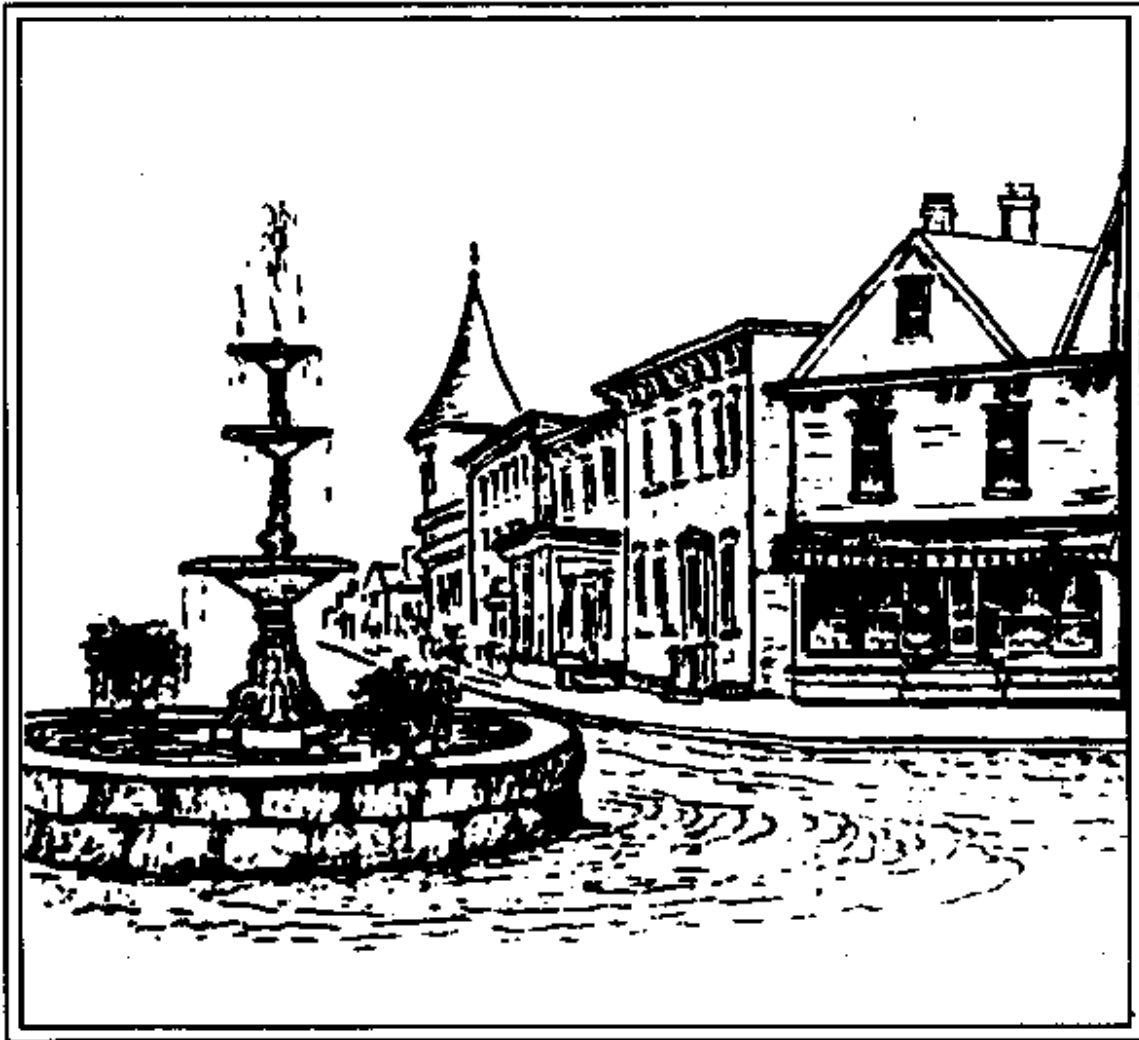


# DEVELOPERS SPECIFICATIONS WATER DISTRIBUTION SYSTEM AND SERVICE CONNECTION INSTALLATION

OCTOBER, 2020



## NEWVILLE BOROUGH WATER & SEWER AUTHORITY

CUMBERLAND COUNTY, PENNSYLVANIA

 **WM. F. HILL & ASSOC., INC.**  
PROFESSIONAL ENGINEERS  
CIVIL ♦ MUNICIPAL ♦ ENVIRONMENTAL

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**DIVISION 1 - GENERAL REQUIREMENTS**  
**SECTION 01320 - SUBMITTALS**

**PART 1 - GENERAL**

1.01 SUBMISSIONS REQUIRED

- A. General: The descriptions under the SUBMITTALS Article in each in each Specifications Section indicates the type of submission required. Make submissions to the address given as the Office of the OWNER OR OWNER REPRESENTATIVE.
- B. Definition: The term shop drawing used throughout this Section includes manufacturer's product data in the forms of descriptive literature, specifications and published detail drawings, and also CONTRACTOR prepared drawings, certified test records or reports and such other information required by the specifications.

1.02 PROGRESS SCHEDULE OF SUBMITTALS

- A. Promptly after the award of Contract, submit a progress schedule of submittals to the OWNER OR OWNER REPRESENTATIVE for approval, indicating the proposed dates of submission and the number for the various types of Work. Arrange submission dates in the proper sequence of the importance of the Work to the progress of construction.

1.03 CONSTRUCTION PROGRESS SCHEDULE

- A. Within forty-five days after issuance of the Notice To Proceed, submit to the OWNER OR OWNER REPRESENTATIVE five copies of a practicable and feasible progress schedule showing the order in which the Work is to be carried on, the dates on which prominent features will start (including procurement of materials and equipment), and the contemplated dates for completing same.
- B. Prepare the schedule in chart form of suitable scale so as to appropriately indicate the percentage of Work completed at any time.
- C. The General Construction CONTRACTOR will prepare the progress schedule and the CONTRACTORS holding other contracts in the Project shall cooperate in its preparation. The final progress schedule must have the approval of all CONTRACTORS.
- D. The General Construction CONTRACTOR shall revise the Construction Progress Schedule as directed by the OWNER OR OWNER REPRESENTATIVE until finally approved by him and after such approval; all CONTRACTORS shall strictly adhere to such schedule unless, upon written order of the OWNER OR OWNER REPRESENTATIVE, it is changed; additionally it is agreed that the OWNER reserves the right to determine the order of precedence and the times at which various portions of the Work are to be performed, all at no additional cost to the OWNER.
- E. At the end of each month the General Construction CONTRACTOR shall update the Construction Progress Schedule by entering the actual progress of the Work on the schedule. The CONTRACTORS holding other contracts in the Project shall submit their progress to the General Construction CONTRACTOR so he can include their progress on the schedule. The General Construction CONTRACTOR shall deliver five copies of the updated Construction Progress Schedule to the OWNER OR OWNER REPRESENTATIVE immediately after its completion.
- F. If the monthly update of the Construction Progress Schedule indicates variations in the schedule as previously approved, the General Construction CONTRACTOR along with the CONTRACTORS holding other contracts in the Project, shall submit a revised Construction Progress Schedule to the OWNER OR OWNER REPRESENTATIVE for approval in accordance with requirements previously specified.

- G. After the OWNER OR OWNER REPRESENTATIVE's approval of the Construction Progress Schedule, it will be distributed by the General Construction CONTRACTOR to all other CONTRACTORS.

#### 1.04 SUBMISSION OF SHOP DRAWINGS

- A. The following requirements for shop drawing submissions apply to all CONTRACTORS.
- B. Submit five copies of each shop drawing in a timely manner to avoid delay in the work.
- C. Each submission of the shop drawings must be accompanied by a letter of transmittal listing the items in the submission. Each shop drawing must be marked with the name of the Project and the name of the CONTRACTOR and will be numbered consecutively.
- D. When making a submission for approval, the CONTRACTOR shall do so with the understanding that he is considered to have checked the items in the shop drawing before submitting them and that he is satisfied that, in their present state, they not only meet the requirements of the Contract Documents, but will present no difficulties in erection and completing his Contract, and shall clearly note his approval on all shop drawings prior to their submission to the OWNER OR OWNER REPRESENTATIVE. Failure of the CONTRACTOR to note his approval will be reason for the OWNER OR OWNER REPRESENTATIVE to return such submission to the CONTRACTOR unchecked. If it appears that shop drawings submitted by the CONTRACTOR to the OWNER OR OWNER REPRESENTATIVE have not been properly checked, even though the CONTRACTOR's approval has been noted thereon, it will also be considered reason for the OWNER OR OWNER REPRESENTATIVE to return such submission to the CONTRACTOR unchecked.
- E. If shop drawings show variations from the Contract requirements because of standard shop practice or other reasons, the CONTRACTOR shall make specific mention of such variations in his letter of submission in order that (if accepted) suitable action may be taken for proper adjustment in the Contract; otherwise the CONTRACTOR will not be relieved of the responsibility for executing the Work in accordance with the Contract even though the shop drawings have been approved.
- F. The approval of the shop drawings will be general and shall not relieve the CONTRACTOR from the responsibility for proper fitting and construction of the Work nor from furnishing materials and work required by the Contract which may not be indicated on the shop drawings when approved.
- G. After review by the OWNER OR OWNER REPRESENTATIVE shop drawings will be returned marked as follows: "Approved", "Approved With Changes Noted", "Returned for Correction", or "Not Approved".
  - 1. Approved: When shop drawings are returned "Approved", that means the shop drawings have been found to be in conformance with the Contract Documents. The OWNER OR OWNER REPRESENTATIVE's approval of the shop drawings does not relieve the CONTRACTOR from responsibility for errors or discrepancies in such shop drawings.
  - 2. Approved with Changes Noted: When shop drawings are returned "Approved With Changes Noted" that means the shop drawings have been found to be in conformance with the Contract Documents, provided the changes noted by the OWNER OR OWNER REPRESENTATIVE are incorporated in the shop drawings. Shop drawings returned "Approved With Changes Noted" will not require resubmission.
  - 3. Returned for Correction: When shop drawings are returned noted "Returned for Correction" that means that the CONTRACTOR should make the required corrections and resubmit five copies of the corrected shop drawings to the OWNER OR OWNER REPRESENTATIVE.
  - 4. Not Approved: When shop drawings are returned "Not Approved" that means the CONTRACTOR will make completely new shop drawings and submit five copies to the OWNER OR OWNER REPRESENTATIVE for review.

## **PART 2 - PRODUCTS**

NOT APPLICABLE TO THIS SECTION

**PART 3 - EXECUTION**

NOT APPLICABLE TO THIS SECTION

**END OF SECTION**

**DIVISION 2 - SITEWORK**  
**SECTION 02300 - EXCAVATION AND BACKFILL**

**PART 1 - GENERAL**

1.01 SCOPE OF WORK

- A. This section consists of all excavation and backfill activities involved in work under this contract.

1.02 QUALITY ASSURANCE

A. Source Quality Control:

- 1. The OWNER/OWNER REPRESENTATIVE reserves the right to require advanced examination or testing according to methods referenced or by other methods chosen.
  - a. If testing is required, the testing laboratory shall furnish both OWNER/OWNER REPRESENTATIVE and CONTRACTOR two (2) copies of test result reports.
  - b. Above reports shall be considered as sufficient evidence of acceptance or rejection of the materials represented.
  - c. The OWNER/OWNER REPRESENTATIVE reserves the right to accept certificates of approved quality materials from an approved source in lieu of laboratory testing, or to require both.

1.03 REFERENCES

A. American Society for Testing and Materials:

- 1. ASTM D 698; Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures.
- 2. ASTM D 1556; Test Method for Density of Soil in Place by the Sand-Cone Method.
- 3. ASTM D 2321; Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
- 4. ASTM D 2922; Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

B. Commonwealth of Pennsylvania Department of Transportation (PA DOT), Specifications Publication 408, and as supplemented:

- 1. PA DOT Section 703.2 Coarse Aggregate.
- 2. PA DOT Section 703.3 Select Granular Material (2RC)

1.04 SUBMITTALS

A. Test Reports:

- 1. Upon request from the OWNER/OWNER REPRESENTATIVE, submit laboratory aggregate test reports based on requirements stated in Source Quality Control.
- 2. Compaction density test reports shall be based on method of density determination as specified in the above Reference Standards and/or the method as approved by the OWNER/OWNER REPRESENTATIVE.

B. Certificates: Submit certificate from aggregate supplier based on requirements stated in the Source Quality Control, when required by the OWNER/OWNER REPRESENTATIVE.

1.05 JOB CONDITIONS

A. The CONTRACTOR shall perform this work only when weather and soil conditions are suitable for the performance of this work.

- 1. Neither frozen earth nor excessively wet materials shall be used for backfill.
- 2. Prior to use, moisten dry backfill not having sufficient moisture to obtain satisfactory placement or compaction.

- B. Excavations shall be kept free from water at all times during the performance of work under this section. Water from the trenches shall be disposed of in such a manner that it doesn't cause injury or damage. Dewatering shall be in compliance with Section 02320, Erosion and Stabilized Sedimentation Control Plan. Keep gutters, sewers, drains and ditches open at all times for surface drainage.
- C. Protection: The CONTRACTOR shall assume all risks resulting from the presence or proximity of overhead or underground public utility and private lines, pipes, conduits and support for the previously mentioned. Also, damages and expenses for direct or indirect injury to structures, persons or property will solely be the CONTRACTOR's responsibility. The CONTRACTOR shall perform all work in conformance with PA Act 172 (PA One Call).
- D. Removal of Obstructions:
  - 1. Remove, realign or change the direction of above or below ground utilities and their appurtenant supports, if such is required in the opinion of the OWNER/OWNER REPRESENTATIVE.  
Additional precautions concerning obstructions as follows:
    - a. Do not interfere with persons, firms, corporations or utilities employing protective measures, removing, changing or replacing their property or structures, but allow said persons, firms, corporations or utilities to take such measures as they may consider necessary or advisable under the circumstances.
    - b. Break through and reconstruct if necessary, the invert or arch of any sewer, culvert or conduit that may be encountered if the said structure is in such a position, in the judgment of the OWNER/OWNER REPRESENTATIVE, as not to require its removal, realignment or complete reconstruction.
- E. Explosives and Blasting: Use and store explosives in accordance with requirements of Federal, State and local laws, rules, regulations, precautions, orders and decrees. Additionally comply with the following:
  - 1. Do not use methods of blasting which will result in breakage beyond work areas or which is dangerous to the public or destructive to property.
  - 2. The CONTRACTOR is solely responsible for injury to persons or property as a result of his use of explosives.
  - 3. Notify utility and property owners prior to blasting.
  - 4. Provide competent, licensed blaster to supervise blasting.
- F. Excess Materials:
  - 1. It is the CONTRACTOR's responsibility to dispose of excess backfill material should the property owner not want the material left on his premises.
  - 2. No right of property in materials is granted to the CONTRACTOR of excavated materials prior to backfilling. This does not relieve the CONTRACTOR of his/her responsibility of disposing of material described above.
- G. Accommodation of Traffic: Do not obstruct streets, roads and highways, unless the Municipality or Governing Agency authorizes in writing the complete closing of the street, road or highway. Employ such measures as may be necessary to keep the street, road or highway open and safe for traffic. Maintain a straight and continuous passageway on sidewalks and over crosswalks, at least three (3) feet wide and free from obstructions. **DO NOT OBSTRUCT FIRE HYDRANTS.**
  - 1. At the shutdown of work at the end of the day all streets shall be left in such condition whereby they can be readily opened and safely traveled in cases of emergency such as fire or for ambulance service.
- H. Structure Supports: Where passing buildings or any structure which by their construction or position might bring a great pressure upon the trenches, the right is reserved by the OWNER/OWNER REPRESENTATIVE to require that such buildings or structures be underpinned or supported and protected, or special sheeting be driven or that short lengths of trench be opened at one time.
- I. Removal of Rock by Means Other Than Blasting: Where removal of rock by means other than blasting is required, in accordance with requirements of State and local laws, rules and regulations, and utility owner requirements, remove by the use of mechanical surface impact equipment, or by

drilling and hydraulic rock splitting equipment, or by other methods acceptable to the OWNER/OWNER REPRESENTATIVE.

