving on the job site shall be stored in such a manner as to keep material free of rust and dirt and so as to keep material properly aligned and true to shape. Rusty, dirty, or misaligned material shall be rejected. Electrical conduit shall be stored to provide protection from the weather and accidental damage. Rigid non-metallic conduit shall be stored on even supports and in locations not subject to direct sun rays or excessive heat. Cables shall be sealed, stored, and handled carefully to avoid damage to the outer covering or insulation and damage from moisture and weather. Adequate protection shall be required at all times for electrical equipment and accessories until installed and accepted. Materials damaged during shipment, storage, installation, or testing shall be replaced or repaired in a manner meeting with the approval of the

Engineer. The Contractor shall store equipment and materials in accordance with Section 01600, Delivery, Storage and Handling.

PART 2 – PRODUCTS

2.01 PRODUCT REQUIREMENTS

A. Unless otherwise indicated, the materials to be provided under this Specification shall be the products of manufacturers regularly engaged in the production of all such items and shall be the manufacturer's latest design. The products shall conform to the applicable standards of UL and NEMA, unless specified otherwise. International Electrotechnical Commission (IEC) standards are not recognized. Equipment designed, manufactured, and labeled in compliance with IEC standards is not acceptable.

B. All items of the same type or ratings shall be identical. This shall be further understood to include products with the accessories indicated.

C. All equipment and materials shall be new, unless indicated or specified otherwise.

D. The Contractor shall submit proof if requested by the Engineer that the materials, appliances, equipment, or devices that he provides under this Contract meet the requirements of Underwriters Laboratories, Inc., in regard to fire and casualty hazards. The label of or listing by the Underwriters Laboratories, Inc., will be accepted as conforming to this requirement.

2.02 CABLES

A. 600 VOLT INSULATED WIRE AND CABLE

1. 600 volt insulated wire and cable shall be used for all 600 volt and below power, lighting and control circuits.

B. 600 volt single conductor wire and cable for installation in conduit for power circuits shall be in accordance with the following:

1. Conductors shall be stranded, tinned coated copper (if available), single conductor cable conforming to ASTM B8, and B33, No. 12 AWG minimum size.

2. Insulation shall be flame-retardant XLPE, or EPR (FREP), moisture and heat resistant thermoset rated 90 degrees C in dry locations and 90 degrees C in wet locations and listed by UL as type XHHW-2 or RHW-2.

3. XHHW-2 shall be used for all indoor circuits and RHW-2 for all underground and outdoor circuits.

4. 600 volt insulated wire and cable for installation in conduit shall be by Okonite Company, Southwire Company, General Cable Corporation, or equal to be approved by the Engineer.

C. 600 volt multiple conductor cable shall be used for control circuits. 600 volt multiple conductor control cable for installation in conduit shall be in accordance with the following:

1. Conductors shall be stranded, tinned coated copper conforming to ASTM B8 and B33, No. 14 AWG minimum size.

2. Insulation shall be moisture and flame resistant cross-linked polyethylene rated 90 degrees C in wet and dry locations and listed by UL as type XHHW-2.

3. Cable conductors shall be assembled together with flame and moisture resistant filters and tape to make round.

4. Cable shall include an overall protective jacket of polyethylene compound, 45 mils minimum thickness.

5. 600 volt multiple conductor control cable shall be Okonite Company, Southwire Company, General Cable Corporation or equal to be approved by the Engineer.

2.03 INSTRUMENTATION CABLE

A. The instrumentation cable for analog signals shall be single, shielded, twisted pairs or triads with 600 volt insulation and shall have a 90°C insulation rating.

B. Conductors shall be tin or alloy coated (if available), soft, annealed copper, stranded per ASTM-B8, Class B stranding unless otherwise specified. Minimum size wire shall be No. 16 AWG.

C. The instrumentation cable shall be Okoseal-N Type P-OS for single pair or triad applications and Okoseal-N Type SP-OS for multiple pair or triad applications as manufactured by the Okonite Company, Belden equivalent, Southwire Company equivalent, or equal.

2.04 CONNECTIONS AT CONTROL PANELS, LIMIT SWITCHES AND SIMILAR DEVICES

A. Where stranded wires are terminated at panels, and/or devices, connections shall be made by solderless lug, crimp type ferrule, or solder dipped.

B. Where enclosure sizes and sizes of terminals at limit switches, solenoid valves, float switches, pressure switches, temperature switches, and other devices make 7 strand, No. 12 AWG, wire terminations impractical, the Contractor shall terminate external circuits in an adjacent junction box of proper size and shall install No. 14 AWG stranded wires from the device to the junction box in a conduit. The #12 AWG field wiring shall also be terminated in the same junction box to complete the circuit.

2.05 PULLING TEMPERATURE

A. Cable shall not be flexed or pulled when the temperature of the insulation or of the jacket is such that damage will occur due to low temperature embrittlement. When cable will be pulled with an ambient temperature within a three day period prior to pulling of 40°F or lower, cable reels shall be stored during the three day period prior to pulling in a protected storage area with an ambient

temperature not lower than 55°F and pulling shall be completed during the work day for which the cable is removed from the protected storage.

2.06 INSTRUMENTATION CABLE INSTALLATION

A. The Contractor shall install all cable or conductors used for instrumentation wiring (4 20mA DC, etc.) in rigid galvanized steel or PVC coated rigid galvanized steel conduit. The use of asbestos cement or plastic conduit will not be permitted. Analog signal wires shall exclusively occupy these conduits. No other wiring for AC or digital DC circuits shall be installed in these conduits.

B. All shielding shall be continuous and shall be grounded in accordance with the instrumentation equipment manufacturer's recommendations, as approved.

C. A raceway containing instrumentation cable shall be installed to provide the following clearances:

D. Raceway installed parallel to raceway conductors energized at 480 through 208 volts shall be 18 inches and 208/120 volts shall be 12 inches.

E. Raceway installed at right angles to conductors energized at 480 volts or 120/208 volts shall be 6 inches.

F. Where practical, raceways containing instrumentation cable shall cross raceway containing conductors of other systems at right angles.

G. Grounding of cable shield shall be accomplished at one point only, unless otherwise required by instrumentation system's manufacturer.

H. Additional pullboxes shall be furnished and installed for ease of cable pulling and the cable manufacturer's recommended conduit fill factor shall be followed. Where required for specifically directed by the Engineer, the Contractor shall moisture seal the cables at all connections with OZ Gedney Type "CSB", or equal, sealing bushings.

I. Special instrument cable shall be as specified or recommended by the vendor of the equipment or instruments requiring such wiring. Installation, storage, terminations, etc., shall be per manufacturer's recommendations.

J. All cable, insulation and jacket shall have adequate strength to allow for it to be pulled through the conduit systems. Sufficient conductors shall be installed to provide space and serve future equipment where shown and specified. All conductors shall be color coded and all wires.

2.07 TESTING

A. All wires and cables shall be tested for insulation levels and continuity. Insulation resistance between conductors of the same circuit and between conductor and ground shall be tested. Testing for insulation levels shall be as follows:

B. For 600V power and control cable, apply 1,000 VDC from a Megohmmeter for all 600V wires and cables installed in control, power, and motor feeder circuits. Testing for continuity shall be "test light" or "buzzer".

C. 600V instrumentation signal cable shall be tested from conductor to conductor, conductor to shield, and conductor to ground using a Simpson No. 260 volt-ohmmeter, or approved equal. The resistance value shall be 200 Megaohms or greater.

D. Low voltage wires and cables shall be tested before being connected to motors, devices or terminal blocks.

E. If tests reveal defects or deficiencies, the Contractor shall make the necessary repairs or shall replace the cable as directed by the Engineer, without additional cost to the County.

F. All tests shall be made by and at the expense of the Contractor who shall supply all testing equipment.

G. Contractor shall clean, service and test the existing power distribution system equipment for correct functionality and operation before connecting loads to the equipment.

2.08 CONDUIT ACCESSORIES

A. The Contractor shall provide conduit accessories for use with the conduit system. The conduit accessories shall be of approved types.

B. Expansion and Deflection Fittings:

1. Expansion and deflection fittings shall be made up of non-corrodible parts and shall provide for ample longitudinal and lateral movement. A suitable bond shall provide a low resistance, continuous longitudinal path for ground currents.

2. Expansion and deflection fittings shall be cast iron, malleable iron or hot dipped galvanized. Fittings shall be corrosion-resistant, UL listed and compatible with the conduit system.

3. Expansion / deflection fittings shall provide both expansion and deflection in a single fitting in accordance with the following:

a. Axial expansion or contraction up to 3/4-inch.

b. Angular misalignment up to 30 degrees.

C. Parallel misalignment up to 3/4-inch.

1. Expansion fittings shall provide expansion / contraction with eight inch total movement.

2. Expansion and deflection fittings shall be by Crouse Hinds, Appleton Electric or equal to be approved by the Engineer.

D. Sealing Fittings:

1. Sealing fittings shall be cast gray iron alloy or cast malleable iron or copper free aluminum with zinc electroplate and lacquer or enamel finish.

2. Sealing fittings shall have an ample opening with threaded closure for access to conduit hub for making dam. Sealing fiber and compound shall be suitable for use with the fitting and shall be the products of the fitting manufacturer.

3. For corrosive locations, seal fittings shall include interior and exterior coatings.

4. Sealing fittings shall be by Crouse Hinds, Appleton Electric or equal to be approved by the Engineer.

2.09 CONDUIT CONNECTIONS TO EQUIPMENT

A. At each motor, limit switch, solenoid valve, electrical control device or other electrically controlled or operated equipment, the Contractor shall install a complete conduit connection between the conduit system and the terminal box of the motor or the conduit connection point of the equipment.

B. Conduits installed in the conduit system shall be terminated in such locations as to permit direct connections to motors, devices or equipment.

C. Connections shall be made with rigid conduit if equipment is fixed and not subject to adjustment, mechanical movement or vibration. Rigid connections shall be provided with union fittings to permit removal of equipment without cutting, breaking or burning conduit.

D. Motors, and equipment subject to adjustment, mechanical movement or vibration shall be connected with flexible metallic conduit.

E. Devices such as solenoid valves, small limit switches, etc., shall be connected with flexible metallic conduit arranged to prevent strain and distortion.

2.10 GROUNDING

A. Ground Cable

1. The ground cable shall be soft drawn bare stranded copper conforming to ASTM B8 and B189.

2. Ground cable shall be General Cable Corporation, Okonite Cable Company or equal to be approved by the Engineer.

B. Ground Rods

1. Ground rods shall be copper-clad steel, 5/8-inch diameter and 10 feet long.

2. Ground rods shall have a drive point at the lower ends. The upperend of each rod shall be equipped with bronze, clamp type connectors with not less than four bolts.

3. Ground rods shall be Heary Brothers Lightning Protection Company, Fushi Copperweld, or equal to be approved by the Engineer.

C. Grounding Connections

1. Compression connectors shall be heavy duty copper. Bolted connectors shall be copper alloy castings, designed specifically for the items to be connected, and assembled with Durium or silicone bronze bolts, nuts and washers.

2. Welded connections shall be by exothermic process utilizing molds, cartridges and hardware designed specifically for the connection to be made.

3. Bolted or compression grounding connectors shall be Burndy, Thomas and Betts or equal to be approved by the Engineer. Welded grounding connections shall be Cadwell or equal to be approved by the Engineer.

D. Substitutions

1. Any reference in the Specifications or on the Drawings to any article, service, product, material, fixture, or item of equipment by name, make, or catalog number shall be interpreted as establishing the type, function, and standard of quality and shall not be construed as limiting competition. The Contactor, in such cases may, at his option use any article, device, product, material, fixture, or item of equipment which in the judgment of the Engineer, expressed in writing, is equal to that specified.

PART 3 – EXECUTION

3.01 CORROSION PROTECTION

A. Wherever dissimilar metals, except conduit and conduit fittings, come into contact, the Contractor shall isolate these metals as required with neoprene washers, nine (9) mil polyethylene tape, or gaskets.

END OF SECTION

SECTION 31 10 00

CLEARING, GRUBBING, AND SITE PREPARATION

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Includes all labor, material, equipment and appliances required for the complete execution of any additions, modifications, or alterations to existing building(s) and new construction work as shown on the Drawings and specified herein.

B. Principal items of work include:

1. Notifying all authorities owning utility lines running to or on the property. Protecting and maintaining all utility lines to remain and capping those that are not required in accordance with instructions of the Utility Companies, and all other authorities having jurisdiction.

2. Clearing the site within the Contract Limit Lines, including removal of grass, brush, shrubs, trees, loose debris and other encumbrances except for trees marked to remain.

3. Boxing and protecting all trees, shrubs, lawns and the like within areas to be preserved. Relocating trees and shrubs, so indicated on the Drawings, to designated areas.

4. Repairing all injury to trees, shrubs, and other plants caused by site preparation operations shall be repaired immediately. Work shall be done by qualified personnel in accordance with standard horticultural practice and as approved by the Engineer.

5. Removing topsoil to its full depth from designated areas and stockpiling on site where directed by the Engineer for future use.

6. Disposing from the site all debris resulting from work under this Section.

1.02 QUALITY ASSURANCE

A. Codes and Standards: State and Local laws and code requirements shall govern the hauling and disposal of trees, shrubs, stumps, roots, rubbish, debris, and other matter.

1.03 GUARANTEE

A. The Contractor shall guarantee the Work performed under this Section will not permanently damage trees, shrubs, or plants designated to remain, or other adjacent work or facilities. If damage resulting from the Contractor's operations appears during the period up to 24 months after completion of the project the Contractor shall replace damaged items at his expense.

1.04 STREET AND ROAD BLOCKAGE

A. Closing of streets and roads during progress of the work shall be in compliance with the requirements of the Owner and other authorities having jurisdiction. Access shall be provided to all facilities remaining in operation.

1.05 PROTECTION OF PERSONS AND PROPERTY

A. All work shall be performed in such a manner to protect all personnel, workmen, pedestrians and adjacent property and structures from possible injury and damage.

B. All conduits, wires, cables and appurtenances above or below ground shall be protected from damage.

C. Provide warning and barrier fence where shown on the Drawings and as specified herein.

D. The Contractor shall return damaged facilities caused by Contractor's operations to original condition satisfactory to the Engineer.

PART 2 – EXECUTION

2.01 CLEARING OF SITE

A. Before removal of topsoil, and start of excavation and grading operations, the areas within the clearing limits shall be cleared and grubbed.

B. Clearing shall consist of cutting, removal, and satisfactory disposal of all trees, fallen timber, brush, bushes, rubbish, sanitary landfill material, fencing, and other perishable and objectionable material within the areas to be excavated or other designated areas. Prior to the start of construction, the Contractor shall survey the entire Contract site and shall prepare a plan which defines the areas to be cleared and grubbed, trees to be pruned, extent of tree pruning, and/or areas which are to be cleared but not grubbed. This plan shall be submitted to the Engineer for approval. Should it become necessary to remove a tree, bush, brush or other plants adjacent to the area to be excavated, the Contractor shall do so only after permission has been granted by the Engineer.

C. Excavation resulting from the removal of trees, roots and the like shall be filled with suitable material, as approved by the Engineer, and thoroughly compacted.

D. Unless otherwise shown or specified, the Contractor shall clear and grub a strip at least 15-ft. wide along all permanent fence lines installed under this Contract.

E. In temporary construction easement locations, only those trees and shrubs shall be removed which are in actual interference with excavation or grading work under this Contract, and removal shall be subject to approval by the Engineer. However, the Engineer reserves the right to order additional trees and shrubs removed at no additional cost to the Owner, if such, in his

opinion, are too close to the work to be maintained or have become damaged due to the Contractor's operations.

2.02 STRIPPING AND STOCKPILING EXISTING TOPSOIL

A. Existing topsoil and sod on the site within areas designated on the Drawings shall be stripped to whatever depth it may occur and stored in locations directed by the Engineer.

B. The topsoil shall be free of stones, roots, brush, rubbish, or other unsuitable materials before stockpiling the topsoil.

C. Care shall be taken not to contaminate the stockpiled topsoil with any unsuitable materials.

2.03 GRUBBING

A. Grubbing shall consist of the removal and disposal of all stumps, roots, logs, sticks and other perishable materials to a depth of at least 6-inches below ground surfaces.

B. Large stumps located in areas to be excavated may be removed during grading operations, subject to the approval of the Engineer.

2.04 DISPOSAL OF MATERIAL

A. All debris resulting from the clearing and grubbing work shall be disposed of by the Contractor as part of the work of this Contract. Material designated by the Engineer to be salvaged shall be stored on the construction site as directed by the Engineer for reuse in this Project or removal by others.

B. Burning of any debris resulting from the clearing and grubbing work will not be permitted at the site.

2.05 WARNING AND BARRIER FENCE

A. If required by the Contractor’s activities, the fence shall be made of a visible, lightweight, flexible, high strength polyethylene material. The fence shall be Guardian Visual Barrier as manufactured by TEMAX, or equal.

B. Physical Properties

Fence	
Color	International Orange
Roll Size	4' x 100'
Roll weight	9 lbs.
Mesh opening	1-3/4" x 1-3/4"
Posts	

ASTM Designation:	ASTM 702
Length:	6 feet long (T-Type)
Weight:	1.25 #/Foot (min)
Area of Anchor Plate:	14 Sq. In.

C. Drive posts 18 inches into ground every 8'. Wrap fence material around first terminal post allowing overlap of one material opening. Use metal tie wire or plastic tie wrap to fasten material to itself at top, middle and bottom. At final post, cut with utility knife or scissors at a point halfway across an opening. Wrap around and tie at final post in the same way as the first post.

D. Use tie wire or tie wrap at intermediate posts and splices as well. Thread ties around a vertical member of the fence material and the post and bind tightly against the post. For the most secure fastening, tie at top, middle and bottom. Overlap splices a minimum of four fence openings, tie as above, fastening both edges of the fence material splice overlap.

END OF SECTION

SECTION 31 23 19

GROUNDWATER MONITORING, CONTROL, AND DEWATERING

PART 1 – GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials, equipment and incidentals, and perform all work necessary to monitor and control the groundwater levels to permit construction to be performed in dry conditions and mitigate buoyancy and hydrostatic pressure.

1. When Digester Tanks are dewatered, if the groundwater level in the vicinity of the work area exceeds elevation +3.0 Nassau County Datum (NCD), the tanks and adjoining buildings may be subject to buoyancy and hydrostatic pressures that may damage the subgrade or structure.

2. Each digester is equipped with twelve (12) groundwater relief valves installed in the sidewall at elevation +2.5 NCD and equally spaced around the circumference of each digester. When the groundwater exceeds elevation +2.5 NCD, groundwater will enter the tank automatically. If at any time groundwater exceeds elevation +2.0 NCD, and the water level in the tank is not at elevation +2.0 NCD, the tank will need to be manually filled to groundwater elevation.

3. Groundwater monitoring records indicate the normal groundwater level at the site varied between approximate elevation +1.0 and +3.0 NCD.

B. The Contractor shall inspect and rehabilitate as needed existing groundwater monitoring wells/piezometers and measure, record and report the levels/hydraulic head of groundwater as required during the project.

C. When the requirements of the Contract require dry conditions to perform Contract Work in a timely fashion as indicated in the Contract Agreement, Contract Specifications and Contract Drawings, a dewatering system shall be implemented, as indicated herein. Major works requiring dewatering are the unwatering of the existing Digester Tanks for cleaning, repairs and rehabilitations to the tank structures. The dewatering system shall be operated continuously twenty-four (24) hours per day, seven (7) days per week during each phase of the work, until all work has been satisfactorily completed, and dewatering is no longer required

D. The work shall include the monitoring, testing, operation, maintenance, supervision, dewatering, and final dismantling and removal from the site of the dewatering system as described herein. It shall also include the cost of any replacement or rehabilitation of the subgrade or structures damaged due to the Contractors inability to control the groundwater below the specified levels, any dewatering system failures or Contractor negligence. The Contractor shall be responsible for compliance with all Federal, State and County regulations relating to this work.

E. Dewatering shall include the diversion, collection, and removal of all ice, snow and surface runoff from the work areas; and removal of groundwater from any new excavations which might be required within the work areas, to allow construction in dry conditions.

F. The Contractor shall provide standby equipment and power supply for maintaining uninterrupted construction dewatering.

G. The Contractor shall obtain and comply with all necessary permits from State and local agencies required for operation of the dewatering system, monitoring groundwater, and disposal of dewatering effluent.

H. The Contractor shall collect samples of the dewatering effluent as required by the applicable State and local permits and provide the services of a laboratory certified under the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) for the analyses of the samples collected to determine the quality of dewatering effluent prior to disposal.

I. In addition to groundwater dewatering, the existing tank pressure relief valves shall be rehabilitated as necessary and utilized to prevent uplift pressures on the unwatered Digester Tanks.

1.02 PAYMENT

A. Payment for the inspection, and rehabilitation if necessary, of the existing groundwater observation wells will be made under allowance as specified in Section 01 20 00 – Measurement and Payment and the Proposal.

B. Payment for the groundwater monitoring using the observation wells shall be per the Bid Item No. 1 Lump Sum as specified in Section 01 20 00 – Measurement and Payment and the Proposal.

C. Payment for the design and installation of a groundwater dewatering system shall be per the Bid Item No. 2 Lump Sum as specified in Section 01 20 00 – Measurement and Payment and the Proposal.

D. Payment for the operation and maintenance of the groundwater dewatering system shall be per Bid Item No. 4 Unit Price as specified in Section 01 20 00 – Measurement and Payment and the Proposal.

E. The cost of any replacement or rehabilitation of subgrade or structures as described above in Section 1.01 E shall be the responsibility of the Contractor.

1.03 RELATED SECTIONS

A. Section 01 20 00 – Measurement and Payment

B. Section 02 24 20 - Soil Sampling and Analysis

C. Section 31 25 00 - Dust, Soil Erosion and Sediment Control

1.04 DEFINITIONS

A. Definitions

1. Construction Dewatering: Controlling groundwater levels, hydrostatic pressures and controlling surface water, such that work required on the Contract Drawings can be performed to required depths in substantially dry and stable conditions.

2. Dewatering System: System of wells, well points, sumps, ejectors, pumps, piping, power supply, effluent treatment equipment and other equipment designed by the Contractor, submitted to and approved by the Engineer prior to dewatering, that will effectively dewater the site as required herein. Adequate monitoring wells/piezometers shall be included in the dewatering system to verify drawdown levels inside the work area and monitor groundwater levels outside the limits of the work area near adjacent structures.

B. Reference Standards

1. 6 NYCRR Part 750, State Pollutant Discharge Elimination System (SPDES) Permits

2. 6 NYCRR Part 601, Water Withdrawal Permitting, Reporting and Registration (Exclusive of Long Island Wells Regulated Under Part 602 of This Title)

3. 6 NYCRR Part 602, Applications for Long Island Wells

4. 6 NYCRR Part 621, Uniform Procedures

5. ASTM standards applicable to piping, equipment and other items required for a complete dewatering system

6. ASTM D1556 - Density of Soil in Place by the Sand Cone Method

7. ASTM D2167 - Density of Soil in Place by the Rubber Balloon Method

8. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

1.05 DESCRIPTION

A. Design Requirements

1. Groundwater Monitoring Wells

a. The Contractor shall inspect and test existing groundwater monitoring wells and rehabilitate them as necessary to restore original functionality. Existing groundwater monitoring wells locations and design are shown on the Contract Documents.

b. All observation wells shall be satisfactorily rehabilitated and proven to be functioning properly prior to commencement of dewatering.

c. The Contractor shall, by adding or removing water from the riser, demonstrate that observation wells are functioning properly. Proper functionality will be approved by the Engineer.

d. Following initial rehabilitation, if any observation well deemed critical by the County becomes inactive, damaged or destroyed, then the County shall suspend the work at no additional expense to the County. Work shall not commence until the critical observation well is repaired or replaced to the satisfaction of the County and reliable observations can be obtained.

2. Digester Groundwater Pressure Relief Valves

a. Each digester is equipped with twelve (12) groundwater relief valves installed in the sidewall and equally spaced around the circumference of each digester. The valves in Digesters 1, 3, and 4 are 6-inch in diameter. The Contractor shall remove each valve cover and replace the cover seal with a BUNA-N seal, remove the debris from the inside of the valve body, remove and clean the valve grate, and reassemble and ensure proper operation. If valves are deemed to be non-operational, they shall be replaced, refer to Section 40 05 68.23 – Miscellaneous Valves.

b. The Contractor shall channel all infiltrating groundwater and rainwater through the use of sandbags or other methods approved by the Engineer into the digesters center cone. The Contractor shall use a pump to remove accumulated groundwater from the center cone and discharge it to the Filtrate wet well.

3. Groundwater Dewatering System

a. The Contractor shall design, install, operate, maintain and remove the dewatering system as necessary to:

1) Lower and maintain groundwater levels to prevent buoyancy of the unwatered structure and relieve all hydrostatic pressure against the height of the tank walls and the lowest portion of the tank structures (elevation -11.83 NCD).

2) Prior to and during tank cleaning and rehabilitation activities maintain the hydrostatic level in the work area to a minimum of two (2) feet below the existing pressure relief valves at the tank wall footings.

a) The discharge outlets for the pressure relief valves are indicated to be at approximate elevation +2.5 NCD, at each tank, according to the As-Built information. These elevations should be verified by the Contractor prior to installing the dewatering system.

3) The Contractor shall provide primary and standby power, including all costs for installation, energy and fuel.

   a) The primary power shall be temporary electric service from the Plant, and the standby power shall be supplied by diesel powered engine generators supplied by the Contractor.

   b) The Contractor shall make all necessary arrangements for a temporary power service, and provide all necessary accessories required. No temporary overhead power lines will be permitted beyond the Plant's existing fence line.

   c) An alarm shall be installed at the standby power station to signal the loss of the primary power source.

   d) An automatic switch shall be installed to change from electric to generators, in the event of primary power loss. For any fuel powered system the Contractor shall maintain a five (5) day fuel supply onsite. Storage of fuel shall include a secondary containment structure, in accordance with Nassau County Fire Marshall's Office (Article III of Nassau County Fire Prevention Ordinance.)

4) The Engineer will perform inspections and witnessing of:

   a) Testing of sand and silt from dewatering wells.

   b) Drawdown and performance testing of Dewatering System.

   c) Performance testing of standby power source and backup Dewatering System.

5) The method of dewatering and control of water shall be selected by the Contractor who shall be solely responsible for the location, arrangement and depth of any system(s) selected to accomplish the Work. The Contractor shall construct protective works as necessary to dewater, cut off porous zones of fill and direct the flow of water from whatever source away from the work area and adjacent areas. Protective works shall include slurry methods, grouting, clay seepage plugs, toe drains with appropriate filters, deep wells, well points, sumps, dikes, ditches and all supporting features as required, but not specifically shown on the Contract Drawings.

6) The dewatering shall be accomplished in a manner that will prevent the loss of fines, seepage, boils, quick conditions or softening of the foundation strata, and will result in relief of all hydrostatic pressure on the tank structures and all construction operations being performed in the dry.

7) The dewatering system shall be designed to treat dewatering effluent to comply with all necessary permits and/or applications for disposal of dewatering effluent.

8) The Contractor shall manage and dispose of all groundwater removed during dewatering activities in accordance with either New York State Pollutant Discharge Elimination System (SPDES) standards set by the New York State DEC for discharge to surface water. The Contractor shall acquire all permits and/or applications for water withdrawal and disposal of dewatering effluent. It shall be the Contractor's responsibility to update permits to match their final dewatering system design.

4. Special Monitoring

a. Vertical Control

1) At a minimum, the Contractor shall establish vertical control points for monitoring tank movement due to uplift caused by hydrostatic pressure and settlement during dewatering at the following locations:

a) At each of the four compass points, on all nine of the Digester Tanks

b) Between the digester tanks on four sides of the Digester Control Building.

2) At least one (1) week prior to the start of work and prior to initiating any dewatering operations, the Contractor shall take and record the elevation of each of the vertical control points a minimum of two (2) times. Starting at the initiation of the tank unwatering, the Contractor shall take and record the elevation of each point on a daily basis with reports submitted to the County on a weekly basis.

3) In the event that the elevation changes by 0.25 inches from the initial readings, the Contractor shall notify the County immediately.

b. Crack Monitoring

1) Any building or tank cracks observed during either the installation of the vertical control points or the examination of the site shall be identified and a crack monitor shall be installed.

2) At least one (1) week prior to the start of any of unwatering work and prior to installing any dewatering wells, the Contractor shall take and record the measurement of each of the crack monitoring points for a minimum of two (2) days. Starting at the initiation of the unwatering work, the Contractor shall

take and record readings on a daily basis. Reports of all readings shall be submitted to the County on a weekly basis.

5. Emergency Plan

a. If during the tank unwatering and rehabilitation work, the groundwater level rises above Elevation +2.0 NCD for whatever reason, all tank unwatering shall be discontinued and the tanks shall be flooded to groundwater elevation.

b. The Contractor shall have in place, pipe and pumps of sufficient size and quantity to be able to simultaneously flood the structures and any within 12 hours in an emergency situation; as demonstrated by computations prepared by the Contractor and submitted to and approved by the County. All additional work to restore the working area shall be carried out by the Contractor at no additional cost to the County.

c. The Contractor shall obtain the County's approval for this emergency plan and procedures, prior to construction.

1.06 QUALITY ASSURANCE

A. The dewatering Work shall be performed by an entity specializing in and having experience with installing and operating dewatering systems in similar subsurface conditions for at least 5 years.

B. The dewatering system shall be designed by a Professional Engineer registered in the State of New York having experience in designing a system in similar site conditions.

C. Well drillers shall be licensed in the State of New York.

1.07 SUBMITTALS

A. The Contractor shall submit Shop Drawings and the following for the approval by the Engineer:

1. Pre-construction Submittals:

a. Name and qualifications of dewatering subcontractor, if applicable, including a listing of recent dewatering installations.

b. Records of inspection, repairs and testing of functionality of existing groundwater observation wells.

c. Emergency Plan as dictated in Section 1.05.A.3.

d. A Dewatering Plan shall be submitted to the Engineer for approval, at least 30 calendar days prior to the scheduled date for commencement of the dewatering Work, and to the NYSDEC, as applicable. Approval of the Dewatering Plan by the Engineer shall not in any way relieve the Contractor from full responsibility for the

complete and adequate design and performance of the dewatering system to provide the necessary construction dewatering. At a minimum, the Dewatering Plan shall include the following:

1) Design Calculations

   a) Design calculations confirming the adequacy of the proposed dewatering system, including depths to groundwater within the area of work.

   b) Calculations and requisite technical data on well screens and filter materials and gradations to demonstrate the adequacy of proposed systems to prevent the pumping of fines.

   c) Shop Drawings shall be prepared by a qualified Registered Professional Engineer, licensed in New York State, and shall bear his seal and signature.

2) Shop Drawings

   a) Shop drawings showing the proposed types and planned locations of surface water control and the dewatering system to be used.

   b) Shop drawings shall include the arrangements, locations and depths of the dewatering system, a complete description of equipment and materials to be used and the procedures to be followed in installation, operation and maintenance in relation to the proposed sequence of digester cleaning and rehabilitation.

   c) Shop drawings shall show relationship of the observation wells, dewatering system and discharge line to existing buildings, other structures, utilities, streets and new construction shall be clearly indicated. Utility locations shall be shown.

   d) The standby equipment and standby power supply details.

   e) The proposed locations and sizes of effluent treatment equipment, effluent flow equalization tanks and discharge of water.

   f) Location and size of sumps, ditches and water discharge lines, including their relation to water disposal points.

   g) Submittals shall also include discharge details, metering, and monitoring schedules and the details of the settling tank and oil/water separator.

h) Methods and equipment to be used for drilling, construction, and development of wells and piezometers.

i) Protocols to be followed for the sampling and analysis of dewatering effluent, and the name and qualifications of the laboratory that will be testing the quality of dewatering effluent prior to disposal.

j) Protocols to be followed for treatment of effluent in conformance with the requirements of the applicable permits.

k) Shop Drawings shall be prepared by a qualified Registered Professional Engineer, licensed in New York State, and shall bear his seal and signature.

3) A sample of all well record forms, weekly reports, daily observation well reports, and settlement report forms, to be maintained during construction.

2. As-built Submittals: Prior to the start of construction dewatering, submit as-built conditions of the dewatering system. As-built data are to include but are not limited to:

a. Plans and sections showing as-built locations, and surveyed elevations of the dewatering system and its components.

b. Drawings to indicate changes made to the original shop drawings to accommodate field conditions and to comply with design standards.

c. Details of installation including dimensions and materials used, description and drawings of all installations, all procedures, soil strata encountered and logs with descriptions of soil samples and stratification.

d. Details of each sump, well, well point, observation well, and piezometer installed, including, but not limited to, the diameters of the borehole and the components, screen type, screen opening size, screen top and bottom elevations, details of filter, seal and grout, pump type, and capacity if installed within. These details should be provided to the Engineer within a week of installation of each entity. The details shall be re-submitted if any part of the entity changes during construction.

3. Regulatory Compliance: Prior to the start of construction dewatering, submit a report comparing site groundwater quality data with the water quality standards to be complied with under permit(s) as applicable to the project. The permitting requirements to be considered under the Work of this section include, but may not be limited to:

a. NYSDEC SPDES Discharge Permit(s) - General or Individual Permits - for dewatering effluent or storm water discharges from construction activities at the project site.

b. Water Withdrawal and Long Island Well Permits, if applicable, in association with construction dewatering.

c. The Contractor shall be responsible for compliance with all dewatering permit requirements including renewals once construction dewatering begins.

4. During Construction:

a. Weekly Dewatering System Monitoring Reports: In each week throughout the work, a weekly monitoring report for the dewatering system shall be submitted. No payment for dewatering expenses shall be made unless all of the weekly monitoring reports for the time period involved have been submitted.

1) For observation wells, daily piezometric levels. Entries shall be identified by date, time, well number and system (subsystem if multiple pumps are used) pumping rate. Piezometric levels shall be noted in feet of drawdown and groundwater elevation.

2) For dewatering wells, suspended material test results. Entries shall be identified by date, time, well number, well pumping rate (if monitored) and system (subsystem if multiple pumps are used) pumping rate.

