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***SECTION 5***  
***SPECIFICATIONS***

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## SECTION 011100 - SUMMARY OF WORK

### PART 1 - GENERAL

#### 1.1 LOCATION OF THE PROJECT

- A. The project is located in the Village of Hiram, Portage County, Ohio. The project sites are located as noted here.
  - 1. Hiram Water Treatment Plant; 7085 Wakefield Road (State Route 305), Hiram, Ohio 44234.
  - 2. Hiram Water Tower; across the street from 6447 Wakefield Road (State Route 82), Hiram, Ohio 44234.

#### 1.2 PROJECT DESCRIPTION

- A. The bid documents contain bid forms for one (1) contract.
- B. The project consists of the construction of a new Water Tower, demolition of the existing Water Tower, and the replacement of the Filter/Softener System Control Panel.
- C. The Hiram Water Treatment Plant shall remain in operation throughout the duration of the project. Temporary interruptions in flow and/or the temporary bypassing of any particular unit process shall be coordinated with the Village a minimum of two (2) weeks prior.

#### 1.3 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.

#### 1.4 DRAWING SCHEDULE

- A. The work to be done under this Contract is shown in the Project Drawings; refer to Sheet 2 of the Drawing Set for the Sheet Index.

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.
- B. Where no emergency exists, but the Contractor feels it advantageous to work at night, Sunday or legal holidays, the Contractor shall notify the Engineer and Owner at least two (2) days in advance, requesting written permission.
- C. 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 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.
- B. 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.
- C. 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.
- B. 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.
- C. 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 013236 – VIDEO MONITORING AND DOCUMENTATION

### PART 1 - GENERAL

#### 1.1 SCOPE

- A. Provide all labor, materials, equipment, and services, and perform all operations necessary to furnish to the Owner a complete color audio-video record of the surface features within the proposed construction zone of influence. This record shall include, but not be limited to, all audio-video files, video logs, and indexes. The purpose of this coverage shall be to accurately document the pre-construction condition of these surface features.

#### 1.2 PRODUCTS

- A. The color audio-video files delivered to the Owner shall be compatible with the Owner's software for viewing such files.

END OF SECTION 013236

## SECTION 013319 - FIELD TEST REPORTING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes, but is not limited to, services performed by *an independent* testing laboratory. Laboratory services covered under this section are for testing materials used for field constructed elements of the work. Performance testing of manufactured items and shop fabricated materials shall be covered under their respective specification section.
- B. All testing performed under this item shall be for the protection and benefit of the Owner and shall not be construed by the Contractor as a comprehensive quality control program intended to protect the Contractor, his subcontractors, or his suppliers. The testing frequency and types of testing shall be *as scheduled herein*.
- C. Inspections, tests, and related actions specified in this section and elsewhere in the contract documents are not intended to limit the Contractor's own quality control procedures and testing, which facilitate overall compliance with requirements of the contract documents. Requirements for the Contractor to provide quality control services as required by the Engineer, the Owner, governing authorities, or other authorized entities are not limited by the provisions of this Section.
- D. The Contractor is required to cooperate with the *independent* testing laboratories performing required inspections, test, and similar services and the Engineer or his representative.
- E. Materials and installed work may require testing or retesting at any time during progress of work. Retesting of rejected materials or installed work shall be done at Contractor's expense.

#### 1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Supplementary Conditions and Division 1 Specifications sections, apply to work of this section.
- B. The Contract Documents may include testing requirements furnished under other Sections. Work elements which may include other testing requirements are:
  - 1. Water distribution systems.
  - 2. Storm sewer systems.
  - 3. Water tightness of tanks.

4. Electrical systems tested and certified by the Electrical Contractor.

### 1.3 SELECTION AND PAYMENT

- A. The Contractor will employ an independent testing laboratory to perform specified testing. Payment shall be incidental to the related work bid item. The laboratory shall be mutually agreed upon by the Owner, Engineer, and Contractor.
- B. Employment of testing laboratory in no way relieves the Contractor of the obligation to perform work in accordance with requirements of the contract documents.
- C. The testing laboratory and their personnel shall be under the direction of the Engineer's on-site representative, regardless of who employs their services.

### 1.4 REFERENCES

- A. AASHTO T-19, Standard Method of Test for Unit Weight and Voids in Aggregate.
- B. AASHTO T-37, Standard Method of Test for Sieve Analysis of mineral Filler for Road and Paving Materials.
- C. AASHTO T-230, Standard Method of Test for Determining Degree of Pavement Compaction of Bituminous Aggregate Mixtures.
- D. ASTM C-29, Standard Method of Test for Unit Weight and Voids in Aggregate.
- E. ASTM C-31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- F. ASTM C-33, Standard Specification for Concrete Aggregates.

- G. ASTM C-39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- H. ASTM C-40, Test Method for Organic Impurities in Fine Aggregates for Concrete.
- I. ASTM C-42, Standard Test Methods for Obtaining and Testing Drilled Cored and Sawed Beams of Concrete.
- J. ASTM C-88, Standard Test Method for Soundness of Aggregate by use of Sodium Sulfate or Magnesium Sulfate.
- K. ASTM C-94, Standard Specification for Ready-Mixed Concrete.
- L. ASTM C-117, Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing.
- M. ASTM C-136, Standard Method for Sieve Analysis of Fine and Course Aggregate.
- N. ASTM C-142, Test Method for Clay Lumps and Friable Particles in Aggregate.
- O. ASTM C-143, Standard Test Method for Slump of Hydraulic Cement Concrete.
- P. ASTM C-172, Standard Practice for Sampling Freshly Mixed Concrete.
- Q. ASTM C-173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
- R. ASTM C-231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

- S. ASTM C-535, Standard Test Method for Resistance to Degradation of Large-Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine.
- T. ASTM C-1064, Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete.
- U. ASTM D-698, Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5-lb. (2.49-kg) Rammer and 12-inc. (305-mm) Drop.
- V. ASTM D-2487, Standard Test Method for Classification of Soils for engineer purposes.
- W. ASTM D-2940, Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports.
- X. ASTM D-4253, Standard Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
- Y. ASTM D-4254, Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
- Z. ASTM D-4832, Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.
- AA. ODOT Supplement 1021, Method of Test for Determination of the Percent of Fractured Pieces in Gravel.
- AB. ODOT Supplement 1029, Method of Test for Determining the Percentage of Deleterious Materials in Course Aggregate.
- AC. ODOT Supplement 1036, Method of Test for Determination of Percent Air Voids in Compacted Dense Bituminous Paving Mixtures.

- AD. ODOT Supplement 1044, Mix Design Method for Bituminous Aggregate Base.
- AE. Uni-Bell PVC Pipe Association UNI-B-6-98 for Low Pressure Air Testing of Installed Sewer Pipe.
- AF. ASTM – C969 – Standard practice for infiltration and exfiltration acceptance of installed concrete sewer pipe.

## 1.5 SUBMITTALS

- A. Prior to the start of work, submit testing laboratory name, address, and telephone number, and names of full-time *specialist* and responsible officer.
- B. Submit copy of the testing laboratory's evaluation report issued by one of the evaluation authorities identified in Article 1.6 of this Section with memorandum of remedies of any deficiencies reported by the inspection.
- C. Submit the chain of custody and other QA/QC procedures for each test to be utilized by the laboratory.
- D. Submit a sample test report for review by the Engineer to demonstrate conformance with Article 3.2 herein.

## 1.6 QUALITY ASSURANCE

- A. Except as otherwise indicated, the testing laboratory engaged shall be prequalified by the Ohio Department of Transportation for the types of services specified herein.
- B. The field personnel utilized to perform all field-testing and preparation shall be certified for those tests being performed.

## 1.7 RESPONSIBILITIES



A. Testing Laboratory Responsibilities:

1. Provide qualified personnel at the site. Cooperate with the Engineer and Contractor in performance of services.
2. Perform specified sampling and testing of products in accordance with the specified standards.
3. Ascertain compliance of materials and mixes with requirements of the contract documents.
4. Immediately notify the Engineer and Contractor of observed irregularities or nonconformance of work or products.
5. Perform additional tests required by the Engineer.
6. Testing personnel are to report to the Engineer or his representative upon arrival on site for instructions and requirements. Prior to leaving the site, furnish the Engineer or his representative all test results whether in a formal or informal format.
7. Attend preconstruction meetings and progress meetings.

B. Contractor Responsibilities:

1. Provide access to materials proposed to be used which require testing.
2. Cooperate with laboratory personnel and provide access to the work.
3. Provide incidental labor and facilities:
  - a. To provide access to work to be tested.
  - b. To obtain and handle samples at the site or at the source of products to be tested.
  - c. To facilitate tests.
  - d. To provide storage and curing of test samples as required by the testing laboratory.
4. Notify the Engineer *and laboratory* 24 hours prior to expected time for operations requiring testing services for scheduling purposes. Materials will not be permitted to be placed without the proper testing being performed in conformance with this Section.

1.8 LIMITS OF LABORATORY AUTHORITY

- A. The laboratory may not release, revoke, alter, or enlarge the requirements of the contract documents.
- B. The laboratory may not approve or accept any portion of the work.
- C. The laboratory may not assume any duties of the Contractor.
- D. The laboratory has no authority to stop the work.

## 1.9 SCHEDULE OF TESTS

Testing anticipated on this project shall include, but is not limited to:

- A. Earthwork
  - 1. Special backfill material sieve analysis per ASTM C-136, one test per source.
  - 2. On-site trench backfill analysis per ASTM D-2487, as directed by Engineer.
  - 3. Pipe bedding and cover sieve analysis per ASTM C-136, one test per source.
  - 4. Drainage fill sieve analysis per ASTM C-136, one test per source.
  - 5. Soil compaction per ASTM D-698.
    - a. Embankment testing shall be at least one (1) test/5,000 S.F. of each lift;
    - b. Trench backfill testing shall be at least one (1) test/50 L.F. of each lift;
    - c. Subgrade and/or subbase testing shall be at least one (1) test/200 L.F. of pavement or 5,000 S.F. of slabs subject to greater frequency due to soil conditions or Engineer's direction.
  - 6. Backfill compaction per ASTM D-4253 and D-4254, one test per 50 L.F. of each lift.
  - 7. Low Strength Mortar testing per ASTM D-4832.

