SECTION 5
SPECIFICATIONS

SECTION 011100 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 LOCATION OF THE PROJECT

A. The project is located at the Village of Brewster Water Treatment Plant. The physical address of the plant is 300 4th Street, Brewster, Ohio 44613.

1.2 PROJECT DESCRIPTION

A. The project generally consists of the removal and disposal of existing, and furnishing and installation of new filter media and internal components for four (4) existing pressure filter steel tanks. After removal and disposal of existing media, each filter will receive an interior and exterior recoat.

B. Plant Flows:
   1. Rated Capacity = 0.864 MGD
   2. Average Daily Demand = <0.2 MGD

1.3 EXISTING CONDITIONS

A. Filters 1, 2, and 3 were installed in 1969 and Filter 4 was added in 1994. Around the time that Filter 4 was added, Filters 1-3 were rehabilitated by Hungerford & Terry. The existing exterior and interior coating system of the filters is unknown. Filters 1-3 have a diameter of 9' and a straight shell length of 6'-4". Filter 4 has a 9' diameter and a straight shell length of 7'-0". The media in Filters 1, 2, and 3 was last replaced in 1992 (existing media depths are given in *Figure 1*).

B. Internal components of each filter consist of an inlet distributor, an airwash distributor, and an underdrain system. Filters 1-3 have red brass airwash distributors and underdrains. Filter 4 has a PVC inlet distributor and airwash distributor and an underdrain system with stainless steel nozzles.

1.4 DESCRIPTION OF WORK

A. <u>Filters 1-4 Media Replacement</u>

Work consists of the removal, disposal, and replacement of filter media from Filters 1-4. All media and gravel support beds shall be removed and replaced. Following existing media removal and filter cleaning and prior to filter recoating, the Contractor shall notify the Owner so that the Owner can perform an inspection of the filter tanks to evaluate the need for interior repairs and/or continued use. Replace filter media as outlined in Specification Section 466113. Replacement media depths for each filter include a 13" gravel support bed, 3" of torpedo sand, 24" inches of manganese greensand plus, and 18" of anthracite (15" for Filter 4).

B. Filters 1-3 Tank Recoating / Rehab

The exterior of each filter tank will receive a two-coat epoxy system and the interior of each tank will receive a three-coat epoxy system. Pit filler shall be applied as needed. Tank internals, as specified in Section 466113, will be replaced following tank coating. Tank internals consist of an inlet distributor, an airwash distributor, a gravel retaining screen, and an underdrain system. The airwash distributor, gravel retaining screen, and underdrain laterals are being replaced. Concrete base and 6" underdrain manifold (see *Figure 2*) to be protected during blast cleaning and recoating. The existing underdrain system is shown in *Figure 2*. As shown in Section "A-A" in *Figure 2*, the outside edge of each underdrain lateral is supported by a concrete curb around the edge of the filter tank. Following underdrain lateral replacement, this curb shall be repaired using SikaTop-111 Plus or Engineer approved equivalent.

Additional tank improvements include replacing the existing 12"x 16" manways with 24" diameter manways (6 total) and cleaning the nameplates from Filters 1 and 2.

C. Filter 4 Tank Recoating / Rehab

The exterior of each filter tank will receive a two-coat epoxy system and the interior of each tank will receive a three-coat epoxy system. Pit filler shall be applied as needed. Tank internals, as specified in Section 466113, will be replaced following tank coating. Tank internals consist of an inlet distributor, an airwash distributor, a gravel retaining screen and an underdrain system. The airwash distributor, gravel retaining screen, and underdrain spreadflow nozzles (Qty. 224) are being replaced. Inlet distributor shall be removed and replaced or protected during tank blast cleaning and recoating. Concrete base and 6" underdrain manifold (see *Figure 3*) to be protected during blast cleaning and recoating. The existing underdrain system is shown in *Figure 3*. The existing SCH 80 PVC underdrain manifold and laterals shall remain in place.

Additional tank improvements include replacing the existing 12"x 16" sidewall manway and 14"x 18" manway on top of tank with 24" diameter manways (2 total).

D. Filter Tank 4 Relocation Alternate

The Village would like to relocate Filter 4 to allow space for a future Filter 5. Once the media and tank internals have been removed and prior to recoating, Filter 4 will be relocated 3 feet due south of its current location. A new 3-foot section of 4" raw water piping and a new 3-foot section of 6" filtered water piping will be provided. This work is described in *Figure 4, Filter 4 Relocation Reference Photos*, and *Filter 4 Relocation Structural Notes* in the Appendix.

1.5 SPECIFICATIONS

A. In general, these Specifications describe the work to be performed by the various trades, other than work specifically excluded. It shall be the responsibility of the Contractor and Subcontractors to perform all work incidental to their trade, whether or not specific mention is made of each item, unless such incidentals are included under another Item.

B. It is advised that the Contractor and all Subcontractors familiarize themselves with the contents of the complete Specifications, particularly for the trades preceding, following, related or adjacent to their work.

1.6 SEQUENCE OF CONSTRUCTION

A. The Contractor is responsible to maintain proper and continuous operation of the water treatment plant during construction. Below is a generalized sequence of construction:

1. Take Filters 1 and 2 offline and drain.
2. Remove and dispose of existing filter media and clean filter.
3. Notify the Village so that each filter can be inspected.
4. Recoat filters and disinfect.
5. Replace tank internals and disinfect.
6. Place new media and disinfect.
7. Put Filters 1 and 2 back into service.
8. Repeat 1-7 for Filter 3 and then Filter 4. Please note that only Filters 1 and 2 will be taken offline together. Filters 3 and 4 will be taken offline individually.

Note: Filter # designation is shown in *Figure 4* in the Appendix.

END OF SECTION 011100

SECTION 011419 – USE OF SITE

PART 1 - GENERAL

1.1 GENERAL

A. The Contractor will be allowed the use of as much of the site designated for the improvements as is necessary for his operation.

1.2 USE OF STREETS

A. During the progress of the work, the Contractor shall make ample provisions for both vehicle and pedestrian traffic on any public street and shall indemnify and save harmless the Owner from any expense whatsoever due to their operations over said streets. The Contractor shall also provide free access to all the fire hydrants, water, and gas valves located along the line of his work. Gutters and waterways must be kept open or other provisions made for the removal of storm water. Street intersections may be blocked only one-half at a time, and the Contractor shall lay and maintain temporary driveways, bridges and crossings, such as in the opinion of the Engineer are necessary to reasonably accommodate the public.

B. In the event of the Contractor's failure to comply with these provisions, the Owner may cause the same to be done, and may deduct the cost of such work from any monies due the Contractor under this Agreement, but the performance of such work by the Owner at its instance shall serve in no way to release the Contractor from his general or particular liability for the safety of the public or the work.

C. The Contractor shall repair at no cost to the Owner, all existing roads, parking areas, grassed areas that are damaged due to the execution of his work. The Contractor shall remove daily all mud, soil and debris that may be tracked onto existing streets, drives, or walks by his equipment or that of subcontractors or suppliers.

1.3 CLOSING STREETS TO TRAFFIC

The Contractor may with the approval of the Engineer, close streets, or parts of streets, to vehicular traffic. The streets are to remain closed as long as the construction work or the condition of the finished work requires or as determined by the Engineer. The Engineer shall be the judge of how many streets or parts of streets it is necessary for the Contractor to close at any time, and may refuse to permit the closing of additional streets to traffic until the majority of the work on the closed streets is completed and they are opened to traffic.

1.4 RIGHTS-OF-WAY

A. Whenever it is required to perform work within the limits of public or private property or in rights-of-way, such work shall be done in conformity with all agreements between the Owner and the owners of such. Care shall be taken to avoid injury to the premises

entered, which premises shall be left in a neat and orderly condition by the removal of rubbish and the grading of surplus materials, and the restoration of said public or private property to the same general conditions as pertained at the time of entry for work to be performed under this contract.

B. The Contractor shall not (except after consent from the proper parties) enter or occupy with men, tools or equipment, any land outside the rights-of-way or property of the Owner.

C. When the Contractor performs construction within 10 ft. of a right-of-way or easement line, he shall place tall stakes properly identified at points of change in width or direction of the right-of-way or easement line and at points along the line so that at least two stakes can be seen distinctly from any point on the line.

1.5 EASEMENTS

A. Where the work is to be constructed upon easements, such easements will be secured by the Owner without cost to the Contractor. The Contractor shall not enter upon or occupy any private property outside of the limits of the easements furnished.

B. Care shall be taken to avoid injury to the premises entered, which premises shall be left in a neat and orderly condition by the removal of rubbish and the grading of surplus materials, and the restoration of said public or private property to the same general conditions as pertained at the time of entry for work to be performed under this contract.

1.6 PROTECTING EXISTING BUILDINGS, STRUCTURES AND ROADWAYS

A. The Contractor shall, at his own expense, shore up and protect any buildings, roadways, utilities or other public or private structures which may be encountered or endangered in the prosecution of the work, and that may not be otherwise provided for, and he shall repair and make good any damages caused to any such property by reason of his operations. All existing fences removed due to the prosecution of the work shall be replaced by the Contractor. No extra payment will be made for said work or material, but the cost of this work must be included in the price stipulated for the work to be done under this contract.

1.7 SITE FACILITIES

A. The Contractor shall furnish and place sufficient quantities of portable toilet facilities at locations convenient for use by the Contractor's personnel, Subcontractors, the Engineer, and the Owner.

1.8 RESTORATION

A. The contractor shall restore all areas per the plans and specifications and if not specified, at least to the condition existing prior to the start of work.

END OF SECTION 011419

SECTION 011423 - ADDITIONAL WORK, OVERTIME

PART 1 - GENERAL

1.1 NIGHT, SUNDAY AND HOLIDAY WORK

A. No work will be permitted at night, Sunday or legal holidays except as noted on the plans or in the case of emergency and then only upon written authorization of the Engineer. Where no emergency exists, but the Contractor feels it advantageous to work at night, Sunday or legal holidays, the Contractor shall notify the Engineer at least two (2) days in advance, requesting written permission. Any work performed during the absence of the Engineer will be done at the Contractor's risk and responsibility and may be subject to rejection upon later inspection.

END OF SECTION 011423

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing Alternates.

1.3 DEFINITIONS

A. Definition: An alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent Work as necessary to completely and fully integrate that Work into the Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

B. Notification: Immediately following the award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate whether alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other Work of this Contract.

D. Schedule: A "Schedule of Alternates" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials necessary to achieve the Work described under each alternate.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. A1: Relocate Filter 4 and associated piping and instrumentation as shown in the Drawings.

END OF SECTION 012300

SECTION 012513 – PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 MATERIALS AND EQUIPMENT

A. In the specifications and on the Engineer's drawings, are specified and shown certain pieces of equipment and materials deemed most suitable for the service anticipated. This is not done to eliminate other equipment and materials equally as good and efficient. The Contractor shall prepare his bid on the particular materials and equipment specified. Following the award of the contract, should the Contractor desire to use other equipment and materials, he shall submit to the Owner a written request for such change and state the advantage to the Owner and the savings or additional cost involved by the proposed substitution. The determination as to whether or not such change will be permitted rests with the Owner and the Engineer.

B. Each major item of equipment shall be inspected by a manufacturer's representative during installation and upon completion of the work. The Contractor shall supply the Engineer with a certificate of such inspection.

END OF SECTION 012513

SECTION 013119 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 PRECONSTRUCTION MEETING

A. Prior to the Contractor beginning any work on the project, the Owner will schedule and hold a preconstruction meeting to discuss all aspects of the contract work.

B. The Contractor shall be present and be prepared to comment in detail on all aspects of his work.

C. The Contractor shall bring to the preconstruction meeting a proposed construction progress schedule, erosion control plan, quality control program, concrete mix designs, asphalt mix designs (JMF), etc. Approval of each by the Engineer is required prior to the start of any work.

D. Included in the construction progress schedule shall be an implementation sequence of the proposed erosion control efforts required by the contract.

1.2 PROGRESS MEETINGS

A. Monthly progress meetings will be held at a location to be determined by the Owner on a regularly scheduled day mutually convenient to the Owner, Contractor, and Engineer.

B. The Contractor shall provide an updated construction progress schedule and be prepared to comment in detail on all aspects of his work.

END OF SECTION 013119

SECTION 013216 – CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 PROGRESS SCHEDULE

A. Immediately after signing the Contract, the General Construction Contractor shall prepare a graphic progress schedule, indicating the work to be executed during each month and the rate of expected progress to secure completion on the agreed-upon completion date. The progress schedule shall be approved by the Engineer and Owner prior to starting work on the site. Copies of such graphic progress charts, upon which has been indicated the actual progress, shall be furnished to the Engineer with each requisition for payment.

B. Should the rate of progress fall materially behind the scheduled rate of progress, and unless the delay is authorized by the Engineer, each offending Contractor shall furnish additional labor, work overtime, or take other necessary means required for completion of the work on the scheduled date. No additional compensation beyond the set Contract price shall be paid for action taken or overtime expense incurred in maintaining scheduled progress.

END OF SECTION 013216

SECTION 013223 – SURVEY AND LAYOUT DATA

PART 1 - GENERAL

1.1 STAKING

A. The Contractor shall hire a surveyor licensed in the state the work is to be installed to provide all reference points not already established and staking. The Contractor shall protect and preserve the established staking and reference points as long as required for installation of the work and field verifications by any party. The Contractor's surveyor shall replace and accurately relocate all staking and reference points so lost, destroyed or moved.