3) Installation records for new observation wells or dewatering wells.

4) Daily operating log which shall include the following data as a minimum, maintenance tests and water quality tests for suspended matter at the discharge point including time of day and elapsed times of tests, daily discharge rates, installation and removal of wells, and general observations on the system such as equipment running times, and failures.

5) For vertical control (uplift or settlement) points, daily readings of elevations and computed changes in elevation for each control point. Entries shall be identified by date, time and control point number.

6) For crack monitoring points, daily readings of changes in the cracks. Entries shall be identified by date, time and crack monitoring point number.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Groundwater Observation Wells

1. Piezometric Levels and Monitoring Equipment

a. Self-Contained Water Level Meters

1) Solinst Model 101 or equal.

b. Automatic Continuous Water Level Recorder

1) Stevens Type F or equal

B. Special Monitoring

1. Crack Monitoring

a. The crack monitor shall be Avongard Calibrated Crack Monitor or equal, as approved by the Engineer.

2.02 MATERIALS AND EQUIPMENT

A. Groundwater Observation Wells

1. Contractor shall provide and maintain water level monitoring equipment consisting of the following:

a. Two (2) self-contained water level meters with both an audio and a visual indicator signal system; Solinst Model 101 or equal.

b. One (1) automatic continuous water level recording unit, Stevens Type F or equal. The unit shall be equipped with a protective enclosure to permit mounting on the observation wells. The enclosures shall be designed to minimize environmental damage while facilitating easy access or water level reading. The water level recording unit shall be capable of recording a permanent record of ground water levels versus time, and shall include date and time which readings are taken.

c. One of the self-contained water level indicators shall be provided to the County for their exclusive use during the dewatering phase of the project. The automatic recording units and protective enclosures shall be installed on one observation well to be designated by the County. The automatic recording unit shall be relocated during each phase of the work, adjacent to the digester tank being unwatered during that phase of the work. During the dewatering phase of the project, the Contractor will relocate the automatic recording unit and protective enclosure as directed by the County.

d. The Contractor shall maintain the monitoring equipment for the duration of the project, until such time that all unwatering of digester tanks has been completed, or as directed by the County. The equipment and enclosure shall become the property of the County at the end of the dewatering phase of the project.

PART 3 – EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Groundwater Dewatering System

1. Sampling After Installation

a. After installation, each well shall be pumped individually, or the wellpoint system shall be pumped as a system at its maximum or design flow, and a water sample taken to determine the sand and silt content of discharge water with an Imhoff settling cone as described in "Ground Water Manual" (US Bureau of Reclamation, pages 398-400). Imhoff cones shall be furnished by the Contractor of the type so that the volume of settled material can be estimated to 0.01 milliliters.

b. Samples shall be obtained from stopcocks located along the discharge lines at points of high turbulence or between 4 and 8 o'clock on the perimeter of straight sections of pipe. The stopcock shall be flushed for a few seconds prior to taking a sample. The sample shall be obtained with the stopcock fully open. After the 1-liter sample has been taken, the cone and its contents shall be set aside and the volume reading taken between 2 and 3 minutes of elapsed time.

1) All wells pumping 10 parts per million (0.01 milliliters = 10 ppm) or less sand and silt as measured above shall be accepted.

2) Wells pumping between 10 and 20 ppm may be accepted by the County based on the evaluation of average ppm for all wells, ppm of adjacent wells, and total quantity of water which is actually pumped to dewater the site.

3) Wells pumping more than 20 ppm shall be abandoned and backfilled as described elsewhere.

2. Monitoring

a. The Contractor shall continue monitoring ppm of suspended material in the discharge water of each well, or for the entire system in the case of a wellpoint system, at least once every two days throughout the dewatering operations. If the quantity of suspended material increases during the life of the system, the wells or wellpoints shall be replaced in accordance with the criteria stated above.

3. Records

a. The Contractor shall maintain a dewatering well installation record which shall include a well identification number, location, and dimensions; drilling method and materials used, well development procedures, and test results for suspended material in discharge water.

4. Standby Dewatering System Requirements

a. The Contractor shall provide a complete 100 percent standby power system and power supply lines as described herein; and a 15 percent minimum increase in the number of wells, and related equipment above that required for the operating dewatering system for each phase of the work, as demonstrated by computations submitted to and accepted by the Engineer for the County, all installed and ready to operate.

b. The Contractor shall furnish sufficient standby power units for the standby power system. In the event individual power supply units are provided for each pump, individual power supply units shall be installed and operating, or ready to operate, for each installed pump including those provided as part of the standby system.

c. The unit and distribution wiring shall be installed in such a way that portions of the dewatering system and other temporary facilities requiring power may be isolated for routine maintenance or repair, in case of accidental damage, without affecting the normal operation of the system.

3.02 IMPLEMENTATION

A. Groundwater Dewatering System

1. Dewatering Performance Criteria Testing

a. During some periods of construction, the groundwater level may be below the required drawdown level, as a result of dewatering operations by others at the Cedar Creek Water Pollution Control Plant. At those times, the Contractor will be required to test only those components of the dewatering system which are in use.

b. Only after the entire approved dewatering system has been installed, tested to the County's satisfaction, and all temporary earth support systems within the affected drawdown area have been installed to their full depth will dewatering be allowed. The Contractor shall dewater to the minimum stated requirements and meet the following performance criteria:

1) Shut off the primary power source and demonstrate that the standby power can be activated prior to the groundwater level rising to elevation +1.5 NCD, one (1) foot below of the pressure relief valves, and that the standby power source is adequate to draw the groundwater level back down to the Contractor's design depth or to the minimum required depths.

2) Shut off one segment of the system and show that redundant components can be activated prior to the groundwater level rising to within one (1) foot of the bottom of the lowest level of the tank structures, or within six (6) feet of the bottom of the footing of the exterior wall of the tank being unwatered,

whichever is deeper, and that the system is adequate to draw the groundwater level back down to the minimum required depths.

c. If the dewatering system fails to meet the performance requirements during testing in either of the above, the Contractor shall add wells, or perform any other work or alteration to the system such that the system when re-tested will be in conformance with these requirements. This shall be done at no additional cost to the County.

d. The performance of the standby system and all components shall be tested at least every two weeks. Testing after performance of the system has been verified and accepted shall consist of demonstrating that the system and components are operational.

2. Dewatering System Failure

a. If the dewatering requirements are not satisfied due to failure of the dewatering system, then loosening of the foundation strata, or damage to the structures may result. The Contractor shall provide in-situ density tests immediately above and at the structure founding grades. In-situ density testing shall conform to ASTM D1556 or D2167. Should any failure of the dewatering systems occur, to the extent that founding soils may have been disturbed, additional in-situ tests will be required by the County, as described above.

b. If additional tests show a marked decrease in density, such that the competency of the subgrade is impaired, the Contractor shall be responsible for removing all of the affected soils, as defined by density tests, and replacing them as compacted backfill. The Contractor shall supply all labor and materials and perform all work necessary to completely repair or replace any damaged structures or foundation soils to a condition satisfactory to the County and at no additional cost to the County. In addition, the Contractor shall carry out all soil and any other tests required by the County to demonstrate that the foundation soils and/or structures have been repaired and returned to a state measurably equal to or better than the in-situ conditions or state existing before failure occurred.

3. Surface Water

a. Surface water on and around the site shall be collected into local sumps by means of trenches, pipes, or other means. All collected surface water should be discharged in a manner in accordance with the Stormwater Pollution Prevention Plan (SWPPP).

3.03 FIELD TESTING AND QUALITY CONTROL

A. Inspection

1. The County will perform inspections including pertinent quality control tests and surveys during the work. The Contractor shall cooperate with the County and provide them safe

access to the inspection locations in order to perform their work. Where necessary, the Contractor shall cease work while the inspections are being performed.

2. The following are hold points requiring witnessing or approval by the County prior to further construction and for which prior notification is necessary:

   a. Installation and testing of the observation wells.

   b. Unwatering the Digester Tanks.

   c. Testing of sand and silt content of discharge water from dewatering wells.

   d. Drawdown testing and performance testing of the dewatering systems.

   e. Performance testing of standby power source, redundant dewatering components, dewatering wells and observation wells every two weeks.

   f. Monitoring of the long-term silt and sand content of dewatering system water at the discharge point.

   g. Assess the stability and integrity of subgrade, and structures in the event of failure of the dewatering system.

   h. Rewatering of site and removal of dewatering system.

3. Written approval by the County to the Contractor which will identify that particular item of work which is being approved is required prior to continuing with the work.

4. Where hold points do not meet approval or where any other inspections by the County indicate nonconformance to these requirements, both oral and written notification of such will be transmitted to the Contractor.

3.04 ADJUSTING, PROTECTION, AND CLEANUP

A. Prior to shutting down any dewatering system, the Contractor shall obtain approval in writing from the County to do so.

B. As the dewatering system is shut down, the Contractor ensure that the level of digester contents is at a higher level than the rising groundwater on the outside. This shall be done until the groundwater level has reached its static level.

C. Following construction, The Contractor shall follow County instruction on how to turnover the existing dewatering wells, wellpoints, and buried and surface piping, cables, pump foundations, and structural supports.

D. The Contractor shall provide documentation of dewatering and observation well removal. At a minimum, this shall include date of removal, well number, location, procedures, and materials used.

END OF SECTION

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SECTION 32 11 00

SURFACE RESTORATION

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Provide all labor, equipment, and materials necessary for final grading, topsoil placement, and miscellaneous site work not included under other Sections but required to complete the work as shown on the Drawings and specified herein.

PART 2 – MATERIALS

2.01 TOPSOIL

A. Topsoil shall be approved by the Engineer.

PART 3 – EXECUTION

3.01 FINAL GRADING

A. Following approval of rough grading the subgrade shall be prepared as follows:

1. For riprap, bare soil 24 inches below finish grade or as directed by Engineer.

2. For topsoil, scarify 2-inches deep at 4 inches below finish grade.

3.02 TOPSOIL PLACEMENT

A. Topsoil shall be placed over all areas disturbed during construction under any contract except those areas which will be paved, graveled or rip rapped.

B. Topsoil shall be spread in place for lawn and road shoulder seed areas at a 4-inch consolidated depth and at a sufficient quantity for plant beds and backfill for shrubs and trees.

C. Topsoil shall not be placed in a frozen or muddy condition.

D. Final surface shall be hand or mechanically raked to an even finished surface to finish grade as shown on Drawings.

E. All stones, roots over 4-inches,rubbish, and other deleterious materials shall be removed and disposed of.

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SECTION 40 05 00

BASIC MECHANICAL REQUIREMENTS

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install to the required line and grade, all piping together with all fittings and appurtenances, required for a complete installation. All piping located outside the face of structures or building foundations and all piping embedded in concrete within the structure or foundation shall be considered exterior piping.

B. The Contractor shall furnish and install fittings, couplings, connections, sleeves, adapters, harness rods and closure pieces as required to connect pipelines of dissimilar materials and/or sizes herein included under this Section and other concurrent Contracts for a complete installation.

C. The Contractor shall furnish all labor, materials, equipment, tools, and services required for the furnishing, installation and testing of all piping as shown on the Drawings, specified in this Section and required for the Work. Piping shall be furnished and installed of the material, sizes, classes, and at the locations shown on the Drawings and/or designated in this Section. Piping shall include all fittings, adapter pieces, couplings, closure pieces, harnessing rods, hardware, bolts, gaskets, wall sleeves, wall pipes, hangers, supports, and other associated appurtenances for required connections to equipment, valves, or structures for a complete installation.

D. Piping assemblies under 4inch size shall be generally supported on walls and ceilings, unless otherwise shown on the Drawings or ordered by the Engineer, being kept clear of openings and positioned above "headroom" space. Where practical, such piping shall be run in neat clusters, plumb and level along walls, and parallel to overhead beams. All piping, including temporary piping shall have a minimum clearance of 7’-6” above finished floor elevation. .

E. The Contractor shall provide taps on piping where required or shown on the Drawings. Where pipe or fitting wall thicknesses are insufficient to provide the required number of threads, a boss or pipe saddle shall be installed.

F. The work shall include, but not be limited to, the following:

1. Connections to existing pipelines.

2. Installation of all new pipe and materials required for a complete installation.

3. Cleaning, testing and disinfecting as required.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Division 01 – General Requirements

B. Division 02 – Existing Conditions

C. Division 05 – Metals

D. Division 09 – Finishes

E. Division 26 – Electrical

F. Division 46 – Water and Wastewater Equipment

1.03 MATERIAL CERTIFICATION AND SHOP DRAWINGS

A. The Contractor shall furnish to the Owner (through the Engineer) a Material Certification stating that the pipe materials and specials furnished under this Section conform to all applicable provisions of the corresponding Specifications. Specifically, the Certification shall state compliance with the applicable standards (ASTM, AWWA, etc.) for fabrication and testing.

B. Shop Drawings for major piping (2-inches in diameter and greater) shall be prepared and submitted in accordance with Section 01 33 00 – Submittal Procedures. In addition to the requirements of Section 01 33 00 – Submittal Procedures, the Contractor shall submit laying schedules and detailed Drawings in plan and profile for all piping as specified and shown on the Drawings.

C. Shop Drawings shall include, but not be limited to, complete piping layout, pipe material, sizes, class, locations, necessary dimensions, elevations, supports, hanger details, pipe joints, and the details of fittings including methods of joint restraint. No fabrication or installation shall begin until Shop Drawings are approved by the Engineer.

PART 2 – PRODUCTS

2.01 GENERAL

A. All specials and every length of pipe shall be marked with the manufacturer's name or trademark, size, class, and the date of manufacture. Special care in handling shall be exercised during delivery, distribution, and storage of pipe to avoid damage and unnecessary stresses. Damaged pipe will be rejected and shall be replaced at the Contractor's expense. Pipe and specials stored prior to use shall be stored in such a manner as to keep the interior free from dirt and foreign matter.

B. Testing of pipe before installation shall be as described in the corresponding ASTM or AWWA Specifications and in the applicable standard specifications listed in the following sections. Testing after the pipe is installed shall be as specified in Part 3.

C. Joints in piping shall be of the type as specified in the appropriate Piping System Schedule in Section 40 06 20 – Process Pipe and Valve Schedules.

2.02 WALL PIPES

A. Where wall sleeves or wall pipes occur in walls that are continuously wet on one or both sides, they shall have water stop flanges at the center of the casting or as shown on the Drawings. Ends of wall pipes shall be flange, mechanical joint, plain end, or bell as shown on the Drawings, or as required for connection to the piping. Wall pipes shall be of the same material as the piping that they are connected to. If welded waterstop flanges are employed, welds shall be 360 degree continuous on both sides of flange. Unless otherwise shown on the Drawings, waterstop flanges shall conform to the minimum dimensions shown below:

Pipe Size	**Waterstop Flange Diameter**	**Waterstop Flange Thickness**
4" - 12"	OD + 3.10"	0.50"
14" - 24"	OD + 4.15"	0.75"
30" - 36"	OD + 4.50"	1.00"
42" - 48"	OD + 5.00"	1.25"
54"	OD + 5.90"	1.50"

2.03 FLUSHING CONNECTIONS

A. Flushing connections shall be 1” female threaded hose bibb connections.

2.04 SLEEVES

A. Unless shown otherwise, all piping passing through walls and floors shall be installed in sleeves or wall castings accurately located before concrete is poured or placed in position during construction of masonry walls. Sleeves passing through floors shall extend from the bottom of the floor to a point 3 inches above the finished floor, unless shown otherwise. Water stop flanges are required on all sleeves located in floors or walls which are continually wet or under hydrostatic pressure on one or both sides of the floor or wall.

B. Sleeves shall be cast iron, black steel pipe, or fabricated steel in accordance with details shown on the Drawings. If not shown on the Drawings, the Contractor shall submit to the Engineer the details of sleeves he proposes to install; and no fabrication or installation thereof shall take place until the Engineer's approval is obtained. Steel sleeves shall be fabricated of structural steel plate

in accordance with the standards and procedures of AISC and AWS. Steel sleeve surfaces shall receive a commercial sandblast cleaning and then be shop painted in accordance with Section 09 90 00 – Painting.

C. When shown on the Drawings or otherwise required, the annular space between the installed piping and sleeve shall be completely sealed against a maximum hydrostatic pressure of 20 psig. Seals shall be mechanically interlocked, solid rubber links, trade name "Link-Seal", as manufactured by Garlock Pipeline Technologies (GPT) or equal. Rubber link, seal-type, size, and installation thereof, shall be in strict accordance with the manufacturer's recommendations. For non-fire rated walls and floors, pressure plate shall be glass reinforced nylon plastic with EPDM rubber seal and 316 stainless steel bolts and nuts. For fire rated walls and floors, two independent seals shall be provided consisting of low carbon steel, zinc galvanized pressure plates, silicon rubber seals and 316 stainless steel bolts and nuts.

D. Cast iron mechanical joint adapter sleeves shall be Clow # 1429, as manufactured by the Clow Corp., or equal. Mechanical joint adapter sleeves shall be provided with suitable gasket, follower ring, and bolts to affect a proper seal. In general, sleeves installed in walls, floors, or roofs against one side of which will develop a hydrostatic pressure, or through which leakage of liquid will occur, shall be so sealed. If welded waterstop flanges are employed, welds shall be 360 degree continuous on both sides of flange.

PART 3 – EXECUTION

3.01 INSTALLATION

A. All piping shall be installed by skilled workmen and in accordance with the best standard practice for piping installation as shown on the Drawings, specified or recommended by the pipe manufacturer. Proper tools and appliances for the safe and convenient handling and installing of the pipe and fittings shall be used. Great care shall be taken to prevent any pipe coating from being damaged on the inside or outside of the pipe and fittings. All pieces shall be carefully examined for defects, and no piece shall be installed which is known to be cracked, damaged, or otherwise defective. If any defective pieces should be discovered after having been installed, it shall be removed and replaced with a sound one in a satisfactory manner by the Contractor and at his own expense. Pipe and fittings shall be thoroughly cleaned before they are installed and shall be kept clean until they are accepted in the complete work. All piping connections to equipment shall be provided with unions or coupling flanges located so that piping may be readily dismantled from the equipment. At certain applications, Dresser, Victaulic, or equal, couplings may also be used. All piping shall be installed in such a manner that it will be free to expand and contract without injury to itself or to structures and equipment to which it is connected. All piping shall be erected to accurate lines and grades with no abrupt changes in line or grade and shall be supported and braced against movement, temporary, or permanent. All exposed piping shall be installed with vertical and horizontal angles properly related to adjoining surfaces or pipes to give

the appearance of good workmanship. Unless otherwise shown or approved, provided a minimum headroom clearance under all piping of 7 feet 6 inches.

B. Unless otherwise shown or specified, all waste and vent piping shall pitch uniformly at a 1/4-inch per foot grade and accessible cleanouts shall be furnished and installed as shown and as required by local building codes. Installed length of waste and vent piping shall be determined from field measurements in lieu of the Drawings.

C. All exposed piping shall be installed with vertical and horizontal angles properly related to adjoining surfaces or pipes to give the appearance of good workmanship. Pipes crossing within a vertical distance of less than or equal to one (1) foot shall be encased and supported with concrete at the point of crossing to prevent damage to the adjacent pipes as shown on the Drawings.

D. Proper and suitable tools and appliances for the safe convenient handling and laying of pipe shall be used and shall in general agree with manufacturer's recommendations.

E. AT THE CLOSE OF EACH WORKDAY, THE END OF THE PIPELINE SHALL BE TIGHTLY SEALED WITH A CAP OR PLUG SO THAT NO WATER, DIRT, OR OTHER FOREIGN SUBSTANCE MAY ENTER THE PIPELINE, AND THIS PLUG SHALL BE KEPT IN PLACE UNTIL PIPE LAYING IS RESUMED.

F. During the laying of pipe, each pipe manufacturer shall provide his own supervisor to instruct the Contractor's pipe laying personnel in the correct procedure to be followed.

G. Ordinarily only full lengths of pipe (as furnished by the pipe manufacturer) shall be used exceptions: closure pieces at manholes and areas where joint deflection is required.

H. A minimum of #4 gauge copper wire shall be installed directly above all piping under 4-inch.

3.02 CARBON AND STAINLESS STEEL PIPE

A. Installation of steel pipe shall be by skilled workmen and shall conform to the applicable sections of AWWA Manual M-11. Joints for steel piping shall be either screwed, welded, or flanged as shown on the Drawings or as specified.

B. Welding in the field shall be performed only when requested on the shop drawings and permitted by the Engineer for carbon steel pipe. No welding of stainless steel pipe shall be allowed in the field. All field welds shall be radiographically inspected.

C. Installation of the steel casing pipe shall be by skilled workmen and in accordance with the best standard practice for steel pipe installation. Joints for steel casing pipe shall be butt welded.

3.03 JOINTS IN PIPING

A. Restrained joints shall be provided on all pipe joints as specified herein and shown on the Drawings. Restrained joints shall be made up similar to that for push-on joints.

B. Push-on joints include a single rubber gasket which fits into the bell end of the pipe. The gasket shall be wiped clean, flexed and then placed in the socket. Any bulges in the gasket which might interfere with the entry of the plain end of the pipe shall be removed. A thin film of lubricant shall be applied to the gasket surface which will come into contact with the spigot end of the pipe. The lubricant shall be furnished by the pipe manufacturer. The plain end of the pipe, which is tapered for ease of assembly, shall be wiped clean and a thick film of lubricant applied to the outside. The pipe shall be aligned and carefully entered into the socket until it just makes contact with the gasket. The joint assembly shall be completed by entering the pipe past the gasket until it makes contact with the bottom of the socket. The pipe shall be pulled "home" with an approved jack assembly as recommended by the pipe manufacturer. If assembly is not accomplished by reasonable force, the plain end shall be removed, and the condition corrected.

C. Flanged joints shall be brought to exact alignment and all gaskets and bolts or studs inserted in their proper places. Bolts or studs shall be uniformly tightened around the joints. Where stud bolts are used, the bolts shall be uniformly centered in the connections and equal pressure applied to each nut on the stud. Pipes in all lines subject to temperature changes shall be cut short and cold sprung into place to compensate for expansion when hot.

D. Welded joints shall be made by competent operators in a first class workmanlike manner, in complete accordance with ANSI B31.1 and AWWA C206. Welding electrodes shall conform to ASTM A233, and welding rod shall conform to ASTM A251. Only skilled welders capable of meeting the qualification tests for the type of welding which they are performing shall be employed. Tests, if so required, shall be made at the expense of the Contractor, if so ordered by the Engineer. Unions shall be required adjacent to valves and equipment.

E. Dielectric isolation such as flange isolation kits, dielectric unions, or similar, shall be installed wherever dissimilar metals are connected according to the following table.

	Zinc	**Galvanized Steel**	**Aluminum**	**Cast Iron**	**Ductile Iron**	**Mild Steel/ Carbon Steel**	**Copper**	**Brass**	**Stainless Steel**
Zinc			•	•	•	•	•	•	•
Galvanized Steel			•	•	•	•	•	•	•
Aluminum	•	•		•	•	•	•	•	•

	Zinc	Galvanized Steel	Aluminum	Cast Iron	Ductile Iron	Mild Steel/ Carbon Steel	Copper	Brass	Stainless Steel
Cast Iron	●	●	●				●	●	●
Ductile Iron	●	●	●				●	●	●
Mild Steel/ Carbon Steel	●	●	●				●	●	●
Copper	●	●	●	●	●	●			●
Brass	●	●	●	●	●	●			●
Stainless Steel	●	●	●	●	●	●	●	●	

Notes:
● signifies dielectric isolation is required between the two materials noted.
Consult Engineer for items not listed in table.
Provide flange isolation kits for all flanged connections of dissimilar metals and hardware including connections to equipment.
Contractor shall include all isolation descriptions with piping submittals.

F. Eccentric reducers shall be installed where air or water pockets would otherwise occur in mains because of a reduction in pipe size.

3.04 FLUSHING AND TESTING

A. All piping shall be properly flushed and tested unless specifically exempted elsewhere in the Specifications or otherwise approved by the Engineer. Air and gas pipelines shall be flushed and tested with compressed air. All other liquid conveying pipelines shall be flushed and tested with water. The Contractor shall furnish and install all means and apparatus necessary for getting the air or water into the pipeline for flushing and testing including pumps, compressors, gauges, and meters, any necessary plugs and caps, and any required blow-off piping and fittings, etc., complete with any necessary reaction blocking to prevent pipe movement during the flushing and testing. All pipelines shall be flushed and tested in such lengths or sections as agreed upon among the Owner, Engineer, and Contractor. Test pressures shall be as specified in Section 40 06 20 – Process Pipe and Valve Schedules and shall be measured at the lowest point of the pipe segment being tested. The Contractor shall give the Owner and Engineer reasonable notice of the time when he intends to test portions of the pipelines. The Engineer reserves the right, within reason, to request flushing and testing of any section or portion of a pipeline.

B. The Contractor shall provide water for all flushing and testing of liquid conveying pipelines. Raw water or non-potable water may be used for flushing and testing liquid pipelines not connected to

the potable water system. Only potable water shall be used for flushing and testing the potable water system.

C. Air and gas piping shall be completely and thoroughly cleaned of all foreign matter, scale, and dirt prior to start-up of the air or gas system.

D. Compressed/service air and gas piping shall be flushed by removing end caps from the distribution lines and operating one (1) compressor, in accordance with the manufacturer's instructions.

E. All digester gas piping shall be leak tested by applying a soap solution to each joint.

F. During testing the piping shall show no leakage. Any leaks or defective piping disclosed by the leakage test shall be repaired or replaced by the Contractor, at his own expense, and the test repeated until all such piping shows tight.

G. Field leakage tests shall be performed for all submerged process air piping. The procedure shall consist of operating the system under clear non-potable water for visual identification of all leaks. All field leakage tests shall be witnessed by the Engineer. All submerged piping shall be installed free of any leaks.

H. After flushing, all liquid conveying pipelines shall be hydrostatically tested at the test pressure specified in the appropriate Piping System Schedule in Section 40 06 20 – Process Pipe and Valve Schedules. The procedure used for the hydrostatic test shall be in accordance with the requirements of AWWA C600. Each pipeline shall be filled with water for a period of no less than 24 hours and then subjected to the specified test pressure for 2 hours. During this test, exposed piping shall show no leakage. Allowable leakage in buried piping shall be in accordance with AWWA C600.

I. Any leaks or defective pipe disclosed by the hydrostatic test shall be repaired or replaced by the Contractor, at his own expense, and the test repeated until all such piping shows tight.

J. After flushing, all gas piping shall be leak tested in accordance with all local codes and regulations and in conformance with the recommendations or requirements of any National Institute or Association for the specific service application.

K. After flushing, all air piping shall be pressure and leak tested prior to coating and wrapping of welded joints. Immediately upon successful completion of the pressure and leak test, welded joints shall be thoroughly cleaned of all foreign matter, scale, rust, and discoloration and coated in accordance with the Specifications.

3.05 PAINTING AND COLOR-CODING SYSTEM

A. All exposed piping specified shall be color coded in accordance with the Owner's standard color designation system for pipe recognition and in accordance with Section 40 05 97 – Piping and

Equipment Identification Systems. In the absence of a standard color designation system, the Engineer will establish a standard color designation for each piping service category from color charts submitted by the Contractor in compliance with Section 09 90 00 – Painting.

B. All piping specified in this Section shall be painted in accordance with Section 09 90 00 – Painting, except as follows:

1. Copper pipe

2. Stainless steel pipe. Flanges and supports or hangers shall be painted.

END OF SECTION

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SECTION 40 05 07

PIPE SUPPORTS

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Furnish all equipment, labor, materials, and design calculations required to provide pipe supports in accordance with the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Division 03 – Concrete

B. Section 05 05 13 – Galvanizing

C. Section 05 05 23 – Metal Fastening

D. Section 05 10 00 – Metal Materials

E. Section 05 12 00 – Structural Steel

F. Section 40 05 00 – Basic Mechanical Requirements

1.03 SUBMITTALS

A. Pipe support submittals will not be reviewed prior to review and acceptance of pipe layout submittal. Pipe support submittal shall be fully coordinated with approved pipe layout submittal. Contractor shall use approved piping layout submittal drawings to show proposed pipe support type and location with accurate dimensions to demonstrate that supports meet all specified requirements.

B. Applicable and associated cut sheets and drawings for materials and support components shall be submitted with the Shop Drawings in accordance with or in addition to the submittal requirements specified in Section 01 33 00 – Submittals, Section 40 05 00 – Basic Mechanical Requirements and other referenced Sections above.

1. Catalog cut information on all system components such as pipe supports, hangers, guides, anchors, and channel-type supports.

2. Drawings of the piping support systems, locating each support, brace, hanger, guide, component and anchor. Identify support, hanger, guide and anchor type by catalog number and Shop Drawing detail number.

3. With each piping support system Shop Drawing, the Contractor shall attach calculations prepared and sealed by a Professional Engineer, licensed in the State or Commonwealth in which the project is located, showing that the piping support system complies with the specified requirements, including all building code and seismic code requirements pertaining to support of piping and other non-structural components.

4. Table showing the manufacturer's recommended hanger support spacing for PVC, CPVC and FRP pipe for the services listed in Section 40 06 20 – Process Pipe, Valve and Gate Schedules.

PART 2 – PRODUCTS

2.01 GENERAL

A. The Contractor shall be responsible for the design of all piping support systems unless noted otherwise herein. The absence of pipe supports and details on the Drawings shall not relieve the Contractor of the responsibility of providing a pipe support design sealed by a Professional Engineer, licensed in the State or Commonwealth in which the project is located. Standard details for pipe supports have been included on the Drawings to define minimum requirements as to the types of Contractors designed pipe supports that will be acceptable.

B. Where a specific location or type of support is shown on the Drawings, the location and type shall be incorporated in the Contractor's pipe support design.

C. Where special pipe support fabrications are required, products and execution shall be as specified in Section 05 50 00 – Metal Fabrications and other related and referenced Sections of the Specifications.

D. Existing piping support systems to support new piping shall only be used if the Contractor can show and demonstrate by submitting supporting calculations that they are adequate for the additional load imposed by the new piping, or if they are strengthened to support the additional load.

E. Contractor's pipe support design should include, but not be limited to, the following criteria and loads imposed on the piping system:

1. Thrust Loads based on the design pressures as specified in Piping Schedules in Section 40 06 20 – Process Pipe and Valve Schedules. Pipe support design shall not utilize process equipment for thrust restraint or support of piping loads.

2. Dead loads and live loads per the latest version of ASCE/SEI 7 or the local building code if more stringent. Loads shall include, but not be limited to, the following:

a. Weight of pipe

b. Weight of pipe contents

c. Weight of insulation

d. Ice loads (If applicable by location, ice loads per code shall be applied as indicated in the governing building code)

e. Seismic loading requirements and conditions as specified in the governing building code and referenced seismic design codes. Refer to the structural code drawing for project specific seismic design criteria. Seismic and sway bracing shall be provided at maximum 10-foot centers.

f. Wind loads

3. Loads associated with thermal expansion and contraction of the piping system over the full range of potential temperatures the piping system could experience that should include, but not be limited to, the following:

a. Ambient temperature range per local historical weather data (historic high and low obtained from NOAA)

b. Process operating temperature range

c. Exposure to sunlight where applicable

4. Additional pipe support design considerations shall include the following:

a. A minimum safety factor of 2 or as approved by the Engineer, based upon the yield strength of the support material, shall be used for pipe supports, braces, hangers, and guides as well as for beam and column members used in channel-type support systems.

b. The horizontal pipe hanger and/or floor support spacing shall be as recommended by the pipe and/or hanger manufacturer but shall not exceed 10 feet on center unless indicated otherwise herein or on the Drawings.

c. The design, sizing and spacing of anchor bolts, including concrete anchors, shall be based on withstanding shear and pullout loads imposed by loading at each particular support. The minimum anchor bolt size shall be ½ inches in diameter. Refer to Section 05 05 23 – Metal Fastening.

2.02 HANGERS AND SUPPORTS

A. All piping shall be adequately supported and braced by means of steel hangers and/or supports, concrete piers, supplemental lateral bracing components, pre-fabricated brackets, or otherwise as

may be required by the location and forces applied per governing code, including gravity and lateral forces from earthquake and/or wind (if outdoors). Generally, concrete supports shall be used where pipe centerline is less than 3 feet above floor, and hangers above 6 feet unless specified or shown otherwise. Supports shall be not more than 10 feet on center for steel and cast iron, 5 feet on center for plastic unless otherwise shown on the Drawings or required by the specific manufacturer. All necessary inserts or appurtenances shall be furnished and installed in the concrete or structures for adequately securing hangers and supports to the structure. Refer to Standard Detail Drawings.

1. Metal pipe support materials, where carbon steel, ductile or other ferrous pipe is supported, shall be galvanized carbon steel meeting Section 05 12 00 – Structural Steel and Section 05 05 13 – Galvanizing unless indicated otherwise on the Drawings or in the Specifications or by the Engineer.

2. Metal pipe supports indicated as standard type pipe hangers are designed and detailed for gravity loading only. Resulting lateral loads from wind, earthquake, or other lateral loads per code, or special loading conditions during construction, shall be applied to the pipe in accordance with the governing building code. Supplemental lateral stiffening members (when necessary) shall be provided along pipe or at gravity supports using appropriate supplemental members and connections when required by calculations. The Contractor shall include design calculations and details with all pipe hangar and support submissions for review by the Engineer. The main structure and structural components that will support the pipe hangers and other appurtenant components of the facility have been designed to resist all resulting secondary lateral loading from pipe hangers and other non-structural members for gravity and resulting lateral loads.

B. Hangers and supports shall conform to the following requirements:

1. All fabricated metal hangers and supports shall be capable of adjustment after installation. Different types of hangers and supports along a pipe length, including bends, shall be kept to a minimum.

2. Hanger rods shall be straight and vertical. Chain, wire, strap, or perforated bar hangers shall not be used. Hangers shall not be suspended from other piping.

3. Vertical piping shall be properly supported at each floor and between floors by stays or braces to prevent rattling and vibration.

4. Supports and hangers for plastic and FRP piping shall include wide saddles or bands as recommended by the manufacturer and approved by the Engineer to distribute load and thus avoid localized deformation of the pipe.