B. Concrete

1. Concrete aggregate deleterious substances per ASTM C-40, ASTM C-117, and ASTM C-142, one test per source.
2. Concrete aggregate abrasion per ASTM C-535, one test per source.
3. Sodium sulfate soundness of coarse aggregate per ASTM C-88, one test per source.
4. Sampling Fresh Concrete: ASTM C-172, except modified for slump to comply with ASTM C 94.
  - a. When cylinders and/or beam samples are made, the slumps and air test shall be made using concrete from the same batch.
  - b. Slump: ASTM C-143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
  - c. Air Content: ASTM C-173, volumetric method of lightweight concrete; ASTM C-231 pressure method for normal weight concrete; at least one for each pour of each type of air-entrained concrete, and each time a set of compression test specimens is made.
  - d. Concrete Temperature: ASTM C-1064, test hourly when air temperature is 40° F. (4° C.) and below, and when 80° F. (27° C.) and above; and each time a set of compression test specimens is made.
  - e. Compression Test Specimen: ASTM C-31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
  - f. Compressive Strength Tests: ASTM C-39; one set for each day's pour exceeding 5 cubic yards plus additional sets for each 50 cubic yards over and above the first 25 cubic yards of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days.

- i. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
    - ii. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.
  - g. Two (2) tests beams shall be made for each 250 square yards of concrete pavement and/or slabs on grade placed.
    - i. For traffic to be allowed on pavement or slab, the modulus of rupture shall be a minimum of 600 psi for Class C concrete or 400 psi for ODOT Class MS or FS.
  - h. When cylinders and/or beam samples are made, the slumps and air test shall be made using concrete from the same batch.
- 5. Nondestructive Testing: Penetration resistance, sonoscope, or other nondestructive devices may be permitted but shall not be used as the sole basis for acceptance or rejection.
- 6. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Engineer. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.
  - a. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

C. Pavement

- 1. Aggregate base sieve analysis per ASTM D-2940, one test per source.
- 2. Sodium sulfate soundness of aggregate base per ASTM C-88, one test per source.

3. Percent of fractured pieces for aggregate base per ODOT Supplement 1021, one test per source.

D. Asphalt

1. Provide testing for mixture acceptance in accordance with Ohio Department of Transportation Procedures. The person performing the testing must have a current Level 1 Bituminous Concrete approval from ODOT.

E. Sewers

1. Deflection Testing

- a. All thermoplastic gravity sanitary sewer pipe shall be tested for allowable deflection.
- b. Deflection tests shall be performed before final acceptance and no sooner than thirty (30) days after installation of final backfill
- c. Maximum allowable pipe deflection shall be five (5) percent of the average inside diameter for the size and class of pipe specified.
- d. Acceptance testing shall be performed with a non-adjustable “go, no-go” mandrel with a minimum of eight (8) contact points. Adjustable mandrels for acceptance testing shall be used only with permission of the Engineer.
- e. The mandrel size shall be ninety-five (95) percent of the average inside diameter for the size and class of pipe specified.
- f. If the "go, no-go" mandrel will not pass through a section of pipe a deflectometer or adjustable mandrel may be used to determine the extent and/or severity of the non-acceptable area. A “go, no-go” mandrel shall be re-run through the pipe section for final acceptance testing at no additional cost to the Owner.
- g. The Contractor or subcontractor performing the test shall be experienced and qualified to perform deflection testing with the equipment and procedures utilized. The contractor shall provide all labor, materials, tools and equipment necessary to clean and test all sections of sewer pipe, locate deficient areas, repair, deficient areas, and retest all repaired areas.
- h. All sewer runs shall be cleaned prior to testing.

- i. The acceptance test shall be performed without mechanical pulling devices.
- j. All pipe failing the deflection test shall be exposed, repaired or replaced and retested at no additional cost to the Owner.

F. Water Main

1. Hydrostatic Testing – Pressure Pipe

- a. The pipe to be tested must be sufficiently backfilled to prevent movement while under test pressure.
- b. Joint restraint at fittings should be permanent and constructed to withstand test pressure. If concrete thrust blocks are used, sufficient time must be allowed before testing to permit the concrete to cure. A cure time of seven (7) days is recommended when Type I Portland Cement is used; three (3) days is recommended when Type III high-early Portland Cement is used.
- c. Test ends should be restrained to withstand the appreciable thrusts that are developed under test pressure.
- d. Air pressure testing of installed pressure pipe is expressly prohibited.
- e. Any testing performed without the knowledge of the Engineer shall not be considered a test for the purpose of this specification.
- f. The hydrostatic testing sheet marked “Exhibit D” following this section shall be filled out for each section of piping tested in this manner.
- g. After the pipe has been installed and partially backfilled (if applicable) subject all newly installed pipe, or any valved sections of it in such lengths of the force main as determined by the responsible agency, unless otherwise specified, to a hydrostatic pressure test equal to 1-1/2 times the line working pressure (50% over the working pressure) but not less than 1.25 times the working pressure at the highest point along the test section; but, in no case, shall such force mains be tested at less than 150 pounds per square inch. The duration of each test shall be at least 2 hours.
- h. Each section of pipeline shall be slowly filled with water and the specified test pressure, measured at the point of lowest elevation, shall be applied by means of a booster pump connected to the pipe

in a manner satisfactory to the Engineer. The duration of the test shall be for a minimum of sixty (60) minutes.

- i. No pipe installation will be accepted unless the leakage rate for the section of pipe being tested does not exceed a rate as shown on hydrostatic test chart, during a 24-hour test duration.
- j. The Contractor shall furnish suitable means for determining the quantity of water lost by leakage during the test.

## PART 2 – PRODUCTS (NOT APPLICABLE)

## PART 3 – EXECUTION

### 3.1 SEQUENCING AND SCHEDULING

- A. The Contractor shall coordinate the sequence of work activities so as to accommodate required testing and shall allow sufficient time for testing of materials by the laboratory so as to cause no delay in the work or the work of any other Contractor. In addition, the Contractor shall coordinate his work so as to avoid the necessity of removing and replacing work to accommodate inspections and tests.

### 3.2 LABORATORY TEST RESULTS

- A. The testing laboratory shall submit a certified written report of each inspection, test, or similar service concurrently to the Owner, Engineer, and Contractor.
- B. Written reports of each inspection, test, or similar service shall include, but not be limited to, the following:
  1. Name of testing laboratory.
  2. Project name and construction contract reference number.
  3. Dates and locations of samples and tests or inspections.
  4. Date of report.
  5. Names of individuals making the inspection or test.
  6. Designation of the work and test method.

7. Test results.
8. Notation of significant ambient conditions at the time of sample taking and testing.

END OF SECTION 013319





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ALLOWABLE LEAKAGE PER 1,000 FEET OF WATERMAIN:

PIPE SIZE <u>INCH DIAMETER</u>	ALLOWABLE LEAKAGE <u>GALS. / 1,000 FEET</u>
6	1
8	1.3
10	1.6
12	1.9
16	2.5
20	3.2
24	3.8
30	4.8
36	5.7

**NOTE: IN NO CASE SHALL THE TESTED SECTION EXCEED 2,000 FEET IN LENGTH.**

## 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. Payment will be deducted from the Contract amount at a rate of 2.8 times direct labor cost plus expenses.

## 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
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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: \_\_\_\_\_  
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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 014126 - GENERAL REGULATIONS AND PERMITS

### PART 1 - GENERAL

#### 1.1 REGISTRATION

- A. All Contractors and subcontractors shall be registered with the Building Department having jurisdiction. Contact the Building Department for additional registration information.

#### 1.2 PERMITS

- A. The Contractor shall apply for all permits from the Owner and/or other authorities having jurisdiction. The Owner will waive all permit and inspection fees for permits under their jurisdiction; however, the Contractor must pay all permit and inspection fees for permits issued by other authorities having jurisdiction.

#### 1.3 ARCHAEOLOGICAL DISCOVERIES

- A. Contractors and subcontractors are required under O.R.C. Section 149.53, to notify the Ohio Historical Society and the Ohio Historic Site Preservation Board of Archaeological Discoveries located in the project area, and to cooperate with those entities in archaeological and historic surveys and salvage efforts if such discoveries are uncovered within the project area.

Contact:       Department Head  
                  Resource Protection and Review  
                  Ohio Historic Preservation Office  
                  800 E. 17th Avenue  
                  Columbus, Ohio 43211-2497  
                  614-298-2000

- B. Should archaeological discoveries or other activities delay progress of the work, an adjustment in contract time will be made.

END OF SECTION 014126

## 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 Owner 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 Owner so orders, and shall not be re-employed unless express permission be given by the Owner. 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 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 015526 - TEMPORARY TRAFFIC CONTROL DEVICES

### PART 1 - GENERAL

#### 1.1 BARRICADES, SIGNS AND LIGHTS

- A. The Contractor shall employ watchmen on the work when and as necessary. The Contractor shall erect and maintain such strong and suitable barriers and such lights as will effectively prevent the occurrence of any accident to health, limb or property. Lights shall be maintained between the hours of one-half (1/2) hour after sunset and one-half (1/2) hour before sunrise.
- B. No manhole, trench, excavation will be left open awaiting connection or removal at a later date by the Contractor's forces or others but shall be temporarily backfilled and resurfaced if applicable with a temporary pavement passable to traffic at no additional cost to the Owner.
- C. In addition to other safety requirements, a minimum of four (4) foot high fence will be incorporated around any shaft or manhole or other excavation left open at the end of a day's work.

#### 1.2 MAINTENANCE OF TRAFFIC

- A. The Contractor is required to provide maintenance of traffic in conformance with the Ohio Manual of Uniform Traffic Control Devices and Item 614 of the current Construction and Material Specifications of the Ohio Department of Transportation.
- B. This work shall include providing suitable and satisfactorily trained and properly attired flagmen for use at any location where existing roadway is narrowed to a width of less than 2 full lanes (18 feet).
- C. The Contractor is also responsible for maintaining local access to all residences and businesses along the route of the construction and to provide whatever temporary materials are necessary to provide a safe, adequate drive surface.
- D. At all boring locations, Contractor shall provide suitable flashers, barricades, and traffic control devices as may be deemed necessary by the Engineer or the responsible authority in the case of the Department of Transportation, Turnpike Commission, or affected railroad. This may extend to maintain facilities on a 24-hour basis until such time as the areas are completely backfilled.

