TOWN OF WHITESTOWN, INDIANA

WATER & WASTEWATER

STANDARD SPECIFICATIONS & DETAILS

WHITESTOWN
INDIANA

ADOPTED:

TOWN HALL: (317) 769-6557
UTILITY OFFICE: (317) 733-8584

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1.01 Introduction

The following Chapters provide a description of acceptable materials, installation and testing for the construction of gravity sanitary sewers, force mains, manholes, water distribution piping, sanitary lift stations, and their appurtenances within the **Town of Whitestown**. Use of other materials, installation practices and testing not specified herein will be allowed only with the prior written approval and authorization of the Publics Works Director of the **Town of Whitestown**.

1.02 Conformance to Town's Master Plan

To ensure the continued development of an integrated and comprehensive water/sanitary sewer system, all new and extended facilities shall conform to the Town's Master Plan(s) in sizing and general location. Information provided to the Town by the Developer and Design Engineer will be used to verify the conformity of the proposed project to the Master Plan. The Town will then provide the Developer and Design Engineer with the required facility size for their use in design.

1.03 Bonds & Insurance

A. Performance & Maintenance Bonds

1. The Contractor shall furnish a Maintenance bond in an amount at least equal to ten percent (10%) of the project construction cost, as security for the quality and craftsmanship of all of the Contractor's work. This bond shall remain in effect for a period of three (3) years after the date when the Town accepts the project.

2. The Contractor shall furnish a Performance bond in an amount equal to one hundred percent (100%) of the project construction cost, as security for the completion of the Contractor's work. This bond shall remain in effect until the Town accepts the project.

3. All bonds shall be in the form prescribed in the Appendices of these Standards except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

4. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.

5. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify the Town and shall, within 20 days after the event giving rise to such notification,

provide another bond and surety, both of which shall comply with the bond and surety requirements above.

6. If the Contractor fails to obtain a required bond, the Town may exclude the Contractor from the project site and terminate right of access.

B. **Insurance**

1. Contractor shall obtain and maintain insurance as required in this section of the Town Standards.

2. All insurance required herein shall be purchased and maintained by the Contractor and shall be obtained from insurance companies that are duly licensed or lawfully authorized, to do business in Indiana and to issue insurance policies for the required limits and coverages, acceptable to the Town, in a form and substance reasonably satisfactory to the Town, which afford coverages set forth herein. This insurance shall be written for not less than limits of liability specified herein or as required by law, whichever coverage is greater, and shall include coverage for Contractor's indemnification obligations contained in this Contract. All companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

3. Prior to commencement of the work, Contractor shall deliver to the Town, copies of certificates of insurance establishing that the Contractor has obtained and is maintaining the policies, coverages, and endorsements required by the Town. Upon written request by the Town, the Contractor shall also furnish other evidence of such required insurance, including but not limited to certified copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles.

    a. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

4. The failure of the Town to request such certificates or other evidence of the Contractor's full compliance with these insurance requirements, or failure of Town to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

5. If the Contractor has failed to obtain and maintain the required insurance, the Town may exclude the Contractor from access to the Site.

6. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

7. Workers' Compensation:

    a. The Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:

        i. Claims under workers' compensation, disability benefits, and other similar employee benefit acts.

ii. Claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees.

iii. Foreign voluntary worker compensation (if applicable).

8. Commercial General Liability—Claims Covered:

   a. The Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:

      i. Claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.

      ii. Claims for damages insured by reasonably available personal injury liability coverage.

      iii. Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

9. Commercial General Liability—Form and Content:

   a. Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:
   b. The Contractor shall furnish the Town evidence of continuation of such insurance at final payment and three years thereafter.
   c. Broad form property damage coverage.
   d. Severability of interest.
   e. Underground, explosion, and collapse coverage.
   f. Personal injury coverage.
   g. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.

      i. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

   h. The commercial General Liability Policy must be endorsed to provide that the general aggregate amount applies separately to each of Contractor's separate projects. ISO Endorsement CG2503 *Per Project Endorsement* or its equivalent shall be used to satisfy this requirement.

10. Automobile Liability:

    a. The Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.

11. Umbrella or Excess Liability:

a. Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.

12. Contractor's Pollution Liability Insurance:

    a. Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result insurance shall be maintained for no less than three years after final completion.

13. Additional Insureds:

    a. All coverage provided herein shall be endorsed to include the **Town of Whitestown** as Additional Insured except for the Worker's Compensation/Employer's Liability and Professional Liability policies. ISO forms CG 2010 07 04 and CG 2037 or equivalent endorsement forms must be used on the commercial general liability policy to provide additional insured status to the Town and shall include coverage for completed operations. The policies for which the Town is named as additional insureds shall provide primary and non-contributing coverage and any valid and collectible insurance carried separately by the Town shall be in excess of the limits provided by such policies and shall be non-contributory.

    b. The commercial general liability, automobile liability and workman's compensation policies must be endorsed to provide a waiver of subrogation in favor of the Town.

    c. Include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.

14. Contractor's Professional Liability Insurance:

    a. If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing

and maintenance of such insurance by such Subcontractor.

b. General Provisions: The policies of insurance required shall:

i. Be written for not less than the limits of liability provided below or required by Laws or Regulations, whichever is greater.

ii. Contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to the Town.

iii. Remain in effect at least until the Project is complete, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.