5. Hanger and supports shall prevent contact between dissimilar metals by use of copper plated, rubber, vinyl coated or stainless-steel hangers.

6. Ferrous pipes to be painted shall be painted in accordance with Section 09 90 00 – Painting. Ferrous pipes that require painting or galvanizing shall be supported by galvanized hangers and supports. Stainless steel piping shall be supported by stainless steel saddles and straps.

7. Copper piping shall be supported by plastic coated or copper plated steel hangers and supports.

8. Plastic piping shall be supported by plastic coated steel hangers and supports.

9. Hangers and supports shall provide for thermal expansion throughout the full operating temperature range.

10. Expansion and adhesive type anchors used for pipe hangers and supports shall be Type 316 stainless steel.

C. Metallic hangers and supports may be standard make by Anvil International, Inc., "Witch" by Carpenter & Paterson, Ltd., B-Line Systems, Inc., or equal; and data on the types and sizes to be used shall be furnished to the Engineer for approval. Metallic support system brackets, rods, support clips, clevis hangers, hardware, etc. shall be cast iron or welded steel construction. All gravity type hangers and supports shall be restrained laterally to resist seismic loading and other loading as required by the governing code.

D. Non-metallic support system shall be a heavy-duty channel framing system. Channel frames shall be manufactured by the pultrusion process using corrosion grade polyester or vinylester resins. All fiberglass construction shall include suitable ultraviolet inhibitors for UV exposure and shall have a flame spread rating of 25 or less per ASTM E84. Piping accessories, pipe clamps, clevis hangers, support posts, support racks, fasteners, etc., shall be constructed of vinylester or polyurethane resin. Non-metallic support systems shall be standard make Aickinstrut by Aickinstrut, Inc., Unistrut Fiberglass by Unistrut, Inc., Enduro Fiberglass Systems, or equal. The Contractor shall submit data on the types and sizes of approval. Unless otherwise shown or specified the Contractor shall provide support spacings in the conformance with the pipe and support system manufacturer's requirements.

2.03 ACCESSORIES

A. Hanger Rods:

1. Hanger Rods shall be constructed of Type 316 Stainless Steel. The maximum allowable working stress shall be 5,800 psi, calculated based on the root diameter.

2. Hanger Rods shall have a square head nut on the top and running thread on the bottom end.

3. Hanger rods for single pipe hangers shall be sized in accordance with the following schedule:

Pipe Sze (in.)	Single Rod (in.)	Double Rod (in.)	Max. Load per Hanger (lbs.)
¾ to 1½	⅜	⅜	300
2	⅜	⅜	325
2½	½	⅜	350
3	½	⅜	400
3½	½	⅜	450
4	⅝	½	850
5	⅝	½	950
6	¾	⅝	1,075
8	*⅞	⅝	1,350
10	*⅞	⅝	1,750
12	*⅞	¾	2,200
14	*1	⅞	2,500
16	*1	⅞	3,075
18	*1	⅞	3,700
20	*1¼	1	4,425
24	*1¼	1	6,050

* To be used subject to the Engineer's specific approval

a. Hanger Loads shall be calculated based on the weight of pipe filled with water plus 50 pounds per foot of deadload.

B. Concrete Inserts, Attachments Plates, and Clamps:

1. Hanger rods up to 7/8-inch diameter shall be attached to new concrete structures using concrete inserts MSS Sp-58, Type 18. Inserts shall be malleable iron with galvanized finish. The use of steel inserts is prohibited. Design of the inserts shall permit the rods to be adjusted laterally in one plane and to lock the rod nut or head to the body. The inserts shall be provided with openings or recesses to receive reinforcing rods. To facilitate installation, slots shall be provided in the exposed flanges of the inserts. Inserts shall be rated to safely carry the maximum load which can be supported by the hanger rod.

2. Hanger rods larger than 7/8-inch diameter shall be attached to new concrete by means of approved hook anchors as shown on the contract drawings.

3. Hanger rods shall be attached to existing concrete structures using stainless steel expansion anchors as specified in Section 05 05 23 – Metal Fastening.

4. Steal beam clamps shall be malleable iron and conform to MSS SP-58 Type 28 or 29 for wide flange or I-beams, and Type 20 for channel sections or where it is necessary to locate the hanger rod off the beam centerline.

5. Steel U-Shape beams attachments welded to the underside of beams, and welded steel brackets fastened to structural steel columns, shall be subject to specific approval of the Structural Steel and Pipe Supports Working Drawings.

2.04 PIPE ANCHORS AND BRACES

A. Anchors and sway braces shall be provided when required to hold pipelines and equipment's in position or alignment. Pipe anchors for rigid fastening to the structures shall be attached to stainless steel anchor plates and anchor bolts set into the forms when placing concrete of new structures.

B. Brackets and braces shall be attached to existing concrete structures with through bolts or expansion anchors.

C. Anchors, guides, and restraints shall be provided for the proper operation of pipeline expansion joints.

D. Cast iron anchors shall be provided with stainless steel straps on piping except where anchors form an integral part of pipe fittings and couplings or where an anchor of special design is required or shown on the Contract Drawings.

E. All pipe anchors, guides, and restraints shall be designed to conform to ASME B31.1.

2.05 INSPECTION

A. The County may elect to conduct shop inspections. The inspections many include bu not be limited to:

1. Mechanical and chemical testing,

2. Material sampling,

3. Material certifications,

4. Traceability of parts,

5. Blasting and painting,

6. Visual and dimensional inspection,

7. And free iron contamination checks on stainless steel parts.

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Support piping connections to equipment by pipe support and not by the equipment.

B. Support large or heavy valves, fittings, flow meters and appurtenances independently of the connected piping.

C. Support no pipe from the pipe above it.

D. Support piping at changes in direction or in elevation, adjacent to flexible joints, expansion joints, and couplings, and where shown.

E. The Contractor shall not install piping supports and hangers in equipment access areas or bridge crane runs.

F. Brace hanging pipes against horizontal movement by both longitudinal and lateral sway bracing.

G. Install pipe anchors (fixed supports and/or guides) where shown and/or as may otherwise be required to withstand expansion thrust loads and to direct and control thermal expansion. The Contractor may install additional pipe anchors and flexible couplings to facilitate piping installation, provided that complete details describing location, pipe supports, and hydraulic thrust protection are submitted.

END OF SECTION

SECTION 40 05 19

DUCTILE IRON PIPE

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. All ductile iron pipe and specials shall be marked with the manufacturer's name or trademark, size, weight, thickness class, the date of manufacture, and the word "Ductile".

B. Ductile iron pipe (DIP) of the sizes shown or specified shall conform to ANSI A21.51 (AWWA C151), Grade 60-42-10 for ductile iron pipe centrifugally cast in metal molds or sand-lined molds. All ductile iron pipe shall conform to ANSI A21.50 (AWWA C150) for thickness design and shall be supplied in 18 or 20 foot nominal lengths or as required to meet the requirements of the Drawings. Fittings and specials shall be cast iron or ductile iron, conforming to the requirements of ANSI A21.10 (AWWA C110) or ANSI A21.53 (AWWA C153).

C. Minimum Class 53 pipe shall be used for flanged spools.

D. Reference Section 40 05 00 – Basic Mechanical Requirements

E. Reference Section 40 06 20 – Process Pipe and Valve Schedules, for pressure rating requirements for specific applications.

PART 2 – PRODUCT

2.01 DUCTILE IRON PIPE AND FITTINGS

A. All pipe and fittings, with the exception of glass lined pipe and sleeves, shall be cement mortar lined. Linings shall conform to American Standard Specifications for Cement Mortar Lining for Cast Iron Pipe and Ductile Iron Pipe and Fittings, ANSI A21.4 (AWWA C104) and shall be standard thickness. The mortar lining shall be protected with the bituminous seal coat. All buried DIP and fittings shall have a bituminous coating on the exterior surfaces in accordance with ANSI A21.51 (AWWA C151). All exposed DIP and fittings shall have a shop applied prime coat in accordance with Section 09 90 00 – Painting.

B. Glass-lined ductile iron pipe shall be furnished and installed where specified in the Exterior Piping System Schedule per ASTM B1000. The finished lining shall be from 0.008-inch to 0.012-inch thick, hardness of from 5 to 6 on the Mohs Scale, density of from 2.5 to 3.0 grams per cubic centimeter as measured in accordance with the requirements of ASTM D792 and be capable of withstanding a thermal shock of 350ºF without crazing, blistering, or spalling. The lining shall be SG-14 by U.S. Pipe, or equal.

01-13-22

C. Cutting of glass-lined pipe in the field shall be limited to only one piece per run of pipe, and this shall be for closure purposes only. Spalling of the glass liner shall be no more than 1/8-inch back from the cut. Flanges and bolt holes on spool pieces shall be aligned prior to glassing and shall be sealed and tested prior to shipment in accordance with the manufacturer's recommendation. Warping of flanges and/or pipe may be cause for rejection as determined by the Engineer.

D. Requirements for various types of joints are described in the following paragraphs. UNLESS OTHERWISE NOTED HEREIN OR ON THE DRAWINGS, ALL EXPOSED DUCTILE IRON PIPING SHALL HAVE FLANGED JOINTS.

E. Flanged joints and fittings shall have a minimum pressure rating of 250 psi with 125 lb. American Standard flanges. All flanges and fittings shall conform to the requirements of ANSI B16.1. Flanges shall be ductile iron and shall be of the threaded or screw on type. The face of the flanges shall be machined after installation of the flange to the pipe. No raised surface shall be allowed on flanges. Flanged pipe shall conform to the requirements of ANSI Specification A21.15, (AWWA C115). Pipe lengths shall be fabricated to meet the requirements of the Drawings.

F. Gaskets shall be the "Ring Gasket" type, 1/8-inch minimum thickness, cloth inserted rubber, red rubber or neoprene and shall be suitable for the service intended. Gaskets for glass lined pipe shall be TORUSEAL flange gasket, or equal. Bolts shall be of the size and length called for and in accordance with the "American Standard" and comply with the requirements of the ANSI/AWWA Standards. The bolts for flanged joints shall be a minimum ASTM A307; Grade B carbon steel and be in accordance with ANSI A21.10, (AWWA C110). The bolts shall have hexagonal heads and nuts, no washers shall be used.

G. Bell and spigot pipe shall be provided with push on, O-ring rubber gasket, compression type joints and shall conform to the requirements of ANSI A21.11 (AWWA C111). Fittings and specials shall be supplied with mechanical joints as specified for mechanical joint pipe. If required by installation conditions, pipe shall have cast-on lugs for adequately tying it together.

H. Mechanical joints and fittings shall conform to the requirements of ANSI A21.11, (AWWA C111). Joints shall be made employing a tapered rubber gasket forced into a tapered groove with a ductile iron follower ring. If required by installation conditions, pipe and fittings shall have cast-on lugs for adequately tying the pipe and fittings together. These shall be in conformance with standard practice and as outlined under the appropriate AWWA Specifications.

I. Bolts for mechanical joints shall be high strength corrosion resistant low-alloy steel tee-head bolts with hexagonal nuts.

J. Mechanical coupling joint pipe and fittings shall be split type, shouldered end. Coupling materials shall be malleable iron. Couplings shall have a minimum pressure rating and service equal to that of the connected piping. Gaskets shall be of rubber. Bolts and nuts shall be heat treated carbon steel track bolts and shall be plated. After installation, buried couplings shall receive two heavy

coats of coal tar epoxy (min. 24 mil thickness) which is compatible with the finish of the couplings. Couplings shall be as manufactured by Victaulic Company of America Style 31, or equal.

K. Restrained joint pipe shall consist of factory manufactured bolted retainer rings, ductile iron locking segments held in place by rubber retainers, or ductile iron retaining rings that lock over the bell of the joint and are secured to prevent rotation, and factory welded retainer beads or rings on the spigot of the pipe. All components of the bolted or snap ring assemblies shall be constructed of corrosion-resistant, high strength, low-alloy steel. Restrained joint pipe shall be Flex-Ring or Lock-Ring type joints as manufactured by American Cast Iron Pipe Company, HP LOK or TR Flex as manufactured by US Pipe, Bolt-Lok or Snap-Lok as manufactured by Griffin Pipe Products, TR Flex or Super Lock as manufactured by Clow Water Systems Co., or approved equal.

L. Restrained fittings for piping systems 16-inches in diameter and greater shall have factory restraint systems identical to the factory restrained joint pipe specified in Item K above. All fittings shall be minimum pressure Class 250 unless otherwise specified.

M. Restrained fittings for pipe systems 14-inches in diameter and smaller shall be Mechanical Joint fittings with restraint assemblies such as Stargrip by Star Pipe Systems, Mega Lug by EBAA Iron, ONE LOK by Sigma, Grip Ring by Romac, or approved equal. Where threaded-rods are allowed, the rods and tabs shall be designed for the specified restraint system design pressure, shall have lengths less than 10 feet between fittings, and shall be painted with two heavy coats of coal tar epoxy after installation.

N. The manufactured systems for thrust restraint indicated above shall be used where restrained joint ductile iron pipe and fittings are specified or indicated on the drawings. Gripping gaskets are not an acceptable form of restraint. Thrust restraint and harnessing systems such as threaded-rods, friction clamps, retainer glands shall be used only where specifically specified herein, indicated on the drawings or if allowed by the Engineer in isolated applications where conditions warrant and necessitate their use. Concrete thrust blocks may be used in accordance with the schedule indicated on the drawings, if applicable.

O. Cast Iron Soil Pipe shall conform to the standards of the Cast Iron Soil Pipe Institute (CISPI) Specification HS-67, and also ANSI Specification A-112.5.2 for Hub & Spigot pipe or A.112.5.1 for Hub & Spigot pipe or A.112.5.1 for No-Hub Pipe. Pipe class shall be "Extra Heavy:(XH).

END OF SECTION

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SECTION 40 05 24.43

STEEL PIPE

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. This specification shall apply to steel pipe only for applications as detailed in Part 2.

B. The AWWA Specifications referenced in this Section are supplemented as follows:

1. An affidavit of compliance is required from the pipe manufacturer.

2. The steel manufacturer's certification that the material meets the ASTM Specification will be accepted in lieu of tests on specimens taken from the fabricated pipe.

3. The fabricator may purchase steel plates on the chemical basis only and shall furnish to the Owner certified test reports.

C. All parts of the materials furnished shall be amply designed, manufactured, and constructed for the maximum stresses occurring during fabrication, erection, and operation. All materials shall be new and both workmanship and materials shall be of the very best quality, shall be entirely suitable for the service to which they will be subjected, and shall conform to all applicable Sections of these Specifications. Manufacturer's designs shall accommodate all of the requirements of these Specifications.

D. The Contractor shall be responsible for the structural design of the steel and stainless steel pipe, fittings, and couplings. The Contractor shall submit certification that the steel and stainless steel pipe, fittings, and couplings have been designed to resist all loads implied and reasonably anticipated.

1.02 REFERENCE STANDARDS, CODES, AND SPECIFICATIONS

A. 09 90 00 – Painting

B. 40 05 00 – Basic Mechanical Requirements.

C. 40 06 20 – Process Piping and Valve Schedules

D. AISC Design Guide 21, Section 9 – Welded Connections

E. ANSI B16.3 – Malleable Iron Threaded Fittings

F. ANSI B16.5 – Pipe Flanges and Flanged Fittings

G. ANSI B16.9 – Factory-Made Wrought Steel Butt-Welding Fittings

H. ANSI B18.2.1 – Bolts and Screws

I. ANSI B18.2.2 – Heavy Hex Nuts

J. ASTM A53 – Carbon Steel Alloy

K. ASTM A 106 – Grade B Carbon Steel Pipe

L. ASTM A380 – Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts Equipment, and Systems

M. AWS D1.1 – Structural Welding Code – Steel

N. AWS D1.6 – Structural Welding Code – Stainless Steel

PART 2 – PRODUCTS

2.01 STEEL PIPE FOR DIGESTER GAS

A. General:

1. Interior and exterior steel pipe and fittings for digester gas shall conform to ASTM A53, black, seamless, schedule 40 or 80 (for pipes two (2) inches to twenty four (24) inches) as indicated in Section 40 06 20 – Process Piping and Valve Schedules or as indicated on the Contract Drawings.

2. Shall conform to ASTM A106, for nominal pipe sizes less than two (2) inches.

3. Digester and natural gas piping shall have a minimum carbon content of 0.32% and shall be in conformity with the requirements of New York State "Rules and Regulations of the Public Service Commission 16 NYCRR Chapter 111, Gas Utilities, Sub-chapter C, Safety, Part 255 Transmission and Distribution of Gas (16 NYCRR 255).

B. Joints:

1. All steel pipes three (3) inches and larger shall have butt-welded fittings, except where such connections interfere with the removal of valves, equipment, or create sections of pipe too large for removal from structures, or wherever shown on the Drawings. In these instances, joints shall be flanged. Joints in pipes of nominal sizes below three (3) inches shall be socket welded.

a. Flanged joints for nominal pipe sizes three (3) inches and larger shall be made up using 150 lb flanges conforming to ANSI B16.5. The flanges can be either hub or ring slip on type. Bolts and nuts used to make up the joint shall conform to ASNI B18.2.1 and ANSI B18.2.2 respectively. Gaskets shall be full face and made of an elastomer appropriate for the gas service in accordance with ANSI B16.21. Welding neck flanges conforming to ANSI B16.5 shall be acceptable.

b. Gaskets for steel flanged pope shall be Teflon. For digester service with temperature greater than 180 °F the gaskets shall be Viton.

C. Fittings:

1. For nominal pipe sizes less than three (3) inches or as specified in the pipe schedule, fittings shall be class 150 banded malleable iron threaded fittings made in conformance with ANSI B16.3.

2. For nominal pipe sizes three (3) inches and larger or as specified in the pipe schedule, fittings shall conform to the dimensional requirements of ANSI B16.5 or ANSI B16.9. Fittings fabricated in conformance with ANSI B16.9 shall be of the same wall thickness as specified for the pipe and shall have tangent for slip on type flanges.

3. Bell type reducers shall not be acceptable, only cone type reducers shall be used.

D. Coating, Lining, and Finishes for Pipes and Fittings

1. Exposed and buried steel pipe exterior coating shall be reamed and flushed after welding to remove scale and dirt. Unions shall be provided at all valves and accessories at least every 50 feet in the piping system.

2. Exposed and buried steel pipe interior shall be surfaced prepared prior to receiving a prime and finish coat. Interior shall receive an SP-5 white metal blast with a minimum anchor pattern of 3.0 mils. Prime coat shall be Tnemec Series 120-5002 (beige prime coat) at 12-18 mils dry film thickness (DFT). Finish coat shall be Tnemec Series 120-5001 (gray finish coat) at 12-18 mils DT.

3. A coat of rush inhibitive primer in conformance with the Section 09 90 00 – Painting shall be applied to the exterior of each pipe before shipment.

PART 3 – EXECUTION

3.01 FIELD WELDING OF STEEL AND STAINLESS STEEL PIPING AND FITTINGS

A. The Contractor shall minimize the amount of field welding of steel and stainless steel piping required. Locations for pipe field welding will be evaluated and allowed on a case-by-case basis

upon written approval of the Engineer. All field welding of steel and stainless steel pipe is subject to the following requirements:

1. Welding shall be performed by AWS-certified welders in conformance with AWS D1.6. Submit welder's certification for approval prior to performing any field welding.

2. Piping with wall thickness up to 11 gauge (0.125-inch) shall be welded with the TIG (GTAW) process. Heavier walls shall be properly beveled and have a root pass with the TIG (GTAW) process followed by subsequent passes with the TIG (GTAW) or MIG (GMAW) process. Filler wire of ELC grades only shall be added to all welds to provide a cross-section at the weld equal to or greater than the parent metal. Weld deposit shall be greater than the parent metal. Weld deposit shall be smooth and evenly distributed and have a crown of no more than 1/16 inch on the I.D. and 3/32 inch on the O.D. of the piping or fittings. Concavity, undercut, cracks, or crevices shall not be allowed. Butt-welds shall have full penetration to the interior surface. Excessive weld deposits, slag, spatter, and projections shall be removed by grinding.

3. Jigs shall be utilized to align adjacent sections of piping.

B. Post-Weld Treatment

1. All field welds shall be wire brushed utilizing steel or stainless steel wire brushes to remove slag and spatter. Stainless steel brushes shall be used on stainless steel pipe.

2. The weld and the heat affected area shall be pickled with a brush-on pickling gel in accordance with ASTM A380 to remove all weld residue, oxide, and heat stain from the field weld and affected areas.

3. Pickling of stainless steel pipe shall be done in accordance with pickling paste manufacturer's directions, and areas being pickled shall be protected from direct sunlight. After pickling period is complete, neutralize pickling gel in accordance with directions and rinse area clean.

C. Where field welding of steel (carbon or stainless) piping is approved by the Engineer, all field welds shall be visually inspected and tested by an approved quality assurance testing firm in accordance with AWS D1.1, AISC Design Guide 21 Welded Connections, Section 9.0 and other applicable referenced sections of AWS and AISC. The Contractor shall be responsible for contracting with an approved testing firm. Nondestructive testing methods shall be used unless otherwise approved by the Engineer. The Contractor shall submit a proposed testing firm and personnel for approval in addition to his proposed plan to visually inspect and test all field welds of steel pipe prior to field welding of steel pipe.

3.02 FLUSHING AND TESTING

A. Flushing and testing of all installed low pressure air piping shall be performed as specified in Section 40 05 00 – Basic Mechanical Requirements. The field testing procedure for process air piping shall use air pressure only.

END OF SECTION

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SECTION 40 05 51

VALVES, GENERAL

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install, complete with all assemblies and accessories, all valves shown on the Contract Drawings and specified herein including all fittings, appurtenances and transition pieces required for a complete and operable installation.

B. All valves shall be constructed of first quality materials which have strength, wearing, and corrosion resistance characteristics entirely suitable for the types of service for which the individual valves are designated. Cast iron valve bodies and parts shall meet the requirements of the latest revision of ASTM Designation A-126, "Standard Specifications for Gray Iron Castings for Valves, Flanges, and Pipe Fittings, Class B."

C. All valve body castings shall be clean, sound, and without defects of any kind. No plugging, welding, or repairing of defects will be allowed.

D. Valves shall have flanged ends for exposed service and mechanical joint ends for buried service, unless otherwise shown on the Drawings or specified herein. Flanged ends shall be flat-faced, 125 lb. American Standard unless otherwise shown or specified in accordance with ANSI B16.1. All bolt heads and nuts shall be hexagonal of American Standard size. The Contractor shall be responsible for coordinating connecting piping. Valves with screwed ends shall be made tight with Teflon tape. Unions are required at all screwed joint valves.

E. All valves shall turn clockwise to close, unless otherwise specified. All valves shall have permanent marking for direction to open.

F. All valves larger than 4 inches shall be provided with a brass or Type 316 stainless steel nameplate attached with Type 316 stainless steel screws. The nameplates shall have engraved letters and shall include the following information as a minimum:

1. Valve size.

2. Pressure and temperature ratings.

3. Date of manufacture.

4. Manufacture’s name and address

G. The valves shall be provided with identification conforming to the requirements of Section 40 05 97 – Pipe and Equipment Identification Systems.

1.02 REFFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Section 01 33 00 – Submittal Procedures

B. Section 01 77 10 – Close Out Requirements

C. Section 01 78 23 – Operation and Maintenance Data

D. Section 46 00 00 – Equipment General Provisions

E. AWWA C500 – Standard for Metal-Seated Gate Valves for Water Service

F. AWWA C517 – Standard for Resilient-Seated Cast-Iron Eccentric Plug Valves

1.03 ACTION / INFORMATIONAL SUBMITTALS

A. Product Data: Shall comply with Section 01 33 00 – Submittal Procedures

B. The following submittal items shall be submitted in accordance with, or in addition to the submittal requirements specified in Section 46 00 00 – Equipment General Provisions:

1. Performance tests shall be conducted in accordance with the latest revision of AWWA C500 or AWWA C517.

2. Shop Drawings conforming to the requirements of Section 01 33 00 – Submittal Procedures, are required for all valves, and accessories. Submittals shall include:

a. Valve layout dimensions, size, and materials of construction for all components

b. Complete catalog information, descriptive literature, specifications, and identification of materials oof construction, dimensions and weights, flow data and pressure ratings.

c. Certificate of compliance with AWWA Standards where applicable

d. Information on support and anchoring where necessary

e. Spare Parts list and Special tools List

1.04 CLOSE OUT SUBMITTALS

A. Submit warranty documentation in compliance with:

1. Section 01 33 00 – Submittal Procedures

2. Section 01 77 19 – Close Out Requirements

B. Comply with Section 46 00 00 – Equipment General Provisions.

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Operation and Maintenance (O&M) manuals shall be in accordance with:

1. Section 01 33 00 – Submittal procedures

2. Section 01 78 23 – Operation and Maintenance Data

B. Comply with Section 46 00 00 – Equipment General Provisions.

C. Operation and maintenance manuals and installation instructions shall be submitted for all valves and accessories in accordance with the Specifications. The manufacturer(s) shall delete all information which does not apply to the equipment being furnished.

1.06 QUALITY ASSURANCE

A. The Manufacturer shall have a minimum of 5 year of experience in the production of substantially similar valve equipment and shall show evidence of satisfactory service in at least 5 installations.

B. Each type of valve shall be the product of one (1) manufacturer.

1.07 DELEVERY, STORAGE, AND HANDLING

A. The protection of materials and equipment shall be as specified in Division 1.

B. Valves and appurtenances shall be handled carefully. Valves which are dropped, dented, cracked, or otherwise damaged will not be acceptable.

C. Valves shall be provided with full-face protectors of waterproof materials fastened to each side of the valve body to protect joints and the valve interior.

1.08 CONTRACTOR'S RESPONSIBILITIES

A. A written report covering the representative's findings and installation approval shall be mailed directly to the Engineer covering all inspection and outlining in detail any deficiencies notes.

B. The times specified are exclusive of travel time to and from the facility and shall not be construed as to relieve the manufacturer of any additional visits to provide sufficient service to place the equipment in satisfactory operation.

PART 2 – PRODUCTS

2.01 FLOW INDICATORS

A. Flow indicators shall be the Akron ball-type as manufactured by Brooks Instrument Co., Fischer and Porter, or equal, and shall have bronze bodies, glass dome, and plastic ball.

2.02 CORPORATION STOPS

A. Corporation stops shall be of bronze with tapered male iron pipe threads on inlets and outlets. Terminal outlets shall have screwed bronze hex head dust plugs or caps. Unions shall be used on all corporation stop outlets with connecting piping. Corporation stops shall have a minimum working pressure rating of 250 psi and shall be as manufactured by Mueller Co., Hays Mfg. Div. of Zurn Industries, or equal.

2.03 ECCENTRIC PLUG VALVES

A. Eccentric Plug Valves for digester sludge and digester gas service shall be in accordance with:

1. Section 40 05 62 – Eccentric Plug Valves

2. Section 40 05 57 – Valve Operators

2.04 GROUND WATER PRESSURE RELIEF VALVES

A. Ground water pressure relief valves shall be in accordance with Section 40 05 68.23 – Miscellaneous Valves.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Except where noted otherwise herein, all valves shall be installing and tested in accordance with the latest revision of AWWA C500 or AWWA C517. Before installation, all valves shall be lubricated, manually opened and closed to check their operation, and the interior of the valves shall be thoroughly cleaned. Valves shall be placed in the positions shown on the Drawings. Joints shall be made as directed under the Piping Specifications. The valves shall be so located that they are easily accessible for operating purposes and shall bear no stresses due to loads from the adjacent pipe. The Contractor shall be responsible for coordinating connecting piping.

B. All valves shall be tested at the operating pressures at which the particular line will be used. Any leakage or "sweating" of joints shall be stopped, and all joints shall be tight. All cylinder operated valves shall be tested for control operation as directed by the Engineer.

C. Provide valves in quantity, size, and type with all required accessories as shown on the Drawings.

D. Install all valves and appurtenances in accordance with manufacturer's instructions. Install suitable corporation stops at all points shown or required where air binding of pipelines might occur. Install all valves so that operating handwheels or wrenches may be conveniently turned from operating floor but without interfering with access, and as approved by Engineer. Unless otherwise approved, install all valves plumb and level. Valves shall be installed free from distortion and strain caused by misaligned piping, equipment, or other causes.

3.02 SHOP AND FIELD TESTING

A. Shop and field testing of valves shall be as follows:

1. Certified factory testing shall be provided for all components of the valve and operator system. Valves and operators shall be shop tested in accordance with the requirements in the latest revision of AWWA C500 or AWWA C517, including performance tests, leakage test, hydrostatic tests, and proof-of-design tests. The manufacturer through the Contractor shall submit certified copies of the reports covering the test for acceptance by the Engineer.

2. Shop testing shall be provided for the operators consisting of a complete functional check of each unit. Any deficiencies found in shop testing shall be corrected prior to shipment. The system supplier through the Contractor shall submit written certification that shop tests for the electrical/pneumatic system and all controls were successfully conducted and that these components provide the functions specified and required for proper operation of the valve operator system.

3. The Contractor shall conduct field tests to check and adjust system components, and to test and adjust operation of the overall system. Preliminary field tests shall be conducted prior to start-up with final field tests conducted during start-up. The factory service representative shall assist the Contractor during all field testing and prepare a written report describing test methods, and changes made during the testing, and summarizing test results. The service representative shall certify proper operation of the valve operator system upon successful completion of the final acceptance field testing.

4. Preliminary and final field tests shall be conducted at a time approved by the Engineer. The Engineer shall witness all field testing.

5. All costs in connection with field testing of equipment such as energy, light, lubricants, water, instruments, labor, equipment, temporary facilities for test purposes, etc. shall be borne by the Contractor. The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

6. Preliminary field tests shall be conducted prior to start-up and shall include a functional check of the entire valve operator system and all system components. Preliminary field tests shall demonstrate that the valve operator system performs according to specifications

and that all equipment, valves, controls, alarms, interlocks, etc., function properly. The preliminary field test report must be approved by the Engineer prior to conducting final field acceptance tests. Based on results of preliminary field tests, the Contractor shall make any adjustments required to settings, etc., to achieve the required valve closing time and operation specified or otherwise directed by the Engineer.

7. Field testing shall include optimization of opening and closing times of the valves. The Contractor shall provide the means for accurate measurement of pipeline pressures as directed by the Engineer. Valve opening and closing times shall be adjusted based on process requirements to optimize operation of the valves. Final valve opening and closing times as determined by field tests shall be approved by the Engineer prior to final acceptance of the system.

END OF SECTION

SECTION 40 05 57

VALVE OPERATORS GENERAL

1.01 THE REQUIREMENT

A. Equipment shall be provided in accordance with the requirements of Section 46 00 00 – Equipment General Provisions and Section 40 05 00 – Basic Mechanical Requirements.

B. Reference Section 40 06 20 – Process Pipe and Valve Schedules for additional information on valves and operators/actuators.

C. Valve operators shall be designed to unseat, open or close, and seat the valve under the most adverse operating condition to which the valves will be subjected.

D. Operator mounting arrangements shall be as indicated on the Drawings or as directed by the manufacturer and/or Engineer.

E. The valve operators shall be the full and undivided responsibility of the valve manufacturer in order to ensure complete coordination of the components and to provide unit responsibility.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Section 01 33 00 – Submittal Procedures

B. Section 01 77 10 – Close Out Requirements

C. Section 01 78 23 – Operation and Maintenance Data

D. Section 01 79 00 Instruction of Owner's Personnel

E. Section 40 05 00 – Basic Mechanical Requirements

F. Section 40 06 20 – Process Pipe, Valve, and Gate Schedules

G. Section 46 00 00 – Equipment General Provisions

1.03 ACTION / INFORMATIONAL SUBMITTALS

A. Product Data: Shall comply with Section 01 33 00 – Submittal Procedures

B. The following submittal items shall be submitted in accordance with, in addition to the submittal requirements specified in Section 01 33 00 – Submittal Procedures and Section 46 00 00 – Equipment General Provisions:

1. Shop Drawings

2. O&M Manuals

3. Certification that the force required to operate all valves is as specified herein.

1.04 CLOSE OUT SUBMITTALS

A. Submit warranty documentation in compliance with:

1. Section 01 33 00 – Submittal Procedures

2. Section 01 77 19 – Close Out Requirements

B. Comply with Section 46 00 00 – Equipment General Provisions.

C. Submit Training Submittlas in accordance with Section 01 79 00 Instruction of Owner's Personnel

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Operation and Maintenance (O&M) manuals shall be in accordance with:

1. Section 01 33 00 – Submittal Procedures

2. Section 01 78 23 – Operation and Maintenance Data

B. Comply with Section 46 00 00 – Equipment General Provisions.

PART 2 – PRODUCTS

2.01 GENERAL

A. Manual operators shall be provided on all valves. Manual operator type shall be as specified herein and as shown on the Drawings.

B. Quarter turn valves 8" and greater in size shall have geared operators. Gate valves 14" and greater in size shall have geared operators.

C. Operators/actuators shall be furnished with conservatively sized extension bonnets, extension stems, or torque tubes, and all required appurtenances required for a complete installation. Operators furnished with extension bonnets shall include stainless steel extension stems, or stainless steel torque tubes.

2.02 MANUAL OPERATORS

A. Unless otherwise specified or shown on the Drawings, manual operator type shall be as follows:

1. Exposed valves up to 6-inch shall be lever operated (except gate valves).

2. Exposed valves 8-inches and larger shall be handwheel operated.

3. Exposed gate valves shall be handwheel operated.

4. Valves with centerline of operator located more than 6-feet above the floor or platform from which it is to be operated shall have a chainwheel operator unless otherwise indicated on the Drawings.

B. Manual operators shall be rigidly attached to the valve body unless otherwise specified or shown on the Drawings.

C. All operators shall turn counter-clockwise to open and shall have the open direction clearly and permanently marked.

D. Valve operators shall be designed so that the force required to operate the handwheel, lever, or chain (including breakaway torque requirements) does not exceed 80 pounds applied at the extremity of handwheel or chainwheel operator. Design pressures for sizing of valve operators shall be the piping test pressure for the piping in which the valve is to be installed as shown in the Piping Schedule in Section 40 06 20 – Process Pipe and Valve Schedules.