END OF SECTION 015526

## SECTION 015713 - TEMPORARY EROSION CONTROL

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Furnishing all labor, materials, tools, equipment and services for the temporary soil erosion and sediment control work as indicated.
- B. Reducing to the greatest extent practicable the area and duration of exposure of readily erodible soils.
- C. Protecting the soils by use of temporary vegetation or mulch or by accelerating the establishment of permanent vegetation.
- D. Mechanically retarding the rate of runoff from the construction site and control disposal of runoff.
- E. Trapping all sediment resulting from construction in temporary or permanent debris basins.
- F. Using temporary measures to keep erosion under control if construction is suspended for any appreciable length of time.
- G. Providing protection against chemical, fuel, or lubricant spills, and sewage pollutants.
- H. Protecting project and existing structures from surface water damage due to utility line excavations.
- I. Controlling soil erosion and sedimentation by use of silt fences, dikes, ditches, slope protection, sediment pits, basins, dams, slope drains, coarse aggregate, mulches, sod, grasses, filter fabrics, and other erosion control devices or methods.

### PART 2 - PRODUCTS

#### 2.1 SEED

- A. Provide fresh, clean, new crop seed complying with tolerance for purity and germination established by Official Seed Analysts of North America.
- B. All areas of temporary seeding shall be seeded with grass as shown in the following table:

March 1 - August 15	Square Feet	Per Acre
Oats	3 lbs.	4 bu.
Perennial Ryegrass	1 lb.	40 lbs.
Tall Fescue	1 lb.	40 lbs.
	Per 1000	
August 16 - November 1*	Square Feet	Per Acre
Rye	3 lbs.	2 bu.
Wheat	3 lbs.	2 bu.
Perennial Ryegrass	1 lb.	40 lbs.
Tall Fescue	1 lb.	40 lbs.

\* After November 1, use mulch only

## 2.2 ORGANIC MULCH

- A. Select mulch material based on site requirements, availability of materials and availability of labor and equipment. The following are the minimum rates:

Rates			
Mulch	Per Acre	Per 1000 ft <sup>2</sup>	Notes
Straw (temporary only)	2 tons	90 lbs.	Free from weeds and coarse matter. Must be anchored. Spread with mulch blower or by hand.
Wood Chips (permanent or temporary)	400 yds. <sup>3</sup>	9 - 10 yds. <sup>3</sup>	Apply approx. 3" deep. Treat with 12 lbs. of nitrogen per ton. Do not use on firm turf areas. Apply with mulch blower, chip handler, or by hand.
Bark Chips or Shredded Bark (temporary mulch only)	70 yds. <sup>3</sup>	1½ - 2 yds. <sup>3</sup>	Do not use in fine turf areas. Apply about ½" thick. Apply with a mulch blower or by hand.

## 2.3 FERTILIZER

- A. All fertilizer shall be manufactured from cured stock and organic sources. Chemical elements shall be accurately proportioned, uniformly mixed, and delivered to the site in factory-sealed containers fully labeled, bearing the name or trademark and warranty of the manufacturer. Commercial fertilizer for lawn sodding shall be dry or liquid compounds of 12-12- 12 analysis, meeting applicable requirements of State and Federal laws.

## 2.4 LIMESTONE

- A. All limestone shall be ground agricultural grade dolomitic limestone containing at least 10 percent magnesium oxide with a minimum total neutralizing power of 90, with at least 40 percent passing a No. 100 sieve and at least 95 percent passing a No. 8 sieve.

2.5 WATER

- A. All irrigation water shall be clean and free from injurious amounts of oil, acid, alkali, or other deleterious substances.

2.6 DITCH CHECKS

- A. Temporary ditch checks shall consist of coarse aggregate dikes.

2.7 INLET FILTERS

- A. Temporary inlet filters and silt fences shall be adequately supported as detailed on the drawings.

2.8 SLOPE DRAINS

- A. Temporary slope drains shall consist of pipe, coarse aggregate, riprap, rock channel protection, mats, plastic sheets or other materials approved by the Engineer. Sediment pits may be included as part of slope drain protection.

2.9 FILTER FABRIC

- A. Synthetic filter fabric shall be a pervious sheet of propylene, nylon, polyester or ethylene yarn and shall be certified by the manufacturer or supplier as conforming to the following requirements:

Physical Property	Requirements
Filtering Efficiency	75% (min.)
Tensile Strength at Extra Strength - 20% (max.) Elongation	50 lbs./lin. in. (min.)
*	
	Standard Strength - 30 lbs./lin. in. (min.)
Flow Rate	0.3 gal./sq.ft./min. (min.)

\*Requirements reduced by 50 percent after 6 months of installation.

- B. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0° F to 120° F.

## 2.10 BURLAP

- A. Burlap shall be 10 ounce per square yard fabric.

## 2.11 FILTER SUPPORTS AND REINFORCING

- A. Posts for silt fences shall be either 4" diameter wood or 1.33 pounds per linear foot steel with a minimum length of 5 feet. Steel posts shall have projections for fastening wire to them.
- B. Stakes for filter barriers shall be 1" x 2" wood (preferred) or equivalent metal with a minimum length of 3 feet.
- C. Wire fence reinforcement for silt fences using standard strength filter cloth shall be a minimum of 42 inches in height, a minimum of 14 gauge and shall have a maximum mesh spacing of 6 inches.

## PART 3 - EXECUTION

### 3.1 CONSTRUCTION REQUIREMENTS

- A. The Contractor shall limit the surface area of erodible earth material exposed by clearing and grubbing; the surface area of erodible earth material exposed by excavation; borrow; and fill operations; and provide immediate permanent or temporary control measures to prevent contamination of adjacent streams or other areas of water impoundment. Such work will involve the construction of temporary ditch checks, filters, benches, dikes, slope drains, and use of temporary mulches, mats, seeding or other control devices or methods necessary to control erosion and sedimentation.
- B. The Contractor shall incorporate all permanent erosion control features into the Work at the earliest practicable time. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. This will require the establishing of final grades as shown on the Drawings and application of agricultural limestone, commercial fertilizer, seeding and mulching or sodding . When directed by the

Engineer, temporary fertilizer, seeding and mulching materials shall be used. In general, the Contractor shall temporarily seed all disturbed areas within seven (7) days if they are to remain dormant for more than forty- five (45) days. Permanent soil stabilization shall be applied to disturbed areas within seven (7) days after final grade is reached on any portion of the site.. Temporary control measures will be used when and as directed by the Engineer to correct conditions that develop during



construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

- C. Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise temporary erosion control measures will be required between successive construction stages.
- D. The Engineer will limit the area of excavation, borrow and embankment operations in progress commensurate with the Contractor's capability and progress in keeping the finished grading, mulching, seeding, and other such permanent control measures current in accordance with the accepted schedule. Mulching, seeding, and other such permanent control measures shall be applied after completion of a vertical eight (8) feet of embankment or cut, unless otherwise directed by the Engineer. Should seasonal limitations or embankment make such coordination unrealistic, temporary erosion control measures shall be taken immediately.
- E. The Engineer may increase or decrease the allowable amount of surface area or erodible earth material to be exposed at one time by clearing and grubbing, excavation, borrow and fill operations as determined by his analysis of project conditions. Factors such as soil erodibility, slope, cut or fill height, exposed area contributing to a watercourse and weather will be considered in this determination.
- F. In the event of conflict between these requirements and pollution control laws, rules, or regulations or other Federal, State or local agencies, the more restrictive laws, rules or regulations shall apply.
- G. Temporary seeding areas shall be fertilized at a rate of 12-15 pounds per 1000 square feet of 10-10-10 or 12-12-12 analysis or equal.
- H. When directed by the Engineer, the seed bed shall be thoroughly watered to maintain adequate moisture in the upper four (4) inches of soil, necessary to promote proper root growth.
- I. When directed by the Engineer, temporary seeded areas shall be mowed when grass exceeds four (4) inches in height.
- J. Temporary erosion control features shall be acceptably maintained and shall subsequently be removed or replaced when directed by the Engineer.
- K. Removed materials shall become the property of the Contractor and shall be disposed of off the site at the Contractor's expense.

### 3.2 PERFORMANCE

- A. If, in the opinion of the Engineer and Owner, proper control of soil erosion and sedimentation is not being provided by the Contractor, the Owner may take all necessary steps to provide corrective measures and the cost of such services will be deducted from any money which may be due or become due the Contractor.
- B. Control work performed for protection of construction areas outside the construction site, such as borrow and waste areas, haul roads, equipment and material storage sites, and temporary plant sites shall be considered as a subsidiary obligation of the Contractor, with all necessary control costs included in the contract price.
- C. In the event that temporary erosion and sediment control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled, and are ordered by the Engineer, such temporary work shall be performed by the Contractor at his expense.

### 3.3 SILT FENCE

- A. The height of a silt fence shall not exceed 36 inches (higher fences may impound volumes of water sufficient to cause failure of the structure).
- B. The filter fabric shall be purchased in a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are necessary, filter cloth shall be spliced together only at a support post, with a minimum six (6) inches overlap and securely sealed.
- C. Posts shall be spaced a maximum of ten (10) feet apart at the barrier location and driven securely into the ground (minimum of 12 inches). When extra strength fabric is used without the wire support fence, post spacing shall not exceed six (6) feet.
- D. A trench shall be excavated approximately four (4) inches wide and four (4) inches deep along the line of posts and upslope from the barrier.
- E. When standard strength filter fabric is used, a wire mesh support fence shall be fastened securely to the upslope side of the posts using heavy duty wire staples at least one (1) inch long, tie wires or hog rings. The wire shall extend into the trench a minimum of two (2) inches and shall not extend more than 36 inches above the original ground surface.
- F. The standard strength filter fabric shall be stapled or wired to the fence, and eight (8) inches of the fabric shall be extended into the trench. The fabric shall not extend more than 36 inches above the original ground surface. Filter fabric shall not be stapled to existing trees.
- G. When extra strength filter fabric and closer post spacing are used, the wire mesh support fence may be eliminated. In such a case, the filter fabric is stapled or wired directly to the posts with all other provisions of Subparagraph F above applying.

- H. The trench shall be backfilled and soil compacted over the filter fabric.
- I. Silt fences shall be removed when they have served their purpose, but not before the upslope area has been permanently stabilized.
- J. Silt fences and filter barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.
- K. Should the fabric on a silt fence or filter barrier decompose or become ineffective prior to the end of the expected usable life and the barrier is still necessary, the fabric shall be replaced promptly.
- L. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.
- M. Any sediment deposits remaining in place after the silt fence or filter barrier is no longer required shall be dressed to conform with the existing grade, prepared and seeded.