1.2 LAYOUT OF WORK

A. The Contractor shall lay out his work and be responsible for correct locations, elevations and dimensions of all work executed by him under this Contract. The Contractor must exercise proper precautions to verify the figures shown on the Drawings before laying out the work and will be held responsible for any error resulting from his failure to exercise such precaution. The Contractor shall insure the new construction aligns with any existing work.

END OF SECTION 013223

SECTION 013323 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.1 GENERAL

A. The Contractor shall submit detailed drawings, acceptable catalog data, specifications and material certifications for all equipment and materials specified or required for the proper completion of the work.

B. The intent of these items is to demonstrate compliance with the design concept of the work and to provide the detailed information necessary for the fabrication, assembly and installation of the work specified. It is not intended that every detail of all parts of manufactured equipment be submitted, however sufficient detail will be required to ascertain compliance with the specifications and establish the quality of the equipment proposed.

Shop Drawings shall be sufficiently clear and complete to enable the Engineer/Architect and Owner to determine that items proposed to be furnished conform to the specifications and that items delivered to the site are actually those that have been reviewed.

C. It is emphasized that the Engineer/Architect's review of Contractor's submitted data is for general conformance to the contract drawings and specifications but subject to the detailed requirements of drawings and specifications. Although the Engineer/Architect may review submitted data in detail, such review is an effort to discover errors and omissions in Contractor's drawings. The Engineer/Architect's review shall in no way relieve the Contractor of his obligation to properly coordinate the work and to Engineer/Architect the details of the work in such manner that the purposes and intent of the contract will be achieved. Such review by the Engineer/Architect shall not be construed as placing on him or on the Owner any responsibility for the accuracy and for proper fit, functioning or performance of any phase of the work included in the contract.

D. Shop Drawings shall be submitted in proper sequence and with due regard to the time required for checking, transmittal and review so as to cause no delay in the work. The Contractor's failure to transmit appropriate submittals to the Engineer/Architect sufficiently in advance of the work shall not be grounds for time extension.

E. The Contractor shall submit Shop Drawings for all fabricated work and for all manufactured items required to be furnished in the Contract in accordance with the General Provisions and as specified herein. Shop Drawings shall be submitted in sufficient time to allow at least twenty-one (21) calendar days after receipt of the Shop Drawings from the Contractor for checking and processing by the Engineer/Architect.

F. It is the responsibility of each Prime Contractor to furnish to all other Prime Contractors and especially the General Construction Contractor reviewed Shop Drawings for guidance in interfacing the various trades; i.e., sleeves, inserts, anchor bolts, terminations, and space requirements.

G. No work shall be performed requiring Shop Drawings until same have been reviewed by Engineer/Architect.

H. Accepted and reviewed Shop Drawings shall not be construed as approval of changes from Contract plan and specification requirements.

I. The Engineer/Architect will review the first and second Shop Drawing item submittals at no cost to the Contractor. Review of the third submittal and any subsequent submittal will be at the Contractor's expense.

1.2 SUBMITTAL PROCEDURE

A. All required submissions shall be made to the Engineer/Architect by the Prime Contractor(s) only. Any data prepared by subcontractors and suppliers and all correspondence originating with subcontractors, suppliers, etc., shall be submitted through the Contractor.

B. Contractor shall review and approve all Shop Drawings prior to submission. Contractor's approval shall constitute a representation to Owner and Engineer/Architect that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that Contractor has reviewed or coordinated each Shop Drawing or sample with the requirements of the work and the Contract Documents.

C. Submittal Preparation: Mark each submittal with a permanent label or page for identification. Provide the following information on the label for proper processing and recording of action taken:

1. Location
2. Project Name
3. Contract
4. Name and Address of Engineer/Architect
5. Name and Address of Contractor
6. Name and Address of Subcontractor
7. Name and Address of Supplier
8. Name of Manufacturer
9. Number and Title of appropriate Specification Section
10. Drawing Number and Detail References, as appropriate.
11. Submittal Sequence or Log Reference Number.

    a. Provide a space on the label for the Contractor's review and approval markings and a space for the Engineer/Architect's "Action Stamp".

D. 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.

_____ _____

Signature Date

_____

Company

E. Shop Drawings shall be submitted in not less than six (6) copies to the Engineer/Architect at the address specified at the Preconstruction Conference. Single mylar or sepia reproducible copies of simple Shop Drawings may be submitted with prior approval of the Engineer/Architect.

F. At the time of each submission, Contractor shall in writing identify any deviations that the Shop Drawings or samples may have from the requirements of the Contract Documents.

G. Drawings shall be clean, legible and shall show necessary working dimensions, arrangement, material finish, erection data, and like information needed to define what is to be furnished and to establish its suitability for the intended use. Specifications may be required for equipment or materials to establish any characteristics of performance where such are pertinent. Suitable catalog data sheets showing all options and marked with complete model numbers may, in certain instances, be sufficient to define the articles which it is proposed to furnish.

H. For product which require submittal of samples, furnish samples so as not to delay fabrication, allowing the Engineer reasonable time for the consideration of the samples submitted. Properly label samples, indicating the material or product represented, its place of origin, the names of the vendor and Contractor and the name of the project for which it is intended. Ship samples prepaid. Accompany samples with pertinent data required to judge the quality and acceptability of the sample, such as certified test records and, where required for proper evaluation, certified chemical analyses.

1.3 REVIEW PROCEDURE

A. Engineer/Architect will review with reasonable promptness all properly submitted Shop Drawings. Such review shall be only for conformance with the design concept of the Project and for compliance with the information given in the plans and specifications and shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto.

B. The review of a separate item as such will not constitute the review of the assembly in which the item functions. The Contractor shall submit entire systems as a package.

C. All Shop Drawings submitted for review shall be stamped with the Engineer/Architect's action and associated comments.

D. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Engineer/Architect will review each submittal, mark to indicate action taken, and return accordingly. Compliance with specified characteristics is the Contractor's responsibility.

Action Stamp: The Engineer/Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

1. If Shop Drawings are found to be in general compliance, such review will be indicated by marking the first statement.
2. If only minor notes in reasonable number are needed, the Engineer/Architect will make same on all copies and mark the second statement. Shop Drawings so marked need not be resubmitted.
3. If the submitted Shop Drawings are incomplete or inadequate, the Engineer/Architect will mark the third statement, request such additional information as required, and explain the reasons for revision. The Contractor shall be responsible for revisions, and/or providing needed information, without undue delay, until such Shop Drawings are acceptable. Shop Drawings marked with No. 3 shall be completed resubmitted.
4. If the submitted Shop Drawings are not in compliance with the Contract Documents, the Engineer/Architect will mark the fourth statement. The Contractor will be responsible to submit a new offering conforming to specific products specified herein and/or as directed per review citations.

E. No submittal requiring a Change Order for either value or substitution or both, will be returned until the Change Order is approved or otherwise directed by the Owner.

APPLICATION FOR USE OF SUBSTITUTE ITEM

TO: _____

PROJECT: _____

SPECIFIED ITEM:

_____ _____ _____

Page Paragraph Description

A. The undersigned requests consideration of the following as a substitute item in accordance with Article 6.05 of the General Conditions.

_____

B. Change in Contract Price (indicate + or -) $ _____

C. Attached data includes product description, specifications, drawings, photographs, references, past problems and remedies, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified. For consideration of the attached data as SHOP DRAWINGS, submittal shall be in accordance with requirements of Section 013323.

D. Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments are correct:

1. The proposed substitute does not affect dimensions shown on Drawings.

2. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested substitution.

3. The proposed substitution will have no adverse affect on other contractors, the construction schedule, or specified warranty requirements. (If proposed substitution affects construction schedule, indicate below using + or -)

_____ CONSECUTIVE CALENDAR DAYS

4. Maintenance and service parts will be locally available for the proposed substitution.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item, and agrees to reimburse the OWNER for the charges of the ENGINEER for evaluating this proposed substitute item.

E. Signature: _____

Firm: _____

Address: _____

_____

Telephone: _____ Date: _____

Attachments: _____

_____

_____

_____

For use by ENGINEER:

_____Accepted as evidenced by affixed SHOP DRAWING REVIEW stamp.
_____Accepted as evidenced by included CHANGE ORDER.
_____Not accepted as submitted. See Remarks.
_____Acceptance requires completion of submittal as required for SHOP DRAWINGS.
_____Not accepted. Do not resubmit.

By: _____ Date: _____

Remarks: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

APPLICATION FOR USE OF "OR-EQUAL" ITEM

TO: _____

PROJECT: _____

SPECIFIED ITEM:

_____ _____ _____

Page Paragraph Description

A. The undersigned requests consideration of the following as an "or-equal" item in accordance with Article 6.05 of the General Conditions.

_____

B. Change in Contract Price (indicate + or -) $ _____

C. Attached data includes product description, specifications, drawings, photographs, references, past problems and remedies, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified. For consideration of the attached data as SHOP DRAWINGS, submittal shall be in accordance with requirements of Section 013323.

D. Signature:

_____

Firm:

_____

Address:

_____

_____

Telephone: _____ Date: _____

Attachments: _____

_____

_____

_____

For use by ENGINEER:

_____Accepted as evidenced by affixed SHOP DRAWING REVIEW stamp.
_____Accepted as evidenced by included CHANGE ORDER.
_____Not accepted as submitted. See Remarks.
_____Acceptance requires completion of submittal as required for SHOP DRAWINGS.
_____Not accepted. Do not resubmit.

By: _____ Date: _____

Remarks: _____

END OF SECTION 013323

SECTION 013326 – PRODUCT TESTING AND CERTIFYING

PART 1 - GENERAL

1.1 QUALITY OF MATERIALS

A. Where the specifications call for mill or shop tests, the Contractor shall furnish duplicate copies of attested manufacturer's certificates showing details of quality or performance sufficient to demonstrate conformity to contract requirements. Mill, shop or witness tests shall be subject to view by the Engineer's representative, but the Engineer's representation shall not relieve the Contractor from the necessity of furnishing certificates specified. The Engineer shall be notified by the Contractor in writing, sufficiently in advance of the time of making tests, so that proper arrangements may be made. Waiving of witness of tests by the Engineer may be in writing only by the Engineer. All costs for travel, lodging, food and transportation that are necessary for the Engineer's representative and the Owner's representative to attend witness tests shall be included in the Contractor's bid for those item(s) specifically designated as being subject to witness testing.

B. Unless otherwise specified, all materials, equipment and articles shall be erected, installed, applied, or connected, used, cleaned and conditioned in accordance with the printed instructions and directions of the manufacturer.

C. The installation shall be so made that its several component parts will function together as a workable system. It shall be complete with all accessories necessary for its operation and shall be left with all equipment properly adjusted and in working order.

D. The work shall be executed in conformity with the best practice and so as to contribute to efficiency of operation, minimum maintenance, accessibility and sightliness. It shall also be executed so that the installation will conform and accommodate itself to the building structure, its equipment and usage.

E. Whenever in the contract documents a particular brand, make of material, device or equipment is shown or specified, such brand, make of material, device or equipment is to be regarded merely as a standard and such trade name shall be followed by "or equal".

1.2 QUALITY ASSURANCE

A. The equipment and materials to be furnished under this Contract shall be the products of well established and reliable firms which have had ample experience for at least five (5) years in the manufacture of equipment or materials similar in design and of equal quality to that specified. If required, the manufacturer shall submit a list of installations of similar equipment which have been in successful operation for at least five (5) years.

1.3 EXPERIENCE CLAUSE REQUIREMENT AND PERFORMANCE BONDS FOR MANUFACTURER

A. For every piece of equipment furnished under this Contract, the manufacturer will be required to have a minimum of five (5) years of experience in providing this specific type of equipment. In lieu of this experience requirement, the manufacturer will be required to provide performance bond(s) for the faithful performance of the equipment and guarantee payment in a sum of not less than one hundred and fifty percent (150%) of the total equipment price for the completed work for that item. In the absence of verifiable experience, the manufacturer will be required to provide the performance bond(s) for the same number of years that the manufacturer was found lacking in experience from the specified five (5) year period. The performance bond(s) shall be from an approved surety company, to the satisfaction of the Owner's Law Director.

B. Agents of bonding companies which write bonds for the performance and payment of the contract shall furnish power of attorney bearing the seal of the company, evidencing such agent's authority to execute the particular type of bond to be furnished, and evidencing also the right of the surety company to do business in the State of Ohio. Copy of this proof shall be attached to each copy of the contract.

C. The bond shall be purchased through a surety company with a local agent upon whom service of process can be made.

D. In event of failure of surety or co-surety, the manufacturer shall immediately furnish a new bond, as required herein. The manufacturer's bond will not be released until all provisions of the contract have been fulfilled.

E. The surety used for the bid bond and performance bond shall be listed in the latest U.S. Treasury Circular 570 and the Penal Sums shall be within the maximum specified for such company in said Circular 570.

END OF SECTION 013326

SECTION 013543 - ENVIRONMENTAL PROTECTION

PART 1 - GENERAL

1.1 UNNECESSARY NOISE, DUST AND ODORS

A. The Contractor's performance of this contract shall be conducted so as to eliminate all unnecessary noise, dust and odors.

1.2 SEWAGE, SURFACE AND FLOOD FLOWS

A. The Contractor shall take whatever action is necessary to provide all necessary tools, equipment and machinery to adequately handle all sewage, surface flows and flood flows which may be encountered during the performance of the work. The entire cost of and liability for handling such flows is the responsibility of the Contractor and shall be included in the price for the appropriate item.