E. Handwheels for valves operators shall not be less than 12 inches in diameter. The maximum diameter of any handwheel shall not exceed 24”.

F. Nut operators shall have standard 2-inch square AWWA operating nuts designed in accordance with AWWA C504-94.

G. Geared manual operators shall be of the worm gear, traveling nut or scotch yolk type except manual operators for butterfly valves 18-inch in diameter or larger which shall be worm gear, unless otherwise indicated in the individual valve specification. Gear operators shall be of the worm gear or bevel gear type. Gear box designs incorporating end of travel stops in the housing shall be equipped with AWWA input stops. Each gearbox shall require a minimum of 10 turns for 90 degree rotation or full valve stem travel and shall be equipped with a mechanical valve position indicator.

PART 3 – EXECUTION

3.01 INSTALLATION

A. All Valve operators shall be installed in accordance with the manufacturer's published recommendations and the applicable Specification Sections for valves.

B. Valve operators shall be factory coated in accordance with the manufacturer's standard paint system.

3.02 SHOP TESTING

A. Shop testing shall be in accordance with Section 46 00 00 – Equipment General Provisions and with the following additional requirements:

1. Conduct a complete functional check of each unit. Correct any deficiencies found in shop testing prior to shipment.

3.03 FIELD TESTS

A. Field testing shall be in accordance with Section 46 00 00 – Equipment General Provisions, Section 40 05 51 – Valves General, and with the following additional requirements:

1. Test all valves at the operating pressures at which the particular line will be used.

2. Test all valves for control operation as directed.

3. Field testing shall include optimization of opening and closing times of the valves. Valve opening and closing times shall be adjusted based on process requirements to optimize operation of the valves. Final valve opening and closing times as determined by field tests shall be approved by the Engineer prior to final acceptance of the system.

B. Preliminary Field Tests

1. General: Preliminary field tests shall be conducted prior to start-up and shall include a functional check of the entire valve operator system and all system components.

2. Scope: Preliminary field tests shall demonstrate that the valve operator system performs according to specifications and that all equipment, valves, controls, alarms, interlocks, etc., function properly.

3. Based on results of preliminary field tests, the Contractor shall make any adjustments required to settings, etc., to achieve the required valve closing time and operation, as specified or otherwise directed.

C. Final Field Tests

1. Final field tests shall be conducted in accordance with the latest revision of AWWA C500 and AWWA C517.

2. Final field tests shall be conducted simultaneously with the start-up and field testing of the pumps.

3. Final field tests shall be conducted for the full range of operating modes and conditions specified and as directed by the Engineer. Each of the valves shall be tested at minimum, maximum, and normal head/flow conditions, and under all specified conditions of opening and closing.

4. Certification of Equipment Compliance: After the final field tests are completed and passed, submit affidavit according to Section 46 00 00 – Equipment and General Provisions.

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SECTION 40 05 62

ECCENTRIC PLUG VALVES

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Eccentric Plug valves shall comply with the requirements of Section 40 05 00 – Basic Mechanical Requirements and Section 40 05 51 – Valves General.

B. The Contractor shall test the functionality of all eccentric plug valves shown on the Contract Drawings. For each eccentric plug valve that has failed the functionality test. The Contractor shall furnish and install, complete with all assemblies and accessories, all eccentric plug valves that have been directed by the Engineer to remove and replace.

C. The eccentric plug valves shall be provided with identification conforming to the reequipments of Section 40 05 97 – Piping and Equipment Identification.

1.02 REFERNCE SPECIFICATIONS, CODES, AND STANDARDS

A. Section 01 33 00 – Submittal Procedures

B. Section 01 77 10 – Close Out Requirements

C. Section 01 78 23 – Operation and Maintenance Data

D. Section 40 05 51 – Valves General

E. Section 46 00 00 – Equipment General Provisions

F. ANSI B16.1 – Cast Iron Pipe Flanges and Flanged Fittings

G. ASTM A743 – 316 Stainless Steel Grade CF-8M

H. ASTM B26 – Aluminum Alloy

I. ASTM D426 Method B – Rubber to Metal Adhesion Test Equipment

J. AWWA C517 – Standard for Resilient-Seated Eccentric Plug Valves

1.03 ACTION / INFORMATIONAL SUBMITTALS

A. Product Data: Comply with Section 01 33 00 – Submittal Procedures and Section 40 05 51 - Valves General.

B. Provide submittals identified in Section 46 00 00 – Equipment General Provisions in addition to the submittals identified herein:

1. The Contractor shall furnish to the Owner, through the Engineer, a Performance Affidavit utilizing the format specified in Section 46 00 00 – Equipment General Provisions.

2. The Performance tests shall be conducted in accordance with the latest revision of AWWA C517 and affidavits shall conform to the requirements of the Specifications.

1.04 CLOSEOUT SUBMITTALS

A. Submit warranty documentation in compliance with:

1. Section 01 33 00 – Submittal Procedures

2. Section 01 77 19 – Closeout Requirements

B. Operation and Maintenance (O&M) manuals shall be submitted in accordance with Section 01 33 00 – Submittal Procedures and Section 01 78 23 – Operation and Maintenance Data.

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Operation and Maintenance (O&M) manuals shall be submitted in accordance with:

1. Section 01 33 00 – Submittal Procedures

2. Section 01 78 23 Operation and Maintenance Data.

B. Comply with Section 46 00 00 – Equipment General Provisions

1.06 SPARE PARTS

A. The following spare parts shall be provided for each eccentric plug valve listed:

1. One (1) set of gaskets.

2. One (1) set of packing.

3. One (1) set of upper and lower journal bearings.

1.07 QUALITY ASSURANCE

A. The Manufacturer shall have a minimum of 5 years of experience in the production of substantially similar eccentric plug valve equipment and shall show evidence of satisfactory service in at least 5 installations.

1.08 GENERAL INFORMATION AND DESCRIPTION

A. The Contractors shall test the functionality of each Eccentric Plug valve for digester sludge and digester gas service as indicated on the Contract Drawings. The Contractor shall remove and replace each eccentric plug valve that is directed by the engineer at the end of each plug valve's functionality test.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. The following manufacturers are acceptable:

B. Eccentric Plug Valves:

1. DeZuirk Co.

2. Clow Valve Co.

3. Or Approved Equal

2.02 ECCENTRIC PLUG VALVES

A. GENERAL

1. All valves shall be provided with limit stops and rotate 90º from fully open to fully shut.

2. The minimum working pressure for all valves 12 inches and smaller shall be 175psig and the test pressure shall be at least 270 psig.

3. Valve body shall be epoxy coated ductile iron, cast iron or semi-steel, unless specified otherwise, and coated as specified herein.

4. Seats shall have a welded overlay of one-half inch wide 90 percent pure nickel and machined to a finish containing no stress cracks. Minimum overlay thickness shall be one-eighth inch. The plug shall contact only the raised nickel seat surface.

5. Plug facings shall be of Neoprene composition and completely suitable for use with domestic sewage.

a. For eccentric plug valves larger than 6 inches in diameter plugs with rubber facing shall be furnished, unless fully encapsulated plugs are required by detailed specification. A minimum thickness of rubber lining shall be 1/8-inch. The rubber hardness shall be a minimum of 70 (Shore A) durometer. The rubber to metal bond shall withstand minimum 75 lb. pull conforming to ASTM D 429, Method B.

6. The shaft seal shall be V-Type with minimum four sealing rings and a follower ring. Stuffing box shall be designed with a space between the bonnet and actuator so that packing can be inspected, adjusted, and replaced without removing the valve actuator.

7. Bearings shall be sleeve type with the following materials.

    a. Sizes 4 – 18 inch: Sintered, oil impregnated, permanently lubricated type 316 stainless steel.

8. Provide PTFE ring on the shaft between plug and body to serve as a thrust bearing and grit excluder.

9. Unless otherwise shown, all exposed valves 4-inches in diameter and larger shall have flanged ends conforming to ANSI B16.1-125/150-pound standard with face-to-face dimensions of standard plug valves. Valves smaller than 4-inches in diameter shall have screwed ends, unless otherwise noted.

10. Valves 8-inches in diameter and larger shall be handwheel or floor stand operated where required or indicated on the Drawings through totally enclosed worm gear actuators, unless otherwise specified or shown on the Drawings. Valves 6-inches in diameter and smaller shall have lever operators, unless otherwise specified or noted on the Drawings. Manual operators for plug valves mounted above 6 feet from the operating floor shall be equipped with worm gear chainwheel actuators.

11. The manufacturer shall certify that the plug valves are capable of operating in continuous duty service under the specified pressures and flow conditions.

12. Each valve shall by hydrostatically tested and tested for bubble tightness after the operator has been mounted and adjusted. Copies of the hydrostatic and leakage test certification and certification of conformance shall be submitted to the Engineer prior to shipment.

13. All internal and external ferrous components and surfaces of the valves, with the exception of stainless steel and finished or bearing surfaces, shall be shop painted with two coats (10 mils min. dry film thickness) of the manufacturer's premium epoxy for corrosion resistance. Damaged surfaces shall be repaired in accordance with the manufacturer's recommendations.

B. DIGESTER GAS SERVICE (PV-DG)

1. Valves install in digester gas applications shall be non-lubricated, eccentric seating type and suitable for operation in a wet anaerobic digester gas stream with moderate concentrations of hydrogen sulfide.

2. Body shall be of Ductile-iron, Grade 65-45-12 and shall conform to the requirements of ASTM A 536. The eccentric plug shall be fabricated from ATAM A743, Type 316 stainless steel, Grade CF-8M . The bottom and top bearings shall be 316 stainless steel that

has been sintered and oil-impregnated. The valve bonnet shall be fabricated from the same material as the valve body and secured with type 316 stainless steel hardware. All internal and external bolting and other hardware including pins, set screws, studs, bolts, nuts, and washers shall be Type 316 stainless steel. Packing shall be NBR acrylonitrile-butadiene, V-type. Thrust bearing ring shall be PTFE.

3. Gaskets used at valves shall be PTFE material.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install in accordance with the manufacturer's recommendations.

B. In applications with suspended solids in the liquid or for dirty gases:

1. Vertical pipelines: Install valve with the seat end at the top.

2. Horizontal pipelines: Install the valve with the stem horizontal so the plug rotates upwards when opening. Higher pressure side of the valve, when closed, shall be on the valve end opposite of the seat.

C. In applications with clean liquids or gases install the valve with the higher-pressure side of the valve, when closed, on the opposite end of the valve from the seat.

3.02 SHOP AND FIELD TESTS

A. Shall comply with Section 40 05 51 – Valves General.

3.03 MANUFACTURER'S FIELD SERVICES

A. The Contractor shall provide the services of qualified factory-trained service technicians during installation and start-up, and to train personnel in the operation, maintenance, and troubleshooting of the valve.

END OF SECTION

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SECTION 40 05 68.23

MISCELLANEOUS VALVES

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. All miscellaneous valves shall comply with the requirements of Section 40 05 00 – Basic Mechanical Requirements and Section 40 05 51 – Valves General.

B. The Contractor shall test the functionality of all Ground Water Pressure Relief Flap Valves as shown on the Contract Drawings. The Contractor shall furnish and install, complete with all assemblies and accessories, all the ground water pressure relief flap valves that have been directed by the Engineer to remove and replace.

1.02 REFFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Section 01 33 00 – Submittal Procedures

B. Section 01 77 00 – Close Out Requirements

C. Section 01 78 23 – Operations and Maintenance Data

D. Section 40 05 00 – Basic Mechanical Requirements

E. Section 40 05 51 – Valves General

F. Section 46 00 00 – Equipment General Provisions

G. ASTM A126 – Gray Iron casting for Valves, Flanges, and Pipe Fittings

1.03 ACTION / INFORMATIONAL SUBMITTALS

A. Product Data: Comply with Section 01 33 00 – Submittal Procedures and Section 40 05 51 – Valves General.

B. Provide all submittals identified in Section 46 00 00 – Equipment General Provisions.

1.04 CLOSE OUT SUBMITTALS

A. Submit warranty documentation in compliance with:

1. Section 01 33 00 – Submittal Procedures

2. Section 01 77 19 – Closeout Requirements

B. Operation and Maintenance (O&M) manuals shall be submitted in accordance with Section 01 33 00 – Submittal Procedures and Section 01 78 23 – Operation and Maintenance Data.

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Operation and Maintenance (O&M) manuals shall be submitted in accordance with:

1. Section 01 33 00 – Submittal Procedures

2. Section 01 78 23 Operation and Maintenance Data.

B. Comply with Section 46 00 00 – Equipment General Provisions.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Ground Water Pressure Relief Flap Valves:

1. M&H Valve Company

2. NEENAH Enterprises Inc.

3. Or Approved Equal

2.02 GROUND WATER PRESSURE RELIEF FLAP VALVES:

A. General:

1. Ground Water Pressure Relief Flap Valves shall be wall type suitable for sidewall installation in tanks and digesters.

2. The valve shall be of the 1.0 degree seat design with an offset single pivoted hinge.

3. The body seat ring shall be threaded and screwed into place and the face shall be machined to a smooth finish.

4. The valve shall have a 4’’ or 6’’ flanged end face and drilled to ANSI 125 pound template for connection to a 4’’ or 6 ‘’ wall pipe.

B. Materials of Construction:

1. The flap gate and body shall be of cast iron conforming to ASTM specifications A-126 Class B

2. The body seating ring and hinge pin shall be furnished of bronze.

3. The gate shall have a neoprene rubber seat cemented and mechanically retained in place by a retainer plate.

PART 3 – EXECUTION

3.01 INSTALLATION

A. All Ground Water Relief Flap Valves shall be installed in accordance with the manufacturer's written Installation and Operation Manual and approved submittals.

B. All valves shall be installed plumb and level. The valves shall be free from distortion and strain caused by misaligned piping, equipment, or other causes.

3.02 SHOP AND FIELD TESTS

A. Shall comply with Section 40 05 51 – Valves General.

3.03 MANUFACTURERS FIELD VISIT

A. The Contractor shall provide the services of qualified factory-trained service technicians during installation and start-up, and to train personnel in the operation, maintenance, and troubleshooting of the valve.

END OF SECTION

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SECTION 40 05 97

PIPING AND EQUIPMENT IDENTIFICATION SYSTEMS

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install all components of the system for identification of piping and equipment as specified hereinafter. The system shall include the application of color coding to all new and altered plant piping. The Contractor shall paint the equipment and piping of all Contracts in the colors herein specified, and in accordance with the requirements of Section 09 90 00 – Painting.

B. In addition to the legends specified herein, the Engineer may order the Contractor to furnish and install additional identification legends and arrows at no additional cost to the Owner. Such additional signs may be requested near completion of the work and shall be limited to no more than five (5) signs for each type specified herein. The legends and color combinations for additional signs shall conform to the requirements specified herein.

C. The Contractor shall submit a schedule of the colors and designations proposed in accordance with Section 01 33 00 – Submittal Procedures and this Section. A minimum of four (4) color charts with cross-references to the colors listed herein shall be included with the Submittal.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Section 09 90 00 – Painting

B. Section 40 05 00 – Basic Mechanical Requirements.

1.03 PAYMENT

A. The cost for piping and equipment identification systems shall be included in the lump sum price bid for the Contract.

1.04 MANUFACTURER’S GUARANTEE

A. Provide the specified items from firms regularly engaged in the manufacture of identification devices of types and sizes required, with at least five (5) years of experience in manufacturing signs.

B. In addition, the manufacturer shall guarantee the sign, in writing, against color fading, chipping, corroding, or any other manufacturing defects for a period of ten (10) years.

1.05 SPARE PARTS AND ACCESSORIES

A. Furnish the following spare parts and accessories:

1. One (1) set of banding tools and banding accessories

2. One (1) stainless steel banding strap, approximately 1000 ft.

3. One (1) stainless steel cable and splice for every 20 valve identification tags.

4. Provide all spare parts and accessories suitable boxed and marked for storage and reordering.

PART 2 – PRODUCTS

2.01 PIPING BAND

A. All new and altered piping shall receive identification bands. Such bands shall be 6-inches wide, neatly made by masking, and spaced at intervals of 30-inches on centers regardless of the diameter of the pipe being painted. The Contractor may use approved precut and prefinished metal bands on piping, in lieu of the masked and painted bands, where approved by the Engineer.

2.02 PIPING IDENTIFICATION LEGEND

A. The Contractor shall apply identification legends to all types and sections of piping as shown on the Drawings or as designated by the Engineer. Such legends shall be in the form of plain block lettering giving the name of the pipe content in full or abbreviated form and showing the direction of flow by arrows. All lettering and arrows shall be of the plastic snap-on type, Seton nameplate "setmarks", or equal, or they shall be formed by stenciling in an approved manner using white or black as directed and shall have an overall height in inches in accordance with the following table:

Diameter of Pipe or Pipe Covering	**Height of Lettering**
3/4 to 1-1/4 inches	1/2-inches
1-1/2 to 2-inches	3/4-inches
2-1/2 to 6-inches	1-1/4-inches
8 to 10-inches	2-1/2-inches
Over 10-inches	3-1/2-inches

B. Identification lettering shall be located midway between color coding bands where possible. Identification lettering and arrows shall be placed as directed by the Engineer but shall generally

be located each fifteen (15) feet in pipe length, and shall be properly inclined to the pipe axis to facilitate easy reading. In the event lettering and arrow identifications are required for piping less than 3/4-inch in diameter, the Contractor shall furnish and attach approved color-coded tags where instructed.

C. All pipelines and equipment shall be painted in accordance with the requirements of Section 09 90 00 – Painting. Color code and match the final coasts as closely as possible, without custom blending, to the colors presented in the following table. The colors in this table are identified by their Federal Standard 595B Colors identification number and shall match this standard.

D. The names of the colors in this table are for convenience only.

E. Piping Identification:

Process / Service Line	**Abbreviation**	**Base Fed. Std. 595B Color**
County Water	CW	Blue 15200
Plant Drain	PD	Gray 16187
Plant Water	PW	Blue 15092
Seal Water	SLW	Blue 15182
Supernatant	SU	Gray 16307
Digester Sludge	DS	Brown 10070
Digester Gas	DG	Orange Yellow 33538
Hydrants	-	Red

F. All inline equipment and appurtenances, including pumps and motors, shall be painted the same base color as the piping. The pipe system shall be painted with the pipe color up to the flanges attached to pumps and mechanical equipment assigned another color. Tanks shall be painted the color of the piping system that they serve, unless the tank is fiberglass and levels are monitored through the tank.

2.03 VALVE IDENFICAION TAGS

A. Furnish and attach valve identification tags on all valves.

B. Provide round fiberglass reinforced plastic disc tags, approximately 2 inches in diameter and made in conformity to ASTM D709. Valve tags shall be provided with one 1/8-inch grommet protected hole at the top for fastening to the valve body using 1/16-inch cable and splices or pins as approved. Provided grommets, cable splices, and pins of stainless steel o other approved corrosion resistant material.

C. In addition to the tagging requirements listed above, provide tags at all gas valves at pressures above ½ psig with the operating pressure within the valve shown as required by Local Law 30.

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 40 06

PROCESS PIPE AND VALVE SCHEDULES

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall provide all labor, materials, equipment, incidentals, and appurtenances as shown, specified, and required to furnish, install, and test all exposed piping as indicated I the exposed piping schedule, complete and operational.

1.02 REFERENCE SPECIFCATIONS, CODES, AND STANDARDS

A. Section 01 33 00 – Submittal Procedures

B. Section 04 05 00 – Basic Mechanical Requirements

1.03 PIPING SYSTEM SCHEDULES

A. Piping requirements for this Section are outlined on the Contract Drawings, and in the Piping System Schedule. In the absence of a specified test pressure, pipes shall be tested at a pressure 50 percent greater than the normal operating pressure as determined by the Engineer or 10 psig, whichever is greater unless the schedule indicates that no test is required.

B. If the pipe material is not shown on the Piping system Schedule or otherwise specified, the following materials shall be used:

PIPE SIZE	MATERIAL	TYPE OF JOINT	CLASS/DESIGN	TEST PRESSURE
4-IN AND LARGER	DIP	FLANGED (EXPOSED)	CLASS 53	(1)
		RESTRAINED (BURIED)	PRESSURE CLASS 350	
LESS THAN 4-IN	PVC/CPVC (2)	SOCKET	SCH 80	(1)

(1) Test at 150 percent of working pressure or 10 psi, whichever is greater.
(2) For all PVC / CPVC designations, if piping is exposed to direct sunlight or if heat tracing is required, CPVC shall be used. Otherwise, PVC shall be used.

C. Non-Critical gravity lines such as drains, floor drains, roof drains, etc., do not typically require a pressure test.

1.04 VALVES SCHEDULE

A. All valves shall be tagged by the manufacturer according to the control valve designations listed in this Section.

B. Performance Affidavits shall be required for all valves listed in the valve schedule(s). Performance Affidavits shall be provided in accordance with Section 01 33 00 – Submittal Procedures.

C. Valves not listed in this Section shall be manually operated, unless

PART 2 – PRODUCTS

2.01 SCHEDULES

A. All piping and valves shall be furnished and installed as listed in the following schedules:

1. Schedule 40 06 20 – 1 Interior and Exposed Piping Schedule

2. Schedule 40 06 20 – 2 Interior and Exposed Valve Schedule Valves 4 – Inches and larger

B. Nomenclature for nominal pipe size ranges shall be as follows: “to” means all pipe sizes within the listed range including the upper listed size, and “up to” means all pipe sizes within the listed range not including upper listed size.

C. Abbreviations of schedules include the following:

1. Material:

DI	-	Ductile Iron
304LSS	-	304L Stainless Steel
316LSS	-	316L Stainless Steel
CS	-	Carbon Steel
CI	-	Cast Iron

2. Wall Thickness:

CL	-	Class
SCH	-	Schedule

3. Type of Joint:

FLG	-	Flanged
GRV	-	Grooved
WLD	-	Welded

4. Protection:

GL	-	Glass Lined
P	-	Painted

5. Valve Operators

M	-	Manual
A	-	Automatic

6. Valve Types:

PLV	-	Eccentric Plug Valve
CV	-	Check Valve
KGV	-	Knife Gate Valve
TSV	-	Temperature Shutoff Valve
PRFV	-	Pressure Relief Flap Valve

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SCHEDULE 40 06 20 – 1

INTERIOR AND EXPOSED PIPING SCHEDULE

Service	Nominal Size (in)	Material	Wall Thickness	Type of Joint	Type of Fitting	Working Pressure (psig)	Test Pressure (psig)	Pipe Protection	
								Interior	Exterior
DS	6 to 12	DI	CL 56	FLG	DI	100	150	GL	P
DG	4 to 16	CS	SCH 80	WLD/FLG	CS	50	50	-	P

SCHEDULE 40 06 20 – 2

INTERIOR AND EXPOSED VALVES SCHEDULE

VALVES 4 – INCH AND LARGER

Service	Nominal Size (in)	Valve Type	Body Material	Type of Joint	Pressure Rating (psig)	Operator	Notes / Remarks
DS	6	PLV	DI	FLG	175	M	(1)
DS	8	PLV	DI	FLG	175	M	(1)
DS	10	PLV	DI	FLG	175	M	(1)
DG	4	PLV	AL or 316LSS	FLG	150	M	(1)
DG	6	PLV	AL or 316LSS	FLG	150	M	(1)
DG	8	PLV	AL or 316LSS	FLG	150	M	(1)
DG	10	PLV	AL or 316LSS	FLG	150	M	(1)
DG	4 to 8	TSV	AL or 316LSS	FLG	150	M	(1)
GW	4 to 6	PRFV	CI	FLG	(2)	A	--

Notes:
(1) The Contractor shall Remove and Replace all valves indicated on the Contract Drawings

SECTION 40 71 23.13

VENTURI FLOW METERS AND PRESSURE TRANSMITTERS

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, test, install and place in satisfactory operation all venturi flow tubes, with all spare parts, accessories, and appurtenances as herein specified and as shown on the Drawings.

B. It is the intent of the Contract Documents that all process taps, isolation valves, nipples, penetrations, embedded instrumentation supports, conduit, wiring, terminations, and the installation of process instrumentation on process lines shall be provided under this Contract. The Instrumentation Subcontractor shall supervise installation of equipment provided where installation is by other Subcontractors or Contractors.

C. Tapping and connections for primary process sensors shall be sized to suit each individual installation and the requirements of the instrument served. The Contractor shall ensure that the location, supports, orientation and dimensions of the connections and tapping for instruments are such as to provide the proper bracing, the required accuracy of measurement, protection of the sensor from accidental damage and accessibility for maintenance while the plant is in operation. Isolation valves shall be provided at all process taps.

D. Where separate elements and transmitters are required, they shall be fully matched, and unless otherwise noted, installed adjacent to the sensor. Special cables or equipment shall be supplied by the associated equipment manufacturer.

E. Equipment installed in a hazardous area shall meet or exceed Class, Group, and Division requirements as shown on the Drawings, to comply with the National Electrical Code.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 09 90 00 – Painting

B. Section 40 61 13 – Process Control System General Provisions

C. Section 40 70 00 – Instrumentation for Process Systems

D. Section 40 73 20 – Pressure Transmitters

1.03 SUBMITTALS

A. The manufacturer shall provide data that substantiates headloss and accuracy for the flow tubes submitted, which shall include the following information:

1. Differential vs. flow curves.

2. Differential vs. flow data in tabular format.

3. Non-recoverable head loss data.

4. A certified dimensional drawing for each flow tube.

5. Specific equations for calculating airflow in scfm or liquid flow in gpm, as appropriate, in the following format:

$$\text{Actual scfm} = \text{constant} \times \frac{(\text{Differential P})^{1/2} \times (\text{Operating Press.})^{1/2}}{(\text{Operating Temp.})^{1/2}} \quad \text{(Gas)}$$

$$\text{gpm (or mgd)} = \text{constant} \times (\text{Differential P})^{1/2} \quad \text{(Liquid)}$$

B. Two copies of each of the following curves with plastic see-through type envelopes shall be furnished for each venturi tube by the manufacturer:

1. Certified differential pressure vs. flow at nominal static pressures.

2. For airflow, flow coefficient vs. pressure for above curves for a pressure range of ±3 psig from the nominal static pressures.

PART 2 – PRODUCTS

2.01 VENTURI FLOW TUBES

A. The Contractor shall furnish the exact internal diameter of process piping to the instrumentation subcontractor for fabricating and calibrating flow tubes. Unless otherwise specified, venturi tubes shall have ANSI flanged end connections. The flow tube and its end connections shall have pressure ratings at least equal to the surrounding piping. The Contractor shall coordinate end conditions for installation allowing for future removal of the tube by use of expansion fittings and flanges in the pipeline, as shown on the Drawings.

B. Venturi flow tubes shall produce a differential pressure proportional to the square of flow. venturi tubes shall be “universal type”, short design, of close grain, high tensile strength, stainless steel construction. The inlet section shall be cylindrical and shall be the same nominal diameter as the process pipe. The high-pressure taps shall be installed in the inlet section. The venturi meter shall have a cylindrical, precision-machined, 304 stainless steel throat section with a minimum length equal to 0.5 times its diameter. The low-pressure taps shall be installed in the throat section. The outlet cone shall be truncated and shall have a maximum included angle of 10 degrees.

C. Venturi tubes shall be furnished complete with two high pressure taps, two low-pressure taps, one vent tap with plug, one drain tap with plug and one inspection port. Pressure taps shall be ½-inch or ¼-inch as recommended by the manufacturer, constructed of 316L stainless steel. If ¼-inch

taps are furnished, appropriate fittings shall be provided to connect to the ½-inch process tubing. Flushing/drain assemblies with stainless steel ball valves for isolation, together with fittings and appurtenances shall be furnished on all high and low pressure taps.

D. The tube discharge coefficient shall be constant and shall be greater than or equal to 0.99 for pipe Reynolds numbers in excess of 75,000 for each specified size venturi tube. For application Reynolds numbers less than 75,000, the manufacturer shall submit actual test data substantiating the effect on meter accuracy. Accuracy shall be + or - 0.50% of actual flow rate over the specified flow range.

E. The tubes shall have a maximum permanent head loss of less than 10 percent of the maximum differential pressure.

F. Prior to shipment, interior and exterior cast iron surfaces shall receive two coats of factory applied epoxy paint with a dry film thickness of not less than 6.0 mils.

G. The venturi flow tubes shall be Model HVT-CI as manufactured by Primary Flow Signal, Inc., Badger Meter, BIF Products, or equal

H. Application Conditions/Requirements:

	Value
Line Size, inches	4
Tap Size, inches	½
Body Material	Stainless Steel
Throat Material	Stainless Steel
Flange Material	Stainless Steel
Fluid	Digester Gas
Maximum Flow, scfm	350
Normal Flow, scfm	221
Minimum Flow, scfm	92.5
Molecular Weight	23.170
Specific Gravity	0.8
Operating Temperature, F	95
Operating Pressure, psia	15.13

2.02 GAUGE PRESSURE INDICATING TRANSMITTERS

A. Gauge pressure transmitters shall have piezoresistive measuring cells with a metallic or ceramic process isolating diaphragm directly in contact with the process liquid. Silicone oil fill fluid shall be used to transfer the pressure from the process isolating diaphragm to the measuring cell. Calibrated span and zero shall be continuously adjustable externally over the entire range. Span and zero adjustments shall be capable of being disabled internally. The maximum zero elevation and maximum zero suppression shall be adjustable to anywhere within sensor limits. Factory set correction coefficients shall be stored in the sensor's non-volatile memory for correction and linearization of the sensor output in the electronics section.

B. Transmitters shall meet the following requirements:

1. Housing: NEMA 4X with low copper, die-cast aluminum body, epoxy coated

2. Wetted Materials: Type 316 stainless steel unless otherwise indicated or required for process fluid compatibility

3. Accuracy: +/- 0.04% of calibrated span

4. Rangeability: 100:1

5. Damping: 0 to 100 seconds, adjustable

6. Output: Linear and isolated 4-20 mA with HART communication protocol

7. Power Supply: 24 VDC, 2-wire loop powered

8. Display: 4-digit (minimum) LCD

9. Overpressure Protection: Yes

10. Ambient Conditions: -40 to 85 degrees C; 0 – 100% relative humidity

11. Operating Temperature: -40 to 100 degrees C

12. Process Connection: 1/2" FNPT

C. All mounting flanges, diaphragms, O-rings and materials used in construction shall be non-corroding and compatible with each other and compatible with the liquid being measured.

D. The piezoresistive silicon pressure sensor shall be mechanically, electrically, and thermally isolated from the process and the environment. Factory set correction coefficients shall be stored in the sensor's non-volatile memory for correction and linearization of the sensor output in the electronics section. The electronics section shall correct the digital signal from the sensor and convert it into a 4-20 mA analog signal for transmission to receiving devices. The electronics section shall contain configuration parameters and diagnostic data in non-volatile EEPROM

memory and shall be capable of communicating, via a digital signal superimposed on the 4-20 mA output signal, with a remote interface device.

E. Gauge pressure indicating transmitters shall be furnished with 316 stainless steel two-valve manifold assembly where a block valve provides instrument isolation and a drain/vent valve allows venting, draining, or calibration. Two-valve manifold assembly shall be Model 306 Series as manufactured by Rosemount, or equivalent by instrument manufacturer.

F. Gauge pressure indicating transmitters shall be Model 3051S as manufactured by Emerson Process Management (Rosemount), Siemens Sitrans P410, Endress + Hauser Model Cerabar S PMP71 Platinum, or equal.

2.03 DIFFERENTIAL PRESSURE INDICATING TRANSMITTERS

A. Differential pressure indicating transmitters shall be the same as the gauge pressure transmitters except for body specifications. Differential pressure units shall be furnished with close coupled 316 stainless steel three-valve manifold valve assembly complete with drain/vent ports. Integral manifold assembly shall be Model 305 Series as manufactured by Rosemount, or equivalent by instrument manufacturer.

B. Each differential pressure transmitter shall be furnished with stainless steel mounting brackets and hardware.

C. The electronics sections of differential pressure transmitters shall contain user-selectable square root extractors to provide a linear 4-20 mA DC output proportional to flow, when activated. Square root extractor circuitry shall be activated only for incompressible fluid flow applications (e.g., water). Flow rates for compressible fluids (e.g., air) shall be calculated externally using line temperature and static pressure corrections as specified elsewhere. In addition, each flow transmitter shall be furnished with laminated flow versus differential pressure curves wall mounted adjacent to the transmitter.

D. Differential pressure indicating transmitters shall be Model 3051S as manufactured by Emerson Process Management (Rosemount), Siemens Sitrans P410, Endress + Hauser Model Deltabar S PMD75 Platinum, or equal.

PART 3 – EXECUTION

3.01 INSTALLATION

A. All venturi meters and appurtenant work, including pressure taps, shall be installed in strict accordance with the manufacturer’s printed instructions.

B. Field equipment shall be wall mounted or mounted on two inch diameter pipe stands welded to a 10 inch square by 1/2 inch thick base plate unless shown adjacent to a wall or otherwise noted. Materials of construction shall be aluminum or 316 stainless steel. Instruments attached directly

to concrete shall be spaced out from the mounting surface not less than 1/2 inch by use of phenolic spacers. Expansion anchors in walls shall be used for securing equipment or wall supports to concrete surfaces. Unless otherwise noted, field instruments shall be mounted between 48 and 60 inches above the floor or work platform.

C. Control and Signal Wiring

1. Electrical, control and signal wiring connections to transmitters and elements mounted on process piping or equipment shall be made through liquid tight flexible conduit. Conduit seals shall be provided where conduits enter all field instrument enclosures and all cabinetry housing electrical or electronic equipment.

3.02 3.02 ADJUSTMENT AND CLEANING

A. The instrumentation subcontractor shall comply with the requirements of Division 01 of these Specifications and all instrumentation and control system tests, inspection, and calibration requirements for all instrumentation and controls provided under this Contract and specified herein. The Engineer, or his/her designated representative(s), reserves the right to witness any test, inspection, calibration or start up activity. Acceptance by the Engineer of plans, reports, or documentation relating to testing or commissioning activity shall not relieve the Contractor of his/her responsibility for meeting all specified requirements.