#### 3.4 TEMPORARY MULCHING

- A. Application
  - 1. Mulch materials shall be spread uniformly, by hand or machine.
    - a. When spreading straw mulch by hand, divide the areas to be mulched into approx. 1000 sq. ft. sections and place approx. 90 lbs. of straw in each section to facilitate uniform distribution.
- B. Mulch Anchoring
  - 1. Straw mulch shall be anchored immediately after spreading to prevent windblow. One of the following methods of anchoring straw shall be used:
    - a. Mulch anchoring tool
      - 1. This is a tractor-drawn implement (mulch crimper, serrated straight disk or dull farm disk) designed to punch mulch approximately two(2) inches into the soil surface. This method provides maximum erosion control with straw. It is limited to use on slopes no steeper than 3:1, where equipment can operate safely. Machinery shall be operated on the contour.

- b. Liquid mulch binders
  - 1. Application of liquid mulch binders and tackifiers should be heaviest at edges of areas and at crests of ridges and banks, to prevent windblow. The remainder of the area should have binder applied uniformly. Binders may be applied after mulch is spread; however, it is recommended to be sprayed into the mulch as it is being blown onto the soil. Applying straw and binder together is the most effective method.
  - 2. The following type of binder may be used:
    - a.) Asphalt - any type of asphalt thin enough to be blown from spray equipment is satisfactory. Recommended for use are rapid curing (RC-80, RC-250, RC-800), medium curing (MC-250, MC-800) and emulsified asphalt (SS-1, MS-2, RS-1 and RS-2). Apply asphalt at 4 gal./1000 ft.<sup>2</sup>, 600 gal./acre. Do not use heavier applications as it may cause the straw to "perch" over rills.
    - b.) Wood Fiber - wood fiber hydroseeder slurries may be used to tack straw mulch.
- c. Mulch nettings
  - 1. Lightweight plastic, cotton or paper nets may be stapled over the mulch according to manufacturer's recommendations.

#### C. Chemical Mulches

- 1. Chemical mulches may be used alone only in the following situations:
  - a. Where no other mulching material is available.
  - b. In conjunction with temporary seeding during the times when mulch is not required for that practice.
- 2. Chemical mulches may be used to bind other mulches or with wood fiber in a hydroseeded slurry at any time. Manufacturer's recommendations for application of chemical mulches shall be followed.

#### D. Nets and Mats

- 1. Nets may be used alone on level areas, on slopes no steeper than 3:1, and in waterways.
- 2. When mulching is done in late fall or during June, July and August, or where soil is highly erodible, net should only be used in conjunction with an organic mulch such as straw.
- 3. When net and organic mulch are used together, the net should be installed over the mulch except when the mulch is wood fiber. Wood fiber may be sprayed on top of the installed net.
- 4. Excelsior blankets are considered protective mulches and may be used alone on erodible soils and during all times of the year.
- 5. Other products designed to control erosion shall conform to manufacturer's specification and should be applied in accordance with manufacturer's instructions provided those instruction are at least as stringent as this specification.

6. Staples will be made of plain iron wire, No. 8 gauge or heavier, and will be six (6) inches or more in length.
7. Prior to installation:
  - a. Shape and grade as required the waterway, channel, slope or other area to be protected.
  - b. Remove all rocks, clods or debris larger than two (2) inches in diameter that will prevent contact between the net and the soil surface.
  - c. When open-weave nets are used, lime, fertilizer and seed may be applied either before or after laying the net. When excelsior matting is used, they must be applied before the mat is laid.
8. Laying the Net:
  - a. Start laying the net from top of channel or top of slope and unroll down-grade.
  - b. Allow to lay loosely on soil - do not stretch.
  - c. To secure net: Upslope ends of net should be buried in a slot or trench no less than six (6) inches deep. Tamp earth firmly over net. Staple the net every twelve (12) inches across the top end.
  - d. Edges of net shall be stapled every three (3) feet. Where two strips of net are laid side by side, the adjacent edges shall be overlapped three (3) inches and stapled together.
  - e. Staples shall be placed down the center of net strips at 3-foot intervals. Do not stretch net when applying staples.
9. Joining strips
  - a. Insert new roll of net in trench, as with upslope ends of net. Overlap the end of the previous roll eighteen (18) inches, turn under six (6) inches and staple across end of roll just below anchor slot and at the end of the turned-under net every twelve (12) inches.
10. At bottom of slopes
  - a. Lead net out onto a level area before anchoring. Turn ends under six (6) inches and staple across end every twelve (12) inches.
11. Check slots
  - a. On highly erodible soils and on slopes steeper than 4:1, erosion check slots should be made every fifteen (15) feet. Insert a fold of net into a six (6) inch trench and tamp firmly. Staple at twelve (12) inch intervals across the downstream portion of the net.
12. Rolling
  - a. After installation, stapling and seeding, net should be rolled to ensure firm contact between net and soil.
13. All mulches should be inspected periodically, in particular after rainstorms, to check for rill erosion. Where erosion is observed, additional mulch should be applied. Net should be inspected after rainstorms for dislocation or failure. If washouts or breakage occur, re- install net as necessary after repairing damage to the slope. Inspections should take place up until grasses are firmly established. Where mulch is used in conjunction with ornamental plantings, inspect periodically throughout the year to determine if mulch is maintaining coverage of the soil surface; repair as needed.

### 3.5 TEMPORARY SEEDING

#### A. Site Preparation

1. Grade as needed and feasible to permit the use of conventional equipment for seedbed preparation, seeding, mulch application and anchoring.
2. Install the needed erosion control practices prior to seeding such as diversions, temporary waterways for diversion outlets and sediment basins.

#### B. Seedbed Preparation

1. Lime (in lieu of a soil test recommendation) shall be applied on acid soil (pH 5.5 or lower) and subsoil at a rate of 100 pounds per 1000 square feet or two tons per acre of agricultural ground limestone. For best results, make a soil test.
2. Fertilizer (in lieu of a soil test recommendation) shall be applied at a rate of 12-15 pounds per 1000 square feet or 500-600 pounds per acre of 10-10-10 or 12-12-12 analysis or equivalent.
3. Work the lime and fertilizer into the soil with a disk harrow, springtooth harrow or similar tools to as depth of two inches. On sloping areas, the final operation shall be on the contour.

#### C. Seeding

1. Apply the seed uniformly with a cyclone seeder, drill, cultipacker seeder or hydroseeder (slurry may include seed and fertilizer) preferably on a firm, moist seedbed. Seed wheat or rye no deeper than one (1) inch. Seed ryegrass no deeper than one-fourth ( $\frac{1}{4}$ ) inch.
2. When feasible, except where a cultipacker type seeder is used, the seedbed should be firmed following seeding operations with a cultipacker, roller or light drag. On sloping land, seeding operations should be on the contour wherever possible.

#### D. Mulching

1. Mulch shall be applied to protect the soil and provide a better environment for plant growth.
2. Mulch shall consist of small grain straw (preferably wheat or rye) and shall be applied at the rate of two tons per acre or 100 pounds (two to three bales) per 1000 square feet.
3. Spread the mulch uniformly by hand or mechanically so the soil surface is covered.
4. Mulch Anchoring Methods
  - a. Mechanical - use a disk, crimper or similar type tool set straight to punch or anchor the mulch material into the soil.
  - b. Asphalt Emulsion - apply at the rate of 160 gallons per acre into the mulch as it is being applied.
  - c. Mulch Nettings - use according to the manufacturer's recommendations. Use in areas of water concentration to hold mulch in place.

#### E. Irrigation

1. If soil moisture is deficient, supply new seedlings with adequate water for plant growth until they are firmly established. This is especially true when seedlings are made late in the planting season, in abnormally dry or hot seasons, or on adverse sites.

END OF SECTION 015713

## 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 016617 - MAINTENANCE

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. This Section provides general requirements for the maintenance of equipment in the field. Storage maintenance requirements are provided by Section 016600, Product Handling and Protection. Specific maintenance requirements are provided by manufacturers per individual Sections in the Project Manual.
- B. Maintenance is performed to ensure delivery to the Owner of equipment in an undeteriorated and fully serviceable condition.
- C. This Section also includes requirements for preventive and corrective maintenance during operation of the equipment prior to the commencement of the Warranty period.

#### 1.2 RELATED SECTIONS

- A. Section 016600, Product Handling and Protection.

#### 1.3 DEFINITIONS

- A. Storage maintenance consists of establishing and maintaining the environment required by the stored materials and performing periodic servicing.
- B. Preventive maintenance consists of activities performed on a periodic basis to maintain operating or operational items or equipment.
- C. Corrective maintenance consists of correcting faults or failures in an item or equipment. This may include adjustments or replacement of defective parts.

#### 1.4 SUBMITTALS

- A. The Maintenance Log shall be submitted to the Owner upon completion of the Operational Demonstration and before the start of the Warranty period.
- B. No submittals are required by this Section, except as noted above. Maintenance schedules and practices shall conform to approved submittals required by individual Sections in the Project Manual.

### PART 2 – PRODUCTS

#### 2.1 COMPONENTS, ACCESSORIES AND REPAIR PARTS

- A. All components, accessories and repair parts used in maintenance shall be supplied by or approved by the equipment manufacturer for use on the equipment.

## 2.2 SOURCE QUALITY CONTROL

- A. All parts and materials used in maintenance shall meet the quality control requirements provided for the item or equipment. These are specified in individual Sections of the Project Manual.

## PART 3 – EXECUTION

### 3.1 EXAMINATION AND VERIFICATION OF CONDITION

- A. The Contractor shall prepare a Maintenance Log for all equipment.
  - 1. This log shall include a list of required maintenance services and inspections, as provided by the manufacturer and submitted under individual Sections of the Project Manual.
  - 2. The Maintenance Log shall include checklists for the periodic services and inspections required.
  - 3. The Contractor shall initial and date the requisite log entries upon completion of the individual servicing or inspection.
  - 4. The Maintenance Log shall be located in the Contractor's Field Office and shall be available for review by the Owner until it is submitted for record purposes upon completion of the Operational Demonstration and the start of the Warranty period.