- J. Borrow Material: When the requirement quantity of backfill material exceeds the quantity of suitable on site material, provide borrow material. If borrow material is needed, notify the OWNER/OWNER REPRESENTATIVE sufficiently in advance to permit the OWNER/OWNER REPRESENTATIVE to verify such need and to view the proposed borrow pit to determine the material suitability. Borrow excavation will be subject to the OWNER/OWNER REPRESENTATIVE's approval whose written consent shall be obtained prior to its use.
- K. Stream Crossings: Excavate trenches in stream crossings to the depth shown on the Drawings or otherwise required by the ENGINEER.
  - 1. Material excavated may be used as backfill if it meets the requirements for backfill, unless specifically prohibited by any state agency having jurisdiction.
  - 2. Make all necessary provisions for cofferdaming, dewatering and removal of excess excavated material.
  - 3. Maintain the flow in the stream at all times.
  - 4. Where rock is encountered in the stream crossings, do not use forms to construct the concrete encasement. Place concrete on firm rock below the pipe and against firm rock on both sides of the pipe to provide a firm bond between the encasement and the rock. Should the CONTRACTOR excavate beyond the dimensions specified herein before for concrete encasement he will be required to furnish and place all additional concrete required beyond the dimensions shown on the Drawings at his own expense and no separate or additional compensation will be paid therefore.
  - 5. Construct stream crossing in accordance with additional requirements specified in Section 02320 - Soil Erosion & Sedimentation Control Plan.
- L. Water Service Lines: Copper water service lines will be placed in trench on clean native material and backfilled with clean earth backfill.

## **PART 2 - PRODUCTS**

### **2.01 MATERIAL**

- A. Backfill: On site excavated soil or soil-rock mixed materials free of topsoil, plant life, lumber, metal, refuse and rock or similar hard objects larger than six inches in any dimension. Rock to soil ratio shall not exceed one part rock to three parts soil.
- B. Clean Earth Backfill: On site excavated material free of plant life, lumber, metal, refuse and rocks or similar hard objects larger than one inch in any dimension. Rock to soil ratio shall not exceed one part rock to three parts soil. Suitable retained material shall be considered in this category.
- C. Aggregate Backfill: Select Granular Material (2RC) conforming to PA DOT Section 703.3.
- D. 2A Aggregate Backfill: Coarse Aggregate conforming to PA DOT Section 703.2.
- E. Pipe Bedding:
  - 1. First Class Bedding: Coarse Aggregate conforming to PA DOT Section 703.2.
    - a. For piping having a diameter of 21-inch and less use AASHTO NO. 8 (PA 1b) Coarse Aggregate.
    - b. For piping having a diameter of 24-inch and larger use AASHTO No. 57 (PA 2b) Coarse Aggregate.
  - 2. Initial Backfill: Same as First Class Bedding.
- F. Concrete Cradle and Encasement: Per requirements of Cast-In-Place Concrete and of the following class:
  - 1. Class B: 3000 psi.
- G. Underground Warning Tape:
  - 1. Printed polyethylene tape, 3-inches minimum width, color coded, one-inch minimum lettering, printed with name of utility buried below, and suitable for installation in all types of soil.
- H. Foundation Backfill: AASHTO No. 3 Coarse Aggregate conforming to PA DOT Section 703.2.



## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

#### **A. Excavation:**

Excavation shall be accomplished as specified above. The ENGINEER and the OWNER reserve the right to limit the length that a trench may be opened in advance of the pipe laid. No trench shall be opened more than 200 feet in advance of the pipelines laid, without the permission of the ENGINEER. Where a rock excavation is encountered, all trenches must be fully opened at least 30 feet in advance of any pipe being laid.

#### **B. Preparation of Surfaces:**

1. Do not remove trees in rights-of-ways except by authorization of the OWNER/OWNER REPRESENTATIVE.
2. Perform authorized tree removal, including stumps and debris, by methods meeting the OWNER/OWNER REPRESENTATIVE's approval.
3. Perform authorized shrubbery removal, store shrubs in protected manner and replant or replace such shrubbery.
4. Trim merchantable timber of limbs and tops, and unless otherwise directed by the OWNER/OWNER REPRESENTATIVE, saw timber into eight (8) foot sections. Stockpile timber at locations designated by the OWNER REPRESENTATIVE. Merchantable timber is timber larger than six (6) inches in smallest diameter from which saw logs, pulpwood, posts, poles, ties or cordwood can be produced.

### **3.02 PERFORMANCE**

- A. Sheeting and Shoring: Perform Sheeting and Shoring in accordance with Section 02310 of These Specifications.
- B. Erosion and Sedimentation Control: Perform Erosion and Sedimentation Control in accordance with Section 02320 of these Specifications.
- C. Excavating: Perform excavation and backfilling using machinery except that hand excavation and backfilling may be required where necessary to protect existing structures, utilities or private or public properties.
  1. Begin excavation in trenches at the control point having the lower invert and proceed upgrade.
  2. Remove rock to subgrade at least thirty (30) feet in advance of pipe laying.
- D. Excavated Materials Storage: In areas where working space is limited, remove the excavated materials from the first 100-feet of any opening, when required by the OWNER/OWNER REPRESENTATIVE, as soon as such is excavated; store and return same for backfilling where required. In no case will the CONTRACTOR be allowed to cast excavated material beyond the curb or right-of-way line or sidewalk or lawn.
- E. Do not perform trenching, backfilling or compacting when weather conditions or the condition of materials are such, in the opinion of the ENGINEER, that work cannot be performed satisfactorily.
- F. Do not use frozen materials as backfill material not having sufficient moisture to obtain satisfactory placement or compaction.
- G. Prior to use, moisten dry backfill material not having sufficient moisture to obtain satisfactory placement or compaction.
- H. Plan work so as to provide adequate protection during storms with provisions available at all time for preventing flood damage. Protect installed piping and other work at all times against damage from uplift due to high ground water levels.
- I. Accommodation of Drainage: Keep gutters, sewers, drains and ditches open at all times for surface drainage. No damming or ponding or water in gutters or other waterways will be permitted, except where stream crossings are necessary and then only to an extent, which the ENGINEER shall consider necessary. Do not direct water flows across or over pavements except through approved

- pipes or properly constructed troughs. When so required, provide pipes or troughs of such sizes and lengths as may be required, and place the same as required. Perform grading in the vicinity of trenches so that the ground surface is properly pitched to prevent water running into the trenches.
- J. Pumping: Keep excavation free from water at all times during the performance of the work under this project. Build dams and other devices necessary for this purpose, and provide and operate pumps of sufficient capacity for dewatering the excavations. Provide for the disposal of the water removed from excavations in such manner as not to cause injury to the public health, to public or private property, to the work of others, to any portion of the work completed or in progress or produce an impediment to the use of streets, roads and highways.
  - K. When it is necessary to haul soft or wet soil material over roadways, use suitably tight vehicles to prevent spillage. Clear away spillage of materials on roadways caused by hauling.
  - L. Provide effective dust control by sprinkling water, use of calcium chloride or any other method approved by ENGINEER. Employ dust control when, where and in a manner required by ENGINEER.
  - M. Temporary Protective Construction:
    - 1. Temporary Fence Barricade: Erect and maintain substantial temporary fences surrounding excavation to prevent unauthorized persons entering such areas.
    - 2. Temporary Fence: Where necessary, to keep one side of streets or roadway free from obstruction or to keep material piled along side of the trench from falling on private property outside the right-of-way, erect and maintain a safe and substantial fence.
    - 3. Barricades: Furnish and erect substantial barricades at crossings of trenches, or along trenches, to protect the traveling public.
    - 4. Excavation Covers: Cover open excavation when work therein is suspended or left unattended, such as at the end of a workday. For such covers, use materials of sufficient strength and weight to prevent their removal by unauthorized persons.
    - 5. Remove temporary protective construction at the completion of work on the Project.
  - N. Accommodation of Traffic: Do not obstruct streets, roads and highways, unless the OWNER authorizes in writing the complete closing of the street, road or highway, employ such measures at no expense to the OWNER as may be necessary to keep the street, road or highway open and safe for traffic. Maintain a straight and continuous passageway on sidewalks and over crosswalks, at least three feet wide and free from obstructions. **DO NOT OBSTRUCT FIRE HYDRANTS.**
  - O. Explosives and Blasting: Use and store explosives in accordance with requirements of Federal, State and local laws, rules, regulations, precautions, orders and decrees. Additionally comply with the following:
    - 1. Do not use methods of blasting which will result in breakage beyond trenching areas or which is dangerous to the public or destructive to property.
    - 2. The CONTRACTOR is solely responsible for injury to persons or property as a result of his use of explosives.
    - 3. Schedule blasting in the proximity of proposed new concrete work prior to placement of concrete.
    - 4. Notify utility owners having structures of other installations (if any) above or below ground in proximity to the trenching work prior to use of explosives. Such notice must be given sufficiently in advance to enable the utility owners to take such steps, as they may deem necessary to protect their property from injury. Such notice shall not relieve the CONTRACTOR of responsibility of damage resulting from his use of explosives. The right is reserved to direct that rock within five feet of pipe, conduit or other structures encountered in the trench be removed by methods other than blasting.
    - 5. Provide competent, licensed blaster to supervise blasting.
    - 6. Cease blasting operations when street paving adjacent to trench is damaged. Repair damaged street paving.
  - P. Removal of Rock by Means Other Than Blasting: Where removal of rock by means other than blasting is required, in accordance with the requirements of State and local laws, rules and

- regulations, and utility owner requirements, remove by the use of mechanical surface impact equipment, or by drilling and hydraulic rock splitting equipment, or by other methods.
- R. Trench Width and Depth:
1. Trench widths shall be such to provide a free working space on each side of the pipe as laid, but shall not exceed the outside diameter of the barrel of the pipe plus sixteen inches at a point one foot above the top of the pipe.
  2. Trench Depth: Excavate the trench to a minimum of four (4) inches or one-fourth of the internal pipe diameter, whichever is greater, below the invert of the pipe. The trench depth shall be adequate so that the pipe will have a minimum of four (4) feet of cover the top of the pipe.
- S. Additional Excavation: Do not excavate below depths indicated or specified except where unstable or unsuitable material is encountered at subgrade. Excavate such material to the increased depth as may be required by the OWNER/OWNER REPRESENTATIVE and refill to the proposed subgrade with thoroughly compacted Foundation Backfill material.
- T. Backfilling: Perform trench backfilling and backfilling excavations for other in line structures by methods which will result in thorough compaction of backfilled material without displacement of the grade and alignment of the pipeline and its appurtenances and minimum settlement of backfilled material. Displacement of the pipeline and settlement of backfill shall be considered evidence of improper workmanship or inclusion of unsuitable backfill materials, or both, and will require regrading and realigning the pipeline and removing and recompacting settled material.
1. All backfill material shall be free from cinders, ashes, refuse, vegetable or organic material, boulders, rocks or stones, frozen soil, or other unsuitable material.
  2. Perform final embedment of trench in accordance with these Specifications. The initial backfill/embedment shall be placed in 4-inch layers to a point of a minimum of 12 inches above the top of the pipe.
  3. Following final embedment fill remainder of trench with materials as specified below. Exercise care to carry backfill up evenly on opposite sides of piping.
    - a) Paved Areas: Aggregate backfill (2RC) compacted in (6-8) inch layers.
    - b) Unpaved Areas: Backfill compacted in six-inch layers to bottom of topsoil. Replace topsoil to approximate depth of existing final refill operation and crown to such a height as directed by the OWNER/OWNER REPRESENTATIVE. From 1 foot above the top of the pipe to the subgrade of the pavement, material containing stones up to 8 inches in their greatest dimension may be used, unless otherwise specified.
- U. Earth Dams in first class bedding installation, construct earth dams composed of clean earth backfill material.
1. Location: At a point not less than (3) feet upstream from inline structure; in trenches for service connections at a point not less than three (3) feet from the main sewer trench; in main sewer trenches at 100 foot intervals; and trenches at such other locations required by the OWNER/OWNER REPRESENTATIVE.
  2. Place clean earth backfill material from subgrade to one (1) foot depth over top of pipe. Length shall be as shown on the Earth Dam Drawing Detail.
  3. Place earth dam material by hand and compact with proper tools designed for such purpose.

**END OF SECTION**

**DIVISION 2 - SITEWORK  
SECTION 02310 - SHORING**

**PART 1 - GENERAL**

1.01 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Shoring materials and installation work shall conform to Federal, State and local laws, rules, regulations, requirements, precautions, orders and decrees. Work shall conform to all OSHA requirements.
2. Provide material for shoring, sheeting bracing and/or trench boxes and drive or set in place in accordance with Federal, State and local laws for excavations and construction; and as may be required to protect the workers and the public, or to maintain the trench widths specified in Section 02300 regardless of whether the same is or is not considered necessary by the CONTRACTOR.
3. Trench supporting shall be individually designed by a registered professional engineer for trench conditions where necessary.

1.02 JOB CONDITIONS

A. Responsibility for Condition of Excavation:

1. The failure or refusal of the AUTHORITY / AUTHORITY REPRESENTATIVE to suggest the use of bracing or sheeting, or better quality, grade, or section, or larger sizes of steel, or to suggest sheeting, bracing, struts, or shoring to be left in place, shall not in any way or to any extent relieve the CONTRACTOR of any responsibility concerning the condition of excavation or of any of his obligations under the Contract, nor impose any liability on the ENGINEER, AUTHORITY REPRESENTATIVE, or the AUTHORITY; nor shall any delay, whether caused by any action or want of action on the part of the CONTRACTOR, or by any act of the ENGINEER, the AUTHORITY, or their agents, or employees, resulting in the keeping of any excavation open longer than would otherwise have been necessary, relieve the CONTRACTOR from the necessity of properly and adequately protecting the excavation from caving or slipping, nor from any of his/her obligations relating to injury to persons or property.

**PART 2 - PRODUCTS**

2.01 MATERIALS

- A. Steel Materials: Steel sheet piling and bracing of suitable, and as designed by a professional engineer where required.
- B. Trench Boxes (Also called trench shields): Specially manufactured structures consisting of two large plates, which are parallel to trench walls, and horizontal cross members that hold the plates apart. Workers shall stay between plates when below grade.

### **PART 3 - EXECUTION**

- A. Using skilled labor, drive or set sheet piling, bracing, shoring or trench boxes in place and arranged such that they may be withdrawn or moved as structures, and without injury to or settlement of adjacent structures and pavements.
- B. When tight plank or steel sheeting is required, drive such sheeting in advance of the excavation. Make joints of tongue and groove or interlocking type and as watertight as possible.
- C. Where the maximum width of trench may be exceeded under these Specifications and where permitted by Federal and State regulations, the sides of the trench may be sloped; the slope shall begin at a point of 12 inches above the top of the pipe. Install sheeting to support the vertical part of the excavation as required by Federal and State regulations.
- D. Remove sheeting, bracing and shores as trenches and other excavations are being backfilled, except where and to such an extent as the ENGINEER/AUTHORITY may require, in writing, that same be left in place or where he/she shall permit the CONTRACTOR to leave same in place at the CONTRACTOR's own request and cost.
  - 1. In withdrawing sheeting and sheet piling, exercise care to insure that all voids or holes left by planks as they are withdrawn, are backfilled and thoroughly rammed with thin rammers provided especially for that purpose.
  - 2. Exercise care to carry backfill up evenly on all sides of items installed in excavations.
- E. Cut off sheeting or sheet piling left in place whenever and at such points as the ENGINEER / AUTHORITY shall require and remove from the work the portion cut off. No additional compensation will be allowed for cutting and removal.

**END OF SECTION**

**DIVISION 2 - SITEWORK**  
**SECTION 02320 - EROSION, SEDIMENTATION AND CONTROL**

**PART 1 - GENERAL**

1.01 SCOPE OF WORK

- A. The purpose of this Erosion and Sedimentation Control Plan is to provide the CONTRACTOR with general guidelines as well as specific techniques for minimizing erosion and sedimentation during and after construction of the project. During construction all attempts shall be made to minimize the potential for erosion and sedimentation problems. All work shall comply with the approved Project Plans and the permits that have been issued for this project.

**PART 2 - PRODUCTS**

- A. Products used to control erosion and sedimentation are as follows. They will be used to temporarily control erosion, primarily at the sites where soil removed from the trench is wasted or stored. They will also be used if protection is required at construction sites that cross small streams. See drawings for item descriptions not included here.
1. Straw bales shall be wire or nylon bound bales.
  2. Silt fences shall be constructed of a geotextile fabric (filter cloth) that is manufactured specifically for this purpose.
  3. Posts for silt fences shall be either wood or steel with a minimum length of 40 inches. Steel posts shall have projections for fastening wire to them.

**PART 3 - EXECUTION**

- A. The CONTRACTOR shall adhere to the following requirements in an effort to control erosion and sedimentation.
1. The CONTRACTOR shall not disturb ground cover areas beyond those necessary to satisfactorily complete the required work.
  2. All temporarily stockpiled fill at the site will be covered or otherwise stabilized to prevent erosion when precipitation is imminent. Grassy areas between the construction area and stream shall be maintained.
  3. The following temporary methods to control erosion are to be followed:
    - a. Silt fence shall be constructed along the downslope of the work areas to filter any silt-laden runoff from the construction area. Place silt fence around temporary stockpiled topsoil or other soil material. Construction details for silt fence installations are included on the plans.
    - b. Temporary seeding shall be performed as outlined under seed mixtures.
  4. Permanent seeding shall be performed as outlined later in this section.
  5. Where wind and dust erosion is a problem, the unstable surface shall be sprinkled, or a dust suppressor will be supplied. Prompt establishment of vegetative soil cover and placement of gravel in specified areas will minimize wind erosion and dust problems.
  6. The CONTRACTOR is responsible for ensuring that sediment is not transported from the construction site.
  7. Before any construction commences all erosion control measures and silt fences must be in place. They must remain in place and be maintained until the construction area can be permanently stabilized.
  8. Silt fence shall be constructed along the downslope section of the construction area. Maintain silt fence by removing sediment when it reaches 1/2 the height of fence.

9. A stabilized construction entrance will be constructed. Maintain by replacing rock as necessary.
10. A rock filter will be placed surrounding the inlet to the existing storm sewer. Maintain by cleaning and replacing rock as necessary.
11. In the event that the site is not permanently stabilized within 14 days, temporary seeding shall take place. All areas of slopes of 3 horizontal to 1 vertical or less shall be temporarily or permanently stabilized within (7) days. Temporary seeding shall be as follows:
  - a. Apply (1) ton of lime per acre.
  - b. Apply fertilizer at the rate of 50-50-50 lbs. per acre of N, P2O5 and K2O, respectively.
  - c. Place mixture of annual ryegrass at the rate of 40 lbs. per acre. This mixture may vary depending on seasonal conditions.
  - d. Mulch with straw or hay at the rate of (3) tons per acre.
12. Permanent stabilization shall be as follows:
  - a. Remove coarse fragments from surface and till top soiled areas to a depth of 3 inches (min.).
  - b. Seeding: Apply seed uniformly. When not using a hydro seeder, seed should be applied to a maximum depth of 1/4 inch on clayey soils and 1/2 inch on sandy soils. Seed mixture shall be a suitable combination of grasses suited for the type of soil and the desired conditions. All seed specifications such as purity, ready germ, total germ, etc., shall be in accordance with the Penn State Agronomy Guide. Seeded areas shall be protected by Mulching in accordance with PennDOT Publication 408. Liming and fertilizer shall be applied as required to obtain a uniform erosion resistant vegetative coverage. The following rates (per acre) represent an estimate of the required amount. The CONTRACTOR may need to exceed or may be able to reduce the rate indicated.
    - (1) One ton of lime per acre.
    - (2) 1000 lbs. per acre using 10 -10 -10.
  - c. Do not sow immediately following rain or when ground is too dry or during windy periods.
  - d. If areas are to remain disturbed from November 1 through March 1 (non-growing season), the CONTRACTOR shall protect seed areas by seeding and mulching, sodding, or by placement of matting as necessary. This work shall be done in accordance with PennDOT Publication 408.
13. Wastewater Collection Mains and Lines in Off-Street Rights-of-Way Including Collection System Adjacent to Streams:

The following are erosion control procedures and techniques to be employed when constructing sewers and/or water mains in off-street rights-of-way including those adjacent to streams:

  - a. Where possible material excavated from trenches shall be cast on the high side of the trench to allow erosion runoff from the excavated material to be intercepted by the trench.
  - b. All material not replaced in the trenches shall be removed and disposed of promptly and in a manner that minimizes erosion. Disposal sites where the material is stored shall be protected by sedimentation basins and/or silt fences. Where the material is spread, the material shall be stabilized with the appropriate ground cover.
  - c. All trench dewatering shall be to a properly constructed and maintained sedimentation area.
  - d. Excess material shall not be temporarily stored unless the CONTRACTOR can demonstrate that it is adequately protected from erosion and sedimentation. No stockpiling of soil material shall take place on asphalt.
14. Dewatering Sewer Line Trenches and Excavation Pits:

If the occasion should arise that excavations will need to be dewatered so that construction can resume and pumping is required one of the following methods, whichever is most applicable, shall be used:

- a. Discharge over areas with extensive vegetation. Check for signs of soil removal over the discharge area. If so, discontinue pumping and construct a sediment trapping facility in accordance with Cumberland County Conservation District standards and details.
  - b. Construct a straw bale sediment trap. Bales should be staked with two 2”X2”X3’ wooden stakes or #6 reinforcing bars. Effluent from the sediment trap should be spread over a vegetated area.
  - c. Construct a temporary lagoon (silt holding basin) for pumping discharge or applying silt-laden runoff. Allow for the following conditions:
    - (1) A detention time of approximately two hours.
    - (2) A two foot freeboard.
    - (3) Prevent short-circuiting with the use of plywood baffles.
  - d. Discharge directly to the stream without a method of filtering silt will be prohibited.
15. Construction Sequence:
- a. Notify the appropriate County Conservation Districts a minimum of (7) days prior to the start of construction or in accordance with the permit.
  - b. Perform construction stake out and locate all underground utilities relative to and in the vicinity of this project per PA State Regulations.
  - c. Install stabilized construction entrance, silt fence, rock filter, and all Erosion and Sediment Control Measures.
  - d. Perform construction activities, final grading, and permanent stabilization. Spread topsoil over areas prior to planting.
  - e. Following establishment of permanent seeding relative to all earth moving activities to a point where 70% minimum uniform perennial vegetative cover has been established, the erosion and sediment control measures shall be removed.
16. Additional Sewer Main Installation Specifications
- a. Limit advance clearing and grubbing operation to a distance equal to two times the length of pipe installation that can be completed that day.
  - b. Limit daily trench excavation to the length of pipe placement installation and backfilling that can be completed each day.
  - c. On the day following pipe placement and trench backfilling, the disturbed areas shall be graded to final contours and appropriate temporary erosion control measures installed. Seeding and mulching of all disturbed areas shall be done at the end of each week.
  - d. Place excavated material on upslope side of trench. All material not used in backfill shall be stockpiled and temporarily seeded.
17. Collection System Construction Involving Stream Crossings:
- The following are erosion control procedures and techniques to be employed in the construction of stream crossings:
- a. All work shall be done in a manner that will minimize erosion and runoff of silt-laden water to the stream.
  - b. After starting construction of an individual crossing, work shall be continuous until that crossing is complete. This shall include removal of all temporary construction and erosion control devices and the grading, seeding, and mulching of disturbed areas as required.
  - c. Stream crossings made in accordance with any of the General Permit issued by the Department of Environmental Protection for the particular stream crossing. A copy of the General Permit for this stream crossing is found in these specifications (if applicable).
18. Erosion Control Facilities Temporary Maintenance Schedule:



The CONTRACTOR shall implement the following maintenance schedule at a minimum. Maintenance shall begin immediately following installation of the erosion and sediment control measures and shall be followed until the facility is removed in accordance with this plan:

<u>Measure</u>	<u>Schedule</u>	<u>Description</u>
Silt Fence	Daily & after all Storm Events	Inspect, repair, and remove sediment when accumulation reaches 1/2 height of fence (above ground).
Seeded/Mulched Areas	Weekly	Inspect, replace any materials necessary. Reseed as required.
Temporarily Stockpiled Soil	Weekly & After all storm events	Inspect, Re-seed. Repair silt fence if necessary. Remove sediment from silt fence at 1/2 height of fence.

**END OF SECTION**

**DIVISION 2 - SITEWORK**  
**SECTION 02400 - BORING AND JACKING**

**PART 1 - GENERAL**

1.01 SCOPE OF WORK

- A. This section consists of all work associated with installing sewer line in a liner conduit under highways by trenchless methods.
- B. Related Work Specified Elsewhere:
  - 1. Shoring: Section 02310
  - 2. Excavation and Backfill: Section 02300
  - 3. Gravity Wastewater Pipe & Installation: Section 02500
  - 4. Pressure Wastewater Sewer: Section 02550
  - 5. Cast-In-Place Concrete: Section 03300

1.02 SUBMITTALS

- A. Workmen Qualifications:
  - 1. Use only personnel thoroughly trained and experienced in the skills required.
- B. Design Criteria:
  - 1. Encasing conduit under highways shall be of sufficient strength to support all superimposed loads, including an American Association of State Highway and Transportation Officials H-20 Loading with 50% added for impact.
- C. Source Quality Control:
  - 1. Shop Tests: Each pipe manufacturer must have facilities to perform listed tests. The ENGINEER reserves the right to require the manufacturer to perform such additional number of tests as the ENGINEER may deem necessary to establish the quality of the material offered for use.

MATERIAL	TEST METHOD	NUMBER OF TESTS
a. Steel Pipe	ASTM A120	As specified in ASTM A120
  - 2. Laboratory Tests: The ENGINEER reserves the right to require that laboratory tests also be conducted on materials that are shop tested. Furnish without compensation, labor, materials, and equipment necessary for collecting, packaging, and identifying representative samples of materials to be tested and the shipping of such samples to the Testing Laboratory.

1.03 SUBMITTALS

- A. Shop Drawings and Product Data: Furnish completely dimensioned shop drawings, cuts or other data as required to provide a complete description of Products to be installed.
- B. Certificates: Certified records or reports of results of shop tests, such records or reports to contain a sworn statement that shop tests have been made as specified.
- C. Furnish to the ENGINEER, detail drawings, accompanied by design calculations, for boring pits including sheeting and bracing therefore, steel pipe and boring procedure and all such drawings and computations shall bear the seal of a Registered Professional Engineer.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Transport, handle and store materials and Products specified herein in a manner recommended by the representative manufacturers of such to prevent damage and defects.

1.05 JOB CONDITIONS

- A. Classification of Materials:

1. Roadway Crossing Boring: No consideration will be given to the nature of materials encountered in the boring for roadway crossings. Remove rock encountered during the boring operation except as provided in the following paragraph.
  - a. Where rock is encountered during the boring of an encasing conduit which is such that in the judgment of the ENGINEER the boring of the encasing conduit cannot be continued, discontinue boring. Construct the remaining portion of the sewer line across the roadway by open cut method meeting with the approval of the ENGINEER.
  - b. If the highway crossing is constructed by open cut methods, provide the same casing pipe that was required for the bored crossing.
  - c. CONTRACTOR shall not obstruct streets, roads and highways. Unless the Municipality or Governing Agency authorizes in writing the complete closing of the street, road or highway, employ such measures at no expense to the OWNER as may be necessary to keep the street, road or highway open and safe for traffic. Maintain a straight and continuous passageway on sidewalks and over crosswalks, at least three feet wide and free from obstructions. DO NOT OBSTRUCT FIRE HYDRANTS.

## **PART 2 - PRODUCTS**

### **2.01 ENCASING CONDUIT**

- A. Steel Pipe: ASTM A 53 or A 139
  1. Minimum Diameter: As determined by the size of the carrier pipe. The casing pipe shall have an inside diameter at least 2 inches greater than the outside diameter of the carrier pipe joint assembly.
  2. Casing spacers shall be utilized for support between carrier pipe and liner pipe as shown in the detail drawings provided herein. Acceptable manufacturer shall be the Ford Inter Box Co., Inc.

## **PART 3 - EXECUTION**

### **3.01 INSPECTION**

- A. Inspect materials and products before installing in conformance with the inspection requirements of the appropriate referenced standard.
- B. Remove rejected materials and products from the Project.

### **3.02 PERFORMANCE**

- A. Boring:
  1. Boring shall conform to acceptable trade practices and additional requirements specified herein.
    - a. Install the encasing conduit by the boring method to the limits specified or such additional limits required by the ENGINEER.
    - b. Excavate and sheet boring pit.
    - c. Provide devices at the front of the pipe to prevent auger and cutting heads from leading the encasing conduit. Unsupported excavation ahead of the pipe is prohibited.
    - d. Over-cut by cutting head not to exceed the outside diameter of the encasing conduit by more than one-half inch.
    - e. The use of water or other liquids to facilitate casing placement and spoil removal is prohibited.
    - f. Check conduit alignment in a manner and at times required by ENGINEER.
    - g. Completely weld joints around the circumference between sections of steel pipe encasing.

2. Testing: After laying pipe in encasing conduit conduct line acceptance testing as specified in Section 02510 or Section 02550.
3. Should the CONTRACTOR in constructing any boring pit excavate below the subgrade for the sanitary sewer main, he will be required to backfill the area excavated below the subgrade with Aggregate Backfill or with concrete as required by the ENGINEER at his own expense and at no cost to the OWNER.

**END OF SECTION**

## **DIVISION 2 – SITEWORK**

### **SECTION 02590 – PIPE, VALVES AND APPURTENANCES & INSTALLATION METHODS**

#### **PART 1 – GENERAL**

##### **1.01 SCOPE OF WORK**

- A. This section consists of furnishing and installing all pipe, valves, and appurtenances used in this project.

##### **1.02 SUBMITTALS**

- A. Shop Drawings and Product Data. Submit completely detailed shop drawings or other data as required to provide a complete description of materials as outlined in this Section.
- B. Certificates. A manufacturer's certified statement shall be submitted certifying that the materials will be supplied in accordance with the specified reference standards when alternative materials are proposed.

#### **PART 2 - PRODUCTS**

##### **2.01 PIPE**

###### **A. Ductile Iron Pipe:**

1. Manufacture-Ductile Iron Grade 60-42 ANSI/AWWA C151/A21.51.
2. Wall Thickness-Class 52 for all sizes ANSI/AWWA C150/A21.50.
3. Cement Mortar Lining-Double Thickness ANSI/AWWA C104/A21.40.
4. Joints-Push on Tyton ANSI/AWWA C111/A21.11.
5. Nominal laying length-18 ft. or 20 ft.
6. Manufacture certification required.
7. Ductile Iron Pipe to be Griffin or Approved Equal.
8. Field Lok 350 Gaskets Joint Restraint or Equal.

##### **2.02 PIPE FITTINGS**

###### **A. Miscellaneous Fittings:**

1. Manufacture-Domestic 70-50-05 Grade Iron, pressure rating of 350 psi. ANSI/AWWA C110/A21.10 and C153/A21.53.

2. Wall Thickness-exceed ANSI/AWWA C153/A21.53 Thickness.
3. Cement mortar lining and Asphaltic coated ANSI/AWWA C104/A21.4.
4. Joints-Mechanical Joints conforming to ANSI/AWWA C111/A21.11.
5. All Joints shall be restrained using Wedge Action Restrained as specified.
6. Fittings to be Tyler, or Approved Equal.

B. Transition Fittings:

1. All transition fittings between HDPE pipe and any other pipe material shall be approved by the Authority.

2.03 JOINTS

A. Restrained Joint Ductile Iron Pipe:

1. Shall be used on slopes of 30% or greater and where specified on the contract drawings.
2. Restrained Joint Pipe shall be Griffin Snap Lok or Approved Equal.
3. Manufacture-Ductile iron Grade 60-42-10 ANSI/AWWA C151/A21.51.
4. Wall Thickness-Class 52 for all sizes ANSI/AWWA C150/A21.50.
5. Cement Mortar Lining-Double Thickness ANSI/AWWA C104/A21.40.
6. Normal Laying Length-18 ft. or 20 ft.
7. Manufacturer certification required.

B. Mechanical Joint Restraint:

1. For Ductile Iron Pipe and fittings:
  - a. Joint to be restrained shall be Mechanical Joint ANSI/AWWA C111/A21.11.
  - b. Glands-Ductile Iron 65-45-12 ASTM A536, maintain flexibility on the joint after burial, designed to be used with the standardized mechanical joint bell and tee bolts ANSI/AWWA C111/A21.11 and C153/A21.53 and be Underwriters Laboratory listed, and Factory Mutual Approved.
  - c. Restraining Devices-Ductile Iron Heat-Treated to a minimum hardness of 370 BNH with twist of nuts to insure proper actuating of the restraining devices.  
(Revised January 2018)
  - d. Working Pressure-4"-16" (350 psi) 18"-36" (250 psi) with a safety factor of 2:1 min.

- e. No specific tools to assemble or disassemble.
- f. Manufacturer-Ford Meter Box Series 1400 or EBBA Iron Mega Lug Series 1100.
- g. Manufacturer certification required.

C. Mechanical Joint Adapter: (Foster Adapter)

- 1. Joints to be connected shall be Mechanical Joint ANSI/AWWA C111/A21.11.
- 2. Manufacture-50-55-06 Grade Ductile Iron Body with Dimensions Compatible to ANSI/AWWA C111/A21.11, and Accessory Kit with Dimensions Compatible to ANSI/AWWA C111/A21.11.
- 3. Manufacturer-Infact Corporation.
- 4. Manufacturer certification required.

2.04 SERVICE LINES

- A. All service lines ¾” through 2” shall be type K soft copper tubing. Service lines shall be installed at right angle to main, no more than one line per trench and hand backfilled. 200 psi HDPE (CTS) pipe will also be permitted, however a copper trace wire (suitable for direct burial in wet conditions) must be installed.

2.05 SERVICE LINE FITTINGS

- A. Manufacture-cast brass ASTM B62 85-5-5-5 and ANSI/AWWA C800.
- B. End Connections: Copper tube size compression type sealed by a Buna-N rubber gasket locked in place by a bronze split grip ring.
- C. Manufacturer-Ford Meter Box, Inc.
- D. Manufacturer certification required.

2.06 VALVES

- A. Gate Valves and Tapping Valves:
  - 1. Body-250 PSI Working Pressure, grade 65-45-12 Ductile Iron Body, no recesses to trap debris or restrict flow ANSI/AWWA C515. Shell tested 500 PSI. The word DUCTILE or DI shall be cast in the valve body.
  - 2. Gate and Seat-Single Gate, Resilient Seated. EPDM Rubber encapsulated Ductile Iron Disk, 100% leak tight closure.
  - 3. Stem-Bronze Grade C or E, with Ductile Iron 2” NRS wrench nut for direct burial and shall have 4 flats at stem connection to assure even input torque to the stem.

NRS or OSY hand valves for flanged valves indicated on contract drawings. The stem shall be sealed with triple O-ring seals and have two (2) thrust washers, one (1) above and one (1) below the thrust collar. ANSI/AWWA C515.

4. Ends-Mechanical Joint ANSI/AWWA C111/A21.11 for buried service. Flanged ends ASI/AWWA C110/A21.10 (ANSI B16.1, Class 152) for above grade application. Tapping Valve connection shall have a raised male face for matting to the tapping sleeve conformation to MSS-SP-60 to insure true alignment to valve.
5. Bolting Material-304 Stainless Steel Bolts and Nuts.
6. Interior and Exterior Coating-Fusion Bonded Epoxy Coating, ANSI/AWWA C550 applied electrostatically prior to assembly. NSF 61 standard certified.
7. Warranty-Ten Year against defective material and workmanship.
8. UL listed FM Approved.
9. Valve shall operate in a counterclockwise direction (Open Left).
10. Valves shall be AFC 2500 Series.
11. Manufacturer certification required.

B. Air Release Valves:

1. Manufacture-Cast iron body ASTM A126 Class B, 30 Stainless Steel Trim, 300 PSI working pressure. Combination Air release / Air Vacuum valve single body type.
2. Seats-Resilient seats shall be Buna-N.
3. Manufacturer-Valmatic 201C.2 and Valmatic 202C.2.
4. Air Valves to be installed as shown on Standard detail titled *Air Release Assembly*.
5. Manufacturer certification required.

2.07 VALVE BOXES

- A. Manufacture-Cast Iron, 5-1/4" Two piece design, round bottom, screw type, adjustable. Tyler Figure # 564-S will only be accepted.
- B. Lid-Drop in lid with marking "Water" on lid.
- C. Coating-Coal tar epoxy.
- D. Manufacturer certification required.

2.08 MISCELLANEOUS FITTINGS



- A. The various service line fittings provided shall be manufactured in compliance with ANSI/AWWA C800-01 Standard for Underground Service Line Valve and Fittings. The following items or equivalent items shall be provided:

1. Ball Corporation Stops:

Manufacture- ¾"-2" size, cast brass ASTM B62 85-5-5-5, high pressure stop, Teflon coated ball, Buna-N, rubber seats secured by epoxy adhesive, waterway equal to nominal valve size, watertight at 300 PSI, and designed to be installed under pressure using standard tapping equipment.

Inlet threads- ¾"through 2" with ANSI/AWWA C800 tapered type threads

Outlet Connection- Copper tube size compression Grip type seal by a Buna-N-Rubber, Nylon Gasket, and locked in place by a C510 Phosphorous Bronze Gripper Ring for axial restraint.

Manufacturer and Model- Ford Meter Box, FB1000

Manufacturer certification required.

2. Curb Stop:

Manufacture- ¾"-2" size, cast brass ASTM B62 85-5-5-5, high pressure stop, Teflon coated ball, Buna-N, rubber seats secured by epoxy adhesive, waterway equal to nominal valve size, watertight at 300 PSI in either direction.

Stem- (2) O-ring seals and a T-head operator for opening and closing valve with a 90 degree turn of T-head. T-head shall be compatible with standard, slotted tee handle curb wrench.

End Connections- Copper tube size compression Grip type sealed by a Buna-N-rubber, and Nylon gasket, locked in place by a C510 Phosphorous Bronze Gripper Ring for axial restraint.

Manufacturer and model- Ford Meter Box B44 Model

Manufacturer certification required.

3. Service Saddles (Required for PVC Pipe):

Manufacture- High strength ductile Iron body per ASTM A536 with a black shop finish. One side of the saddle body has closed bolt lugs for easy installation.

Hardware: Straps 5/8" AISI C1010 Steel, zinc plated with dichromate seal. Each strap has 5/8" flat bearing surface. ½" straps are furnished on saddles 3" and smaller. Heavy Hex Nuts and Washers-1/2" or 5/8" AISI steel Alloy, zinc plated with dichromate seal.

Threads- CC per AWWA C800 or standard FIP or BSP

Gasket- Buna-N Rubber per ASTM- D2000

Manufacturer and Model Number- Ford Meter Model F202 Model

Manufacturer certification required.

#### 4. Curb Boxes

Manufacture- 2-1/2" style screwed cast iron design, adjustable 36"-48", buffalo style arched bottom with lid marked "water"

3/4"- 1" size lateral valve

Coating- Coal Tar Epoxy

Manufacturer- Tyler 93-d

For Valves of size 1-1/4"-2", a Tyler Enlarged Base CB-7 is required.

Manufacturer certification required.

#### 2.09 Fire Hydrants

- A. Manufacture-5-1/4" American Flow Control B-62-B will only be accepted. Ductile Iron, pressure rated 200 psi working pressure, 400 psi test, 6" mechanical joint, nozzle section to rotate a full 360 degree at field installation. ANSI/AWWA C502.
- B. Depth of Bury-Field determined. Extensions available in 6' increments through 36".
- C. Main Valve-5-1/4" size, compression type opening against the pressure, and closing with the pressure. Bronze seat shall be threaded into mating threads of bronze.
- D. Drain system-Bronze, activated by main stem without auxiliary mechanism, be completely closed after three (3) turns of the operating nut in the opening direction permitting throttling by the hydrant, have two (2) inside ports and four (4) outlet drain ports and shut-off shall be by direct compression closure.
- E. Dry top shall have internal housing with triple O-rings to seal operation threads from waterway and accommodate an anti-friction washer.
- F. Outlet Nozzles-Bronze, lock into the hydrant with locking lugs, sealed with O-rings, and permit field replacement without special tools or disturbing parts of the hydrant.
- G. Outlet nozzle threads-One (1) 4-1/2" Pumper Nozzle with Male National Standard threads and two (2) 2-1/2" Male National Standard Hose Nozzles. Pumper Nozzle to come with Storz Fire Department Connection. Storz Connection shall be provided with cap and stainless steel cable for securing the cap to the hydrant.
- H. Paint-Red.

- I. Hydrants to be installed as shown on standard detail as provided in the Appendix.
- J. Manufacturer certification provided.

#### 2.10 Magnetic Marking Tape

- A. Manufacture-Designed as three-layer sandwich, with a layer of foil encased between two layers of plastic. Consists of a nominal 5 mil (0.005”) overall thickness construction, with no less than a 35 gauge (0.00035”) solid aluminum foil core. The foil must be visible from both sides. No inks for printing extend to the edges of the tape. All printing is encased to avoid ink rub-off. Tape is specified and supplied in accordance with the APWA National Color Code.
- B. Test Data
  - 1. Thickness ASTM D2103 5 mils nominal
  - 2. Tensile Strength ASTM D-882 22lbs/in width (4400 psi)
  - 3. Elongation ASTM D-882 50% at break
  - 4. Printability ASTM D2578 > dynes/cm<sup>2</sup>
- C. Tape Size and Labeling-All pipe less than 12” will require using a 2” Magnetic tape, meeting the above requirements. All pipe larger than 12” will require using a 6” Magnetic tape, meeting the above requirements. All tape should be blue in color and labeled, “Caution Waterline Below.”
- D. Manufacturer-Empire & IN STOCK NOW

### **PART 3 – EXECUTION**

#### 3.01 MATERIALS & METHODS

- A. All pipe, fittings, valves, hydrants, and accessories shall be loaded and unloaded by lifting with hoists or skidding in order to avoid shock or damage. Under no circumstances shall such material be dropped. Pipe handles on skidways shall not be rolled or skidded against other pipe. When loading or unloading pipe proper safety procedures shall be observed. Slings, hooks, or pipe tongs shall be padded and used in such manner as to prevent damage to the exterior surface of internal lining of the pipe fitting, or related product.
- B. If stored, materials shall be kept safe from damage. The interior of all pipe, fittings, and other appurtenances shall be kept free from dirt or foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage by freezing. Gaskets shall be stored in a cool location, out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis. Mechanical joint bolts shall be handled and stored in a dry location in a manner that will ensure proper use with respect to types and sizes.
- C. The water mains shall be laid and maintained to lines and grades established by the plans and specifications for the project. Fittings, valves, tapped or bossed outlets, and hydrants must be installed at the required locations unless field conditions warrant

otherwise, and such changes are approved in accordance with the specifications. Hydrants shall be installed plumb.

- D. The trench shall be excavated to the required alignment, depth, and width specified or shown on the plans and shall be in conformance with all federal, state or provincial, and local regulations for the protection of the workers. Trench preparation shall proceed in advance of pipe installation for only as stated in the specifications. Discharges from trench dewatering pumps shall be directed away from the trench as not to affect stability, and shall be in accordance with federal, state, and local point-discharge requirements. Excavated materials shall be placed in a manner that will not obstruct the work nor endanger the workers or the public.
- E. The width of the trench at the top of the pipe shall be the same as that afforded by the single-pass capabilities of normally available excavating equipment. The width shall be ample to permit the pipe to be laid and joined properly and to allow the backfill to be placed in accordance with the specifications. If installing ductile iron pipe holes for the bells shall be provided at each joint, but shall be no larger than necessary to allow joint assembly and to ensure that the pipe barrel will lie flat on the trench bottom. The dimensions of bell-hole depressions for push-on-type joints only need to be large enough to ensure that the pipe is not resting on the bells and is supported by the full length of the pipe barrel. As an alternative to digging bell holes the contractor can lay the ductile iron pipe on 4" of crushed stone. Other than noted previously, the trench bottom shall be true and even to provide support for the full length of the pipe barrel, except that a slight depression may be provided to allow withdrawal of pipe slings or other lifting tackle without damaging the coating.
- F. When excavation of rock is necessary, all rock shall be removed to provide a clearance below and on each side of all pipe, valves, and fittings of at least 6 inches for normal pipe sizes twenty-four (24) inches or smaller and nine (9) inches for normal pipe sizes thirty (30) inches and larger. When excavation is completed, a layer of appropriate backfill material shall be placed on the bottom of the trench to the previously mentioned depths, leveled, and tamped. These clearances and bedding procedures shall also be observed for pieces of concrete or masonry and other debris or subterranean structures, such as masonry walls, piers, or foundations, that may be encountered during excavation. This installation procedure shall be followed when gravel formations containing loose boulders greater than approximately 8 inches in diameter are encountered. In all cases, the specified clearances shall be maintained between the bottom of all pipe and appurtenances and any part, projection, or point of rock, boulder, or stone of sufficient size and placement that could cause a fulcrum point or point load.
- G. If the trenches pass over a sewer or other previous excavation, the trench bottom shall be sufficiently compacted to provide support equal to that of the native soil or conform to other regulatory requirements in a manner that will prevent damage to the existing installation.
- H. Blasting for excavation shall be permitted only after securing approval(s) and establishing the hours of blasting as required by the specifications. The blasting procedure, including protection of persons and property, shall be in strict accordance with federal, state, or local regulations.

- I. Temporary support, adequate protection, and maintenance of all underground and surface structures, drains, sewers, and other obstructions encountered in the progress of the work shall be provided in accordance with specifications or applicable regulations. All properties that have been disturbed shall be restored as completely as practical to their original condition.
- J. When the subgrade is found to include ashes, cinders, refuse, organic material, or other unsuitable material, such material shall be removed to a minimum of at least six (6) inches below the bottom of the pipe or to the depth required by the specifications. The removed materials shall be replaced with clean, stable backfill.
- K. Proper implements, tools, and facilities shall be provided and used for the safe and convenient performance of the work. All pipe, fittings, valves, and hydrants shall be lowered carefully into the trench by means of a backhoe, a crane, ropes, or other suitable tools or equipment, in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench. Where practical the trench shall be dewatered prior to installation of the pipe.
- L. All pipe, fittings, valves, hydrants, and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and removed from the job. All lumps, blisters, and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and be free from dirt, sand, grit, or any foreign material before the pipe is laid.
- M. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing, or other material shall be placed in the pipe at any time.
- N. It is common practice to lay pipe with the bells facing the direction in which work is progressing; however, it is not mandatory. For example, when the main is being laid on a slope, the pipe is frequently laid with the bells facing uphill for ease of installation. The direction of the bells is not functionally related to the direction of flow within the main.
- O. When pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means as specified. The plug shall be fitted with a means for venting. When practical, the plug shall remain in place until the trench is pumped completely dry. Care must be taken to prevent pipe flotation, if the trench fills with water. Prior to removal of the plug for extending the line or for any other reason, air and/or water pressure in the line shall be released.
- P. Buried pipe joints may be either push-on joints or mechanical joints. When it is necessary to deflect pipe from a straight line in either the horizontal or vertical plane, the amount of joint deflection shall not exceed the amounts as shown in the two tables given below:

Maximum joint deflection full-length pipe- push-on-type-joint pipe:

Nominal Pipe Size (degree)	Deflection Angle (in)	Maximum Offset – inches L=18 ft L=20 ft			Approx. Radius of Curve Produced by Succession of Jts. L=18 ft L=20 ft	
		(inches)	(inches)	(feet)	(feet)	(feet)
3	5	19	21		205	230
4	5	19	21		205	230
6	5	19	21		205	230
8	5	19	21		205	230
10	5	19	21		205	230
12	5	19	21		205	230

Maximum joint deflection full-length pipe-mechanical-joint pipe:

Nominal Pipe Size (in)	Deflection Angle (deg. & min.)	Maximum Offset – inches L=18 ft L=20 ft			Approx. Radius of Curve Produced by Succession of Jts. L=18 ft L=20 ft	
		(inches)	(inches)	(feet)	(feet)	(feet)
3	8-18	31	35		125	140
4	8-18	31	35		125	140
6	7-07	27	30		145	160
8	5-21	20	22		195	220
10	5-21	20	22		195	220
12	5-21	20	22		195	220

3.02: Joint Assembly

A. Push-on joints: Push-on joints shall be assembled as follows:

1. Thoroughly clean the groove and the bell socket of the pipe or fitting; also clean the plain end of the mating pipe. Using a gasket of the proper design for the joint to be assembled, make a small loop in the gasket and insert it in the socket, making sure the gasket faces the correct direction and that it is properly seated. (Note: in cold weather, it is necessary to warm the gasket to facilitate insertion.)
2. Apply lubricant to the gasket and plain end of the pipe in accordance with the manufacturer's recommendations. Lubricant is furnished in sterile containers, and every effort should be made to protect against contamination of the container's contents. In some cases, manufacturer's recommendations on joint lubrication require that the gasket groove not be lubricated; in others, lubrication of the groove is necessary. It is important to follow the pipe manufacturer's instructions.
3. Be sure that the plain end is beveled; square or sharp edges may damage or dislodge the gasket and cause a leak. When pipe is cut in the field, bevel the plain end with heavy file or grinder to remove all sharp edges. Push the plain end into the bell of the pipe. Keep the joint straight while pushing. Make deflection after the joint is assembled.

4. Small pipe can be pushed into the bell socket with a long bar. Large pipe requires additional power, such as a jack, lever puller, or backhoe. The supplier may provide a jack or lever puller on a rental basis. A timber header should be used between the pipe and jack or backhoe bucket to avoid damage to the pipe

B. Mechanical Joint Pipe: Mechanical joints shall be assembled as follows:

1. Clean the socket and plain end. Lubrication and additional cleaning should be provided by brushing both the gasket and plain end with soapy water or an approved pipe lubricant meeting the requirements of ANSI/AWWA C111-00/A21.11, just prior to slipping the gasket onto the plain end for joint assembly. Place the gland on the plain end with the lip extension toward the plain end, followed by the gasket with the narrow edge of the gasket toward the plain end.
2. Insert the pipe into the socket and press the gasket firmly and evenly into the gasket recess. Keep the joint straight during assembly.
9. Push the gland toward the socket and center it around the pipe with the gland lip against the gasket. Insert bolts and hand tighten nuts. Make deflection after joint assembly but before tightening bolts.
10. Tighten the bolts to the normal range of bolt torque as recommended by the manufacturer while at all times maintaining approximately the same distance between the glands and the face of the flange at all points around the socket. This can be accomplished by partially tightening the bottom bolt first, then the top bolt, next the bolts at either side, finally the remaining bolts. Repeat the process until all bolts are within the appropriate range of torque. This use of a torque-indicating wrench will facilitate this procedure.

When it is necessary to deflect pipe from a straight line in either the horizontal or vertical plane, the amount of joint deflection shall not exceed that shown in the above two tables.

Existing gray-iron pipe may be cut using a hydraulic squeeze cutter, abrasive pipe saw, rotary wheelcutter, guillotine pipe saw, or milling wheel saw.

Ductile-iron pipe may be cut using an abrasive pipe saw, rotary wheel cutter, guillotine pipe saw, milling wheelsaw, or oxyacetylene torch if recommended by the pipe manufacturer.

Cut ends and rough edges shall be ground smooth, and, for push-on joint connections, the cut end shall be beveled by methods recommended by the manufacturer.

### 3.03 VALVE AND FITTING INSTALLATION

Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure-containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces, handling damage, and cracks. A visual inspection of the bronze gate rings and body rings should be performed to detect any damage in shipment or scoring of the seating surfaces. Inspection personnel should look for bent stems, broken handwheels, cracked part, loose bolts, missing parts and

accessories, and any other evidence of mishandling during shipment. Each valve should be cycled through one complete opening-and-closing cycle in the position in which it is to be installed. Defective valves shall be marked and removed from the job site. All bolts and nuts, with the exception of seat adjusting bolts or screws in butterfly valves, shall be checked for proper tightness. Seat adjusting bolts in butterfly valves shall only be adjusted on recommendation from the manufacturer.

Valves should be stored in the fully closed position to prevent entry of foreign material that could cause damage to the seating surfaces. Whenever practical, valves should be stored indoors. If outside storage is required, means should be provided to protect operating mechanisms, such as gears, motor, actuators, and cylinders, from weather elements. During outside storage, valves should be protected from the weather, sunlight, ozone, and foreign material. In colder climates, where valves may be subject to freezing temperatures, it is absolutely essential to remove water from the valve interior and close the gates tightly before storage. Failure to do so may result in a cracked valve casting. Valves in outside storage in cold climates should be stored with the discs in a vertical position. If the discs are in a horizontal flat position, rainwater can accumulate on top of the disc seep into the valve body cavity, and freeze and crack the casting.

Valves, fittings, plugs, and caps shall be set and joined to the pipe in the manner specified for cleaning and laying and joining pipe, except that 12-inch and larger valves should be provided with special support, such as treated timbers or concrete pads, to support the weight of the valve. Before being buried, the valve box base shall be wrapped with plastic sheeting or filter fabric to keep dirt and stone from infiltrating the valve box. Valves installed above ground or in plant piping systems shall be supported to prevent bending of the valve connections as a result of pipe loading. Valves shall be installed in the closed position.

A valve box or a vault shall be provided for every valve. A valve box shall be provided for every valve that has no gearing or operating mechanism or in which the gearing or operating mechanism is fully protected with a gear case. The valve box shall not transmit shock or stress to the valve. The valve box shall be of the three-piece design (not counting the lid) so that the bottom of the box will fit over the pipe.

All dead ends on new mains shall be closed with plugs or caps that are suitably restrained to prevent blowing off under test pressure. All dead ends shall be equipped with a suitable blowoff or venting device.

### 3.02 HYDRANT INSTALLATION

- A. All fire hydrants shall be dry barrel American-Darling B-62-B or equivalent. All hydrants shall be of the traffic type. Hydrants shall “open left” (counterclockwise). The hydrant shall have two 2-1/4 inch hose connections and one 4-1/2 inch steamer connection. Fire hydrants provided shall have 5-1/4 inch valve openings. All threads shall be male hose threads. The opening nuts shall be pentagonal in shape. The pentagon shall measure 1-1/2 inches from point to flat at the base of the operating nut and 1-1/16 inch at the top; faces shall be tapered uniformly, and the height of the operating nut shall not be less than 1 inch. The point-to-flat dimension shall be measured to the theoretical point where the faces would intersect if the corners were not rounded off. The hydrant shall connect to hydrant lead with a mechanical joint. All fire hydrant connecting lines shall be 6” in diameter. All ferrous metal parts of the



hydrant, inside and outside, shall be thoroughly cleaned before coating. Coatings used on interior surfaces of the hydrant that are in contact with water shall be suitable for contact with drinking water. A second coat of compatible paint or primer shall be applied. All barrels are to be painted chrome yellow. Tops and nozzle caps of hydrants in the classes outlined below shall be painted the color indicated:

Class AA: (Individual test flow capacity of 1,500 gpm or greater.) Color- light blue.  
Class A: (Individual test have flow capacity of 1,000 to 1,499 gpm.) Color – green.  
Class B: (Individual test have a flow capacity of 500 to 999 gpm.) Color – orange  
Class C: (Individual test have a flow capacity of less than 500 gpm.) Color – red

All exterior ferrous surfaces below the ground line shall be covered with two coats of asphaltic coating; the first being allowed to dry thoroughly before the second is applied. All interior ferrous surfaces, except machined surfaces, such as the threaded portion of the stem or nut, that must fit closely with the adjacent parts, shall be coated with asphaltic coating, primer, or its equivalent.

Prior to installation, all hydrants shall be inspected for direction of opening, nozzle threading, operating-nut and cap-nut dimensions, tightness of pressure-containing bolting, cleanliness of inlet elbow, handling damage, and cracks. Defective hydrants shall be marked and removed from the project area. All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the curb, with pumper nozzle facing the curb, except that hydrants having two-hose nozzles 90° apart shall be set with each nozzle facing the curb at an angle of 45°. Hydrants shall be set to the grade shown on the plans. The lowest nozzle shall be at least 12 inches above the ground or as required by the specifications. The lowest nozzle shall be installed away from the curb line at a sufficient distance to avoid damage from or to vehicles. Traffic-model hydrants shall be installed so that the breakaway flange is not less than 2 inches, nor more than 6 inches above the established grade.

Each hydrant shall be connected to the main with a 6-inch diameter branch controlled by an independent valve, unless otherwise specified. The valve shall be restrained to allow shutoff when the hydrant is to be removed.

When a dry-barrel hydrant is set in soil that is impervious, drainage shall be provided at the base of the hydrant by placing coarse gravel or crushed stone mixed with coarse sand from the bottom of the trench to at least 6 inches above the drain-port opening in the hydrant and to a distance of 1 foot around the elbow. Where groundwater rises above the drain port or when the hydrant is located within 10 foot of a sanitary sewer main, or where drainage is not permitted, the drain port shall be plugged and water pumped from the hydrant when freezing may occur.

When a dry-barrel hydrants with an open drain port is set in clay or other impervious soil, a drainage pit 2 ft X 2 ft X 2 ft shall be excavated below each hydrant. The drainage pit shall be filled with coarse gravel or crushed stone mixed with coarse sand under and around the elbow of the hydrant and to a level of 6 inches above the drain port. To prevent possible contamination of the water supply, do not connect hydrant drains to a sanitary or storm sewer.

In the case of hydrants that are intended to fail at the ground-line joint on vehicle impact traffic hydrants), specific care must be taken to provide adequate soil resistance

to avoid transmitting shock moment to the lower barrel and inlet connection. In loose or poor load bearing soil, this may be accomplished by pouring a concrete collar approximately 6 inches thick to a diameter of two feet at or near the ground line around the hydrant barrel.

A. Thrust Restraint

The bowl of each hydrant shall be well braced against a sufficient area of unexcavated earth at the end of the trench with thrust blocks of concrete or as preferred it shall be tied to the pipe with metal tie rods, clamps, or restrained joints, as shown on the plans or as specified. All plugs, caps, tees, reducers, and bends, unless otherwise specified, shall be provided with thrust blocks or suitably restrained joints, as shown on the plans or as specified.

<u>Pipe Size (in)</u>	<u>Total Surface 90° Elbow</u>	<u>Area of 45° Elbow</u>	<u>Thrust Backing Required Valves, Tees &amp; Dead Ends</u>
2"	1.0 sq.ft.	1.0 sq.ft.	1.0 sq.ft.
6"	5.5 sq.ft.	3.0 sq.ft.	4.0 sq.ft.
8"	9.5 sq.ft.	5.0 sq.ft.	6.5 sq.ft.
10"	14.0 sq.ft.	7.6 sq.ft.	11.0 sq.ft.

3.03 SERVICE TAPS

A. Ductile Iron Pipe

Corporation stops may be installed either before or after pipe installation. Generally, they are located at ten o'clock or two o'clock on the circumference of the pipe and may be screwed directly into the tapped and threaded main without any additional appurtenances. In cold climates with deep frost penetration, freezing of horizontally at the three o'clock or nine o'clock position on the pipe circumference is preferred. When more than one tap is necessary to deliver the required flow the taps should be staggered around the circumference at least 12 inches apart. The torque requirement for the installation may be effectively reduced by the application of two layers of 3-mil pipe-thread sealant tape to the male threads of the corporation stop.

B. PVC Pipe

PVC pipe is not allowed for installation of new water mains. When PVC pipe may exist in the water system, all service connections made to PVC pipe will be made with a service saddle. Direct tapping of PVC mains will not be allowed.

All water service connections shall be made using corporation valves and curb valves which conform to AWWA C800. All curb valves shall be installed in two-piece valve boxes (not including the lid).

### C. HDPE Pipe

HDPE pipe is not allowed for installation of new water mains. When HDPE exists in the water system, all service connections made to HDPE pipe will be made with fusion methods and fittings in accordance with Manufacturer's recommendations and guidelines. Testing of all HDPE connections will be done in accordance with these specifications.

All water service connections shall be made using corporation valves and curb valves which conform to AWWA C800. All curb valves shall be installed in three-piece valve boxes (not including the lid).

### 3.05 SERVICE LINES

The portion of the service line that is between the water main and the curb box will be type K copper. All underground service line valves and fittings shall be in conformance with AWWA C800. All service lines 3/4" through 2" shall be type K soft copper tubing. Service lines shall be installed at a right angle to main, no more than one line per trench and hand backfilled.

Service connections that require fire suppression systems shall be split into separate domestic and fire service lines at the meter box. Detail 14 shall be referenced when providing this type of service.

#### A. Copper Service Lines:

Copper Service Line shall be seamless copper tubing suitable for underground water services. The copper tube shall be type K. The copper tubing shall be in conformance with the following table:

Nominal Or Standard Size (in)	Outside Nominal Dia. (in)	Nominal Wall Thickness Type K(inch)		Theoretical Weight-lb/ft Type K
		Wall Thickness	Tolerance	
1/4	0.375	0.035	0.004	0.145
3/8	0.500	0.049	0.004	0.269
1/2	0.625	0.049	0.004	0.344
5/8	0.750	0.049	0.004	0.418
3/4	0.875	0.065	0.0045	0.641
1	1.125	0.065	0.0045	0.839
1-1/4	1.375	0.065	0.0045	1.04
1-1/2	1.625	0.072	0.005	1.36
2	2.125	0.083	0.007	2.06

**END OF SECTION**

(Revised April 2011)

## **DIVISION 2 – SITEWORK**

### **SECTION 02592 – TESTING & DISINFECTION**

#### **PART 1 – GENERAL**

##### **1.01 SCOPE OF WORK**

- A. This section of the specifications consists of pressure testing and disinfecting the pipe installed under this contract prior to it being put into service.

##### **1.02 SUBMITTALS**

- A. Laboratory reports indicating that bacteriological testing as specified in AWWA Designation C-651 was completed and that no evidence of bacteria remained shall be submitted.

#### **PART 2 – PRODUCTS**

- A. Chemicals used for disinfection shall meet AWWA Standards for disinfecting agents for this use.

#### **PART 3 – EXECUTION**

##### **3.01 PIPE DISINFECTION**

- A. Before being placed into service, all new water lines or extensions to the existing system shall be thoroughly flushed and disinfected. Any disinfection method which conforms with AWWA Standard C651-92 for disinfecting water mains can be used. The most common method for disinfecting short extensions up to 2500 feet of 12 inch and smaller diameter mains is with calcium hypochlorite tablets at a dosage rate of 50 mg/l. This method may be used only if the pipes and appurtenances are kept clean and dry during construction.

##### **B. BASIC DISINFECTION PROCEDURE**

The basic disinfection procedure consists of:

1. Preventing contaminating materials from entering the water main during storage, construction, or repair.
2. Removing, by flushing or other means, those materials that may have entered the water main.
3. Chlorinating any residual contamination that may remain, and flushing the chlorinated water from the main.
4. Protecting the existing distribution system from backflow due to hydrostatic pressure test and disinfection procedures.
5. Determining the bacteriological quality by laboratory test after disinfection.

Number of 5-g Calcium Hypochlorite Tablets Required for Dose of 25 mg/l

(Based on 3.25g available chlorine per Tablet; any portion of tablet rounded to the next higher integer)

Pipe Dia. (in.)	Length of Pipe Section, ft					
	13 or less	18	20	30	40	
4	1	1	1	1	1	1
6	1	1	1	1	2	2
8	1	2	2	2	3	4
10	2	3	3	3	4	5
12	3	4	4	4	6	7
16	4	6	7	10	10	13

- C. The tablet method consists of placing calcium hypochlorite granules or tablets in the water main as it is being installed and then filling the main with potable water when installation is completed. During construction, 5-g calcium hypochlorite tablets shall be placed in each section of pipe. Also, one such tablet shall be placed in each hydrant, hydrant branch, and other appurtenance. The number of 5-g tablets required for each pipe section shall be  $0.0012 d^2L$  rounded to the next higher integer, where  $d$  is the inside pipe diameter, in inches, and  $L$  is the length of pipe section, in feet. The tablets shall be attached by a food-grade adhesive. Attach all tablets inside and at the top of the main, with approximately equal numbers of tablets at each end of a given pipe length. If the tablets are attached before the pipe section is placed in the trench, their position shall be marked on the section so it can be readily determined that the pipe is installed with the tablets at the top.

When installation has been completed, the main shall be filled with water at rate such that water within the main will flow at a velocity no greater than 1 ft/s. Precautions shall be taken to ensure that air pockets are eliminated. This water shall remain in the pipe for at least 24 hours. If the water temperature is less than 41°F, the water shall remain in the pipe for at least 48 hours.

D. FINAL FLUSHING

After the applicable retention period, heavily chlorinated water should not remain in prolonged contact with the pipe. In order to prevent damage to the pipe the heavily chlorinated water shall be flushed from the main until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the distribution system or is acceptable for domestic use. The environment into which the chlorinated water is to be discharged should be inspected. If there is any possibility that the chlorinated discharge will cause damage to the environment, then a neutralizing chemical shall be applied to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water. Where necessary, federal, state, provincial, and regulatory agencies should be contacted to determine the provisions for the disposal of heavily chlorinated water.

Amounts of Chemicals Required to Neutralize Various Residual Chlorine Concentrations in 100,000 gallons of water.

Chemical Required:

<u>Residual Chlorine</u>	<u>Sulfur Dioxide</u>	<u>Sodium Bisulfite</u>	<u>Sodium Sulfite</u>	<u>Sodium Thiosulfate</u>
Concentration Mg/l	(SO <sub>2</sub> ) lb	(NaHSO <sub>3</sub> ) lb	(Na <sub>2</sub> SO <sub>3</sub> ) lb	(Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> 5H <sub>2</sub> O) lb
1	0.8	1.2	1.4	1.2
2	1.7	2.5	2.9	2.4
10	8.3	12.5	14.6	12.0
50	41.7	62.6	73.0	60.0

D. BACTERIAL TESTS

After final flushing and before the new water is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the new main. At least one sample shall be collected from every 1200 feet of the new main, plus one set from the end of the line and at least one set from each branch. All samples shall be tested for bacteriological quality in accordance with Standard Methods for the Examination of water and wastewater, and shall show the absence of coliform organisms.

E. SAMPLING PROCEDURE

Sampling for bacteriological analysis shall be collected in sterile bottles treated with sodium thiosulfate as required by *Standard Methods for the Examination of Water and Wastewater*. No hose or fire hydrant shall be used in the collection of samples.

F. REDISINFECTION

If the initial disinfection fails to produce satisfactory bacteriological results, the new main may be reflushed and shall be resampled. If check samples also fail to produce acceptable results, the main shall be rechlorinated by the continuous-feed or slug method of chlorination until satisfactory results are obtained.

G. PREVENTATIVE AND CORRECTIVE MEASURES DURING CONSTRUCTION

Heavy particles generally contain bacteria and prevent even very high chlorine concentrations from contacting and killing such organisms. It is, therefore, essential that the procedures of this section be observed to assure that a water main and its appurtenances are thoroughly clean for the final disinfection by chlorination. Also, any connection of new water main to the active distribution system prior to receipt of satisfactory bacteriological samples may constitute a cross-connection.

Precautions shall be taken to protect the interiors of pipes, fittings, and valves against contamination. Pipe delivered for construction shall be strung so as to minimize the entrance of foreign material. All openings in the pipeline shall be closed with watertight plugs when pipe laying is stopped at the close of the day's work or for break

periods. Rodent-proof plugs may be used when it is determined that watertight plugs are not practicable and when through cleaning will be performed by flushing or other means. The more closely the rate of delivery is correlated to the rate of pipe laying, the lower the risk of contamination. Joints of all pipe in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dry.

If dirt enters the pipe, it shall be removed and the interior pipe surface swabbed with a 1 percent hypochlorite disinfecting solution. If, in the opinion of the purchaser the dirt remaining in the pipe will not be removed by the flushing operation, then the interior of the pipe shall be cleaned by mechanical means such as a hydraulically propelled foam pig in conjunction with the application of a 1 percent hypochlorite disinfecting solution to the interior pipe surface. If the main is flooded during construction, it shall be cleared of the floodwater by draining and flushing with potable water until the main is clean. The section exposed to the floodwater shall then be filled with chlorinated potable water that, at the end of a 24-hour holding period, will have a free chlorine residual of not less than 25 mg/l. The chlorinated water may then be drained or flushed from the main. After construction is completed, the main shall be disinfected using the continuous feed method.

#### H. FINAL CONNECTIONS TO EXISTING MAINS

Water mains and appurtenances must be completely installed, flushed, disinfected, and satisfactorily bacteriologically sampled prior to permanent connections being made to the active distribution system. Sanitary construction practices must be followed during installation of the final connection, so that there is not contamination of the new or existing water main with foreign material or groundwater.

Connections Equal to or Less than one pipe length (less than or equal to 18')

As an optional procedure, the new pipe and valve required for the connection may be spray disinfected or swabbed with a minimum 1 percent solution of chlorine just prior to being installed. If the length of connection from the end of a new main to the existing main is equal to or less than 18'.

Connections Greater than one pipe length (greater than 18')

As an optional procedure, the pipe required for connection must be setup above ground, disinfected and bacteriological samples taken, as described previously, if the total length of connection from the end of a new main to the existing main is greater than 18'. After satisfactory bacteriological sample results have been received for this "pre-disinfected" pipe, the pipe can be used in connecting the new main to the active distribution system. Between the time that satisfactory bacteriological sample results are received and the time that the connection piping is installed, the ends of this piping must be sealed with plastic wraps or watertight plugs or caps.

#### I. HYDROSTATIC TESTING

1. All joints in the pipe lines shall be subject to pressure tests of 50 pounds in excess of what the static pressure at the points of reading will be when the system has been put onto operation.

2. Before applying the specified test pressure air shall be expelled completely from the section of piping under test.
3. All pipe shall be tested for a minimum of two hours with a pressure change not to exceed 5 psi of the specified test pressure. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air expelled. Allowable leakage is defined by the following formula:

$$L = \frac{NDP}{7400}$$

L = Allowable leakage (gal/hr)  
 N = Number of Joints in Tested Section  
 D = Nominal Diameter of Pipe (in)  
 P = Average Test Pressure (psig)

Leakage Allowable (Gallons per 1000 Ft (50 Joints)/Hr.)

Pipe Size (inches)	Test Pressure (psi)				
	50	100	150	200	250
4	.19	.27	.33	.38	.43
6	.29	.41	.50	.57	.64
8	.38	.54	.66	.76	.85
10	.48	.68	.83	.96	1.07
12	.57	.81	.99	1.15	1.28



**DIVISION 2 - SITEWORK**  
**SECTION 02710 - VALVE VAULTS**

**PART 1 - GENERAL**

1.01 RELATED WORK

- A. Related Work Specified Elsewhere:
  - 1. Section 02300 - Excavation and Backfill
  - 2. Division 3 - Concrete

1.02 QUALITY ASSURANCE

- A. Source Quality Control: Maintain uniform quality of products and component compatibility by using the products of one manufacturer in the case of precast reinforced manholes.
- B. Obtain certificate of construction compliance with ASTM C478 from the precast reinforced concrete vault manufacturer. Submit same certificate as part of required submittals.
- C. Obtain certificate of material compliance with ASTM A 48, Class 30 tensile strength from the manhole frame and cover manufacturer.

1.03 SUBMITTALS

- A. Submit manufacturer's instructions for installation of adapters and maximum recommended deflection per pipe joint. Submit manufacturer's catalog product information showing dimensions and construction information.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. During loading, transporting and unloading, and storage on site, exercise care to prevent damage to materials.
- B. Transport and handle precast vault components and other products specified herein in a manner recommended by the respective manufacturers of such to prevent damage and defects.
- C. In no instance shall vault bases be set or constructed on subgrade containing frost. To improve workability of "Preformed Plastic Sealing Compound" during cold weather, store such at temperature above 70°F or artificially warm compound in a manner satisfactory to the ENGINEER. During warm weather stiffen "Preformed Plastic Sealing Compound" by placing under cold water or by other means as recommended by compound manufacturer.

**PART 2 - PRODUCTS**

2.01 PRECAST VAULTS:

- A. The vaults shall be constructed of precast reinforced concrete manhole sections or be one independent precast unit as noted on the Drawings. Type II Portland Cement concrete should be used.
- B. The top of the base walls, the ends of reinforced concrete risers and the bottom ends of precast tops shall be so formed that when risers and tops are assembled with the base they will make continuous manhole. Joints shall be of such design as will permit effective joining and placement without irregularities in the interior wall surface of the manhole. All joints shall include rubber or flexible plastic "o" ring gaskets or RamNek flexible plastic gasket.
- C. Vault pipe penetrations shall be made using a manufactured product similar to "A-LOK" gaskets per ASTM C-923 or Lock Joint Flexible Manhole Sleeves. The gaskets must be integrally cast into the vault walls.
- D. Vault Covers and Frames: Unless otherwise shown all casting for vault covers and frames shall be close grained, tough gray iron free from cracks, holes, swells and cold shuts. The quality shall be such that a blow from a hammer will produce an indentation on a rectangular edge of the

casting without flaking the metal. All manhole castings shall be made accurately to the patterns so that specified thicknesses shall not be reduced. All lids which “rock” and are solid after construction is finished will be rejected and shall be replaced by adequate lids. No plugging, burning in, or filling will be allowed. Covers shall fit the frames in any position. Frame covers shall say “WATER”. All castings shall be carefully coated, both inside and out, with coal-tar pitch varnish. The varnish shall be made from a good quality coal-tar shall be applied with a smooth coating, tough and tenacious when cold, and not brittle or with any tendency to scale off.

- E. The vault cover and frame shall be of heavy duty design with machined bearing surfaces and solid lid. The frame and cover shall be designed for a minimum of AASHO HS-20 highway loading. The opening inside diameter shall be twenty-four (24) Inches and the minimum total height shall be seven inches. Weight and dimensional tolerances shall not exceed those permitted by ASTM standards. Frame bases shall have four (4) one-inch diameter holes in it to receive the anchor bolt. A one piece O-ring gasket factory installed in a machined rectangular or dovetail groove in the cover bearing surface. The gasket shall be made of a material of neoprene composition having good abrasion resistance, low compression set, suited for use in sanitary sewer manholes. The manhole cover shall be attached to the precast manhole with 3 / 4” diameter, all thread steel rods with a minimum 2-inch projection through the frame. The all-thread steel rods, washer, and nuts shall be galvanized.
- F. Concrete & Mortar: Concrete for manhole bases shall be 4000 psi concrete.
- G. Preformed Plastic Sealing Compound: Rope Form, of either bitumastic base compound or butyl rubber base compound, and shipped protected in a removable two-piece wrapper. Size cross-section of rope form to provide squeeze-out of material around entire interior and exterior circumference when joint is completed.

### **PART 3 - EXECUTION**

- A. All precast vault components shall be lifted and moved by use of suitable lifting slings and plugs that will not damage the precast vault lip. Any damage which should occur shall be repaired. Repair and patching of minor breaks shall be done by chipping and scarifying the defective area before the application of grout. Sufficient time shall be allowed for curing before the precast sections are put together.
- B. Vaults shall rest upon and be uniformly supported by a four (4) inch maximum mat of compacted screened gravel placed over a base of sound, level, undisturbed earth.
- C. Any vault that is installed to provide access to a pipe or valve shall be installed at locations that will provide adequate drainage. Each of these manholes will be equipped with a drain in the manhole base for piped gravity drainage or have an open bottom which will have approximately 6” of crushed stone placed in the bottom of the manhole.

**END OF SECTION**

## DIVISION 2 – SITEWORK

### SECTION 02712 – WATER METER INSTALLATION

#### PART 1 – GENERAL

##### 1.01 SCOPE OF WORK

- A. This section consists of furnishing and installing all items required for residential water meter installation.
- B. Commercial, industrial, and institutional water meters are to be of the Omni™ Series, as manufactured by Sensus. Commercial, industrial, and institutional meters shall be reviewed and approved on an individual basis by the Authority and/or Engineer. Commercial, industrial, and institutional water meters shall be installed in meter vaults that are designed sufficiently to accommodate design, operation, and maintenance of the meter. Meter vault design shall be reviewed and approved by the Authority and/or Engineer. Property Owner shall be responsible for cost of water meter, meter vault, and installation.
- C. Larger commercial and industrial facilities with a fire protection system will require separate Omni™ Series, as manufactured by Sensus, for the fire line and the domestic water supply line. Touch pad Read-Out(s) to be located at the discretion of the Newville Borough Water and Sewer Authority. See Meter Detail.

#### PART 2 – PRODUCTS

##### 2.01 SINGLE FAMILY RESIDENTIAL METER PRODUCTS

- A. The residential meter will be provided by the Newville Borough Water & Sewer Authority for installation by the Contractor. The current model used by NBWSA is an iPERL™, 5/8” water meter, manufactured by Sensus, and shall be for single-family residential use only.
- B. All water meters will be installed in the interior of a residence/building with an inside meter setting device, except where conditions are noted herein, that allow for the water meter to be installed in a meter pit. All interior water meters shall be installed with meter setting devices such as those provided by Ford Meter Box Company.
- C. Residential Outside Meter Pit Installations /Setting (5/8” water meter to be provided by the Newville Borough Water & Sewer Authority for installation by Contractor) – long water service lines only; long service lines are defined as service lines that are 50 lineal feet or more, in length. All long service lines require the installation of a water meter pit.

##### 1. HDPE Meter Pit:

- a. 18” x 36” Meter Pit constructed of high density polyethylene, as manufactured by Carson Industries, Oldecastle, Inc. Wall thickness of pit must exceed thickness .500. Box must be one piece molded construction, and has to have passed an independent lab test to accept vertical loads in excess of 15,000 lbs. freestanding.
- b. The interior of the Meter Box is a bright, reflective white to make meter reading easier, faster, and more accurate. The exterior of the box is black to inhibit UV degradation

and allow outdoor storage. The interior and exterior walls are smooth with clean, rounded edges for safer and easier handling.

- c. A flange is molded in to the top and bottom of the box. The bottom flange combats settling and sinking in soft soils while providing a stable, even platform for the setting. The top flange provides a wide and even seating surface for the cover, helping to minimize encroachment into the setting.
2. Meter Box Cover (3/4" Service Line/ 5/8" Water Meter):
    - a. Manufacture-Cast Iron, Frost Proof, Locking Nut.
    - b. Lid: Cast Iron 11-1/2", standard size 27/32" Bronze worm lock, Touchread Hole.
    - c. Frame: Cast Iron, inner plastic lid provides 4" of dead air space, 18" Tile size.
    - d. Manufacturer: Ford Meter Box, Model: W32-T.
  3. Meter Setter:
    - a. All brass conforms to AWWA standard C800, No-Lead/NSF 61 certified.
    - b. Inlet – 5/8" angle ball valve.
    - c. Outlet- 5/8" angle cartridge style ASSE Dual Check Valve Accessible Assembly.
    - d. Inlet/outlet connections - 3/4" CTS Grip Joint for Copper service line.
    - e. Height - 18"
    - f. Manufacturer: Ford Meter Box, Model: VBHC271-18W-44-33-G-NL.
    - g. Manufacturer certification required.
    - h. Mount in residence/ house or building unless defined as a long water service line.

### **PART 3 – EXECUTION**

#### **3.01 METER INSTALLATION REQUIREMENTS**

- A. The meter should be located as near as possible to the point of entry of the supply line, to discourage hidden connections ahead of the meter. If the service line is 50 lineal feet or more, it will be necessary to install a water meter in a vault/pit at or near the curb box. This meter will be used for billing purposes.
- B. The meter should be located so that it is safe from freezing and accessible for reading, inspection, and changing.
- C. The meter should be located from two or four feet above the floor, with the dial pointing up. Meters are more accurate in this position.
- D. Valves should be located just ahead of the meter and just after the meter to prevent backflow and pipe drainage during changeouts. **END OF SECTION**

**DIVISION 2 - SITEWORK**  
**SECTION 02950 – RESURFACING AND RESTORATION**

**PART 1 - GENERAL**

1.01 RIGHTS OF THE OWNER

- A. All pavement restoration is part of this project.

**PART II - PRODUCTS**

2.01 MATERIALS

- A. Coarse Aggregate (Penna. Dept. of Transportation No. 2A): Conforming to PADOT Section 703.
- B. Fine Aggregate (Penna. Dept. of Transportation No. 1): Conforming to PADOT Section 703.
- C. Bituminous Tack Coat: Bituminous Tack Coat shall conform to PA DOT Form 408 for material and construction requirements, including all revisions.
- D. Class A Concrete: Conforming to PA DOT Section 704
- E. #2A Modified Aggregate: Conforming to PA DOT Section 703
- F. #2RC Modified Aggregate: Conforming to PA DOT Section 703
- G. Retained Suitable Material: Conforming to PA DOT Section 703
- H. Formula B Mixture: Applied at 2.1 pounds per 100 square yards.

Seed	% by Weight	% Purity	% Germination
Perennial Ryegrass	20	95	90
Pennlawn Red Fescue	30	98	85
Kentucky Blue Grass	50	90	80

- I. Formula D Mixture: Applied at 2.1 pounds per 100 square yards.

Seed	% by Weight	% Purity	% Germination
Kentucky 31 Tall Fescue	80	98	85
Pennlawn Red Fescue	20	98	85

**PART III – EXECUTION**

3.01 PREPARATION

- A. Crushed Aggregate Base Course:
  - 1. After the trench has been backfilled to a depth of 10” below the surface of the street, the Contractor shall fill the trench with a minimum of eight inches (8”) of well-compacted coarse aggregate (PA2A) conforming to the gradations specified in Part II: Materials, of these specifications.
- B. Temporary Resurfacing:
  - 1. After the eight inches (8”) of crushed Aggregate Base Course has been placed, the final two inches (2”) shall be filled with an asphaltic hot mix, as shown on the Construction Details, to the level of the original street surface.
  - 2. This resurfacing shall be well compacted with a ten-ton roller and must be started within 48 hours after the trench has been backfilled.
  - 3. Cold patch may be used during the winter months when asphaltic hot mix is not available at the batch plant, or as determined by the OWNER / OWNER REPRESENTATIVE.
- C. Settlement Period:
  - 1. For a period of not less than three months, unless otherwise directed by the OWNER, the Contractor shall maintain the coarse aggregate base course and temporary resurfacing, in a condition adequate for traffic, and replace any settlement of the trench with additional crushed stone and/or temporary resurfacing.

2. The time fixed in the contract for the completion of the contract shall be interpreted to mean the completion of the construction, including the crushed aggregate base course and temporary resurfacing but excluding the permanent resurfacing.
  3. The Contractor shall pay all claims for damages arising from his / her neglect to properly maintain the backfilled and resurfaced trench.
- D. Permanent Resurfacing of Roadways Other Than State Roadways
1. At the expiration of the three-month period, unless otherwise directed by the OWNER, the temporary resurfacing shall be removed and the coarse aggregate rolled and compacted to a depth of 4.5" below the finished surface and a 3" bituminous binder course, ID-2 and 1.5" bituminous wearing course, ID-2, conforming to the PA DOT Specifications Form 408, shall be applied.
  2. When permanent resurfacing is made, the Contractor shall be responsible for failure of the highway surface during a period of one year following acceptance of the permanent resurfacing.
  3. All edges of existing roadway surface that are disturbed during construction shall be cut or sawed in a straight line. Cutting of edges and tacking of vertical surfaces shall have been done prior to placing of the wearing surface and shall be as the OWNER / OWNER REPRESENTATIVE directs.
  4. All seams shall be sealed with AC-20 or equal, in accordance with PennDOT Specification Form 408.
  5. All replaced areas shall be compacted by the use of a ten-ton roller or vibrating compacting equipment giving the equivalent compaction of a ten-ton roller.
- E. Permanent Resurfacing (PennDOT Highways)
1. All pavement restoration of PennDOT streets shall be in accordance with the included PennDOT Permit. At the expiration of the three-month period, unless otherwise directed by the OWNER, the temporary resurfacing shall be removed and the pavement cut back 1-foot. The coarse aggregate shall be rolled and compacted to a depth of 6.5" below the finished surface. Place and compact 5" BCBC, and overlay with 1.5" bituminous wearing course, ID-2 SRL-6, conforming to the PA DOT Specifications Form 408, shall be applied. Joints shall be sealed with AC-20.
  2. When permanent resurfacing is made, the Contractor shall be responsible for failure of the highway surface during a period of one year following acceptance of the permanent resurfacing, unless a longer period is required by the PennDOT Permit.
  3. All edges of existing roadway surface that are disturbed during construction shall be cut or sawed in a straight line. Cutting of edges and tacking of vertical surfaces shall have been done prior to placing of the wearing surface and shall be as the OWNER / OWNER REPRESENTATIVE directs.
  4. All seams shall be sealed with AC-20 or equal, in accordance with PennDOT Specification Form 408.
  5. All replaced areas shall be compacted by the use of a ten-ton roller or compacting equipment giving the equivalent compaction of a ten-ton roller.

### 3.02 MISCELLANEOUS ITEMS

#### A. Paint Identification:

1. Upon completion of temporary and permanent resurfacing, the resurfacing date shall be painted on the pavement immediately adjacent to the cut.
2. The painted date shall indicate the month and year numerically.
3. The numerals shall be at least six inches in height.
4. The paint shall be of a durable wearing quality and shall be green in color.

### 3.03 LANDSCAPING

- A. The Contractor shall grade and seed all disturbed areas and other adjacent areas that have been damaged, compacted, or otherwise disturbed during construction.
- B. All work to be performed by qualified landscape workpeople approved by the OWNER / OWNER REPRESENTATIVE.
- C. All disturbed areas to be replaced to a condition similar to the condition that existed prior to the initial construction.
- D. Payment for all restoration work to be included in the unit price for pipe.
- E. Topsoil:
  - 1. The Contractor shall obtain topsoil from a location where the quality of the soil has proven ability to grow crops.
  - 2. The topsoil shall contain no less than 2% nor more than 10% organic matter as determined by AASHTO Designation T194.
  - 3. The source of supply, quality, depth, and method of removal shall be approved by the OWNER / OWNER REPRESENTATIVE.
  - 4. Payment for the required topsoil shall be included in the unit price for pipe.
- F. Seeding:

All seed shall conform to the Pennsylvania Seed Act of 1965 and the regulations of the Pennsylvania Department of Agriculture, Bureau Plant Industry.
- G. Fertilizer:
  - 1. The topsoil and fertilizer shall be mixed to a depth of two inches and applied at a rate of 20 pounds per 100 square yards.
  - 2. Commercial fertilizers shall be in accordance with the requirements of the Pennsylvania Fertilizer Act of 1965 and shall be 10-20-20 in conformance with the standard designation.
- H. Pulverized Limestone:
  - 1. Pulverized limestone shall conform to the requirements of the Pennsylvania Agriculture Lime Act of 1961 and meet the Specification No. 1-36 for Group 1, Class B, Type MO.
  - 2. The lime shall be mixed with topsoil to a depth of 2 inches.
  - 3. Lime shall be applied at a rate of 80 pounds per 100 square yards.
- I. Maintenance of Unpaved Areas:
  - 1. The Contractor shall be responsible for establishing a complete cover of growth and shall resod, reseed, or apply additional lime and fertilizer so as to establish good coverage.
  - 2. The Contractor shall correct any settlement and rutting that may occur by regrading, reseeding, or resodding.
  - 3. All unimproved areas such as woods, pastures, unused field, unopen streets, and creek banks shall have all construction material and excess dirt removed and left in a smooth graded condition.
    - a. The backfill shall be mounded over the trench.
    - b. The excavated material shall be graded and shaped before loosening to a depth of at least 2" by plowing, discing, or harrowing.
    - c. All stones or debris over 6" in any dimension shall be removed and then reseeded with Formula B or D.
  - 4. All improved areas such as lawns shall be prepared as specified for the unimproved areas with the exception that the backfill shall not be humped and will flush with the surrounding area.
    - a. Any debris, such as sticks and stones, greater than 2 inches in any dimension shall be removed.
    - b. The Contractor shall stockpile the existing topsoil and supplement as necessary or supply new topsoil in sufficient quantity to provide 4 inches of topsoil.
    - c. After tilling, fertilizer and lime shall be applied and Formula B mixture.
    - d. Within 48 hours of seeding, the area shall be covered with mulch at a rate of 2-1/2 tons per acre in order to provide a uniform continuous blanket.

- e. After grass has been established, the Contractor shall remove excess mulch.
5. Unimproved Roads:
- a. After the trench has been backfilled to a depth of six inches below the surface of the road, the Contractor shall fill the remaining six inches with well-compacted coarse aggregate choked with fine aggregate meeting the requirements under “Crushed Aggregate Base Course”

**END OF SECTION**



**DIVISION 3 - CONCRETE**  
**SECTION 03300 - CAST-IN-PLACE CONCRETE**

**PART 1 - GENERAL**

1.01 SCOPE OF WORK

- A. This section consists of furnishing and placing Portland Cement Concrete of the strength and to the dimensions shown on the plans, or as specified. This includes materials, mixing, proportioning, sampling, testing, placing, finishing, and curing of all plain and reinforced cast-in-place, normal-weight concrete.
- B. It is the intent of this Specification to secure, for every part of the work, concrete of homogeneous composition which, when cured, will exhibit the required strength, durability, and resistance to weathering. Laboratory testing is required in order to determine compliance with specified strengths.
- C. Elements of the work are shown on the drawings.

1.02 QUALITY ASSURANCE

- A. Materials and work shall conform to the requirements of all standards, codes and recommended practices listed below. In conflicts between standards, or required standards and this Specification, the more stringent requirements shall govern.
  - 1. "Specifications for Structural Concrete for Buildings" ACI 301.
  - 2. "Building Code Requirements for Reinforced Concrete" ACI 318
  - 3. "Standard Specification for Ready-Mixed Concrete" ASTM C94
  - 4. Field Reference Manual, ACI Publication SP-15.
- B. The CONTRACTOR shall have available in the field office a copy of this manual containing "Specifications for Structural Concrete For Buildings (ACI 301, latest edition) with Selected ACI 301 ASTM references".

1.03 SUBMITTALS

- A. Submit samples of materials being used when requested by the ENGINEER including names, source and descriptions as required.
- B. Submit two copies of laboratory trial mix designs proposed in accordance with ACI 301, or one copy of each of 30 consecutive test results and the mix design used from a record of past performance in accordance with ACI 301.
- C. Submit a sample ready-mixed concrete delivery ticket in accordance with the requirements of ASTM C 94.
- D. Reinforcing steel shop drawings showing type, grade, all fabrication dimensions and locations of placing reinforcing steel and accessories shall be submitted for review.
- E. Strength test results as called for in Paragraph 2.04, "Testing and Inspection" shall be submitted to the ENGINEER.

**PART 2 - PRODUCTS**

- A. Portland Cement, conforming to ASTM C 150. Cement used in the work shall correspond to that on which the selection of concrete proportions was based. Only one brand and manufacturer of approved cement shall be used for exposed concrete. The type of cement shall be as shown on the drawings.
- B. Aggregates, conforming to ASTM C 33. Local aggregates not complying with this standard may be used providing it can be shown by special test or record of past performance that these aggregates produce concrete of adequate strength and durability.

1. Fine Aggregate: Clean, sharp, natural sands free from loam, clay, lumps or other deleterious substances, within allowable standards.
  2. Coarse Aggregate: Clean, uncoated, graded aggregate containing no clay, mud, loam or foreign matter.
- C. Water shall be fresh, clean, and drinkable.
- D. Admixtures. An air-entraining admixture, conforming to ASTM C 260 shall be used in all concrete. No other admixture shall be used regardless of the type of cement selected, unless the ENGINEER permits or requires use of a chemical admixture, if required, it shall meet the requirements of ASTM C 618. Any admixture shall be used in accordance with the provisions ACI212.1R and ACI212.2R.
- E. Metal reinforcement shall be provided in accordance with the drawings.
1. Reinforcing steel, conforming to ASTM A 615 ‘Standard Specification for deformed and Plain Billet-Steel Bars for Concrete Reinforcement.’
  2. Welded wire fabric, conforming to ASTM A 185 ‘Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement’.
  3. Metal accessories shall conform to the requirements of the CRSI ‘Manual of Standard Practice for Reinforcing Concrete Construction’.
- F. Joint material, conforming to ASTM D 1751, or ASTM D 1752.
- G. Curing materials shall exceed the moisture requirement of ASTM C 309 ‘Standard Specification for Liquid Membrane-Forming Compounds for Concrete’. Commercial curing compounds shall be ‘Masterseal’ manufactured by Master Builders; ‘CS-309’ manufactured by W. R. Meadows, Inc., ‘Horncure 50C’ manufactured by Grace Construction Materials, or accepted equal. Curing material shall provide water retention not exceeding loss of .035 gm/sq cm when used at a coverage of 200 square feet per gallon and tested in accordance with ASTM C 156.

## 2.02 CONCRETE QUALITY REQUIRED

- A. Where the concrete strength is listed ‘fc’ on the drawings, it shall be the specified compressive strength at 28 days. The average strength shall exceed specified compressive strength as required in accordance with ACI 318.
- B. When Type III Portland Cement, high early strength, is used, the specified strength at 7 days shall be the same as that required at 28 days for compressive strength.
- C. Concrete shall have a maximum water-cement ratio by weight of 0.45.
- D. Concrete shall be air-entrained. Total air content required (air-entrained and entrapped air) shall be 6% + or - 1%. Air content shall be measured by ASTM C 231 ‘Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method’.
- E. Concrete shall be proportioned and produced to have a slump, not to exceed 4 inches.
- F. Lightweight aggregate concrete shall not be used without prior approval of the ENGINEER.

## 2.03 MIX PROPORTIONS

- A. Concrete shall be composed of Portland Cement, fine aggregate, coarse aggregate, water and an air-entraining admixture. Proportions of ingredients shall produce concrete which will work readily into corners and angles of forms and bond to reinforcement without segregation or excessive bleed water forming on the surface. Proportioning of materials shall be in accordance with ACI 211.1 ‘Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete’. Proportions of ingredients shall be selected by past field experience or in-lieu of past performance by laboratory trial mixes to produce placeability, durability, strength and the additional properties specified.
- B. Required Average Compressive Strength Above Specified Strength. Determinations of required average strength above specified strength shall be in accordance with ACI 318 ‘Building Code Requirements for Reinforced Concrete’, and evaluations of compressive strength results of field

concrete shall be in accordance with ACI 214 “Recommended Practice for Evaluation of Strength Test Results of Field Concrete”.

1. Past Field Experience: Proportions shall be established on the actual field experience of the ready-mix producer with the materials proposed for use. Standard deviation shall be determined by 30 consecutive tests (or two groups of tests totaling 30 or more). The average strength used for selecting proportions shall exceed the specified strength ( $f'c$ ) by at least:
  - 400 psi - standard deviation less than 300
  - 550 psi - standard deviation 300 to 399
  - 700 psi - standard deviation 400 to 499
  - 900 psi - standard deviation 500 to 600
  - 1200 psi- standard deviation above 600, or unknown
2. Trial Mixes: When the ready-mix producer does not have a record of past performance, the combination of materials and the proportions selected shall be selected from trial mixes having proportions and consistencies suitable for the work based on ACI 211.1, using at least three different water-cement ratios which will produce a range of strengths encompassing those required. The average strength required shall be 1200 psi above specified strength.

#### 2.04 TESTING AND INSPECTION

- A. Materials and operations shall be tested and inspected as work progresses. Failure to detect defective work shall not prevent rejection when defect is discovered, nor shall it obligate the ENGINEER for final acceptance.
- B. Testing agencies shall meet the requirements of “Practice for Use in the Evaluation of Testing and Inspection Agencies as Used in Construction”, ASTM E 329.
- C. The following tests shall be performed by the CONTRACTOR or the designated agency and shall be paid for by the CONTRACTOR: The CONTRACTOR shall provide evidence that the laboratory collecting and testing the concrete samples is ASCI approved.
  1. Secure composite samples in accordance with “Standard Method of Sampling Freshly mixed Concrete” ASTM C 172.
  2. Mold and cure three specimens from each sample in accordance with “Test Methods of Making and Curing Concrete Test Specimens in the Field”.
  3. Compressive tests shall be in accordance with “Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens” ASTM C 39. Two specimens shall be tested at 28 days for acceptance and shall be tested at 7 days for information.
  4. Make one strength test for each 100 cu. yd. or fraction thereof, of each mix design of concrete placed in any one day.
  5. Determine slump for each strength test and whenever consistency of concrete appears to vary, using “Standard Test Method for Slump of Portland Cement Concrete” ASTM C 143.
  6. Determine total air content of normal-weight concrete sample for each strength test in accordance with “Standard Test Method for Air Content of Freshly Mixed concrete by the Pressure Method” ASTM C 231.
  7. Determine temperature of concrete sample for each strength test.
  8. Determine unit weight, yield and air content for each strength test in accordance with “Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete” ASTM C 138.

#### 2.05 EVALUATION AND ACCEPTANCE

- A. The strength level of the concrete will be considered satisfactory if the average of all sets of three consecutive strength test results equal or exceed specified strength and no individual test result is below specified strength by more than 500 psi for compressive tests. If the concrete fails to meet these criteria, remedial action shall be taken in accordance with ACI 318, Section 5.6.4 and requirements of the ENGINEER.

## 2.06 FORMWORK

- A. Forms shall be used to confine and shape concrete to required dimensions. Forms shall have sufficient strength to withstand forces from placement and vibration of the concrete and sufficient rigidity to maintain specified tolerances.
- B. Design, engineering, and construction of the formwork shall be the responsibility of the CONTRACTOR.
- C. Formwork shall be designed for loads, lateral pressure and allowable stresses in accordance with ACI 347 “Recommended Practice for Concrete Formwork”.
- D. All tolerances, preparation of form surfaces, removal of forms, reshoring and removal strength shall be in accordance with ACI 301, “Specifications for Structural Concrete for Building”.

## 2.07 REINFORCEMENT

- A. Details of all reinforcement and accessories not covered in this section shall be in accordance with ACI SP-66 “ACI Detailing Manual”.
- B. All reinforcement shall be of the grade shown and shall conform to the following Specifications:
  - 1. Deformed Bars: ASTM A 615 “Standard Specifications for Deformed and Plain Billet Steel Bars for Concrete Reinforcement”, grade 40 or 60, as shown on the drawings.
  - 2. Welded Wire Fabric: ASTM A 185 “Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete reinforcement”. Size shall be as shown on the drawings.
- C. Fabricating, placing tolerances, and placing shall be in accordance with the requirements of ACI 301, “Specifications for Structural Concrete for Buildings”.
- D. No welding of any reinforcement is allowed without prior approval of the ENGINEER.

## 2.08 JOINTS AND EMBEDDED ITEMS

- A. Construction joints, when not shown on working drawings, shall be made and located to least impair the strength of the structure and shall be acceptable to the ENGINEER.
- B. Isolation and Expansion Joints: Premolded expansion joint filler shall conform to one of the following:
  - 1. ASTM D 1751 “Standard Specification for Preformed Expansion Joint Fillers for Concrete paving and Structural Construction (Nonextruding and Resilient Bituminous Types)”
  - 2. ASTM D 1752 “Standard Specifications for Preformed Sponge Rubber and Concrete Paving and Structural Construction.”
- C. Construction joints shall be as shown on the working drawings.

## **PART 3 - EXECUTION**

### 3.01 MIXING AND TRANSPORTATION

- A. Concrete shall be ready-mixed batched, mixed and transported in accordance with ASTM C 94 “Standard Specifications for Ready-Mixed Concrete” plant equipment and facilities shall conform to the “Check-List for Certification of Ready-Mixed Concrete Production Facilities” of the National Ready-Mixed Concrete Association.

### 3.02 PLACEMENT

- A. Preparation: The CONTRACTOR shall provide access for delivery and provide sufficient equipment and manpower to rapidly place all concrete.
  - 1. All work shall be in accordance with ACI 304R “Guide for Measuring, Mixing, Transporting, and Placing Concrete”.
  - 2. Formwork shall have been completed; snow, ice, water, debris removed from within forms.
  - 3. Reinforcement shall have been secured in position.
  - 4. Expansion joint material, anchors and all embedded items shall have been positioned.
  - 5. Subgrade shall be prepared and sprinkled to eliminate water loss from the concrete.

- 6. Concrete shall not be placed on frozen ground.
- B. Conveying: Concrete shall be handled from mixer to final deposit rapidly by methods which will prevent segregation or loss of ingredients to maintain required quality of concrete. Concrete shall not be pumped through a pipe made of aluminum alloy.
- C. Depositing: Concrete shall be deposited continuously; when continuous placement is not possible, construction joints shall be located as accepted by the ENGINEER. Concrete shall be placed as nearly as possible to its final position; avoid rehandling or flowing.
- D. Concrete shall be consolidated by vibration, spading, rodding, or forking. Work concrete around reinforcement, embedded items, and into corners, eliminate all air or stone pockets and other causes of honeycombing, pitting or planes of weakness.
  - 1. Internal vibration shall have a minimum frequency of 8000 v/min. with amplitude to consolidate effectively.
  - 2. Vibrators shall be operated by competent workmen. Use vibrators to transport concrete shall not be allowed.
  - 3. Vibrators shall be inserted and withdrawn approximately every 18 inches for 5 to 15 seconds.

### 3.03 COLD WEATHER

- A. Temperature of concrete delivered at the job-site shall conform to the following:
 

Air Temperature	Concrete Temperature
30 to 45 degrees F.	55 to 90 degrees F.
0 to 30 degrees F.	60 to 90 degrees F.
Below 0 degrees F.	65 to 90 degrees F.
- B. Water heated to above 100 degrees F. shall be combined with the aggregates before cement is added. Cement shall not be added to water or aggregates having a temperature greater than 100 degrees F.
- C. All work shall be in accordance with ACI 306R "Cold Weather Concreting".
- D. When the outdoor temperature is less than 40 degrees F., the temperature of the concrete shall be maintained at not less than 50 degrees F. for the required curing time.
  - 1. Arrangements shall be made before placement to maintain required temperature without injury from excessive heat.
  - 2. Combustion heaters shall not be used during the first 48 hours without precautions to prevent exposure of concrete and workmen to exhaust gases containing carbon dioxide and carbon monoxide.
- E. Use of additives of so-called anti-freeze compounds for protection from freezing shall not be allowed.

### 3.04 HOT WEATHER

- A. Temperature of concrete delivered at the job-site shall not exceed 90 degrees F. Ingredients shall be cooled before mixing to prevent concrete temperatures in excess of 90 degrees F.
- B. All work shall be in accordance with ACI 305R "Hot Weather Concreting".
- C. Provisions shall be made for windbreaks, shading, fog spraying, sprinkling or wet cover when necessary.
- D. Use an evaporation retarder, finishing aid, similar to "Confilm" manufactured by Master Builders, or equal.

### 3.05 DEPOSITING CONCRETE UNDER WATER

- A. If necessary to deposit concrete under water the methods, equipment, materials, and mix to be used shall be submitted to and shall be approved by the ENGINEER before the work is started.
- B. Concrete shall not be placed in water having a temperature below 40 degrees F. The temperature of the concrete, when deposited, shall not be less than 60 degrees F. nor more than 90 degrees F.

- C. Cofferdams or forms shall be sufficiently tight to reduce the flow or current of water to 10 feet per minute through the space into which concrete is to be deposited and shall be sufficiently tight to prevent loss of mortar through the walls. Pumping of water will not be permitted while concrete is being placed, nor until 24 hours thereafter.
- D. Concrete shall be placed continuously until it is brought to the required height. During placement, the top surface shall be kept as nearly level as possible and the formation of seams shall be avoided. The method to be used for depositing concrete under water shall be one of the following.
  - 1. Tremie: The tremie shall be watertight and large enough to allow a free flow of concrete. It shall be kept filled with concrete at all times during placing. The concrete shall be discharged and spread by so moving the tremie as to maintain a uniform flow and to avoid dropping the concrete through water. The slump of concrete shall be maintained between 4 and 6 inches.
  - 2. Drop Bottom Bucket: The top of the bucket shall be open. Bottom doors shall open freely downward and outward when tripped. The bucket shall be completely filled and lowered slowly, shall not be dumped until it rests on the surface upon which the concrete is to be deposited, and when discharged shall be withdrawn slowly.
- E. To minimize the formation of laitance, care shall be exercised to disturb the concrete as little as possible while it is being deposited. Upon completion of a section of concrete, all laitance shall be entirely removed before work is resumed.

### 3.06 CURING AND PROTECTION

- A. Immediately following placement, concrete shall be protected from premature drying, hot and cold temperatures, rain, flowing water and mechanical injury.
- B. Materials and methods of curing shall be accepted by the ENGINEER. Final curing shall continue for not less than 7 days.
- C. Approved methods include: ponding or continuous sprinkling, continuously wet mats, sand kept continuously wet, and liquid membrane - forming compounds.
  - 1. Applications of waterproof sheet material shall conform to ASTM C 171 "Standard Specifications for Sheet Materials for Curing Concrete".
  - 2. Application of liquid membrane-forming compound shall conform to ASTM C 309 "Standard Specification for Liquid Compounds for Curing Compounds for Curing Concrete". Material shall maintain a maximum moisture loss of .035 gm/sq cm when used at a coverage of 200 square feet per gallon tested in accordance with ASTM C 156 "Standard Test Method for Water Retention by Concrete Curing Materials."

**END OF SECTION**