B. The instrumentation subcontractor shall provide the services of factory trained technicians, tools and equipment to field calibrate, test, inspect and adjust each instrument to its specified performance requirement in accordance with manufacturer's specifications and instructions. Instruments which fails to meet Contract requirements, or published manufacturer performance specification for functional and operational parameters, shall be repaired or replaced, at the discretion of the Engineer, at no cost to the Owner. The Contractor shall bear all costs and provide all personnel, equipment and materials necessary to implement all installation tests and inspection activities for equipment specified herein.

C. At least 60 days before the anticipated initiation of installation testing, the Contractor shall submit to the Engineer a detailed description of the installation test(s) to be conducted to demonstrate the correct operation of the instrumentation supplied hereunder.

D. Field instrument calibration shall conform to the following requirements:

1. The instrumentation subcontractor shall provide the services of factory trained instrumentation technicians, tools and equipment to field calibrate or verify factory calibration of each instrument supplied under this Contract and existing instruments shown to its specified accuracy in accordance with the manufacturer's specification and instructions for calibration. Calibration and verification shall take place under actual process conditions. Forcing outputs shall not be acceptable.

2. Each instrument shall be calibrated/verified at 0, 25, 50, 75 and 100 percent of span using test instruments to simulate inputs and read outputs. Test instruments shall be rated to an

accuracy of at least five (5) times greater than the specified accuracy of the instrument being calibrated. Where applicable, such test instruments shall have accuracy's as set forth by the National Institute for Standards and Technology (NIST).

3. The instrumentation subcontractor shall provide a written calibration/verification sheet to the Engineer for each instrument, certifying that it has been calibrated to its published specified accuracy. The Contractor shall submit proposed calibration sheets for various types of instruments for Engineer approval prior to the start of calibration. This sheet shall include but not be limited to date, instrument tag numbers, brief description of how the calibration process was performed, calibration data for the various procedures described herein, name of person performing the calibration, a listing of the published specified accuracy, permissible tolerance at each point of calibration, calibration reading as finally adjusted within tolerance, defect noted, corrective action required and corrections made. For electronic or powered instruments, the calibration/verification sheet shall also list all configurable parameters that have been modified from their default factory setting.

4. If doubt exists as to the correct method for calibrating or checking the calibration/verification of an instrument, the manufacturer's printed recommendations shall be used as an acceptable standard, subject to the approval of the Engineer.

5. Upon completion of calibration, devices calibrated hereunder shall not be subjected to adjustments, sudden movements, accelerations, or shocks, and shall be installed in permanent protected positions not subject to moisture, dirt, and excessive temperature variations. Caution shall be exercised to prevent such devices from being subjected to over-voltages, incorrect voltages, overpressure or incorrect air. Damaged equipment shall be replaced and re-calibrated/verified at no cost to the Owner. Equipment that has been adjusted, modified, or moved or there is evidence of such activity shall be re-calibrated/verified at no cost to the Owner.

6. After completion of instrumentation installation, the instrumentation subcontractor shall perform a loop check. The Contractor shall submit final loop test results with all instruments listed in the loop. Loop test results shall be signed by all representatives involved for each loop test.

END OF SECTION

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SECTION 46 00 00

EQUIPMENT GENERAL PROVISIONS

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish, install, test, and place in acceptable operation all mechanical equipment and all accessories as specified herein, as shown on the Drawings, and as required for a complete and operable system.

B. The mechanical equipment shall be provided complete with all accessories, special tools, spare parts, mountings, shims, sheaves, couplings, and other appurtenances as specified, and as may be required for a complete and operating installation.

C. The Contractor shall provide the Owner complete and operational equipment/systems. To this end, it is the responsibility of the Contractor to coordinate all interfaces with related mechanical, structural, electrical, instrumentation, and control work and to provide necessary ancillary items such as controls, wiring, etc., to make each piece of equipment operational as shown and specified.

D. The complete installation shall be free from excessive vibration, cavitation, noise, and oil or water leaks.

E. The requirements of this section shall apply to equipment furnished under Divisions 40 and 46.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Section 01 33 00 – Submittal Procedures

B. Section 01 61 00 – Product Requirements and Options

C. Section 01 75 00 – Check Out and Start-Up Procedure

D. Section 01 78 23 – Operation and Maintenance Data

E. Section 01 78 43 – Spare Parts and Extra Materials

F. Section 01 79 00 – Instruction of Owner’s Personnel

G. Section 03 60 00 – Grout

H. Section 05 05 13 - Galvanizing

I. Section 05 05 23 – Metal Fastening

J. Section 05 10 00 – Metal Materials

K. Section 05 12 00 – Structural Steel

L. Section 09 90 00 - Painting

M. All equipment, materials, and installations shall conform to the requirements of the most recent editions with latest revisions, supplements, and amendments of the specifications, codes, and standards listed in each respective equipment specification section.

N. AWS D1.1 – Structural Welding Code for Steel

O. AWS D1.2 – Structural Welding Code for Aluminum

P. AWS D2.0 – Standard Welding Symbols

1.03 ACTION/INFORMATIONAL SUBMITTALS

A. Product Data: Comply with Section 01 33 00 – Submittals Procedures

B. Shop Drawings shall be submitted to the Engineer for all equipment in accordance with Section 01 33 00 – Submittal Procedures and shall include the following additional information:

1. Equipment name, identification number and specification number.

2. Performance characteristics and descriptive data.

3. Detailed equipment dimensional drawings and setting plans.

4. General lifting, erection, installation, and adjustment instructions, and recommendations.

5. Complete information regarding location, type, size, and length of all field welds in accordance with “Standard Welding Symbols” AWS 2.0 of the American Welding Society. Special Conditions shall be fully explained by notes and details.

6. The total uncrated weight of the equipment plus the approximate weight of shipped materials. Support locations and load that wil be transmitted to based and foundations. Exact size, placement, and embedment requirements of all anchor bolts.

7. Piping schematics.

8. Equipment protective device details and connection diagrams.

9. Panel layout drawings, schematic wiring diagrams, and component product data sheets for control panels.

10. Equipment Shop coating systems, interior and exterior.

11. A list of spare parts and special tools to be provided.

12. Any additional information required to demonstrate conformance with the equipment specifications.

13. Warranty documentation including statement of duration of warranty period and contact phone numbers and addresses for warranty issues.

14. Shipment, delivery, handling, and storage instructions.

C. When required in the individual equipment Specifications, the Contractor shall submit manufacturer's Performance Affidavits for equipment to be furnished. Performance Affidavits shall conform to the following:

1. The manufacturer must certify to the Contractor and the County jointly, that the Contract Documents have been examined and the equipment, apparatus, or process he offers to furnish will meet in every way the performance requirements set forth or implied in the Contract Documents.

2. The Contractor must transmit to the Engineer three (3) original copies of the affidavit given him by the manufacturer or supplier along with the initial Shop submittals.

3. The Performance Affidavit must be signed by an officer of the basic corporation, partnership, or company manufacturing the equipment and witnessed by a notary public.

4. The Performance Affidavit shall have the following format:

Addressed to: (Contractor) and County of Nassau
Department of Public Works

Reference: Cedar Creek Water Pollution Control Plant Digester Rehabilitation and Cleaning (Contract No. S35100-07C)

Text: (Manufacturer's Name) has examined the Contract Documents and hereby state that the (Product) meets in every way the performance requirements set forth or implied in Section ____ of the Contract Documents.

Signature: Corporate Officers shall be Vice President, or higher. (Unless statement authorizing signature is attached.)

1.04 CLOSEOUT SUBMITTALS

A. Submit warranty documentation in compliance with:

1. Section 01 33 00 – Submittal Procedures

2. Section 01 61 00 – Product Requirements and Options

B. Operation and Maintenance (O&M) manuals shall be submitted in accordance with Section 01 33 00 – Submittal Procedures and Section 01 78 23 Operation and Maintenance Data.

C. Training lesson Plans shall be submitted in accordance with Section 01 79 00 Instruction of Owner's Personnel

1.05 MAINTENANCE MATERIALS SUBMITTALS

A. Operation and Maintenance (O&M) manuals shall be submitted in accordance with:

1. Section 01 33 00 – Submittal Procedures

2. Section 01 78 23 – Operation and Maintenance Data

B. Comply with Section 01 78 43 – Spare Parts and Extra Materials:

1. For spare parts, extra stock materials, and tools, submit quantity of items specified in associated Specification Section.

2. Submit complete list of spare parts, extra stock materials, maintenance supplies and special tools required for maintenance for one year with unit prices and source of supply. Indicate number/quantity specified and furnished, manufacturer, part number, description,

C. Comply with Section 01 79 00 – Instructions to Owner's Personnel.

1.06 QUALITY ASSURANCE SUBMITTALS

A. Factory testing plan.

B. Factory Test Results shall be submitted and approved prior to shipment of equipment.

C. Field testing plan.

D. Comply with Section 01 75 00 – Check Out and Start Up Procedures.

E. Preliminary field test data

F. Final field test data

1.07 GENERAL INFORMATION AND DESCRIPTION

A. All parts of the equipment furnished shall, be designed and constructed for the maximum stresses occurring during fabrication, transportation, installation, testing, and all conditions of operation. All materials shall be new and shall conform to all applicable Sections of these Specifications.

B. All parts of duplicate equipment shall be interchangeable without modification. Manufacturer's design shall accommodate all the requirements of these Specifications.

C. Equipment and appurtenances shall be designed in conformity with specifications, codes and reference standards.

D. Details shall be designed for appearance as well as utility. Protruding members, joints, corners, gear covers, etc., shall be finished in appearance. All exposed welds on machinery shall be ground smooth and the corners of structural shapes shall be rounded or chamfered.

E. Machinery parts shall conform within allowable tolerances to the dimensions shown on the working drawings.

F. All machinery and equipment shall be safeguarded in accordance with the specifications, codes, and reference standards.

G. All equipment greater than 100 pounds shall have lifting lugs, eyebolts, etc., for ease of lifting, without damage or undue stress exerted on its components.

H. All manufactured items provided under this Section shall be of current manufacture and shall be the products of manufacturers specializing in the manufacture of such products.

1.08 EQUIPMENT WARRANTIES

A. Warranty requirements shall be as specified in Section 01 61 00 – Product Requirements and Options and Section 01 75 00 – Checkout and Startup Procedures. Warranty requirements are supplementary to the individual equipment specifications.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. The materials covered by these Specifications are intended to be equipment of proven reliability, and as manufactured by reputable manufacturers having experience in the production of such equipment. The Contractor shall, upon the request of the Engineer, furnish the names of not less than 5 successful installations of the manufacturer’s equipment of the same size and model of that offered under this contract. The equipment furnished shall be designed, constructed, and installed in accordance with the industry accepted practices and shall operate satisfactorily when installed as shown on the Contract Drawings and operated per manufacture’s recommendations.

2.02 ANCHORS AND SUPPORTS

A. The Contractor shall furnish, install, and protect all necessary guides, bearing plates, anchor and attachment bolts, and all other appurtenances required for the installation of the devices included in the equipment specified. Working Drawings for installation shall be furnished by the equipment manufacturer, and suitable templates shall be used by the Contractor when required in the detailed equipment Specifications.

B. Anchor bolts and fasteners shall be furnished in accordance with Section 05 05 23 – Metal Fastening, and with the individual equipment Specifications. All anchor bolts shall be a minimum of 1/2-inch diameter. All anchor bolts, guard bolts, washers, clips, clamps, and fasteners of any type shall be constructed of 316 stainless steel, unless otherwise specified the individual equipment Specifications.

C. The Contractor shall provide all concrete pads or pedestals required for equipment furnished. All concrete equipment pads shall be a minimum of 6” high, unless otherwise shown on the Drawings and shall be doweled.

D. Pipe sleeves or other means of adjusting anchor bolts shall be provided where indicated or required. Equipment shall be leveled by first using sitting nuts on the anchor bolts, and then filling the space between the equipment base and concrete pedestal with non-shrink grout, unless alternate methods are recommended by the manufacturer and are acceptable to the Engineer (such as shim leveling pumps, or chemical grout). Non-shrink grout shall be as specified in Section 03 60 00 – Grout.

2.03 STRUCTURAL STEEL

A. Structural steel used for fabricating equipment shall conform to the requirements of Section 05 12 00 – Structural Steel.

B. All materials shall conform to applicable provisions of the AISC Specifications for the design and fabrication of structural steel, and to pertinent ASTM Standard Specifications.

2.04 DISSIMILAR METALS

A. All dissimilar metals shall be isolated in accordance with Section 05 10 00 – Metal Materials and to the satisfaction of the Engineer.

2.05 GALVANIZING

A. Where required by the equipment specifications, galvanizing shall be performed in accordance with Section 05 05 13 – Galvanizing.

2.06 STANDARDIZATION OF GREASE FITTINGS

A. The grease fittings on all mechanical equipment shall be such that they can be serviced with a single type of grease gun. Fittings shall be “Zerk” type.

2.07 ELECTRICAL REQUIREMENTS

A. All electrical equipment and appurtenances, including but not limited to motors, panels, conduit, and wiring, etc., specified in the equipment specifications shall comply with the applicable requirements of Division 26 Specifications and the latest National Electric Code.

2.08 ACCESSORIES, SPARE PARTS, AND SPECIAL TOOLS

A. Accessories, spare parts, and special tools shall be provided in accordance with Section 01 78 43 – Spare Parts and Extra Materials.

2.09 EQUIPMENT IDENTIFICATION

A. All mechanical equipment shall be provided with a substantial stainless-steel nameplate, mechanically fastened with stainless steel hardware in a conspicuous place, and clearly inscribed with the manufacturer's name, year of manufacture, serial number, and principal rating data.

B. Nameplates shall not be painted over.

PART 3 – EXECUTION

3.01 SHOP TESTING

A. All equipment shall be tested in the shop of the manufacturer in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents and that it will operate in the manner specified or implied.

B. No equipment shall be shipped to the project until the Engineer has been furnished a certified copy of test results and has notified the Contractor, in writing, that the results of such tests are acceptable.

C. A certified copy of the manufacturer's actual test data and interpreted results thereof shall be forwarded to the Engineer for review.

D. If required by the individual equipment Specifications, arrangements shall be made for the Owner/Engineer to witness performance tests in the manufacturer's shop. The Engineer shall be notified ten working days before shop testing commences. Expenses are to be paid by Contractor.

3.02 SHIPMENT, DELIVERY, HANDLING AND STORAGE

A. Shipment, delivery, and handling of equipment and materials shall be in accordance with Section 01 65 00 – Product Delivery Requirements.

B. Storage of equipment and materials shall be in accordance with Section 01 66 00 – Product Storage and Protection Requirements.

3.03 MANUFACTURER'S FIELD SERVICES

A. Manufacturer's field services shall be in accordance with Section 01 75 00 – Checkout and Startup Procedures.

B. The Contractor shall arrange for a qualified factory trained Technical Representative from each manufacturer or supplier of equipment who is regularly involved in the inspection, installation, start-up, troubleshooting, testing, training, maintenance, and operation of the specified equipment. Qualification of the Technical Representative shall be appropriate to the type of equipment furnished and subject to the approval of the Engineer and the Owner. Where equipment furnished has significant process complexity, furnish the services of engineering personnel knowledgeable in the process involved and the function of the equipment. When necessary, the Contractor shall schedule multiple Technical Representatives to be present at the same time for the purpose of coordinating the operation of multiple pieces of related equipment.

C. Services of the Technical Representative will require a minimum of two (2) site visits, one for installation and testing and one for startup and training and will be for the minimum number of days recommended by the manufacturer and approved by the Engineer but will not be less than the number of days specified in individual equipment sections. Additional site visits may be required as described below and in the equipment specifications.

D. For each site visit, the Technical Representative shall submit jointly to the Owner, the Engineer, and the Contractor a complete signed report of the results of his inspection, operation, adjustments, and testing. The report shall include detailed descriptions of the points inspected, tests and adjustments made, quantitative results obtained if such are specified.

E. The manufacturer's Technical Representative shall provide the following services.

1. Installation: The Technical Representative shall inspect the installed equipment to verify that installation is in accordance with the manufacturer's requirements. Where required by individual equipment specifications, the Technical Representative shall also supervise the installation of the equipment.

2. Testing: After installation of the equipment has been completed and the equipment is presumably ready for operation, but before it is operated by others, the Technical Representative shall inspect, operate, test, and adjust the equipment as required to prove that the equipment is in proper condition for satisfactory operation under the conditions specified. Unless otherwise noted in the signed site visit report, the report shall constitute a certification that the equipment conforms to the requirements of the Contract and is ready for startup and that nothing in the installation will render the manufacturer's warranty null and void. The report shall include date of final acceptance field test, as well as a listing of all persons present during tests.

3. Startup: The Technical Representative shall start up the equipment for actual service with the help of the Contractor. If equipment or installation problems are experienced, the Contractor and the representative shall provide the necessary services until the equipment is operating satisfactorily and performing according to the specifications at no additional

cost to the Owner. Unless otherwise noted in the signed site visit report, the report shall constitute a certification that the equipment conforms to the requirements of the Contract and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void.

4. Training: Training shall be provided in accordance with Section 01 79 00 –Instruction of Owner Personnel.

5. Services after Startup: Where required by the individual equipment specifications, the Technical Representative shall return to the project site thirty (30) days after the startup date to review the equipment performance, correct any equipment problems, and conduct operation and maintenance classes as required by the Owner. This follow-up trip is required in addition to the specified services of Technical Representative prior to and during equipment startup. At this time, if there are no equipment problems, each manufacturer shall certify to the Owner in writing that his equipment is fully operational and capable of meeting operating requirements. If the equipment is operating incorrectly, the Technical Representative will make no certification to the Owner until the problems are corrected and the equipment demonstrates a successful thirty (30) days operating period.

F. The Contract amount shall include the cost of furnishing the Technical Representative for the minimum number of days specified, and any additional time required to achieve successful installation and operation. The times specified for services by the Technical Representative in the equipment Specifications are exclusive of travel time to and from the facility and shall not be construed as to relieve the manufacturer of any additional visits to provide sufficient service to place the equipment in satisfactory operation.

G. The Contractor shall notify the Engineer at least 14 days in advance of each equipment test or Owner training session.

H. The Technical Representative shall sign in and out at the office of the Engineer's Resident Project Representative on each day the Technical Representative is at the project.

3.04 INSTALLATION

A. The Contractor shall obtain written installation manuals from the equipment manufacturer prior to installation. Equipment shall be installed strictly in accordance with recommendations of the manufacturer. A copy of all installation instructions shall be furnished the Engineer's field representative one week prior to installation.

B. The Contractor shall have on hand sufficient personnel, proper construction equipment, and machinery of ample capacity to facilitate the work and to handle all emergencies normally encountered in work of this character. To minimize field erection problems, mechanical units shall be factory-assembled insofar as practical.

C. Equipment shall be erected in a neat and workmanlike manner on the foundations at the locations and elevations shown on the Drawings.

D. All equipment sections and loose items shall be match-marked prior to shipping.

E. For equipment that requires field alignment and connections, the Contractor shall provide the services of the manufacturer's qualified mechanic, millwright, or machinist, to align the equipment and motor prior to making piping connections or anchoring the equipment base. Alignment shall be as specified herein.

F. The Contractor shall furnish oil and grease for initial operation and testing. The manufacturer and grades of oil and grease shall be in accordance with the recommendations of the equipment manufacturer.

3.05 ALIGNMENT

A. Set equipment to dimensions shown on drawings. Dimensions shall be accurate to +/- 1/16 inch unless otherwise noted on the drawings. Wedges shall not be used for leveling, aligning, or supporting equipment.

B. General Equipment Leveling: Non-rotating equipment shall be set level to +/- 1/16 inch per 10-foot length (.005 inch per foot) unless otherwise noted on the drawings. Shims shall be used unless equipment is furnished with leveling feet. Set shims flush with equipment baseplate edges. When grouting is required, equipment shall be shimmed to allow a minimum of one-inch grout thickness. Grout shall cover shims at least 3 inches. Final level check shall be held for inspection and approval by Engineer before proceeding.

C. Grouting

1. Fill anchor bolt holes or sleeves with grout, after bolt alignment is proven, and prior to placing grout under equipment bases.

2. Surface Preparation. Roughen surface by chipping, removing laitance, and unsound concrete. Clean area of all foreign material such as oil, grease, and scale. Saturate area with water at least 4 hours prior to grouting, removing excess water ponds.

3. Application. Place grout after the equipment base has been set and its alignment and level have been approved. Form around the base, mix grout, and place in accordance with the grout manufacturers published instructions. Eliminate all air or water pockets beneath the base using a drag chain or rope.

4. Finishing. Point the edges of the grout to form a smooth 45-degree slope.

5. After grout has cured (not before 3 days after placement) paint exposed surfaces of grout with shellac.

6. Level Verification. After grout has cured, and immediately prior to drive alignment, recheck equipment for level and plumb. Re-level and square as necessary. Hold final checks for inspection and approval by Engineer.

D. Inspect for and remove all machining burrs or thread pulls in female holes on mating surfaces of mounting frame and machine feet.

E. Inspect and clean equipment mounting base pads, feet, and frames to remove all grease, rust, paint, and dirt.

3.06 FIELD TESTING

A. Field testing shall be in accordance with Section 01 75 00 – Checkout and Startup Procedures.

B. All equipment shall be set, aligned, and assembled in conformance with the manufacturer's drawings and instructions. Provide all necessary calibrated instruments to execute performance tests. Submit report certified by the pump manufacturer’s representative.

C. Preliminary Field Tests, Yellow Tag

1. As soon as conditions permit, after the equipment has been secured in its permanent position, the Contractor shall:

   a. Verify that the equipment is free from defects.

   b. Check for alignment as specified herein.

   c. Check for direction of rotation.

   d. Check motor for no load current draw.

2. When the Contractor has demonstrated to the Engineer that the equipment is ready for operation, a yellow tag will be issued. The tag will be signed by the Engineer, or his assigned representative and attached to the equipment. The tag shall not be removed.

3. Preliminary field tests, yellow tag, must be completed before equipment is subjected to final field tests, blue tag.

D. Final Field Tests, Blue Tag

1. Upon completion of the above, and at a time approved by the Engineer, the equipment will be tested by operating it as a unit with all related piping, ducting, electrical and controls, and other ancillary facilities.

2. The equipment will be placed in continuous operation as prescribed or required and witnessed by the Engineer or his assigned representative and the Owner or his assigned representative.

3. The tests shall prove that the equipment and appurtenances are properly installed, meet their operating cycles and are free from defects such as overheating, overloading, and undue vibration and noise. Operating field tests shall consist of the following:

a. Check equipment for excessive vibration and noise as specified herein.

E. Additional field testing recommended by the manufacturer shall be performed at no cost to Owner.

F. Until final field tests are acceptable to the Engineer, the Contractor shall make all necessary changes, readjustments, and replacements at no additional cost to the Owner.

G. Upon acceptance of the field tests, a blue tag will be issued. The tag will be signed by the Engineer and attached to the unit. The tag shall not be removed, and no further construction work will be performed on the unit, except as required during start-up operations and directed by the Engineer.

H. Defects which cannot be corrected by installation adjustments will be sufficient grounds for rejection of any equipment.

I. All costs in connection with field testing of equipment such as lubricants, temporary instruments, labor, equipment, etc., shall be borne by the Contractor. Power, fuel, chemicals, water, etc. normally consumed by specific equipment shall be supplied by the Owner unless otherwise specified in the individual equipment specifications.

J. The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

3.07 VIBRATION TESTING

A. Vibration testing shall be in accordance with Section 01 75 00 – Checkout and Startup Procedures.

3.08 FAILURE OF EQUIPMENT TO PERFORM

A. Any defects in the equipment, or failure to meet the guarantees or performance requirements of the Specifications shall be promptly corrected by the Contractor by replacements or otherwise.

B. If the Contractor fails to make these corrections, or if the improved equipment shall fail again to meet the guarantees or specified requirements, the Owner, notwithstanding his having made partial payment for work and materials which have entered into the manufacture of said equipment, may reject said equipment and order the Contractor to remove it from the premises at the Contractor's expense.

C. The Contractor shall then obtain specified equipment to meet the contract requirements or upon mutual agreement with the Owner, adjust the contract price to reflect not supplying the specific equipment item.

D. In case the Owner rejects said equipment, then the Contractor hereby agrees to repay to the Owner all sums of money paid to him for said rejected equipment on progress certificates or otherwise on account of the lump sum prices herein specified.

E. Upon receipt of said sums of money, the Owner will execute and deliver to the Contractor a bill of sale of all his rights, title, and interest in and to said rejected equipment; provided, however, that said equipment shall not be removed from the premises until the Owner obtains from other sources other equipment to take the place of that rejected.

F. Said bill of sale shall not abrogate Owner's right to recover damages for delays, losses, or other conditions arising out of the basic contract.

3.09 PAINTING

A. All surface preparation, shop painting, field repairs, finish painting, and other pertinent detailed painting specifications shall conform to applicable paragraphs of Section 09 90 00 – Painting.

B. All shop coatings shall be compatible with proposed field coatings.

C. All inaccessible surfaces of the equipment, which normally require painting, shall be finished painted by the manufacturer. The equipment and motor shall be painted with a high-quality epoxy polyamide semi-gloss coating specifically resistant to chemical, solvent, moisture, and acid environmental conditions, unless otherwise specified.

D. Gears, bearing surfaces, and other unpainted surfaces shall be protected prior to shipment by a heavy covering of rust-preventive compound sprayed or hand applied which shall be maintained until the equipment is placed in operation. This coating shall be easily removable by a solvent.

3.10 WELDING

A. The Equipment Manufacturer's shop welding procedures, welders, and welding operators shall be qualified and certified in accordance with the requirement of AWS D1.1 "Structural Welding Code - Steel" or AWS D1.2 "Structural Welding Code - Aluminum" of the American Welding Society, as applicable.

B. The Contractor's welding procedures, welders, and welding operators shall be qualified and certified in accordance with the requirements of AWS D1.1 "Structural Welding Code - Steel" or AWS D1.2 "Structural Welding Code - Aluminum" of the American Welding Society, as applicable.

C. The Contractor shall perform all field welding in conformance with the information shown on the Equipment Manufacturer's drawings regarding location, type, size, and length of all welds in accordance with "Standard Welding Symbols" AWS A2.0 of the American Welding Society, and special conditions, as shown by notes and details.

END OF SECTION

SECTION 46 73 16

DUAL DECK TRUSS-TYPE FLOATING COVERS

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish and install all labor, materials, equipment, and incidentals as required to complete, ready for operation and field test three (3) dual-deck truss-type floating digester covers including all appurtenances and accessory equipment as shown on the Drawings and as specified herein for Digesters No. 1, No. 3, and No.4.

1. Appurtenances provided by the manufacturer include but are not limited to gas collection domes, entrance hatches, manholes and covers, drain sumps, combination pressure/vacuum relief valves, access stairway assemblies, and anti-rotation guides.

2. The Contractor shall furnish and install the top roller protective plates as detailed in this specification.

B. Floating Covers design shall be of the Dual-Deck Truss type with steel ceiling and roof plates, constructed to float directly upon the liquid contents of the tank, thereby providing positive submergence of floating materials and preventing structural components from contacting the digester contents.

C. Furnishing and Installation of three (3) dual-deck truss type floating covers within existing 105’-0’’ diameter concrete tanks.

1. The Contractor shall perform a survey in order to verify the dimensions of each digester cover prior to submitting the order for the new cover fabrication.

a. The Contractor shall take a minimum of eighteen (18) measurements of diameter across each digester tank evenly spaced at 20° angular spacing.

b. The Contractor shall identify any irregularities discovered during the cover survey to the digester cover manufacturer.

D. Equipment shall be provided in accordance with the requirements of Section 46 00 00 – Equipment General Provisions.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Section 01 33 00 – Submittal Procedures

B. Section 01 77 19 – Close out Requirements

C. Section 01 78 23 – Operation and Maintenance Data

D. Section 05 12 00 – Structural Steel

E. Section 05 05 23 – Metal Fastening

F. Section 09 90 00 – Painting

G. Section 40 70 00 – Instrumentation for Process Systems

H. Section 46 00 00 – Equipment General Provisions

I. Section 46 73 19 – Miscellaneous Digester Gas Equipment

J. ACI 301 – Specification for Concrete Construction

K. ACI 318 – Building Code Requirements for Reinforced Concrete

L. AISC 2016 Specification for Structural Steel for Buildings – Allowable Stress Design and Plastic Design

M. AISC Quality Certification Program

N. ASTM A36 – Standard Specification for Carbon Structural Steel

O. ASTM B16.1 – Standard for Cast Iron Pipe Flanges and flanged Fittings

P. ASTM C94 – Standard Specification for Ready-Mixed Concrete

Q. AWS A2.0 – Standard Welding Symbols

R. AWS D1.0 – Welding in Building Construction

S. AWS D1.1 – Structural Welding Code – Steel

T. New York State Building Code (Edition 2020)

1.03 ACTION/INFORMATIONAL SUBMITTALS

A. Product Data: Comply with Section 01 33 00 –Submittal Procedures

B. Provide submittals identified in Section 46 00 00 – Equipment General Provisions in addition to the submittals identified herein:

1. Complete design data and structural calculation for each digester cover including ballast calculations for normal operating pressure and escape pressure. The structural calculations shall be signed and sealed by a Professional Engineer, registered in the State of New York, who is taking professional responsibility, attesting to the adequacy and accuracy of the design.

2. Submit, with the bid, a copy of the current AISC quality certification program certificate for fabricating plant.

3. Shop Drawings: minimum of three (3) sets shall be submitted with the following:

   a. Detailed construction sequence with assembly and installation instructions with clearly indicated installation tolerances.

   b. Manufacturer's literature, illustrations, specifications, and engineering data including materials, members, supports, secondary steel, attachments, connections, weld requirements, bolts, appurtenances, dimensions, size, and weights.

   c. Layout of structural truss members, cover ceiling plates, rim skirt, roof penetrations, non-slip walkways for access to the roof, and appurtenances.

4. An additional complete set of shop drawings shall be sent to Owner for their record.

5. Descriptive literature, bulletins, and/or catalogs of the equipment.

   a. The total weight of the equipment including the weight of the single largest item and the weight of each item of equipment.

   b. A complete bill of materials for all equipment.

   c. A list of the Manufacturer's recommended spare parts with the Manufacturer's current price for each item.

6. Welder's Certificates.

7. Performance Affidavit

8. At the Engineer's request, submit certification that the Equipment Manufacturer has not less than (10) years of experience in the application, design, and manufacture of anaerobic digester floating covers in wastewater treatment plants and submit a list of not less than twenty-five (25) operating installations as evidence of meeting the experience requirement.

9. Reports by independent testing lab detailing all field test results.

1.04 CLOSEOUT SUBMITTALS

A. Submit warranty documentation in compliance with:

   1. Section 01 33 00 – Submittal Procedures

   2. Section 01 77 19 – Closeout Requirements

B. Operation and Maintenance (O&M) manuals shall be submitted in accordance with Section 01 33 00 – Submittal Procedures and Section 01 78 23 – Operation and Maintenance Data.

C. Training Submittals shall be submitted in accordance with Section 01 79 00 – Instruction of Owner's Personnel.

1.05 QUALITY ASSURANCE

A. All the equipment specified herein shall be furnished by a single supplier who shall be responsible for the satisfactory performance of the equipment.

B. Manufacturer shall have not less than ten (10) years of experience in the application, erection, and manufacture of truss type digester floating covers in wastewater treatment plants and shall submit qualifications as such.

C. The Manufacturer shall review and prepare all Shop Drawings and other Submittals for components furnished in this specification.

D. All connections shall be designed for digester gas service and shall be integrated into the overall fabrication for gas tightness of all joints.

E. The Digester cover fabricator shall possess a Quality Certification Program Certificate from the American Institute of Steel Construction (AISC) for Category (Sbd), Conventional Steel Buildings.

F. Welders Qualifications: Certificate by AWS for required welding in accordance with Section 05 12 00 – Structural Steel.

1.06 GENERAL INFORMATION AND DESCRIPTION

Digester Cover Design Criteria

Digesters 1, 3 and 4	
Number of Units	3
Digester Type	Primary
Current Operation Type	Primary
Year Digester Placed in Service	1971
Tank Dimensions	
Tank Inside Diameter, ft-in	105'-0"
Side Water Depth, ft-in	26'-0"
Landing Bracket Elevation	+16.70
Structural Design Requirements	(1)
Notes: (1) All Structural Design Requirements for live loads, snow loads, wind design criteria, and seismic loads shall be in compliance with the Contract Drawings.	

A. Floating Dual-Deck Truss Digester Covers shall be designed in accordance with AISC 2016 – Specification for Structural Steel for Buildings – Allowable Stress Design and Plastic Design.

B. The cover shall be arranged for the full range of travel between its highest position above the maximum water level and its lowest position when resting on fabricated concrete corbels. Restrictions of cover travel by mechanical stops shall not be permitted.

C. The maximum allowable stress shall not exceed the limiting stresses as set forth in ASIC specifications for structural steel with 36,000 psi yield point (A36).

D. The Structural design shall take into consideration live load, snow load, wind load, and dead load, including weight of cover, ballast, process piping, and other appurtenances.

E. Structural Steel:

1. Comply with Section 05 12 00 – Structural Steel

2. Floating covers shall be designed to maintain a maximum nominal clearance of 3 inches between the digester wall and the floating cover rim plate.

1.07 WARRANTY

A. Comply with the Equipment Warranties requirements specified in Section 46 00 00 – Equipment General Provisions.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Dual-Deck Truss Type Covers:

1. Evoqua Water Technologies

2. Olympus Technologies, Inc.

3. Or Approved Equal

2.02 DIGESTER COVER

A. Type: Dual-Deck Truss Floating Cover with steel ceiling plates, roof plates, and side skirt constructed to float directly upon the liquid contents of the tank and preventing structural components from coming into contact with digester contents.

B. Floating covers shall be made up of prefabricated subassemblies, set up and assembled in the shop to the degree necessary to ensure proper field set up, and then piece marked, disassembled, and shipped to the site for field erection. Subassemblies shall be prefabricated in units as large as shipping and handling restrictions will allow.

C. All structural steel used in the fabrication of the sludge digestion equipment shall conform to the requirements of ASTM A-36. Design and fabrication of structural steel members shall be in accordance with the AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings, latest addition. All welding shall conform to the latest Standards of the American Welding Society. Where materials are specified to be galvanized, galvanizing shall be done after the shop welding is completed. Galvanized materials shall not be field welded.

D. All openings for appurtenances protruding through the cover roof and ceiling plates shall be located and precut in the factory and designed to allow field installation of the appurtenances with gas tight welds at the roof and ceiling plate.

E. The floating cover side skirt sections shall be designed with lifting lugs for use in field assembly located to provide lifting of the skirt sections in a manner maintain the skirt in the vertical plane. Vertical skirt joints shall have shop welded back-up plates and temporary connection tabs used for convenience in field assembly.

F. The floating cover side skirt shall include ballast support structure at the bottom. Tie-rods, wire rope, or similar items shall not be used in the design of the ballast support structure.

G. Each Truss shall comprise an upper and lower chord from the gas dome to the rim plate and shall include the required supporting interconnecting members in the vertical plane. Each truss shall include a ¼’’ minimum thickness factory welded bottom chord plate (not a structural element of the truss) to accommodate installation of the ceiling plate with all down hand welding. To assure proper alignment and to aid erection, trusses shall have bolted connections at the gas dome, rim plates, and purlins.

H. The rim plates shall extend 1’-0’’ below the bottom truss chord to provide a liquid seal between the digester cover and the tank wall. All rim plate sections shall be provided with splice connections which run the entire skirt depth to aid in the erection of the cover rim sections and to provide additional stiffness to the rim. The splice connections shall enable the welding of the skirt section from the inside of the tank without burning the coating on the outer surface.

I. The gas dome shall include a connection for the pressure/vacuum relief valve assembly and shall provide a suitable collection point for digester gas. The dome shall be fitted with a bolted and gasket cover plate. The cover plate shall accommodate gas pipe housing.

J. The roof and ceiling plate sections shall be precut at the factory and shall be designed for all down hand fillet or overlap welding in the field. Framing shall be provided in the ceiling plate for manways and in the roof plate for entrance hatches. Purlins shall be provided between the top chords of the trusses for support of the outer roof plate sections.

K. Top Rollers and Spring Shoes:

1. Top rollers shall be grease lubricated and shall be attached to the cover at every other truss.

2. Spring shoes shall be attached to the bottom of the skirt plate, midway between trusses.

L. Concrete Inner Wall Protective Plates at Top Roller Locations

1. At Digesters No. 1, No. 3, and No.4, the Contractor shall furnish and install protective plates along the concrete inner wall at the location of each new digester cover Top Roller.

2. Prior to the installation of the protective plates, the Contractor shall verify with the Digester Cover Manufacturer the location of each new top roller for Digester No. 1, No. 3, and No.4.

3. The protective plates shall be 1/8-inch thick, 6 inches wide, stainless steel type 316 plate, with stainless steel, type 316 ¼ -inch diameter low profile adhesive anchor anchors at 12 inch spacing, along the entire length of the cover travel similar to Detail 3 on Contract Drawing Sheet S-3.

M. Welding:

1. All steel fabrications shall be fabricated by a shop certified to the latest edition of the "Structural Welding Code", AWS D1.1, of the American Welding Society

2. Shield arc in accordance with AWS D1.1 gastight welding standards.

3. Minimum weld size: ¼ -inch

4. Minimum seal weld size: ¼ -inch

2.03 ANTI-ROTATION ASSEMBLIES

A. At Digesters No. 1, No. 3, and No.4, the Contractor shall furnish and install two (2) sets of anti-rotation assemblies spaced 180 degrees apart along each floating cover.

B. At a minimum, each anti-rotation assembly shall consist of two (2) 3'' x 2'' x ¼ '' stainless steel, type 316 angle wall guides, with stainless steel type 316, 3/8" inch diameter adhesive wall anchors at 12 inch spacing, along the full range of the cover travel. The wall guides shall be designed for installation on the inside face of the concrete tank wall.

C. Each anti-rotation assembly shall include a steel slide member attached to the floating cover designed to slide within the wall guides.

D. The anti-rotation assemblies shall prevent the floating cover from rotating throughout the entire cover travel range.

2.04 BALLASTS

A. The Floating Cover shall be provided with the required quantity of ballast blocks to counterbalance the cover appurtenances and to obtain a gas pressure of 14 inches of water column. Ballast blocks shall consist of 300# concrete blocks installed on support beams in the attic space of the cover. No ballast material will be allowed on the top of the cover.

B. The cover manufacturer shall be responsible for determining the sizes, weights, locations, and number of ballast blocks to be installed.

C. The Contractor shall weigh all ballast blocks prior to installation to verify proper installation weights. Weights shall be permanently marked on each block.

2.05 COVER INSULATION

A. The floating covers shall be insulated by applying a 1.5'' layer of lightweight concrete over the entire area of the ceiling plates. The insulation shall be applied to the ceiling plates spanning the lower chords of the trusses within the attic space after painting.

B. Insulation shall not be applied external to the cover nor on the underside of the roof plates.

C. The concrete insulation shall be completely set before installation of the roof plates is begun. Concrete shall have a 36 pound per cubic foot density and a nominal thermal conductivity (k) value of 0.85.

2.06 APPURTENANCES

Digester Cover Appurtenances

Digesters 1, 3 and 4		
Appurtenance Type	**No. Required per Digester**	**Size**
Gas Dome	1	Per Manufacturer Recommendation
Sampling Wells	4	8"
Entrance Hatch to Attic Space	2	36"
Access Manholes to Digester Interior	2	48"
Drain Sump	Per Manufacturer Recommendation	Per Manufacturer Recommendation
Combination Pressure/Vacuum Relief Valves with Flame Arrestor and Safety Selector Valve	2	8"
Stair Assembly	1	Per Manufacturer Recommendation

A. In addition to the requirements listed below, Cover Appurtenances shall conform to the additional requirements of Section 46 73 19 – Miscellaneous Digester Gas Equipment.

B. Provide a single (1) gas withdraw dome for Digester No. 1, No. 3, and No. 4, as shown on the Contract Drawings.

C. Four (4) - 8 - inch sample wells with gas-tight, quick-opening covers. The central sampling well to stop at the ceiling plate. The peripheral sampling wells to extend to the bottom of the rim plate. Sampling wells shall be fitted with gas tight, hinged, quick opening covers.

D. Two (2) - 36 – inch diameter entrance hatch to attic space.

1. Entrance hatches shall be fitted with gas tight bolted and gasketed covers. The covers shall be equipped with a pressure equalization unit to maintain atmospheric pressure in the cover attic.

E. Two (2) - 48 – inch diameter digester access manholes shall be provided in the cover.

1. The manways shall be equipped with rungs for access and shall be fitted with a gas tight bolted and gasketed covers.

F. Drain Sumps shall be provided on the bottom of the covers with capped airtight access wells on the cover surface. Drain Sumps shall be of steel construction with schedule 40 sample tubes. The size, quantity, and location of drain sumps and wells shall be provided by the cover manufacturer.

G. Two (2) 8'' combination pressure/vacuum relief valves with flame arrestor shall be provided. A 3-way safety selector valve with lever operator shall be provided between the two PVR's for the isolation of each unit during times of servicing.

H. One (1) Hinged Stair Assembly, pivoting around the upper end, to provide access to the floating cover, regardless of the position of the cover, as shown on the Drawings. The stair assembly shall conform to the following requirements:

1. The minimum clear width of the stairway shall be 48 inches.

2. The stairway shall comply with the applicable requirements of NAAM and OSAH Standards.

3. The lower end shall be fitted with double rollers. Wearing plates, minimum ¼ - inch thick, shall be provided on the floating cover roof for protection against abrasion by the rollers.

4. The treads shall be provided with a mechanism for self levelling. The lower end rollers shall be connected to the mechanism and shall determine the position of the treads.

5. Materials of Construction:

a. Treads, platform, brackets, bearings, framing and other appurtenances: steel. Treads shall have non-slip surface.

b. Handrail and safety chains: Aluminum. Dielectric protection shall be provided between aluminum and steel contact surfaces.

c. Anchors bolts, assembly bolts, nuts, and washers: Type 316 stainless steel.

I. In the event the new digester cover bottom spring shoes do not line up with the existing digester concrete landing brackets for Digesters No. 1, No. 3, and No 4, the Contractor shall furnish and install new stainless steel, type 316 landing brackets to be adhesively anchored to the digester inner wall. The landing brackets shall be designed by the Contractor's Professional Engineer, registered in the State of New York, who is taking professional responsibility, attesting to the

adequacy and accuracy of the design. The Professional Engineer's structural calculations shall be signed, sealed, and submitted for review.

PART 3 – EXECUTION

3.01 MANUFACTURER'S FIELD SERVICES

A. The services of a qualified manufacturer's technical representative shall be provided in accordance with Section 46 00 00 – Equipment General Provisions and shall include the following site visits for each cover.

Service	Number of Trips	Number of Days/Trips
Field Testing & Start Up	2	3
Training	1	1
Final Adjustments	1	1

3.02 FABRICATION AND WELDING

A. All workmanship shall be first class in every respect shall conform to the latest and best practice. All structural material shall be thoroughly straightened at the shop by methods that will not injure it before templates are placed on same for laying out, and before any work is done on it. Finished metal must be absolutely straight and free from open joints and distortions of any kind. All shearing and cutting shall be neatly and accurately done. All necessary fittings, connections, or other details necessary for the work shall be furnished.

B. All field welding shall be shielded arc welding and shall conform to the latest standards AWS D1.0 "Welding in Building Construction" of the American Welding Society (AWS) for gastight welding.

C. Members to be joined by welding shall be accurately cut to size and where required shall be rolled or pressed to the proper curvature. The dimensions and shape of the edge to be joined shall be such as to allow thorough fusing and complete penetration. The members which are to be welded together shall be so positioned at the time of the welding that members will not be forced more closely together by the cooling of the weld, thereby setting up additional strains and distortions. Distortion due to welding or stress relieving shall not be corrected by blows.

D. Surface of the plates or members to be welded shall be free from rust, grease, or scale at the time of the welding. The welding of all joints shall produce complete fusion with the parent metal and shall be free from deleterious metals and cracks. Finished welded joints shall be reasonably smooth and free from grooves, depressions, and other irregularities.

E. The Contractor's welding procedures, welders, and welding operators shall be qualified and certified in accordance with the requirements of AWS D1.0 "Welding in Building Construction" of the American Welding Society. The Contractor shall perform all field welding in conformance

with information shown on the Equipment Manufacturer's drawings regarding location, type, size and length of all welds in accordance with "Standard Welding Symbols" AWS A2.0 of the American Welding Society and special conditions as shown by notes and details.

F. The Contractor shall submit copies of valid certifications for the welders he proposes to use on a form similar to that outlined in Part QW-448 of ASME, Section IX, including the name of welder, length of employment, total years of experience, and qualified welding procedures. All welders shall be subject to the qualifications test prescribed by the standard qualification procedure of the American Welding Society.

G. The Engineer shall have the right at any time to call for and witness the making of the test specimen by any welder in accordance with the above and to observe the physical test of the test specimens. Materials shall be furnished, and all tests shall be made by, and at the expense of the Contractor.

3.03 FIELD ERECTION AND INSTALLATION

A. Covers shall be erected inside the existing digester tanks.

B. Covers shall be erected and installed in strict conformance with the cover manufacturer’s recommendations and installation instructions and approved shop drawings.

C. The Contractor shall provide all equipment, platforms, supports, scaffolding, etc. As required to complete the installation.

D. Ceiling plates and roof plates shall be installed in two (2) separate steps to allow for testing as described herein.

E. The Contractor shall protect and maintain all interior piping until ready for handover back to the County.

3.04 SURFACE PREPARATION AND PAINTING AND INSULATION APPLICATION

A. All covers and appurtenances shall be surface prepared, field primed, and painted in accordance with Section 09 90 00 – Painting.

B. Field painting shall not begin until all testing requirements have been met, except the outer surfaces of the rim plates which shall be painted before installation.

C. Adequate lighting shall be provided during all surface preparation and coating operations. The lighting shall be sufficient to clearly illuminate the working area without shadows.

D. Surface Preparation and coating application shall proceed only when air and surface temperatures are between 50 and 120 F, relative humidity is below 80 percent, and surface temperature is at least five degrees above wet bulb temperature.

E. No surface preparation or coating application work shall be done under unfavorable weather conditions unless the work is protected from such conditions, and then only with specific approval of the County or the Engineer.

F. Spray equipment shall be comparable to that specified herein and shall be thoroughly cleaned before and after use with appropriate cleaning solvents specified herein.

G. Access to the interior of the digester during preparation and coating operations shall be limited to essential personnel. All necessary precautions shall be employed to avoid contamination or damage to freshly prepared or coated surfaces by working personnel. Similar precautions shall be employed when inspecting the completed and cured coating system. In order to avoid damaging the coating system, protect surfaces by temporary shielding with taped down heavy Kraft paper or tar paper.

H. Precautions shall be employed to avoid damaging the competed coating system.

I. Insulation Application

1. Insulation shall be applied in accordance with the manufacturer's recommendations and as previously specified in Section 46 73 17.2.06 - Floating Dual-Deck Truss Digester Covers – Cover Insulations and Coatings. The applicator shall be licensed by or acceptable to the manufacturers.

2. The cover shall be cleaned, prepared, and primed in accordance with the insulation manufacturer's recommendations.

3. All applied insulation must be completely covered with primary and top coatings on the same working day.

3.05 FIELD TESTING AND QUALITY CONTROL

A. Testing shall be conducted in the presence of the Engineer of Record.

B. Water Testing will be made available from the plant effluent. The Contractors shall provide all necessary pumps, piping, and other facilities to transfer the water from the source of supply to the digesters.

C. After the cover frame has been erected and ceiling plates have been welded in place with all penetrating appurtenances installed, the ceiling and rim plate shall be tested for gas tightness by filling the tank with water and trapping air beneath the ceiling plate to create a positive internal pressure. All welded seams shall be checked for leaks by means of a soapsuds solution and all leaks re-welded. After the air test, the cover shall be floated on plant effluent water and all seams tested for water tightness and all leaks re-welded.

D. After installation of the ballast and cover plates, pressurize the buoyancy chamber (attic space) by use of air compressor or other devices and check for leaks. All welded seams shall be checked for leaks by means of a soapsuds solution and all leaks re-welded

E. Demonstrate proper cover travel by increasing and decreasing the plant effluent water level in the digester, beginning with cover on corbels, and allowing cover to travel to high water level and back again to corbels. One (1) full cycle must be completed, unassisted, without any binding, scraping, tilting, or any other characteristic not consistent with the manufacturer's intended operation.

F. The contractor shall check and approve the complete installation before operation. The Contractor shall verify that the equipment conforms to all requirements and shall correct all deficiencies.

G. All Testing equipment, including air compressors, shall be furnished by the Contractor.

END OF SECTION

NO TEXT THIS PAGE

SECTION 46 73 19

MISCELLANEOUS DIGESTER GAS EQUIPMENT

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor Shall furnish all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install miscellaneous digester gas safety and control equipment complete and operational.

B. The Contractor shall be responsible for coordinating work in this Section with related work specified elsewhere in this Contract to provide all assemblies, hardware, appurtenances, transition pieces and accessories for a complete and fully functional installation.

C. The contractor shall coordinate with the digester cover manufacturer and ensure that all digester gas equipment located on the digester covers is compatible with the manufacturer's cover design.

1.02 REFERENCES SPECIFICATIONS, CODES, AND STANDARDS

A. Section 01 33 00 – Submittal Procedures

B. Section 01 77 19 – Close Out Requirements

C. Section 01 78 23 – Operation and Maintenance Data

D. Section 01 79 00 Instruction of Owner's Personnel

E. Section 46 00 00 – Equipment General Provisions

F. Section 09 90 00 – Painting

G. Section 46 73 16 – Dual-Deck Truss-Type Floating Digester Covers

H. Division 40, Sections on Piping, Valves, and Appurtenances

I. ASME Boiler and Pressure Vessel Code, Section XIII

J. ASTM A53 – Carbon Steel Alloy

K. AWWA C207 – Steel Pipe Flanges for Water Work Services Sizes 4 in through 144 in

L. NFPA Standard No. 54 – Standard for the Installation of Gas Piping and Gas Equipment on Industrial Premises and Certain Other Premises.

M. OSHA requirements for safety

1.03 ACTION / INFORMATIONAL SUBMITTALS

A. Product Data: Comply with Section 01 33 00 – Submittal Procedures

B. Provide submittals identified in Section 46 00 00 – Equipment General Provisions in addition to the submittals identified herein:

1. Manufacturer's literature, illustrations, specifications, and engineering data including dimensions, materials, size, weight, and methods of fabrication.

2. Complete assembly, layout, installation, and wiring diagrams.

3. Provide setting drawings, templates, and directions for the installation of anchor bolts and other anchorages.

4. Equipment cross section drawings.

5. Performance Affidavit

1.04 CLOSEOUT SUBMITTALS

A. Submit warranty documentation in compliance with:

1. Section 01 33 00 – Submittal Procedures

2. Section 01 77 19 – Closeout Requirements

B. Operation and Maintenance (O&M) manuals shall be submitted in accordance with Section 01 33 00 – Submittal Procedures and Section 01 78 23 – Operation and Maintenance Data.

C. Training Submittals shall be submitted in accordance with Section 01 79 00 – Instruction of Owner's Personnel

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Operation and Maintenance (O&M) manuals shall be submitted in accordance with:

1. Section 01 33 00 – Submittal Procedures

2. Section 01 78 23 Operation and Maintenance Data.

B. Comply with Section 46 00 00 – Equipment General Provisions

C. Installation manuals and O&M manuals shall be submitted completely and shall include 3 copies of all approved shop drawings.

1.06 QUALITY ASSURANCE

A. The Equipment Manufacturer shall certify, with their submittal information, to not less than ten

(10) years of experience in the application design, and manufacture of sludge digester gas safety and control equipment for use in wastewater treatment plants and shall submit a list of not less than twenty-five (25) operating installations as evidence of meeting the experience requirement.

B. All materials and equipment covered in this Section, except insulation and field paint shall be furnished by, or through, a single manufacturer who shall be responsible for the design, coordination, and satisfactory performance of all components.

1.07 GENERAL INFORMATION AND DESCRIPTION

A. All gas handling equipment shall be suitable for digester gas having the following general composition by percent volume:

No.	Component	Average % by Volume	Range
1.	Methane	57.2%	52-62
2.	Carbon Dioxide	38.9%	32-42
3.	Nitrogen	3.82%	2-5
4.	Hydrogen Sulfide	0.017%	0.01-0.1
5.	Hydrogen	0.05%	0-1

B. Design Specific Gravity of Digester Gas: 0.84

C. Free air capacity (FAC) where specified herein, shall be based on atmospheric air at a pressure of 14.7 psia (1 atmosphere) and a temperature of 60° F (15.6°C).

D. Gas control systems shall include all safety devices specified, indicated on the contract drawings, or otherwise required to ensure continuous protection against fire, explosion and gas hazard.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Gas Safety and control equipment shall be as manufactured by:

1. Varec Biogas

2. Shand and Jurs,

3. or an approved equal.

2.02 GENERAL REQUIREMENTS

A. All gas safety and control devices shall be constructed of first quality materials which have strength, wearing, and corrosion resistance characteristics entirely suitable for the types of service for which the individual devices are designated.

B. All body castings shall be clean, sound, and without defects of any kind. No plugging, welding, or repairing of defects will be allowed.

C. Fabricated Stainless Steel Items:

1. All stainless steel welded fabricated items shall be passivated after manufacture by immersion in a pickling solution of 6 percent nitric acid and 3 percent hydrofluoric acid. Temperature and detention time shall be sufficient for removal of oxidation and ferrous contamination without etching of surface. Perform a complete neutralizing operation by immersion in a trisodium phosphate rinse followed by clean water wash.

2. The welds shall be scrubbed with same solution or pickling paste and stainless-steel wire brushes after fabrication, to remove weld discoloration and then neutralize and wash clean.

D. All bolt heads and nuts shall be hexagonal of American Standard size. The Contractor shall be responsible for coordinating connecting piping. Gas safety and control devices with screwed ends shall be made tight with Teflon tape. Unions are required at all screwed joint valves within a run of pipe.

E. All welding shall conform to ASME Boiler and Pressure Vessel Code Section XIII, Part UW. Welders shall be AWS certified. All welds shall be given radiographic examination.

F. All gaskets shall be minimum 1/8-inch thick and shall be suitable for digester gas.

G. All electrical items shall be suitable for explosion proof environment Class 1, Division 1, Group C and D and shall be provided with NEMA 7 enclosures.

H. All equipment shall be free of weld splatter and sharp edges.

2.03 FLAME ARRESTERS

A. Flame arresters shall be provided in locations and sizes indicated on the Drawings. Flame arresters shall prevent the passage of flame by means of a removable flame-arresting bank arranged for easy removal for cleaning, inspection, and replacement.

B. Flame arresters shall be Varec Biogas 5000/5010 Series, Shand and Jurs 94309, or equal.

C. Flame arresters shall be provided with Underwriters Laboratory (UL) and/or Factory Mutual (FM) approved elements, or elements of similar design and configuration as elements approved by UL and/or FM for similar service conditions.

D. Net free area through the bank assembly shall be not less than three times the corresponding size standard pipe.

E. The entire bank assembly shall slide out of the arrester housing to facilitate inspection and cleaning. The bank assembly shall be filled with corrugated rectangular shaped flame sheets.

F. Removing or replacing the bank assembly shall not require support for alignment or jack screws for extending the housing and shall not place a strain on the connecting piping.

G. Flame arresters for vertical installation shall be self-draining. Flame arresters for

horizontal service shall include an offset housing with a 1/2" NPT drip trap connection at the low point.

H. Housing construction shall be 356-T6 low copper cast aluminum. The Bank assembly shall include a 356-T6 low copper cast aluminum frame, 316 stainless steel bank sheets, and 316 stainless steel hardware.

I. Flame arrester shall be leakproof to 10 psig.

J. Drain piping with drip traps shall be provided from the inverts of all horizontally installed flame arresters which do not completely drain to adjacent piping.

K. Flame arresters shall be of the size shown in the contract drawings.

2.04 PRESSURE RELIEF AND VACUUM RELIEF VALVES

A. Pressure and vacuum relief valves shall be provided in locations and sizes indicated on the Drawings.

B. Pressure relief and vacuum breaker valves shall be Varec Biogas 2011B Series, Shand and Jurs 94020, or equal.

C. Pressure relief and vacuum breaker valves shall provide both over-pressure and over-vacuum protection for the tank on which it is installed. The valve shall be suitable for installation in an exterior location and operation in all-weather conditions.

D. Pressure relief and vacuum breaker valves shall have a 356-T6 low copper cast aluminum body with Type 316 stainless steel pallet assembly and seating ring. Pallet seals shall be PTFE or FEP. Stem guide shall be 356-T6 low copper cast aluminum body or stainless steel. Hardware shall be Type 316 stainless steel. The units shall be factory tested to no more than 0.5sfh air at 95% of the set point.

E. Pressure relief and vacuum breaker valves shall be provided with 356-T6 low copper cast aluminum weather hoods and be suitable for operation in all weather conditions, including freezing. Screens shall be provided and shall be HDPE or stainless steel.

F. Pressure relief and vacuum breaker valve shall be weight loaded with removable lead weights to allow adjustment of the pressure relief pallet. Pallet weights shall be lead. The pressure pallet shall be adjustable from +4 inches to +16” inches w.c. and initially set at +12 inches w.c. The vacuum pallet shall be set at -2 inches w.c.

2.05 PRESSURE AND VACUUM RELIEF VALVE WITH FLAME ARRESTER ASSEMBLIES

A. Pressure and vacuum relief valve with flame arrester assemblies shall be provided in locations and sizes indicated on the Drawings and shall be equipped with Safety Selector Valves as specified elsewhere in this Section and as shown on the Drawings.

B. The pressure and vacuum relief valve with flame arrester assemblies shall be Varec Biogas

5811B Series, Shand and Jurs 97571, or equal.

C. The pressure and vacuum relief valves shall meet the requirements specified elsewhere in this Section. The flame arrester shall also meet the materials of construction requirements specified elsewhere in this Section.

D. All hardware shall be Type 316 stainless steel.

2.06 SAFTEY SELECTOR VALVES

A. Safety selector valves shall be provided in conjunction with two (2) pressure vacuum relief valve and flame arrester assemblies to allow maintenance on one unit assembly while the other remains in operation.

B. The safety selector valves shall be Varec Biogas SSV Series, Shand and Jurs 97190, or equal.

C. The valve shall consist of a cast aluminum body with a Type 316 stainless steel rotor and indicator seat.

D. The isolation disc, index shaft and retraction bushing shall be fabricated from 17-4 stainless steel.

E. The hardware shall be Type 316 stainless steel.

F. Valve seats and seals shall be PTFE or Teflon.

G. The valve shall have built in seat equalization which is defined as the pressure being uniform and equalized across the valve seat during change-over in order to facilitate the change-over process. During the change-over, pressure shall be applied to both sides of the seating surface. Valves, wherein pressure is only applied on one seating surface during change-over, is not allowed.

H. There shall be no special tools required to operate the unit and must not require more than 80 ft-lb of force. Valves requiring greater than 80 ft-lb of force shall be supplied with explosion proof electric actuators.

I. A bright red indicator manufactured in stainless steel is included to provide positive indication of active pressure and vacuum relief and flame arrester.

J. There shall be means to accommodate a locking device to prevent unwanted access to either of the Pressure and Vacuum Relief Valve and Flame Arrester Assembly.

K. The safety selector valves shall be of the same diameter as the pressure vacuum and flame arrestor assembly it is supporting and shall have a pressure drop through the active device of no greater than 3% of the flow with the pressure relief valve fully open.

L. Valve Cv values shall be included with the submittal information.

M. Packing design shall be tested to ASTM E427, Method A Haolgen leak Test, to reduce the possibility of fugitive emissions.

N. The safety selector valve shall come with threaded ports on both process sides. The threaded ports shall come with 1-inch manual hand valves constructed in stainless steel.

O. The safety selector valve shall be rated for a minimum pressure of 10 psig at 100°F and shall be rated for a maximum temperature of 400°F. The unit shall come with ANSI 150 FF flanged connections.

2.07 MANHOLE COVERS – SELF LOCKING PEDAL STYLE

A. Digester manhole covers of the self-locking pedal style shall be provided in locations and sizes indicated on the Drawings. Each manhole shall include a flanged base for mounting.

B. Self-locking pedal style digester manhole covers shall be Varec Biogas 220W Series, Shand and Jurs 95220, or equal.

C. Manholes shall be provided with lifting handles, a self-locking pedal, open cover catch, and safety pin to prevent accidental closure of the cover. Manhole bases and covers shall be aluminum with coal tar epoxy-lined interior. Manholes shall be provided with neoprene sealing gasket to allow for non-sarking operation. Clamping hardware, including wing nuts, hinge pins, and bolts shall be stainless steel.

2.08 SAMPLING HATCHES

A. Sampling and gauging hatch covers shall be provided in locations and sizes indicated on the Drawings.

B. The sampling hatch shall be Varec 42 Series, Shand and Jurs 95021, or equal.

C. Construction shall be Type 316 stainless steel with replaceable FEP seat inserts provided for non-sparking operation. Sampling and gauging hatches shall be provided flanged connections, an inclined foot pedal, and a locking screw clamp to provide a gastight seal. The flanges shall be drilled per ANSI standards to mount to cover.

D. Maximum working pressure shall be 3 psig.

2.09 CONDENSATE AND SEDIMENT TRAPS

A. Condensate and Sediment traps for condensate and sediment shall be inspected and replaced if directed by the Engineer and the County as indicated on the Contract Drawings and in Section 46 73 33 – Gas Recirculation Compressors.

B. Condensate and sediment traps shall be Varec Biogas 233 Series, Shand and Jurs Model 97120, or equal.

C. Condensate and Sediment Trap tanks construction shall be of 304 Stainless Steel or 316 Stainless

Steel.

D. Storage capacity shall be a minimum of six gallons sediment and six gallons condensate.

E. The operating principal for removing sediment from gas shall be centrifugal force developed by a circular motion of gas passing through at high velocities and gravity at low velocities. The inlet elbow shall be specifically designed to swirl the gas inside the reservoir. An internal baffle shall be located at the base of the reservoir to provide efficient separation of entrained droplets.

F. A 2" NPT blowout connection, a 1" NPT drain connection and two 1/2" NPT connections for sight glass shall be provided. Removable top cover for interior access with integral 3/4" NPT inspection pipe for sediment level measurement shall be provided.

G. Sight glass assemblies shall be provided for each condensate and sediment trap assembly and field installed by the Contractor.

H. Condensate and sediment traps shall withstand working pressure of 5 psig without leaking.

I. Condensate and sediment traps installed in outdoor conditions shall be provided with an insulating jacket.

2.10 DRIP TRAPS

A. Low Pressure Drip Traps:

1. Low pressure drip traps shall be provided for any low pressure sediment traps that require replacement.

2. Drip traps shall be of 6 quarts capacity and be of the reservoir type.

3. Drip traps shall be designed to withstand a working pressure of up to 5 psig without leaking.

4. All drip traps shall be of the rotating disc type and shall be Varec Biogas 246 Series, Shand and Jurs 97100, or equal.

5. Drip traps shall not allow for escape of gas, regardless of disc position. All ports shall be O-ring sealed. The disc, ports, and seals shall be provided to permit free flow of condensate into the reservoir when filling while providing gastight seal on the outlet port. Similarly, the discs, ports, and seals shall be provided to permit free flow of condensate out of the reservoir when draining while providing gastight seal on the inlet port.

6. Housing construction shall be 356-T6 low copper cast aluminum body, cover plate, disc, and handle. Cover plate and disc shall be anodized. All internal working parts and fasteners shall be stainless steel. O-rings shall be neoprene

B. High Pressure Drip Traps

1. High pressure drip shall be provided for any high pressure sediment traps that require replacement.

2. Drip traps shall be controlled with separate ball valves with integral locking lever for open and close operation and shall be Varec Biogas 247 Series, Shand and Jurs 97101, or equal.

3. Drip traps shall not allow for escape of gas at any time, including when filling or draining. The ball valve locking lever shall be provided to prevent the opening of both the fill and drain valves at the same time.

4. Construction shall be entirely Type 316 stainless steel, including body, cover plate, disc, handle, ball valves, all internal working parts, and fasteners.

5. Drip traps shall have a 4 quart minimum capacity and shall be designed for a 65 psig working pressure and a 100 psig test pressure.

6. Each drip trap shall be isolated with a 1-inch gas cock, union, and the required 1-inch piping. The discharge shall be piped to the nearest drain with a minimum 1-inch diameter piping. All pipe fittings, union and valve shall be Type 304 Stainless Steel. Pipe and fittings shall be Schedule 40.

2.11 THERMAL SHUT-OFF VALVES

A. Thermal shut-off valves shall be provided in locations and sizes indicated on the Drawings.

B. Thermal shutoff valve shall be Varec Biogas 430 Series, Shand and Jurs Model 97130, or equal.

C. Thermal shutoff valves shall include a fusible element designed to close the valve within 15 seconds upon reaching a temperature of 255 F (minimum). The fusible element shall control a spring-loaded pallet.

D. An isolated sight glass shall be provided so that pallet position can be determined without having to remove the valve from service.

E. The fuse plug shall be gas tight and shall be removable for replacement of the fusible element.

F. Construction shall be 356-T6 low copper cast aluminum body and cover. The inner valve shall include a low copper aluminum pallet assembly with 304 stainless steel compression spring. Sight glass shall be acrylic with neoprene gaskets.

G. Flanges shall be drilled to ASA 125# FF dimensions. Maximum working pressure shall be 5 psig.

PART 3 – EXECUTION

3.01 INSTALLATION

A. The miscellaneous digester gas safety and control equipment shall be installed in accordance with

the manufacturer's recommendations.

B. The gas piping and equipment shall be installed in accordance with the latest edition of the National Fire Protection Association Standard No. 54A, "Standard for the Installation of Gas Piping and Gas Equipment on Industrial Premises and Certain Other Premises".

3.02 SHOP AND FIELD TESTS

A. After installation of the equipment, controls and all appurtenances, shop and field testing of the equipment for system operation and conformance to the specified performance parameters. The Contractor shall perform shop and field tests in accordance with Section 46 00 00 – Equipment General Provisions and Division 1 - General Requirements. Shop and field testing shall be as follows:

1. Certified factory testing shall be provided for all gas safety and control devices. Gas safety and control devices shall be shop tested, including performance tests, leakage test, and proof-of-design tests. The manufacturer through the Contractor shall submit certified copies of the reports covering the test for acceptance by the Engineer.

2. The Contractor shall conduct field tests to check and adjust system components, and to test and adjust operation of the overall system.

   a. Preliminary field tests shall be conducted prior to start-up with final field tests conducted during start-up.

   b. The factory service representative shall assist the Contractor during all field testing and prepare a written report describing test methods, and changes made during the testing, and summarizing test results.

   c. The service representative shall certify proper operation of the valve operator system upon successful completion of the final acceptance field testing.

3. Tests shall be conducted at a time approved by the Engineer. The Engineer shall witness all field testing.

4. All pressure and vacuum relief valves shall be tested for control operation.

5. Preliminary field tests shall be conducted prior to start-up and shall include a functional check of all gas safety and control devices and all system components.

   a. Preliminary field tests shall demonstrate that the gas safety and control devices perform according to specifications and that all equipment, valves, controls, alarms, interlocks, etc., function properly.

   b. The preliminary field tests shall include all leakage testing.

   c. The preliminary field test report must be approved by the Engineer prior to conducting final field acceptance tests.

d. Based on results of preliminary field tests, the Contractor shall make any adjustments required to settings, etc., to achieve the required operation specified or otherwise directed by the Engineer.

6. Final field acceptance tests shall be conducted simultaneously with the start-up and field testing of the digesters, gas holders, gas compressors, gas drying and conditioning system, engines, boilers, etc. Field tests shall be conducted for the full range of operating modes and conditions specified and as directed by the Engineer. Each of the gas safety and control devices shall be tested at minimum, maximum, and normal head/flow conditions, and under all specified conditions of opening and closing.

7. Field testing shall include optimization of opening and closing times of the applicable gas safety and control devices. The Contractor shall provide the means for accurate measurement of pipeline pressures. Valve and vent opening and closing times shall be adjusted based on process requirements to optimize their operation. Final valve and vent opening and closing times as determined by field tests shall be approved by the Engineer prior to final acceptance of the system.

3.03 MANUFACTUER'S FIELD SERVICES

A. The Contractor shall furnish the services of a qualified manufacturer's services representative to assist in the installation of equipment, check the installation before it is placed into operation, assist in the performance of field tests, observe and assist initial operations and train the plant operations and maintenance staff in the care, operation, and maintenance of the equipment.

B. The Contractor shall provide equipment start-up services in accordance with as described in this Section.

C. The services of a qualified manufacturer's technical representative shall be provided in accordance with Section 46 00 00 – Equipment General Provisions and shall include the following site visits:

Service	Number of Trips	Number of Days/Trips
Installation and Checkout	3	1
Initial Operations/Training	3	1
Services After Start-Up	1	1

D. The Contractor shall submit a report from the manufacturer of each visit to the site. The Contractor shall provide complete information on time, schedule, tasks performed, persons contacted, problems corrected, test results, training, instruction, and all other pertinent information.

E. All services representatives shall sign in with the Engineer on each day they are at the construction site.

END OF SECTION

10/01/18

SECTION 46 73 33

DIGESTER GAS RECIRCULATION COMPRESSORS

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall field test, adjust, and place in satisfactory operation four (4) digester gas recirculation compressors (No. 4, No. 5, No. 9, and No. 10) and ancillary equipment as required for a complete and operable system.

B. The Contractor shall perform an inspection of all process piping, valves, and equipment upstream of the four (4) digester gas recirculation compressors as shown in the contract drawings and specified herein. If any process equipment is determined to be inoperable by the contractor, they are to be removed and replaced.

C. The gas compressor and ancillary equipment shall compress digester gas for use in the existing digester mixing systems.

D. All electrical equipment shall be explosion proof, Class 1, Division 1, Group D

1.02 PAYMENT

A. Comply with Section 01 20 00 – Measurements and Payments

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Section 01 20 00 – Measurements and Payments

B. Section 01 33 00 – Submittal Procedures

C. Section 01 61 00 – Product Requirements and Options

D. Section 01 78 23 – Operation and Maintenance Data

E. Section 05 05 23 – Metal Fastening

F. Section 05 10 00 - Metal Materials

G. Section 09 90 00 - Painting

H. Section 09 97 00 – Special Coatings

I. Section 46 00 00 - Equipment General Provisions

J. Division 40 – Mechanical

K. Section 46 73 19 – Miscellaneous Digester Gas Equipment

L. ASTM - American Society for Testing Materials

M. AISC - American Institute of Steel Construction

N. AWS - American Welding Society

O. NEMA - National Electrical Manufacturers Association

P. NEC - National Electrical Code

Q. UL - Underwriters Laboratories

1.04 ACTION/INFORMATIONAL SUBMITTALS

A. Product Data: Comply with Section 01 33 00 Submittal Procedures.

B. Provide the submittals identified in Section 46 00 00 – Equipment General Provisions in addition to the submittals identified herein:

1. Field test results

1.05 CLOSEOUT SUBMITTALS

A. Submit warranty documentation in compliance with:

1. Section 01 33 00 – Submittal Procedures

2. Section 01 61 00 – Product Requirements and Options

1.06 TRAINING SUBMITTAL

A. Training Submittals shall be submitted in accordance with Section 0179 00 – Instruction of Owner's Personnel

1.07 MAINTENANCE MATERIAL SUBMITTALS

A. Operation and Maintenance (O&M) manuals shall be submitted in accordance with:

1. Section 01 33 00 – Submittal Procedures

2. Section 01 78 23 – Operation and Maintenance Data

1.08 QUALITY ASSURANCE

A. The materials covered by these Specifications are intended to be standard equipment of proven reliability and produced by a reputable manufacturer having experience in the production of such equipment. They shall operate satisfactorily to requirements in this specification and operated per

manufacturers recommendations.

B. The testing and placement into satisfactory operation of the digester gas recirculation compressors shall be performed by the previous gas recirculation compressor manufacturer Glauber Equipment Corporation (No other compressor manufacturer shall be acceptable). The Contractor, through the gas recirculation compressor manufacturer shall have the responsibility of matching all components and providing equipment which functions together as a complete and operable system.

1.09 TOOLS, SUPPLIES, AND SPARE PARTS

A. The Contractor shall furnish all special tools necessary to disassemble service, repair and adjust the equipment, and shall furnish a one year supply of all recommended lubricating oils and greases, if they are non-standard.

B. The Contractor shall furnish one set of spare parts recommended by the equipment manufacturers in addition to those listed below. All of these materials shall be properly packed, labeled and stored where directed by the Engineer.

C. The spare parts identical and interchangeable with the original parts shall be furnished in clearly identifiable and labeled containers.

1. Gas compressor

a. Four (4) complete bearing kits

b. Manufacturer's standard parts and accessories

2. Oil-Water Separator

a. Four (4) complete set of gaskets

b. One (4) complete set of filter elements

1.10 GENERAL INFORMATION AND DESCRIPTION

A. Gas Recirculation Compressor units 4, 5 , 9, and 10 complete with all accessories including but not limited to an inlet scrubber, lubrication system, pressure relief valve, inlet and outlet isolation valves, discharge check valves, cooling system, oil-water separator, electric motors, steel bases, expansion joints, bypass control valve, interconnecting piping, wiring, electrical conduit and related supports, structural steel supports for each component, control panels, air temperature and pressure gauges have been previously installed as factory assembled, skid mounted units. The gas compressors have been connected to gas, water, and drain piping, and power and signal wiring.

B. The gas recirculation compressor manufacturer shall test the functionality of all the equipment items which are an integral part of a complete gas recirculation compressor system including all other equipment items specified in this section. If the gas recirculation compressor subcontractor

determines any essential equipment items to be inoperable, they are to be removed and replaced.

C. Prior to the manufacturer's field testing of the gas recirculation compressor units, the Contractor shall perform an inspection of the upstream process gas system for each unit. The Inspection shall be performed on all process piping, valves, and equipment as specified in this Section. The inspections shall include a leak test for all piping and valves, a functionality test to determine the operability for all process equipment, and blockage test to determine if any blockages have formed throughout the process gas piping.

D. If the stainless-steel nameplate attached to each gas compressor, motor, oil-water separator, and inlet scrubber is determined to be visually damaged and unreadable. A new stainless-steel nameplate securely fastened in a conspicuous place shall be provided with the following inscriptions:

1. The manufacturer's name, year of manufacture, serial number, and specified rating data.

2. Gas compressor data shall include cfm, pressure, and horsepower ratings.

3. Motor rating data.

4. Oil-water separator data shall include flows, maximum temperature, pressure rating and filter element part number.

E. If the nameplate attached to each gas compressor is determined to be visually damaged and unreadable. A new nameplate shall be suitably attached to the unit identifying it by name and number, e.g. Recirculation Gas Compressor No. 4. The name and number shall be coordinated with those on control panels, motor starters, control equipment, etc. Nameplates shall not be painted over.

1.08 WARRANTY

A. Comply with the Equipment Warranties requirements specified in Section 46 00 00 – Equipment General Provisions.

PART 2 – PRODUCTS (FOR INFORMATION ONLY)

2.01 NOTICE

A. The following Section is included for information only. The gas recirculation equipment, accessories and instrumentation and control equipment were previously installed and conform to the requirements of this Section. Contractor shall ultimately be responsible for verifying equipment and field conditions in order to satisfy the requirement of Part 3 of this Section.

2.02 GAS RECIRCULATION COMPRESSORS AND MOTORS

A. Compressors:

1. Type: Horizontal, rotary, single stage positive displacement water cooled, sliding vane gas compressors. The gas recirculation compressor subcontractor shall test the functionality of all equipment items which are an integral part of a complete compression system including all other equipment items specified in this section. If the gas recirculation compressor manufacturer determines any essential equipment items to be inoperable, they are to be removed and replaced.

2. The gas recirculation compressors shall be inspected, tested, adjusted, and placed in satisfactory operation by the previous gas recirculation compressor manufacturer Glauber Equipment Corporation.

3. The primary operating requirement of the gas recirculation compressor system shall be to provide adequate gas flow at design conditions. Each gas recirculation compressor shall be capable of delivering the following flows at discharge pressures shown below.

Table 1: Gas Recirculation Compressors No. 4 and No. 5 System Requirements

Number of gas compressors	2
Flow rate/gas compressor, SCFM	220
Compressor discharge pressure, psig*	20.0
Barometer pressure, psia	14.7
Inlet temperature, degrees F.	95 - 100
Relative humidity %	100
Maximum hp draw/gas compressor under above conditions	33
Motor hp min	40

**The system discharge pressure listed in the table above shall be as measured at the outlet nozzle flange of the compressor skid. Manufacturer shall provide compressor discharge pressure sufficient to allow for pressure drop through all system components.*

Table 2: Gas Recirculation Compressors No. 9 and No. 10 System Requirements

Number of Gas Compressors	2
Flow rate/gas compressor, SCFM	560
Compressor discharge pressure, psig*	20.0

Barometer pressure, psia	14.7
Inlet temperature, degrees F.	95 - 100
Relative humidity %	100
Maximum hp draw/Gas compressor under above conditions	53
Motor hp min	60

**The system discharge pressure listed in the table above shall be as measured at the outlet nozzle flange of the compressor skid. Manufacturer shall provide compressor discharge pressure sufficient to allow for pressure drop through all system components.*

B. Gas Compressor Motors:

1. Type: horizontal, TEFC, squirrel cage, explosion proof induction motor with NEMA Class F insulation and NEMA Design B, normal torque (minimum 165% @ L.R.) with a maximum starting code F (Maximum 5.59 F.L.C. @ L.R.). The motor nameplate rating shall not be exceeded by the brake horsepower requirement of the compressor for any condition of service specified.

2. The gas compressor motor shall be inspected by the previous gas recirculation compressor manufacturer to ensure it is in operable condition. If the gas recirculation compressor manufacturer determines the existing motor is inoperable. The motor shall be replaced with motors from the following acceptable manufacturer's:

   a. Baldor Electric Company

   b. Marathon Electric

   c. Or Approved Equal

3. Electrical Requirements: 480 volt, 3 phase, 60 Hz AC. All motors shall operate within applicable performance limits.

4. Enclosure: NEMA 7 (Class 1, Division 1, Group D) with cast iron frame and bearing brackets, and space or strip heaters to prevent moisture build-up in the motor windings.

5. Insulation: NEMA Class F

2.03 COMPRESSOR ACCESSORIES (FOR INFORMATION ONLY)

A. Inlet scrubber:

1. The inlet gas scrubber on each gas recirculation compressor skid shall be rated for 99.95% water droplet removal to 5 micron. The inlet scrubber shall be constructed of 304 SS with a 304 SS mesh pad. Two level switches, and a 2-inch NPT drain with isolation ball valve and a minimum of 10 gallon condensate storage capacity shall be provided. The isolation ball valve shall be operated by a solenoid valve which will open and close based on the level in the condensate storage..

2. The inlet scrubber shall be ASME stamped.

3. Flanged inlet and outlet connections conforming to ANSI Class 125

B. Oil-Water Separator:

1. Each gas recirculation skid shall include an oil water separator installed downstream of the compressor discharge, with two-stage separation, including an initial knock out for lubrication liquids, and a 1.0 micron final separation for aerosols. The coalescing element shall be suitable for compressor maximum discharge gas temperature, 350 degrees Fahrenheit without loss of efficiency. Each unit shall be provided with an ASME stamp.

2. All coalescers shall be of rugged construction and free from defects in design, materials and workmanship. The coalescer shall be of the filter element type, with replaceable elements.

3. The coalescer housing shall be carbon steel with carbon steel internals. The "wetted" interior shall be coated with AkzoNobel Resicoat Covel EP-10 primer 10-6051and finish coat AkzoNobel Resicoat Covel 10-6051, mix melted, 100% solids modified epoxy thermosetting pipe and vessel coating for elevated temperatures, or equal for corrosion resistance.

C. Pressure Relief Valve:

1. Each gas recirculation compressor shall be included with a spring loaded, pop type safety relief valve. The valve shall have a minimum capacity of two times the compressor capacity and shall open at 25 psi discharge pressure.

2. The Valve body and trim shall be constructed of stainless steel.

D. Cooling Water System:

1. Cooling water source is routed from the existing cooling water piping within the compressor rooms.

2. Available water pressure in the Protected Water main serving the cooling water piping is approximately 60 psi. Maximum water temperature is 85 degrees Fahrenheit.

3. Cooling system is a closed loop jacket water cooling system. The system includes a recirculation pump and plate and frame heat exchanger rated for cooling service of the

jacket coolant. Heat exchanger plates shall be constructed of 316 SS with a carbon steel powder carbon frame. All connections and hardware shall be 316 SS

E. Inlet and Outlet Isolation Butterfly Valves:

1. Inlet and outlet isolation butterfly valves body and disk are constructed of 316 SS with metal seats. Valves shall be provided with 125# ANSI flanges.

F. Discharge Check Valve:

1. The discharge check valves included shall be a dual wafer type with 316 SS body and disks, and seat shall be metal. Valve shall be rated for a minimum temperature of 400 degrees Fahrenheit.

G. Electric Discharge Valve:

1. An electrically actuated open/close valve is provided on the outlet line of each compressor downstream of the discharge check valve. This valve is not a part of the gas recirculation compressor skid but shall be replaced by the gas compressor subcontractor if it is determined to be inoperable. The valve shall be a quick opening-port guided valve which shall open on compressor start-up and close on compressor shutdown. New valve diameters shall match the diameter of the existing valves that are being replaced. Valves shall provide for gas and liquid, be tight shut-off and withstand gas temperatures of up to 350 degrees Fahrenheit. The valve body shall be Cast Iron with ANSI 125# flanges. The stem packing shall be chevron type Teflon, spring loaded with a Teflon seat disc. The motor actuator shall be 120 volt, 60 Hz, single phase enclosed in an explosion proof enclosure conforming to Class 1, Division 1, Group D,.

H. Bypass Return System

1. An automatic bypass control valve and piping shall be provided on each system to allow for unloaded starting against full line pressure. The bypass piping shall be sized for the full discharge capacity of the compressor. The valve shall be a ball valve with valve body, ball and shaft being constructed of 316 SS. The valve seat material shall be suitable for digester gas service up to temperatures of 350 degrees Fahrenheit. The valve shall provide bubble tight shutoff and shall have 125# ANSI flanged ends. Valve actuator shall be suitable for operation in Class 1, Division 1, Group D area.

2.04 COMPRESSOR INSTRUMENTATION AND CONTROLS

A. Instrumentation:

1. The instruments furnished with each gas recirculation compressor shall conform to the requirements this section. All switches shall be explosion proof.

2. Each gas recirculation compressor skid shall be provided with the following instruments:

a. Pressure Transmitters with digital display

b. Suction Pressure (-15 to +15 inches of water column)

c. Discharge Pressure (0-50 psi range)

d. Pressure transmitters shall be Rosemount 3051 or engineer approved equal.

3. Pressure Switches:

a. Suction Pressure Switch

b. Discharge Pressure Switch

c. Impulse tubing shall be arranged so that condensate cannot accumulate in the tubing

4. Temperature RTD:

a. Compressor suction temperature (0 to 500 Deg. F range)

b. Compressor discharge temperature (0 to 500 Deg. F range)

c. Coolant discharge temperature (Range as recommended by gas recirculation compressor supplied)

5. Discharge Temperature Switch (Max set point of 350 Deg. F)

6. Lubrication flow switch

7. Inlet scrubber level control

1) Continuous measurement of liquid level to PLC which opens and closes valve on condensate drain system

B. The following alarms and shut-downs shall be provided for each gas recirculation compressor:

1. Local E-Stop for provision for future remote E-Stop

2. Lube failure/low oil flow shutdown with indicator

3. Low oil level reservoir alarm and shutdown with indicator

4. High gas temperature alarm shutdown with indicators

5. Run enable indicator

6. High/low condensate alarm and indicator

7. Low suction pressure alarm and shutdown with indicator

8. High discharge pressure alarm and shutdown with indicator

9. High coolant temperature alarm and shutdown with indicator

10. Motor overload

C. Compressor Control Panel:

1. The recirculation gas compressor skid supplier shall provide a NEMA 7 skid mounted control panel for each gas recirculation compressor skid with hinged access doors. The gas compressor system supplier shall be responsible for furnishing and coordinating all instrumentation and controls as specified herein and as required for a complete monitoring and control system, including all ancillary equipment, parts, devices, wiring, electrical conduit, and hardware necessary to meet system functional requirements. Panel construction shall be of cast aluminum. A transparent viewing window shall be provided allowing full view of all device displays.

2. The control panel shall be completely prewired and tested at the factory

3. Each control panel shall be designed for a single 480VAC/60Hz/3phase external power connection to power the gas compressor motor and all related equipment. Control power transformers shall be provided integrally with each panel, as required, to power all associated instruments, controls, bypass valve and other accessories from within the panel

4. All electrical work associated with the gas compressor control instruments, and controls provided by the gas compressor system supplier shall be in accordance with the Local, State, and National Electric Codes, the National Fire Protection Association, OSHA and shall be U.L. listed.

5. Internal wiring shall be minimum wire size 14 AWG for control circuits and shall be Type MTW color coded with thermoplastic insulation rated for 600 volts and 90 deg. C. Terminal blocks shall be 300 volt, 30 amp, barrier type screw terminals with 20 percent of terminals on each terminal block as spares. Each terminal shall be identified by an engraved or painted wire number on a marking strip attached to the block. Power and control wiring shall use separate blocks from analog signal wiring. Analog signal wiring shall be shielded.

6. Wiring shall run in plastic wiring ducts. Outside wiring ducts, wiring shall be bundled with plastic wrapping strips. The bundles shall be securely fastened to the steel of the panel using standard switchboard cleats located at suitable points between the terminal blocks and electrical devices. AC and DC wiring shall be run separately. All wiring shall be in horizontal or vertical runs and groups of wires to and from common points shall be neatly harnessed and adequately supported. Maximum bundle size shall be 1 inch.

7. A grounding bus shall be installed in the panel with adequate provisions for grounding all installed devices, a future unit, and an additional 20%. A lug shall be provided for connection of the bus to the system ground.

8. An as built wiring diagram of the completed panel shall be encased in plastic or plexiglass for installation inside the panel.

9. Engraved plastic nameplates shall be mounted on the inside of the control panel to designate the gas compressor served and to identify the various indicators, devices, instruments, etc. Nameplates shall have white letters on a black background.

10. Panel layout and wiring diagrams shall be submitted in accordance with Subsection 1.04. Drawings shall show all control elements which originate or receive signals as part of the gas compressor control system. Drawings shall be prepared specifically for this project. In addition, a detailed narrative functional description shall be submitted fully describing start up, normal operation, and shutdown for automatic and manual control operations.

11. The following instruments and controls shall be included on the front of each gas recirculation compressor control panel:

    a. Power disconnect switch with lockout device

    b. Control power switch and indicator light

    c. Local-Off-Remote selector switch for gas recirculation compressor control mode selection

    d. Emergency Stop pushbutton

    e. Start and Stop pushbuttons for gas compressor system

    f. Discharge valve open/close

    g. Recirculation valve open/close

    h. Digital indicators for gas compressor current/gas flow rate (via viewing window)

    i. All alarms specified in paragraph 2.04.B

    j. CONTROL DESCRIPTION

D. The following functional descriptions describe the operation of the gas recirculation compressor and control system. The functional descriptions are not intended as complete descriptions of required logic but as descriptions of the most significant control sequences and interlocks required.

E. Compressor start-up will consist of the following sequence:

1. Cooling water solenoid valves to heat exchanger cooling water recirculation pump starts, and bypass loop open.

2. Start compressor at confirmation that bypass control valve is open.

3. Open discharge valve.

4. Compressor bypass control valve closes.

F. Compressor shut-down will consist of the following sequence

1. Compressor bypass control valve opens

2. Discharge valve closes after confirmation that bypass control valve is fully open

3. Compressor stops

4. Cooling water solenoid valve to compressor heat exchanger recirculation pump stops.

G. The compressor shall immediately shutdown upon any of the following conditions:

1. Depressing the emergency stop button

2. Low suction pressure

3. High discharge pressure

4. High discharge temperature

5. Low oil level in reservoir

6. Low oil flow/lubrication system failure

7. High coolant temperature

8. Motor overload

H. Following a safety shutdown of a gas recirculation compressor, the cooling water system shall stop, the discharge valve shall close and the bypass valve shall return to open. No automatic restart shall occur after a safety shutdown.

PART 3 – EXECUTION

3.01 TESTING OF EXISTING EQUIPMENT

A. The accessories listed above in Section 2 shall be tested for functionality by the gas compressor manufacturer for each compressor skid. The list may not be inclusive of all accessories required for a complete and operable system. The gas recirculation compressor manufacturer is responsible for testing all required items and replacing all required items that are determined to be inoperable during inspection. Accessory items that need to be replaced shall comply with the details specified in Section 2.

3.02 UPSTREAM COMPRESSOR PROCESS GAS SYSTEM

A. The contractor shall inspect and test the functionality of all process piping, valves, and equipment upstream of each gas recirculation compressor unit before the manufacturer can perform field testing and start-ups on any unit.

1. The process valves shall be tested to ensure that the successful isolation of each digester gas recirculation compressor unit can occur; and that gas suction pressure can be adequately supplied in accordance with each of the compressor's operational requirements specified in this section

2. Leak testing shall be performed on all valves necessary to isolate the gas recirculation compressor units.

3. Process gas piping shall be inspected to ensure that blockages have not accumulated in the upstream piping.

4. Each type of process gas valve and digester gas equipment indicated on the contract drawings shall be inspected including but not limited to:

a. Plug Valves

b. Thermal Shut-off Valves

c. Flame Arrestors

d. Sediment Traps (Accumulators)

B. The removal and replacement of inoperable equipment upstream of the gas recirculation compressor units shall be the responsibility of the Contractor.

1. The replacement of any process gas piping shall comply with Section 40 05 24.43 – Steel Piping for Miscellaneous Service

2. The replacement of any process gas valves shall be in accordance with Section 40 05 61 – Eccentric Plug Valves and Section 46 73 19 – Miscellaneous Digester Gas Equipment.

3. The replacement of any other process gas equipment shall be in accordance with Section 46 73 19 – Miscellaneous Digester Gas Equipment.

3.03 MANUFACTURER'S FIELD SERVICES

A. The services of a qualified manufacturer's technical representative shall be provided for each compressors as follows:

1. At least one trip of two (2) days, for each recirculation gas compressor, to initially place in service on digester gas. During this trip, the systems shall be pressure tested and leak tested using nitrogen at normal operating pressures. Confirmation shall be made that all

system items perform as designed and operators/maintenance personnel shall be trained. An 8-hour extended run test shall also be performed as specified in Section 3.04.

2. At least one trip of two (2) day after all compressors are placed in operation to ensure digester gas recirculation compressor skids perform as designed and are capable of delivering the required quantity of digester gas at the specified discharge pressure to the mixing systems. Refresher training shall also be provided to operators/maintenance personnel during this visit.

B. The Contractor shall arrange for the manufacturer to furnish the services of a qualified service person, with at least five years of experience, who is regularly involved in the inspection, operation, and maintenance of gas compressors, gas scrubbers, coalescers and gas compressor systems of the size and type being furnished. The service persons shall:

1. Witness and check final adjustments and alignments

2. Witness and check start up of each gas recirculation skid

3. Assist the Contractor in performing field testing and prepare a written report as specified below

4. Troubleshoot and correct any mechanical or control problems with the system which are noted during initial operation

5. Submit written certification signed by the service person that the system has been properly installed, tested, and adjusted; that the system operates as specified or as required; and that all controls and protective devices operate properly, including date of field test, as well as a listing of all persons present during the tests.

6. Investigate and supervise correction of any operating problems which may arise during the guarantee period of the equipment

C. Such services shall be furnished at no additional cost to the County. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor

3.04 FIELD TESTING

A. Field tests shall be conducted on digester gas after the gas compressor systems are completely installed and all the electrical connections have been made. Field tests shall be conducted by the factory service people with assistance of the Contractor and witnessed by the Engineer. Field tests shall include an 8-hour extended running test on gas compressor performance using digester gas.

B. The 8-hour run test shall be conducted on digester gas under actual operating conditions as far as is practical for a period of not less than 8 hours for the gas compressor. The test shall demonstrate that the gas compressor is free from all objectionable vibration, noise and overheating throughout the entire range of specified operation. Initial running tests shall demonstrate that all instruments, controls, and protective shutdown interlocks function properly.

Field check out of shutdown interlocks shall be as directed by the Engineer. Temperature, pressure, amperage, and gas flow rate readings for all monitored points shall be recorded after 4 hours and at the conclusion of the 8 hour run period. Any shutdown of the gas compressor during the test period shall be recorded and the cause noted. Any defects or operating problems found during extended running tests shall be promptly corrected.

C. Field performance testing shall verify compliance with all performance requirements.

D. Field performance tests shall be run with all accessory items and associated instrumentation and controls installed and fully functional. The Contractor shall coordinate with the compressor manufacturer of equipment and instrumentation furnished under other sections of the specifications as required. The following data shall be recorded by the Contractor and provided to the Engineer for all field performance tests:

1. Barometric pressure during testing

2. Inlet and discharge gas temperature

3. Inlet and discharge gas pressure

4. Gas Flow Rate Capacity

5. Line voltage and current

6. Functional check of all accessory devices

E. The Contractor shall be responsible for providing all material, labor, and equipment required for running all field tests.

F. The Contractor shall submit seven copies of field performance test results certifying that field tests were successfully conducted in accordance with test requirements and that all specified performance conditions were demonstrated for each gas recirculation compressor system. Certified performance curves shall be submitted for field performance tests in terms of standard conditions as specified above.

3.05 PAINTING

A. All surface preparation, field repairs, and field painting shall conform to applicable sections of Section 09 90 00 – Painting, unless otherwise specified in this specification section

3.06 EQUIPMENT IDENTIFICATION

A. The equipment shall be provided with a substantial stainless steel nameplate, securely fastened in a conspicuous place and clearly inscribed with the manufacturer's name, year of manufacture, serial number, and principal rating data.

END OF SECTION

SECTION 46 73 41

SLUDGE HEAT EXCHANGERS (TUBE-IN-TUBE)

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. Not Used

PART 2 – PRODUCTS (FOR INFORMATION ONLY)

2.01 ACCEPTABLE MANUFACTURERS

A. Not Used

PART 3 – EXECUTION

3.01 INSTALLATION

A. The new heat exchanger shall be installed within the location of the existing Heat Exchanger Unit 3 as shown on the Contract Drawings.

3.02 MANUFACTURER'S FIELD SERVICES

A. A Manufacturer's Data Report for Unfired Pressure Vessels, Form U-1, as required by the provisions of the ASME Code Rules shall be furnished to the Contractor for transmittal to the Owner. This form must be signed by a qualified inspector, holding a National Board commission, certifying that construction conforms to the latest revision of the ASME Code. The ASME "U" symbol shall be stamped on the heat exchanger nameplate.

B. The services of a qualified manufacturer's technical representative shall be provided in accordance with Section 46 00 00 – Equipment General Provisions and shall include the following site visits:

Service	Number of Trips	Number of Days/Trip
Inspection	1	1
Installation and Testing	1	1
Startup	1	1
Training	1	1
Services after Startup	1	1

3.03 PAINTING

A. The paint coating shall be inspected by the Contractor prior to installation. If the coating is determined to be substantially deteriorated, the contractor shall clean and paint two (2) finish coats of Tnemec #135-1243 Gray Aluminum Chembuild (minimum of 7-9 mils dry film thickness).

SECTION 46 73 72

CLEANING OF DIGESTERS AND STORAGE TANKS, HEAT EXCHANGERS, GAS RECIRCULATION COMPRESSORS, AND MISCELLANEOUS REPAIR WORK

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The contractor shall furnish all labor, materials, and equipment necessary for the complete cleaning and rehabilitation of

1. Three (3) Primary Digesters (Digester's No. 1, No. 3, and No. 4),

2. The associated digester piping,

3. The installation of one (1) Heat Exchanger (No. 3),

4. The cleaning, inspection, and necessary repairs of two (2) Heat Exchangers (No. 1 and No. 2),

5. The start-up and commissioning of four (4) digester gas recirculation compressors (No. 4, No. 5, No.9, and No. 10) for the Cedar Creek Water Pollution Control Plant.

B. In this Section, the terms "digester cleaning", "digester contents", "digester material", "digester residuals", "tanks" and any other references to digesters or tanks refer to the applicable Sludge Digester Tank(s) and/or Sludge Storage Tank(s). The use of these terms may not be interpreted to exclude these sludge tanks from the work required. The term "digester contents" can be considered to include materials typically found in municipal sewages/sludge not limited to heavy consolidated organic/inorganic material, sand, silt, dense floating scum material, plastics, rags, grit and matted hair.

1. Based on information from previous digester tank cleanings at the Cedar Creek WPCP, approximately 60 – 70% of the digester tanks contain pumpable dense sludge mixed with grit, hair, grease, etc. and approximately 30 – 40% non-pumpable material such as thick grease with plastics and other floatables, hair mats, mop heads, compact grit, etc.

C. Tank cleaning shall include, but not be limited to, the removal of digester contents from the digester or storage tanks, pumping of sludge and wash water into a temporary dewatering system, hauling and disposing of the dewatered digester contents using the Contractor's sludge hauling vehicle, complete washing down of tank walls, covers/ceilings, floor, supports, piping and other appurtenances, groundwater relief valve repairs, replacement of existing digester covers and other digester cover appurtenances, and compliance with all Federal, State and Local laws and ordinances.

D. The Contractor shall provide, set up, test, and operate continuously a portable activated carbon canister type odor control system deemed acceptable by the County, while performing this work.

E. The screened plant effluent water required for cleaning activities shall be obtained from the screened effluent piping located in the basement of the digester building. The Contractor shall provide pumps, strainers, adaptors or other appurtenances and piping to deliver effluent water to his equipment and shall be responsible for its proper operation and maintenance throughout the duration of the project.

F. The seal waters, wash waters etc. shall be discharged into the filtrate wet well located on the west side of the Sludge Thickening Building, and as shown on the drawings. The Contractor shall provide tanks, pumps, appurtenances and shall inspect and replace as necessary the existing piping as required, to discharge the wastewater into the specified location and shall be responsible for its proper operation and maintenance throughout the duration of the project.

G. The Contractor shall have the complete responsibility for the proper tank contents pump out, removal, dewatering, transfer, loading and disposal utilizing the Contractor's sludge hauling vehicles in an even and uniform manner. The Contractor will be responsible to insure that the subcontractor(s), if any, have the necessary permits for work being performed. The Contractor shall submit for approval and secure a containment and spill cleanup plan to mitigate adverse environmental impacts in the event of a spill or accident at the site.

H. Following inspection of the cleaned tank, the County may formally authorize the contractor to proceed with the demolition and replacement of the existing digester cover. Upon completion of the work, the Contractor shall restore the work area to its prior condition.

1.02 REFERENCES

A. Section 01 10 00 – Summary of Work

B. Section 01 14 00 – Coordination with Owners Operations

C. Section 01 20 00 – Measurement and Payment

D. Section 01 35 27 – Environmental Health and Safety Requirements

E. Section 01 35 44 – Working in Hazardous (Classified) Locations

F. Section 01 35 29 – Hazardous Materials Control

G. Section 01 52 00 – Construction Facilities

H. Section 01 57 00 – Temporary Controls

I. Section 31 23 19 – Groundwater Monitoring, Control and Dewatering

J. Section 46 73 16 – Dual-Deck Truss Type Floating Digester Cover

1.03 MEASUREMENT AND PAYMENT

A. All costs for the work described in this section shall be per Section 01 20 00 – Measurement and

Payment and as described herein and elsewhere in the Contract Specifications.

B. Payment for the design, installation, testing and removal of the systems required to facilitate the digester cleaning as described herein including the odor control system, tank pump out system, and sludge dewatering system is to be included in the Bid Item No. 1 - Lump Sum – Base Bid. Payment for the operation of these systems is to be included in Bid Item No. 3 – Unit Price, see below for details.

C. Payment for the design, installation, testing and removal of the Groundwater Dewatering System is to be included in Bid Item No. 2 – Lump Sum. Payment for the operation of the Groundwater Dewatering System is to be included in Bid Items No. 4 – Unit Price and Bid Item No. 5 – Unit Price.

1. Refer to Section 31 23 19 – Groundwater Monitoring, Control, and Dewatering, Section 01 20 00 – Measurement and Payment, and the Proposal for details.

D. Measurement/Calculation of Estimated Quantities of Tank Contents for Removal:

1. The measurement and calculation of the volumetric contents to be removed from a specified tank shall be based upon soundings of liquid/contents level for a known tank configuration.

a. The County will take soundings utilizing three (3) ports in the tank cover to determine the remaining level of the contents (sludge, debris, grit, grease, etc.). The average level and the known tank geometry are used to determine the actual quantity to be removed for each tank. If the Contractor feels the measured quantities are significantly different than his own determinations the Contractor should formally bring this to the attention of the County as soon as possible.

2. Estimated volumetric quantities of digester contents to be removed and wet tons of contents to be hauled and disposed of are provided at the end of this Section.

a. The Contractor is cautioned that the quantities provided at the end of this Section are not exact guaranteed quantities and may differ from the quantity measured for removal. Daily records of all material (including cleaning water, etc.) removed shall be kept for truck loading purposes.

E. Removal, Dewatering, Hauling and Disposal of Digester Tank Contents:

1. For Bid Item No. 3 – Unit Price as described in the Proposal and Section 01 20 00 – Measurement and Payment, the unit cost for digester tank materials removal, dewatering, hauling and disposal shall be all inclusive. The Contractor shall be paid the unit price bid per gallon of digester materials removed (exclusive of wash water and other materials used to slurry/dilute the contents).

2. This unit cost shall include all contractual costs such as but not limited to digester contents removal by pumping, vacuuming or other methods, dewatering, chemicals, odor control,

conveying, shredding, loading, hauling, disposing etc. No additional payments shall be considered for dilution water, sand removal, or other requirements described in this Contract.

F. Specific work assignments may be made to the Contractor by the County pursuant to an inspection or evaluation of the cleaned portions of the digester. If a progress or post cleaning inspection reveals the need for emergency or unforeseen work, the allowance will be utilized. The allowance shall cover the cost of labor, materials, and equipment plus overhead and profit, computed in accordance with the requirements of the Agreement, Article XXII, “Extra Work”.

G. The use of the allowances by the Contractor shall only be by written authorization or instruction from the Engineer and the County. Any amounts not expended at the completion of the work shall be deducted from the final payment to the Contractor. A change order will be processed to increase the allowance if the amount becomes insufficient to complete the work of the Contract.

H. Subcontractors proposed for any of the work must be approved by the County. The Contractor will be responsible for a warranty for such work and to correct any work deficiencies over the duration of the assignment/warranty period.

1.04 CONTRACT DURATION AND SEQUENCE/SCHEDULE CONSTRAINTS

A. Digester Cleaning and Dewatering Constraints:

1. Comply with Section 01 14 00 – Coordination with Owner Operations.

1.05 GENERAL INFORMATION AND DESCRIPTION

A. Description of Digester Operation and Facilities

1. The Cedar Creek Water Pollution Control Plant utilizes anaerobic biological stabilization and separation to process the sewage sludge generated from the liquid treatment units. Initial digestion occurs in the primary digesters where the volatile solid organic components are converted to inert liquid and gases (primarily water and carbon dioxide). Other gaseous end products are methane and minute amounts of hydrogen sulfide. The gases are recycled for mixing in the digester and a portion removed for ultimate use in the plant power generation system. The hydrogen sulfide gas is the primary source of potential odors.

B. The Tanks to be cleaned are:

1. Three (3): 105’-0” diameter primary digesters (Digester No. 1, No. 3, and No. 4)

C. All tanks are equipped with steel frame floating covers. The "floating" cover travel for Digesters / Tanks 1,3, and 4 is limited between bottom landing brackets or ledge (where rollers stop) at an approximate elevation of +16.70 ft to an overflow elevation of approximately +26.50 ft.

D. When sludge is removed the cover descends to a level above the brackets so as not to break the liquid seal around the cover perimeter. The sludge is then pumped to the secondary digesters for

additional treatment OR pumped to the storage tanks. From the storage tanks the sludge is transported into the plant sludge dewatering facilities where excess water is removed, then loaded onto the trucks. Currently the County operates the digestion process using only primary and storage digesters.

E. The covers for Digesters 1 and 3 are equipped with one 48-inch manhole and one 30-inch manhole with access to the attic space, two 48-inch manholes with access to the interior of the tanks, and five 8-inch sampling wells. The cover for Digesters Tank 4 is equipped with two 48-inch manholes with access to the interior of the tanks, one 30-inch manhole and a five 8-inch sample wells. These manways shall be used for odor control duct connection, ventilation, and access. The Contractor is responsible for verifying all access points for odor control duct connection, ventilation, sampling and access for cleaning.

F. The Contractor may use at their own risk the key tank information included at the end of this Section. Other detailed information about the tanks is available from Karen Fay, Project Engineer from the County's Water and Wastewater Engineering Unit, telephone (516) 571-7534 or via email at kfay@nassaucountyny.gov.

1.06 SUBMITTALS

A. General

1. The items listed in this section include submittals that are required for the County's approval. The omission of components from the listing of items requiring submittals does not relieve the Contractor from the obligation to provide a complete system for the removal of digester material and the complete cleaning of the tanks. All pumps, piping, fittings, electrical service and connections, ductwork, etc. shall be suitable for the service required, furnished and utilized as part of the Contractor's work. Within a week after NTP the Contractor shall prepare a list of submittals to be submitted for this Contract for the County's approval.

B. Summary of Submittals:

1. The following is a summary of the submittals (not necessarily limited to this listing) required to complete the contract work.

a. Work Plan

1) Within three weeks after NTP, the Contractor shall submit for approval a detailed work plan, which shall include as a minimum:

a) Proposed methods for pumping out the sludge in the tanks, including details on pump type, capacity, piping sizes, layouts and materials, locations of odor control and other equipment and description on executing this portion of the work.

b) Engineering calculations and details of the proposed effluent water

system to meet the needs to power wash and clean the sludge digester tanks and for makeup water during the sludge dewatering operation stamped and signed by a Professional Engineer licensed and registered to practice in New York State. The Contractor shall utilize screened effluent water as the source of available water and provide pumps as necessary. The Contractor shall tie-into the screen effluent line located in the basement of the Digester Building. The Contractor shall provide layout, calculations, structural core and repair details into the effluent channel deck, pipe layouts and supports, and electrical layout and conduit runs. The Contractor shall not impact plant operations and/or vehicle traffic patterns.

c) Cleaning methods and techniques for the tank walls, floor slab, underside of the tank cover, piping and supports/metal work.

d) Proposed method of dewatering sludge on-site, including odor control and filtrate water sampling.

e) Engineering calculations and details of the jacking and shoring for the temporary support of floating covers stamped and signed by a Professional Engineer licensed and registered to practice in New York State.

f) Ventilation and Lighting details.

g) Temporary heating details.

h) Temporary Electrical Service details.

i) No work may commence on any tank until the proposed work plan has been reviewed and approval of the plan has been granted by the County Engineer. The Contractor shall be responsible for all labor, methods and equipment selected for performing the work.

b. Bar chart or Gantt chart showing work activity schedule

c. All Appropriate permits

d. Spill prevention and Containment Plan

e. Information on key equipment utilized. Shop drawings/submittals at minimum shall be provided for

1) odor control system,

2) sludge dewatering system,

3) groundwater monitoring system,

4) effluent water supply system,

5) filtrate disposal system,

6) sludge removal/loading system,

7) ventilation,

8) temporary cover support,

9) back up or substitute equipment,

10) and any other submittals the County deems necessary to ensure a safe/reliable operation

f. Confined space entry plan, containing required Contractor certification prior to start of work and a job hazard analysis. See Section 01 01 00 - Summary of Work.

g. Special requirements for Process Safety Management (PSM) for compliance with OSHA and/or other similar regulations for working in hazardous areas.

h. Requirements for these submittals are outlined in various areas of these specifications.

1.07 TEMPORARY FACILITIES AND CONTROLS

A. Comply with Section 01 05 00 – Construction Facilities.

B. Comply with Section 01 57 00 – Temporary Controls.

1.08 SAFETY PRECAUTIONS AND WORK LIMITATIONS

A. Lighting:

1. The Contractor shall provide NEC, Class I, Division I, Group D, explosion-proof lighting fixtures within each tank to the satisfaction of the Engineer.

B. Due to the potential for the presence of explosive gas the Contractor shall take necessary measures and follow procedures required for work performed in a hazardous environment. Only non-sparking tools and equipment shall be used during digester cleaning and rehabilitation work.

C. The Contractor is responsible for continuously maintaining, in all work areas, at least three portable gas detection devices. Gas detection devices shall be suitable for detection of hazardous and combustible gases.

D. Railings and Stairways

1. The Contractor shall provide railings around hatch openings and in all other locations as required to protect its workers as well as inspectors of the County and their Consulting

Engineer from falls during the execution of the work. The Contractor shall also provide temporary stairways for exterior access to the digester roofs. Stairways shall meet all applicable OSHA standards.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 DIGESTER CLEANING WORK – SPECIAL REQUIREMENTS

A. Qualifications :

1. The Contractor must have appropriate experience in the clean out of digesters and similar hazardous and non-hazardous material storage tanks. The Contractor and his personnel must have had at least ten (10) years of experience in the cleaning of digesters and similar tank cleaning and demonstrate that they have sufficient experience/expertise in this area and have performed work at similar work sites.

B. Confined Space Entry Requirements:

1. Comply with Section 01 01 00 – Summary of Work.

2. Comply with Section 01 35 44 – Working in Hazardous (Classified) Locations.

C. Groundwater Monitoring and Control

1. Comply with Section 31 23 19 – Groundwater Monitoring, Control, and Dewatering.

D. Odor Control System Requirements

1. General

a. The Contractor shall provide a portable activated carbon (impregnated with potassium hydroxide) canister type Odor Control System of the appropriate capacity for his work while pumping out and cleaning the sludge tanks.

b. The Contractor shall provide, no later than two weeks before intended use, to the County Engineer (or his duly authorized representative) a complete shop drawing submittal of the carbon canister system he wishes to utilize for approval. Approved manufacturers include Carbtrol Corp., Purafill Environmental Systems or equal.

c. The system shall collect vented gases from one of the manhole access openings on the cover of each tank and from the enclosure of any temporary sludge storage and processing facility. The gases collected shall pass through this canister where they are allowed to be adsorbed by the activated carbon. The Contractor shall furnish any additional controls, piping/duct, drains, appurtenances, etc. to allow his system to

perform as required herein. The carbon shall be replenished by the Contractor as many times as necessary to maintain performance of the odor control system at no additional cost to the County.

d. The Contractor will be required to deliver, install, test and operate this system as required herein. The Contractor shall rehabilitate/tune up, and/or adjust his system as required so that it passes a performance operability test, hereinafter described. Thereafter, the Contractor shall operate and maintain his system while performing the work.

e. The system shall be operated continuously, twenty-four (24) hours-per-day, seven (7) days a week to capture and treat odors from the tank(s) being cleaned and from the portable sludge dewatering equipment. Such operation shall begin once the liquid tank seal has been broken.

f. Standby facilities no less than one (1) each for the canister, the blower/fan, suitable amount of duct work instruments, shall be available and shall be immediately installed in event of failure of one (1) or more components of the system so that the system can be restored expeditiously.

g. Failure of the system to perform its required functions shall result in the immediate stoppage of sludge removal or cleaning and sealing of the tank until the odor control system is restored to full operation.

h. At the conclusion of the cleaning work, this system shall be disconnected, prepared, and removed from the work site. In addition, the spent carbon canister contents shall be regenerated and/or disposed of off site in accordance with all applicable federal, state and local laws.

2. Performance Test

a. The system performance test shall be conducted on site for eight (8) consecutive hours prior to the commencement of the digester cleaning/pump-out operation. The Contractor shall sample the hydrogen sulfide concentration in the inlet and exhaust stream. The performance test shall demonstrate that the system achieves a removal efficiency of at least 95% when treating moist influent odorous air containing at least 5ppm of hydrogen sulfide. The inlet air flow shall be a minimum of 4000cfm.

b. Any additional capacity required to meet performance test requirements and provide a safe work environment for the Contractor shall be at no additional cost to the County. The Contractor shall submit a testing procedure and provide all necessary equipment as required to demonstrate the system performance. If the odor control system does not perform as specified, the Contractor shall make all required repairs/modifications to achieve the specified performance. All repairs/modifications shall be at no expense to the County.

E. Tank Pump Out System

1. The Contractor shall furnish, install, and place into operation a tank contents removal system that will feed the downstream dewatering system prior to loading sludge cake onto the contractor's sludge hauling vehicles. This removal system shall consist of pumps, pipes, a shredder (as described in the next paragraph), equalization tanks, and all other auxiliary equipment/appurtenances required to pump/grind tank contents and convey it to his sludge dewatering system. All components of this system shall be "heavy duty" type quality so as to perform the operation reliably for the required duration.

2. The Contractor will be responsible for having such components operate harmoniously as a system and shall immediately replace non-operational components. In addition to the tank interior, control of odors from the pumping, dewatering, and loading equipment is required.

3. Shredder

   a. The Contractor shall furnish, install, and test a complete "in line" electrically driven shredder as an integral component of the pumping system used in transferring digester material to the Contractor's portable sludge dewatering equipment. All material transferred from the digesters and sludge storage tanks and pumped must pass through a shredding device.

   b. The heavy-duty shredder shall be used to shred and grind a wide variety of materials such as wood, hair rags, small flakes/pieces of concrete, grease, plastics, etc. that could enter a sewage treatment plant and be found in the digesters or sludge storage tanks. The shredder shall be compatible and operate in combination with the pump-out system.

F. Sludge Dewatering System

1. General

   a. The Contractor shall furnish, install, and place in operation a temporary portable dewatering system with all auxiliary equipment and appurtenances required to dewater all digester contents including digester cleaning wash water. The system layout, components, methods, etc. proposed by the contractor shall be submitted to the County for approval and must comply with all applicable federal, state, and local regulations.

   b. The Contractor shall ensure that the dewatering system is sized so that the complete removal and dewatering of all sludge inside the digester shall take no more than twenty (20) consecutive calendar days to complete, after the approval of submittals for cleaning. Replacement parts shall be available on site for immediate installation in the event of failure.

   c. The Contractor shall provide appropriate supervision for the installation and start-up of sludge dewatering facilities. Remote interlocking controls shall be provided between the portable dewatering system and the Contractor's digester pumps. The

filtrate water from the portable dewatering system shall be pumped to the Filtrate Wet-well located to the west of Sludge Thickening Building.

d. The Contractor shall be responsible for pumping and delivering any other liquid streams needed for his dewatering operation and/or for the pumping/delivery of any waste streams occurring from this operation and properly dispose of them.

e. The Contractor shall furnish and install a leak proof berm system underneath and around the entire dewatering system so as to prevent all runoff and/or spills from the dewatering operation from escaping into the surrounding area. As directed by the Engineer, the Contractor shall also install a berm system underneath other associated equipment (e.g., oil reservoir tanks (110% containment), polymer tanks, etc.) as may be necessary to prevent all runoff and/or spills.

1) The minimum height of the retaining walls for the berm system shall be twelve (12) inches. The berm shall be designed such that all runoff and/or spills shall flow towards a single location (within the berm area) from where it will be pumped back into the incoming slurry line. The configuration of the berm system shall be approved by the Engineer. The material of the berm shall be durable and shall be able to withstand the application without ripping, tearing, etc. In addition, in order to prevent damage to existing structures from leaks, spills, etc., the Contractor shall furnish and install, as necessary, approved covers, aprons, etc.

f. The Contractor shall take all necessary measures to minimize odors and noise during the dewatering operation. The equipment shall be housed in a weather proof enclosure with sound attenuation as required.

g. This enclosure shall be connected to the temporary Odor Control System through duct work, including adjustable dampers capable of balancing airflow to the odor control system fan.

2. Manufacturer

a. The equipment shall be standard equipment of proven performance and reliability and manufactured by a reputable manufacturer having experience in the production of portable dewatering equipment.

b. The equipment shall be designed, constructed, and installed in accordance with the best practices and methods.

c. The Contractor and manufacturer shall have the responsibility of matching all components which function together as a system. This may include but not be limited to providing flow equalization basins, chemical/polymer mix tanks, etc. to allow an efficient functioning of this system. The Contractor shall collect sludge samples prior to construction and coordinate with the portable dewatering system and polymer manufacturer for selection of polymer.

3. Description of Service

a. The portable dewatering system shall be designed to dewater anaerobically digested primary sludge, including, but not limited to grit scum, hair mat and washwater.

b. This system shall continuously flocculate, condition, and dewater the digester contents, and neatly discharge the dewatered sludge cake into the Contractor's sludge hauling vehicle. The Contractor, if necessary, will provide portable polymer blending pumping equipment and introduce it upstream of the dewatering equipment to achieve the dewatering performance as specified below. The Contractor must supply and shall at all times maintain a minimum of five-day supply of all polymer that he will need for his work at the site.

c. The Contractor shall supply a conveyor which shall be of sufficient length and height and be capable of pivoting to convey dewatered digester contents from the portable dewatering system loading to the Contractor's sludge hauling vehicle neatly and evenly in a uniform manner. The Contractor shall take all necessary measures to minimize odors during the sludge conveyance operation to the Contractor’s Sludge hauling vehicle.

d. The Contractor may utilize the existing structure shown in the Contract Drawings or erect their own to house the Contractor’s sludge hauling vehicles during a loading sequence. The Contractor shall construct a temporary odor control to be connected to the Existing Structure. The Contractor shall ensure that their sludge hauling vehicles will meet the spatial constraints of the Existing Structure shown on the Contract Drawings.

e. All dewatering operations shall occur on the Plant grounds at a location approved by the Engineer. The rate and manner in which the Contractor returns the filtrate water or similar waste stream to Filtrate Wetwell shall be approved by the County Engineer. The Contractor shall furnish and install an inspection valve on the filtrate return line so that samples may be drawn for analysis. The sampling equipment shall be provided by the Contractor.

f. The Engineer will randomly sample the filtrate water. Should the filtrate or similar waste stream exceed one-tenth-of-a-percent (0.1%) total suspended solids, the Contractor shall stop operations until such time as the Contractor can demonstrate that he can decrease the percent total suspended solids to 0.1% (1000 mgTSS/L).

g. Dewatered cake shall be suitable for landfill disposal and shall not have measurable free water by demonstration using the EPA’s Paint Filter Liquid Test (EPA Method 9095B). Should the dewatered sludge cake not meet this criteria, the Contractor shall stop his operations until such time as the Contractor can demonstrate that they can meet this criteria.

h. The County will take random samples of the dewatered sludge cake during the course of the tank cleaning operation.

3.02 EXECUTION OF WORK

A. Initial Preparation

1. Pre-Commencement Inspection:

a. Subsequent to a pre-commencement meeting and prior to the commencement of Contractor activities on the site, County Representatives and the Contractors Project Supervisor shall conduct an inspection of all plant areas where work activities are expected to occur.

b. Prior to equipment mobilization and set-up, the Contractor shall photograph the proposed work location and submit to the Engineer a minimum of ten (10) 5" x 7" photographs. Additional photographs will be taken as required.

c. The Contractor shall issue a purchase order for all necessary parts, materials, equipment etc., immediately upon the issuance of NTP so that the earliest possible dates for delivery can be obtained. Proof of compliance shall be furnished to the County.

B. Sequence of Work: The Contractor is advised that the order in which the work is presented is intended to be the actual sequence of work. Any proposed deviation requests are to be submitted immediately in writing to the Engineer. The Contractor is advised that Plant operational requirements have priority over the Contractors work activities. Contractual time extensions in such situations shall be considered on a case-by-case basis.

1. First Stage - Lowering of Sludge Level

a. Once it is known when a tank is contractually scheduled for cleaning, the County shall isolate the digester, and lower the sludge to a predetermined elevation slightly above the corbels (or bottom cover landing brackets) which are various distances above the bottom of the tank sidewall. The bottom of the sidewall coincides with the top of the conical bottom section of the tank. The Contractor and Plant Assistant Superintendent, or their designee(s), shall meet to review the contract specifications, specific hazards and safety information, as well as to verify that all digester valves, pumps, etc., have been properly locked and tagged out so as to prevent leakage of residuals back into the tank.

b. The Contractor shall arrange with the Plant Assistant Superintendent and Engineer, or their designee(s) to have equipment taken out of service for work under this contract. The Contractor shall have no direct authority to remove any equipment from service except under emergency conditions where a reasonable belief exists on the part of the Contractor that continued operation of the equipment may cause personal injury and/or property damage. In the event of such occurrence, the Contractor shall immediately notify the Engineer and the Plant Superintendent.

c. Sealing Digester Tank Cover

1) The Contractor shall place heavy duty waterproofed canvas strips (or an acceptable alternative) over the space between the tank wall and the outer rim of the tank cover. These strips shall be a minimum of three (3) feet in width and shall be placed in an overlapping manner and in sufficient quantity to prevent any passage of air (during pump down) through the space between the cover and wall. This shall be done around the entire perimeter of the tank. Sandbags shall be placed over the canvas strips in sufficient quantity to prevent any passage of air through the space and to prevent the canvas strips from being dislodged by the wind.

d. Testing and Connection of the Temporary Odor Control System

1) The Contractor shall set up and test the temporary odor control system as described in Paragraph 3.01.D.1. The testing shall be done with the inlet duct work to this system not connected. After successful testing, the inlet duct work shall be connected to the access manhole on top of the digester cover. To prevent the odors from escaping, the digester liquid levels shall not be lowered until the County has approved the proper installation and testing of the Temporary Odor Control System.

e. Start of Odor Control Operation

1) Unless otherwise instructed by the Engineer, the odor control system shall be placed in operation no later than at the commencement of the second stage, see below, of lowering the sludge level in each tank, or any operation associated with the sludge removal and cleaning, whether performed by the County or the Contractor, which requires that the tank be vented to the odor control system.

2) The odor control system shall be operated at all times while the tanks are being purged, pumped down and cleaned and inspected. Twenty-four (24) hours-per-day, seven days a week, the odor control system shall be operated while the cleaning operation is in progress, regardless of the number of hours cleaning or pumping work is being performed on the tank. The Contractor shall adjust the air flow rate or other operating conditions if deemed necessary and as directed by the County to achieve a better operation or environmental control. The system may be discontinued for each tank no earlier than when water blast cleaning has been completed and all sludge with dilution water is removed from the tank and the tanks have been inspected.

3) In the event of a failure of any part of the odor control system that causes the system to not meet any of its required performance criteria, sludge removal and cleaning operations shall cease and the digester cover manhole shall be sealed until the system is restored to operable condition. Replacement parts shall be provided and installed within forty-eight (48) hours at no additional cost to the County.

4) Prior to the initial start-up of the odor control system, the Contractor shall provide the Engineer with a list of at least three (3) of its personnel with their appropriate phone numbers, including office, home, car and mobile phone numbers. These designated persons may be contacted at any time of day within fifteen (15) minutes of the event of a system failure, so they can respond if necessary. ***At no time is a telephone answering machine to be relied upon or employed as a failure notification system during any time of operation.*** The Contractor shall keep the names and phone numbers of the designated personnel updated with any changes during the progress of the work. If the system cannot be placed back into satisfactory operation within fifteen (15) minutes of contacting a designated person by phone, or in the case that no contact can be made, fifteen (15) minutes from the final phone call, the cleaning operation shall cease until the odor control system is effectively repaired or replaced with backup equipment.

5) The Odor Control System shall be located adjacent to the tank being cleaned, in an area designated by the County Engineer. The Contractor shall move the system within the site between cleaning operations to the next tank to be cleaned.

2. Second Stage - Lowering the Sludge Level

a. If the odor control system is acceptable, the County will further reduce the liquid level in the tank, as far as possible without over stressing their equipment or impacting the treatment process. When the digester or storage tank is turned over to the Contractor, the volume of sludge (including debris, grit, grease, etc.) remaining for withdrawal will be as close as practically possible to the quantity indicated on the Bid proposal form of this Contract. The estimated/predetermined quantities are as indicated in Section 46 73 72 A-1 located in Appendix A at the end of this Specification.

C. Start-Up of Contractor Cleaning Operation

1. The Contractor shall verify that the groundwater is at an acceptable level prior to commencing the cleaning of the tanks. Refer Section 31 23 19 – Groundwater Monitoring, Control and Dewatering for additional requirements.

2. Pumping Operation and Tank Access for Washing:

a. Pursuant to successful startup of the ventilation and odor control system:

1) After approval, the Contractor may proceed to pump out and remove the tank contents. This shall be coordinated with the Engineer for verification that the groundwater is at an acceptable level.

2) The Contractor shall remove the sludge by pumping from the interior of each tank through temporary piping or hoses. The shredding device shall be installed in-line on the pumping system, with no bypass permitted.

3) The Contractor shall take notice of the fact that rapid pumping and removal of the tank contents could produce a vacuum within the tank, creating an unsafe condition. All work shall be performed to avoid such an occurrence.

b. The Contractor shall provide an adequate enclosure and suitable noise protection for the pumping and shredding facilities during these operations.

c. The Contractor may expect to find a significant volume of scum, sand, and grease in any of the tanks. The removal and pumping work shall include all effort required to break up the scum layer and other heavy consolidated material so that it can be pumped out of the tanks and into the portable sludge dewatering equipment.

d. At the end of the pump down operation, the contractor shall construct/supply whatever scaffolding or means of access they require to safely enter the lower portions of the tank for slurrying/pumping or vacuuming out the residuals/washwater. Confined space entry procedures are to be followed. Contractor may create additional openings in the cover, see Section 1.05 E above for constraints.

D. Washing and Tank Cover Support

1. Following the pumping down of sludge, each tank shall be washed using the "water blast" technique. This method shall use high pressure nozzles with built in booster pumps to remove the organic matter from all concrete surfaces.

2. Before using water blast techniques for cleaning a test shall be performed on one small area to determine the water pressure that is required without causing damage or erosion to the concrete structure. The walls, floors, supports, piping, and other surfaces normally in contact with the digester contents and all interior piping, supports, appurtenances, shall then be water blast cleaned upon complete removal of the digester contents.

3. The Contractor shall provide temporary support of a specific sludge tank cover (if necessary) to properly and safely complete the cleaning/pumping operation. The Contractor shall employ a Professional Engineer licensed and registered to practice in New York State to design an appropriate cover support system. The system layout, components, construction methods, etc. proposed by the Contractor shall be submitted to the County for approval and must comply with all applicable federal, state, and local regulations. The pumpable digester contents (sludge, washwater, etc.) shall be collected in the tank then pumped from the tank through the shredding, and dewatering systems for processing and loading for disposal as indicated below.

4. The Contractor shall use only potable water for a final power wash and steam vapor cleaning to prepare the tank for inspection. Potable water required for the Contract will

only be available through hydrants located outside of the plant. The Contractor shall provide a flush truck and other equipment required for his potable water requirements.

E. Handling of Materials

1. Pumpable Sludge and Other Digester Contents:

a. All materials removed from a digester or sludge storage tank by pumping shall be transferred into the portable sludge dewatering equipment. The dewatered material then shall be transferred to the Contractor's sludge hauling vehicle. Material that cannot reasonably be rendered into a pumpable slurry form shall be removed by bucketing, vactor truck, or other method approved by the County. Such objectionable material shall be loaded into a vehicle provided by the Contractor for appropriate disposal.

b. The Contractor shall insure that the operation is performed in a manner that prevents the occurrence of any offensive or objectionable odors. The Contractor shall also maintain the sludge loading areas in a clean condition so as to prevent the formation of odors.

F. Digester Residuals Hauling and Removal

1. The Contractor shall provide all vehicles and/or equipment needed for handling, loading, removal, and transporting of residuals and shall pay for all operations including at a minimum, maintenance, repair, tarps, license fees, permits, insurance, fuel, clean-up, and labor as required to perform services of the contract.

2. The Contractor shall maintain all transport equipment in a clean, neat and safe condition, free from dirt, mud and stains. The Contractor shall be responsible for cleaning equipment frequently to prevent odors, insects, rodents, or other nuisances. All drainage from cleaning shall be managed properly to prevent pollution.

3. The Contractor shall inspect every transport vehicle to ensure that all doors, tarp(s), cover(s), etc. are secure and in good operating condition to prevent residuals from falling out or leaking during transportation.

4. The Contractor's driver shall be responsible for ensuring the hauling vehicle meets all New York Department of Transportation (NYDOT) AND other applicable jurisdictions' weight requirements for on road travel.

5. The Contractor shall submit certified weight tickets before and after disposal of residuals at the Contractor's disposal facility. Contractor shall submit all tickets to the Engineer and the County within 24 hours of disposal along with copies of the latest certifications of the truck scale used to generate the weight tickets.

G. Spills

1. The Contractor shall take every precaution to prevent leaks or spills of digester material at the plant. In the event of a spill, the Contractor is responsible for notifying the proper regulatory agencies as well as the County and preparing any necessary reports as outlined in the submitted work and spill response plans. The Contractor shall be responsible for all costs associated with cleaning up of any material that is discharged or spilled from the pumping and piping systems.

H. Post Clean Out Requirements

1. Inspection:

a. After the removal of each digester cover the Engineer, Plant Personnel, and Contractor shall perform an inspection of the cleaned surfaces within the tank. This inspection is necessary to see if cleaning has been completed to the County's satisfaction and if any urgent repair work is necessary. This will be a very thorough inspection which will not exceed forty-eight (48) hours. The digesters shall be considered cleaned when no visible residual material is present on the digester floor and sidewalls.

b. The County and or the Engineer will furnish direction to the Contractor regarding the extent of repairs necessary.

2. Replacement of the Existing Digester Cover:

a. After the completion of the digester tanks final cleaning, the Contractor shall request approval from the County to remove the existing digester cover. The removal and replacement of each digester cover shall be in accordance with Section 46 73 16 – Dual Deck-Truss Type Floating Covers.

I. Upon the completion of the new digester cover installation, the Contractor shall restore the work area of the digester unit to the satisfaction of the Engineer. The work areas consist of the digester cover, interior of the digester tank, the exterior of the digester tanks and covers, the associated digester sludge piping, gas piping and gas safety equipment.

1. Digester Sludge and Gas Piping testing shall comply with Section 40 05 00 – Basic Mechanical Requirements.

2. The testing of gas safety equipment shall comply with Section 46 73 19 – Miscellaneous Digester Gas Equipment.

J. The affected area shall be restored to the condition prior to the start of work, e.g., removed and/or damaged trees, shrubs, grass, etc. shall be replaced, stains on concrete, buildings, etc. resulting from the operations shall be removed, etc. The Contractor shall furnish and install any broken manhole covers, nuts, bolts, latches, etc. with identical replacement equipment as approved by the Engineer.

K. Once the Contractor has completed the necessary field tests for the new digester covers as

specified in Section 46 73 16 - Dual Deck-Truss Type Floating Covers, the County will start the digester by pumping sludge to the clean digester with a newly furnished floating cover. The next digester tank cleaning and floating cover replacement will start after the previous digester has been placed back into satisfactory operation.

3.03 REPLACEMENT OF HEAT EXCHANGER, CLEANING OF HEAT EXCHANGER AND DIGESTER PIPING

A. Heat Exchangers

1. Replacement of Heat Exchanger No. 3

a. See Section 01 10 00 – Summary of Work and Section 46 73 41 – Sludge Heat Exchangers for additional requirements.

b. The Contractor shall remove existing Heat Exchanger No. 3 from service and install the new heat exchanger, furnished by the County, and associated heat exchanger piping and accessories, furnished by the Contractor, on the facility grounds as shown in the Contract drawings.

c. The Contractor shall have the equipment manufacturer of the Heat Exchanger furnished by the County inspect the unit on site. The equipment manufacturer shall ensure that the heat exchanger unit is in satisfactory operating condition and shall approve the unit for installation. If the heat exchanger unit is determined to be in inoperable working condition, the manufacturer shall prepare a report of any necessary repairs for approval by the engineer. Once the repairs are made by the Contractor, the manufacturer shall inspect and certify completion of repairs of the heat exchanger prior to placing the heat exchanger in service.

2. Cleaning of Heat Exchangers No. 1 and No. 2

a. After the successful replacement of Heat Exchanger No. 3, the Contractor shall also clean Heat Exchangers No. 1 and No. 2. The heat exchanger associated with the digester will be available for cleaning at the same time the digester is taken out of service. Only one heat exchanger may be cleaned at a time. Work on subsequent heat exchangers may not begin until the heat exchanger cleaning is thoroughly completed, inspected and returned to service to the satisfaction of the Engineer. The Contractor is responsible for confirming operation of the heat exchangers with the digester following cleaning and or repairs.

b. The heat exchangers shall be inspected by the manufacturer who will prepare a report of the necessary repairs (including the temperature control valves) for approval by the Engineer. Once the repairs are made by the Contractor, the manufacturer shall inspect and certify completion of repairs prior to placing the heat exchanger in service.

3. Digester Piping

a. The digester piping associated with the digester, gas mixing system, and heat exchanger shall be cleaned by the Contractor using high pressure water spray. The Contractor shall utilize the existing flushing connections to remove any loose debris and sludge. The flushed material shall be routed to a plant drain. Once flushed the Contractor shall utilize the existing recirculation pumps and effluent water within the cleaned digester to flush the entire system. Once all piping is flushed, video inspection shall be performed as directed by the Engineer. The Contractor shall perform a TV inspection of the pipes to determine their condition. The section of the pipes that cannot be cleaned shall be replaced as directed by the County.

3.04 GAS RECIRCULATION COMPRESSORS

A. Gas Recirculation Compressors

1. Refer to Section 46 73 33 – Gas Recirculation Compressor and the Contract Drawings for requirements for Gas Recirculation Compressors #4, #5, #9, and #10.

3.05 MISCELLANEOUS REPAIR WORK

A. Within two (2) working days after the interior of the digester has been cleaned to the satisfaction of the Engineer and access provisions have been made by the Contractor, the Engineer will conduct an inspection to establish the nature of repairs necessary to the inside of the tank. The County will provide direction to the Contractor regarding the extent of repairs necessary. Repairs could be at any elevation in the digesters. All repair work authorized by the County will be paid at the unit price or under the allowance listed in the Proposal.

B. The Contractor will submit for approval his schedule and anticipated costs for the items not included in the Base Bid, prior to starting the repairs. The repair work includes, but may not be limited to the following:

1. Concrete rehabilitation including hairline cracks and spalled concrete. See Division 03 – Concrete for details on repairs.

2. Expansion joint repair

3. Welding Repairs

4. Seal patching

5. Sludge valve replacement not previously identified on the drawings or in valve schedule

6. Gas valve replacement

7. Groundwater relief valve repair or replacement

8. Repair or replacement of digester and storage tank piping and supports.

9. Additional work as directed by the County or the Engineer.

END OF SECTION

Digester No.	Type	Current Operation	Placed in service	Last Cleaned	Tank Inside Diameter (1)	Access Information	Landing Bracket Elevation	Estimated Volume (Gallons) of sludge for removal	Digester Contents Anticipated Percent Solids Range (%)	Estimated Materials to be Hauled and Disposed (Wet Tons)
1	Primary	Primary	1971	1997	105’-0”	Refer to Paragraph 1.05.B.3 for details.	+16.70	1,300,000	4 - 10	1,500
3	Primary	Primary	1971	1997	105’-0”		+16.70	1,300,000	4 - 10	1,500
4	Primary	Primary	1971	1986	105’-0”		+16.70	1,300,000	4 - 10	1,500

Notes:

(1) Contractor to field verify per requirements of Section.

(2) Additional tank as-built information can be obtained by contacting Karen Fay at (516) 571-7534