### 3.2 PREPARATION

- A. Before removing an item from storage per Section 016600, the Contractor shall review the installed location. Protection and services at the installed location must meet the equipment storage requirements.
- B. Before moving equipment to the installed location, the Contractor shall have available materials for temporary shelter or services required to establish the proper storage environment after the equipment is installed until it is placed in service in its final operating environment.

### 3.3 PERFORMANCE OF MAINTENANCE

- A. The Contractor shall perform all storage and preventive maintenance and inspections required by the manufacturer at the specified intervals.
- B. When notified by the Owner, the Contractor will perform corrective maintenance. This will be performed at no cost to the Owner. Corrective maintenance will be performed per manufacturer's written instructions or by direction of the approved representative of the manufacturer.

- C. The Contractor shall restore equipment to its operating condition before start-up.
- D. The Contractor shall re-establish storage maintenance in the event an item or equipment is removed from service.
- E. When the equipment warranty becomes effective, the Owner will assume responsibility for its maintenance.

END OF SECTION 016617

## 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 017823 – MAINTENANCE MANUALS

### PART 1 - GENERAL

#### 1.1 OPERATION AND MAINTENANCE MANUALS

- A. Operation and maintenance information shall be submitted for all manufactured items, i.e. equipment, hardware, pumps, valves, motors, etc.
- B. This manual will either contain or make reference to all information that has been issued during the construction and start-up periods, as well as information necessary for the proper operation and maintenance of equipment.
- C. It shall be the responsibility of the Contractor who supplies such equipment to obtain from his vendors the required information and submit to the Engineer. This information will be accepted only if properly identified and only after it has been revised, where necessary, to conform to previous transmittals of the same material that have been "approved as noted" by the Engineer. All submittals shall be on 8-1/2" X 11" size paper or folded to that size.
- D. In general and where applicable, the information shall consist of, but not be limited to, six (6) sets of the following:
  - 1. Descriptive literature, bulletins or other data covering equipment or system.
  - 2. Complete list of equipment and appurtenances included with system, complete with manufacturer and model number.
  - 3. Utility requirements.
  - 4. General arrangement drawing.
  - 5. Sectional assembly.
  - 6. Dimension print.
  - 7. Materials of construction.
  - 8. Certified performance curve.
  - 9. Performance guarantee.
  - 10. Parts list.
  - 11. Recommended spare parts list with part and catalog number.
  - 12. Lubrication recommendations and instructions.
  - 13. Schematic wiring diagrams.
  - 14. Schematic piping diagrams.
  - 15. Instrumentation data.
  - 16. Drive dimensions and data.
  - 17. Control data.
  - 18. Operating instructions.
  - 19. Maintenance instructions including troubleshooting guidelines and preventative maintenance instructions with task schedule.
  - 20. Required tools and equipment for operation and maintenance.
  - 21. Safety considerations for O & M procedures.

END OF SECTION 017823

## SECTION 017839 - PROJECT RECORDS, DRAWINGS

### PART 1 - GENERAL

#### 1.1 RECORD DRAWINGS

- A. The Contractor shall furnish an authentic set of marked-up drawings showing the installation insofar as the installation shall have differed from the Engineer's drawings. The drawings shall be delivered to the Engineer for making revisions to the original drawings immediately after final acceptance by the Owner.
- B. The Contractor shall furnish dimensioned drawings indicating locations of all underground mechanical and electrical facilities.

END OF SECTION 017839

## SECTION 018000 - SYSTEM PERFORMANCES

### PART 1 - GENERAL

#### 1.1 GENERAL

- A. It is the intent of this Contract that the final installation shall be complete in all respects.
- B. The Contractor shall be responsible for all minor details, whether or not shown on the Drawings or specifically included in these Specifications.

#### 1.2 BUILDINGS

- A. The building and components shall function properly and in accordance with the plans, specifications and industry standards.

#### 1.3 FACILITIES

- A. The facilities and equipment shall function properly and in accordance with plans, specifications and industry standards.

#### 1.4 CERTIFICATION

- A. The Contractor shall provide written certification from the manufacturers and/or installers that the various major components are in working order or have been installed in accordance with the manufacturer's instructions.

END OF SECTION 018000



## SECTION 323113 - CHAIN LINK FENCING AND GATES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This work consists of the supply and installation of galvanized chain link fencing as called out on the plans and details.

#### 1.2 SUBMITTALS

- A. Comply with all provisions of Section 013323, Shop Drawings and Submittals.
- B. Product Data: For the following:
  - 1. Submit manufacturer's technical data, and installation instructions for fencing, fabric, gates and accessories, for approval by the Owner's Representative.

#### 0.1 QUALITY ASSURANCE

- A. Any subcontracted fence work shall be performed by a qualified firm specializing in fence work.

### PART 2 - PRODUCTS

#### 2.1 GENERAL

- A. Dimensions indicated for pipe and roll-formed are outside dimensions, exclusive of coatings.
- B. Products: Subject to compliance with requirements, fence is to be provided from one of the following sources:
  - 1. Galvanized Steel Fencing and Fabric:
    - a. Allied Tube and Conduit Corp.
    - b. Master - Halco
    - c. Merchants Metals, Inc.
    - d. Richard's Fence of Akron

#### 2.2 STEEL FABRIC

- A. Fabric: Comply with Chain Link Manufacturer's Institute (CLFMI) Product Manual. Furnish one-piece fabric widths for fencing up to 16' high. Wire size includes zinc coating with 2.0 oz. per square foot of surface, galvanized after weaving, or .4 oz. aluminized coating.
- B. Selvage: Fabric shall be knuckled at both selvages.

## 2.3 FRAMING AND ACCESSORIES

- A. Steel Framework, General: Galvanized Steel, ASTM A 120 or A 123 with not less than 1.8 oz. zinc per square foot of surface. All framework shall match fabric.
  - 1. Fittings and Accessories: Galvanized Steel, ASTM A 153. All fittings and accessories shall match fabric.
- B. End, Corner, and Pull Posts:
  - 1. Up to 12' fabric height: 2.875" OD schedule 40 pipe weighing 5.79 pounds per linear foot, galvanized inside and out.
- C. Line Posts:
  - 1. 5' to 12' fabric height: 2.375" OD schedule 40 pipe weighing 3.65 pounds per linear foot, galvanized inside and out.
  - 2. Up to 4' fabric height: 1.9" OD schedule 40 pipe weighing 2.75 pounds per linear foot, galvanized inside and out.
- D. Top Mid-rail and Bottom Rail: In twenty-one or twenty-four foot lengths with expansion type couplings, approximately 6" long, for each joint. Provide means for attaching top and bottom rail securely to each gate corner, pull and end post.
  - 1. 1.66" OD pipe, 2.27 pounds per linear foot.
  - 2. Mid-Rail: Same as top and bottom rail and used when fence fabric is 10' and higher.
  - 3. Provide manufacturer's standard galvanized steel rail end cup for each end.
- E. Tension Wire: 7 gage, coated coil spring wire.
  - 1. Locate at bottom of fabric if bottom rail is not specified.
- F. Fabric Ties: 9-gage aluminum wire.
- G. Hog Rings: 11 gage galvanized steel.
- H. Post Brace Assembly: Manufacturer's standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use same material as top rail for brace, and truss to line posts with 0.375" diameter rod and adjustable tightener.
- I. Post and line Caps: Provide weather tight closure cap for each post. Provide line caps with loop to receive tension wire or top rail.
- J. Tension or Stretcher Bar: One-piece lengths equal to full height of fabric, with minimum cross-section 3/16" x 3/4". Provide one for each gate and end post, and two for each corner and pull post.
- K. Tension or Stretcher Bar Bands: Space not over 15" o.c., to secure bars to end, corner, pull, and gate posts.
- L. Concrete for footers: ODOT items 499 and 511 (Class C, F, or S).

## 2.4 SWING GATES

- A. Fabrication: Fabricate perimeter frames of gates from metal and finish to match fence framework. Assemble gate frames by welding for rigid connections, providing security against removal or breakage connections. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware and accessories. Space frame members maximum of 8” apart unless otherwise indicated.
1. Provide same fabric as for fence, unless otherwise indicated. Install fabric with stretcher bars at vertical edges and at top and bottom edges. Attach stretcher bars to gate frame at not more than 15” on center.
  2. Install diagonal cross bracing consisting of 3/8” diameter adjustable length truss rods on gates to ensure frame rigidity without sag or twist.
  3. Fabricate perimeter frames of minimum 1.90” OD pipe.
  4. All gates with a 6’ opening or larger shall be double swing.
- B. Gate Posts: Furnish posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:

<u>Leaf Width</u>	<u>Gate Post</u>	<u>lbs./lin. ft.</u>
Up to 6’	2.875” OD Pipe	5.79
Over 6’ to 13’	4.000” OD Pipe	9.11
Over 13’ to 18’	6.625” OD Pipe	18.97
Over 18’	8.625” OD Pipe	28.55

- C. Gate Hardware: Provide hardware and accessories for each gate, galvanized per ASTM A 153, and in accordance with the following:
1. Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180-degree gate opening.
  2. Latch: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch.
  3. Keeper: Provide keeper for vehicle gates, which automatically engages gate leaf and holds it in open position until manually released.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Do not begin installation and erection before final grading is completed, unless otherwise permitted.
1. Fabric shall be applied to the ‘security’ side of framework. For sports facilities the ‘security’ side is the playing side of the framework. For other applications, the ‘security’ side is the outside of the framework.

- B. Excavation: Drill or hand excavate (using posthole digger) holes for posts to diameters and spacings shown.
  - 1. Posts shall be spaced a maximum of 10' on center.
  - 2. If not indicated on drawings, excavate holes for each post to minimum diameters as recommended by fence manufacturer, but not less than 4 times largest cross-section of post.
  - 3. Unless otherwise indicated, excavate hole depths approximately 3" lower than post bottom, with bottom of posts set not less than 36" below finish grade surface.
- C. Setting Posts: Center and align posts in holes 3" above bottom of excavation.
  - 1. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hole in position during placement and finishing operations.
    - a. Unless otherwise indicated, extend concrete footings 2" above grade and trowel to a crown to shed water.
- D. Top Rails: Run rail continuously through post caps, bending to radius for curved runs. Provide one expansion coupling for every five couplings.
- E. Mid-Rails: Provide mid-rails as indicated. Install in one piece between posts, using line rail clamps necessary.
- F. Bottom Rail: Provide as indicated. Install in one piece between posts using line rail clamps where necessary.
- G. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.
- H. Tension Wire: Install tension wire at bottom of fabric. Fasten fabric to tension wire using hog rings 24" on center.
- I. Fabric: Leave approximately 1" between finish grade and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.
- J. Tension or Stretcher Bars: Thread through and clamp to fabric and secure to posts with metal bands spaced 15" on center.
- K. Swing Gates: Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.
- L. Tie Wires: Tie fabric to line posts, with wire ties spaced 12" on center. Tie fabric to rails and braces, with wire ties spaced 24" on center. Tie fabric to tension wires, with hog rings space 24" on center.