C. **Limits of Liability**

The limits of liability for insurance required by the Town shall provide coverage for not less than the following amounts, or greater where required by Laws and Regulations:

1. Workers' Compensation:
   a. Applicable Federal or State: Statutory

   b. Employer's Liability:
      i. Bodily Injury by Accident:
         - $1,000,000 Each Person
         - $5,000,000 Each Accident
      ii. Bodily Injury by Disease:
         - $1,000,000 Policy Limit
         - $1,000,000 Each Person

2. Contractor's Commercial General Liability:
   a. General Aggregate: $2,000,000
   b. Each Occurrence: $1,000,000
   c. Products and Completed Operations: $2,000,000
   d. Personal and Advertising Injury: $1,000,000
   e. Property Damage liability insurance shall provide Explosion, Collapse and Underground coverages.
   f. Excess or Umbrella Liability:
      i. General Aggregate: $5,000,000
      ii. Each Occurrence: $5,000,000

3. Automobile Liability:
   a. Combined Single Limit: $1,000,000 Each Accident

1.04 Easement Requirements

A. Sanitary Sewer Requirements

Easements shall be exclusive Sanitary Sewer Easements and shall be dedicated and recorded solely for the benefit of the **Town of Whitestown**. No building, structure, tree, landscaping or other obstruction shall be allowed to be placed, erected, maintained, or allowed to be within the easement.

Exclusive sanitary sewer easements shall not overlap other easements.

Easement boundaries shall be shown on the plans, referenced in the specifications, and shown on the plats as "Sanitary Sewer Easement" in lieu of "Utility Easement." Common utility easements are prohibited for sanitary sewer facilities.

1. Minimum Requirements

   a. Sanitary Sewers Less than Twenty-Four inches in diameter (24"):

Depth of Sewer	**Minimum Width (feet)**
Up to and including 10 feet	20
Greater than 10 feet to and including 20 feet	30
Greater than 20 feet	40

All sanitary sewers shall be centered in the easement. For those sanitary sewers constructed in the public right-of-way, the easement shall extend the distance outside the right-of-way necessary to provide the required easement width.

In residential development as determined by the Town. If the sewer is located outside, but within five (5) feet of the right-of-way and is fifteen (15) inches or less in diameter, then the easement is only required to be ten (10) feet wide.

   b. Sanitary Sewers Twenty-Four Inches (24") and Larger:

The easement width will be determined on a case-by-case basis by the **Town of Whitestown**, but shall not be less than a minimum of fifty (50) feet in width.

   c. Lift Stations

The easements for lift stations may, at the discretion of the **Town of Whitestown**, be modified on a case-by-case basis. At a minimum, the easement requirements for lift stations are included in the attached Standard Details.

B. **Water System Requirements**

The Utility shall prepare the easement document and the Developer or Design Engineer shall provide the easement exhibits (with legal description and drawing) and last deed of record. The easement description and exhibits shall be prepared by a licensed Professional Land Surveyor registered in the State of Indiana.

The Developer or Design Engineer shall submit drawings as prepared by the Surveyor with the easement submittal. A digital layout of the tract of land shall be provided which delineates the proposed easement in addition to the last deed of record. The easement shall be laid out in compliance with the Utility's GIS system referencing the Indiana West State Plane Coordinate system. Additionally, the easement shall be laid out using North American Datum of 1983 (NAD83) for horizontal control and be measured in US Survey Foot Feed (not international Foot).

1. Minimum Requirements

    a. Adjacent to a platted public right-of-way (ROW):

        i. A minimum twenty foot (20') wide utility easement directly adjacent to the right-of-way is required. The easement shall be adjacent to the right-of-way in order to allow the Utility access for future maintenance and repair of the facilities installed within the easement.

    b. Adjacent to a Private Street:

        i. A minimum thirty foot (30') wide utility easement directly adjacent to a permanent feature for example, the edge of pavement, back of curb, or sidewalk is required.

    c. Undeveloped Areas:

        i. In areas where no private or platted streets exist, the easement shall be a thirty foot (30') wide non-exclusive easement. Provisions must allow the Utility access for future maintenance and repair of the facilities installed within the easement.

    d. Special Areas:

        i. Site conditions or facility requirements may require a departure from the standard easement requirements. The **Town of Whitestown** shall notify the applicant if this is applicable.

2.01 Introduction

The following Chapter provides a description of materials acceptable for the construction of gravity sanitary sewers, force mains, manholes, gravity storm sewers, sanitary lift stations, and their appurtenances within the **Town of Whitestown**. Use of other materials not specified herein will be allowed only with the written approval and authorization of the Utilities Manager of the **Town of Whitestown**.

2.02 Gravity Sanitary Sewer Materials

A. General

1. The **Town of Whitestown** currently allows the use of the following pipe materials meeting or exceeding the minimum requirements/specifications set forth herein for the construction of gravity sanitary sewers:

    a. Polyvinyl Chloride Pipe (PVC) **(STANDARD)**
    b. Ductile Iron Pipe (DIP) **(With Town Approval Only)**

2. All gravity sanitary sewer shall be Polyvinyl Chloride Pipe (PVC), unless otherwise noted or approved.

3. Each length of pipe shall be marked per the requirements of the respective ASTM standard. Upon request, the Contractor at his own expense shall furnish the **Town of Whitestown** with copies of all material tests required by applicable ASTM standards.

B. Polyvinyl Chloride (PVC) Pipe and Fittings

1. Pipe: PVC Pipe shall be installed where indicated on the Contract Drawings.

2. Pipe shall be “Green” in Color.

3. Pipe must be delivered to job site by means which will adequately support it, and not subject it to undue stresses. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by crushing. Pipe shall be unloaded carefully and strung or stored as close to the final point of placement as is practical. Pipe shall not be stored outside where subject to sunlight.

4. Jointing of PVC pipe shall be by a natural rubber ring inserted into the belled end of the pipe or double hub joints. Solvent weld joints are not acceptable.

5. The PVC pipe manufacturer shall provide special fittings, acceptable to the Town to make watertight connections to manholes.

6. Pipe manufacturer shall furnish notarized certificate of compliance with applicable specifications.

7. Gravity Sewer Application (15" and Smaller):

a. PVC gravity sewer shall be polyvinyl chloride plastic pipe, SDR-35 pipe. PVC pipe shall have a maximum laying length of 20 feet, with bell end and elastomeric gasket, and with plain end for ductile-iron fittings. All PVC pipe shall conform to the latest revisions of the following, unless otherwise noted:

i. ASTM D 3034 Standard Dimension Ratio SDR-35.

ii. Gravity Sewer connection to lift station wetwell:

(1) Gravity Sewer between manhole on lift station site and connection to lift station wetwell shall be water grade PVC plastic IPS pipe to connect to required gate valve and shall conform to ASTM D2241, Pressure Class 200 (SDR 21). PVC pipe shall have a maximum laying length of 20 feet, with bell end and elastomeric gasket, and with plain end for cast-iron or ductile-iron fittings. Elastomeric gasket shall conform to the requirements of ASTM F-477.

8. Joints for polyvinyl chloride (PVC) mains shall be integral bell and spigot type joints with rubber-o-ring gasket. The cleaning and assembling of the pipe joints shall be in accordance with manufacturer's recommendations.

9. All pipe and fittings shall be inspected at the factory and on the job site. Testing of PVC pipe and fittings shall be accomplished in conformance with the latest revision of ASTM D3034, ASTM D2444, ASTM D2412, and ASTM D2152. The manufacturer shall submit five (5) copies of certification of test for each lot of material represented by shipment to the job site.

10. The pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects. The pipe shall be as uniform in color as commercially practical. PVC pipe shall have a ring painted around spigot ends in such a manner as to allow field checking of setting depth of pipe in the socket.

11. Large Diameter Gravity Sewer Application (Greater than 15"):

a. PVC gravity sewer shall be polyvinyl chloride plastic pipe, PS 46 pipe. PVC pipe shall have a maximum laying length of 20 feet, with bell end and elastomeric gasket, and with plain end for ductile-iron fittings. Large diameter PVC pipe used for gravity sewer applications shall meet or exceed all performance requirements of the previous paragraph, except ASTM F679 shall be referenced instead of ASTM D3034.
b. The cleaning and assembly of pipe and fittings shall be in accordance with the manufacturer's recommendation.

12. PVC Pipe installed at depths greater than and including 16-feet deep shall be SDR-26 (PS115 for diameters larger than 15").

13. PVC Gravity Lateral Service Connection Piping (6").

a. PVC gravity lateral service connection pipe (6") shall be ASTM-3034, SDR 35 solid wall PVC pipe. All fittings shall be heavy wall, SDR-26.

b. For deep sewer house connection laterals (deeper than 10 feet) and for near vertical (within 30 degrees of vertical) lateral risers, install a vertical riser adapter with flange (Plastic Treads Model No. G-986 or equal) between the bottom fitting and the vertical riser section to prevent settlement of the lateral riser and to prevent possible damage to the bottom fitting joint. See detail in appendices for deep sewer house connection laterals.
c. Service Connections shall include cleanouts per details that are 6" above the surrounding grade.
d. For laterals with no existing stub out connection, use Inserta-Tee or approved equal when tapping into an existing sewer main.
e. The repair of laterals shall install a connector with metal shear guard. Connector shall be "Indiana Seal Shear Guard" by GPK Products, Inc., Fernco, or approved equal.

C. Ductile Iron Pipe and Fittings (With Town Approval Only)

1. Ductile iron pipe shall conform to the current requirements of AWWA C151, Pressure Class 350, with push-on joints unless otherwise noted on drawings.

2. The interior of the pipe shall be ceramic-epoxy lined with Protecto 401; or equal. The thickness of the lining shall be 40 mils nominal DFT with 6-10 mils DFT Protecto Joint Compound for the bell sockets and spigot ends.

3. The exterior of all pipes, unless otherwise specified, shall receive either coal tar or asphalt base coating a minimum of 1 mil thick.

4. Each piece of pipe shall bear the manufacturer's name or trademark, the year in which it was produced and the letters "DI" or the word "DUCTILE".

5. Pipe manufacturer shall furnish notarized certificate of compliance to the above AWWA or ANSI specifications.

6. Provide AWWA C110 mechanical joint plugs and locked or restrained pipe joints where indicated on Drawings. Fittings under structures shall be mechanical joint with retainer glands.

7. All underground ductile iron pipes shall be encased with polyethylene film in tube form conforming to AWWA C105 (latest edition).

   a. Polyethylene encasement for use with ductile iron pipe systems shall consist of three layers of co-extruded linear low density polyethylene (LLDPE), fused into a single thickness of not less than eight (8) mils.

   b. The inside surface of the polyethylene wrap to be in contact with the pipe exterior shall be infused with a blend of antimicrobial compound to mitigate antibiological influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion.

   c. The polyethylene film shall have the following characteristics:
      i. Impact Resistance: 600 grams per ASTM D1709 Method B

ii. Propagation Tear Resistance: 2,550 grams force per ASTM D1922
iii. Thickness: 0.008 inches minimum (8 mil)

d. Polyethylene encasement shall be installed per ANSI/AWWA C105 Modified Method A.

e. Polyethylene encasement shall be V-Bio as manufactured by DIPRA.

8. Storage and installation of polyethylene shall be in accordance with the manufacturer's recommendation and shall prevent contact between the pipe and the surrounding backfill and bedding material; but is not intended to be airtight or watertight.

9. The cleaning and assembly of pipe and fitting joints shall be in accordance with the manufacturer's recommendations.

D. Identification Tape

1. Identification Tape shall be constructed of an aluminum foil core with an acid and alkali resistant polyethylene film. The tape shall be imprinted with a warning legend that is completely incased to prevent ink rub-off. The tape shall be a minimum of 5 mils thickness. The tape shall be "green" in color to meet APWA color standards.

2.03 Forcemain Materials

A. General

1. The **Town of Whitestown** allows the use of the following pipe materials meeting or exceeding the minimum requirements set forth herein, for the construction of sanitary sewer force mains.

a. Polyvinyl Chloride Pipe (PVC)
b. High Density Polyethylene Pipe (HDPE)
c. Ductile Iron Pipe (DIP) **(at Mag Meter Vault and ARV Vault Only)**

B. **Polyvinyl Chloride (PVC) Pressure Pipe**

1. Pipe:

a. Pipe shall be "Green" in Color.

b. 4" through 12" Diameter – shall conform to one of the following:

i. PVC plastic IPS pipe shall conform to ASTM D2241, Pressure Class 200 (SDR 21). PVC pipe shall have a maximum laying length of 20 feet, with bell end and elastomeric gasket, and with plain end for cast-iron or ductile-iron fittings. Elastomeric gasket shall conform to the requirements of ASTM F-477. The seal of the National Sanitation Foundation Testing Laboratory must appear on each pipe.

ii. PVC plastic DIPS pipe shall conform to ANSI/AWWA C-900, Pressure Class 235 (DR 18). PVC pipe shall have a maximum laying length of 20 feet, with

bell end and elastomeric gasket, and with plain end for cast-iron or ductile-iron fittings. Elastomeric gasket shall conform to the requirements of ASTM F-477. The seal of the National Sanitation Foundation Testing Laboratory must appear on each pipe.

a. 16" through 30" Diameter – shall conform to the following:

i. PVC plastic pipe shall conform to ANSI/AWWA C-900, Pressure Class 235 (DR 18). PVC pipe shall have a maximum laying length of 20 feet, with bell end and elastomeric gasket, and with plain end for cast-iron or ductile-iron fittings. Elastomeric gasket shall conform to the requirements of ASTM F-477. The seal of the National Sanitation Foundation Testing Laboratory must appear on each pipe

c. Each length of pipe shall be marked, at no more than 10 foot intervals, with the following information:

i. Nominal Pipe Size
ii. Type Plastic Material – AWWA C900
iii. Manufacturer's Name, Trademark and Code

d. Joints:

i. Joints for PVC mains shall be integral bell and spigot type joints with rubber-o-ring gasket. The cleaning and assembling of the pipe joints shall be in accordance with manufacturer's recommendations. Joints shall conform to ASTM D3139

ii. Joints shall be restrained as required in the Restrained Joint Tables for PVC pipe included in the Standard Details.

2. Fittings:

a. Fittings shall be ductile iron pressure class 350 and have restrained mechanical-joints or push-on joints in accordance with ANSI/AWWA C110/A21.10, latest revision, and shall conform to the details and dimensions shown therein. The interior of the fittings shall be double cement-mortar lined with bituminous seal coat in accordance with the current requirements of AWWA C104. Thickness of the lining shall be set forth in the aforementioned specification unless otherwise directed by the Town. The exterior of all pipe, unless otherwise specified, shall receive either coal tar or asphalt base coating a minimum of 1 mil thick. Compact ductile iron fittings meeting the requirements of ANSI/AWWA C153/A21.53, latest revision, will also be acceptable.

3. Restrained Joints:

a. Restrained joints for pipe, fittings, and valves shall be required where shown on the Drawings, and applies to restrained joints at ductile iron fittings, across the joints of bell and spigot pipe joint, and where the spigot end of pipe connect with valves or other items that have mechanical joint ends. Mechanically restrained joints for sanitary forcemains shall be as follows:

i. PVC Pipe: Pipe restraint shall be accomplished by Restraint devices for nominal pipe sizes 4 inch through 54 inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10. Restraining devices shall be Mega-Lug Series 2000PV, 2200, 1900, 1600, 2800, 1100HV, and 6500 (as applicable) as manufactured by EBAA Iron Sales, Inc., Eastland, Texas; or approved equal.

ii. Restrained joints shall have a minimum working pressure equal to that of the pipe, with a minimum 2:1 safety factor.

iii. All bolts, nuts, and studs for mechanical joint restraint devices shall be coated with FluoroKote#1 or be 300 Series stainless steel.

iv. To ensure uniformity of installation and appearance, all restraint devices shall be the products of one manufacturer.

v. The use of restrained joints utilizing a friction type gasket connection shall not be accepted.

4. All pipe in the vicinity of fittings shall be restrained in accordance with the Town's Standard Details. Pipe at ends left for future connections shall also be restrained as a dead end in accordance with the Town's Standard Details.

5. All underground DI fittings for PVC Pipe shall be encased with polyethylene film in tube form conforming to AWWA C105 (latest edition).

   a. Polyethylene encasement for use with ductile iron pipe systems shall consist of three layers of co-extruded linear low density polyethylene (LLDPE), fused into a single thickness of not less than eight (8) mils.
   b. The inside surface of the polyethylene wrap to be in contact with the pipe exterior shall be infused with a blend of antimicrobial compound to mitigate antibiological influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion.
   c. The polyethylene film shall have the following characteristics:

      i. Impact Resistance: 600 grams per ASTM D1709 Method B
      ii. Propagation Tear Resistance: 2,550 grams force per ASTM D1922
      iii. Thickness: 0.008 inches minimum (8 mil)

   d. Polyethylene encasement shall be installed per ANSI/AWWA C105 Modified Method A.
   e. Polyethylene encasement shall be V-Bio as manufactured by DIPRA.

C. **High Density Polyethylene (HDPE) Pipe and Fittings**

1. High density polyethylene pipe shall be manufactured by the following:
   a. "Driscopipe" as manufactured by Phillips Product Company, Inc.,
   a. "PLEXCO" as manufactured by Chevron,
   b. POLYPIPE,
   c. or Approved equal.

2. Pipe shall have "Green" stripe.

3. Standard Dimension Ratio (SDR) for Pipe:

    a. All HDPE pipe for forcemain applications shall be IPS DR 11 (200 psi WPR), unless otherwise directed by the Town.

4. Materials for Polyethylene Pipe:

    a. Pipe shall be manufactured from a PE 4710 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material shall meet the requirements of ASTM D3350 with a minimum cell classification of PE 445574C. Pipes having an outside diameter of 4" and larger shall have a manufacturing standard of ASTM F-714. Pipes smaller than 4" shall have a manufacturing standard of ASTM D 3035. All pipe diameter sizes shall be in iron pipe sizes (IPS) with DR (11) minimum wall thickness. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.

    b. Pipe made from these resins must have a long-term strength rating of 1600 psi or more.

    c. The polyethylene resin shall contain antioxidants and shall be stabilized with carbon black against ultra-violet degradation to provide protection during processing and subsequent weather exposure

    d. The polyethylene resin compound shall have a resistance to environmental stress cracking as determined by the procedure detailed in ASTM D 1693, Condition B with sample preparation by procedure C of not less than 200 hours

5. Polyethylene Pipe and Fittings:

    a. Butt fusion fittings shall be in accordance with ASTM D3261, Cell Classification of 445574C, and shall be manufactured by injection molding, a combination of extrusion and machining, or fabricated from HDPE pipe conforming to this specification. All fittings shall be pressure rated to provide a working pressure rating no less than that of the pipe. Fabricated fittings shall be manufactured using a McElroy Datalogger to record fusion pressure and temperature. A graphic representation of the temperature and pressure data for all fusion joints made producing fittings shall be maintained as part of the quality control. The fitting shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.

    b. Electrofusion Fittings shall be PE 4710 HDPE, Cell Classification of 445574C as determined by ASTM D3350 and be the same base resin as the pipe. Electrofusion Fittings shall have a manufacturing standard of ASTM F1055.

    c. Flanged and Mechanical Joint Adapters: Flanged and Mechanical Joint Adapters shall be PE 4710 HDPE, Cell Classification of 445574C as determined by ASTM D3350 and be the same base resin as the pipe. Flanged and mechanical joint adapters shall have a manufacturing standard of ASTM D3216. All adapters shall be pressure rated to provide a working pressure rating no less than that of the pipe.

d. The pipe shall be designed for a normal internal working pressure and earth cover over top of the pipe to suit the conditions of proposed use.

e. Each length of pipe shall be marked, at no more than 10 foot intervals, with the following information:

i. Nominal Pipe Size
ii. Type Plastic Material – PE4710
iii. Pipe Pressure Rating
iv. Manufacturer's Name, Trademark and Code

6. All pipe shall be made from virgin material. No rework compound. Pipe shall be homogenous throughout, and be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.

7. Fittings for the polyethylene pipe line shall be molded or fabricated from the same material as specified hereinbefore for the high density polyethylene pipe.

8. Fittings for bends 22-1/2° or greater shall be provided as shown on the Drawings. For alignment changes of less than 20° deflection, the pipe may be laid in curves with a radius of 100 feet or greater.

9. All run-of-the-pipe fittings shall be fusion welded into the pipeline.

10. Tee branches shall be of the size shown on the Drawings and shall be furnished with flanged ends per ANSI B-16.1. All fittings shall be factory made.

11. Fittings shall be capable of withstanding the same pressure and loading conditions specified for the pipe.

12. Wye branches shall be true wyes.

13. HDPE Pipe Jointing:

14. Pipe to be joined by leak proof, thermal, butt fusion joints. All fusion must be done by personnel trained by the pipe supplier using tools approved by the pipe supplier.

15. The fusion machine shall have hydraulic pressure control for fusing two (2) pipe ends together; it shall include pressure fusion indicating gauges to correctly monitor fusion pressures. The machines correctly monitor fusion pressures. The machines shall be equipped with an electric or gasoline engine powered facing unit to trim irregularities from the pipe ends. The heating plate on the fusion machine shall be electrically heated and thermostatically controlled and shall contain a temperature gauge for monitoring temperature.

16. Joint strength must be equal to that of adjacent pipe as demonstrated by tensile test. In addition, results of tensile impact testing of joint should indicate a ductile rather than a brittle fracture. External appearance of fusion bead should be smooth without significant juncture

groove.

17. Tools and Procedures:
    a. Fusion jointing and other procedures necessary for correct assembly of the polyethylene pipe and fittings will be done only by personnel trained in those skills by the pipe supplier.
    b. Only those tools designed for aforementioned procedures and approved by the pipe supplier shall be used for assembly of pipe and fittings to insure proper installation

18. Threaded or solvent cement joints and connections are not permitted

19. Joining, Terminating or Adapting by Mechanical Means:

    a. The polyethylene pipe shall be connected to systems or fittings of other materials by means of an assembly consisting of a polyethylene flange adapter butt-fused to the pipe, a backup ring of either cast iron, steel, or high silica aluminum alloy made to ANSI B-16.1 dimensional standards (with modified pressure ratings), bolts of compatible material (insulated from the fittings where necessary) and a gasket of reinforced black rubber, or other material approved by the Engineer, cut to fit the joint. In all cases, the bolts shall be drawing up evenly and in line.

    b. Termination of valves, or fittings such as tees, bonds, etc., made of other materials shall be by the flange assemblies specified hereinbefore. The pipe adjacent to these joints and to joints themselves must be rigidly supported for a distance of one pipe diameter or 1 foot, whichever is greater, beyond the flange assembly.

    c. Appurtenances must be placed on their own foundations, unsupported by the pipe.

    d. All bolts, nuts, and studs for mechanical joint restraint devices shall be coated with FluoroKote#1 or be 300 Series stainless steel.

D. **Ductile Iron Pipe (at Mag Meter Vault and ARV Manhole/Vault Only)**

1. Unless otherwise approved by the **Town**, ductile iron pipe for forcemains shall only be installed at the mag meter vault at the lift station and ARV vaults for forcemains per **Town Standard Details**.

2. Ductile iron pipe shall conform to the current requirements of AWWA C151, Pressure Class 350, with push-on joints unless otherwise noted on drawings.

3. The interior of the pipe shall be double cement-mortar lined with bituminous seal coat in accordance with the current requirements of AWWA C104. Thickness of the lining shall be set forth in the aforementioned specification unless otherwise directed by the Town.

4. The exterior of all pipes, unless otherwise specified, shall receive either coal tar or asphalt base coating a minimum of 1 mil thick.

5. Each piece of pipe shall bear the manufacturer's name or trademark, the year in which it was

produced and the letters "DI" or the word "DUCTILE".

6. Pipe manufacturer shall furnish notarized certificate of compliance to the above AWWA or ANSI specifications.

7. DI Fittings shall be as noted herein for PVC Pipe.

8. Provide AWWA C110 mechanical joint plugs and locked or restrained pipe joints per Town Standards.

9. Mechanical joints shall be bolted and of the stuffing box type and shall consist of a bell, with exterior flange and interior recess for the sealing gasket, a pipe or fitting plain end, a sealing gasket, a follower gland, tee-head bolts and hexagon nuts. All bolts, nuts, and studs for mechanical joint restraint devices shall be coated with FluoroKote#1 or be 300 Series stainless steel.

10. All underground ductile iron pipes shall be encased with polyethylene film in tube form conforming to AWWA C105 (latest edition).

    a. Polyethylene encasement for use with ductile iron pipe systems shall consist of three layers of co-extruded linear low density polyethylene (LLDPE), fused into a single thickness of not less than eight (8) mils.
    b. The inside surface of the polyethylene wrap to be in contact with the pipe exterior shall be infused with a blend of antimicrobial compound to mitigate antibiological influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion.
    c. The polyethylene film shall have the following characteristics:

        i. Impact Resistance: 600 grams per ASTM D1709 Method B
        ii. Propagation Tear Resistance: 2,550 grams force per ASTM D1922
        iii. Thickness: 0.008 inches minimum (8 mil)

    d. Polyethylene encasement shall be installed per ANSI/AWWA C105 Modified Method A.
    e. Polyethylene encasement shall be V-Bio as manufactured by DIPRA.

11. Storage and installation of polyethylene shall be in accordance with the manufacturer's recommendation and shall prevent contact between the pipe and the surrounding backfill and bedding material; but is not intended to be airtight or watertight.

12. The cleaning and assembly of pipe and fitting joints shall be in accordance with the manufacturer's recommendations.

E. **Identification Tape**

1. Identification Tape shall be constructed of an aluminum foil core with an acid and alkali resistant polyethylene film. The tape shall be imprinted with a warning legend that is completely incased to prevent ink rub-off. The tape shall be a minimum of 5 mils thickness.

The tape shall be “green” in color to meet APWA color standards.

F. **Tracer Wire**

1. Open Cut Excavation tracer wire shall be 10 gauge copper wire with 30-mil polyethylene jacket. Tracer wire shall be installed with all buried sanitary and water piping, “duct” taped to top of pipe.

2. Horizontal Direction Drilling tracer wire shall be 10 gauge copper wire with 45-mil polyethylene jacket. Tracer wire shall be installed with all buried sanitary and water piping, “duct” taped to top of pipe. Three tracer wires shall be installed for directional drilling and jack-and-bore operations.

3. Tracer wire shall be “green” in color to APWA standards.

2. Dryconn Direct Bury Lug Aqua water proof connectors are required when connecting two (2) pieces of tracer wire. Wire and connector shall be wrapped with electrical tape

3. Tracer wire shall be brought up into locator boxes with grounding devices. Locator boxes shall be valve boxes with a polystyrene donut that fits around the box to serve as a termination point for tracer wire. Locator boxes shall be installed at a maximum of 500 linear feet apart or where shown on the Drawings.

G. **Couplings and Adapters**

1. Couplings and Adaptors:

   a. Couplings shall be of the sleeve type with a middle ring, two wedge shaped resilient gaskets at each end, two follower rings, and a set of steel track head bolts. The middle ring shall be flared at each end to receive the wedge portion of the gaskets. The follower rings shall confine the outer ends of the gaskets, and tightening of the bolts shall cause the follower rings to compress the gaskets against the pipe surface, forming a leak-proof seal.
   b. Flexible couplings shall be steel with minimum wall thickness of the middle ring or sleeve installed on pipe being 5/16-inch for pipe smaller than 10 inches, 3/8-inch for pipe 10 inches or larger. The minimum length of the middle ring shall be 5-inches for pipe sizes up to 10 inches and 7 inches for pipe 10 inches to 30 inches. The pipe stop shall be removed.
   c. Gaskets shall be suitable for 250 psi pressure rating or at rated working pressure of the connecting pipe. Couplings shall be harnessed and be designed for 250 psi.
   d. Flanged adapters shall have one end suitable for bolting to a pipe flange and the other end of flexible coupling similar to that described hereinbefore. All pressure piping with couplings or adapters shall be harnessed with full threaded rods spanning across the couplings or adapters. The adapters shall be furnished with bolts of an approved corrosion resistant steel alloy, extending to the adjacent pipe flanges. Flanges on flanged adapter (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.

e. Flexible couplings and flanged adapters shall be as manufactured by Dresser, per the following, unless otherwise specified and/or noted on the Drawings:

i. Steel couplings for joining same size, plain-end, steel, cast iron, and PVC plastic pipe:
- Style 138 by Dresser

ii. Transition couplings for joining pipe of different outside diameters:
- Style 162 by Dresser (4"-12")
- Style 62 by Dresser (2"-24")

iii. Flanged adapters for joining plain-end pipe to flanged pipe, fittings, valves and equipment:
- Style 127 by Dresser cast (3"-12")
- Style 128 by Dresser steel (3"-48" C.I. Pipe)
- Style 128 by Dresser steel (2"-96" steel pipe)

2.04 Sanitary Sewer Manhole Materials

A. General

1. Sanitary sewer manholes shall be installed at the end of each line segment; at all changes in grade, size, materials, and/or alignment; at all intersections; and at distances not greater than 400 feet. Cleanouts shall not be substituted for manholes.

2. In unpaved/grassy areas manholes shall be designed and installed such that they extend a minimum of three (3) inches above finished grade to prevent water ponding. Positive drainage away from the manhole shall be provided. Manholes are not to be buried. All manholes are to be constructed a minimum of 2 feet above USGS 100 year flood plain.

B. Pre-cast Concrete Manhole

1. Manholes of the form and dimensions shown on the Drawings shall be constructed of ASTM C 478 precast reinforced concrete manhole sections erected on 4,000-psi concrete foundation. Precast concrete manhole bottom sections may be substituted for "cast-in-place" foundations subject to the **Town of Whitestown**'s review. The excavation shall be kept free of water while the manhole is being constructed and the manhole shall not be backfilled until inspected by the Engineer.

2. Standard manholes shall be 4' -0" inside diameter and greater than six (6) feet in depth, measured from the top of the cover frame to the invert of the outlet and shall be of eccentric cone top construction as shown on the Drawings. Shallow manholes of five (5) feet or less in depth, measured from the top of the cover frame to the invert of the outlet and shall be of flat top construction.

3. Concrete Manhole Sections: Precast concrete manhole sections (risers and grade rings) shall conform to ASTM C478.

4. Precast Concrete Eccentric Cones: Precast concrete eccentric cones shall be of the size and shape shown on the Drawings and shall conform to ASTM C478.

5. Precast Manhole Section Joints: Precast manhole section joints shall be jointed with an ASTM C 443 rubber gasket plus one of the following products and wrapped with Conseal CS-212 or approved equal:

    a. AASHTO M-198-75 preformed flexible butyl type joint sealant Hamilton-Kent "Kent-Seal No. 2"
    b. K.T. Snyder Co. "Rub'r-Nek" Press
    c. Seal Gasket "E-Z stik" Concrete
    d. Sealants, Inc. "Conseal"
    e. or equal, or joined with bituminous mastic joint sealing compound.

6. When making joints with mastic compound prime and seal all joints with primer supplied with the joint compound. Manhole section joints shall be watertight. These requirements apply to all joints, including manhole risers, cones, and grade rings.

7. Exterior Coating: All barrel and cone sections of the manhole shall be coated with No. 90 Dampproofing as manufactured by Value Waterproofing or approved equal.

8. Manhole Inverts: Manhole inverts shall be formed with 3,000 psi concrete. Inverts shall be constructed as shown on the details and shall form a smooth finish. The inverts shall be constructed on site after both inlet and outlet pipes are installed. With review and approval by the Owner, the table and trough may be cast as part of the base unit. The crown of the pipe shall be removed through the entire manhole when constructing doghouse manholes. Invert channel shall be smooth with a semi- circular bottom and vertical sides extending up to the height of the pipe crown. Changes of flow direction within manholes shall be made by a smooth curve having as large a radius as possible. The manhole table shall be smooth and slope towards the channel not less than one inch per foot. Trough shall extend to crown of pipe.

9. Manhole Steps: Steps shall be included in the structures.

10. Manhole Frame and Cover: Manhole castings shall consist of cast iron frames with a minimum clear opening of twenty-four (24) inches. Casting shall have a minimum of four (4) bolt holes for the purpose of anchoring the casting to the manhole cone or grade ring.

11. Manhole covers must set neatly in the rings, with contact edges machined for even bearing and tops flush with ring edge. They shall have sufficient corrugations to prevent slipperiness and be marked in large letters, "SANITARY SEWER". The covers shall have two concealed, non-penetrating, pick holes. Covers on sanitary sewer manholes shall not be perforated.

12. Acceptable manhole covers are Model 1045 as manufactured by EJ, Inc. (formerly East Jordan Iron Works, Inc.), East Jordan, MI, or Model R-1642 as manufactured by Neenah Foundry Company, Neenah, WI, or equal.

13. Where indicated on the Drawings or in the Specifications, Traffic Weight Manhole frames and covers shall be provided. These shall weigh a minimum of 325 pounds.

14. Non-Traffic Weight: Manhole frame and cover weight to be minimum of 250 pounds.

15. Watertight Manhole Covers: Watertight manhole covers shall consist of cast iron frames with machined bearing surfaces, continuous gasket seal preinstalled into slots with dovetail design and shall be of the self-sealing type as manufactured by Neenah Foundry Company, East Jordan Iron Works, Inc., or equal. Watertight manhole covers shall have sufficient corrugations to prevent slipperiness and be marked in large letters "SANITARY SEWER".

16. Pipe Connections into Manholes: To connect a sanitary sewer to a manhole, either a flexible boot KOR-N-SEAL 1 or 2 flexible connector, cast-in-place Dura-Seal gasket, "A"-Lock gaskets or approved equal shall be used. Connections to an existing manhole shall be flexible boot KOR-N-Seal or approved equal.

17. All flexible connectors shall conform to ASTM C-923, and shall be resistant to ozone, weather elements, chemicals including acids and alkalis, animal and vegetable fats, oils and petroleum products.

18. The stainless steel elements of the connector shall be totally non-magnetic Series 305 stainless steel. The stainless steel clamp shall be capable of sustaining applied torque in excess of eighty (80) inch-pounds.

19. Forcemain Discharge Manholes: The forcemain discharge manhole, as well as the three manholes downstream of the discharge manhole, shall be coated with a composite liner system. The liner system shall be Mainstay Composite by Madewell Products Corp, or Town approved equal.

20. Forcemain shall not discharge directly into lift stations unless otherwise approved by Town.

21. Precast Concrete Manhole Base Sections: Base sections shall follow INDOT requirements.

22. Drop Connections into Manholes: Where indicated on the Drawings, drop connections into manholes shall be installed. Drop connections shall be cast-in-place or precast, and shall conform to the requirements shown on the Details.

C. Compression Couplings

1. When joining different types of pipe together or new pipe to existing pipe, the Contractor shall install a connector with metal shear guard. Connector shall be "Indiana Seal Shear Guard" by GPK Products, Inc., Fernco, or approved equal. Each coupling shall bear the manufacturer's

name and an indication of its size.

2.05 Sanitary Sewer Valves

A. Plug Valves (Forcemains Only)

1. All plug valves shall be eccentric plug valves unless otherwise specified.

2. Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with end connections as shown on the plans. Flanged valves shall be faced and drilled to the ANSI 125/150 lb. standard. Mechanical joint ends shall be to the AWWA Standard C111-64, grooved ends per AWWA C606-87. Screwed ends shall be to the NPT standard.

3. Valve bodies shall be flushing body type and made of ASTM A126 Class B cast iron. Valves shall be furnished with a 1/8" welded overlay seat of not less than 95% pure nickel. Seat area shall be raised, with raised surface completely covered with weld to insure that the plug face contacts only nickel. Screwed-in seats shall not be acceptable.

4. Plugs shall be made of ductile iron. The plug shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft. The interference between the plug face and body seat, with the plug in the closed position, shall be externally adjustable in the field with the valve in the line under pressure. Plug shall be resilient faced with neoprene or hycar, suitable for use with sewage.

5. Valves shall have replaceable sleeve type bearings and grit seals at the upper and lower journals.

6. Valve shaft seals shall be of the multiple V-ring type and shall be externally adjustable and repackable without removing the bonnet or actuator from the valve under pressure. Valves utilizing O-ring seals or non-adjustable packing shall not be acceptable.

7. Valve pressure ratings shall be 175 psi through 12" and 150 psi for 14" through 72". Each valve shall be given a hydrostatic and seat test with test results being certified when required by the specifications.

8. Buried valves shall be manually operated with 2-inch square operating nuts in vertical position for use in a valve box unless otherwise indicated on the plans. Buried valves shall have extension stems that bring the 2-inch square operating nut to within 2 feet of finished grade. Each buried valve shall be supplied with a tee wrench that allows the valve to be operated with the tee handle at waist height. All valves 6- inch and larger shall be equipped with gear actuators. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. The actuator shaft shall be stainless steel and the quadrant shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque and to provide seat adjustment to compensate for change in pressure differential or flow direction change. All exposed nuts, bolts, washers and appurtenances shall be stainless steel.

9. Valves and gear actuators for buried or submerged service shall have seals for all shafts and gaskets on the valve and actuator covers to prevent the entry of water. Actuator mounting

brackets for buried or submerged service shall be totally enclosed and shall have gasket seals. All exposed nuts, bolts, springs, washers and appurtenances shall be stainless steel.

10. