Town of Danville
Standards and Specifications:
Drinking Water

49 North Wayne Street
Danville, IN 46122

PART 1 - DESIGN

1.1. **Basis of Design**

A. All mains shall be sized large enough to provide for maximum daily demand plus fire protection flows to the respective project areas. The Town reserves the right to oversize mains to provide service for future needs.

B. Sound engineering judgment shall be utilized when determining locations for water mains. The locations must adhere to the water main extension policy. Existing easements and rights- of-way shall be utilized if at all possible. Service needs of both the present service area and future service areas should be thoroughly evaluated.

1.2. **Quality Assurance**

A. Regulatory Requirements:
   1. Comply with requirements and recommendations of authorities having jurisdiction over the Work, including.
      a. Indiana Title 327 Water Pollution Control Division
      b. Indiana Department of Environmental Management
      c. Ten State Standards
      d. American Water Works Association

1.3. **Design Criteria**

A. General: Sound engineering judgment should be employed when designing water distribution systems. The following sections outline specific design requirements and considerations.

B. Pressure & Flowrate: All potable water distribution system projects shall be designed to maintain a minimum pressure of 20 psi at ground level at all points in the distribution system under maximum daily demand plus fire flow demand. In addition, all distribution systems shall be designed to maintain a minimum static (no flow) pressure of 35 psi.

C. Design Demand: Water mains shall be designed to provide for the Design Demand in accordance with 327 IAC 8-3.3.

1.4. **Hydraulic Calculations**

A. Hydraulic calculations that demonstrate the adequacy of design must be submitted with each proposed project. The calculations must be consistent with the requirements for calculations and shall address the existing conditions and translation of the flow test results as well as the determination of the changes in these conditions along existing water mains. The calculations must demonstrate that the proposed design meets required performance criteria at **all** most-remote points in the proposed potable water distribution system.

B. Hydraulic calculations completed for distribution system design must be reproducible using the Hazen-Williams equation. Commercial programs may be utilized to compute distribution system hydraulic calculations but if requested by the Town must be reproduced utilizing Hazen-Williams related equations.

C. Flow testing results, provided by the Town, representative to each of the points of connection of the proposed project are required to base the design of the proposed project and determine the adequacy of the system to handle anticipated demands.

D. The flow test pressure hydrant will likely not be the point of connection for the proposed water main. As such, the effect of the existing water mains between the pressure hydrant and the proposed point of connection must be determined. These effects are calculated by minor losses (if required), friction losses, and changes in elevation. Changes in elevation must address both the elevation of the pressure hydrant and the point(s) of connection.

1.5. **General Location Requirements**

A. All public mains shall be located in the middle of their associated easement unless authorized otherwise by the Town.

B. Water mains are preferred to cross other utility conduits, highways, and railroads at 90-degree (90°) angles. The minimum angle of intersection between any water main and sanitary or storm sewer should be 45 degrees (45°).

C. Hydrant Spacing: Fire hydrants should be located at every major intersection and shall not exceed average spacing intervals of 500 feet (500') in residential areas, 400 feet (400') in commercial areas, and 350 feet (350') in industrial or other higher risk areas. In addition, commercial and industrial areas may require on-site "private" hydrants under the direction of the developer or owner. Flushing devices consisting of fire hydrants or blow-off assemblies shall be placed at permanent or temporary end points of water mains. Fire hydrants are the preferred method of ending a main.

D. Structures located outside the roadway shall be adjusted to final grade by the Owner/Builder/Developer.

E. Under no circumstances will a structure (valve box, curb box, hydrant, etc.) be allowed to be in the driveway or sidewalk.
   1. All Curb Boxes will be 3 feet off of curb or edge of pavement if no curb exists.
   2. Where fire hydrant must be located in a paved area provide a minimum of 5-foot by 5-foot concrete block-out, with expansion joints on all sides.
   3. Place valves within park strip areas (grass area between sidewalk and curb), or as directed by the Town / Engineer.

F. Water services shall be located at the center of the property unless authorized differently by the Town.

1.6. **Cover Requirements:**

A. Water mains and water services equal to or greater than 2-inch diameter: 5 feet minimum.

B. Water services smaller than 2-inch diameter: 4.5 feet minimum.

C. No water line shall be installed at a depth of greater than seven feet (7') of cover to top of pipe unless approved by Town on project specific basis.

1.7. **Pipe Materials**

A. Water mains shall be zinc coated ductile iron piping per the Materials specification. Piping provided shall have a minimum laying length of 20 feet.

B. Water service piping shall be HDPE DR 9 per the Materials specification. No other water service piping material permitted for services without the written permission of the Town. Larger services shall utilize water main materials.

1.8. **Water Service Connections**

A. Service taps on a water main shall include the brass corporation stop in the main, saddle on plastic mains, service line, curb stop and box, and reconnection to existing service if applicable. The curb stop shall include a cast iron curb box with lid marked water.

B. Owner / Builder / Developer is responsible for supplying and installing all materials necessary to make a water tap.

C. Trenchless Service Connections: Install pipe under street and highway pavements by pushing or boring in accordance with the Directional Drilling requirements of these Specifications.

D. All taps and services shall be inspected by the Town prior to covering.

E. All services that are extended to vacant lots shall be clearly marked at the termination point for future reference and extend a minimum of 24" above grade.

F. Water Meter
   1. All water meters shall match the service piping size unless approved otherwise by the Town in writing.
   2. Water meters shall be installed at the same time as the water service. If not, the service will remain shut off at the curb box.
   3. Owner / Builder is responsible for rough in for the water meter. The plumber shall obtain a meter setter from the Town and install during rough in. A Town employee will install the meter.
   4. All water services are required to have a bronze ball valve with full port design for unrestricted flow installed on both upstream and downstream sides of the water meter. If a valve is not installed on both sides of the meter, the water will not be turned on. See Town Standard Detail.
   5. All water services are required to have a tee and cap placed after ball valve on upstream side for future irrigation installation.
   6. All water meters shall be readily accessible to the meter reader / repairman.
   7. If the water meter is installed in the garage, provisions shall be made to protect it from freezing.

G. In no case, shall the water be turned on to building without a water meter or the approval of the Town.

H. Large Service Connections (Larger than 2 Inch) on New Mainline
   1. Install tee compatible with the mainline material.
   2. Install a standard gate valve and valve box.

I. Large Service Connections (Larger than 2 Inch) on Mainlines In Service
   1. Install tapping sleeve compatible with the mainline material.
   2. Install a tapping valve and standard valve box.

1.9. **Pipe Tracer Wire**

A. Tracer wire shall be required on all water mains and water services.

B. All service lines shall be installed with tracer wire to the water meter valve in the house as well as to the top of the curb box. Ensure connectivity is maintained between the mainline tracer wire and the service connection tracer wire.

1.10. **Valves**

A. Valves used in water distribution systems shall be resilient wedge gate valves unless the valves are not available in a required size.

1.11. **Blow Off Assembly**

A. Minimum working pressure of 200 psig. Include separate curb valve and restrained joints in supply piping. See Standard Drawings.

1.12. **Testing Requirements**

A. Provide hydrostatic testing for all water main piping at a test pressure of 150 psi, unless approved otherwise by Town in writing. Unless otherwise specified, required test pressures are at lowest elevation of pipeline segment being tested.

B. Pressure tests shall conform to the applicable AWWA and ASTM standard.

C. Disinfect water lines in accordance with IDEM regulations and these Standards & Specifications.

1.13. **Value Added Services**

A. Proposed systems should contain the following general features (for suppliers)
   1. The Town of Danville's inventory will be owned by the Town of Danville and controlled by the Town of Danville. Supplier's role will be one of an advisory role.
   2. Grouping of materials in Requests of Proposals is for comparison only. Other materials that are supplied by the vendor and required for projects will also be included in the program.
   3. Material delivery for any normally stocked item by the Town will be within a specified period, usually two (2) hours.
   4. The Town will not be charged shipping on any normally stocked item.

5. Return of any regularly stocked materials to supplier will not be subject to restocking fees.
6. The supplier shall provide the necessary personnel for the unloading of all material and the stringing of all pipe. The Town will not supply any personnel to assist the supplier.
7. The Town shall have access to supplier 24/7/365
8. The supplier shall have a formal 24-hour Emergency System in place with at least tow employees with individual service trucks capable of performing taps, pressure testing, insertion valves, etc. able to respond within two hours.
9. The supplier must provide at least 10 contact names with cell and home phone numbers that can be reached for assistance with program. Included in the list must be the company owners along with two service technicians.

1.14. **Beyond Specs**

B. Safety
   1. For a Contractor to qualify, the Contractor must meet all of the following safety qualifications:
      a. The Contractor shall be able to provide documentation upon request of active safety training for their employees.
      b. The Contractor's Outside Sales Representatives shall possess a current OSHA 10-hour card.
      c. The Contractor's Service Technicians shall possess a current OSHA 10-hour card.
      d. The Contractor must have the capability of providing the Town and its employees with an OSHA 10-hour or 30-hour safety course. The Contractor shall provide the name and appropriate qualifications of the person conducting safety training.
      e. The Contractor shall include in its hiring practices the requirement of drug and alcohol screening and background checks for any new employees.
      f. The Contractor shall subscribe to random drug and alcohol testing of its drivers.

C. Training and Education
   1. For a Contractor to qualify, the Contractor must be able to provide the following:
      a. The Contractor shall provide an in-house Reference Manual available to all Town personnel. Within this manual shall be a variety of products, services, engineering data, specifications and other information pertaining to the water, wastewater and stormwater industry. A copy of the manual shall be provided for Town approval.
      b. The Contractor shall have a program for sponsoring continued education seminars and shall have sponsored at least one within the last two years in which continuing educational credits were awarded. The Contractor shall provide documentation of recent educational seminars.
      c. The Contractor shall have an accredited waterworks apprenticeship program recognized by the Department of Labor, through which various aspects of the industry are taught. The program curriculum must be provided, along with testimonials from graduates of the program.
      d. The Contractor shall employ the services of qualified individuals who have the knowledge to provide technical assistance to the Town for all products carried by the Contractor.

e. The Contractor shall have an emergency guide that can aid as a pocket reference for various situations.

D. Transportation & Delivery

1. The qualified Contractor must be able to provide safe and timely deliveries that are essential to the success of any project.
    a. The Contractor shall have the ability to unload material with truck-mounted cranes. Cranes and operators must be certified.
    b. The Contractor shall have insurance that covers unloading.
    c. The Contractor's Sales Representatives shall have pickup trucks to provide timely and flexible deliveries.
    d. The Contractor's vehicles shall have GPS tracking devices installed in delivery vehicles. The Contractor shall provide examples of how the tracking device is administered.
    e. The Contractor shall have access to a company-owned flatbed trucking fleet that has operating authority in 48 states and Canada. All trucks shall have the above-mentioned GPS capabilities.
    f. The Contractor shall have a professional inventory management program available. The program shall provide logistical capabilities for Town to locate product from surrounding Utilities.

E. Water Conservation & Revenue

1. The Contractor shall provide the following services to the Town to assist with water conservation efforts and revenue:
    a. The Contractor shall possess ground listening devices available to the Town.
    b. The Contractor shall possess a digital leak correlator available to the Town.
    c. The Contractor shall employ a minimum of three Meter Specialists dedicated to providing metering solutions and responses to technical inquiries of the Town.
    d. The Contractor shall have meter equipment available to loan to the Town.
    e. The Contractor shall employ a Certified Professional in Erosion and Sediment Control (CPESC) on staff to provide erosion and sediment solutions.
    f. The Contractor shall have GIS mapping capabilities available to the Town.
    g. The Contractor shall manufacture UL FM approved and patented for meter downsizing that apply to all NSF61 regulations.
    h. Contractor shall have a submersible camera with capabilities of tank inspection available to the Town.
    i. The Contractor shall offer live water main inspection using the JD7 water main camera.

F. 24-Hour Emergency Service

1. The Contractor shall provide the following:
    a. The Contractor shall provide emergency protocol.
    b. The Contractor shall provide to the Town a contact list of people that can assist the Town in addressing emergencies. The list shall include home phone and cell phone numbers of all emergency responders. The list shall also include the phone number and cell phone number of all owners of the company along with ten other employees, two of whom must be Service Technicians that have access to

a service truck and all appropriate tools, materials and equipment necessary to assist the Town in an emergency response.

c. The Contractor shall maintain a company emergency services guide that contains useful information in dealing with an emergency. This guide shall include all Contractor locations.

d. The Contractor shall employ Service Technicians experienced in providing service work to the Town. The Service work available to the Town shall include, but not be limited to service taps, water main taps, quick valve insertion and other services associated with the water industry. The Service Technician shall also be capable of providing independent pressure tests, chlorination and de-chlorination of a water line.

e. The Contractor shall employ Service Technicians who can provide independent testing of sewer and drains including, but not limited to, low-pressure air testing, vacuum testing of manholes and closed-circuit television inspection.

f. The Contractor shall maintain a complete line of fusion equipment for both the butt fusing of high-density polyethylene pipe and electrostatic fusing of fittings. Additionally, the Contractor shall employ Service Technicians who are proficient in operating said equipment.

g. The Contractor-employed Service Technicians will maintain a current OSHA 10-hour card. The Service Technician will have an OSHA-compliant trench box available.

h. All service trucks shall be equipped with a GPS tracking device.

i. All service trucks shall be equipped with a certified crane.

j. The Contractor shall have a company-owned closed-circuit television camera for the inspection of sewer and drain main and lateral connections.

k. The Contractor shall have company-owned facilities with capabilities of fabricating flanged pipe up to 6 0'' in diameter. Shop shall be NSF61 certified and third-party inspected (AWWA C115).

l. In regards to New England and New York - Contractor shall be partnered with a ductile iron pipe manufacturer so they have access to a pipe depot yard that stocks 4-48" ductile pipe.

PART 2 - WATER METHODS AND MATERIALS

2.1 **Excavation & Backfill**

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Revise two paragraphs and associated subparagraph below and identify soil materials according to geotechnical engineer's written recommendations. Revise soil groups and size of stone to suit Project. Add liquid limit and plasticity index if further qualifying satisfactory soil groups. Most soils are classified according to ASTM D 2487. Heavy civil or highway projects may use AASHTO M 145.

C. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

D. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

E. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

F. Terms, descriptions, and gradations of granular soil materials in paragraphs below are examples only. Revise to comply with local practices and to suit Project. For example, granular materials may be referenced by state or local highway designations rather than by ASTM classifications.

G. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

H. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

I. Engineered Fill: Naturally or artificially graded mixture crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

J. Bedding Course: Naturally or artificially graded mixture of crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

K. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

L. Filter Material: Narrowly graded mixture of crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

M. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

N. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 **Lawns & Grasses**

A. Topsoil:
   1. Seeding / Sodding: INDOT Section 914.01
   2. All soil accepted as topsoil, whether obtained from on-site or off-site sources, shall

comply with specified topsoil requirements.

3. Provide fertile, friable, natural topsoil, surface soil, capable of sustaining vigorous plant growth; free of any admixture of subsoil, clods of hard earth, plants or roots, sticks, stones larger than 1-inch in diameter, or other extraneous material harmful to plant growth, in compliance with ASTM D 5268.
4. Topsoil Source: Reuse surface soil stockpiled on-site, where possible. Verify suitability of stockpiled surface soil to produce topsoil, as specified. If not suitable amend topsoil to meet requirements approved by the Town / Engineer. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
    a. Supplement acceptable on-site soil with manufactured topsoil from off-site sources, when quantities available on-site are insufficient to complete the Work.

B. Lawn Grass Seed:
1. Lawn Grass Seed Mixture: Provide fresh, clean, new-crop seed complying with the tolerance for purity and germination established by INDOT 621. Provide seed of the grass species, proportions and minimum percentages of purity, germination, and maximum percentage of weed seed, specified. Apply "Lawn Grass Seed" in all lawns and areas to be regularly mowed.
2. Seed Species:
    a. Apply "Lawn Grass Seed" at proportion by weight as follows:
        1) 50 percent Premium Grade Kentucky Bluegrass (2 Types)
        2) 50 percent perennial ryegrass (2 Types)
        3) 0 percent noxious weeds
        4) Or as approved otherwise.
    b. Apply "General Purpose Mixture" at proportion by weight as follows:
        1) The general-purpose mixture shall be "Seed Mixture R" in accordance with INDOT 621.06, or approved equal.
    c. The Town may revise seed mix requirements on a project-specific basis.

C. Fertilizers:
1. Provide commercial grade complete fertilizer of neutral character, consisting of fast- and slow release nitrogen with an analysis of 12-12-12, in accordance with Indiana Department of Transportation Standard Specification Subsection 914.03.

D. Mulches:
1. Provide air-dry, clean, mildew- and certified seed and weed free, mulch. Mulch may consist of straw, excelsior mulch, wood cellulose fiber mulch, excelsior blanket, paper mat or straw mat, in accordance with Indiana Department of Transportation Standard Specification Subsection 914.05.

E. Water:
1. Provide water acceptable for lawn and meadow application and containing no material harmful to plant growth and establishment and in accordance with Indiana Department of Transportation Standard Specification Subsection 914.09 (a).

2.3 General Pipe & Utility Appurtenances Materials Requirements

A. Quality Assurance
   1. Qualifications
      a. Manufacturer shall have a minimum of five (5) years of experience producing pipe, fittings, and appurtenances of the materials specified, and shall be able to submit documentation of at least five (5) installations in satisfactory operation for at least five (5) years.

   2. Component Supply and Compatibility:
      a. All pipe, valves, fittings, hydrants, and appurtenances shall be of **Domestic Manufacturing Only**. **Products not manufactured domestically will be rejected and replaced at no expense to the Town of Danville**.
      b. All pipe and appurtenances of each material type shall be furnished by the same manufacturer.
      c. Pipe Supplier shall prepare and review all Shop Drawings and other submittals for all materials furnished under this section.
      d. Materials shall be suitable for specified conditions of service and shall be integrated into overall assembly by Pipe Supplier.
   3. Regulatory Requirements:
      a. Drinking Water Requirements: Pipe, fittings, and appurtenances that will be in contact with potable water or water that will be treated to become potable shall comply with ANSI/NSF 61 and the Safe Drinking Water Act.
   4. Quality of materials, process of manufacture and finished pipe shall be subject to inspection by Town / Engineer.

B. Conditions of Service
   1. Pipe materials and appurtenances shall be suitable for services intended.
   2. Pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, and other defects. Unless otherwise shown or indicated, pipe shall be uniform in color, opacity, density, and other physical properties.
   3. Buried pipe shall be capable of withstanding external live load, including impact, equal to AASHTO H-20 loading, with cover shown or indicated in the Contract Documents.
   4. Pipe, fittings, and appurtenances in contact with potable water or water that will be treated to become potable shall be listed in NSF 61 as being suitable for contact with potable water, and shall comply with requirements of the municipal utility.
   5. Clean rework or recycled material generated by the manufacturer's own production may be used as long as the pipe or fittings produced meet all the requirements of this Section.

C. Marking for Identification
   1. Marking:
      a. Each standard and random length of pipe in compliance with this specification shall be clearly marked with the following information that will remain legible during normal handling and storage.
         1) ASTM or AWWA Standard Designation.
         2) Pipe Size.
         3) Pressure/Thickness Class/Profile Number/Standard Dimension Ratio (SDR).

4) All HDPE for water line piping shall have a blue stripe installed by the manufacturer during the pipe forming process. The pipe shall have multiple stripes so as to be viewed from any angle along the pipe.

2.4 **Zinc-Coated Ductile Iron Pipe, Joints, and Fittings**

A. Flanged pipe shall only be used inside buildings or structures. It shall not be used in a direct bury application unless noted otherwise.

B. Laying Length: Pipe laying lengths shall be provided in 20-foot nominal lengths with allowable trim pipe lengths in accordance with AWWA C151 and special shorter lengths provided as required.

C. Flanged Pipe: Fabricate in accordance with AWWA C115.
1. Pressure Rating: As specified in on Contract Drawings. If not otherwise specified, 3 inch to 12 inch diameter pipe shall be a minimum Pressure Class 350 in accordance with AWWA C150. Water main pipe with a diameter larger than 12 inch shall be a minimum Pressure Class 250 in accordance with AWWA C150.

D. Non-Flanged Pipe: Conform to AWWA C151 for material, pressure, dimensions, tolerances, tests, markings, and other requirements.
1. Pressure Class:
a. 3 inch diameter through 12 inch diameter shall be a minimum Pressure Class 350 in accordance with AWWA C150.
b. Larger than 12 inch diameter shall be a minimum Pressure Class 350 in accordance with AWWA C150.

E. Pipe Joints:
1. Flanged Joint Pipe: Conform to AWWA C110 and AWWA C111 capable of meeting the pressure rating or special thickness class, and test pressure noted on Contract Drawings.
a. Gaskets: Unless otherwise specified, gaskets shall be at least 1/8 inch thick, ring or full-face as required for the pipe, of synthetic rubber compound containing not less than 50 percent by volume nitrile or neoprene, and shall be free from factice, reclaimed rubber, and other deleterious substances. Gaskets shall be suitable for the service conditions specified, specifically designed for use with ductile iron pipe and fittings.
b. Bolts: Comply with ANSI B18.2.1.
1) Exposed: ASTM A307, Grade B.
2) Buried or Submerged: ASTM A193, Grade B8M, Class 2, Heavy hex, Type 316 stainless steel.
c. Nuts: Comply with ANSI B18.2.2.
1) Exposed: ASTM A563, Grade A, Heavy hex.
2) Buried or Submerged: ASTM A194, Grade B8M, Heavy hex, Type 316 stainless steel.

2. Mechanical Joint Pipe: Comply with AWWA C111 and AWWA C151, capable of meeting pressure rating or special thickness class, and test pressure specified.
    a. Glands: Ductile iron.
    b. Gaskets: Plain tip.
    c. Bolts and Nuts: High strength, low alloy steel in accordance with AWWA C111. Cor-Blue or approved equal.
3. Push-On Joint Pipe: Comply with AWWA C111 and AWWA C151, capable of meeting pressure class or special thickness class, and test pressure specified.
    a. Gaskets: Vulcanized SBR, unless otherwise specified.
    b. Stripes: Each plain end shall be painted with a circular stripe to provide a guide for visual check that joint is properly assembled.
    c. Products and Manufacturers: Provide one of the following:
        1) Fastite Joint by American Cast Iron Pipe Company.
        2) Or equal.
4. Restrained Joint Pipe and Fittings: Restrained joints shall comply with AWWA C110 or AWWA C153. Shall be installed on each side of the pipe. Field cuts of restrained pipe are not allowed without approval of Town / Engineer.
    a. Products and Manufacturers: Provide restrained joints for mechanical joint pipe and fittings by one of the following:
        1) Gripring Pipe Restraint, by Romac
    b. Products and Manufacturers: Provide restrained joints for push-on joint pipe by one of the following:
        1) Amarillo Fast-Grip Gaskets, by American Cast Iron Pipe Company: (Used with Horizontal Directional Drilling Installation Method).
        2) 600 Series, by Romac Industries: (Used with Open Trench Installation Method, Minimum 2 Pipe Joints Before and Minimum 2 Pipe Joints After Each Side of Fittings, Valves, and Hydrants)
5. Flanged and Push-On Joint Fittings: Comply with AWWA C110/AWWA C153 and AWWA C111.
    a. Material: Ductile iron.
    b. Pressure rating, gaskets, bolts, and nuts shall be as specified for flanged joints. Pressure rating of fittings shall meet, but not exceed, specified pressure rating or special thickness class of the connected pipe.
6. Mechanical Joint Fittings: Comply with AWWA C110/AWWA C153 and AWWA C111.
    a. Material: Ductile iron.
    b. Glands: Ductile iron.
    c. Pressure rating, gaskets, bolts, and nuts shall be as specified for mechanical joints. Pressure rating of fittings shall meet, but not exceed, specified pressure rating or special thickness class of connected pipe.
    d. All buried fittings shall be mechanical restrained joint fittings.

F. Cement-mortar Lining:
1. Unless noted otherwise in the Contract Documents, interior surfaces of all ductile iron pipe, fittings, and specials shall be cleaned and lined at the pipe casting facility with a standard thickness cement-mortar lining applied in conformity with AWWA C104. A seal coat shall not be applied to the surface of the cement-mortar lining.

G. Specials:
   1. Transition Pieces:
      a. Provide suitable transition pieces (adapters) for connecting to existing piping. Submit for approval prior to construction.
      b. Unless otherwise shown or indicated, expose existing piping to determine material, dimensions, and other data required for transition pieces.

H. Exterior Surface Preparation and Coatings
   1. Buried Pipe and Fittings:
      a. Zinc-Coating: The exterior of ductile iron pipe shall be coated with a layer of arc-sprayed zinc per ISO 8179. The mass of the zinc applied shall be 200 g/m^2 of pipe surface area. A finishing layer topcoat shall be applied to the zinc. The mean dry film thickness of the finishing layer shall not be less than 3 mils with a local minimum not less than 2 mils. The zinc coating system shall conform to ISO 8179-1 "Ductile iron pipes – External zinc-based coating – Part 1: Metallic zinc with finishing layer. Second edition 2004-06-01."
      b. Asphaltic Coating: Coat fittings with an asphaltic coating approximately 1 mil thick, in accordance with AWWA C151, AWWA C115, AWWA C110, and AWWA C153, as applicable.
   2. Fusion Bonded Epoxy Coating for Fittings
      a. When specified, fittings shall be factory coated with 100 percent solids, thermosetting, dry powder epoxy, in conformance with AWWA C116.

2.5 **Water Service Piping & Fittings**

A. HDPE Water Service Pipe and Fittings
   1. Polyethylene compounds shall be per PE-3408 with minimum cell classification 345444C.
   2. HDPE tubing shall be copper tubing size, CTS, outside diameter controlled, minimum based on meter pit (see drawings.) Typically, 1" diameter for double meter pit and 3/4" for single meter pit.
   3. SDR 9, 200 psi working pressure rated @ 73.4 degrees F with ability to maintain 300 psi for 1000 hours @ 73.4 degrees F.
   4. Meet requirements of ASTM D-2737, ASTM D-3350, NSF-14, NSF-61, AWWA C-901.
   5. Color: Shall be solid blue exterior tubing.
   6. Tubing shall be labeled at minimum with manufacturer, diameter, outside diameter control, working pressure rating, ASTM specifications and NSF approval.
   7. All HDPE shall be continuous from the water main to the curb stop and from the curb stop to the water meter.
   8. Stainless steel sleeves should be inserted in all pipe ends connecting to a meter or fitting. Inserts shall be:
      a. 304 stainless steel material, seamless (not split)
      b. Properly sized diameter for CTS, SDR 9 200 psi HDPE tubing and length that does not extend beyond the end of the compression fitting
      c. Designed for use with compression style connections.
   9. Conduit shall be a minimum of 3" in diameter.

10. All connections and joints shall utilize brass mechanical compression fittings that are designed and specified for use with HDPE tubing.
    a. Gripping band type restraint shall be used (i.e. Mueller C110 Compression Connection, Ford Quick Joint).
11. All service connections shall have tracer wire installed in accordance with requirements in this document.

2.6 Polyethylene Encasement

A. Supply polyethylene in tubes or sheets.

B. Polyethylene encasement materials shall be in accordance with AWWA C105.

C. In addition, polyethylene encasement for use with ductile iron pipe and fitting systems shall consist of three layers of co-extruded linear low density polyethylene (LLDPE), fused into a single thickness of not less than eight mils.

D. The inside surface of the polyethylene wrap to be in contact with the pipe exterior shall be infused with a blend of anti-microbial biocide to mitigate microbiologically influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion.

2.7 Pipe Tracing Wire

A. All wire utilized for tracing wire shall be designed for and approved by the manufacturer for use in buried low voltage applications and approved by the Town / Engineer.

B. Provide – 3 Strands No. 10 or stronger high strength copper clad steel reinforced with HDPE insulation tracing wire rated for a minimum tensile strength of 600lbs. Tracer wire shall be blue with a solid core. The following materials are acceptable:
    1. Soloshot Copperhead Industries, LLC
    2. BoreTough, Agave Wire, LTD
    3. Or approved equal

C. Splice tracing wire together with the following material:
    1. DRYCONN Direct Bury Lug Aqua
    2. Agave Direct Bury lug DWTWC-003
    3. Or approved equal

2.8 Gate Valves

A. Resilient-Seated gate valve with Alpha Restraint Joint, ductile-iron body, bonnet and gate; resilient seats, bronze stem and stem nut. Resilient seated gate valves are to be manufactured in accordance with AWWA C509 or AWWA C515. Valves shall be ductile iron bronze mounted. Resilient seats shall be applied in accordance with AWWA C509 or AWWA C515.

B. Buried valves shall have mechanical joints with ALPHA Restraints. Valves shall open left (counterclockwise) and shall be equipped with O-ring packing and a two inch (2”) operating nut and non-rising stem. Contractor shall verify direction of opening with Town / Engineer prior to ordering.

C. Provide fusion bonded epoxy interior coating according to AWWA C550 and fusion bonded epoxy exterior coating.

D. Valves shall be designed for a working pressure of 250 psi.

E. Provide valve nut extension if valve is installed deeper than 60" cover.

F. Provide with posi-cap alignment device.

G. The following resilient seated gate valves are acceptable for use in connection with water main installation, listed by manufacturer and model number:
   1. American Flow Control, 2500 Series with Alpha Restraint Joints

2.9 **Hydrant Assembly**

A. Fire hydrants shall conform to AWWA C502 and shall be complete with all necessary fittings and accessories. Hydrants shall conform to the Water Utility Owner standards and specifications. Hydrants shall be 5 ¼" size with 6" inlet connection. They shall have one 4 ½ inch pump connection and two 2 ½ inch hose connections, unless an alternate configuration is requested or approved by the Town.

B. The hydrant shall open left (counterclockwise) and be of sufficient length to accommodate depth of burial of water main and for pumper nozzle height 18" minimum above grade. Contractor shall verify direction of opening with Town & Engineer prior to ordering.

C. All hydrants shall be properly painted before shipment and after installation in accordance with AWWA C502. Contractor shall verify color with Town prior to ordering.

D. Provide anchorage with Alpha Restraint Joints, and support in upright position.

E. Hydrants shall have an auxiliary valve as detailed on fire hydrant assembly standards and according to AWWA M17.

F. Hydrants shall be for 250 psi working pressure. The hydrant shall be such that the valve will remain closed if the upper portion of the fire hydrant is removed or broken off. The operating nut shall be pentagonal.

G. The hose caps shall be secured to the hydrant with a chain during shipment. The chains may only be removed after the hydrant is placed into service.

H. A drainage pit shall be provided below each hydrant, consisting of at least ½ cubic yard of compacted pervious material.

I. The following fire hydrants are acceptable for use in connection with water main installation, listed by manufacturer and model number:
   1. Waterous Pacer WB-67-250 (American Flow Control) with ALPHA restraint joint
   2. American Darling B-84-B-5 Traffic Model wwith ALPHA restraint joint

2.10 **Curb Stops**

A. Curb stops shall be ball type valves of extra heavy, all brass construction. The curb stops shall have a heavy or thick tee-head operator and a 90 degree rotation of the ball. Each stop shall be equipped with a curb box. Ball valves shall have Teflon coated balls and hard or synthetic rubber seat-rings.

B. The following corporation stops are acceptable for use in connection with water main installations, listed by manufacturer and model number:
   1. Ford, B22-NL or B44-NL
   2. Or Approved Equal.

2.11 **Corporation Stops**

A. Corporation stops shall be ball type valves of extra heavy, all brass construction. The corporation stops shall have a flat, thick, operating head. The corporation stop inlet threads shall be machined with standard AWWA tapered threads.

B. The following corporation stops are acceptable for use in connection with water main installations, listed by manufacturer and model number:
   1. Ford, FB-600NL or FB-1000NL
   2. Or Approved Equal.

2.12 **Valve Boxes & Curb Boxes**

A. Valve boxes shall cast iron, two (2) or three (3) piece, Buffalo-style, screw type boxes. The boxes shall be five and one-quarter inch (5¼") shaft size with a round base. The word "water" or "sewer" shall be cast on the box lid as appropriate. Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length as required for depth of burial of valve, and bottom section with base of size to fit over valve. Install valve box extension if valve is installed deeper than 60" cover. Place geotextile around valve bonnet and connections of three pieces.

B. Curb boxes shall be cast iron two (2) piece, Buffalo-style, screw type boxes. The box shall be 2 ½" diameter with a 3' stainless steel extension rod attached to the curb stop with centering guide, brought up to final grade. The word "water" or "sewer" shall be cast on the lid as appropriate. A curb lock box shall be placed under curb stop for curb box feet to set on.

2.13 **Tapping Saddles**

A. Tapping saddles shall be used for service taps of plastic piping. The tapping saddles and hardware shall be ductile iron or stainless steel with nylon or epoxy coating with AWWA tapered threads and stainless steel straps. The tapping saddle design shall be hinged or bolted, both with a minimum strap width of two inches (2"). Three (3) piece tapping saddle design is not allowed.

B. Tapping saddles must be used for the installation of a corporation stop in a tapped pipe. The tap saddle is made to a specific inner diameter to match the outer diameter of the pipe. It fully supports the pipe and is sized so that the parts when bolted together cannot be over tightened on the pipe; Manufacturer's installation instructions must be followed.

2.14 Tapping Sleeve & Valve Assembly

A. The tapping sleeve and valve shall be suitable for wet installation without interrupting service. The tapping sleeve shall be suitable for the pipe material and size of the line being tapped.

B. Tapping sleeves shall be manufactured of ductile iron or stainless steel. Stainless steel sleeves shall be Type 304 steel. Sleeve shall be flanged faced and drilled per ANSI B 16.1, with standard tapping flange counterbore per MSS SP-60. Tapping sleeves shall meet minimum working pressure requirements of 200 psi for twelve inch and smaller sleeves. All tapping sleeves shall include a test plug.

C. Gasket for tapping sleeve shall completely surround pipe.

D. Nuts and bolts shall be Type 304 stainless steel.

E. Acceptable tapping sleeves:
   1. Ford FAST
   2. Romac SST III
   3. Mueller H-304
   4. Or approved equal

F. The tapping valve shall be mechanical joint x tapping flange. The flanged end shall have a raised face to match counterbore in tapping sleeve outlet per MSS SP-60. Tapping valves shall also conform to the specifications as outlined for gate valves in this Specification.

2.15 Backflow Prevention Devices

A. All backflow prevention devices for potable water protection must be approved and listed by the Foundation for Cross Connection Control and Hydraulic Research as published by the University of Southern California. This listing is available from USC or IDEM's Drinking Water Branch.

PART 3 - SPECIFICATIONS OF CONSTRUCTION

3.1 Scope of the Work

A. Unless otherwise noted, the Contractor shall furnish all labor, materials, necessary tools, equipment, all utility and transportation services and construct all mains and appurtenances complete and ready for continuous operation, including all pipe, valves, hydrants, fittings, curbs, curb and gutter, sidewalks, pavement removal, pavement replacement, new pavement, site restoration, the protection of all existing structures and utilities, and all other items as required by the permitted Contract Documents.

3.2 Utilities for Construction Purposes

A. Unless otherwise noted, the Contractor shall furnish all utilities for construction purposes. Any expenses related to temporary water or power connections shall be paid by the Contractor. Connections shall be made in accordance to Local, State, and Federal Codes.

B. Construction Water Usage
   1. Construction water connections shall be temporary, to be broken when not in use and are to be made only with the permission of the Town.
   2. Contractors shall not use water from any home or business fixture unless the meter has been set. Once the meter has been set the holder of the building permit is subject to a one-time minimum monthly water usage charge.
   3. For penalties or fees associated with construction water usage refer to Chapter 51.13 of the Danville Code of Municipal Ordinances.
   4. An occupancy permit shall not be issued until all outstanding charges are paid.
   5. Hydrants: Contractors may use water from fire hydrants as long as the hydrant has been furnished with a meter, and the Town notified so that the meter can be read before and after use.

C. The Town will provide water for the first sequence of flushing, disinfection, and pressure testing. Water required due to failed hydrostatic or disinfection tests will be charged to the Owner / Builder / Developer. Contractor(s) shall provide means to convey water for hydrostatic testing into piping being tested. Contractor(s) shall provide water for other types of testing required.

3.3 Material Furnished by the Contractor

A. Unless otherwise noted, the Contractor shall be responsible for all material furnished by him and shall replace at his own expense all such material found defective in manufacture or damaged in handling after delivery by the manufacturer. Installed material discovered to be defective shall be removed and replaced with acceptable material at no additional cost to the Town. The Contractor shall be responsible for the safe storage of material furnished by him or to him, accepted by him, and intended for the work, until the material has been incorporated in the completed project. The interior of all pipe, fittings and accessories shall be kept free from dirt or foreign matter at all times.

B. Changes Caused by Material Purchased by the Contractor: The Contractor shall make any and all necessary changes in construction and piping to install materials approved for installation.

3.4 **Material Furnished by the Town**

A. The Contractor's responsibility for any material furnished by the Town shall begin at the point of delivery thereof to the Contractor. Material already on the site shall become the Contractor's responsibility.

B. The Contractor shall examine all material furnished by the Town at the time and place of delivery to him and shall reject all defective material. Material furnished by the Town that becomes damaged after acceptance by the Contractor shall be replaced by the Contractor at no expense to the Town.

3.5 **Disposition of Defective Material**

A. Unless otherwise noted, all material found during the progress of the work to have cracks, flaws or other defects will be rejected by the Town. All defective materials shall be promptly removed from the site of the work by the Contractor.

3.6 **Material Verification**

A. The Town / Engineer Representative shall have access to material delivery tickets to allow for compliance verification with the specifications.

3.7 **Disposal of Waste and Water**

A. Unless otherwise noted, during and following the completion of all work, the Contractor shall dispose of all waste, water and debris in a legal manner satisfactory to the Town.

3.8 **Erosion Control**

A. Contractor shall provide and maintain methods, equipment, and temporary construction as required to control dust, erosion, and sediment at the Site and adjacent areas. Maintain controls until site is stabilized and controls no longer required by permit. Upon completion of Work, remove erosion and sediment controls and restore the Site to specified condition. If condition is not specified, restore Site to preconstruction condition. Comply with Indiana Department of Environmental Management Rule 5 regulations, with the requirements of the Hendricks County Municipal Separate Storm Sewer System (MS4), and with any project applicable Stormwater Pollution Prevention Plan (SWPPP).

3.9 **Excavation & Backfill for Water**

A. Excavation
1. All earth excavation shall be open cut from the surface, except where otherwise shown on the drawings. Excavation shall be interpreted to mean clearing the site; pavement removal where required; excavation of the material encountered in the proposed grade of the conduit; furnishing and placing all sheeting, trenching, trimming and bracing; supporting of structures above and below ground; removal and disposal of w a t e r ;

repairing damage to structures, conduits, and utilities encountered; backfilling; compaction; temporary surfacing of roadways; disposal of surplus materials; providing barricades; temporary lighting; and restoration of the site. During the progress of excavation, care shall be exercised to reserve sufficient material for filling and backfilling.

B. Utility Trench Excavation

1. The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures and utilities, both known and unknown, may be determined, and he shall be held responsible for the repair of such when broken or otherwise damaged. The trench shall be excavated to a point below the bottom of proposed pipe to allow placement of bedding per these Specifications.
2. Open trenches shall be properly protected and guarded by the Contractor in such a manner as to prevent accidents, casualties, or damage of any nature whatsoever to persons, vehicles and abutting property.
3. The trench shall be excavated so that the pipe can be laid to the alignment and grade required. The trench shall be so braced and drained that the workmen may work therein safely and efficiently. It is essential that the discharge of any trench dewatering pumps be conducted to natural drainage channels, storm drains or storm sewers.
4. The Contractor shall thoroughly familiarize himself with and implement OSHA Rules and Regulations relating to the Construction Industry, with specific attention being given to the sections devoted to trench construction.

C. Exploratory Excavation

1. Location of Existing Underground Facilities:
    a. Locations of existing Underground Facilities shown on the Drawings should be considered approximate.
    b. Determine the true location of existing Underground Facilities to which connections are to be made, crossed, and that could be disturbed, and determine location of Underground Facilities that could be disturbed during excavation and backfilling operations, or that may be affected by the Work.
2. The Contractor will be required to excavate and locate existing underground improvements in advance of proceeding with the excavation for the conduit or carry the excavation sufficiently in advance of pipe laying operations that changes in line and grade may be accommodated in order to avoid such existing underground facilities. The cost of all exploratory excavation shall be the responsibility of the Contractor.
3. On the basis of the information obtained from the exploratory excavation, the Town / Engineer may order certain changes in line or grade of the conduit. In any case, changes in the new conduit, or in existing improvements, shall be made only with approval of the Town / Engineer.

D. Pipe Clearance in Rock

1. Ledge rock, boulders and large stone shall be removed to provide a clearance of at least six (6) inches below and on each side of all pipe and appurtenances. Pipe bedding shall be utilized around the pipe within these clearance areas.

2. The specified minimum clearances are the minimum clearance distances which will be permitted between any part of the pipe and appurtenances being laid, and any part, projection or point of such rock, boulder or stone.

E. Utility Trench Unstable Soil

1. In areas where unstable soil is encountered below the bottom of the pipe, the Contractor shall notify the Town / Engineer Representative. The length and depth to which unstable soil is to be excavated shall be as determined by the Town / Engineer Representative and no such material shall be excavated unless and until so ordered by the Town / Engineer Representative. All unstable soil shall be completely removed from the site of the work.
2. In cases where over-excavation for the replacement of unacceptable soil materials is required, the excavation shall be backfilled to the required subgrade with special backfill material and thoroughly compacted as specified.

F. Width of Trench

1. The width of trench shall be the minimum which will permit the pipe to be laid safely and jointed properly and the backfill to be placed and compacted as specified and as recommended by the pipe manufacturer and the Town / Engineer.

G. Sheeting, Bracing, and Shoring

1. Where required to properly protect the construction work, adjacent property, work or workmen, sheeting, bracing and shoring shall be provided by the Contractor.

H. Sheeting Left in Place

1. Sheeting, bracing and shoring shall not be left in place after completion of the work except as required by written order of the Town. Where required to protect the work, adjacent structures or property, sheeting, bracing and shoring shall be left in place, but shall be cut or left not less than two feet below the established surface grade.

I. Removal of Water

1. The Contractor shall provide and maintain during construction, adequate equipment to properly remove and dispose of all water entering the trench or other part of the work where conduits are being placed. In water bearing strata, well points or under drain material may be required to affect a dry trench or pit. No pipe shall be laid in water or when, in the opinion of the Town / Engineer Representative trench conditions are unsuitable.

J. Piling of Excavated Material

1. In general, material excavated from trenches will not be allowed to be piled on adjacent walks and driveways. The amount of Public Street which may be occupied by the construction work at any time shall be subject to the requirements of the use of the street by the public and approval by the Town. Piling of material outside of right-of-way or easement lines will not be allowed without the written permission of the property owner.

K. Disposal of Excavated Materials

1. All suitable excavated material shall be used in backfilling over the pipe and appurtenances or distributed otherwise in lawn areas to the design grades. All excess /

unsuitable excavated material shall be removed by the Contractor and disposed of in a timely, legal, and appropriate manner. The Contractor shall be responsible for securing disposal site(s), as well as all grading or reseeding required at same.

2. For all offsite stockpiles and disposal of excavated materials, Contractor is responsible for the Indiana Rule 5 Erosion Control Permit as applicable and implementation of erosion control.

L. Blasting

1. Blasting and explosives will not be permitted.

M. Backfilling

1. All trenches and excavations shall be backfilled to at least the original surface of the ground or pavement subgrade with allowances made for subsequent settlement. Backfill material shall be deposited in the trench in lifts for its full width simultaneously. Care shall be exercised to work the embedment material completely around the pipe and backfill material completely around appurtenances, filling all voids. Compaction of the backfill shall be provided to the extent that undue settlement of the backfill does not occur. For nonpavement areas, the backfill shall be placed in lifts to the original grade level. For pavement areas and areas within the loading influence of the pavement, special backfill shall be placed in lifts and compacted per these specifications.

N. Backfilling in Freezing Weather

1. Backfilling shall not be completed in freezing weather except by permission of the Town / Engineer Representative. No backfilling shall be made with frozen material, nor shall backfilling be made when the material in the trench is already frozen.

O. Backfill and Fill; Suitable & Unsuitable Materials

1. See “Materials”.

P. Embedment Material for Flexible Pipes

1. See “Materials”.

Q. Embedment Material for Rigid Pipes

1. See “Materials”.

R. Special Backfill

1. See “Materials”.

S. Compaction

1. Compaction will be required of all embedment material. The Contractor shall maintain on the job site with each crew, a copy of the manufacturer’s recommendations with respect to pipe embedment material and compaction.
2. With respect to special backfill material, the Contractor shall place the material in lifts and compact each lift per the following table.
3. Material shall be within plus or minus two percent (2%) of optimum moisture content. The Contractor shall submit to the Town written documentation of proof of compaction. Provide mechanical compaction for cohesive material and vibratory compaction for granular materials, unless otherwise approved by the Town / Engineer. Jetting, flooding, puddling, or vibroflotation may not be used without written consent of the Town /

Engineer. Noncohesive soils shall be compacted with vibrating roller or equivalent; cohesive soils shall be compacted with sheeps-foot roller, pneumatic tamping, or approved equivalent, unless otherwise indicated. Granular bedding for structures shall have each lift thoroughly compacted and seated with the subgrade. Compaction methods and procedures shall be subject to approval of the Town / Engineer. Unless otherwise indicated or approved by the Town / Engineer, place fills in the loose lift thicknesses indicated hereafter and compact to a dry density not less than the specified percentage of maximum dry density, determined by the Modified Proctor Test, ASTM D1557, unless otherwise noted.

Usage	Percent Compaction	Lift Thickness
Subgrade and Subbase Fill:		
Below Pavements, Walkways	95	8
Below Footings or Structural Slabs	98	6
Lawn Areas	90	8
Fill Adjacent to (Or Behind) Vertical Walls	95	8
Special Backfill (Pipes & Structures)	95	6
Trench Backfill Above Pipe (Lawn Areas)	90	8
Granular Pipe Embedment Material	90	6

T. Compaction Testing During Construction

1. Quality Control Testing During Construction: Contractor's independent testing service shall inspect and approve subgrades and fill layers before construction Work is performed thereon. All associated costs for density testing as specified by the Town shall be at the expense of the Contractor.
2. Testing agency will conduct and interpret tests and state in each report whether tested work complies with or deviates from specified requirements.
3. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
4. Tests of subgrades and fill layers shall be taken as follows:
    a. The frequency of Contractor confirmation tests shall be not less than as follows: Each test location for trenches shall include tests for each layer, type, or class of backfill from bedding to finish grade.
        1) Trenches for Underground Facilities:
            a) In open fields: Two locations every 1,000 linear feet.
            b) Along dirt or gravel roads or off traveled Right-of-Way: Two locations every 500 linear feet.
            c) Crossing paved roads: Two locations along each crossing.

d) Under pavement cuts or within two feet of pavement edges: One location every 400 linear feet.

2) For Structural Backfill: On 30-foot intervals on all sides of the structure for every compacted lift, but no less than one per lift on each side of the structure for structures less than 60 feet long on a side.

3) In Embankment or Fill: One per 1,000 square feet on every compacted lift.

4) Base Material: One per 1,000 square feet on every compacted lift.

5) Footing Subgrade: For each strata of soil on which footings will be placed, conduct at least 1 test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to Town / Engineer.

b. Copies of the test reports shall be submitted promptly to the Town / Engineer. Contractor tests shall be performed by a soils testing laboratory acceptable to the Town / Engineer.

U. Construction in Highway Rights of Way

1. All construction within the road right-of-way shall be carried out in complete accordance with the requirements of the respective highway authority: Town, County, or INDOT.

V. Special Highway and Railroad Crossings

1. Special construction procedures will be required at those locations as shown on the drawings. When required, special construction procedures shall consist of boring a casing pipe for installation of a carrier pipe. The casing pipe lengths, size, thickness and location shall be as shown on the drawings and on the permits.

W. Directional Drilling (Pipe Sizes Greater than 2")

1. General
   a. The pilot hole and reamed hole shall be drilled so as to provide straight sections and uniform transitions from straight to long radius curve sections. The pipeline profile shall contain no high points except as noted on the drawings. The drill path shall be monitored by using a pothole machine and electronic package. The minimum required cover on water mains shall be five (5) feet. At no time shall any bore contain voids. All directional drilling shall be stopped immediately if any surface deformation is detected in the road right-of- way.
2. Equipment Requirements:
   a. The Contractor shall ensure that appropriate equipment is provided to facilitate the installation. Equipment shall be matched to the size of pipe being installed and shall have appropriate torque and thrust/pullback capacity for the diameter and length of the intended drilling sections. The Contractor will ensure that the drill rod can meet the bend radius required for the proposed installation.
3. Drilling Fluids:
   a. In order to minimize friction and prevent collapse of the bore hole, introduce a soil stabilizing agent (drilling fluid) into the annular bore space from the trailing end of the drill bit. The rotation of the bit in the soil wetted by the drilling fluid

creates a slurry. The slurry acts to stabilize the surrounding soil and prevent collapse of the bore hole as well as provides lubrication.

b. Select or design drilling fluids for the site specific soil and ground water conditions.

c. A mixture of bentonite clay or other approved slurry and potable water with a minimum pH of 6.0 shall be used as the cutting and soil stabilization fluid. The viscosity shall be varied to best fit the soil conditions encountered. Water shall be clean and fresh. No other chemicals or polymer surfactant are to be used in the drilling fluid without the written consent of the Engineer and after a determination is made that the chemicals to be added are not harmful or corrosive to the facility and are environmentally safe.

d. The Contractor shall identify the source of fresh water for mixing the drilling mud. The Contractor shall be responsible for approvals and permits required for such sources as streams, rivers, ponds, or fire hydrants. Any water source other than potable water may require a pH Test.

e. Ensure that all drilling fluids are disposed of or recycled in a manner acceptable to the appropriate local, state, or federal regulatory agencies. When drilling in suspected contaminated ground, the drilling fluid shall be tested for contamination and disposed of appropriately. Any excess material shall be removed upon completion of the bore.

4. Installation

a. General

1) Contractor shall install the pipelines by means of horizontal directional drilling as shown, specified and as recommended by the manufacturer.

2) Contractor shall be responsible for his means and methods of directional drilling construction and shall ensure the safety of the work, the Contractor's employees, the public, and adjacent property, whether public or private.

3) Contractor shall anticipate that portions of the drilled excavation will be below the groundwater table.

4) Contractor shall comply with all local, state, and federal laws, rules, and regulations at all times to prevent pollution of the air, ground, and water.

5) If there is a conflict between manufacturer's recommendations and the Drawings or Specifications, request instructions from Engineer before proceeding.

6) The pipe shall be installed in the location and to the line and grade designated on the drawings.

7) The timing of all boring processes is critical. Install a product into a bore hole within the same day that the pre-bore is completed to ensure necessary support exists.

8) Provide for testing and cleanup as soon as practicable, so these operations do not lag far behind pipe installation. Perform preliminary cleanup and grading operations immediately after backfilling.

9) All surfaces shall be finish graded to original contours and ground cover.

10) Excavated material, which is not removed from the immediate work site, shall be stockpiled so as to cause as little inconvenience to the property owners as possible. Driveways and street crossings must be kept clear.

11) Carry out excavation for entry, exit, recovery pits, slurry sump pits, or any other excavation.
12) Confine free flowing (escaping) slurry or drilling fluids at the ground surface during pull back or drilling. Accomplish this by creating sump areas or vacuum operations to prevent damage or hazardous conditions in surrounding areas. Sump pits are required to contain drilling fluids if vacuum devices are not operated throughout the drilling operation.
13) Ensure adequate removal of soil cuttings and stability of the bore hole by monitoring the drilling fluids such as the pumping rate, pressures, viscosity and density during the pilot bore, back reaming and pipe installation. Relief holes can be used as necessary to relieve excess pressure down hole. To minimize heaving during pull back, the pull back rate is determined in order to maximize the removal of soil cuttings without building excess down hole pressure. Contain excess drilling fluids at entry and exit points until they are recycled or removed from the site or vacuumed during drilling operations. Ensure that entry and exit pits are of sufficient size to contain the expected return of drilling fluids and soil cuttings.
14) After completing installation of the product the work site shall be restored. The work site shall be cleaned of all excess slurry left on the ground. Removal and final disposition of excess slurry or spoils as the product is introduced shall be the responsibility of the Contractor.
15) Excavated areas shall be restored in accordance with the Contract Documents. The cost of restoring damaged pavement, curb, sidewalk, driveways, lawns, storm drains, landscape, and other facilities is borne by the Contractor.
16) Contractor shall take responsibility for any damage caused by heaving, settlement, separation of pavement, escaping drilling fluid (frac-out), or the directional drilling operation, at no cost to the Owner. All restoration shall be per the Town's standards.
17) If an existing marked (or otherwise known) utility is damaged, stop bore immediately and repair at no cost to the Town.
18) If underground utilities and/or structures not shown on the Drawings are encountered, notify the Town and do not proceed until instructions are obtained.
19) Notify the Town if springs or running water are encountered.
20) Provide maintenance of traffic in accordance with the municipal street department, county highway department, or state department of transportation and these Specifications as applicable. Comply with the Manual of Uniform Traffic Control Devices when the former are silent.

5. Utility Verification (Potholing)
   a. Contractor shall conduct prior to the start of construction the verification of all underground utilities (potholing) that may conflict with construction.
   b. Potholing results shall be presented to the Town on a full set of drawings showing accurate locations of utilities. Information marked on the plans should include horizontal tie downs as well as depths related to USGS elevation.
   c. Alignment of the proposed utility (horizontal and vertical) may be adjusted in the field upon review of potholing results by the Town.
   d. All potholes are to be protected and marked so as to not cause injury.

6. Locating and Protecting Sanitary Sewer Laterals
    a. Sanitary sewer laterals are considered “private” and are not part of the public sewer system and begin at the inside face of the public sewer.
    b. It shall be the Contractor’s responsibility to pothole and verify the location of the underground utility (sanitary sewer lateral) that may be in conflict with the water main construction.
    c. It shall be the Contractor’s responsibility to protect sanitary sewer laterals during all construction activities.
    d. Any and all costs associated with locating, protecting, and repairing sanitary sewer laterals shall be considered incidental to the project cost and the responsibility of the Contractor.
7. Drilling Operations
    a. Directional drilling/boring shall use techniques of creating or directing a borehole along a predetermined path to a specified target location. This must involve use of mechanical and hydraulic deviation equipment to change the boring course and must use instrumentation to monitor the location and orientation of the boring head assembly along a predetermined course.
    b. Drilling must be accomplished with fluid assisted mechanical cutting. The spoils must be transported from the job site and be properly disposed. Under NO circumstances will the drilling spoils be permitted to be disposed into waterways, sanitary, storm, or any other public or private drainage system.
    c. Steering shall be accomplished by the installation of an offset section of drill stem that causes the cutterhead to turn eccentrically about its centerline when it is rotating. When steering adjustments are required, the cutterhead offset section is rotated toward the desired direction of travel and the drill stem is advanced forward without rotation.
8. Locating and Tracking
    a. The Contractor shall at all times provide and maintain instrumentation that will accurately locate the pilot bore/hole and measure drilling fluid flow and pressure.
    b. The Contractor shall describe the method of locating and tracking the drill head during the pilot bore. The accepted methods of tracking directional bores are walkover, wire line, and wire line with surface grid verification, or any other system as approved by the Engineer. The locating and tracking system shall be capable of ensuring that the proposed installation is installed as intended. The locating and tracking system shall provide information on:
        1) Clock and pitch information
        2) Depth.
        3) Transmitter temperature.
        4) Battery status.
        5) Position (x,y).
        6) Azimuth, where direct overhead readings (walkover) are not possible (i.e. subaqueous or limited access transportation facility.)
        7) Alignment readings or plot points shall be taken and recorded such that elevations from the top of and offset dimensions from the center of the product to a permanent fixed feature are provided. Provide elevations and dimensions at all bore alignment corrections (vertical and horizontal) with a minimum distance between points of fifty (50) feet. Provide a sufficient number of elevations and offset distances to accurately plot the vertical

and horizontal alignment of the installed product. Before commencement of a directional drilling operation, proper calibration of the equipment (if required) shall be undertaken.

c. Contractor shall grant Town access to all data and readout pertaining to the position of the bore head and fluid pressures and flows. No information pertaining to the position or inclination of the pilot bores shall be withheld from the Town.

d. Install all facilities such that their location can be readily determined by electronic designation after installation. Tracer wire complying with Town standards as set forth in this specification shall be provided with each directionally drilled pipe.

e. Test conductors for continuity. Conductors shall be installed to ground level at each hydrant and valve box.

9. Ream and Pullback

a. After an initial bore has been completed, a reamer will be installed at the termination/exit pit and the pipe will be pulled back to the starting/entry pit.

b. Reaming operations shall be conducted to enlarge the pilot after acceptance of the pilot bore. The number and size of such reaming operations shall be conducted at the discretion of the Contractor. However, the Contractor shall minimize potential damage from soil displacement / settlement by limiting the ratio of the bore hole to the product size. The size of the back reamer bit or pilot bit, if no back reaming is required, will be limited relative to the product diameter to be installed as follows:

Maximum Pilot or Back-Reamer Bit Diameter When Rotated 360 Degrees	
Nominal Inside Pipe Diameter Inches [mm]	Bit Diameter Inches [mm]
2 [50]	4 [100]
3 [75]	6 [150]
4 [100]	8 [200]
6 [150]	10 [250]
8 [200]	12 [300]
10 [250]	14 [350]
12 [300] and greater	Maximum Product OD plus 6 [150]

c. The maximum allowable pull exerted on the HDPE pipelines shall be measured continuously and limited to the maximum allowed by the pipe manufacturer so that the pipe or joints are not over stressed.

d. A swivel shall be used to connect the pipeline to the drill pipe to prevent torsional stresses from occurring in the pipe.

e. The lead end of the pipe shall be closed during the pullback operation.

f. The pipelines shall be adequately supported by rollers and side booms and monitored during installations so as to prevent over stressing or buckling during the pullback operation.

g. Support/Rollers shall be spaced at a maximum of 60 feet on centers, and the rollers to be comprised of a non-abrasive material arranged in a manner to provide support to the bottom and bottom quarter points of the pipeline allowing for free movement of the pipeline during pullback.

10. Drilling Failure
    a. If conditions warrant removal of any materials installed in a failed bore path, it will be at no cost to the Owner. Promptly fill all voids by injecting all taken out of service products that have any annular space with excavatable flowable fill.
    b. No payment will be made for failed bore paths, injection of flowable fill, products taken out of service or incomplete installations.
11. Work Affecting Existing Piping
    a. Location of Existing Piping
        1) Locations of existing piping shown should be considered approximate.
        2) Contractor shall determine the true location of existing piping to which connections are to be made, and location of other facilities which could be disturbed during earthwork operations, or which may be affected by Contractor's Work in any way.
    b. Taking Existing Pipelines Out of Service
        1) Do not take pipelines out of service unless approved by Engineer.
        2) Notify Engineer, in writing, at least 48 hours prior to taking pipeline out of service.
12. Quality Control
    a. A representative of the Contractor must be in control of the operation at all times. The representative must have a thorough knowledge of the equipment and the procedures to be performed and must be present at the job site during the installation.
    b. The Town must be notified forty-eight (48) hours in advance of starting work. The installation shall not begin until the Town's representative is present at the job site and agrees that proper preparations have been made.

3.10 **Polyethylene Encasement**

A. When specified, provide polyethylene encasement for ductile iron piping to prevent contact between pipe and surrounding bedding material and backfill.

B. Lumps of clay, mud, cinders etc. on the pipe surface shall be removed prior to installation of the polyethylene encasement.

C. Polyethylene film shall be fitted to the contour of the pipe creating a snug, but not tight, encasement with the minimum space between the polyethylene and the pipe. Sufficient slack shall be provided in contouring to prevent stretching the polyethylene where it bridges irregular surfaces, such as, bell-spigot interfaces, bolted joints or fittings and to prevent damage to the polyethylene caused by backfilling operations.

D. Overlaps and ends shall be secured with adhesive tape or plastic tie straps.

E. Installations below the water table tube-form polyethylene should be used with both ends thoroughly sealed with adhesive tape or plastic tie straps at the joint overlaps.

F. Circumferential wraps of tape shall be placed at 2 foot internals along the barrel of the pipe.

G. Provide polyethylene wrap for fire hydrant leads and valves if specified in Contract Documents.

3.11 **Pipe Tracing Wire**

A. Installation
1. Three (3) strands of tracing wire shall be laid directly over and adjacent to the pipe and attached to the pipe at regular intervals not to exceed ten (10) feet.
2. Location tape shall be installed between gravel back fill and 2 feet below surface.
3. Attach the tracer wire to the pipe using plastic “zip” strapping or metal wire.
4. The following technique shall be used to splice wires together:
    a. Use direct bury lug and strip the wire to 5/8”.
    b. Place one stripped conductor into the lug.
    c. Tighten the set screw till it comes in contact with the solid conductor.
    d. Note the location of screwdriver and continue tightening the set screw ¾ turn for # 10 solid copper wire.
    e. Repeat the steps for the adjacent side.
    f. Remove sealant cover and discard. Close housing, aligning conductors until housing lid is fully latched.
5. For valves, the wire shall be brought up the outside of the valve or curb box riser. Construct an opening in the lip of the valve box or curb box to allow the top of the tracer wire to be stored inside the box. Ensure that the opening is sized adequate so the cover will fit snug onto the box, once the tracer wire is installed. The wire should be installed with an excess length of 4-6 inches that is to be folded down in the valve box.
6. For hydrants, install tracing wire in the hydrant shut off valve box in accordance with the installation requirements for values listed above.

7. All water service lines shall be installed with tracer wire to the water meter valve in the house as well as to the top of the curb box.
8. Successful completion of conductivity test to be completed by the Contractor and in the presence of the Town / Engineer. Successful completion of the test will be required prior to acceptance of water main.

3.12 Pipe Installation for Water

A. General
1. Install piping as shown, specified, and as recommended by pipe and fittings manufacturer.
2. In event of conflict between manufacturer's recommendations and the Contract Documents, request interpretation from Town / Engineer before proceeding.
3. Town / Engineer will observe excavations and bedding prior to laying pipe by Contractor. Notify Town / Engineer in advance of excavating, bedding, pipe laying, and backfilling operations.
4. Comply with NFPA 24 for "Outside Protection", where applicable to water piping systems used for fire protection.
5. The Town of Danville shall be the only party allowed to operate Danville's water valves and hydrants.

B. Cleaning Pipe and Fittings
1. All lumps, blisters, and excess coatings shall be removed from the bell and spigot end of each pipe.

C. Separation of Sewers from Potable Water Piping or Potable Water Structures
1. Horizontal Separation:
   a. Existing and proposed potable water mains and service lines, and sanitary, combined, and storm sewers shall be separated horizontally by clear distance of at least ten feet.
   b. If local conditions preclude the specified clear horizontal separation, installation will be allowed if potable water main is in separate trench or on undistributed earth shelf on one side of sewer and with bottom of potable water main at least 18 inches above top of sewer.
   c. No water main should be located within 10 feet of a sanitary or storm sewer manhole as measured from the outside edge of the water main to the outside edge of the structure.
   d. Exception:
      1) Where it is not possible to provide minimum horizontal separation described above, construct sewer pipe of pressure pipe complying with public water supply design standards of authority having jurisdiction. Hydrostatically test newly installed pressure piping to a minimum complying with public water supply design standards of authority having jurisdiction. Hydrostatically test water main and sewer as specified in this Section prior to backfilling. Hydrostatic test pressure at crossing shall be at least 150 psi.
      2) Alternatively, the water main or the sewer line may be encased in a watertight carrier pipe which extends 10 feet on both sides of the crossing, measured perpendicular to the water main. The carrier pipe shall be of the materials approved by the Town for water main construction.

2. Vertical Separation:
    a. Provide minimum vertical distance of 18 inches between outside of potable water main and outside of sewer when sewer crosses potable water main.
    b. Center a section of potable water main pipe at least 20 nominal feet long over sewer so that sewer joints are equidistant from potable water main joints.
    c. Provide adequate structural support where potable water main crosses under sewer. At minimum, provide compacted select backfill for ten feet on each side of crossing.
    d. Exceptions:
        1) Where it is not possible to provide minimum vertical separation described above, construct sewer pipe of pressure pipe complying with public water supply design standards of authority having jurisdiction. Hydrostatically test water main and sewer as specified in this Section, prior to backfilling. Hydrostatic test pressure at crossing shall be at least 150 psi.
        2) Encase either potable water main or sewer in watertight carrier pipe extending ten feet on each side of crossing, measured perpendicular to potable water main, with a watertight carrier pipe of the materials approved by the Town for water main construction.
    e. Where a water main crosses under a sewer, the main shall use 22.5 degree elbows to minimize the length of water main installed in excess of five feet (5') of cover.
3. Separation of Sewer Mains from Potable Water Structures:
    a. Maintain sanitary setbacks from water supply wells and other water supply sources and structures per the requirements of 327 IAC 8-3.4-9.

D. Plugs (Bulkheads)
1. Temporarily plug installed pipe as directed by Town at end of each day of work or other interruption of pipe installation to prevent entry of animals, liquids, and persons into pipe, and entrance or insertion of deleterious materials into pipe. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.
2. Install standard plugs in bells at dead ends, tees, and crosses. Cap spigot and plain ends.
3. Fully secure and block plugs, caps, and bulkheads installed for testing to withstand specified test pressure.
4. Where plugging is required for phasing of the Work or subsequent connection of piping, install watertight, permanent type plugs, caps, or bulkhead acceptable to Town / Engineer.

E. Bedding Pipe
1. Bed pipe as specified herein and in accordance with the Town standard drawings.
2. Excavate trenches below bottom of pipe by amount shown and indicated in the Town standard drawings and permitted Contract Documents. Remove loose and unsuitable material from bottom of trench.
3. Carefully and thoroughly compact pipe bedding with hand held pneumatic compactors.
4. Bedding to be shaped to provide continuous bearing support to pipe for full length. Bedding to be shaped to receive bell and maintain bearing support on remainder of pipe.
5. Do not lay pipe until Town / Engineer approves bedding condition.

6. Do not bring pipe into position until preceding length of pipe has been bedded and secured in its final position.

F. Alignment
   1. Install pipe accurately to line and grade shown and indicated in the Contract Documents, unless otherwise approved by Town / Engineer.
   2. Slope piping uniformly as shown on the Drawings.

G. Laying Pipe
   1. Conform to manufacturer's instructions and requirements of standards and manuals listed below, as applicable:
      a. Ductile Iron Pipe: ANSI/AWWA C600, ANSI/AWWA C105, AWWA M41.
      b. Thermoplastic Pipe: ASTM D2321, ASTM D2774, ANSI/AWWA C605, AWWA M23, AWWA M45, AWWA M55, ASTM F645.
   2. Each piece shall be opposite or near the place where it is to be laid in the trench. Proper implements, tools and facilities shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe and fittings shall be carefully lowered into the trench, piece by piece, by means of a crane, rope or other suitable tools or equipment, in such a manner so as to prevent damage to main materials and to protective coatings and lining. Under no circumstances shall main materials be dropped or dumped into the trench.
   3. Slope piping uniformly between elevations shown.
   4. No pipe lengths shorter than 6 ft are permitted without written approval of the Town / Engineer.
   5. Do not lay pipe in water. Maintain dry trench conditions until jointing and backfilling are complete. Keep clean and protect interiors of pipe, fittings, valves, and appurtenances.
   6. Place bell and spigot-type pipe so that bells face the direction of laying, unless otherwise approved by Town / Engineer.
   7. Deflections at joints shall not exceed 75 percent of amount allowed by pipe manufacturer, unless otherwise approved by Town / Engineer.
   8. Carefully examine pipe, fittings, valves, and specials for cracks, damage, and other defects while suspended above trench before installation. Immediately remove defective materials from the Site and replace with acceptable products.
   9. Inspect interior of all pipe, fittings, valves, and specials and completely remove all dirt, gravel, sand, debris, and other foreign material from pipe interior and joint recesses before pipe and appurtenances are moved into excavation. Bell and spigot-type mating surfaces shall be thoroughly cleaned and dried immediately before pipe is laid.
   10. Field cut pipe, where required, with machine approved by manufacturer for cutting the type of pipe being installed. Make cuts carefully, without damage to pipe, coating or lining, and with smooth end at right angles to axis of pipe. Cut ends on push-on joint type pipe shall be tapered and sharp edges filed off smooth. Do not flame-cut pipe. Breaking of the pipe with any type of hammer will not be permitted.
   11. Do not place blocking under pipe, unless specifically approved by Town / Engineer for special conditions.
   12. Touch up protective coatings in manner satisfactory to Town / Engineer prior to backfilling.
   13. Notify Town / Engineer in advance of backfilling operations.
   14. On steep slopes, take measures acceptable to Town / Engineer to prevent movement of pipe during installation.

15. Thrust Restraint: Where required by specifications or shown on permitted Contract Documents, provide thrust restraint.
16. Exercise care to avoid flotation when installing pipe in cast-in-place concrete, and in locations with high groundwater. The Contractor shall take all precautions necessary to prevent flotation of the pipe due to water coming into the trench. Any damage from flotation or water entering the trench shall be corrected by removing that section which becomes damaged and repairing or replacing it.

H. Joining Pipe
1. All pipe joints shall be made up in strict accordance with the pipe manufacturer's recommendations. Joints not tight shall be disassembled, thoroughly cleaned, and remade. Under no conditions shall bolted joints be made tight by overstressing the bolts or tightening the bolts beyond the manufacturer's recommended range of torque. The Contractor shall provide and have available for the use of the Town / Engineer Representative on the job at all times, properly calibrated indicating torque wrenches to fit all joint bolts being used. Joints found to have bolts tightened above the manufacturer's recommended maximum torque shall be disassembled, cleaned, and properly remade as directed by the Town.
2. Slip joints and other rubber gaskets type pipe joints shall be installed in strict accordance with the manufacturer's recommendations. Lubricants other than those recommended by the pipe manufacturer shall not be used. Joints found to be not tight or with the plain end not sufficiently inserted into the socket shall be disassembled, thoroughly cleaned and properly installed. The plain end shall not be inserted beyond the manufacturer recommendations into the receiving end.

I. Backfilling
1. Conform to applicable requirements of the Excavation & Backfill Specifications.
2. Place backfill as Work progresses.

J. Transitions from One Type of Pipe to Another
1. Provide necessary adapters, specials, and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.

K. Thrust Restraint
1. Provide thrust restraint on piping systems where shown or indicated in the Contract Documents.
2. Thrust restraint may be accomplished by using restrained pipe joints. Harnessing buried pipe or use of thrust blocks is permitted only if approved by Town / Engineer in writing. Thrust restraints shall be designed for axial thrust exerted by test pressure specified on Contract Drawings, or 150 psi for water mains if not listed on Drawings.
3. Restrained Pipe Joints:
    a. Pipe joints shall be restrained by means suitable for the type of pipe being installed.
        1) Ductile Iron, Push-on Joints and Mechanical Joints: Restrain with proprietary restrained joint system; or other suitable joint restraint system, subject to the approval of Town / Engineer.
        2) Thermoplastic and HDPE Joints: Where bell and spigot-type or other non-restrained joints are utilized, provide proprietary restrained joint system; or other suitable joint restraint system, subject to the approval of Town / Engineer.

4. Project Engineer shall submit for approval a joint restraint length schedule for each diameter and material of piping utilized on the project and requiring restraint. See standard drawings for further detail.

L. Work Affecting Existing Piping
   1. Operation of existing valves shall be by Town only.
   2. Taking Existing Pipelines and Underground Facilities Out of Service:
      a. Do not take pipelines or Underground Facilities out of service unless specifically listed in the Contract Documents or approved by Town / Engineer.
      b. Notify Town / Engineer in writing prior to taking pipeline or Underground Facilities out of service.
      c. Shutdown notification shall be provided twenty-four (24) hours in advance of the shutdown in accordance with the General Conditions and Contract Documents. Notice to affected occupants, Fire Department, Owner, and Town / Engineer is required.
      d. Shutdown not to exceed four (4) hours. Stand-by service to be provided as required.
   3. Work on Existing Pipelines or Underground Facilities:
      a. Cut or tap piping or Underground Facilities as shown or required with machines specifically designed for cutting or tapping pipelines or Underground Facilities, as applicable.
      b. Prevent contamination of existing facilities. Install temporary plugs to prevent entry of mud, dirt, water, and debris into pipe.
   4. Salvage all hydrants, valve boxes, & curb boxes removed and deliver to Town unless noted otherwise by the Town. Remove with caution to avoid damage to hydrant or box.

M. Records
   1. Record Documentation:
      a. Maintain accurate and up-to-date record documents showing modifications made in the field, in accordance with approved submittals, and other Contract modifications relative to buried piping Work. Submittal shall show actual location of all piping Work and appurtenances at same scale as the Drawings.
      b. Show piping with elevations referenced to Project datum and dimensions from permanent structures. For each horizontal bend in piping, include dimensions to at least three permanent structures, when possible. For straight runs of piping provide offset dimensions as required to document piping location.
      c. Include profile drawings with buried piping record documents when the Contract Documents include piping profile drawings.
      d. The Contractor shall keep accurate and complete records of the actual location of all fittings, existing pipes, repair of existing utilities or tiles, tap locations into the main and the depths of the service laterals at the point of termination of the laterals.
         1) Said records shall be turned over to the Town at the completion of the project. Each water fitting, structure, tap location, or valve box shall be referenced to three permanent monuments. All water service tap lines shall be measured from the building corners on the property served.

      e. As-built drawings shall be submitted on a hard paper format and in an electronic

format compatible with AutoCAD.

1) All as-built wye and connection locations shall be as shown on a set of as-built drawings by the Contractor and also typewritten on a separate page with the owner's name and address.

N. Electronic Submittal Requirements for GIS

1. Contractor shall meet Town of Danville's Electronic Submittal Requirements for GIS collection. These standards are provided separate from this documentation, but the general requirements are listed below. These requirements are separate from the records requirements in section "M" of this document.
   a. Contractor shall locate via GPS all mains, water meters, water valves, service lines, and hydrants. Location of all features shall be collected with a horizontal accuracy of at least 4 inches.
   b. Photos shall be taken of all features. Photos shall be taken in landscape orientation and facing north, except for hydrants where the orientation shall be focused on the information stamp. Photo size shall be restricted to 10MB per photo. Photos should be attached to features when submitted.
   c. Features should be collected with the required fields, in the required format, listed in the electronic submittal requirement. Generally, the fields are as follows:

Watermain	Water Meter Pit	Water Valves	Hydrants
Pipe_Size	Meter_ID	Valve_ID	Hydrant_ID
Pipe_Material	Lid_Condition	Manufacturer	Manufacturer
Upstream_Point_ID	Pit_Condition	Model	Model
Downstream_Point_ID	Number_of_Meters	Size	Size
Date_of_Install	Meter_Read_Type	Valve_Type	Bury_Depth
Length	Meter_1_Address	Install_Date	Hydrant_Valve_ID
Comment	Meter_2_Address	Date_Last_Exercised	Install_Date
	Meter_3_Address	Comment	Date_of_Last_Service
	Comment		Date_Last_Exercised
			Comment

   d. All data shall be submitted in as a file geodatabase (i.e. ".gdb" file extension). Other file types will not be accepted.

O. Special Installation Instructions

1. In recognition of the fact that there are currently many different pipe materials available from many different manufacturers, the Contractor will be required to obtain from the pipe manufacturer his published recommendations for installation of his pipe, and nothing in these specifications shall preclude compliance by the Contractor with the manufacturer's recommendations. Contractor responsible to notify Engineer of conflict between manufacturer's recommendations and applicable ASTM / AWWA standards.

3.13 Water Appurtenances Installation

A. General:

1. Install water appurtenances as shown, specified, and as recommended by the manufacturer.
2. In the event of conflict between manufacturer's recommendations and the Contract Documents, request interpretation from Engineer before proceeding.

3. Location of service connections and insertion valves indicated are approximate. Final location will be established during construction by the Town.
4. Do not install water service connections until new mains have been successfully tested, disinfected, and placed in service.
5. Prior to ordering tapping sleeve assembly, expose existing main and verify circumference of existing pipe.
6. Prior to ordering insertion valve and sleeve assembly, expose existing main at point of installation and verify circumference, actual caliper diameter and roundness of existing pipe. In addition, identify the exterior condition of the pipe with respect to pitting, scaling, electrolysis, or other defects which would affect manufacturing dimensions or exact location of the insertion.

7. The Town of Danville shall be the only party allowed to operate Danville's water valves and hydrants.

B. Fire Hydrants
1. Install hydrants as shown and indicated in these Standards & Specifications and the permitted Contract Documents.
2. Provide suitable adapters when hydrants and piping have different joint types.
3. Provide thrust restraint at all hydrants located at pipeline terminations.
4. Set hydrants plumb and to grade of curb, street, alley, highway, or right-of-way with pumper nozzle toward middle line of street, highway, or right-of-way.
5. Set hydrant on crushed stone or well tamped gravel; provide loose stone or gravel fill up to drainage port.
6. When Town / Engineer deems it necessary to set a fire hydrant at a greater depth of bury as a result of changing hydrant location from that shown, adjust elevation by furnishing and installing the fire hydrant manufacturer's standard barrel and stem extensions.

C. Valves
1. Install valves, valve boxes, and curb boxes as shown and indicated in these Standards & Specifications and the permitted Contract Documents.
2. Provide suitable adapters when valves and piping have different joint types.
3. Provide thrust restraint at all valves located at pipeline terminations.
4. Set valves plumb and on solid bearing.
5. Install insertion valves and sleeves using personnel skilled and experienced in the use of the valve insertion machinery and accessory equipment of the type, design and size corresponding to each valve size installed. Remove section of severed water main and present to Town as proof of satisfactory execution of the operation. Town may retain coupon for further analysis or testing to evaluate the condition of existing water main.

D. Tapping Sleeve & Valve
1. Contractor shall perform the tapping of the existing main according to the manufacturer's specifications.
2. The Contractor shall excavate an area of sufficient size and depth, conforming to OSHA requirements, to accommodate the operations of tapping the existing line and setting the valve.
3. Assemble, align, and fit tapping sleeve and tapping valve to main using personnel skilled and experienced in making of pressure taps. In the event of mismatch of purchased

materials, make necessary arrangements with manufacturer for factory refit. Any field refit will require written manufacturer and Town approval. Remove section of severed water main through tapping valve and present to Town as proof of satisfactory execution of the operation. Town may retain coupon for further analysis or testing to evaluate the condition of existing water main.

4. The Contractor shall furnish and install a valve box with the necessary extensions, backfill and compact the excavated area.
5. The Contractor shall perform a 150 psi hydrostatic pressure test, or a different pressure as required by the Town / Engineer, on the tapping sleeve and valve prior to tapping the existing water main. *Lower test pressures for air testing will be permitted only when approved in writing by the Town / Engineer.* This pressure test will be performed using the test plug provided with the tapping sleeve.

E. Valve Boxes & Curb Boxes
   1. Center and plumb valve and curb box over valve; set box cover flush with finished grade.

F. Small Water Service Connections (¾-Inch Thru 2-Inch)
   1. Ensure service connection has a minimum cover of 4 feet 6 inches (4'-6").
   2. Buried Piping Identification Tracing for Service Connections.
      a. Install tracing wire for service connections in accordance with Town Standards & Specifications.
      b. Ensure connectivity is maintained between the mainline tracer wire and the service connection tracer wire.
      c. All tracing wire splices and connections shall be made using a direct bury waterproof connection device, intended for use with low voltage tracing wire.
      d. When connecting tracing wire from the mainline to a service line secure the connection with 2 plastic hose clamps and wrap the connection in waterproof tape.
   3. For existing service connections, intercept or extend as shown or noted to connect to new water mains.
   4. For existing service connection pipe to be abandoned, close the exposed end by crimping.
   5. For existing service connections to be abandoned on existing water mains to remain in service, dig up (expose) and turn off the existing corporation stop at the connection to the existing main.

G. Large Water Service Connections (3 Inch and Larger)
   1. Minimum cover for services shall be per the pipe installation specifications.
   2. Service Connections on New Mainline
      a. Install tee compatible with the mainline material.
      b. Install a standard gate valve and valve box.
   3. Service Connections on Mainlines In Service
      a. Install tapping sleeve compatible with the mainline material.
      b. Install a tapping valve and standard valve box.

H. Connections and Insertions into Existing Mains
   1. Existing mains into which valves are to be inserted cannot be shut down or taken out of service. The entire operation of installing the valves shall be accomplished below 100 psig at the point of installation.
   2. Connect new mains to existing mains using proper fittings and in a manner acceptable to

Town / Engineer.

3. Expose existing mains at connection points prior to making connections with reasonable time available to determine elevation, verify type of pipe, confirm outside diameter of pipe, identify type of existing restraints, and order correct materials for connection.
4. No cut-ins or connections to existing mains shall be made unless written approval is obtained from the Town / Engineer.
5. Plan all connecting work to reduce number of shutoffs.
6. Two days prior to shutting valves on existing lines, notify all affected property owners, local official in charge of the water works system, and Town / Engineer of such shutoff.
7. Keep shutoff time to a minimum and do at off-peak hours.
8. A representative of Town shall operate existing valves. Contractor shall not operate existing valves.
9. Town and Engineer assume no responsibility for any delay occasioned by special requirements or conditions which must be met in making connections.
10. Take extreme care in making connections to prevent contamination of existing mains.
11. Before making cut-ins or connections to existing mains, wash all fittings, valves, and pipe with clean water, and then disinfect by washing with a chlorine solution having a residual chlorine strength of not less than 50 ppm. Follow all IDEM requirements for disinfection.
12. Plugs removed from existing mains that are not damaged may be reused within the Project, and those remaining after completion of construction shall remain the property of Town.
13. Contractor responsible for all bypass pumping required for connection.

I. Water Meter Boxes

1. Install assemblies as shown or noted and with meter pit cover at grade level; comply with component manufacturer's instructions.
2. Install meter setters level and plump.
3. Do not install meter pits in street, parking lots, driveways, or any area where vehicular traffic may occur.

J. Connections to Meter Assemblies, Backflow Prevention Assemblies, Valves, and Hydrants

1. Install meters, backflow prevention, valves and hydrants as shown and indicated in the Contract Documents.
2. Provide suitable adapters when meter assemblies, backflow prevention assemblies, valves or hydrants and piping have different joint types.
3. Provide thrust restraint at all meter assemblies, backflow prevention assemblies, hydrants, and at valves.

K. Backflow Prevention Devices

1. Install backflow valves in accordance with manufacturer's recommendations.

3.14 Painting of Buried Valves and Appurtenances

A. Exterior steel, cast-iron, and ductile iron surfaces, except machined or bearing surfaces of buried valves and appurtenances and except those surfaces coated with fusion bonded epoxy, shall be painted in manufacturer's shop with two coats of asphalt varnish conforming to FS TT- C 494.

3.15 **Testing & Sterilization for Water**

A. General

1. General Testing Requirements

a. All testing shall be in accordance with IDEM, INDOT or other recognized standards and regulations.

b. Notify Town / Engineer and authorities having jurisdiction in writing at least 48 hours in advance of testing. All testing to be witnessed by a Town Employee or representative.

c. Do not install more than 1,000 feet of pipe without being tested, unless approved by Town.

d. Prepare and submit schedules and procedures to Town for testing. Submit the schedule at least seven days prior to any testing.

e. Remove or protect pipeline-mounted devices that could be damaged by testing.

f. Provide all apparatus and services required for testing, including:

1) Test risers and associated connections to the main, test pumps, compressors, hoses, calibrated gauges, meters, test containers, valves, fittings, and temporary pumping systems required to maintain Town's operations. The Town reserves the option to furnish the gauges and metering devices for the tests. Pressure gauges used for testing shall have no greater than 5 psi increment markings or shall be as directed by the Town for the satisfactory evaluation of the required testing.

2) Temporary bulkheads, bracing, blocking, and thrust restraints.

g. Provide air if an air test is required, power if pumping is required, and gases if gases are required.

h. Demonstrate that all valves in the test section are opened as appropriate for the test.

i. Unless otherwise specified, Town will provide water required for hydrostatic testing and disinfection except for water required due to a failed test. Contractor shall provide means to convey water for hydrostatic testing into piping being tested. Contractor shall provide water for other types of testing required.

j. Do not place water into the newly installed pipe until the Town is on the project site and gives the Contractor approval. Any valve opening to place potable water into the newly installed pipe shall be done by the Town.

k. All leaks, broken or cracked pipe, valves, etc. which are identified by testing shall be repaired. Any sections of main which do not meet test acceptance criteria shall be repaired or replaced. Retest after repair at no additional cost.

l. Where necessary due to absence of valves or structures, testing shall include existing piping systems that connect with new piping system. Test existing pipe to nearest valve or structure. Piping not installed by Contractor and that fails the test shall be repaired upon authorization of Town. Unless otherwise included in the Work, repair of existing piping or underground facilities will be paid as extra Work.

m. Test to confirm connectivity of tracer wire.

n. Copies of all test reports are required, or test shall be considered to have failed.

B. Hydrostatic Testing

1. General:
    a. All newly installed water mains must be pressure and leak tested prior to final acceptance.
2. Preparation
    a. Pipeline shall be laid and backfilled.
    b. Valves shall be properly located, operable, and plumb and at correct elevation.
    c. Prior to testing, ensure adequate thrust protection is in place and joints are properly installed.
    d. Prior to testing ensure that the line is clean and free of dirt and debris.
    e. For PVC and thermoplastic pipe, follow preparation and procedures described in Section 7 of ANSI/AWWA Standard C605. Test pressure & duration shall be 150 psi for 2 hours for water mains, unless noted otherwise.
    f. For ductile iron piping, follow preparation & procedures described in AWWA C600. Test pressure shall be as specified and duration shall be for 2 hours.
    g. For HDPE pipe, follow preparation and procedures described in ASTM F2164. Test duration, including time to pressurize, time for initial expansion, time at test pressure, and time to depressurize shall not exceed 8 hours. If re-testing of a test section or pipeline is required, at least 8 hours shall elapse between tests. HDPE pipe test pressure and duration shall be 150 psi for 4-hour expansion period and 140 psi for the 1-hour test.

3. Test Procedure:
    a. Fill pipeline slowly to minimize air entrapment and surge pressures. Fill rate shall not exceed one foot of pipe length per second in pipe being tested.
    b. Expel air from pipe as required by venting through air release valves, blow-offs, or special taps at high points in line. Obtain approval of Town / Engineer prior to tapping pipe for expelling air.
    c. During the test, examine all exposed pipe, fittings, valves and appurtenances for leakage. Make repairs to eliminate visible leakage.
    d. For DIP and PVC Pressure Pipe
        1) Add fluid as required to pressurize line to required test pressure. Maintain test pressure for a stabilization period of ten minutes before beginning test.
        2) Timed test period shall not begin until after pipe has been filled, exposed to required wetting period, air has been expelled, and pressure stabilized.
        3) Timed Test Period: After stabilization period, maintain test pressure for at least two hours. During timed testing period no fluid can be added to maintain pressure of required test pressure.
        4) Record pressure at test pump at 15 minute intervals for duration of test.
    e. For HDPE Pressure Pipe
        1) After filling pipeline, gradually pressurize pipe to test pressure and maintain required test pressure for four hours for pipe to expand. During expansion, add fluid to maintain required test pressure. Begin timed test period after expansion period and other requirements are met.
        2) Timed test period shall not begin until after pipe has been filled, exposed to required wetting period, air has been expelled, and pressure stabilized.
        3) Timed Test Period: After four hour expansion phase, reduce test pressure by ten psig and do not add liquid. Test pressure shall then remain steady for three

hours, indicating no leakage.

4) If no visible leakage is observed and pressure remains within 5% of the original test pressure for one hour, a passing test is indicated.

4. Makeup Water Allowances:
   a. No Makeup Water: Pipe with flanged, welded, fused, threaded, soldered, push-on, or brazed joints.
   b. Observed leaks shall be repaired regardless of leakage measurements.
   c. Any damaged or defective pipes, fittings, valves, or joints should be repaired and the pressure test repeated until satisfactory results are obtained, at no additional cost to the Town.

C. Cleaning and Disinfection for Potable Water Piping
   1. Cleaning, General: Clean pipe systems as follows:
      a. For piping that requires disinfection and has not been kept clean during storage or installation, swab each section individually before installation with five percent sodium hypochlorite solution.
      b. Thoroughly clean all piping, including flushing with water, in manner approved by Town / Engineer, prior to placing in service. Flushing may occur prior to or after pressure testing, but prior to disinfection. Following disinfection, flush chlorine solution and sodium hypochlorite out of piping with water.
      c. Flushing operation shall maintain a minimum velocity of 2.5 ft/sec in main. Taps and openings shall be provided by the Contractor as necessary to achieve minimum velocity.
      d. The Contractor shall submit a method and schedule for flushing to the Town / Engineer.
   2. Disinfection:
      a. Disinfect all potable and finished water piping.
      b. Disinfect following pressure tests and prior to connection to existing water main.
      c. Suggested procedure for accomplishing complete and satisfactory disinfection is specified below. Other procedures may be considered for acceptance by Town / Engineer.
         1) Prior to disinfection, clean piping as specified and flush thoroughly per AWWA C651.
         2) For disinfection, conform to procedures described in ANSI/AWWA C651. Use continuous feed method of disinfecting, unless alternative method is acceptable to Town / Engineer. Chlorine tabs are not permitted unless approved by the Town / Engineer in writing.
      d. Chlorine, testing, disinfection, work and all necessary equipment shall be provided by Contractor. Chlorine gas is not permitted on the jobsite.
      e. Chlorine concentration in water entering the piping shall be between 50 and 100 ppm, such that minimum residual concentration of at least 25 mg/L shall remain in the pipe after 24 hours.
      f. Disinfect piping and all related components. Repeat as necessary to complete disinfection.
      g. Operate all valves during disinfection.
      h. Bacteriologic tests shall be performed by Contractor, unless otherwise dictated by the Town. Certified test laboratory report must be provided to the Town.
         1) Two consecutive safe bacteriological samples shall be taken 24 hours apart

before placing the water line into service. Samples shall be collected for every 1,200 feet of new main, plus samples from each branch and the end of the line. If excessive quantities of debris, or trench water, has entered the main, samples shall then be taken at approximately 200-foot intervals. Samples should never be collected from hoses or fire hydrants. A suggested sampling tap is a corporation stop with copper goose neck assembly. The goose neck assembly shall be removed after use as directed by the Town.

2) Disinfection record:
   a) Type and form of disinfectant used.
   b) Date and time of disinfectant injection; start and time of completion.
   c) Test locations.
   d) Date and time of flushing start and completion.
3) Bacteriological report record:
   a) Date issued, project name, and testing lab information.
   b) Time and date of water sample collection.
   c) Name of person collecting samples.
   d) Test locations.
   e) Coliform bacteria test results for each outlet tested.
   f) Certification that water confirms, or fails to conform, to bacterial standards.
   g) Bacteriologist's signature and authority.

i. After required retention period,
   1) Properly dispose of chlorinated water in accordance with Laws and Regulations, including 327 IAC 8-3.2-18.
   2) Only flush chlorinated water to the Sanitary Sewer if written permission obtained from Town.
   3) Do not discharge chlorinated water to storm sewers, ditches, or overland.
   4) If water has been properly dechlorinated, flushing to the Storm Sewer is acceptable.
   5) No flushing during a rain event.

j. If first bacteriologic sample fails, one more is allowed at Contractor's expense. If the second sample fails, another flush must take place. If the second sample fails, the disinfection process shall be repeated. Contractor must remain on site for the entire disinfection process until the pipe passes.

3.16 **Electrical**

A. Scope
1. The electrical work to be executed shall include all material, transportation, labor, tools, and equipment to complete and leave ready for operation a complete electrical system as called for in these specifications and/or on the accompanying drawing.

B. General Requirements
1. Perform all work in accordance with the latest edition of the National Electric Code. Nothing contained in these specifications should be interpreted as conflicting with the Code.
2. All materials and equipment installed shall be new and undeteriorated and of a quality not less than the minimum specified. Materials for which examination service

is provided shall bear the Underwriters label.

3. All workmanship shall be in accordance with the best practices of the trade. Electrical work shall be installed by journeymen electricians under the direct supervision of a competent foreman. At no time shall electrical work be installed by apprentice electricians or laborers without the immediate on-the-job supervision of a journeyman electrician.
4. Wiring layouts when shown on Drawings are schematic and the exact locations shall be determined by structural and other conditions. This shall not be construed to mean that the design of the system may be changed. It refers only to the exact locations of conduits and equipment to fit into the work and the coordination of conduits and other equipment with piping and equipment included under other divisions of the specifications.
5. Furnish and install all necessary hangers, supports, straps, pull boxes and fittings not indicated on the drawings but which are required for a complete and properly installed system.
6. Consult all contract drawings which may affect the location of any equipment, conduit or wiring and make minor adjustments in location to secure coordination.
7. Other than minor adjustments all modifications shall be submitted to the Town / Engineer for approval before proceeding with the work.
8. The Contractor shall at all times be fully informed of the progress of the general construction, and shall install all work that is concealed and built into the work in place in sufficient time to insure proper location without delays to the work of the other trades. Properly attend the electrical work during the progress of construction to prevent misalignments of and damages to the electrical work.

C. Grounding

1. Grounding shall be in strict accordance with the requirements of the National Electric Code.
2. Only approved grounding clamps shall be used for attachment of grounding conductors.
3. Grounding conductors exposed to mechanical injury shall be installed in conduit.
4. Provide code size grounding conductors in all runs of PVC conduit.

D. Shop Drawings

1. Prior to the commencement of work the Contractor shall submit to the Town, for approval, drawings relating to the arrangement of work and shop drawings of all equipment and apparatus.
2. The drawings as submitted shall bear the stamp of approval of the Contractor as evidence that the drawings have been checked and considered satisfactory to the Contractor. Drawings submitted which include variations from the requirements of the contract specifications, or plans shall include specific mention of such variations in order that, if acceptable, action may be taken for adjustment.
3. The Town's review and approval of the Contractor's drawings or equipment details do not relieve the Contractor of responsibility for errors, omissions, deviation from specified requirements and incidental work required for proper operation, equipment failure and space requirements.

E. Inspection, Tests, Permits and Fees

1. After completion of the work, furnish to the Town a certificate of inspection and approval from the inspecting agency having jurisdiction for all electrical work.
2. Immediately correct all work which is found unacceptable by the Town. Work shall be considered unacceptable when it is contrary to the plans and/or specifications and/or the National Electric Code and/or accepted standards of good workmanship.
3. Demonstrate by tests, at the request of the Town, the compliance of the installation with these specifications, the drawings, the National Electric Code and the accepted standards of good workmanship. These tests shall include operation of equipment, continuity of the conduit system and grounding resistance. All labor and testing equipment for the performance of these tests shall be furnished by the Contractor.

F. Electrical Service

1. The general details of the electrical services are shown on the drawings. The Contractor shall arrange for modifications or changes to the required electrical service with the electric company serving the station.

G. Underground Electrical Line Identification Tape

1. During trench backfilling for exterior underground power, signal and communications lines, install permanent, bright colored continuous printed underground plastic tape compound, 6 inches wide by 4 mils thick, located directly above line at 6 to 8 inches below finished grade. Where multiple lines installed in a common trench or concrete envelope do not exceed an overall width of 16 inches, install a single line marker. Printed legend shall be indicative of the general type of underground line below.

H. Service-Entrance Equipment

1. Provide service-entrance equipment and accessories, which are UL listed and labeled and marked 'Suitable For Use As Service Entrance Equipment' of types, sizes, ratings and electrical characteristics indicated, which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation, and as herein specified. Contractor is to verify with the Electric Utility, the necessary service entrance equipment, installation procedures, each entity's responsibility.

I. Wiring Methods

1. All wiring shall be installed in conduit or raceway. All conduit installed exposed to (10) feet elevation above grade shall be aluminum (ARC) conduit. Galvanized conduit is not permitted. All conduit installed underground shall be polyvinyl chloride heavy wall conduit approved for direct burial with all joints cemented together using couplings and fittings as recommended by the manufacturer. All conduit installed underground shall be installed with top of conduit at a minimum of thirty inches below final grade.

3.17 **Site Restoration**

A. The Contractor shall restore all sidewalks, property monumentation, curbing, gutters, drives, fences, poles, topsoil, grass, trees, landscaping, or other property and surface structures removed or disturbed as a part of the work to a condition equal to that before the work began, unless noted otherwise.

B. Restoration Materials: See Materials specification for seed mixture requirements.
   1. Contractor to restore unpaved areas with "Lawn Grass Seed" for all mowed areas.
   2. Unmowed areas shall be restored using "General Purpose Mixture".
   3. Turf grass sod shall be utilized when required by the Town on a case-by-case basis. Examples of potential areas requiring sod are swales and other concentrated flow areas.
   4. The Town may revise seed mix requirements on a project-specific basis.

C. Grading and Seeding
   1. The Contractor shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install all lawns and grasses.
   2. Review installation procedures under other sections and coordinate the installation of items that must be installed with, or before, lawns and grasses. If applicable, notify other Contractors in advance of the planting of lawns and grasses to provide them with sufficient time for the installation of items that must be installed with, or before, lawns and grasses.
   3. The project site disturbed by construction shall be rough graded to a uniform and level grade prior to fine grading and seeding. All surplus or borrowed material necessary for completion of the fine grading shall be placed by the Contractor. All areas to receive seeding shall be shaped, trimmed, raked uniform smooth, free from clods, rocks and other deleterious matter.
   4. Quality Assurance
      a. Source Quality Control:
         1) Provide topsoil that is of good, rich, uniform quality, free from any material such as hard clods, stiff clay, hardpan, partially disintegrated stone, rocks, cement, bricks, ashes, cinders, slag, concrete, bitumen or its residue, boards, sticks, chips, or other undesirable material harmful or unnecessary to plant growth. Topsoil shall be reasonably free from perennial weeds and perennial wood seeds, and shall not contain objectionable plant material.
         2) Provide sod procured from areas having growing conditions similar to location of Site.
         3) Machine-cut sod into rectangular sections, exercising care to retain the native soil on the roots of the sod, during stripping, transportation and planting.
         4) Cut and move sod only when soil moisture conditions are such that favorable results can be expected.
         5) Rectangular sections of sod may vary in length but shall be equal in width and of a size that permits the sod to be lifted and rolled without breaking.
         6) Seed that has been stored at temperatures, or under conditions not recommended by the seed Supplier, or has become wet, moldy, or otherwise damaged, shall not be acceptable.

2. Project Conditions
    a. Environmental Requirements:
        1) Proceed with and complete lawn and grass planting as rapidly as portions of the Site become available, working within the seasonal limitations for each type of lawn and grass planting required.
        2) Proceed with planting only when current and forecasted weather conditions are favorable to successful planting and establishment of lawns and grasses.
            a) Do not spread seed when wind velocity exceeds five miles per hour.
            b) Do not plant when drought, or excessive moisture, or other unsatisfactory conditions prevail.
        3) Begin maintenance immediately after each area is planted and continue until acceptable growth is established.
        4) Herbicides, chemicals and insecticides shall not be used on areas bordering wetlands.

    b. Scheduling:
        1) Plant during one of the following periods:
            a) Spring Planting: April 1 to June 15.
            b) Fall Planting: September 1 to October 30.
            c) During other periods, the time of planting shall be determined by the Town / Engineer.
    c. Water & irrigate lawn and grass plantings as required to obtain adequate establishment of lawns and grasses.
3. Examination
    a. Contractor shall examine the areas and conditions under which lawn and grass Work is to be performed, and notify Town / Engineer, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to Town / Engineer.
4. Preparation
    a. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
    b. Provide erosion-control measures to prevent erosion or displacement of seeded soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
    c. Confirm that subgrade is at proper elevations and that no further earthwork is required to bring the subgrade to proper elevations. Provide subgrade elevations that slope parallel to finished grade and towards subsurface drains shown.
    d. Remove all construction debris, trash, rubble, and all extraneous materials from subgrade. In the event that fuels, oils, concrete washout, or other material harmful to plant growth or germination have been spilled into the subgrade, excavate the subgrade sufficiently to remove all such harmful materials and fill with approved fill, compacted to the required subgrade compaction level. Removed materials to be disposed of in a legal manner.
5. Fine Grading
    a. Reset and realign curb boxes and meter boxes to ensure proper alignment and plumbness upon fine grading.
    b. Immediately prior to dumping and spreading topsoil, clean subgrade of all stones

greater than 1 inch and all other extraneous matter. Remove all such material from Site.

c. Notify Town / Engineer that subgrade has been cleaned, and obtain approval prior to spreading topsoil.
d. Do not attempt to spread excessively wet, muddy or frozen topsoil. Do not spread topsoil more than five days before seeding or planting.
e. Spread topsoil to a minimum depth of three (3) inches but not less than required to meet finish grades after light rolling and natural settlement.
f. The area to be seeded shall be made smooth and uniform and shall conform to the finished grade and cross section shown on the Drawings or as directed by the Town / Engineer.
g. Incorporate fertilizers, after spreading Topsoil, as specified, and at a rate of:
    1) Fertilizer: 18 pounds per 1,000 square feet.

6. Conventional Seeding
    a. General: Maintain grade stakes until removal is mutually agreed upon by all parties concerned.
    b. Rake or harrow all seedbeds immediately prior to seeding to produce a rough, grooved surface, no deeper than 1 inch. Seed only when seedbed is in a friable condition and not muddy or hard.
    c. Sow seed using a spreader or seeding machine.
    d. Distribute seed evenly over entire area by sowing equal quantity in two directions at right angles to each other.
    e. Sow lawn grass seed mixture at the rate of not less than 5 pounds for every 1,000 square feet.
    f. All seeded areas shall be thoroughly mulched by a method approved by the Town / Engineer. Mulching material shall be applied uniformly in a continuous blanket at a rate of 92 pounds per 1,000 square feet. Mulch shall be punched into the soil so that it is partially covered. The punching operation shall be performed longitudinally with a mulch tiller. Care shall be exercised to obtain a reasonably even distribution of mulch incorporated into the soil.
    g. Using a uniform fine spray, irrigate lawn and grass plantings as required to obtain adequate establishment of lawns and grasses.
    h. Reseed areas that remain without mulch for longer than 3 days.
    i. Take precautions to prevent damage or staining of construction or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.
    j. Prevent foot or vehicular traffic, or the movement of equipment, over the mulched areas. Reseed areas damaged as a result of such activity.
    k.
7. Sodding Lawns
    a. Prepare, lay, and water sod per the requirements of INDOT Standard Specifications, latest edition, Section 621.
    b. Do not lay sod on ground that is frozen, dust dry or that has not been uniformly prepared, as specified. Do not lay dormant sod.
        1) Lay sod within 24 hours of harvesting.
    c. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod.

d. Place sod strips in straight lines parallel to one another.
e. Lay sod across angle of slopes exceeding one on three.
f. Anchor sod on slopes exceeding one on three and steeper, and in ditches with grade steeper than one percent. Space anchors as recommended by sod Supplier, but not less than two anchors for each sod strip to prevent slippage. Use the following anchor dimensions:
g. Wood Peg Anchors: 1/2 inch x 3/4 inch x 12 inch minimum.
h. T-shaped Wire Pins: Machine bent from 8 gauge low carbon steel with a minimum if an 8 inch leg, a 4 inch head, and a 1 inch secondary drive.
i. Immediately upon completion of a section of sodding, tamp, roll lightly and water to ensure contact with subgrade and elimination of air pockets.
j. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass.
k. Immediately after planting, water sod thoroughly with a fine spray. Water sufficiently to ensure penetration of moisture to bottom of prepared topsoil layer; not just to bottom of sod blanket.

8. Reconditioning Existing Lawns and Grass Areas
   a. Recondition existing lawn damaged by Contractor's operations, including areas used for storage of materials or equipment and areas damaged by movement of vehicles. Recondition existing lawn and grass areas where minor regrading is required.
   b. Provide fertilizer, seed or sod and soil amendments, as specified for new lawns and grass areas, and as required to provide satisfactorily reconditioned lawns and grass areas. Provide new topsoil as required to fill low spots and meet new finish grades.
   c. Till stripped, bare, and compacted areas thoroughly to a depth of 12 inches.
   d. Remove diseased or unsatisfactory lawn and grass areas; do not bury into soil. Remove topsoil containing extraneous materials resulting from Contractor's operations including oil drippings, stone, gravel and other construction materials.
   e. In areas approved by Town / Engineer, where substantial lawns and grass areas remain (but are thin), mow, dethatch, core aerate and rake. Fill low spots, remove humps, cultivate soil, fertilize, and seed. Remove weeds before seeding or if extensive, apply selective chemical weed killers, as required. Apply seedbed mulch, if required, to maintain moist condition.
   f. Water newly planted areas and keep moist until new lawns are established, as specified.
9. Acceptance Criteria for Lawns and Grass Areas
   a. Lawn and grass Work will be considered acceptable when:
      1) Areas Seeded with “Lawn Grass Seed” Mixture: When a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 square feet and bare spots not exceeding 5 inches by 5 inches.
      2) Areas Seeded with “General Purpose” Mixture: When a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 20 square feet and bare spots not exceeding 12 inches by 12 inches.
      3) Areas Sodded with “Turf Grass Sod”: When a healthy, well-rooted, even-colored, viable lawn has been established, free of weeds, open joints, bare areas, and surface irregularities.

10. Cleanup and Protection
    a. Promptly remove soil and debris, created by lawn and grass Work, from paved areas. Clean wheels of vehicles before leaving Site to avoid tracking soil and topsoil onto roads, walks, or other paved areas.
    b. Erect barricades and warning signs as required protecting newly planted areas from traffic. Maintain barricades throughout extended service period and remove when service period ends. Treat, repair or replace damaged lawns and meadows.
11. Inspection & Acceptance
    a. The Contractor shall replace or repair any areas damaged by erosion or which fail to grow or take root within one (1) year of the date of final acceptance of the work.
    b. Where lawns and grass areas do not comply with specified acceptance criteria, reestablish lawns and grasses and continue extended service period until lawns and grasses comply with criteria for acceptance.

3.18 **Maintenance of Traffic**

A. Traffic Control shall be in accordance with the Indiana State Department of Transportation Specifications (latest edition), Section 800, Hendricks County Highway Department standards, and OSHA regulations.

B. The Contractor shall cooperate with the Danville street department and Hendricks County Highway Department to maintain traffic and shall submit a Maintenance of Traffic plan to the Town and to the Highway Department for review and approval fifteen (15) days prior to construction.

C. The Contractor shall notify and arrange with the municipal police, fire and EMS departments and the School Corporation before closing any street. Where it is necessary to maintain one-way traffic, the Contractor shall provide necessary watchmen, flagmen, and proper barricades to insure safety. The Contractor shall notify the Town of Danville forty-eight (48) business hours in advance of any closures or restrictions on the Town of Danville streets.

D. Full Lane Closures
    1. No full lane closures will be allowed on State Roads.
    2. The Contractor may, with the approval of the authority having jurisdiction, close local roads for minimum periods of time with proper notice to the Town or County Highway Department as applicable, local occupants of all premises, police and fire protection authorities, and other public authorities as applicable. The Contractor shall schedule this work so that this time is at a minimum and shall, whenever possible, make suitable provisions for access by local residents, businesses, school buses, police and fire emergency vehicles and mail delivery vehicles. The Contractor shall keep fire hydrants and other public utility valves accessible at all times.
    3. The Contractor shall submit traffic control plans to the Town or the County Highway Department if required.
    4. The Contractor shall furnish, erect, and maintain barricades, suitable and sufficient red lights and other lights or reflecting material as may be required for the protection of any local traffic permitted on the roadway.
    5. The Contractor shall furnish, erect, and maintain advanced warning signs to direct traffic away from closed sections and detour marking signs on temporary routes, except where same may be furnished by the State or County Highway Departments.

6. All road crossings where the Contractor is permitted to open cut the trench, the crossing shall be completed, cleaned up, temporary pavement in place, and open to traffic within twenty-four (24) hours from the time the road is closed to through traffic, unless specific approval is received from the authority having jurisdiction, for a longer period.

E. Single Lane Closures

1. No single lane closures will be allowed on State Roads.
2. The Contractor may, with the approval of the authority having jurisdiction, close a single lane on local roads. The Contractor shall submit traffic control plans to the Town or the County Highway Department for review and approval.
3. The Contractor shall furnish, erect, and maintain lights, signs, barricades, temporary guardrails and other traffic control devises, watchmen and flagmen as may be necessary to maintain safe traffic conditions.
4. Whenever it is necessary to divert traffic from its normal channel into another channel, such diversion shall be clearly marked by cones, drums, barricades or temporary guardrail. If markers are left in place at night, pot flares or other suitable lights shall be maintained.

3.19 Manufacturer's Service Representative

A. The Contractor shall provide the services of qualified and technically trained representative(s) of the manufacturer(s) of the principal items of equipment, as necessary to supervise the installation of the equipment, supervise the start-up, and instruct the operation personnel in the operation and maintenance of the equipment. These services shall be provided as part of the work under the applicable contract items and no extra payment will be made by the Owner for any such services in connection with the installation, start-up, operation, and maintenance instructions relating to the equipment.

3.20 Adjustment and Operation of Systems

A. Prior to time of final inspection, the Contractor shall carefully adjust and place in operation all parts of the equipment, systems and electrical facilities, installed by him when any work included in this contract is completed. The Contractor shall also assist in the adjustment of equipment and systems furnished by the Owner and installed by the Contractor. All automatic controls and safety devices shall be adjusted, all air and water flow shall be balanced and adjusted, and all valves shall be properly set. The Contractor shall perform all other necessary operations to make the equipment, systems and electrical facilities fully operable. Where required, all equipment shall be oiled and greased and all oilers and grease cups shall be left filled.

B. Upon completion of this work, the Contractor shall notify the Engineer that all equipment, systems and electrical facilities are ready for final tests and inspection and shall cooperate with the Owner's representative in charge in conducting the tests and inspection.

C. At the time of final inspection, the Contractor shall be represented by a person of authority. Major subcontractors also shall be represented. Each shall demonstrate that his work fully complies with the purpose and intent of the plans and specifications. All labor, all services,

and all instruments or tools necessary for such demonstration and tests shall be provided by the Contractor.

3.21 **Curb Stamping**

A. Contractor shall stamp concrete curbs at all valves and meter pits so that items can be easily located in the event they are buried.

3.22 **Cleanup**

A. The Contractor shall maintain the site of work, in a neat and clean condition at all times and shall not allow surplus construction materials, tools, rubbish, excess soil and other foreign matter to accumulate in a nuisance fashion and/or hazardous or unsightly manner. The timely disposition or disposal from the site of any such item shall be the complete responsibility of the Contractor. The Contractor shall follow the requirements of IDEM Rule 5 at all times.

B. Final acceptance will not be made until after all cleanup, site work including restoration of all fences, lawns, landscaping, mailboxes, curbs, drives, poles, signs, sidewalks, property monument replacement, pavement replacement, repair work and all other miscellaneous items disturbed during construction have been completed to a condition equal to that before construction began, and to the satisfaction of the Town and/or any other public body that may have jurisdiction.

3.23 **Guarantee**

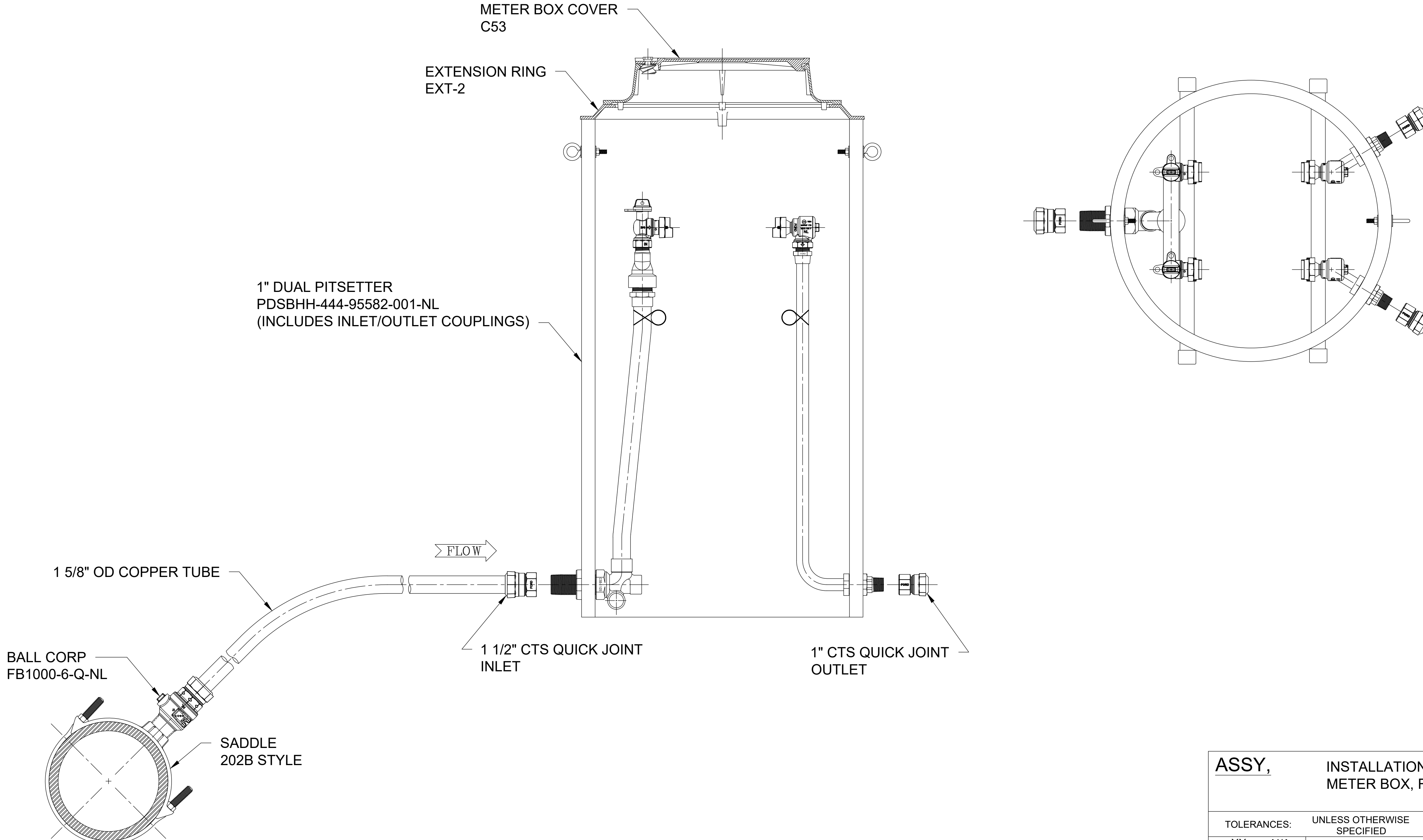
A. All materials, labor, equipment, miscellaneous accessories and their installation shall be guaranteed to be free from all defects for a period of one year from the date of acceptance and/or continuous use by the Town, or of equipment “startup”, unless a longer period is specified elsewhere in these Standards and Specifications. Any defects found during this one (1) year period shall be repaired or replaced at no cost to the Town and any such defect that has been repaired or replaced shall thenceforth be guaranteed for an additional twelve (12) months from the date of such repair or replacement.

B. The Contractor shall assume complete responsibility for the guarantee of all facets of construction and is hereby cautioned that individual manufacturer’s guarantees of equipment or other appurtenances will not be recognized unless they exceed the requirements of the previous paragraph.

C. The required lubrication, start-up and adjustment of equipment and other appurtenances shall be performed at the appropriate time by or under the direct supervision of the Contractor and the manufacturer's representative with all equipment and appurtenances left in proper working order for use by the Town.

D. The Contractor shall be responsible for assembling from each manufacturer of equipment supplied on the project, shop drawings, specifications, and operations and maintenance (O&M) instructions into one or more manuals and furnish the Town with three (3) hard copies plus one (1) PDF copy of each manual.

REFERENCE DOCUMENT



REV.	DATE	ECN	REVISION DESCRIPTION	DWN BY	APPV BY
1	11/26/2018	18-444	UPDATED SHEET FORMAT, ADDED "-NL" SUFFIXES	KLP	RLR

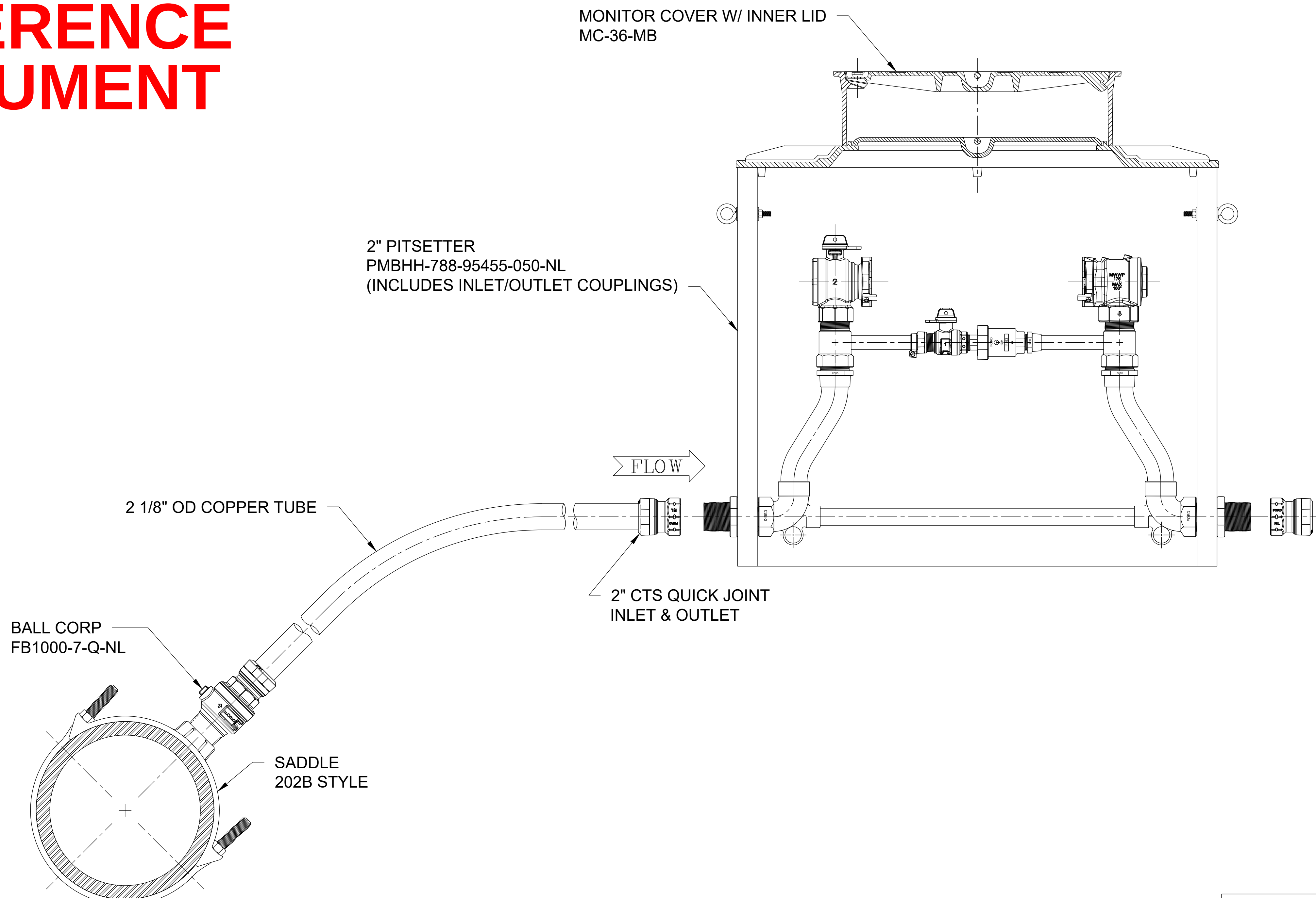
ASSY, INSTALLATION DRAWING, WATER MAIN TO METER BOX, FOR DUAL SETTING

TOLERANCES: .XX ± N/A; .XXX ± N/A; ∠ ± N/A	UNLESS OTHERWISE SPECIFIED	PATTERN:	
		CORE(S):	
SCALE: 1:10	EST WEIGHT: ---- lb	SIZE: B	DRAWING NO. 95406-002

THE FORD METER BOX CO., INC.
Wabash, Indiana 46992 U.S.A.

95406-003

REFERENCE DOCUMENT

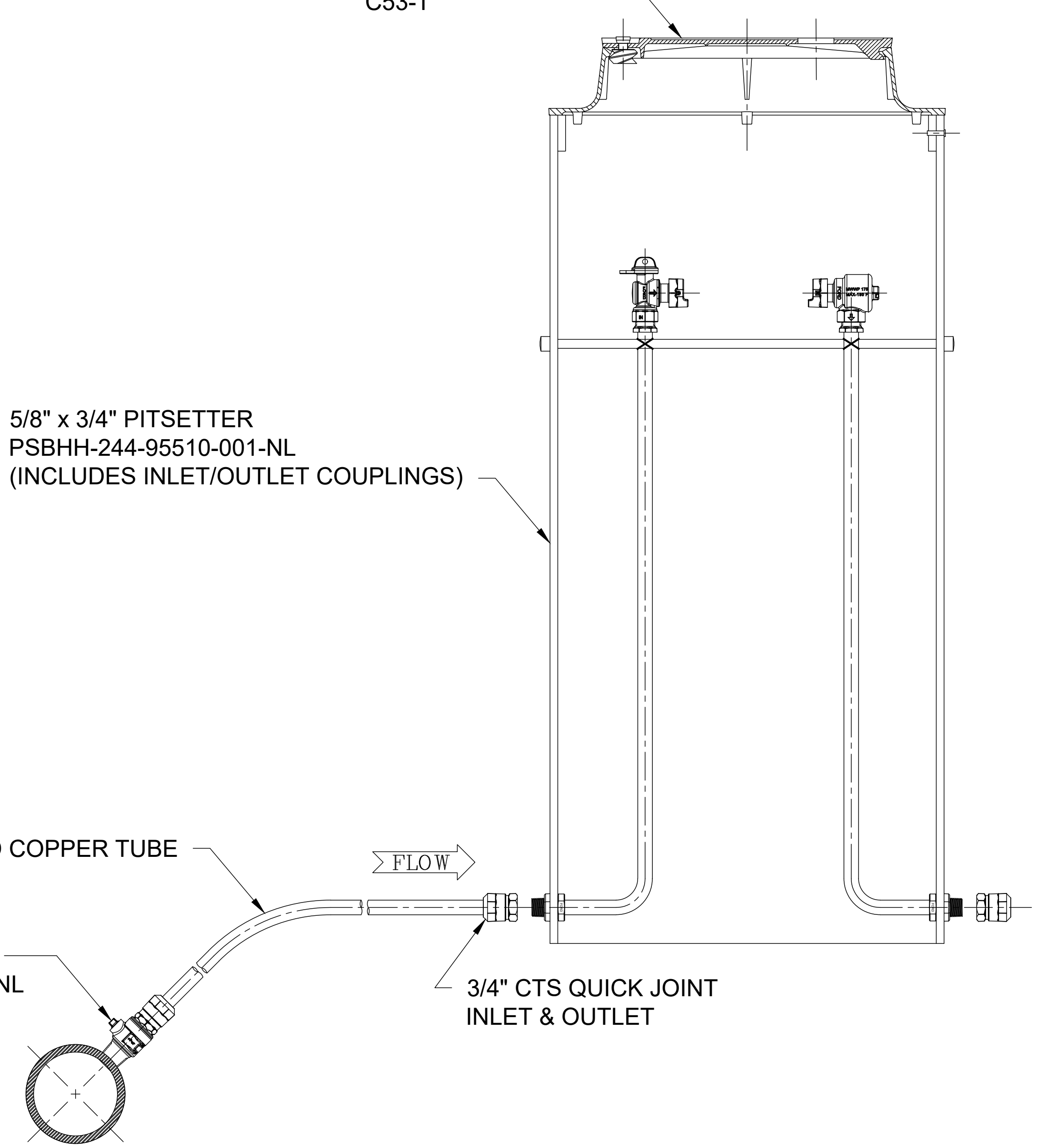


ASSY,	INSTALLATION DRAWING, 2" PITSETTER, 2" SERVICE LINE, 36" DEPTH
TOLERANCES: UNLESS OTHERWISE SPECIFIED .XX ± N/A .XXX ± N/A ∠ ± N/A	PATTERN: CORE(S):
SCALE: 1:10	EST WEIGHT: ---- lb
SIZE: B	DRAWING NO. 95406-003

REV.	DATE	ECN	REVISION DESCRIPTION	DWN BY	APPV BY
1	11/26/2018	18-444	UPDATED SHEET FORMAT, ADDED "-NL" SUFFIXES	KLP	RLR

THE FORD METER BOX CO., INC.
Wabash, Indiana 46992 U.S.A.

95619-001



REFERENCE DOCUMENT

ASSY, INSTALLATION DRAWING, WATER MAIN TO METER BOX, FOR 5/8" X 3/4" METER

TOLERANCES: UNLESS OTHERWISE SPECIFIED
.XX ± N/A
.XXX ± N/A
∠ ± N/A

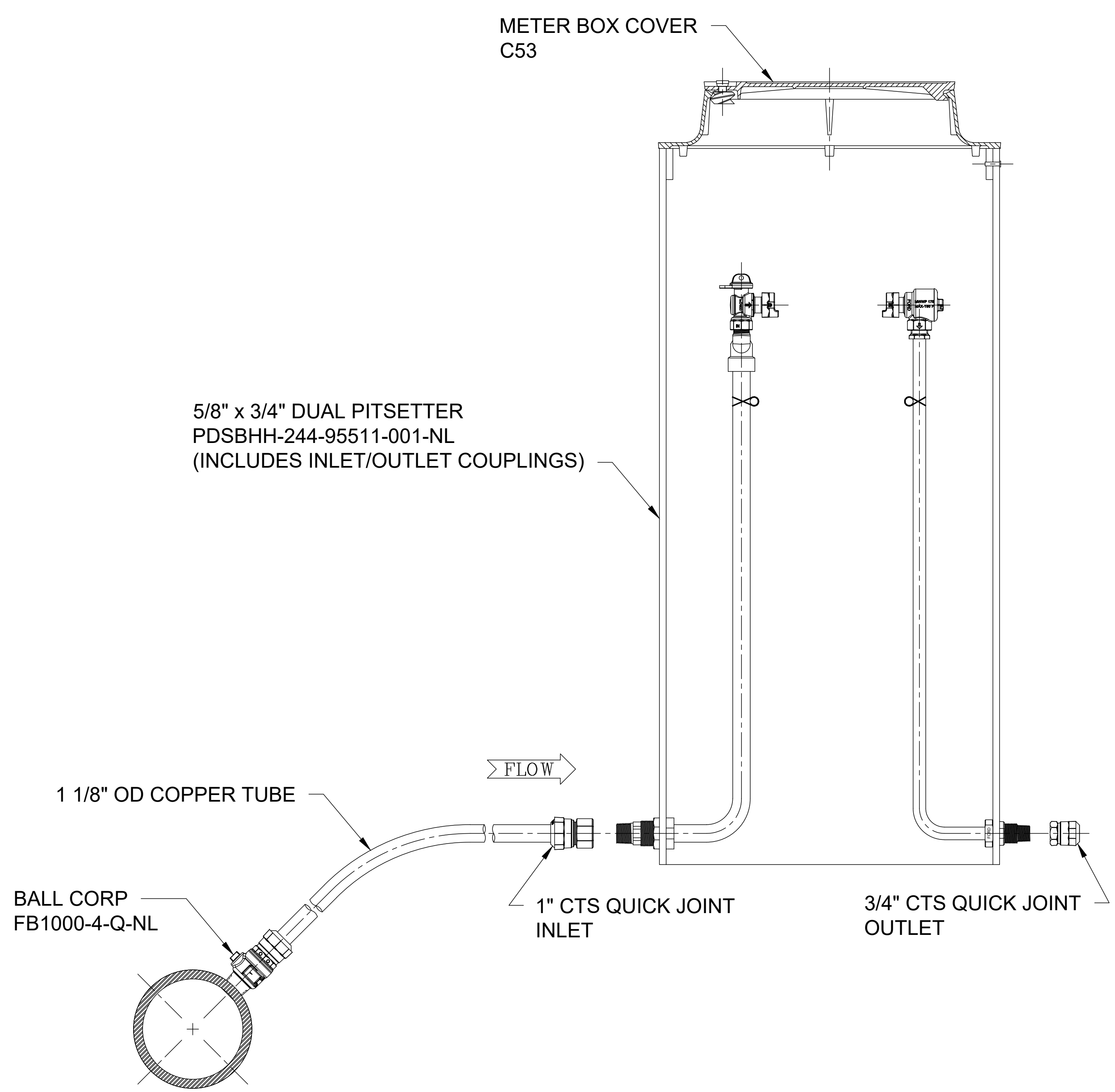
PATTERN:
CORE(S):
SCALE: 1:10
EST WEIGHT: ---- lb
SIZE: B
DRAWING NO. 95619-001

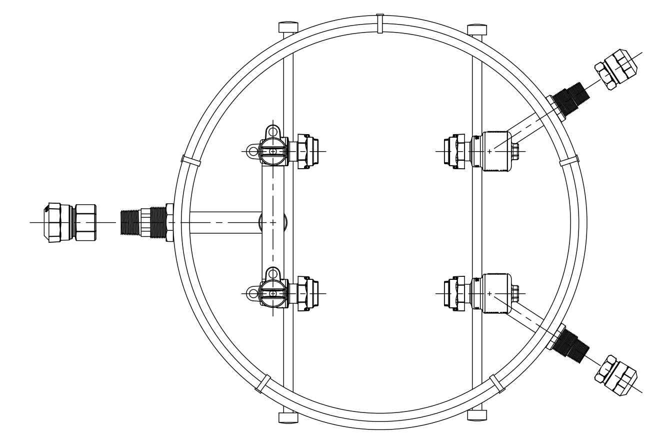
THE FORD METER BOX CO., INC.
Wabash, Indiana 46992 U.S.A.

REV.	DATE	ECN	REVISION DESCRIPTION	DWN BY	APPV BY
2	11/26/2018	18-444	UPDATED SHEET FORMAT, ADDED "-NL" SUFFIXES	KLP	RLR

95619-002

REFERENCE DOCUMENT





REV.	DATE	ECN	REVISION DESCRIPTION	DWN BY	APPV BY
2	11/26/2018	18-444	UPDATED SHEET FORMAT, ADDED "-NL" SUFFIXES	KLP	RLR

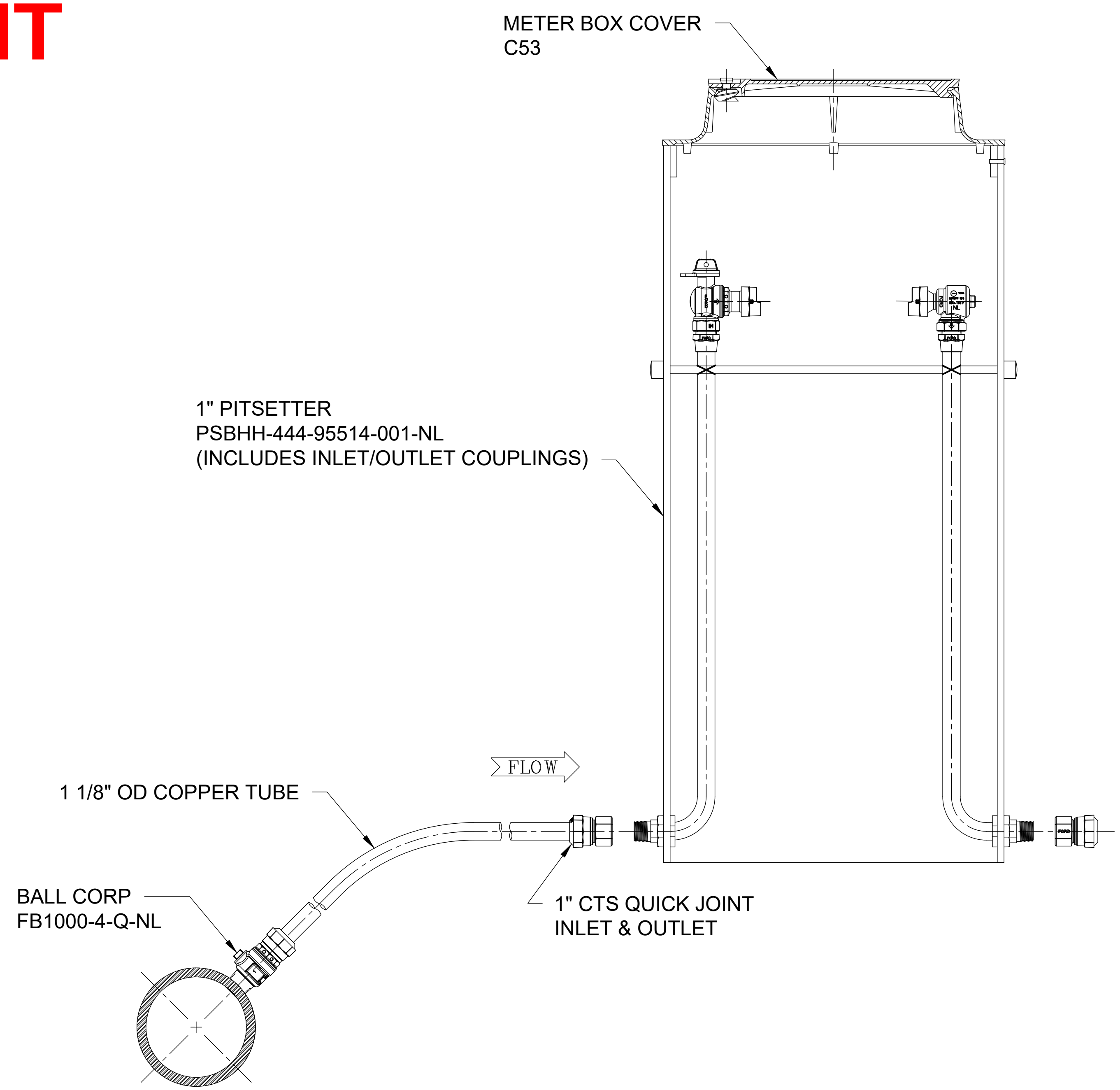
ASSY, INSTALLATION DRAWING, WATER MAIN TO METER BOX FOR 5/8" X 3/4" DUAL METER

TOLERANCES:	UNLESS OTHERWISE SPECIFIED	PATTERN:
.XX ± N/A .XXX ± N/A ∠ ± N/A		CORE(S):
SCALE: 1:10	EST WEIGHT: ----lb	SIZE: B / DRAWING NO. 95619-002

THE FORD METER BOX CO., INC.
Wabash, Indiana 46992 U.S.A.

95619-003

REFERENCE DOCUMENT



REV.	DATE	ECN	REVISION DESCRIPTION	DWN BY	APPV BY
2	11/26/2018	18-444	UPDATED SHEET FORMAT, ADDED "-NL" SUFFIXES	KLP	RLR

ASSY,	INSTALLATION DRAWING, WATER MAIN TO METER BOX, FOR 1" METER		
TOLERANCES:	UNLESS OTHERWISE SPECIFIED	PATTERN:	
.XX ± N/A .XXX ± N/A ∠ ± N/A		CORE(S):	
SCALE: 1:10	EST WEIGHT: ----lb	SIZE: B	DRAWING NO. 95619-003

THE FORD METER BOX CO., INC.
Wabash, Indiana 46992 U.S.A.

611 PIPE RESTRAINING SYSTEM

ROMAC INDUSTRIES, INC.

MATERIAL SPECIFICATIONS

CASTINGS: Ductile iron, meeting or exceeding ASTM A 536, Grade 65-45-12.

CLAMPING BOLTS FOR SIZES 4" - 12": High Strength Low Alloy Steel per AWWA C111. Nuts are ANSI B 18.2.2.

CLAMPING BOLTS AND HEX NUTS FOR SIZES 14" - 36": High strength steel in accordance with ASTM A449 and zinc plated to B633, Type III Sc.1 for corrosion resistance.

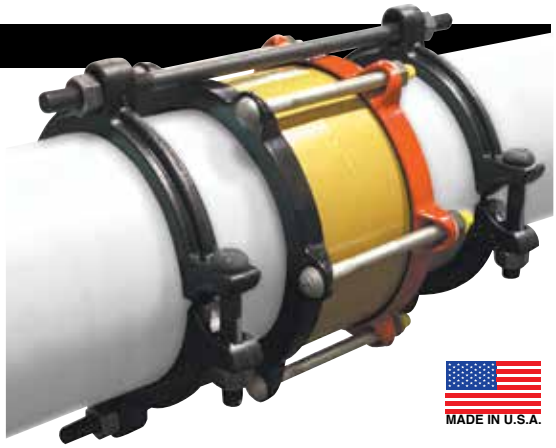
RESTRAINING RODS AND NUTS FOR SIZES 4" - 12": High strength, low alloy steel per AWWA C111.

RESTRAINING RODS AND NUTS FOR SIZES 14" - 36": high strength, low alloy steel in accordance with AWWA/ANSI C111/A21.11 and provide a minimum 45,000 psi yield and 60,000 psi tensile strength.

COATING 4" - 12": Color coded shop coat. Black for ductile iron and C900 sizes, Red for IPS size PVC.

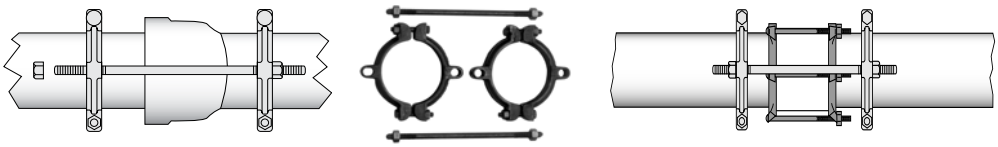
COATING 14" - 36": Red for C905 PVC only.

NOTE: Stainless steel bolts and rods are available upon request, please provide maximum pressure.



6 INCH 611 RESTRAINING PIPE ENDS ON BOTH SIDES OF A ROMAC 501 COUPLING

FM APPROVED 600 SERIES APPROVED FOR 4" - 10" SIZES FOR C900



STYLE 611

for Bell & Spigot Joints, Romac Couplings and Transitions

NOM. PIPE SIZE	PIPE MATERIAL	PIPE O.D.	CATALOG NUMBER	CLAMPING BOLTS[1] QTY: SIZE	RESTRAINING RODS QTY: SIZE	APPROX. WEIGHT (lbs.)	LIST PRICE
4"	IPS size PVC DI, C-900	4.50 4.80	611 - 4.50 611 - 4.80	4: 5/8" x 4"	2: 3/4" x 18"	20 #	$70.36
6"	IPS size PVC DI, C-900	6.63 6.90	611 - 6.63 611 - 6.90	4: 5/8" x 4"	2: 3/4" x 20"	22 #	93.29
8"	IPS size PVC DI, C-900	8.63 9.05	611 - 8.63 611 - 9.05	4: 3/4" x 5"	2: 3/4" x 20"	40 #	151.17
10"	IPS size PVC DI, C-900	10.75 11.10	611 - 10.75 611 - 11.10	4: 7/8" x 5"	4: 3/4" x 22"	50 #	263.52
12"	IPS size PVC DI, C-900	12.75 13.20	611 - 12.75 611 - 13.20	4: 7/8" x 5"	4: 3/4" x 22"	60 #	288.31
14"[2]	C905	15.30	611 - 15.30 [2]	8: 7/8" x 6 1/4"	6: 3/4" x 30"	105 #	570.00
16" [2]	C905	17.40	611 - 17.40 [2]	8: 7/8" x 6 1/4"	6: 3/4" x 30"	115 #	605.00
18" [2]	C905	19.50	611 - 19.50 [2]	8: 1" x 6 1/4"	8: 3/4" x 30"	165 #	695.00
20" [2]	C905	21.60	611 - 21.60 [2]	8: 1 1/4" x 6 1/2"	8: 3/4" x 36"	235 #	1,200.00
24" [2]	C905	25.80	611 - 25.80[2]	8: 1 1/4" x 6 1/2"	10: 3/4" x 36"	290 #	1,305.00
30" [2]	C905	32.00	611 - 32.00 [2]	8: 1 1/4" x 8 1/2"	10: 1" x 40"	465 #	2,150.00
36" [2]	C905	38.30	611 - 38.30 [2]	8: 1 1/4" x 8 1/2"	12: 1" x 40"	525 #	2,670.00

[1] Per pair of castings

[2] Imported

Not for use on polyethylene pipe, C909, steel pipe or ductile iron pipe larger than 12 inches.

TO ORDER: Specify catalog number.

EXAMPLE: For a 6" DI or C-900 Bell & Spigot Joint, order **STYLE 611 - 6.90**

ROMAC INDUSTRIES, INC.

612 PIPE RESTRAINING SYSTEM

MATERIAL SPECIFICATIONS

CASTINGS: Ductile iron, meeting or exceeding ASTM A 536, Grade 65-45-12.

CLAMPING BOLTS FOR SIZES 4" - 12": High Strength Low Alloy Steel per AWWA C111. Nuts are ANSI B 18.2.2.

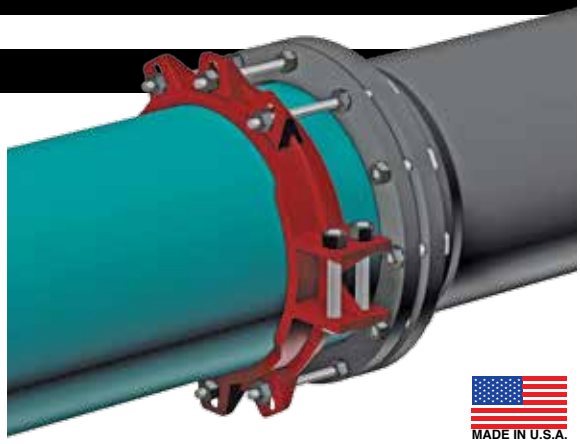
CLAMPING BOLTS AND HEX NUTS FOR SIZES 14" - 36": High strength steel in accordance with ASTM A449 and zinc plated to B633, Type III Sc.1 for corrosion resistance.

T-BOLTS AND NUTS FOR SIZES 4" - 12": High strength, low alloy steel per AWWA C111.

T-BOLTS AND NUTS FOR SIZES 14" - 36": high strength, low alloy steel in accordance with AWWA/ANSI C111/A21.11 and provide a minimum 45,000 psi yield and 60,000 psi tensile strength.

COATING 4" - 12": Color coded shop coat. Black for ductile iron and C900 sizes, Red for IPS size PVC.

COATING 14" - 36": Red for C905 PVC only.

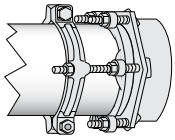


MADE IN U.S.A.

16 INCH 612 RESTRAINING A STANDARD MECHANICAL JOINT.

FM APPROVED

600 SERIES APPROVED FOR 4" - 10" SIZES FOR C900



STYLE 612

for Mechanical Joints & Push-On Fittings with Restraint Ears.

NOM. PIPE SIZE	PIPE MATERIAL	PIPE O.D.	CATALOG NUMBER	CLAMPING BOLTS QTY: SIZE	RESTRAINING RODS QTY: SIZE	APPROX. WEIGHT (lbs.)	LIST PRICE
4"	IPS size PVC DI, C-900	4.50 4.80	612 - 4.50 612 - 4.80	2: 5/8" x 4"	2: 3/4" x 7"	10 #	$49.93
6"	IPS size PVC DI, C-900	6.63 6.90	612 - 6.63 612 - 6.90	2: 5/8" x 4"	2: 3/4" x 7"	15 #	60.50
8"	IPS size PVC DI, C-900	8.63 9.05	612 - 8.63 612 - 9.05	2: 3/4" x 5"	2: 3/4" x 7"	25 #	89.98
10"	IPS size PVC DI, C-900	10.75 11.10	612 - 10.75 612 - 11.10	2: 7/8" x 5"	4: 3/4" x 7"	28 #	168.80
12"	IPS size PVC DI, C-900	12.75 13.20	612 - 12.75 612 - 13.20	2: 7/8" x 5"	4: 3/4" x 7"	32 #	179.35
14"	C905	15.30	612 - 15.30 [1]	4: 7/8" x 6 1/4"	6: 3/4" x 17"	52 #	310.00
16"	C905	17.40	612 - 17.40 [1]	4: 7/8" x 6 1/4"	6: 3/4" x 17"	58 #	340.00
18"	C905	19.50	612 - 19.50 [1]	4: 1" x 6 1/4"	8: 3/4" x 17"	86 #	390.00
20"	C905	21.60	612 - 21.60 [1]	4: 1 1/4" x 6 1/2"	8: 3/4" x 24"	123 #	640.00
24"	C905	25.80	612 - 25.80 [1]	4: 1 1/4" x 6 1/2"	10: 3/4" x 24"	151 #	780.00
30"	C905	32.00	612 - 32.00 [1]	4: 1 1/4" x 8 1/2"	10: 1" x 24"	240 #	1,290.00
36"	C905	38.30	612 - 38.30 [1]	4: 1 1/4" x 8 1/2"	10: 1" x 24"	269 #	1,550.00

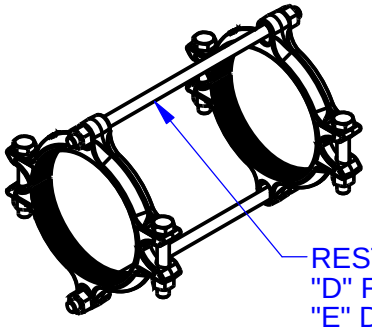
[1] Imported

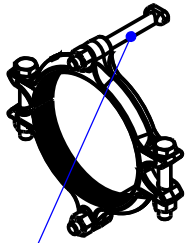
Not for use on polyethylene pipe, C909, plain end mechanical joint fittings, steel pipe or ductile iron pipe larger than 12 inches.

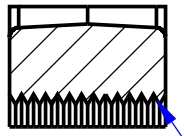
TO ORDER: Specify catalog number.
EXAMPLE: For a 6" DI or C-900 MJ fitting, order **Style 612 - 6.90**

CAD-010427

REVISIONS			
REV.	DESCRIPTION	DATE	EDITOR
0	INITIAL RELEASE, REPLACES C0688-A	2/5/2014	S. HILL
1	ADDED DIMENSION "J"	2/27/2014	S. HILL
2	MAX WORKING PRESSURE WAS 150PSI	8/21/2014	D. RICHARDSON
3	ADD PRESSURE RATING TO NOTE 6	1/21/2015	D. RICHARDSON
4	REMOVED NOTE 6	02/20/2015	D. RICHARDSON
5	10" & 12" 612 T-BOLT QTY WAS 2	3/13/2015	N.THOGERSEN



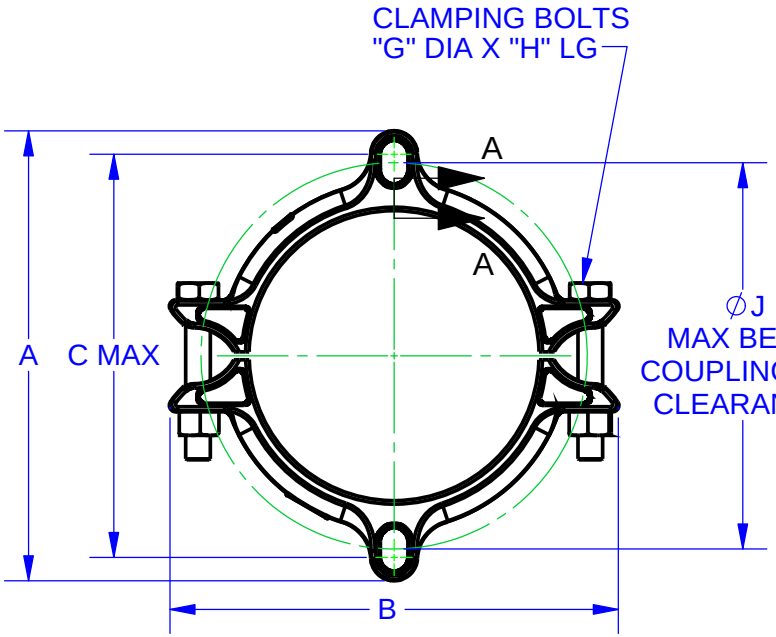




SECTION A-A

STYLE 611
FOR BELL & SPIGOT JOINTS,
ROMAC COUPLINGS AND TRANSITIONS

STYLE 612
FOR MJ AND PUSH-ON
FITTINGS WITH RESTRAINT EARS



DIMENSIONS								
		RESTRAINER						
						611 TIE RODS	612 T-BOLTS	BOLTS
NOM. SIZE	PIPE OD	A	B	C	J	D, ØE X F	D, ØE X F	ØG X H
4	4.50	9.62	8.37	8.16	7.29	2, 3/4 X 18.0	2, 3/4 X 7.0	5/8 X 4.0
	4.80	9.62	8.72					
6	6.63	11.62	10.76	10.16	9.29	2, 3/4 X 20.0	2, 3/4 X 7.0	5/8 X 4.0
	6.90	11.62	11.06					
8	8.63	14.06	13.48	12.60	11.73	2, 3/4 X 20.0	2, 3/4 X 7.0	3/4 X 5.0
	9.05	14.06	14.05					
10	10.75	16.75	16.53	15.20	14.33	4, 3/4 X 22.0	4, 3/4 X 7.0	7/8 X 5.0
	11.10	16.75	16.69					
12	12.75	19.25	18.62	17.72	16.85	4, 3/4 X 22.0	4, 3/4 X 7.0	7/8 X 5.0
	13.20	19.25	18.85					

4 NOTE:
1. PIPE APPLICATION: DI (ALL CLASSES), C900 PVC, ASTM D1785 & ASTM D2241 PVC
2. MAX WORKING PRESSURE: 200 PSI OR MAX PRESSURE RATING OF PIPE, WHICHEVER IS LESS.
3. ALL MATERIAL DUCTILE IRON PER ASTM A536 UNLESS NOTED.
4. BOLT MATERIAL:
   - CLAMP BOLTS AND RESTRAINING RODS: HSLA PER AWWA C111
   - CLAMP NUTS: ANSI B 18.2.2.
5. COATING: SHOPCOAT ENAMEL.

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES

TOLERANCES ARE ON:

1 PL DECIMALS ± 0.060
2 PL DECIMALS ± 0.030
3 PL DECIMALS ± 0.010
ANGLES ± 1°
FRACTIONS ± 1/64

SIGNATURES	DATE
DRAWN: Derek Richardson	02/05/2014
APPROVED: Peter Nielsen	3/18/2015

ROMAC INDUSTRIES INC.

TITLE: 600 SERIES PIPE JOINT RESTRAINT

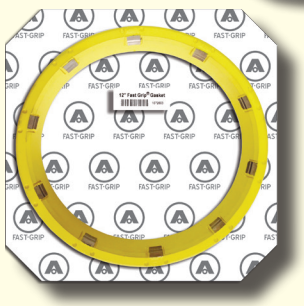
DWG. NO.	SIZE	REV. NO.	SCALE	SHEET
CAD-010427	A	5	1:8	1 OF 1

MODEL NAME: 611 Series Restraint Assembly
CONFIGURATION NAME:Default
MODEL CAD #: CAD-010424
LEGACY DRAWING #: C0688-A
AUTHOR: Sam Hill
DRAWING FILE NAME: 600 Series Pipe Joint Assembly Customer Drawing

A-Fab_V2

AMERICAN Amarillo Fast-Grip Gaskets

It's More Than Just A Color – It's Confidence



AMERICAN Amarillo Fast-Grip gaskets are the latest innovation in an already proven, field-adaptable method of restraining 4" – 30" ductile iron pipe.

AMERICAN has been in the business of bright ideas for over 110 years. The bright yellow Amarillo Fast-Grip gasket is just the latest example of a water works innovation that benefits our customers and the public. Designed to the same specifications as the previous generation of Fast-Grips, the Amarillo model gives you added confidence that you've selected the proper gasket for the Fastite bell, that the gasket seated properly during installation and that it's an AMERICAN product – made in America, The Right Way.

EOE/Minority/Female/Veteran/Disability

AMERICAN

DUCTILE IRON PIPE

THE RIGHT WAY

AMERICAN-USA.COM
1-800-442-2347

DUCTILE IRON PIPE | FLOW CONTROL | INTERNATIONAL | SPIRALWELD PIPE | STEEL PIPE

AMERICAN
THE RIGHT WAY

A Specification for
Amarillo Fast-Grip Gaskets
On Ductile Iron Pipe

Four-inch through 30-inch restrained joints shall be AMERICAN Amarillo Fast-Grip gasket and joint restraining system.

Pressure ratings shall be 350 psi for 4-inch through 18-inch; 250 psi for 20-inch through 24-inch; and 150 psi for 30-inch, but in no case shall the joint be considered rated at a higher pressure than the pipe of which it is a part.

Joint deflection shall be 5 degrees for 4-inch through 12-inch; 4 degrees for 14-inch; 3 degrees for 16-inch through 24-inch; and 2.5 degrees for 30-inch.

Gaskets shall meet applicable requirements of AWWA/ANSI C111/A21.11, shall be styrene butadiene rubber (SBR), and shall be ANSI/NSF Standard 61 certified for contact with potable water.

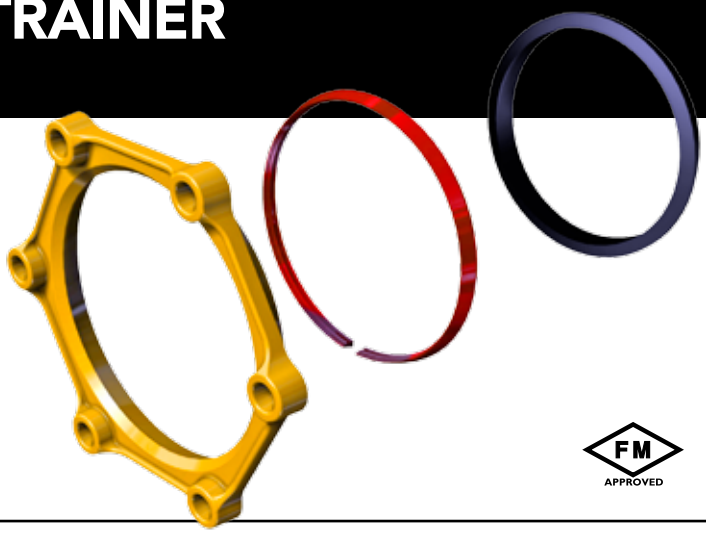
Gaskets shall be yellow in color, and the yellow color shall be consistent throughout the entire cross section of the gasket. The yellow color shall not be attained by surface coating; it shall be inherent within the rubber.

Restraining gaskets shall be manufactured in the United States.

P.O. Box 2727 – Birmingham, Alabama 35202-2727 – american-usa.com
1-800-442-2347

GRIP RING™ PIPE RESTRAINER
4 THROUGH 12 INCH

SUBMITTAL INFORMATION



FM APPROVED

USE

The Romac Grip Ring is used for the restraint of mechanical joint pipe, valves, fittings, and fire hydrants in water distribution and fire protection lines. Grip Rings replace costly concrete thrust blocks, corrodible steel tie rods and clamps, and fittings using radial bolts or pads. Not for use on plain end mechanical joint fittings or Molecularly Oriented Polyvinylchloride (PVCO) AWWA C909-02.

PIPE COMPATABILITY

Grip Rings may be used on most Ductile Iron, Cast Iron, PVC. See Grip Ring Pipe Restrainer Application Chart for specific applications. Chart is on the back of the Grip Ring Installation Instructions or in the current Romac catalog under restraint system.

MATERIALS

GLAND (FOLLOWER)
Ductile (nodular) iron, meeting or exceeding ASTM A 536, Grade 65-45-12.

RING
Ductile (nodular) iron, meeting or exceeding ASTM A 536, Grade 65-45-12. Heat treated using a proprietary process to assure proper penetration of rigid pipe materials.

GAP CAP
Heavy gauge 304 stainless steel (10 and 12 inch only).

GASKET
A standard MJ gasket is used with this fitting. See ANSI/AWWA C111/A21.11 for specifications. Transition gaskets may be used for steel (IPS) pipe size PVC.

BOLTS AND NUTS
Standard MJ tee-bolts and nuts are used with this fitting. See ANSI/AWWA C111/A21.11 for specifications.

COATINGS AND COLORS
Shop coat applied to the castings for corrosion protection in transit. Glands are yellow to distinguish them from standard MJ fittings. Rings are color coded BLACK for Ductile Iron size and RED for IPS.

PERFORMANCE

May be used up to the pressure rating of the pipe when used on Ductile Iron, CI, and PVC pipe. See catalog and installation instructions

FM APPROVED

FM approved for cast iron and ductile iron pipe at 175 psi working pressure (4 : 1 test). Also approved for PVC C900 pipe at the pressure rating of the pipe.

UL LISTED

UL listed for cast iron and ductile iron pipe at 350 psi working pressure. Also listed for PVC C900 pipe at the pressure rating of the pipe. UL reference number is 6M46

UNI-BELL UNI-B-13-92

UNI-B-13-92 is now governed by ASTM F 1674-96. The Grip Ring meets the requirements of F 1674-96.

This information is based on the best data available at the date printed above. Please check with Romac for any updates or changes.

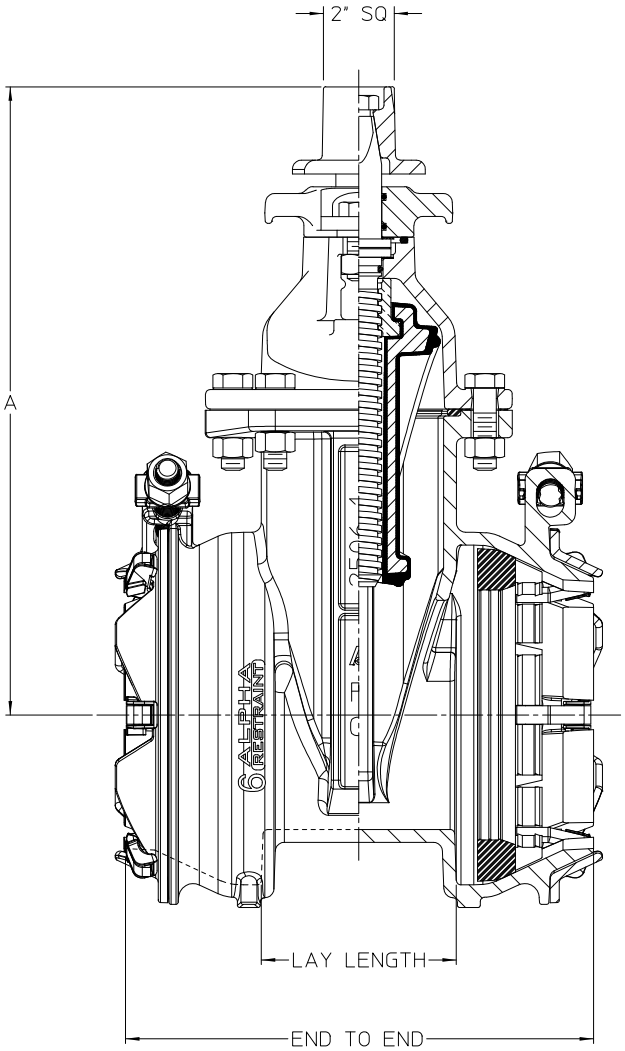
Document # 05-8-0012 1/17

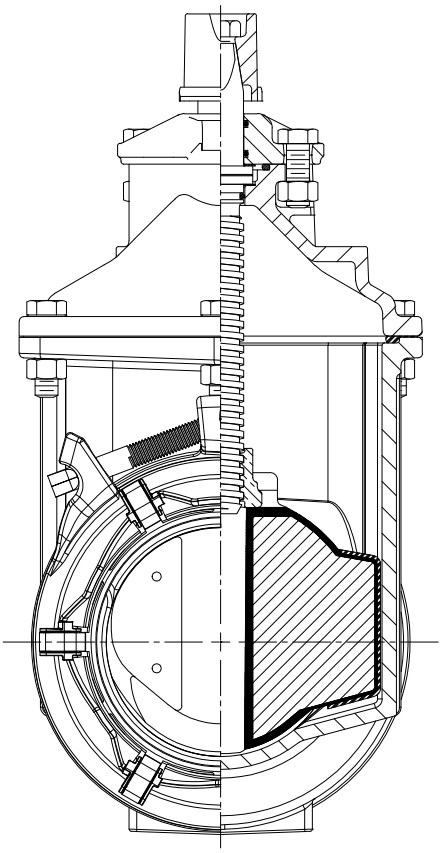
ROMAC INDUSTRIES, INC.
www.romac.com
21919 20th Avenue SE • Suite 100 • Bothell, WA 98021
Phone (425) 951-6200 • 1-800-426-9341 • Fax (425) 951-6201

AMERICAN Flow Control Submittal Information

4" - 12" SERIES 2500-1 RESILIENT WEDGE GATE VALVE, NRS

WITH ALPHA™ RESTRAINT JOINTS





AWWA

IL4357

ALPHA restraint joints will accommodate the following pipe types and sizes:

ALPHA

- Ductile iron per AWWA C151
- PVC per ASTM D1785 (Schedule 40 and 80)
- PVC per ASTM D2241 (SDR 21)
- PVC per AWWA C900
- HDPE per AWWA C906 (SDR 9, 11, 13.5, and 17)

DIMENSION	VALVE SIZE				
	4"	6"	8"	10"	12"
End to End	11.34	12.81	16.22	17.34	18.96
A	13.91	17.12	20.47	24.06	27.59
Lay Length	4.24	5.32	6.37	7.15	8.31
Handwheel Diameter	10.00	12.00	14.00	16.00	16.00
No. of Turns to Open	14	20	26	32	38

Nominal Size (in)	ALPHA OD Range (in)
4	4.50 - 4.90
6	6.60 - 7.00
8	8.60 - 9.10
10	10.75 - 11.20
12	12.75 - 13.30

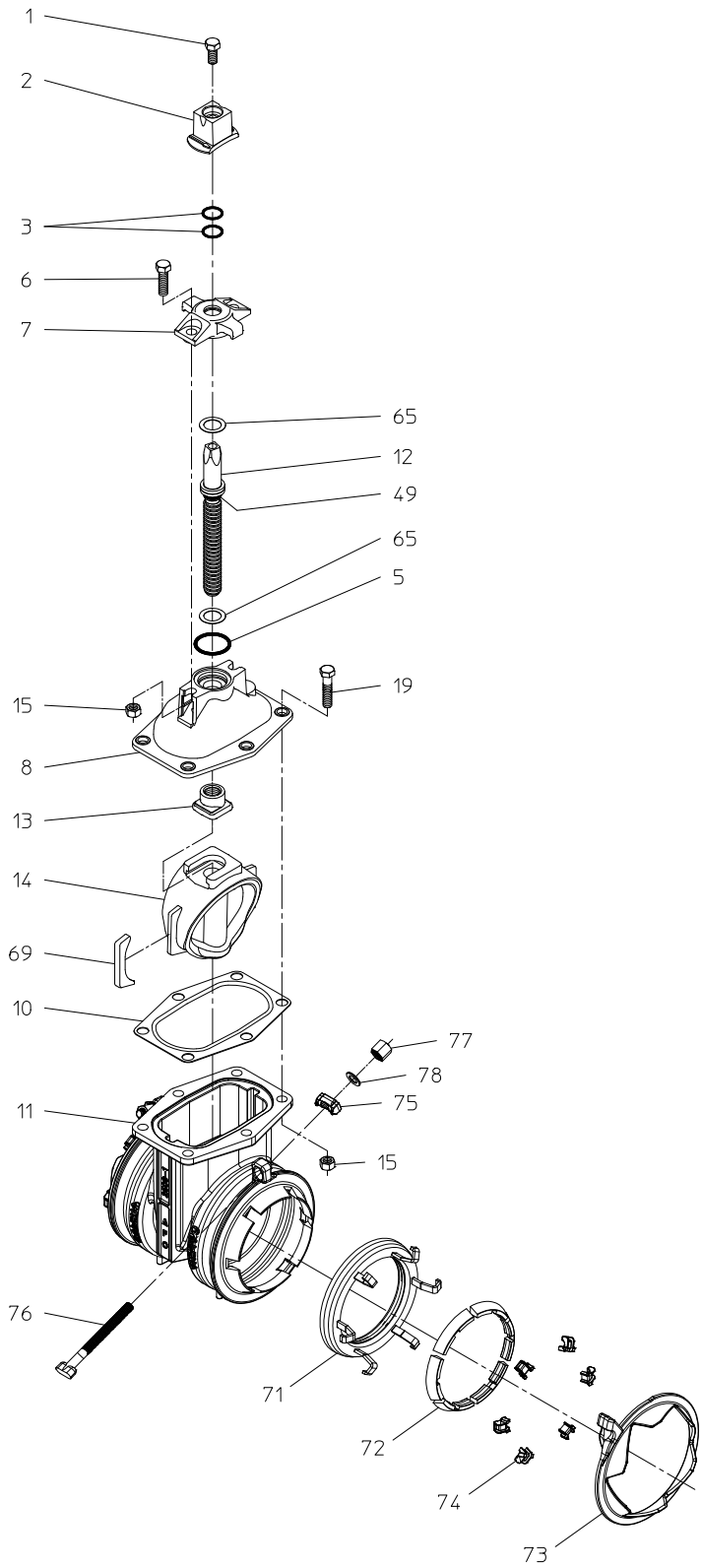
AMERICAN FLOW CONTROL

THE RIGHT WAY

AMERICAN Flow Control
P.O. Box 2727
Birmingham, Al. 35202-2727
Phone: 1-800-326-8051
Fax: 1-800-610-3569
E-mail: afcsales@american-usa.com

Waterous Company
125 Hardman Avenue South
South St. Paul, Mn. 55075-1191
Phone: 1-888-266-3686
Fax: 1-800-601-2809
E-mail: afcsales@american-usa.com

WWW.AMERICAN-USA.COM



IL4358

Construction shown is typical of the 6-inch size and is illustrative only.

AMERICAN
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AMERICAN Flow Control
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125 Hardman Avenue South
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REF NO.	DESCRIPTION	MATERIAL
1	Hex Head Bolt, 5/8-11 x 1”	304 Stainless Steel
2	Operating Nut, 2” Square	Ductile Iron, ASTM A536
3	O-Ring	Rubber
5	Stuffing Box Gasket	Rubber O-ring
6	Hex Head Bolt, 5/8-11 x 1-3/4”	304 Stainless Steel
7	Stuffing Box	Ductile Iron, ASTM A536
8	Bonnet	Ductile Iron, ASTM A536
10	Bonnet Gasket	Rubber
11	Body	Ductile Iron, ASTM A536
12	Stem	Manganese Bronze, ASTM B763, UNS C86700
13	Wedge Nut	Manganese Bronze, ASTM B763, UNS C86700
14	Resilient Wedge	EPDM Rubber Encapsulated Ductile Iron ASTM A536
15	Hex Nut, 5/8-11	304 Stainless Steel
19	Hex Head Bolt, 5/8-11 x 2-1/4”	304 Stainless Steel
49	O-Ring	Rubber
65	Thrust Washer	304 Stainless Steel
69	Wedge Cover	Acetal Polymer
71	Gasket Assy (ALPHA)	NBR or SBR Rubber, ASTM D2000 304 Stainless Steel
72	Gripper (ALPHA)	Ductile Iron, ASTM A536
73	End Ring (ALPHA)	Ductile Iron, ASTM A536
74	Ramp Runner (ALPHA)	Nylon
75	Bolt Guide (ALPHA)	Ductile Iron, ASTM A536
76	T-Head Bolt (ALPHA)	304 Stainless Steel
77	Coupling Nut (ALPHA)	304 Stainless Steel
78	Washer (ALPHA)	304 Stainless Steel

OPTIONAL MATERIALS ARE AS FOLLOWS

BODY BOLTING: 316 Stainless Steel
STEM: Cast NDZ-S Bronze, ASTM B763, UNS C99500
STEM: Stainless Steel
WEDGE NUT: Silicon Bronze, ASTM B584, UNS C87600

Open Direction: ☐ Left (C.C.W.) ☐ Right (C.W.)

NOTES:

1. Meets requirements of ANSI/AWWA C515 with 250 psig rated working pressure.
2. Fusion-bonded epoxy-coated in accordance with ANSI/AWWA C550.
3. Certified to NSF/ANSI 61 and 372.

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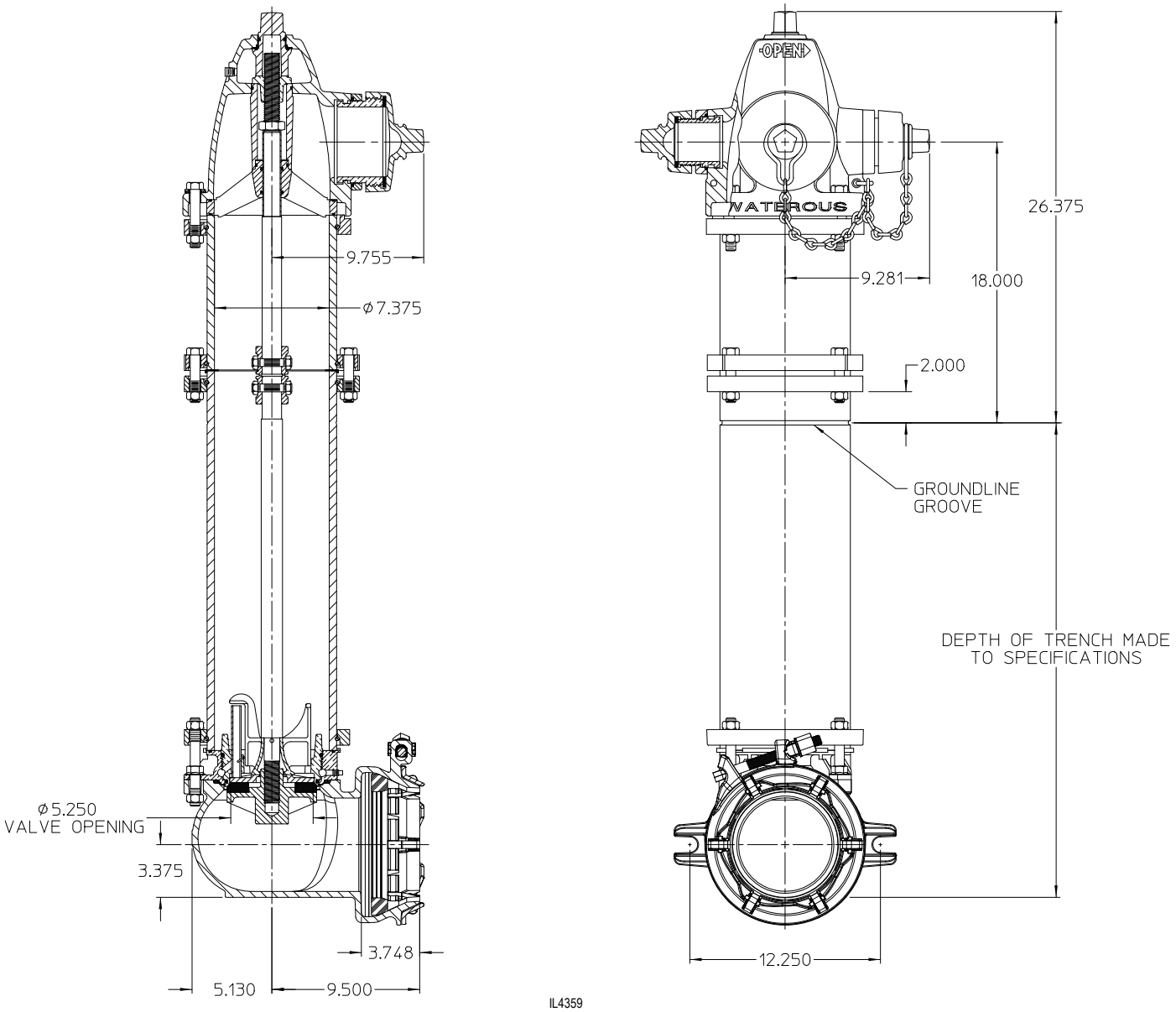
AMERICAN Flow Control Submittal Information

5-1/4 WATEROUS PACER® TRAFFIC MODEL WB67-250 FIRE HYDRANT

WITH ALPHA™ RESTRAINT JOINT



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ALPHA restraint joints will accommodate the following pipe types and sizes:

ALPHA

- Ductile iron per AWWA C151
- PVC per ASTM D1785 (Schedule 40 and 80)
- PVC per ASTM D2241 (SDR 21)
- PVC per AWWA C900
- HDPE per AWWA C906 (SDR 9, 11, 13.5, and 17)

Nominal Size (in)	ALPHA OD Range (in)
6	6.60 - 7.00

NOTES:

1. 250 psig rated working pressure.
2. This hydrant meets or exceeds all requirements of AWWA C502.
3. 10 in. upper standpipe (traffic section) is standard. 16 in., 22 in., 28 in. and 34 in. upper standpipes are available by special order. Nozzle elevation will vary accordingly.
4. 5-1/4" valve opening.
5. Hydrants are available with counterclockwise opening direction (open-left) or clockwise opening direction (open-right).
6. Operating nut and nozzle cap wrench nuts are available in various shapes and sizes.

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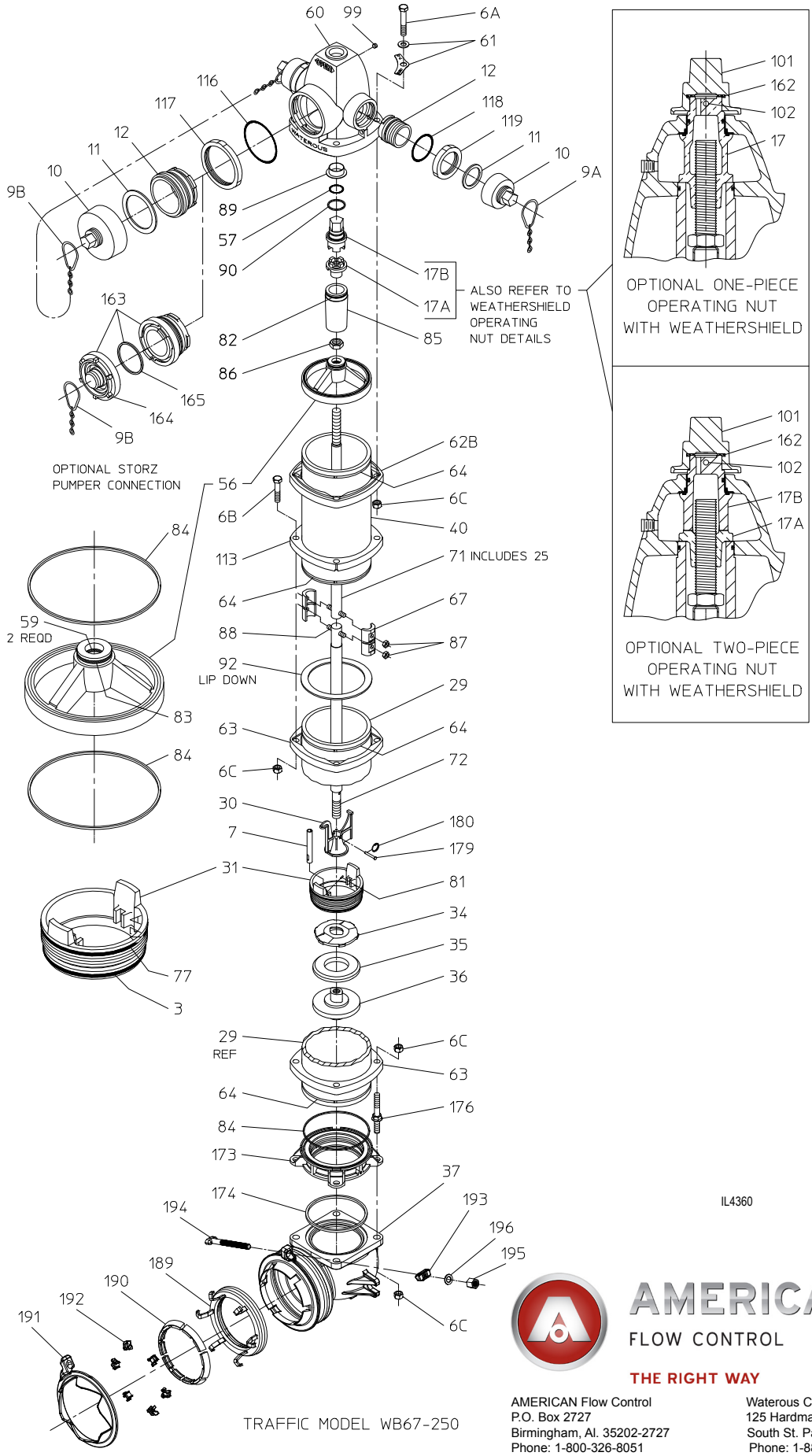

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REF NO.	DESCRIPTION	MATERIAL
3	O-ring (Lower Valve Seat)	Buna-N
6A	Hex Head Bolt, 5/8-11 x 3-3/4"	Zinc Plated Steel, ASTM A307
6B	Hex Head Bolt, 5/8-11 x 3"	Zinc Plated Steel, ASTM A307
6C	Hex Nut, 5/8-11 (Above Ground)	Zinc Plated Steel, ASTM A307
6C	Hex Nut, 5/8-11 (Below Ground)	Stainless Steel, Type 304, ASTM F594
7	Drain Plunger	Red Brass, ASTM B135, UNS C23000
9A,9B	Nozzle Cap Chain, Single or Double	Zinc Plated Steel
10	Nozzle Cap, Hose or Pumper	Ductile Iron, ASTM A536 Grade 65-45-12
11	Cap Gasket, Hose or Pumper	Neoprene
12	Nozzle, Hose	Brass, ASTM B505, UNS C83600
12	Nozzle, Pumper	Bronze, ASTM B584, UNS C87600
17	Operating Nut (One-Piece)	Bronze, ASTM B763, UNS C86500 or UNS C86700
17A	Lower Operating Nut	Bronze
17B	Upper Operating Nut	Ductile Iron, ASTM A536 Grade 65-45-12
25	Rod Bushing	Red Brass, ASTM B135, UNS C23000
29	Lower Standpipe	Centrifugally Cast Ductile Iron Pipe, ANSI A21.51 (AWWA C151)
30	Crossarm	Bronze, ASTM B763, UNS C99500
31	Valve Seat	Bronze, ASTM B584, UNS C87600
34	Upper Valve Washer	Ductile Iron, ASTM A536 Grade 65-45-12
35	Main Valve Rubber	Urethane
36	Lower Valve Washer	Ductile Iron, ASTM A536 Grade 65-45-12 / Epoxy Coated, AWWA C550
37	Hydrant Bottom	Ductile Iron, ASTM A536 Grade 65-45-12 / Epoxy Coated, AWWA C550
40	Upper Standpipe	Centrifugally Cast Ductile Iron Pipe, ANSI A21.51 (AWWA C151)
56	Support Wheel	Ductile Iron, ASTM A536 Grade 65-45-12
57	O-ring (Operating Nut)	Buna-N
59	O-ring (Support Wheel)	Buna-N
60	Nozzle Section	Ductile Iron, ASTM A536 Grade 65-45-12
61	Bury Depth Plate	Aluminum
61	Bury Depth Plate Washer	Zinc Plated Steel
62B	Upper Standpipe Flange	Ductile Iron, ASTM A536 Grade 65-45-12
63	Standpipe Flange	Ductile Iron, ASTM A536 Grade 65-45-12
64	Flange Lock Ring	Stainless Steel, Type 430
67	Coupling Sleeve (two-halves)	Gray Iron, ASTM A48 Class 30B
71	Upper Rod	Steel Rod, ASTM A575
72	Lower Rod	Steel Rod, ASTM A575
77	O-ring (Upper Valve Seat)	Buna-N
81	Groove Pin, 3/32 x 7/16"	Beryllium Copper
82	O-ring (Upper Tube Seal)	Buna-N
83	O-ring (Lower Tube Seal)	Buna-N
84	Support Wheel / Lower Standpipe Gasket	Buna-N
85	Support Tube	Ductile Iron, ASTM A536 Grade 65-45-12

REF NO.	DESCRIPTION	MATERIAL
86	Stop Nut, 1"-8	Zinc Plated Steel
87	Coupling Nut, 1/2-20	Brass
88	Coupling Stud, 1/2-20 x 2-9/16"	Stainless Steel, Type 430
89	Nozzle Section Bushing	Brass
90	Thrust Ring	Polymer Bearing
92	Upper Standpipe Gasket	Neoprene
99	Pipe Plug, 1/4 NPT	Brass
101	Weathershield Nut	Ductile Iron, ASTM A536 Grade 65-45-12
102	Heavy Spirol Pin, 1/4 x 2-1/4"	Stainless Steel, Type 302
113	Breakable Flange	Ductile Iron, ASTM A536 Grade 65-45-12
116	O-ring (Pumper Nozzle)	Buna-N
117	Pumper Nozzle Retainer	Ductile Iron, ASTM A536 Grade 65-45-12
118	O-ring (Hose Nozzle)	Buna-N
119	Hose Nozzle Retainer	Ductile Iron, ASTM A536 Grade 65-45-12
162	Weathershield Nut Gasket	Nitrile
163	Nozzle, Pumper, Storz (with cap and gasket)	Bronze and Aluminum
164	Nozzle Cap, Pumper, Storz	Aluminum
165	Cap Gasket, Pumper, Storz	Buna-N
173	Valve Seat Insert	Bronze, ASTM B584, UNS C87600
174	Valve Seat Insert Gasket	Nitrile
176	Stud, 5/8-11 x 5.650"	Stainless Steel, Type 304, ASTM F593
179	Clevis Pin, 1/4 x 1-11/16"	Stainless Steel, Type 18-8
180	Kickout Ring	Stainless Steel, Type 18-8
189	Gasket Assy (ALPHA)	NBR or SBR Rubber, ASTM D2000 Stainless Steel, Type 304
190	Gripper (ALPHA)	Ductile Iron, ASTM A536 Grade 65-45-12
191	End Ring (ALPHA)	Ductile Iron, ASTM A536 Grade 65-45-12
192	Ramp Runner (ALPHA)	Nylon
193	Bolt Guide (ALPHA)	Ductile Iron, ASTM A536 Grade 65-45-12
194	T-Head Bolt (ALPHA)	Stainless Steel, Type 304
195	Coupling Nut (ALPHA)	Stainless Steel, Type 304
196	Washer (ALPHA)	Stainless Steel, Type 304

Open Direction: ☐ Left (C.C.W.) ☐ Right (C.W.)

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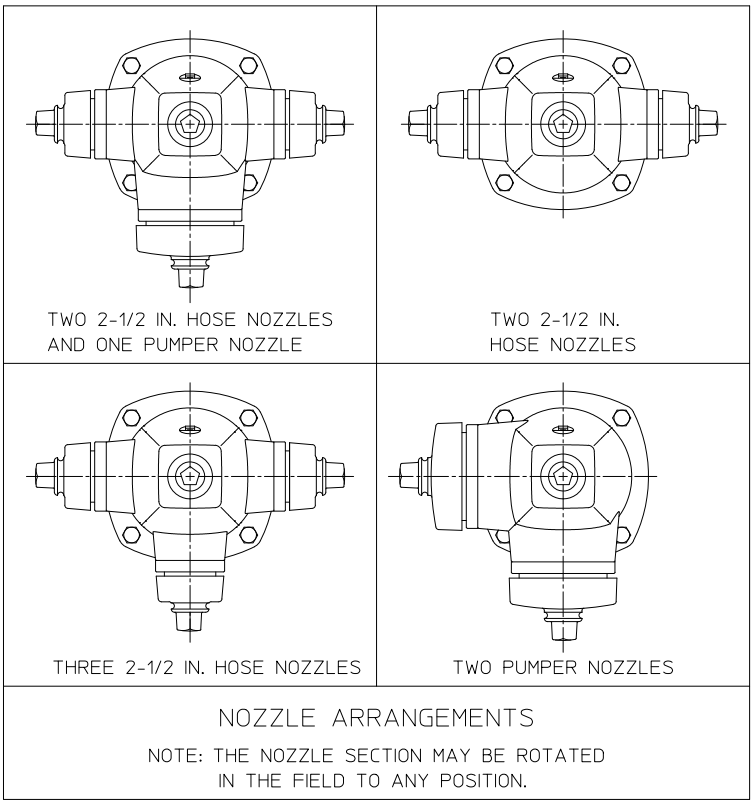

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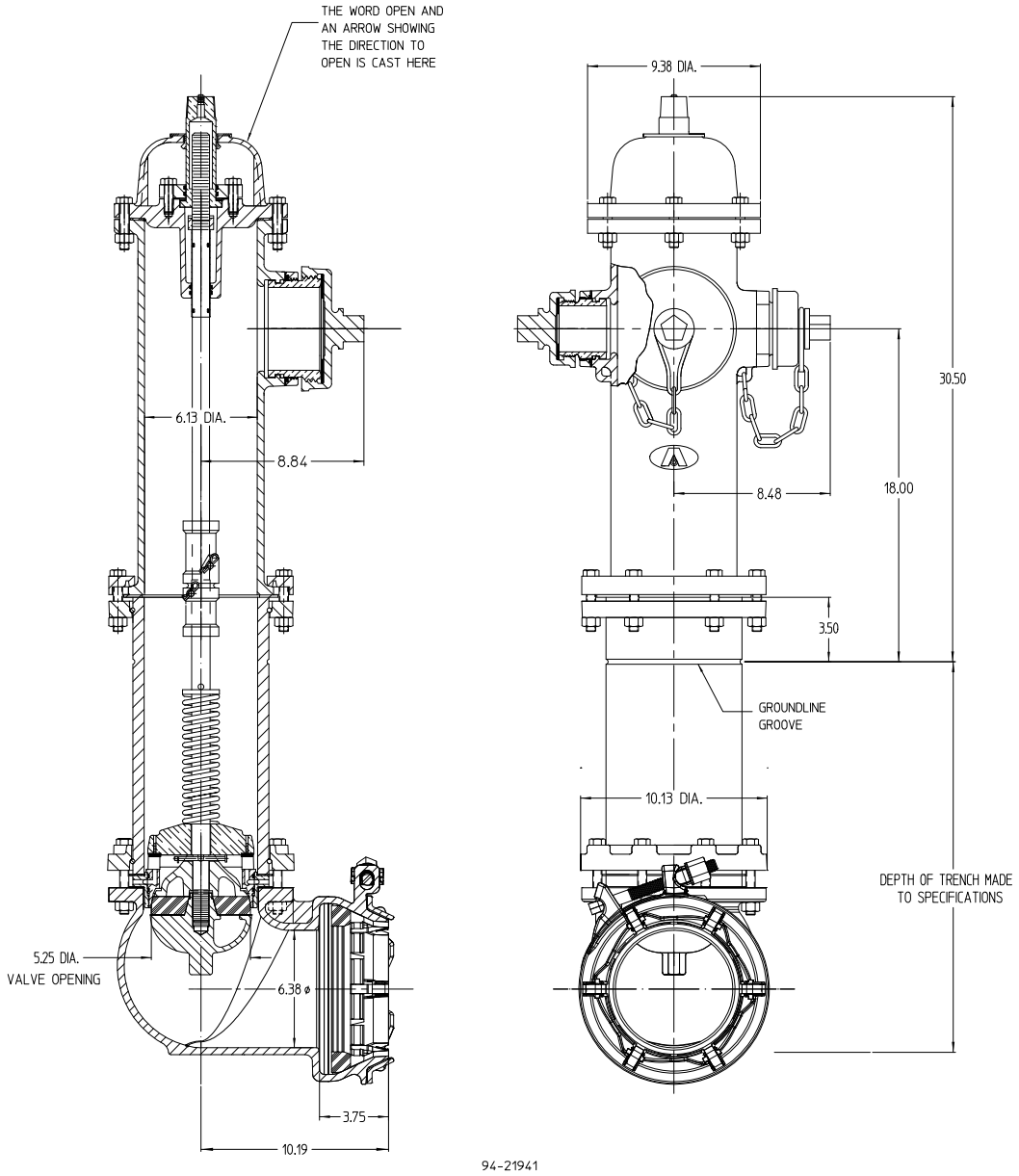
AMERICAN Flow Control Submittal Information

5-1/4 AMERICAN-DARLING® B-84-B-5 TRAFFIC MODEL FIRE HYDRANT WITH ALPHA™ RESTRAINT JOINT



ALPHA restraint joints will accommodate the following pipe types and sizes:

ALPHA

- Ductile iron per AWWA C151
- PVC per ASTM D1785 (Schedule 40 and 80)
- PVC per ASTM D2241 (SDR 21)
- PVC per AWWA C900
- HDPE per AWWA C906 (SDR 9, 11, 13.5, and 17)

Nominal Size (in)	ALPHA OD Range (in)
6	6.60 - 7.00

NOTES:

1. Size and shape of operating nut and nut on caps, threading on nozzles and caps and the direction of opening made to specifications.
2. Cap chains are not furnished unless specified.
3. Bolts and nuts are rustproof steel ASTM A307 or equivalent, in accordance with AWWA 502
4. Working pressure 250 psig, test pressure 500 psig.
5. Hydrant conforms to AWWA standard C502
6. Valve top, valve bottom and base coated with fusion bonded epoxy coating.
7. Certified to NSF/ANSI Standard 61 and NSF/ANSI 372.
8. Nominal turns to open is 19-1/2.

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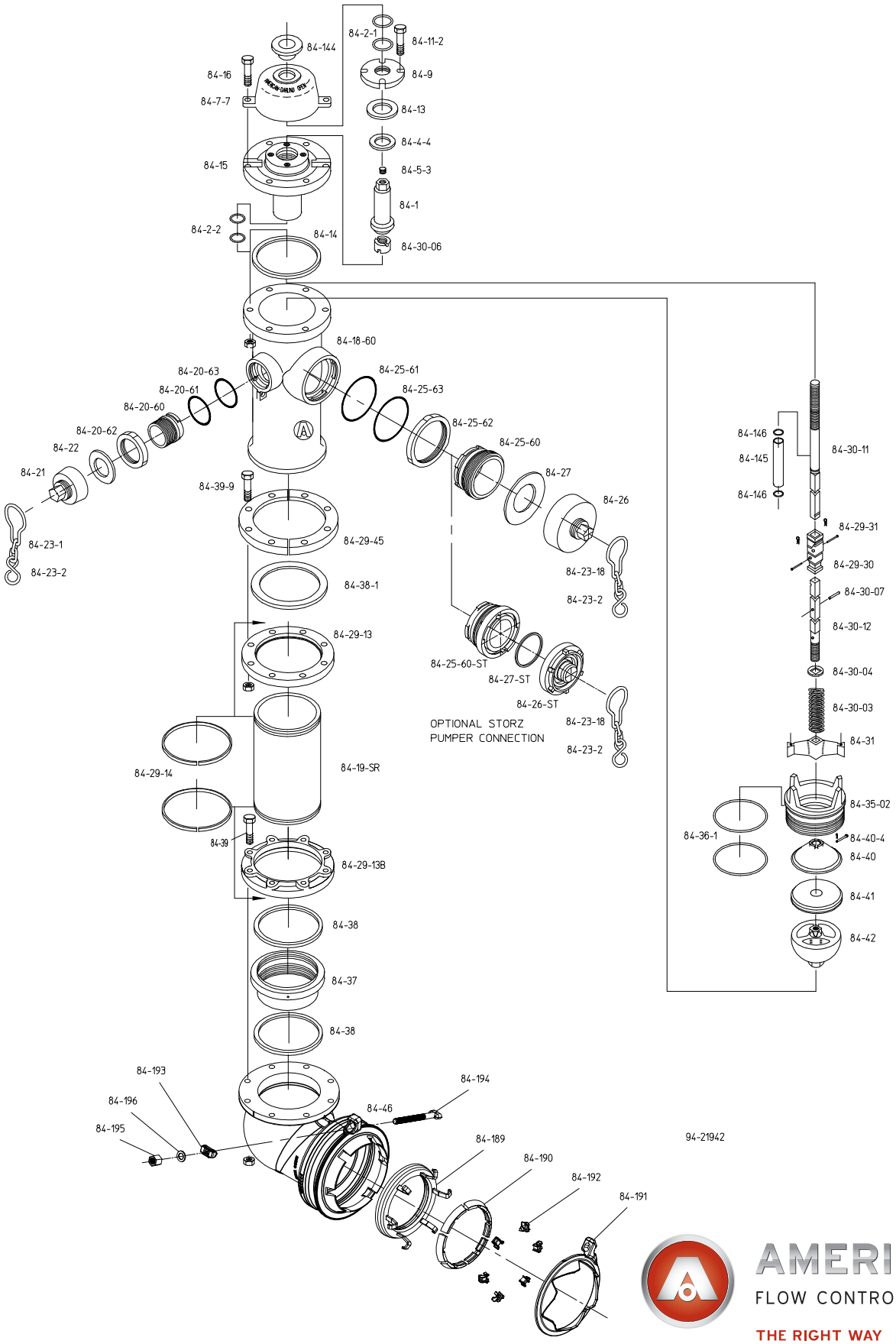

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Ref. No.	Qty.	Description	Material
84-1	1	Operating Nut	Bronze ASTM B763 UNS C86500
84-2-1	2	Cover O-Ring	Buna N
84-2-2	2	Housing O-Ring	Buna N
84-4-4	1	Thrust Washer	Nylatron
84-5-3	1	Pipe Plug	Stainless Steel
84-7-7	1	Weather Cover	Gray Iron ASTM A126 Class B
84-9	1	Housing Cover	Gray Iron ASTM A126 Class B
84-11-2	4	Cover Cap Screws	See Note 3
84-13	1	Cover Gasket	Fiber
84-14	1	Housing Gasket	EPDM Rubber
84-15	1	Housing	Ductile Iron ASTM A536 Grade 65-45-12
84-16	6	Housing Bolts & Nuts	See Note 3
84-18-60	1	Upper Barrel	Ductile Iron ASTM A536 Grade 65-45-12
84-19-SR	1	Lower Barrel	Ductile Iron AWWA C151 Grade 60-42-10
84-20-60	2	Hose Nozzle	Bronze ASTM B763 UNS C87600
84-20-61	2	Hose Nozzle Seal	Buna N
84-20-62	2	Hose Nozzle Retainer	Ductile Iron ASTM A536 Grade 65-45-12
84-20-63	2	Hose Nozzle Retainer Washer	Teflon
84-21	2	Hose Cap	*See Below
84-22	2	Hose Cap Gasket	Rubber
84-23-1	2	Hose Cap Chain with S-Hook	Steel
84-23-2	3	S-Hook	Steel
84-23-18	1	Pumper Cap Chain with S-Hook	Steel
84-25-60	1	Pumper Nozzle	Bronze ASTM B763 UNS C86700
84-25-60-ST	1	Storz Nozzle	Bronze/Aluminum
84-25-61	1	Pumper Nozzle Seal	Buna N
84-25-62	1	Pumper Nozzle Retainer	Ductile Iron ASTM A536 Grade 65-45-12
84-25-63	1	Pumper Nozzle Retainer Washer	Teflon
84-26	1	Pumper Cap	*See Below
84-26-ST	1	Storz Nozzle Cap	Aluminum
84-27	1	Pumper Cap Gasket	Rubber
84-27-ST	1	Storz Cap Gasket	Rubber
84-29-13	1	Barrel Flange	Ductile Iron ASTM A536 Grade 65-45-12
84-29-13B	1	Base Flange	Ductile Iron ASTM A536 Grade 65-45-12
84-29-14	2	Snap Ring	Stainless Steel
84-29-30	1	Rod Coupling	Gray Iron ASTM A126 Class B
84-29-31	2	Rod Coupling Pin & Clip Pin	Stainless Steel
84-29-45	1	Breakable Flange	Gray Iron ASTM A126 Class B
84-30-03	1	Hydrant Spring	Stainless Steel

*National Standard and other common cap configurations are constructed of ASTM A536 Grade 65-45-12 ductile iron. Other offerings may be constructed of ASTM A126 Class B gray cast iron.

Ref. No.	Qty.	Description	Material
84-30-04	1	Spring Plate	Stainless Steel
84-30-06	1	Travel Stop Nut	Bronze ASTM B283 UNS C37700
84-30-07	1	Spring Plate Pin	Stainless Steel
84-30-11	1	Upper Rod	Steel
84-30-12	1	Lower Rod	Steel
84-31	1	Drain Lever	Bronze ASTM B584 UNS C92200
84-35-02	1	Hydrant Seat	Bronze ASTM B584 UNS C92200
84-36-1	2	Seat O-Ring	Buna N
84-37	1	Drain Ring	Bronze ASTM B763 UNS C87600
84-38	2	Drain Ring Gasket	Composition Rubber
84-38-1	1	Barrel Gasket	EPDM Rubber
84-39	8	Base Bolts & Nuts	0304 Stainless Steel
84-39-9	8	Barrel Bolts & Nuts	See Note 3
84-40	1	Valve Top	Ductile Iron ASTM A536 Grade 65-45-12
84-40-4	1	Valve Top Clevis & Clip Pin	Stainless Steel
84-41	1	Hydrant Valve	EPDM Rubber
84-42	1	Valve Bottom	Ductile Iron ASTM A536 Grade 65-45-12
84-46-6AA	1	ALPHA™ Restraint Joint Base	Ductile Iron ASTM A536 Grade 65-45-12
84-144	1	Weather Shield	Rubber
84-145	1	Rod Sleeve	Bronze
84-146	2	Rod Sleeve O-Ring	Buna N
84-189	1	Gasket Assy (ALPHA)	NBR or SBR Rubber, ASTM D2000 Stainless Steel, Type 304
84-190	6	Gripper (ALPHA)	Ductile Iron, ASTM A536 Grade 65-45-12
84-191	1	End Ring (ALPHA)	Ductile Iron, ASTM A536 Grade 65-45-12
84-192	6	Ramp Runner (ALPHA)	Nylon
84-193	1	Bolt Guide (ALPHA)	Ductile Iron, ASTM A536 Grade 65-45-12
84-194	1	T-Head Bolt (ALPHA)	Stainless Steel, Type 304
84-195	1	Coupling Nut (ALPHA)	Stainless Steel, Type 304
84-196	1	Washer (ALPHA)	Stainless Steel, Type 304

Hydrants are furnished as “Draining” unless optional “Non-Draining” Configuration is otherwise noted below.

☐ Optional “Non-Draining” Configuration required

Open Direction ☐ Left(C.C.W.) ☐ Right(C.W.)

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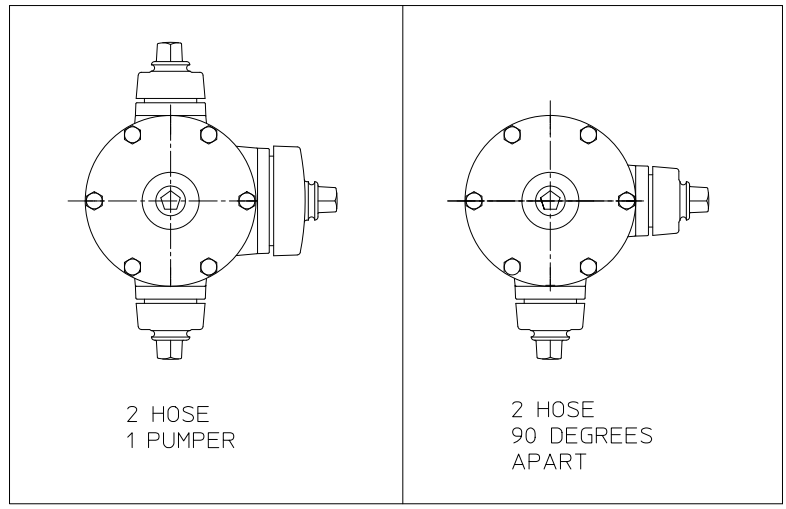
AVAILABLE NOZZLE ARRANGEMENTS



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