M. Fasteners: Use 5/16" x 1-1/4" galvanized carriage bolts with hex nut. Install so head of carriage bolt is on the 'secure' side of the fence.

END OF SECTION 323113

## SECTION 331618 – GLASS FUSED TO STEEL BOLTED STORAGE TANK

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 DESCRIPTION OF WORK

- A. Contractor shall furnish and erect a glass-coated, bolted-steel water storage tank, including foundation, tank structure and tank appurtenances as shown on the contract drawings and described herein. All required labor, materials and equipment shall be included.
- B. All required tank materials and principal appurtenances shall be supplied by the tank manufacturer.
- C. Installation shall be executed by a qualified and experienced erection crew, trained and certified by the tank manufacturer.
- D. Tank structures and appurtenances shall be new and not previously used.

#### 1.3 SUBMITTALS

- A. Detail Drawings:
  - 1. Drawings shall include all dimensions, sizes, plate thicknesses, anchorage details, roof, manways, hatches, ladders, and details of all required accessories.
  - 2. Fabrication shall not start until submitted drawings are approved.
- B. Design Calculations:
  - 1. Structural calculations shall be submitted for tank structures. The calculations shall be reviewed and the submittals sealed by a Professional Engineer licensed and registered in the State of Ohio.
- C. Tank manufacturer's and installing contractor's standard published warranty.
- D. A standard Maintenance Manual shall be provided upon approval of the drawings.

#### 1.4 QUALITY ASSURANCE

- A. The Manufacturer shall offer a factory applied glass coated bolt together shop pre-fabricated sectional steel tank.

- B. The Manufacturer will offer a new tank structure as a manufacturer specializing in the design, fabrication and erection of factory applied galls coated, bolted tank systems. Structural design shall meet or exceed the latest AWWA Standards for Bolted Steel Tanks (AWWA D103) unless otherwise specified herein.
- C. The tank manufacturer shall be ISO-9001 certified to assure product quality.
- D. The tank manufacturer shall undergo an annual FM (Factory Mutual) inspection of their glass-coated, bolted-steel tank factory & provide written proof thereof to assure quality.
- E. Design and Fabrication Criteria:
  - 1. Except as otherwise shown or specified, all materials, joints, workmanship and all other aspects of the tank and fabrication shall meet or exceed ANSI/AWWA D103, hereinafter AWWA D103. The tank structural design shall conform to AWWA specifications.
  - 2. The vitreous coating on the tank, bolt head encapsulation material, and joint sealant shall have been approved for listing under ANSI/NSF Standard 61 for Indirect Additives.
  - 3. The tank manufacturer shall be ISO-9001 certified to assure product quality.
  - 4. Tank roof shall be designed for roof live loads and roof dead loads.
  - 5. Snow Load: 30 psf.
  - 6. Seismic: IBC 2009.
  - 7. Wind Conditions: 100 mph @ Shape Factor of 0.6.
  - 8. Specific Gravity: 1.00.
  - 9. Allowable Soil Bearing: 3,000 psf. (refer to Geotechnical Report)

## 1.5 APPROVED MANUFACTURERS

- A. Aquastore; Model 3161 MSWT.
- B. Approved Equal.

## PART 2 - PRODUCTS

### 2.1 TANK

- A. General Information:
  - 1. Nominal Diameter: 31 feet.
  - 2. Maximum Nominal Tank Sidewall Height: 64 feet.
  - 3. Design Freeboard: 36 inches.
  - 4. Nominal Tank Capacity: 340,000 Gallons (includes concrete portion of tank).
- B. Plates and Sheets:
  - 1. Plates and sheets used in construction of the tank shell shall meet or exceed structural requirements of the standards of AWWA D103, latest edition.

2. Design requirements for mild strength steel shall be ASTM A1011 Grade 30 with a maximum allowable tensile stress of 14,566 psi per AWWA D103.
3. Design requirements for high strength steel shall be ASTM A1011 Grade 50 with a maximum allowable tensile stress of 26,000 psi per AWWA D103.
4. The annealing effect created from the glass coated firing process shall be considered in determining ultimate steel strength. In no event shall a yield strength greater than 50,000 psi be utilized for calculations detailed in AWWA D103, Sections 5.4 and 5.5.
5. Multiple vertical bolt line sheets and plates of ASTM A1011 Grade 50 only shall be manufactured such that holes are staggered in the vertical bolt lines and that no two adjoining holes are in-line horizontally, except at the center of the sheet or plate.
  - a. Bolt seam design shall generally be in accordance with the requirements of AWWA D103 section 5.5.2; bolt spacing may be adjusted in the vertical bolt lines to increase the net section and improve joint efficiency to a maximum of 85%.
  - b. Double sheeting of tank panels shall not be permitted to achieve structural sidewall thickness requirements.

C. Rolled Structural Shapes:

1. Material shall conform to minimum standards of ASTM A36 or ASTM A992.

D. Horizontal Wind Stiffeners:

1. Bolts used in tank lap joints shall be 1/2" - 13 UNC- 2A rolled thread, and shall meet the minimum requirements of AWWA D103, Section 4.2.
2. Web truss stiffeners shall be of steel with hot dipped galvanized coating.
3. Rolled steel angle stiffeners are not permitted for intermediate stiffeners.

E. Bolt Fasteners:

1. The lap joint sealant shall be a one component, moisture cured, polyurethane based elastic sealant.
2. Bolt Material:
  - a. SAE J429 (1" and 1-1/4" bolt length) heat treated to:
    - 1) Tensile Strength - 120,000 psi Min.
    - 2) Proof Load - 85,000 psi Min.
    - 3) Allowable shear stress – 29,454 psi.
  - b. SAE J429 (>1-1/4" bolt length) heat treated to:
    - 1) Tensile Strength - 150,000 psi Min.
    - 2) Proof Load - 120,000 psi Min.
    - 3) Allowable shear stress - 36,818 psi.
3. Bolt Finish - Zinc, mechanically deposited.
  - a. 2.0 mils minimum - under bolt head, on shank and threads.
4. Bolt Head Encapsulation
  - a. High impact polypropylene co-polymer encapsulation of entire bolt head up to the splines on the shank.
  - b. Natural resin with UV (ultraviolet) light inhibitor. Color to be black.
5. All tank shell bolts shall be installed such that the head portion is located inside the tank, and the washer and nut are on the exterior.
6. All lap joint bolts shall be properly selected such that threaded portions will not be exposed in the "shear plane" between tank sheets. Also, bolt lengths shall be sized as



to achieve a neat and uniform appearance. Excessive threads extending beyond the nut after torquing will not be permitted.

7. All lap joint bolts shall include a minimum of four (4) splines on the underside of the bolt head at the shank in order to resist rotation during torquing.
8. All exterior nuts, washers, and bolt threads will be covered with a sealer-filled protective plastic cover. Color to match tank shell.

F. Sealants:

1. The lap joint sealant shall be a one component, moisture cured, polyurethane compound. The sealant shall be suitable for contact with potable water and meet applicable FDA Title 21 regulations, as well as, ANSI/NSF Additives Standard 61.
2. The sealant shall be used to seal lap joints, bolt connections and sheet edges. The sealant shall cure to a rubber like consistency, have excellent adhesion to the glass coating, have low shrinkage, and be suitable for interior and exterior exposure.
3. Sealant curing rate at 73° F and 50% RH:
  - a. Tack-free time: 6 to 8 hours.
  - b. Final cure time: 10 to 12 days.
4. The sealant shall be ESPC System Sealer No. 98.
5. Neoprene gaskets and tape type sealer shall not be used.

G. Glass Coatings:

1. The tank coating system shall conform solely to Section 12.4 of the latest ANSI/AWWA D103-09.
2. Surface Preparation and Cleaning:
  - a. After plate fabrication and prior to application of the glass coating system, all sheets/plates shall be grit-blasted to SSPC SP-10/NACE2 (near white metal) on all sides.
  - b. The surface anchor pattern shall be not less than 1.0 mil.
  - c. These sheets shall be evenly oiled on both sides to protect them from corrosion during fabrication.
  - d. Sheet edges of sidewall and floor plates shall be mechanically rounded and flame coated with 316 stainless steel prior to glass coating. Glass coating of the sheet edges shall be similar to the flat panel surfaces. The process shall be applied to all four sheet edges, and shall be equal to EDGECOAT\* by CST Storage.
  - e. After edgecoating and prior to application of the coating system, all sheets shall be thoroughly cleaned by a caustic wash and hot rinse process followed immediately by hot air drying.
  - f. Inspection of the sheets shall be made for traces of foreign matter or rust. Any such sheets shall be re-cleaned or grit-blasted to an acceptable level of quality.
3. Coating:
  - a. All sheets shall receive one coat of a catalytic nickel-oxide glass pre-coat to both sides and then air dried.
  - b. Another coat of milled cobalt blue glass shall be applied to both sides of the sheets and then dried.
  - c. A third coat of milled titanium dioxide white glass shall be applied to all wetted surfaces which must be an 18 to 22 percent titanium dioxide reinforced mixture. The specified coating shall be Aquastore Vitrium. An acceptable

alternate three coat two fire system must be submitted for approval prior to the bid.

- d. The sheets shall then be fired at a minimum temperature of 1500° F in strict accordance with the manufacturer's ISO 9001 quality process control procedures, including firing time, furnace humidity, temperature control, etc.
  - e. The dry film interior coating thickness shall be 10.0 to 18.0 mils minimum. The finished inside color shall be white.
  - f. The dry film exterior coating thickness shall be 7.0 to 15.0 mils minimum. The finished exterior color shall be cobalt blue.
  - g. The same glass coating as applied to the sheet surfaces shall be applied to the exposed edges.
4. Factory Inspection:
- a. The manufacturer's quality system shall be ISO 9001 certified.
  - b. Chemical Resistance of Glass Coating:
    - 1) Every batch of component frits shall be individually tested in accordance with PEI Test T-21 (Citric Acid at Room Temperature).
  - c. Factory Holiday Test:
    - 1) A dry volt test using a minimum of 1100 volts is required.
    - 2) Frequency of the test shall be every sheet. Any sheet registering a discontinuity shall be rejected.
    - 3) All inside sheet surfaces shall be holiday free.
  - d. Measurement of Glass Thickness:
    - 1) Glass thickness shall be measured using an electronic dry film thickness gage (magnetic induction type) approved by CST Storage. The thickness gage shall have a valid calibration record.
    - 2) Frequency of the test shall be every tenth sheet. The thickness of the glass shall be between 10.0 and 18.0 mils.
  - e. Measurement of Color:
    - 1) The exterior color of the sheets shall be measured using a colorimeter approved by CST Storage. The colorimeter shall have a valid calibration record.
    - 2) Frequency of the test shall be every tenth sheet. The color must fall within the tolerance specified by CST Storage, else the panel shall be rejected.
  - f. Impact Adherence Test:
    - 1) The adherence of the glass coating to the steel shall be tested in accordance with ASTM B916-01. Any sheet that has poor adherence shall be rejected.
    - 2) Frequency of this test shall be one sheet per gage lot run minimum.
  - g. Fishscale Test:
    - 1) The glass coating shall be tested for fishscale by placing the full size production sheets in an oven at 400° F for one hour. The sheets will then be examined for signs of fishscale. Any sheet exhibiting fishscale shall be rejected and all sheets from that gage lot will be similarly tested.
    - 2) Frequency of this test shall be one sheet per gage lot run minimum.

H. Aluminum Dome Roof:

- 1. Roof shall be furnished by the Tank manufacturer.
- 2. Roofs shall be clear span and self-supporting. Center post supports are not permitted.

3. Roof live loads and dead loads shall be carried by the tank sidewalls, without additional support.
4. Roof shall be constructed of non-corrugated, triangular aluminum panels, which are sealed and firmly clamped in an interlocking manner within a fully triangulated aluminum space truss system.
5. The dome shall be clear span and designed to be self-supporting from the periphery structure with primary horizontal thrust contained by an integral tension ring. The dome dead weight shall not exceed 3 pounds per square foot or surface area.
6. The dome and tank will be designed to act as an integral unit. The tank will be designed to support an aluminum dome roof including all specified live loads.
7. Roof Vent:
  - a. A properly sized atmospheric vent assembly in accordance with AWWA D103-09 shall be furnished and installed on the roof.
  - b. The vent will be so deigned in construction as to prevent the entrance of birds and/or animals by including an expanded aluminum screen.

## 2.2 TANK ACCESSORIES

### A. Pipe Connections:

1. Where pipe connections are shown to pass through tank panels, per the Drawings, they shall be factory located and cut at the factory prior to the application of the glass coating system.
2. The manufacturer shall utilize an interior and/or exterior flange assembly and the tank shell reinforcing as required by the project requirements.
3. A single component urethane sealer shall be applied on any cut panel penetrations or bolt connections.

### B. Access Manway:

1. Tank shall be provided with a minimum of one (1) 24-inch diameter manway located in the first (bottom) ring, per AWWA D103.

### C. Cathodic Protection System:

1. A passive cathodic protection system shall be designed and supplied by the tank manufacturer.
2. The system shall be a bolt-on anode style, and designed for a 10-year life span.
3. Attachment of the anodes and wiring to tank structure shall be approved by tank manufacturer.
4. Electrical continuity between sidewall panels shall be the responsibility of the tank manufacturer.
5. If required, Contractor shall test the conductivity of the sludge, for proper design of the cathodic protection system.

### D. Identification Plate:

1. A manufacturer's nameplate shall list the tank serial number, tank diameter and height, maximum design capacity, intended storage use, and date of installation. The

nameplate shall be affixed to the tank exterior sidewall at a location approximately 5 feet from grade elevation in a position of unobstructed view.

- E. Roof Access Hatch: Provide a minimum of one (1) 24-inch x 24-inch square access hatch.
- F. Ladders:
  - 1. An exterior vertical caged tank ladder shall be furnished and installed.
  - 2. Ladders shall be fabricated of carbon steel. Finish shall be hot dipped galvanized or epoxy coating. EPDM protective pads should be used to protect the tank from damage.
  - 3. Safety cage and step-off platform shall be constructed of galvanized steel.
  - 4. A locking cage gate shall be attached to the bottom of the safety cage.
- G. Pipe Stand-Offs, Roof Nozzles and Roof Pass-Thru Boots:
  - 1. By Tank Manufacturer, as needed for modifications to the existing tank.

## 2.3 TANK PACKAGING

- A. All sheets that pass Factory Inspection and Quality Control checks shall be protected from damage prior to packing for shipment.
- B. Suitable non-abrasive packaging sheets shall be placed between each panel to eliminate sheet-to-sheet abrasion during shipment.
- C. Individual stacks of panels will be wrapped in heavy mil black plastic and steel banded to special wood pallets built to the roll-radius of the tank panels.
- D. Shipment from the factory to the job site will be by truck, hauling the tank components exclusively. No common carrier, drop, or transfer shipments.

## PART 3 - EXECUTION

### 3.1 ERECTION

- A. Foundation:
  - 1. The tank foundation is a part of this contract.
  - 2. The tank foundation shall be designed by the manufacturer to safely sustain the structure and its live loads.
  - 3. Tank footing design shall be based on 3,000 psf soil bearing capacity or greater as determined by geotechnical analysis performed by a licensed soils engineer.
  - 4. Footing designs for soil bearing strengths less than that specified, and those designs deviating from tank manufacturers standard shall be the responsibility of the Owner and his Engineer based on tank live and dead loading data provided by the tank manufacturer.
- B. Concrete Tank Floor:
  - 1. The floor design is of reinforced concrete with an embedded glass coated steel starter sheet per AWWA D103-09 section 13.4.6 and the manufacturer's design, and is an

integral element of the tank assembly; therefore the tank foundation and floor slab (performed in two separate pours) with embedded starter sheet shall be constructed by the tank supplier using manufacturer trained personnel regularly engaged in this type of tank construction.

2. Leveling of the starter ring shall be required and the maximum differential elevation within the ring shall not exceed one-eighth (1/8) inch, nor exceed one-sixteenth (1/16) inch within any ten (10) feet of length.
  3. A leveling plate assembly (per Harvestore Products, Inc. - U.S. Patent No. 4,483,607), consisting of two 18" anchor rods (3/4" dia.) and a slotted plate (3 1/2" X 11" X 3/8" thk) shall be used to secure the starter ring, prior to encasement in concrete. Installation of the starter ring on concrete blocks or bricks, using shims for adjustment, is not permitted. The foundation with anchor bolts/leveling plates shall be a separate pour from the concrete floor.
  4. Two water stop seals made of a butyl rubber elastomer special for this application shall be placed on the inside surface of the starter ring below the concrete floor line. These materials shall be installed as specified by the tank manufacturer.
- C. Tank erection shall occur after installation of the concrete portion has been completed and passed all inspection and testing requirements.
- D. Except as otherwise shown or specified, Tank shall be erected in accordance with the requirements of AWWA Standard D103, latest edition, and the manufacturer's recommendations and instructions.
- E. Sidewall Structure:
1. Field erection of the glass-coated, bolted-steel tank shall be in strict accordance with the procedures outlined in the manufacturer's erection manual, and performed by an authorized dealer of the tank manufacturer, regularly engaged in erection of these tanks.
  2. Specialized erection jacks and building equipment developed and manufactured by the tank manufacturer shall be used to erect the tanks.
  3. Particular care shall be taken in handling and bolting of the tank panels and members to avoid abrasion of the coating system. Prior to liquid test, all surface areas shall be visually inspected by the Engineer.
  4. An electrical holiday test shall be performed during erection using a nine (9) volt leak detection device. All electrical leak points found on the inside surface shall be repaired in accordance with manufacturer's published touch up procedure using urethane sealer.
  5. The placement of sealant on each panel may be inspected prior to placement of adjacent panels. However, the Engineer's inspection shall not relieve the bidder from his responsibility for liquid tightness.
  6. No backfill shall be placed against the tank sidewall without prior written approval and design review of the tank manufacturer. Any backfill shall be placed according to the strict instructions of the tank manufacturer.

### 3.2 FIELD TESTING

- A. Following completion of erection and cleaning, the structure shall be tested for liquid tightness by filling to its overflow elevation.
- B. The erector, in accordance with manufacturer's recommendations, shall correct any leaks identified by this test.
- C. The Owner shall furnish the water required for testing at the time of tank erection completion. Disposal of test water shall be the responsibility of the Owner.

### 3.3 DISINFECTION

- A. The tank structure shall be disinfected at the time of testing by chlorination in accordance with AWWA Specification C652 "Disinfection of Water Storage Facilities" as modified by the tank manufacturer.
- B. Disinfection shall not take place until tank sealant is fully cured (10 to 12 days at 73° F/50% relative humidity).
- C. Acceptable forms of chlorine for disinfection shall be:
  - 1. Liquid chlorine as specified in AWWA C652.
  - 2. Sodium hypochlorite as specified in AWWA C652.
  - 3. Calcium hypochlorite (HTH) is not acceptable.
- D. Acceptable methods of chlorination per AWWA C652:
  - 1. Section 4.1.1.
  - 2. Section 4.1.2 - chemical feed pump only (4.1.2.1).
  - 3. Section 4.3.
  - 4. Section 4.2 is not acceptable.

### 3.4 WARRANTY

- A. If within a period of one (1) year from the date of completion, or 14 months after delivery, the tank structure or any part thereof shall prove to be defective in material or workmanship upon examination by the manufacturer, the manufacturer will supply a replacement part, will repair, or allow a credit for same.

END OF SECTION 331618

## SECTION 333100.06 - STORM SEWER CONSTRUCTION

### 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. This work shall consist of the construction of a storm sewer in accordance with these specifications and in reasonably close conformity to the lines and grades indicated on the plans or as established by the Engineer. This work shall include excavating for pipe, fittings, and other appurtenances, clearing and grubbing and the removal of all materials necessary for placing the pipe, except removals listed separately; furnishing and placing granular or concrete bedding and granular backfill as required, constructing and subsequently removing all necessary cofferdams, cribs, and sheeting, pumping and dewatering, making all pipe joints as required, installing all necessary pipe, joining existing and proposed appurtenances as required, performing leakage tests as specified and restoration of disturbed facilities and surfaces. Arrangements for and the performance of all tests shall be the Contractor's responsibility.

#### 1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of storm system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.
- B. Installer's Qualifications: Firm with at least three (3) years of successful installation experience on projects with storm work similar to that required for project.
- C. Codes and Standards:
  - 1. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of storm system's materials and products.
  - 2. Environmental Compliance: Comply with applicable portions of local Environmental Agency regulations pertaining to storm systems.

#### 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for storm system materials and products.

- B. Shop Drawings: Submit shop drawings for storm systems, showing piping materials, size, locations, and inverts. Include details of underground structures, connections, and manholes. Show interface and spatial relationship between piping and proximate structures.
- C. Record Drawings: At project closeout, submit record drawings of installed storm sewage piping and products, in accordance with requirements of Division 1.
- D. Maintenance Data: Submit maintenance data and parts lists for storm system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 1.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Pipe, fittings, specials, manholes, joint materials, thrust blocks, and other appurtenances shall be the size and kind specified in the proposal and shown on the plans.

## PART 3 - EXECUTION

### 3.1 EXCAVATION

- A. Sewer trenches must be excavated with vertical sides from the bottom of the trench to one (1) foot above the top of the sewer, from which point sides may slope to ground surface, except that in streets or roadway, trenches must be excavated with vertical sides to the top of the trench. Width of trench in the vertical section shall be excavated only as wide as necessary to provide free working space on each side of the sewer according to the size of the sewer and the character of the ground; but in every case there shall be sufficient space between the sewer and the sides of the trench to make it possible to thoroughly ram the backfilling around the sewer and to secure tight joints, but in no case less than nine (9) inches on either side of the pipe. In no case, however, shall the width of the trench at the top of the sewer exceed the dimensions as shown on the contract drawings. In no case will it be permitted to excavate sewer trenches with sides sloping to the bottom.

### 3.2 LAYING PIPE

- A. The Contractor shall furnish all of the proper tools and equipment required for the safe, proper handling and laying of all pipe, fittings, and specials that are to be installed in this work. All storage, handling, laying, and backfill methods shall be performed so as to avoid damaging either the interior or the exterior surfaces of all pipe fittings, specials, joint materials, or other appurtenances, and any such damage shall be remedied at the Contractor's expense, as approved or directed by the Engineer.



- B. Before any pipe is lowered into the trench, it shall be inspected for damage, and any unsatisfactory lengths shall be rejected. The interior and exterior of each pipe length used shall be cleaned as necessary to remove all dirt or other foreign material before it is inspected. The interior of the pipe shall be kept clean until the work is accepted.
- C. No pipe shall be laid in water, mud or when trench conditions or weather is unsuitable for such work, except by permission of the Engineer.
- D. If mud, surface water, leaves and/or other debris have been permitted to enter the strung-out pipe, the inside shall be cleaned as directed by the Engineer and before the pipe is lowered into the trench.
- E. Pipe shall not be pushed off the bank nor shall it be permitted to fall into the trench. Each type of pipe, fitting, special or other appurtenances shall be handled in strict accordance with recommendations of its respective manufacturer.
- F. No rocks, stones, metal, concrete, bricks, pavement pieces, wood, soil lumps or other hard materials too big to pass through a six inch (6") screen shall be permitted within six inches (6") of the pipe after it is laid in the trench. Any pipe endangered by such debris shall be subject to removal and disposal at the Contractor's expense as and when directed by the Engineer.
- G. When pipe laying is not in progress, the open ends of installed pipe shall be closed by appropriate means to prevent the entrance of dirt and water.
- H. Pipe lengths shall not be deflected at the joint to any greater degree than recommended by the manufacturer of the particular joint being used. Where deflections in excess of such recommendations are necessary, the appropriate specifications for the particular type of pipe being installed shall govern the mode of accomplishing such excessive deflections. All pipe deflections shall be performed only with the Engineer's approval.

### 3.3 JOINTING PROCEDURES

- A. The particular method of making up pipe joints shall be governed by the type of pipe material and type of joint in accordance with the drawings and/or specifications.

### 3.4 ANCHORAGE

- A. All sewers where shown on the drawings shall be provided with a reaction backing or shall be restrained by attaching suitable metal rods, clamps, anchored fittings or harnessed joints, as shown on the plans or as specified so as to prevent movement.
- B. Reaction backing shall be of concrete, with steel reinforcement as required, unless otherwise shown on the drawings. Backing shall be placed between solid ground and the fitting or other part of the pipeline to be anchored; the area of bearing on the pipe and on the ground in each instance shall be that as indicated on the plans. The backing shall be so placed unless otherwise directed, that the pipe and fitting joints will be accessible for repair.

- C. Steel tie rods or clamps of adequate strength to prevent movement may be used instead of concrete backing. Steel rods or clamps shall be painted with three coats of an approved bituminous paint or coal tar enamel.

### 3.5 BACKFILLING

- A. Backfilling shall be accomplished in a two-step procedure as follows: 1) partial backfill before leakage tests and 2) completion of backfill after tests. Departure from this procedure due to traffic or other conditions shall be approved by the Engineer.
- B. All backfill in trenches under street pavements shall be thoroughly compacted as specified, before replacing any pavements, either permanent or temporary.

### 3.6 COMPACTION

- A. General: Control soil compaction during construction providing minimum percentage of density specified for each area classification as indicated below.
- B. Percentage of Maximum Density Requirements for Cohesive Soils: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture density relationship (cohesive soils) determined in accordance with ASTM D 698.
  - 1. Pavements: Compact top 12" of subgrade and each layer of 8" base at 100% maximum density.
  - 2. Walkways: Compact top 6" of subgrade and each layer of 6" base at 95% maximum density.
  - 3. Trench Backfill: Compact each layer of 8" backfill or fill material at 100% maximum density.
- C. Requirements for Cohesiveless Soils:
  - 1. Pavements: Compact each layer of backfill material with 2 passes of vibratory plate.
    - a. The depth of each layer of backfill material will be determined by the Contractor's equipment.
    - b. The Contractor shall submit information on his vibratory compaction equipment for review by the Engineer.
- D. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations.
  - 1. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
    - a. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing,

harrowing or pulverizing until moisture content is reduced to a satisfactory value.

### 3.7 LINE AND GRADE

- A. The Contractor will be required to set up and use batter boards located at every established grade and line point. A line shall be set on these batter boards at an elevation such that it is parallel to the invert grade line and on the proper centerline of the pipe. Not less than three batter boards shall be set before any pipe is placed. A grade stick provided with a bracket on the bottom shall be used to locate the pipe at the proper elevation and a plumb bob shall be used to locate it on line.
- B. In lieu of the above method the Contractor may, if he has suitable equipment and a capable operator, use a laser beam for establishing line and grade. The method used shall be as recommended by the manufacturer of the laser equipment and must be satisfactory to the Engineer. The laser beam shall be of no greater power than 2.5 milliwatts (0.0025 watts). A continual visual check shall be provided by the laser equipment. The Engineer will provide reference points for line and grade in sufficient numbers to make possible the efficient use of the laser beam equipment.
- C. No sewer pipe shall be laid until a sufficient length of trench has been properly prepared to permit laying at least twelve (12) feet of pipe at one time. No pipes shall be laid except in the presence of the Engineer and no pipes shall be covered or backfilled until they have been examined and directions given to cover the same.

### 3.8 PROTECTION OF SEWER

- A. After the sewer or drain is completed and trench backfilled, the Contractor shall maintain barricades and keep traffic off freshly backfilled trenches until the backfill has consolidated, but in no event shall traffic be permitted on backfill in less than seventy-two (72) hours after the trench has been properly backfilled and compacted.

### 3.9 STORM SEWER TELEVISION

- A. Prior to final payment for and acceptance of the storm sewer installation, the sewer shall be televised.

### 3.10 MAINTENANCE OF EXISTING DITCHES

- A. The Contractor shall use the utmost care in maintaining ditches and other waterways, and, if either bottoms or banks of such ditches are disturbed, they shall be promptly restored and maintained for the life of the guaranty period. Similar care shall be used in preventing damage to existing paving by caving of trench walls and undermining such paving. If paving is damaged, the Contractor shall repair same at his own expense.

### 3.11 CLEARING SITE AND RESTORING DAMAGED SURFACES

- A. Upon completion of the backfill work, the Contractor shall immediately remove and dispose of all surplus materials including dirt and rubbish.
- B. Unless otherwise called for on the plans, the Contractor shall replace all pavement, sidewalks, sod, or other surfaces disturbed to a condition equal to that existing before the work was started, furnishing all materials, labor, equipment, etc., at no additional cost to the Owner.
- C. All restoration of lawns shall be performed in accordance with these specifications as a part of performing the work as specified herein.
- D. All restoration of driveways, sidewalks, roadways and shoulders (berms) shall be in accordance with these specifications as a part of performing the work as specified herein.
- E. Upon completion of the foregoing work, all tools and other property belonging to the Contractor shall be removed, and the site shall be left in good condition.

END OF SECTION 333100.06

## SECTION 333100.13 - PVC PIPE

### 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. The Contractor shall furnish all the materials for and shall properly place at the locations shown on the drawings or as directed, all PVC pipe of the sizes specified, shown or required for the proper completion of the work included under this contract.

#### 1.3 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

#### 1.4 SUBMITTALS

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

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. All PVC pipe used, as covered under this section, shall conform to ASTM D 3034, with end being designated for one of the type joints as specified herein. PVC compounds shall conform to ASTM D 1784.
- B. The minimum class for PVC pipe under this Item shall be SDR 35.
- C. Materials of construction, including joints and fittings, shall be suitable for exposure to raw sewage, and shall also be UV stabilized with either 2% carbon black or titanium dioxide.

#### 2.2 JOINTS AND FITTINGS

- A. Bell and spigot type joints, including their respective appurtenances shall conform to ASTM D 3212. Gaskets shall be in accordance with ASTM F 477.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. 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.
- B. 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.
- C. 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.
- D. Installation shall conform to ASTM D 2321.

END OF SECTION 333100.13