1.3 WORK IN FREEZING WEATHER

A. Written permission from the Engineer shall be obtained before any work is performed which, in the judgment of the Engineer, may be affected by frost, cold, or snow. When work is performed under such conditions, the Contractor shall provide facilities for heating the materials and for protecting the finished work.

1.4 POLLUTION CONTROL

A. It shall be the responsibility of the Contractor to prevent or limit pollution of air and water resulting from his operations.

B. The Contractor shall perform work required to prevent soil from eroding or otherwise entering onto all paved areas and into natural watercourses, ditches, and public sewer systems. This work shall conform to all local ordinances and/or regulations, if any, and if not otherwise regulated by local ordinances or regulations shall at a minimum conform to the Ohio EPA General Storm Water NPDES Permit for Construction Activities and the Ohio Department of Natural Resources Rainwater and Land Development manual. This work may consist of but not be limited to construction and continual maintenance of silt fence, bio bag filters, sedimentation traps, stilling basins, check dams, temporary seeding, temporary mulching, erosion mats and other means to clarify waters containing suspended materials from excavations, embankments, cleared and grubbed or stripped areas, stockpiles, well points, and disposal sites and shall be commensurate with the contractor’s schedule, sequence of work, means and methods. If a SWPPP plan is not required for the project, the contractor shall at a minimum submit a plan of his proposed erosion control prevention methods for approval by the Owner and/or other regulatory authorities having jurisdiction prior to starting any construction activities which may cause erosion.

C. The Contractor shall perform work required to prevent dust attributable to his operations from entering the atmosphere. Dust on unsurfaced streets or parking areas and any remaining dust on surfaced streets shall be controlled with water and/or calcium chloride dust palliative as needed.

D. Any material removed from sanitary or storm sewers shall be disposed in accordance with all applicable regulations.

END OF SECTION 013543

SECTION 014223 - INDUSTRY STANDARDS

PART 1 - GENERAL

1.1 ABBREVIATIONS

A. Abbreviations, as used, designate the following:

AASHTO	-	American Association of State Highway and Transportation Officials
ACI	-	American Concrete Institute
AIEE	-	American Institute of Electrical Engineers
AISC	-	American Institute of Steel Construction
ANSI	-	American National Standards Institute
ASTM	-	American Society of Testing and Materials
AWWA	-	American Water Works Association
CMS	-	Construction and Material Specifications
NEMA	-	National Electrical Manufacturers Association
ODOT	-	Ohio Department of Transportation
ORC	-	Ohio Revised Code
UL	-	Underwriters Laboratories, Inc.

1.2 REFERENCE TO OTHER SPECIFICATIONS

A. Where reference is made to specifications such as ASTM, AWWA or AASHTO, the latest edition shall be used, unless otherwise noted on the plans or in the specifications.

1.3 CODES AND STANDARDS

A. All work provided for by these specifications must be installed according to the provisions of the State and local building codes, subject to inspection and acceptance by the State and local inspectors.

END OF SECTION 014223

SECTION 014323 – QUALIFICATIONS OF TRADESMEN

PART 1 - GENERAL

1.1 CHARACTER OF WORKMEN AND EQUIPMENT

A. The Contractor shall employ competent and efficient workmen for every kind of work. Any person employed on the work who shall refuse or neglect to obey directions of the Engineer or his representative, or who shall be deemed incompetent or disorderly, or who shall commit trespass upon public or private property in the vicinity of the work, shall be dismissed when the Engineer so orders, and shall not be re-employed unless express permission be given by the Engineer. The methods, equipment and appliances used on the work and the labor employed shall be such as will produce a satisfactory quality of work, and shall be adequate to complete the contract within the specified time limit.

B. In hiring of employees for the performance of work under this Contract, or any Subcontract hereunder, no Contractor or Subcontractor, nor any person acting on behalf of such Contractor or Subcontractor, shall, by reason of race, sex, creed or color, discriminate against any citizen of the State of Ohio in the work to which the employment relates. No Contractor, Subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of work under this contract on account of race, creed, sex or color.

END OF SECTION 014323

SECTION 015100 - TEMPORARY POWER SERVICE

PART 1 - GENERAL

1.1 ELECTRICAL POWER

A. The Contractor shall furnish at his own expense all electrical power which may be required for the project. All temporary lines shall be furnished and installed by the Contractor at his own expense in a manner which meets the approval of the Engineer, and shall be removed by the Contractor at the completion of the construction.

END OF SECTION 015100

SECTION 015113 - TEMPORARY ELECTRICITY

PART 1 - GENERAL

1.1 APPLICABLE CONTRACTORS

A. General Construction Contractor

B. Plumbing Contractor

C. HVAC Contractor.

D. Electrical Contractor

1.2 GENERAL CONSTRUCTION CONTRACTOR shall provide and/or install the following:

A. All costs of electrical current consumed by all Prime Contractors. The General Construction Contractor shall make arrangements with the local electric utility company to have the periodic bill sent directly to the General Construction Contractor.

B. Temporary heating system, as required, to protect the work until the work is complete and ready for occupancy by the Owner. Such system shall meet all requirements of the N.E.C., O.B.B.C. and the local codes for temporary construction services. The heating system shall be for the use of all the Prime Contractors involved in this project.

C. All costs of natural gas, propane, fuel oil, electric power or other energy consumed and costs related to provide temporary heat.

1.3 PLUMBING CONTRACTOR shall provide and install the following:

A. All piping necessary to provide fuel for the temporary heating system.

1.4 HVAC CONTRACTOR shall provide and install the following:

A. All ductwork and vents necessary for the temporary heating system.

1.5 ELECTRICAL CONTRACTOR shall provide and/or install the following:

A. Power

1. Temporary power facilities for construction purposes for the use of all the Prime Contractors including the cost of running temporary service from the utility supply to the various project construction areas. Power shall be provided in accordance with the General Construction Contractor's construction schedule.

2. One (1) full-time electrician to maintain the temporary services. The electrician shall be on site at all times any trade is working which will require temporary power. This shall include both regular and overtime hours. The electrician may be employed in other phases of the work while on the project.
   Premium pay for the temporary power electrician shall be negotiated between the Prime Contractors on the job requiring overtime service.
3. The electrical work for construction purposes shall conform to all Federal, State (Ohio Safety Code IC-3, Specific Safety Requirements) as well as requirements of the National Electric Code. The Electrical Contractor shall obtain and pay for required applications, permits and inspection pertaining to this work. This cost shall also be included in the Electrical Contractor's price.
4. All utility charges or fees for permits, step down transformers, metering or other materials.
5. Temporary work shall be installed in such a manner as not to interfere with the permanent construction. If such interference does occur, it shall be the responsibility of the Electrical Contractor to make such changes as may be required to overcome the interference.
6. The Electrical Contractor shall arrange for the installation of temporary service for construction purposes as well as making provisions to adequately protect the transformer and any associated temporary power equipment throughout the course of construction.

B. Heating

1. The electrical facilities for temporary heating and ventilating systems. All temporary systems shall be connected directly to the project temporary power system by the Electrical Contractor.

C. Lighting

1. Provide labor and material for the installation and maintenance of temporary light and power as may be required during the period of construction. The following will form minimum requirements:

   a. Temporary general lighting.
   b. General all purpose temporary power and telephone requirements.
   c. Make connections for temporary heat. Check temporary heat requirements in these specifications.
   d. Provide temporary power and telephone connections to the various Prime Contractors and Resident Engineer's field trailers.
   e. Power for any electric arc welding shall not be furnished by this temporary power service. Power for any electric arc welding equipment shall be furnished complete by the trades requiring the welding.

2. This service is to consist of distribution system, panel board, grounding, branch circuits, switches, receptacle outlets and all other labor and materials necessary to provide a complete operating system.

3. Temporary wire is to be laid out, balanced, and sized so as to produce a voltage drop of no more than five percent (5%) at the extreme end of the line, when operating a full load.
4. There shall be a minimum of one 200 amp 120/208 three phase panel board for each building area. All panels shall be securely and neatly installed on substantial framework. Any panel installation which does not meet with the Engineer's approval shall be remounted in an approved manner.
5. Temporary lighting distribution will be made from the temporary panels indicated above. From the panel, circuit wiring with "pigtail" medium base lamps will distribute lighting on the basis of 1/8 watt per square foot average for the construction area. Each circuit will consist of "pigtail" receptacles on 20 foot centers, and 200 watt lamps will be installed in every other receptacle for added concentration of lighting as needed. Fixtures shall be wired with #8 AWG wire and suspended not less than 7'-6" above the floor.
6. As interior partitions are erected, the Electrical Contractor shall revise the temporary lighting arrangements so that not less than one lamp is provided in each space over one hundred square feet in area. Lights shall also be installed by the Electrical Contractor as directed by the Engineer, in smaller areas where required to provide adequate light for work being carried out in the space.
7. In addition to the specific requirements indicated herein, there will be required 480V-3 phase, 208 volts and 120 volt power receptacles. Provide one 480V-3 phase 20 amp outlet and two 20 amp outlets for 208 volt, 3 phase service, and six 20 amp duplex 120V outlets all mounted on a plywood panel and serviced from the local temporary panel. Not less than one such panel shall be provided for each building. All receptacle circuits shall be wired with #10 AWG wire minimum and protected by 30 amp circuit breakers or fuses.
8. Each Prime Contractor shall provide and pay for its own extensions for lights or power tools beyond the receptacle outlets provided above.
9. The Electrical Contractor shall furnish and install 200 watt lamps for general circuit lighting and all fuses as may be required for a complete job. Replacement of lamps, fuses, including theft, will be the responsibility of the Electrical Contractor throughout the life of the project.
10. The Electrical Contractor shall be responsible for installing and maintaining a reasonably balanced system and shall take current readings on the feeders at regular intervals as required. Any serious phase unbalance shall be corrected by the Electrical Contractor.
11. The Electrical Contractor shall protect his installation against weather damage, the normal operations of other trades, Owner's personnel, and visitors to the site. The Electrical Contractor shall be responsible for the proper use and maintenance of all temporary wiring systems until they are removed.

END OF SECTION 015113

SECTION 015136 - TEMPORARY WATER AND DISTRIBUTION

PART 1 - GENERAL

1.1 WATER

A. The Contractor shall be responsible for an adequate supply of water suitable for his use for construction and drinking. At his own expense, he shall provide and maintain adequate supplies and supply lines in such locations and installed in such a manner as may be satisfactory to the Engineer.

END OF SECTION 015136

SECTION 016600 - PRODUCT HANDLING AND PROTECTION

PART 1 - GENERAL

1.1 DELIVERY AND STORAGE OF MATERIALS

A. The Contractor shall be responsible for delivery and storage of all materials.

B. The Contractor shall coordinate with the Engineer on the arrangement for storing construction materials and equipment. Deliveries of all construction materials and equipment should be made at suitable times.

C. The Contractor shall store all materials required for the performance of this contract at sites designated by the Engineer.

D. All stockpiles shall be neat, compact, completely safe, and barricaded with warning lights if necessary.

E. Precautions shall be taken so that no shade trees, shrubs, flowers, sidewalks, driveways or other facilities will be damaged by the storage of materials. The Contractor shall be responsible for the restoration of all stockpile sites to their original condition.

F. Materials, tools and machinery shall not be piled or placed against shade trees, unless they shall be amply protected against injury therefrom. All materials, tools, machinery, etc. stored upon public thoroughfares must be provided with red lights at night time so as to warn the traffic of such obstruction.

G. Materials shall be so stored as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, shall again be inspected prior to their use in the work. Stored materials shall be located so as to facilitate their prompt inspection. Approved portions of the construction site may be used for storage purposes and for the placing of the Contractor's plant and equipment, but any additional space required therefore must be provided by the Contractor at his expense. Private property shall not be used for storage purposes without written permission of the property owner or lessee, and copies of such written permission shall be furnished the Engineer. All storage sites shall be restored to their original condition by the Contractor at his expense.

END OF SECTION 016600

SECTION 017800 - FINAL COMPLIANCE AND SUBMITTALS

PART 1 - GENERAL

1.1 The following forms and related sign-offs shall be documented in accordance with provisions of the contract. These forms shall be completed by the Contractor and approved by the Owner before final retainer is approved for release. Forms for Items A to E will be attached to the Contractor's executed copy of the contract.

A. Certificate of Substantial Completion (To be submitted at time of Substantial Completion).

B. Contractor's Certification of Completion.

C. Contractor's Affidavit of Prevailing Wage.

D. Consent of Surety Company for Final Payment.

E. Affidavit of Final Acceptance Date and Correction Period.

F. Before the OWNER will approve and accept the work and release the retainer, the CONTRACTOR will furnish the OWNER a written report indicating the resolution of any and all property damage claims filed with the CONTRACTOR by any party during the construction period. The information to be supplied shall include, but not be limited to, name of claimant, date filed with CONTRACTOR, name of insurance company and/or adjuster handling claim, how claim was resolved and if claim was not resolved for the full amount, a statement indicating the reason for such action.

END OF SECTION 017800

SECTION 017821 - CLEANING AND PROTECTION

PART 1 - GENERAL

1.1 GENERAL

A. On or before the completion date for the work, the Contractor shall tear down and remove all temporary structures built by him, all construction plant used by him, and shall repair and replace all parts of existing embankments, fences or other structures which were removed or injured by his operations or by the employees of the Contractor. The Contractor shall thoroughly clean out all buildings, sewers, drains, pipes, manholes, inlets and miscellaneous and appurtenant structures, and shall remove all rubbish leaving the grounds in a neat and satisfactory condition.

B. As circumstances require and when ordered by the Engineer, the Contractor shall clean the road, driveway, and/or sidewalk on which construction activity under this contract has resulted in dirt or any other foreign material being deposited with an automatic self-contained mechanical sweeper with integral water spray, vacuum and on-board or supplementary containment.

C. Failure to comply with this requirement when ordered by the Engineer or his representative, may serve as cause for the Engineer to stop the work and to withhold any monies due the Contractor until such order has been complied with to the satisfaction of the Engineer.

D. As the work progresses, and as may be directed, the Contractor shall remove from the site and dispose of debris and waste material resulting from his work. Particular attention shall be given to minimizing any fire and safety hazard from form materials or from other combustibles as may be used in connection with the work, which should be removed daily.

E. The Contractor shall wash all windows and other glass surfaces, leaving all areas free from putty marks, paint, etc.

F. During and after installation, the Contractor shall furnish and maintain satisfactory protection to all equipment against injury by weather, flooding or breakage thereby permitting all work to be left in a new condition at the completion of the contract.

END OF SECTION 017821

SECTION 099713.10 – STEEL COATING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Painting of steel structures.

1.2 REFERENCES

A. AWWA Standards:
   1. D102 – 11 Painting Steel Water Storage Tanks.
   2. C652 – Disinfection of Water Storage Facilities.

1.3 WORK INCLUDED

A. Exterior: Apply a two (2) coat epoxy system.

B. Wet Interior: Apply a three (3) coat zinc epoxy system and pit filler as needed, replace the manway gaskets.

C. Nameplates: Remove the nameplates from tanks 1 and 2 and clean the rust and paint from the surface, apply a clear coat, and reinstall on the existing bracket.

1.4 EXISTING CONDITIONS

A. Exterior: Tanks #1, 2 and 3 were constructed in 1969 and tank #4 was constructed in 1994, the existing coating and heavy metal content is unknown.

B. Wet Interior: Coating system is unknown.

1.5 TERMINOLOGY

A. Wet Interior: Internal surfaces, excluding inaccessible areas, accessories, and appurtenances that are exposed to the stored water or its vapor.

B. Exterior: External surfaces, excluding inaccessible areas and appurtenances that are exposed to the elemental atmosphere. Limit for coating the filter tanks is to include all supports and piping to the 1st flanged connection.

C. Inaccessible Areas: Areas of the finished structure that, by virtue of the configuration of the completed structure, cannot be accessed to perform surface preparation or coating application (with or without the use of scaffolding, rigging, or staging). Inaccessible areas include such areas as the contact surfaces of roof plate lap joints, underside of roof plates where they cross supporting members, top surface of rafters directly supporting roof plates, contact surfaces of bolted connections, underside of column baseplates, contact surfaces of mating parts not intended to be removed or disassembled during routine operation or maintenance of the structure.

1.6 OMISSIONS OR INCIDENTAL ITEMS

A. It is the intent of these specifications to coat the structure for the purpose of corrosion protection on wet interior surfaces. It is the intent to coat the exterior for corrosion protection and aesthetics.

B. Any small or incidental items not specifically detailed in the schedule, but obviously a part of the work are included in the work at no additional cost to the owner.

C. Engineer, as interpreter of the specifications, will determine if disputed items fall under this category. Prevailing custom and trade practices will be considered in this determination.

1.7 SUBMITTALS

A. Submit the following with your annual prequalification:
   1. Occupational Safety and Health Programs and certification that all site personnel have been trained as required by law.

B. Submit the following ten (10) days prior to the preconstruction meeting:
   1. Safety Data Sheets (SDS) and Product Data Sheets:
      a. Furnish from all suppliers Safety Data Sheets and product data sheets for all applicable materials including, but not limited to, paints, thinners, cleaners, degreasers, and abrasive materials.
      b. Provide for employees one (1) copy of all data sheets at the job site for employee access.
      c. Provide two (2) copies to the owner.
      d. Provide two (2) copies to the engineer.
      e. No work may commence without the complete filing. All SDS shall conform to requirements of SARA (EPCRA) Right-to-Know Act.
   2. Ventilation Design Plan. Include airflow calculations and model, and number of fans.
   3. Fall Prevention Plan and Site Specific Fall Hazard Evaluation:
      a. Site specific plan to contain a generic drawing of the existing structure and appurtenances of this structure and reflect safety changes specified for this project.
      b. Certifications for all spiders, scaffolding, stages, etc. to be used on the project. All certifications to be current, less than one year old.

C. Submit the following at the preconstruction meeting:
   1. Designated OSHA Competent Person and qualifications, if not previously submitted.
   2. Waste hauler and disposal facility.
   3. Submit all power tools and attachments to be used during the project.

D. Submit the following within two (2) weeks of project completion with final pay request:
   1. Waste manifest.
   2. Waivers of lien.
   3. Copies of any formal worker safety or environmental citations received on the project.

1.8 OWNER RESPONSIBILITY

A. Drain the structure with seven (7) days' notice, after contractor meets all precedent conditions of the contract.

B. Fill the tank and draw samples and test after chlorination; responsibility of good results remains with the contractor. Poor test results could result in added costs to contractor, including rechlorination, cost of water, plus possible liquidated damages.

1.9 WARRANTY

A. Approximately one (1) year from the date of completion, the structure will be inspected by the owner and/or their representative.

B. The inspection will be performed in accordance with the applicable portions of AWWA D-102-11 Standard for Painting Steel Water Storage Tanks and industry standards.

C. The owner will establish a date of inspection and shall notify the contractor ten (10) days in advance. The contractor's attendance will not be required.

D. The owner will select a third party inspection firm (either engineer or project representative) to document inspection. Contractor shall be notified in advance by the Engineer, the contractor waives all rights to dispute findings if not present for the inspection.

E. Any failed work will be documented and the contractor will be notified of necessary repair (method and extent). The owner reserves the right to require inspection of the repair work and possibly a second warranty inspection, dependent on degree of failure.

F. Except where noted in the Contract Documents, the contractor guarantees all material and equipment furnished and all work performed for a period of one (1) year from the date of substantial completion of the contract. This warranty will automatically be extended until the tank is ice-free (if applicable) and the warranty inspection can be performed. The contractor guarantees that the system is free from defects due to faulty materials or workmanship and the contractor shall make the necessary correction to correct these defects. If the amount of rework exceeds ten percent (10%) of a portion of the project, then the owner reserves the right to have the warranty period extended one (1) year for the entire portion of the work.

G. Cost for one (1) year warranty inspection will be the responsibility of the owner.

H. Cost for a second warranty inspection and repair inspections will be the responsibility of the contractor and guaranteed by Contractor's Performance Bond.

I. The owner retains all contractual remedies. The warranty shall not be considered an exclusive remedy.

1.10 DELIVERY AND STORAGE OF MATERIAL

A. Submit manufacturer's invoice, with or without paint cost, to the engineer for review. This submittal will be used to identify the quantity of paint recommended by the manufacturer for a job of this size and design, and will be used to check the quantity actually delivered to the project.

B. Cover bulk materials subject to deterioration because of dampness, weather, or contamination, and protect while in storage.

C. Maintain materials in original, sealed containers, unopened and with labels plainly indicating the manufacturer's name, brand, type, grade of material, and batch numbers.

D. Remove from the work site containers that are broken, opened, water marked, and/or contain caked, lumpy, or otherwise damaged materials. They are unacceptable.

E. Store the material in a climate controlled designated area where the temperature will not exceed the manufacturer's storage recommendations. Heat the storage area to the manufacturer's recommended minimum mixing temperature.

F. Keep equipment stored outdoors from contact with the ground, away from areas subject to flooding, and covered with weatherproof plastic sheeting or tarpaulins.

G. Store all painting materials in a location outside the structure.

H. Do not store or have on-site unapproved material, material from different manufacturers, or materials from different projects.

1.11 ACCESS AND INSPECTOR SAFETY

A. Provide access to all portions of the project where work is being completed. Access must be close enough and secure enough to allow inspector to use inspection equipment without extensions.

B. Provide personnel to assist with access and to ensure contractor's access equipment is safely used.

C. Provide separate fall protection for owner and inspectors. Limit fall to 5 ft. vertically.

D. These specifications require the contractor to supply a separate fall protection cable and safety grab for each tie-off point for the inspector's use. The contractor is encouraged to provide a separate cable and tie-off for each worker. The cables may be connected to the same tie-off point as the inspector's, but a separate cable and safety grab are required for each user.

1.12 INSPECTION AND TESTING

A. Prior to the scheduled inspection, remove all dust, spent abrasive, and foreign material from the surface to be coated

B. Furnish an instrument for measuring the wet film thickness, and also dry film thickness of each field coat of paint. The dry film thickness testing gauge shall be the magnetic type as manufactured by Elcometer Co., or the Nordson Gauge Co.; spring loaded model with two percent (2%) accuracy margin over a range of one-to-twenty-one (1-21) mils or equal.

C. Certify to the owner that the specified paint has been applied at the paint manufacturer's recommended coverage, and to the specified thickness required. Also, certify that the paint has been applied in accordance with this contract.

D. Take all necessary steps, including dry striping by brush or roller, to ensure a holiday-free coating system.

E. The owner reserves the right to perform low voltage holiday tests on all areas including the exterior.

F. The owner and engineer reserve the right to perform destructive testing under conditions deemed necessary. Testing may include, but is not limited to, the Tooke thickness test and adhesion testing. Any damage caused by these tests will be corrected to specifications at the contractor's expense.

1.13 CLIMATIC CONDITIONS

A. Do not apply paint when the temperature, as measured in the shade, is below the manufacturer's required ambient and surface temperatures.

B. Do not apply paint to wet or damp surfaces.

C. Do not apply paint when it is expected the relative humidity will exceed 85%, or the surface temperature is less than 5º above dew point, or the air temperature will drop below the manufacturer's requirements for proper cure. Anticipate dew or moisture condensation, and if such conditions are prevalent, delay painting until the owner is satisfied the surfaces are dry.

1.14 APPLICATION

A. Complete all painting and surface preparation in strict accordance with these specifications, approved paint manufacturer's specifications, and good painting practices per SSPC.

B. Apply each coating at the rate and in the manner specified by the manufacturer. Check the wet film thickness every 200 sq. ft. to ensure each coat applied meets the dry film thickness range requirements.

C. Allow sufficient time for each coat of paint to dry and cure. Allow a minimum of twenty-four (24) hours between coats, unless product requirements have a maximum time less than 24 hours.

D. Apply exterior coating by brush and roller only. Spray application is not permitted without prior approval of the engineer. Even with prior approval, responsibility for damage still remains with the contractor.

E. The contractor is responsible for the appearance of the finished project, and is warned to prevent contact with any freshly applied coating. Removal of rigging shall be completed so not to mar or damage the coating.

F. Coatings shall be applied using methods to eliminate roller or spray marks in the finished product on the exterior.

G. Stripe the wet interior prior to application of final coat.

H. Additional coats required for coverage or to eliminate roller marks, spray marks and to repair dry spray and overspray are the responsibility of the contractor at no additional cost to the owner.

I. Use of pole extension on spray guns is prohibited for all paint application.

J. Mixing of partial kits is not permitted. All partial cans of coating must be removed from the site.

K. Mixing blades to be clean. The engineer has the right to reject mixing blades based on cleanliness or paint build-up. Do not use the same mixing blade for different coatings (i.e. epoxy and urethane coatings).

PART 2 - PRODUCTS

2.1 COLOR

A. Exterior Coatings:
   1. Supply the engineer with a color chart to allow the owner ample time for the exterior topcoat color selection.

2. Factory tint the intermediate coat(s) for all areas of the structure if similar to the finish coat. Tinting shall be sufficient to allow visibility of the dissimilar color from 1 ft., and from 100 ft.
3. After evaluating the bids, the owner shall select the color. All bids shall be based on common “sky-blue” color. The owner recognizes the additional cost for deep color paints. After the color has been selected, document the difference in cost and quantity used for the selected color and the owner will issue a Change Order for the exact cost differential only.
4. Documentation of additional cost is the responsibility of the contractor, and must be supplied two (2) weeks before application. If necessary documentation is not supplied, any additional cost will be borne by the contractor. If selection/application time is less than two (2) weeks, then as soon as possible. The owner has the right to switch to a less expensive color; therefore, the contractor must submit cost before ordering paint.

B. Wet Interior Coatings:
1. The color is to be a different tint between coats. Tinting to be performed in the factory.

2.2 SUBSTITUTIONS

A. All coatings specified and approved herein have met or exceeded a specified list of ASTM standards. The materials specified are the standard to which all others shall be compared.

B. The purpose is to establish a standard of design and quality, and not to limit competition.

C. Other manufacturers wishing to have their products approved have also had their coatings tested using the same representative of Dixon Engineering, Inc., and the same test methods.

D. Approval by ANSI/NSF Standard 61 is also a requirement for potable water contact coatings.

E. The selection of coatings also has taken into consideration the manufacturer’s current and past performance on availability, stocking, and shipping capabilities, ability to resolve disputes, and any applicable warranties.

2.3 DUST COLLECTORS – AIR FILTRATION UNITS

A. Furnish and use a dust collector during all blasting work.

B. Units to be equal in filtration capacity to Eagle Industries dust collectors. Other units may be used, but their substitution will be evaluated on efficiency at 0.5 micron size and airflow movement.

C. Use 10,000 CFM minimum for wet interior work.

D. Substitution of steel grit blasting may decrease the requirements above. New requirements will be defined by the engineer based on the efficiency of the contractor's equipment.

E. Furnish HEPA filters for dust collection.

F. Number of dust collectors shall be sufficient to supply a 50 ft./minute downward draft at most areas. An average may be considered. Determination of actual containment plan will be the deciding factor. Calculations of airflow shall be included in the containment submittal.

G. Use only new filters or filters certified clean.

2.4 GROUND TARPS

A. Use impermeable ground tarps, 20 mils thick.

B. Use ground tarps able to withstand the anticipated construction traffic without tearing or separating.

2.5 EQUIPMENT COVERING

A. Use material that is 8 – 10 mils thick, and 100% impermeable to all vulnerable equipment.

B. Use material resistant to tear and/or rip by mechanical action from abrasive blasting during blasting operations.

C. Make coverings airtight by use of duct tape at the openings, or other suitable measures.

D. Meet with representative of equipment owner to verify covering will not damage equipment. Damage is the contractor's responsibility. This includes not only the owner's equipment, but also telecommunication antennas, cables, buildings, controls, etc.

PART 3 - EXECUTION

3.1 DUST CONTAINMENT – INTERIOR

A. Do everything within the contractor's power to minimize dust as a nuisance.

B. No visible dust release is allowed from roof openings and other access openings. Seal or close all openings prior to blasting (see ventilation requirements).

C. Connect the air filtration unit directly to a manhole extension.

D. Design the manhole extension to allow access of hoses through a side exit that is sealable after hoses are in-place. Install the air filtration unit directly to the end of the extension.

E. Seal of the side exit will be tested by holding a smoke agent 6 in. outside the seal with the air filtration unit operating. If smoke is drawn to the seal area, additional sealing will be necessary.

F. The contractor may reverse this operation by connecting the air filtration unit to the roof manhole and sealing around the hose. Also seal the roof vent. A sealed semi-rigid structure also may be used where employees have access through a side door. 90% of the air draw must be from the tank proper.

G. Construct the semi-rigid structure from 8 ft. x 8 ft. x 6 ft. high scaffold framing and cover with tarps, with all edges lapped 2 ft. minimum and an overlapped entranceway.

3.2 VENTILATION REQUIREMENTS

A. Supply mechanical ventilation sufficient to change air in the tank six (6) times each hour.

B. In calculating air exchange, the dust collector air capacity can be considered a part of the air being changed up to 50% of ventilation requirements.

C. Use the manways with fans to move the required air.

D. Ventilate wet interior areas a minimum of seven (7) days after completion of painting, or longer until the wet interior coating has fully cured. Maintain ventilation at the rate of two (2) complete air changes per hour. The owner reserves the right to perform a MEK Solvent Double Rub Test per ASTM D 4752 to verify the cure of the coating film prior to returning the tank to service.

E. Cost of ventilation is incidental to the paint project.

F. Additional ventilation openings may have to be installed by the contractor. Submit size, details, and location(s) for approval by the owner prior to cutting any opening. All costs associated with repairs by a certified welder are incidental

G. Connect the air filtration unit per this Section, Dust Containment – Interior. All fans on the roof and sidewalls must blow in. If all openings are not needed for ventilation, seal them. Zero release to the atmosphere will be permitted.

3.3 PROTECTION of NON-WORK AREAS

A. Protect all non-painted surfaces prior to all painting.

B. Protect and seal all controls and electrical components (even if they are not in the immediate work area) that are in danger from the project. Coordinate with the owner so all controls are shut down and/or vented if necessary.

3.4 HAND WASH FACILITY

A. Provide OSHA approved hand wash facility with running water. Hot water is not required.

B. Stock facility with soap and towels, and keep supply replenished.

C. Test water and dispose of properly after job is completed.

3.5 GROUND COVER

A. Protect the ground from paint chips during surface preparation and from paint drips during coating application. Tarp at least 10 ft. from the structure's base.

B. Lap all ground tarps a minimum of 2 ft.

PART 4 – SPECIAL PROVISIONS

4.1 GRASS RESTORATION

A. The contractor is to report any damaged ground at the construction site in writing prior to mobilization of equipment, otherwise all repairs to the damaged ground will be the responsibility of the contractor.

B. Refill all holes, ruts etc. with clean topsoil, and level area around the construction site to the original grade.

C. Fill material to be clean soil, no gravel, rocks or construction debris is to be used as fill material without the owner's consent.

D. Bring soil to a friable condition by disking, harrowing, or otherwise loosening and mixing to a depth of 3 in. – 4 in. Thoroughly break all lumps and clods.

E. Rake area to be seeded. Sow seed at a minimum rate of 220 lbs/acre. Use seed intended for the climate.

F. Work to be completed to the owner's satisfaction.

G. Cost is incidental to exterior painting.

4.2 NAMEPLATE

A. Remove the existing nameplate, clean the area behind, and paint the same as the exterior system.

B. Remove the existing coating from the nameplate without destroying lettering on the nameplate. Apply a clear coat to the nameplate using Rust-Oleum Automotive Clear Enamel Spray Paint or approved equal.

C. Reattach with stainless steel fasteners or using the existing fasteners after painting has been completed.

D. Cost is incidental to exterior coating.

END OF SECTION 099713.10

SECTION 099713.10.01 - STEEL COATING SURFACE PREPARATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Power Tool Cleaning.

B. High Pressure Water Cleaning.

1.2 REFERENCES

A. AWWA Standards:
   1. D102-11 Painting Steel Water Storage Tanks.

B. SSPC and NACE Standards:
   1. SP11 – Power Tool Cleaning to Bare Metal.
   2. SP10/NACE No. 2 – Near White Metal Abrasive Blast.
   3. SP12/NACE No. 5 – High and Ultra High Pressure Water Jetting.
   4. VIS 1 (Visual standard for abrasive blasted metal).
   5. VIS 3 (Visual standard for hand and power tool cleaned metal).

1.3 WORK INCLUDED – SURFACE PREPARATION

A. Exterior: Low pressure water clean (3,500 to 5,000 psi), spot power tool clean to a SSPC-SP11 standard, and scarify the entire exterior.

B. Wet Interior: Abrasive blast clean to a SSPC-SP10 near white metal standard.

1.4 WASTE SAMPLING

A. Sample waste and send to a NLLAP certified lab and test for TCLP for eight (8) metals (Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium and Silver).

B. The owner reserves the right to collect samples and to send them to their selected lab. This will be determined at the preconstruction meeting.

C. Pay all lab fees for eight (8) metals TCLP analysis on waste samples and any subsequent testing if clean-up is warranted.

PART 2 – PRODUCTS

2.1 EXTERIOR TANK CLEANER

A. United 727 Weather-Zyme as manufactured by United Laboratories, 320 37th Ave., St. Charles, IL 60174 1-800-323-2594.

2.2 ABRASIVE – COAL SLAG – PRETREATED AND NON-LEAD SURFACES

A. The coal slag shall be 20-40 grade, or 30-60 grade.

B. The abrasive shall be free of moisture, water soluble contaminants, dust, and oil.

C. The abrasive shall be stored and covered to prevent moisture contamination.

D. All leaking or spilling bags shall be removed, and affected areas properly cleaned.

E. All slag abrasive shall meet the requirements of SSPC-AB1 “Mineral and Slab Abrasive” June 1, 1991 – Grade 3.

F. The use of silica sand, flint sand, and glass beads is prohibited.

G. All abrasive and grit material used, and all equipment supplied shall be subject to approval of the engineer. The abrasive or grit shall be sharp enough and hard enough to remove the mill scale, rust, and paint.

2.3 RECYCLABLE STEEL GRIT – ALTERNATE

A. Use recyclable steel grit size G-25 or G-50.

B. The abrasive is to be free of moisture, water soluble contaminants, dust, and oil.

C. The abrasive is to be stored and covered to prevent moisture contamination.

D. All leaking or spilling containers are to be removed, and affected areas properly cleaned.

E. All recyclable steel grit shall meet requirements of SSPC-AB1 “Metallic Abrasive” June 1, 1991.

F. All abrasive and grit material used, and all equipment supplied shall be subject to approval of the engineer. The abrasive or grit shall be sharp enough and hard enough to remove the mill scale, rust, and paint.

PART 3 - EXECUTION

3.1 PRE-SURFACE PREPARATION – WET INTERIOR

A. Low pressure water clean at 4,000 psi all surfaces and appurtenances to remove sediment, minerals, soot, and other contaminants.

B. Staining may remain in place prior to abrasive blast cleaning, engineer to approve cleanliness.

3.2 NEAR WHITE METAL (SSPC-SP10) DRY BLAST – WET INTERIOR

A. Abrasive blast clean all surfaces and appurtenances to a near white metal finish (SSPC-SP10), latest edition thereof.

B. Maintain a profile of 2.0 – 3.0 mils on abrasive blast cleaned surfaces.

C. All interior abrasive blast cleaning is to be completed and all spent abrasive removed, and surfaces thoroughly cleaned prior to any primer application.

D. Once an area is acceptable for painting, apply all coats and allow coating to cure to touch prior to resumption of blasting or blast the entire tank before painting, use dehumidification to hold the blast. It is the contractor's discretion and responsibility to determine if the entire tank is to be blasted, or what size is to be blasted and coated (all coats).

E. The contractor is responsible for supplying heat and dehumidification to maintain blast conditions.

3.3 SURFACE PREPARATION - EXTERIOR

A. Solvent clean all visible grease, oil, salts, and residue.

B. Low pressure water clean (3,500 to 5,000 psi) the generator enclosure exterior to remove all mildew, dirt, soot and other contaminants.

C. Power tool clean all exterior surfaces to bare metal SSPC-SP11 standard where steel is exposed or rusted. All remaining coating is to be scarified by hand or pole sanding with 30-60 grit paper, wipe off all dust on surface with tack-free cloth, or power wash before painting.

D. Retain or produce a surface profile to all power tool cleaned surfaces. Surface profile shall be greater than 1.0 mil.

E. Feather all edges of adjacent coating with 3M Scotch-Brite Clean'n Strip discs a minimum of $^{1}/_{2}$ in. from exposed steel.

F. Submit all power tools for approval prior to beginning of work. Approval will be based on quality of tool, functionality, and possibility of damage to steel or adjacent paint.

G. Attach a vacuum to all power tools (not needed for tank #4). Size vacuum per manufacturer's recommendations for optimal recovery of spent paint debris. Attach a HEPA filter sized as required.

H. Disposal of vacuumed waste is the responsibility of the contractor. Follow instructions on waste containers and store as directed by the owner.

3.4 WASTE DISPOSAL – NON-HAZARDOUS

A. If after testing of the spent abrasive material the TCLP tests indicate the abrasive is not a hazardous waste, dispose the abrasive in a waste disposal facility.

B. All waste shall be handled by a licensed hauler. Supply the owner with all proper documentation of the final disposal site. The actual bill of lading and all manifests will be required prior to any payment.

C. Payment for non-hazardous waste disposal is incidental to interior or exterior painting.

3.5 WASTE DOCUMENTATION

A. Supply proper documentation of storage, transportation, and treatment, or disposal of the waste to the owner. The owner will retain sufficient funds from the contractor to pay for hazardous waste transportation, treatment, and any possible fines until all documentation has been received. This retainage will be held, even if the waste has tested non-hazardous.

3.6 TESTING AND CLEAN-UP OF WASTE

A. Daily collect all spent abrasive from the ground tarps and dispose in the required receptacles. Prior to receiving test results, spent abrasive shall be stored on ground tarps. The spent abrasive is to be covered and weighted down so no dust can be released.

B. Furnish containers with proper labels for storage of the spent debris. Containers shall meet requirements of the EPA (or their local counterpart) for hazardous waste disposal. The spent abrasive will be moved directly from the tank into the waste containers. The containers will remain until final test results have been received. Furnishing containers with covers will be incidental to respective repaint, and will not be affected by the owner’s final selection of respective interior or exterior disposal.

C. Waste to remain on-site in covered receptacles until waste test results are received.

END OF SECTION 099713.10.01

SECTION 099713.13.08 - WET INTERIOR STEEL COATING - THREE COAT ZINC EPOXY

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Painting the wet interior of the filter tanks.

1.2 REFERENCES

A. SSPC and NACE Standards:
   1. PA1 – Paint Application.
   2. PA2 – Measurements and Calibration.
   3. NACE RP 0178 Surface Finish Requirements.

1.3 WORK INCLUDED

A. Application of a three (3) coat zinc epoxy system.

B. Application of a 100% solids pit filler.

PART 2 - PRODUCTS

2.1 ZINC EPOXY – 3 COAT SYSTEM

A. Three (3) coat zinc epoxy system meeting all National Sanitation Foundation certification standards for potable water contact.

B. Approved suppliers and systems:

Manufacturer	System
Tnemec	94H2O/N140/N140(stripe)/N140
Induron	Indurazinc MC-67/PE-70/PE-70(stripe)/PE-70
PPG	Amercoat 68MCZ/Amerlock 2/Amerlock 2(stripe) /Amerlock 2
Sherwin Williams	Corothane I galvapac/646PW/646PW(stripe)/646PW

C. Approved pit filler:

Tnemec	215
Induron	Aquatopoxy A-6 Thick
PPG	Amercoat 133 with 884 filler

PART 3 - EXECUTION

3.1 ZINC EPOXY – 3 COAT SYSTEM

A. Apply a three coat high build epoxy paint system with a zinc primer to all prepared surfaces and appurtenances.

B. Abrasive blast cleaning and paint requirements have been previously defined in Section 099713.10.

C. Apply each coat at the following rates:

Coat	Minimum DFT (mils)	Maximum DFT (mils)
Primer	2.5	3.5
Intermediate	4.0	6.0
Stripe Coat	1.5	2.5
Topcoat	4.0	6.0
Total	10.5*	15.5*

*Total does not include stripe coat.

D. Stripe coat to be applied to all welds, angles, and sharp edges throughout the structure.

E. Each full coat to be a different color from the previous coat and is to be approved by the engineer. No color bleedthrough should occur if proper application rates are observed.

F. Apply all coats in uniform color and sheen without streaks, laps, runs, sags, cloudy, or missed areas. Correct all defects before application of the successive coat.

G. Allow a minimum of twenty-four (24) hours between coats (including stripe coat). Additional time may be necessary if low temperatures require an increase in the necessary cure time.

H. MAINTAIN FORCED VENTILATION A MINIMUM OF SEVEN (7) DAYS AFTER TOPCOAT APPLICATION, time required for cure is dependent on the coating manufacturer and temperature. Record variations of the standard procedures (roof hatch closure because of rain, etc.), and submit to the engineer. Heat is required if, in the opinion of the engineer, the integrity of the coating is endangered by cold weather, or if additional cure time will delay the project beyond the substantial completion date.

3.2 PIT FILLER

A. Fill all pits marked by the engineer.

B. The engineer will assess severity of pitting after old coating has been removed.

C. Apply filler with the stripe coat application.

D. Payment will be on a per pit basis with all pits smaller than $2^1/_2$ in. diameter equal to one pit. Pits greater than $2^1/_2$ in. will be negotiated extrapolating from the criteria of $2^1/_2$ in. diameter equals one pit. Pits will not be measured; visual interpretation only.

E. Payment will be a separate line item "Pit Filling." The figure of 100 pits per filter is an estimated figure. The owner reserves the right to increase or decrease this quantity, or delete this item.

END OF SECTION 099713.13.08

SECTION 099713.24.02 - EXTERIOR STEEL COATING - TWO COAT EPOXY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Painting on the exterior of the filter tanks.

1.2 REFERENCES

A. SSPC and NACE Standards:
   1. PA1 – Paint Application.
   2. NACE RP 0178 Surface Finish Requirements.

1.3 WORK INCLUDED

A. Application of a two (2) coat epoxy system.

PART 2 - PRODUCTS

2.1 EPOXY - 2 COAT OVERCOAT SYSTEM

A. The coating shall be an epoxy system.

B. Approved suppliers and systems:

Manufacturer	System
Tnemec	27WB(spot)/27WB/27WB

PART 3 - EXECUTION

3.1 EPOXY - 2 COAT OVERCOAT SYSTEM

A. Apply to all prepared surfaces and appurtenances a two (2) coat epoxy system.

B. Surface preparation and paint requirements have been previously defined in Section 099713.10. Apply all coatings by brush and roller. Spray application is prohibited.

C. Apply each coat at the following rates:

Coat	Minimum DFT (mils)	Maximum DFT (mils)
Primer (spot)	5.0	8.0
Intermediate (full)	5.0	8.0
Topcoat	5.0	8.0
Total	15.0	24.0

D. Each full coat to be a different color from the previous coat and is to be approved by the engineer. No color bleedthrough should occur if proper application rates are observed.

E. Apply all coats in uniform color and sheen without streaks, laps, runs, sags, cloudy, or missed areas. Correct all defects before application of the successive coat.

F. Allow a minimum of twenty-four (24) hours between coats. Additional time may be necessary if low temperatures require an increase in the necessary cure time.

END OF SECTION 099713.24.02

SECTION 330110.58 - DISINFECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. Related American Water Works Association (AWWA) Specifications:
   1. ANSI/AWWA C651, Disinfecting Water Mains
   2. ANSI/AWWA C652, Disinfection of Water Storage Facilities
   3. ANSI/AWWA C653, Disinfection of Water Treatment Plants
   4. ANSI/AWWA B300, Hypochlorites
   5. ANSI/AWWA B301, Liquid Chlorine

1.2 SUMMARY OF WORK

A. This specification describes the cleaning, disinfection, and testing requirements of the treatment plant facilities following completion of all plant work and prior to being placed back into service.

1.3 SUBMITTALS

A. Product Data: Submit the manufacturer's technical data and application instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products used for disinfection shall conform to the latest revisions of ANSI/AWWA B300 or ANSI/AWWA B301.

PART 3 - EXECUTION

3.1 PRESSURE FILTERS - FOLLOWING TANK COATING

A. After all work in complete and before the filter is placed in service, the Contractor shall disinfect the entire filter by chlorination according to the latest revision of ANSI/AWWA C652.

3.2 PRESSURE FILTERS - FOLLOWING NEW MEDIA PLACEMENT

A. After all work in complete and before the filter is placed in service, the Contractor shall disinfect the entire filter by chlorination according to the latest revision of ANSI/AWWA C653.

END OF SECTION 330110.58

SECTION 400507 - PROCESS PIPE HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes hangers and supports for process piping systems and equipment.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Section "Metal Fabrications" for materials for attaching hangers and supports to building structure.

1.3 DEFINITIONS

A. Terminology used in this Section is defined in MSS SP-90.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of hanger and support.

C. Submit pipe hanger and support schedule showing manufacturer's Figure No., size, location, and features for each required pipe hanger and support.

D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

E. Shop Drawings shall be signed and sealed by a qualified professional engineer for multiple piping supports and trapeze hangers. Include design calculations and indicate size and characteristics of components and fabrication details. Shop drawings for each type of hanger and support, indicating dimensions, weights, required clearances, and methods of component assembly.

1.5 QUALITY ASSURANCE

A. Qualify welding processes and welding operators according to AWS D1.1 "Structural Welding Code--Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

B. Qualify welding processes and welding operators according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."

C. NFPA Compliance: Comply with NFPA 13 for hangers and supports used as components of fire protection systems.

D. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100.

1. UL and FM Compliance: Hangers, supports, and components include listing and labeling by UL and FM where used for fire protection piping systems.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

E. Licensed Operators: Use operators that are licensed by powder-operated tool manufacturers to operate their tools and fasteners.

1.6 PERFORMANCE REQUIREMENTS

A. Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

B. Design heavy-duty steel trapezes for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58.

1. Components include galvanized coatings where installed for piping and equipment that will not have a field-applied finish.
2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.

B. Thermal-Hanger Shield Inserts: 100-psi (690-kPa) average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.

C. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.

D. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.

2.2 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36 (ASTM A 36M), steel plates, shapes, and bars, black and galvanized.

B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.

C. Washers: ASTM F 844, steel, plain, flat washers.

D. Grout: ASTM C 1107, Grade B, nonshrink, nonmetallic.

1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic-cement-type grout that is nonstaining, noncorrosive, nongaseous and is recommended for both interior and exterior applications.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
3. Water: Potable.
4. Packaging: Premixed and factory-packaged.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATION

A. Specific hanger requirements are specified in the Section specifying the equipment and systems.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

3.2 HANGER AND SUPPORT INSTALLATION

A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible.

C. Install supports with maximum spacings complying with MSS SP-69.

D. Where pipes of various sizes are supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

E. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.

F. Install concrete inserts in new construction prior to placing concrete.

G. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches (100 mm) thick.

H. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches (100 mm) thick.

I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

J. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

K. Support fire protection systems piping independent of other piping.

L. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

M. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.

O. Insulated Piping: Comply with the following installation requirements.

1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.
2. Saddles: Install protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.
3. Shields: Install MSS Type 40, protective shields on cold piping with vapor barrier. Shields span an arc of 180 degrees (3.1 rad) and have dimensions in inches (mm) not less than the following:

NPS (Inches)	LENGTH (Inches)	THICKNESS (Inches)
1/4 to 3-1/2	12	0.048
4	12	0.060
5 and 6	18	0.060
8 to 14	24	0.075
16 to 24	24	0.105

4. Pipes 8 Inches (DN 200) and Larger: Include wood inserts.
5. Insert Material: Length at least as long as the protective shield.
6. Thermal-Hanger Shields: Install with insulation of same thickness as piping.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.

B. Grouting: Place grout under supports for equipment, and make a smooth bearing surface.

3.4 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.

B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal-arc welding, appearance and quality of welds, methods used in correcting welding work, and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

A. Touching Up: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal is specified in Division 9, Section 099700 - Special Coatings.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.7 WARRANTY

A. The equipment supplier shall warrant for a period of 12 months that its equipment shall be free from defects in material and workmanship; and that it will replace or repair, F.O.B. its factory, any part or parts returned to it which examination shall show to have failed under normal use and service by the user. Warrantee period will commence upon completion of all project improvements.

END OF SECTION 400507

SECTION 402336 - PROCESS PIPE AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Extent of pipe, tube, and fittings required by this section is indicated on drawings and/or specified in other sections.

B. Types of pipe, tube, and fittings specified in this section include the following:

1. Steel Pipes
2. Copper Tube
3. Ductile Iron Pipe
4. Plastic Pipe
5. Plastic Tubing
6. Drainage Tile
7. Miscellaneous Piping Materials/Products

C. Pipes and pipe fittings furnished as part of factory- fabricated equipment are specified as part of equipment assembly in other sections.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of pipes and pipe fittings of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
2. All castings used for couplings housings, fittings, or valve and specialty bodies shall be date stamped for quality assurance and traceability.

B. Codes and Standards:

1. Welding: Quality welding procedures, welders and operators in accordance with ASME B31.1, or ASME B31.9, as applicable, for shop and project site welding of piping work. Certify welding of piping work using Standard Procedure Specifications by, and welders tested under supervision of, the National Certified Pipe Welding Bureau (NCPWB).

2. Brazing: Certify brazing procedures, brazers, and operators in accordance with ASME Boiler and Pressure Vessel Code, Section IX, for shop and job-site brazing of piping work.
3. NSF Labels: Where plastic piping is indicated to transport potable water, provide pipe and fittings bearing approval label by National Sanitation Foundation (NSF).

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, installation instructions, and dimensioned drawings for each type of pipe and pipe fitting. Submit piping schedule showing Manufacturer, pipe or tube weight, fitting type, and joint type for each piping system.

B. Welding Certifications: Submit reports as required for piping work.

C. Brazing Certifications: Submit reports as required for piping work.

D. Grooved joint couplings and fittings shall be shown on drawings and product submittals, and be specifically identified with the applicable Victaulic style number.

E. Maintenance Data: Submit maintenance data and parts lists for each type of mechanical fitting. Include this data, product data, and certifications in maintenance manual; in accordance with requirements of Division 1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Except for concrete, corrugated metal, hub-and-spigot, clay, and similar units of pipe, provide factory-applied plastic end-caps on each length of pipe and tube. Maintain end-caps through shipping, storage and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube.

B. Where possible, store pipe and tube inside and protected from weather. Where necessary to store outside, elevate above grade and enclose with durable, waterproof wrapping.

C. Protect flanges and fittings from moisture and dirt by inside storage and enclosure, or by packing with durable, waterproof wrapping.

PART 2 - PRODUCTS

2.1 GENERAL

A. Piping Materials: Provide pipe and tube of type, joint type, grade, size and weight (wall thickness or Class) indicated for each service. Where type, grade or class is not indicated, provide proper selection as determined by Installer for installation requirements, and comply with governing regulations and industry standards. Where any cuprous material contact iron products a dielectric union shall be provided.

B. Pipe/Tube Fittings: Provide factory-fabricated fittings of type, materials, grade, class and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, tube, valve or equipment connection in each case. Where not otherwise indicated, comply with governing regulations and industry standards for selections, and with pipe manufacturer's recommendations where applicable.

2.2 STEEL PIPES AND PIPE FITTINGS

A. Black Steel Pipe: ASTM A 53, A 106 or A 120; except comply with ASTM A 53 or A 106 where close coiling or bending is required.

B. Galvanized Steel Pipe: ASTM A 53 or A 120; except comply with ASTM A 53 where close coiling or bending is required.

C. Malleable-Iron Threaded Fittings: ANSI B16.3; plain or galvanized as indicated.

D. Malleable-Iron Threaded Unions: ANSI B16.39; selected by Installer for proper piping fabrication and service requirements, including style, end connections, and metal-to-metal seats (iron, bronze or brass); plain or galvanized as indicated.

E. Threaded Pipe Plugs: ANSI B16.14.

F. Steel Flanges/Fittings: ANSI B16.5, including bolting and gasketing of the following material group, end connection and facing, except as otherwise indicated.

1. Material Group: Group 1.1.
2. End Connections: Buttwelding.
3. Facings: Raised-face.

G. Grooved-Joint Couplings/Fittings: Fittings to be ductile iron conforming to ASTM A536 Grade 65-45-12; wrought steel conforming to ASTM A234 Grade WPB; or factory-fabricated from ASTM A53 carbon steel pipe. Basis of Design: Victaulic Company.

1. Couplings consist of two ductile iron housing segments conforming to ASTM A536 Grade 65-45-12, pressure responsive elastomer gasket (grade to suit the intended service) and ASTM A449 compliant bolts and nuts. Couplings conform to ASTM F1476: Standard for Performance of Gasketed Mechanical Couplings in Piping Applications.

a. Rigid Type: Housings cast with offsetting, angle-pattern, bolt pads to provide system rigidity and support and hanging in accordance with ANSI B31.1 and B31.9. Installation-Ready™ for complete installation without field disassembly. Basis of Design: Victaulic Style 107N.
b. Flexible Type: For use in locations where vibration attenuation and stress relief are required: Basis of Design: Victaulic Installation-Ready Style 177 or Style 77.

c. AGS two-segment couplings for pipe sizes 14" and larger, with wide-width FlushSeal® gasket and lead-in chamfer on housing key. Basis of Design: Victaulic Style W07 (rigid) and Style W77 (flexible).

2. Installation-Ready™ gaskets are center-leg, with pipe stop to ensure proper groove engagement, alignment, and pipe insertion depth.
3. For direct connection between IPS / steel pipe and AWWA / ductile iron pipe, Victaulic Style 307 transition coupling.

H. Ductile Iron Couplings/Fittings/Flanges:

1. Refer to Section 02617 Ductile Iron Fittings.

2.3 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88; Type L (above grade), Type K (below grade) as indicated for each service; hard-drawn temper, except as otherwise indicated.

1. Grooved-end joint couplings for copper tubing shall consist of copper colored alkyd enamel coated ductile iron housings, conforming to ASTM A395 and A536, cast with offsetting angle-pattern bolt pads, complete with pressure responsive synthetic rubber center-leg gasket with pipe stop to ensure proper groove engagement, alignment, and pipe insertion depth. Installation-Ready™ for complete installation without field disassembly (Grade to suit the intended service). Victaulic Style 607.
2. Grooved-end joint fittings for copper tubing shall be wrought copper, conforming to ASTM B75 and B152 and ANSI B16.22, or bronze sand castings, conforming to ASTM B584-87 and ANSI B16.18. (Fittings manufactured to copper tubing sizes. Flaring of tube and fitting ends to IPS dimensions is not allowed.)
3. Installation-Ready™ fittings for grooved end copper tubing shall be manufactured to copper-tube dimensions. Fittings shall be ductile iron conforming to ASTM A-536, Grade 65-45-12, with Installation-Ready™ ends, complete with PVDF (Poly Vinylidene Fluoride) and Grade "EHP" EPDM-HP [Grade 'T' Nitrile] gasket; and ASTM A449 electroplated steel bolts and nuts. System shall be rated to 300 psi (2065 kPa) with Type K or L Copper Tubing.

B. DWV Copper Tube: ASTM B 306.

C. ACR Copper Tube: ASTM B 280.

2.4 DUCTILE IRON PRESSURE PIPES AND PIPE FITTINGS

A. Ductile Iron Pipe: ANSI A21.51; AWWA C151.

B. Cement Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings for Water: ANSI A21.4; AWWA C104.

C. Polyethylene Encasement for Ductile Cast-iron Piping: ANSI A21.5; AWWA C105.

D. Ductile Iron-Fittings: AWWA C110. All fittings shall be full body. Compact fittings are not permitted.

E. Rubber Gasket Joints: AWWA C111.

H. Grooved-end joint couplings for ductile iron piping designed for the working pressures specified for the piping system with which they are to be used. Couplings shall be self-centering and shall engage and lock in place the grooved pipe and pipe fitting ends, in a positive couple. Coupling housing clamps shall be fabricated in two or more sections of ductile iron castings, conforming to the requirements of ASTM A 536, Grade 65-45-12. Coupling gaskets shall be molded synthetic rubber, FlushSeal®, conforming to ASTM D 2000, Grade to suit the intended service. Bolts shall be oval neck, track head type, with hexagonal heavy nuts conforming to ASTM A449 and A183. Grooved, hinged flange adapters, with gaskets, shall be furnished for making valve or flanged connections, and shall be constructed of the same materials as used for the couplings. Basis of Design: Victaulic Style 31 (coupling) and Style 341 (flange adapter).

I. Flanged Joints for Ductile Iron Pipe and Fittings:

1. All flanged joints shall conform to ANSI/AWWA C115/A21.15. Full face type rubber gaskets one eighth (1/8) inch thick as manufactured by the U.S. Rubber Company or equal shall be used in all flanged joints.
2. All bolt heads and nuts shall conform in dimensions to the American Standard heavy series and nuts shall be hexagonal cold pressed with well fitting threads. Bolts and nuts shall be cadmium plated by an approved process with a plate thickness of 0.0003 to 0.0005 inches. In lieu of cadmium plating, galvanizing will be acceptable. All studs shall be made from silicon bronze ASTM B 124 with bronze nuts where used in contact with any liquid or buried underground or Type 316 stainless steel using an anti-seize lubricant during assembly or as called for on the contract drawings.
3. Flanged coupling adapters are permitted as may be useful in pipe assembly. Fittings shall meet or exceed ASTM A536, Grade 65-45-12. Flange shall meet ANSI Class 125. Flange gasket shall be an O ring nitrile butadiene rubber meeting ASTM D 2000. T bolts shall be high strength alloy steel meeting AWWA C111.

J. MECHANICAL JOINTS

1. All mechanical joints and accessories shall be in accordance with AWWA C111/A21.11.
2. Gaskets shall be in compliance with ANSI A21.11and made of SBR rubber unless a material or tip style change is deemed appropriate to suit the needs of the service being conveyed in accordance with pipe manufacture’s recommendations.
3. Mechanical joint connections using a smaller diameter PVC or other iron pipe size pipe, an approved duck-tipped transition gasket shall be provided in accordance with the manufacturer's standards and recommendations.

4. M.J. bolt assemblies shall be in accordance with the manufacturer's recommendations using a Tee-head bolt per ANSI/AWWA C-111, thread pitch -ANSI/ASME B1.1 (UNC), thread class 2A and a Hex nut thread pitch -ANSI/ASME B1.1 (UNC), thread class 2B.
5. Bolt assemblies used on inside applications shall be corrosion resistant, high strength, low carbon alloy steel having minimum yield strength of 45,000 psi.
6. All bolt heads and nuts shall conform in dimensions to the American Standard heavy series and nuts shall be hexagonal cold pressed with well fitting threads. Bolts and nuts shall be cadmium plated by an approved process with a plate thickness of 0.0003 to 0.0005 inches. In lieu of cadmium plating, galvanizing will be acceptable. All studs shall be made from silicon bronze ASTM B 124 with bronze nuts where used in contact with any liquid or buried underground or Type 316 stainless steel using an anti-seize lubricant during assembly or as called for on the contract drawings.
7. All "job" cut pipe ends shall be ground, filed or otherwise properly worked on so as to be beveled and square to the pipe barrel similar to "factory" finished pipe ends. There shall be no "burrs" on any part of the cut pipe end.
8. Joint deflection shall be limited to no more than eighty percent (80%) of the manufacturer’s maximum recommendation. Joints shall not be deflected after being secured on pipe.
9. Where shown on the drawings, or ordered, mechanical joints shall be provided with approved harnesses to affect tied joints.
10. No special payment will be made for glands, bolts, nuts, gaskets, harnesses to effect tied joint or lock type joints used for mechanical joint connections. The cost thereof shall be included in the unit price bid for mechanical joint cast/ductile iron pipe and mechanical joint cast/ductile iron fittings. Payment, when specified, on a tonnage basis will be based on the body weight of the pipe or fittings only and shall not include additional weight of accessories.

2.5 PLASTIC PIPES AND PIPE FITTINGS

A. Polyvinyl Chloride Pipe (PVC): ASTM D 1785.

B. Polyvinyl Chloride Water Pipe (PVC): AWWA C900, and C905.

C. Polyvinyl Chloride Sewer Pipe (PVC): ASTM D 2729.

D. PVC Fittings:

1. Schedule 80 Socket: ASTM D 2467.
2. Schedule 80 Threaded: ASTM D 2464.
3. Sewer Socket: ASTM D 2729.
5. Fusion ASTM D638
6. Solvent Cement: ASTM D 2564.
7. Solvent Cement (To Join PVC to ABS): ASTM D 3138.
8. Appurtenances used to make flanged joints shall include: 1/8 in. thick red rubber gaskets, bolts having American Standard Heavy Unfinished Hexagonal Head and Nut dimensions in conformance with ANSI B18.1, and material for bolts and nuts shall conform to ASTM A 575 or A 576.

E. Polyethylene Tubing (PE): ASTM D 2737.

F. Polyvinyl Chloride Tubing (PVC): ASTM D 2740.

G. PE Fittings: ASTM D 2609.

H. PVC Fittings: ASTM D 2609.

J. Materials of construction, including joints and gaskets, shall be suitable for exposure to raw sewage, and shall also be UV stabilized with either 2% carbon black or titanium dioxide.

K. Threaded connections will be used and changes in same class as the pipe. It is the intent of these specifications and be put together in such a way that it can be easily rodded and disassembled in short lengths for cleaning.

L. Push on Joints for PVC Pipe and Fittings:

1. Push on type joints shall be in accordance with applicable ANSI/AWWA or ASTM standards as well as the requirements of the manufacturer's pipe and fittings being used for intended service use of either gravity or pressure pipe application as called for on the contract drawings.
2. Rubber gaskets shall be of type shaped to fit the particular configuration of the bells of the pipe being installed and shall produce a leak free pipe system.
3. Immediately prior to assembly, thoroughly clean all pipe surfaces which the rubber gasket contacts, insert the gasket properly and lubricate the joint surfaces.
4. Schedule 40, 80, and 120 sizes and pressure-rated for water is often belled for use as line pipe. For details of the solvent cement bell, see ASTM Specification D 2672 and for details of belled elastomeric joints, see ASTM Specifications D 3139 and D 3212.
5. All ends shall be beveled and square to the pipe barrel and shall be kept in a straight and square alignment to the receiving bell during assembly.
6. All "job" cut pipe ends shall be ground, filed or otherwise properly worked on so as to be beveled and square to the pipe barrel similar to "factory" finished pipe ends. There shall be no "burrs" on any part of the cut pipe end.

2.6 MISCELLANEOUS PIPING MATERIALS/PRODUCTS

A. Welding Materials: Except as otherwise indicated, provide welding materials as determined by Installer to comply with installation requirements. Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials.

B. Soldering Materials: Except as otherwise indicated, provide soldering materials as determined by Installer to comply with installation requirements. Solder shall be lead free.

C. Brazing Materials: Except as otherwise indicated, provide brazing materials as determined by Installer to comply with installation requirements. Comply with SFA-5.8, Section II, ASME Boiler and Pressure Vessel Code for brazing filler metal materials.

D. Grooved Joint Lubricants: Lubricate gasket in accordance with the manufacturer's published instructions with lubricant approved for the gasket elastomer and fluid media. Basis of Design: Victaulic Vic-Lube.

E. Gaskets for Flanged Joints: ANSI B16.21; full-faced for cast- iron flanges; raised-face for steel flanges, unless otherwise indicated.

F. Piping Connectors for Dissimilar Non-Pressure Pipe: Elastomeric annular ring insert, grooved-end waterway, or elastomeric flexible coupling secured at each end with stainless steel clamps, sized for exact fit to pipe ends and subject to approval by plumbing code.

1. Dielectric Waterway: Fittings shall be a copper-silicon casting conforming to UNS C87850, and UL classified in accordance with ANSI / NSF-61 for potable water service. Fittings shall have threaded ends, grooved ends, or a combination. Victaulic Style 647.

G. Expansion joint fittings: Expansion joint fittings to be integral flanged end wide arch spools where no gaskets are required, rated for a vacuum of 26" Hg and 250 °F continuous service. Tube and cover elastomers to be EDPM. Flanged ends to match drilling pattern of mated piping joint. Sewage lines to have solid filled arch and air lines to have open arch. All expansion joints shall be provided with control units of a style that is compatible with the mated piping joint. Control rods shall be stainless steel and of the style recommended by the manufacturer for the specific application. The number and size of rods shall be based on maximum test pressure. Expansion joints shall be heavy duty Series 1101 as manufactured by General Rubber; Flexicraft Industries – Ultraspool or approved equivalent. Expansion joints and control units shall be of the same manufacturer.

H. Expansion joint fittings: Expansion joint fittings to be integral flanged end wide arch spools

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Install drainage piping (perforated, porous or tile) from lowest end of slope to highest, solidly bedded in filtering or drainage fill. Shape bed for bells of piping (if any). Place bells/hubbs and grooved-ends of units up-stream. Lay perforated pipe with perforations down.
2. All trenches, when pipe laying is in progress, shall be kept dry and all pipes and specials shall be laid accurately to the required lines and grades and shall be uniformly supported along their entire lengths. The bottom of the excavation shall be properly trimmed, with holes at each joint to receive the bell and to permit the properly cementing the joints.
3. Pipe shall be fully entered and shall abut against adjacent pipe and in such a manner that there will be no unevenness along the inverts.

4. When pipes enter or pass through concrete walls, manholes, sewers or other structures, holes shall be provided and the pipes properly cemented in place so as to form a watertight joint.
5. Install gray and ductile cast-iron water mains and appurtenances in accordance with AWWA C600.
6. Install pipes and pipe fittings in accordance with recognized industry practices which will achieve permanently- leakproof piping systems, capable of performing each indicated service without piping failure.
7. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings.
8. Align piping accurately at connections, within 1/16" misalignment tolerance.
9. Comply with ANSI B31 Code for Pressure Piping.

D. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines.

Locate runs as shown or described by diagrams, details and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, columns and other structural and permanent-enclosure elements of building; limit clearance to 1/2" where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1" clearance outside insulation. Wherever possible in finished and occupied spaces, conceal piping from view, by locating in column enclosures, in hollow wall construction or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated.

E. Electrical Equipment Spaces: Do not run piping through transformer vaults and other electrical or electronic equipment spaces and enclosures unless unavoidable. Install drip pan under piping that must be run through electrical spaces.

3.2 PIPING SYSTEM JOINTS

A. General: Provide joints of type indicated in each piping system.

B. Thread pipe in accordance with ANSI B2.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed.

C. Braze copper tube-and-fitting joints where indicated, in accordance with ANSI B31.

D. Solder copper tube-and-fitting joints where indicated, in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.

E. Mechanically Formed Tee Connections: In lieu of providing tee fittings in copper tubing, Installer may, as option, provide mechanically formed tee connections, providing they are in accordance with the following:

1. Size and wall thickness of both run tube and branch tube are listed by Manufacturer of forming equipment as "Acceptable Application".
2. Height of drawn collar is not less than 3 times wall thickness of run tubing.
3. End of branch tube is notched to conform to inner curve of run tube, and dimpled to set exact penetration depth into collar.
4. Resulting joint is minimum of 3 times as long as thickness of thinner joint member, and brazed using B-CuP series filler metal.

F. Mechanically Formed Couplings: In lieu of providing couplings in copper tubing, Installer may, as option, provide mechanically formed couplings, provided they are in accordance with the following:

1. Form couplings by first annealing area at end of tube where expansion will occur. Insert tube expander to die size required and expand tube end to accept tubing of same size.
2. Resulting joint is a minimum of 3 times as long as thickness of tube, and brazed using B-CuP series filler metal.

G. Weld pipe joints in accordance with ASME Code for Pressure Piping, B31.

H. Weld pipe joints in accordance with recognized industry practice and as follows:

1. Weld pipe joints only when ambient temperature is above 0 deg F (-18 deg C) where possible.
2. Bevel pipe ends at a 37.5 deg angle where possible, smooth rough cuts, and clean to remove slag, metal particles and dirt.
3. Use pipe clamps or tack-weld joints with 1" long welds; 4 welds for pipe sizes to 10", 8 welds for pipe sizes 12" to 20".
4. Build up welds with stringer-bead pass, followed by hot pass, followed by cover or filler pass. Eliminate valleys at center and edges of each weld. Weld by procedures which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow-holes and non-metallic inclusions.
5. Do not weld-out piping system imperfections by tack- welding procedures; refabricate to comply with requirements.
6. At Installer's option, install forged branch-connection fittings wherever branch pipe is indicated; or install regular "T" fitting.
7. At Installer's option, install forged branch-connection fittings wherever branch pipe of size smaller than main pipe is indicated; or install regular "T" fitting.

I. Weld pipe joints of steel water pipe in accordance with AWWA C206.

J. Flanged Joints: Match flanges within piping system, and at connections with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets.

K. Grooved joints shall be installed in accordance with the manufacturer's latest published instructions. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Grooved coupling manufacturer's factory trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically visit the jobsite to ensure best practices in grooved product installation are being followed. Contractor shall remove and replace any improperly installed products.

L. Concrete Pipe Joints: Except as otherwise indicated, comply with applicable provisions of "Concrete Pipe Field Manual" by the American Concrete Pipe Assn.

M. Plastic Pipe/Tube Joints: Comply with manufacturer's instructions and recommendations, and with applicable industry standards:

1. Heat Joining of Thermoplastic Pipe: ASTM D 2657.
2. Making Solvent-Cemented Joints: ASTM D 2235, and ASTM F 402.

N. Open Drain-Tile Joints: Except as otherwise indicated, provide 1/4" open joint, with top 2/3 of annular space covered by joint accessory material.

O. Joint Lubricant: Lubricant shall be nontoxic, not support the growth of bacteria, have no deteriorating effects on the gasket, pipe, or fitting, and shall not impart a taste or odor to the liquid being carried in the pipe.

3.3 CLEANING, FLUSHING, INSPECTING

A. General:

1. Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings (if any). Flush out piping systems with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.
2. Inspect pressure piping in accordance with procedures of ASME B31.

B. Disinfect water mains and water service piping in accordance with AWWA C601.

3.4 PIPING TESTS

A. Test pressure piping in accordance with ASME B31.

B. General: Provide temporary equipment for testing, including pump and gages. Test piping system before insulation is installed wherever feasible, and remove control devices before testing. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for indicated pressure and time.

1. Required test periods is 2 hours.
2. Test long runs of Schedule 40 pipe at 150 psi, except where fittings are a lower Class or pressure rating.
3. Test each piping system at 150% of operating pressure indicated, but not less than 25 psi test pressure.
4. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.

C. Repair piping systems sections which fail required piping test, by disassembly and re-installation, using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.

D. Drain test water from piping systems after testing and repair work has been completed.

3.5 COATINGS AND LININGS

A. Paint: The outside of all interior ferrous pipe and fittings, except plastic coated pipe and fittings, shall be shop primed as specified under Section 09801, "Special Coatings".

B. Bituminous and Coat Tar: The inside of ferrous pipe and fittings shall be coated with an asphaltic material in accordance with ANSI/AWWA C104/A21.4 for ductile iron pipe and fittings, and with a coal tar in accordance with AWWA C203 for steel pipe and fittings. If this coating material is found to be damaged prior to the pipe trench being backfilled, the Contractor shall provide and apply additional material of that required to repair the damages. The Contractor shall have sufficient coating material available at the job site prior to laying the pipe.

C. Polyethylene Wrap: All underground, buried ductile iron pipe, fittings and appurtenances shall be encased with 8 mil polyethylene film conforming to ANSI/AWWA C105/A21.5, unless noted otherwise. Installation shall include wrapping overlapping terminations at pipe joints.

D. Glass: A glass lining, where called for, shall be a minimum of two (2) coats, fired separately, for a total thickness of not less than 0.008 inch, have a hardness of 5 to 6 on the MOHS scale with a density of 2.5 to 3.0 grams per cubic centimeter. Glass lining shall be capable of withstanding a thermal shock of 350 deg F., solutions with a pH range of 3 to 10 and no visible loss of surface gloss after immersion in an 8% sulfuric acid solution at 148 deg F. for 10 minutes. In addition, the lining, when tested according to ASTM C283, shall show a weight loss of not more than 3 milligrams per square inch. Lining shall be Ervite Type SG-14 by the Ervite Corporation, the Glass Lined Pipe Company, or equal.

E. Plastic: A plastic coating and/or lining, when called for, shall not be less than 60 mils thick, be corrosion and abrasion resistant, and be a vinyl polymer conforming to ASTM F491 or a polyethylene copolymer conforming to ASTM F546.

F. Cement: When called for, pipe and fittings shall be lined with cement mortar and seal coated in accordance with ANSI/AWWA C104/A21.4.

END OF SECTION 402336

SECTION 466113 - FILTER MEDIA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 SUMMARY

A. Furnish and place filter media according to the specifications and the most currently published AWWA B100 and AWWA B102 standards.

B. Replace tank internals, including filter airwash distributor, underdrain system, and gravel retaining screen.

C. Replace existing manways on all filters with 24” diameter manways.

1.3 QUALITY ASSURANCE

A. Obtain materials from sources regularly engaged in producing and furnishing the specified materials.

B. Filter media shall be produced for use in contact with potable water and comply with ANSI/NSF 61 - Drinking Water System Components - Health Effects.

1.4 SUBMITTALS

A. Provide an affidavit with typical media samples stating that the materials furnished comply with the applicable requirements of AWWA B100 and NSF 61.

B. Sieve analyses for sand and anthracite, as performed in accordance with AWWA B100.

C. Per specification 013323.

1.5 DELIVERY, STORAGE, AND HANDLING.

A. In accordance with the manufacturer's instructions and Section 016600.

B. Deliver all equipment in an undamaged condition and make shipment in bags or semibulk containers.
   1. Bags. Suitable heavy duty cloth, paper, or plastic bags containing not more than one cubic foot of material. Mark each bag so the contents are identified. Include gradation, date of filling, and lot or stockpile identification in the markings.

2. Semibulk Containers. Suitable heavy duty, woven semibulk containers, each containing one or more tons of material with attached straps or sleeves strong enough to support their entire weight when full to aid in handling. Mark so that its contents are identified, including gradation, date of filling, and lot or stockpile identification.

C. Storage
1. Make all arrangements and provisions necessary for the storage of the filter equipment in accordance with the manufacturer's instructions.
2. Keep filter materials clean.
3. Cover materials shipped in bags or semibulk containers with a durable opaque material to block sunlight and to provide protection from weather.
4. Store bags and semibulk containers on pallets or dunnage.
5. Store each size and type of filter material separately.
6. When materials are shipped in bags or semibulk containers, do not remove material from the bags or the semibulk containers prior to placement in the filter under any circumstances, except for sampling.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Filter media shall comply with the AWWA B100 and AWWA B102 standard.

B. Gravel support bed shall comply with AWWA B100.

C. In accordance with this specification, the filter media can be supplied by one of the following manufacturers:
1. Hungerford & Terry
2. Leopold – Xylem,
3. Unifilt Corporation,
4. CEI, Inc.,
5. Parry Co.,
6. Or Engineer approved equivalent.

D. Filter internal replacement parts shall be supplied by Hungerford & Terry or Engineer approved equivalent.

E. Installation of the filter media shall be under the direct supervision of an employee of the filter manufacturer experienced in this procedure.

F. Filter Sand
1. Provide filter sand to a total finished depth as shown below.

2. Filter sand shall consist of hard, durable grains of siliceous material less than 2.4 mm in greatest dimension, and shall be visually free from dirt, loam, clay, and micaceous and organic matter. The particle-size distribution shall be determined using standard sieves calibrated in accordance with ASTM Method Ell; grain size shall be defined in terms of the smallest sieve opening through which it passes; and percent sizes of sand shall be determined from a plot of the sieve data on probability paper, showing the percent of the material passing the sieve versus the sieve size opening.
3. After all filter sand is placed, and before any anthracite is placed, the filter shall be washed and scraped and placed at the finished elevation.

G. Filter Anthracite
1. Provide filter anthracite to a finished depth as shown below, with at least one additional inch to be provided and scraped off after washing.
2. Filter anthracite shall consist of hard, durable coal particles of various sizes, and shall be visually free of clay, shale, and extraneous dirt.
3. The hardness shall not be less than 2.7 on the Moh scale.
4. The specific gravity shall not be less than 1.4.
5. Particle (grain) size and percent sizes shall be determined as specified for filter sand.

After placement of the anthracite, wash the filter at a minimum rate of 15 gpm/sf at least three successive times, with the surface to be scraped after each washing. After washing, place the surface at the finished elevation, with additional material added if necessary to bring the surface to the finished elevation.

H. Anthracite and filter sand media shall have the following characteristics:

MEDIA	EFFECTIVE SIZE (mm)	UNIFORMITY COEFFICIENT	BED THICKNESS (in)
TORPEDO SAND	0.8 TO 2.0	<1.7	3”
MANGANESE GREENSAND	0.3 TO 0.35	<1.6	24”
ANTHRACITE	0.8 TO 1.2	<1.7	18” 15” (Filter 4)

I. Media shall be supported by a 13-inch graded gravel support bed.

J. Airwash Distributors
1. Filters 1-3: Schedule 80 PVC complete with 4-inch manifolds and ½ laterals with orifices.
2. Filter 4: Schedule 80 PVC complete with a 4-inch manifold and ¾-inch wrapped laterals, and one (1) row of holes drilled on 3-inch centers.

K. Underdrain Laterals
1. Filters 1-3: Schedule 80 PVC, 1-1/2 inch drilled under drain laterals.
2. Filter 4: Replace 3/8-inch stainless steel spreadflow nozzles.

L. Gravel Retaining Screen
   1. 304 stainless steel support angles and flats, 8-mesh 304 stainless steel screen, and stainless steel nelson studs as required to fasten the screen to the tank and supports.

M. Manway Replacement
   1. Replace existing manways (8) on Filters 1-4 with 24" inch diameter manway opening.
   2. Gasket:
      a. Replace manway gaskets with new 3/8-inch neoprene gasket material.
      b. Gaskets to meet ASTM D2000-86E, Type BC with a 70A durometer rating and black color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Completely remove and dispose of the existing filter media and gravel support layer. Upon completion of media removal, each filter shall be thoroughly cleansed of deleterious materials and foreign matter.

B. Special care shall be taken in transporting and placing the filter media to prevent contamination of any sort. Any filter media which may become dirty either before or after placing in the filters shall be either removed and washing or replaced by other clean filter media in a satisfactory manner. The filter shall be clean before placing of filter media.

C. Media shall be placed using manufacturer's loading recommendations.

D. The several layers of filter media shall be placed accurately to the required depths and each layer shall be struck off to a true level surface. The filter shall be backwashed after the filter media has been placed to ascertain the required filter media depth has been installed. After backwashing, the bed depth shall be adjusted as required and the procedure repeated as necessary to meet the specifications for bed depth.

END OF SECTION 466113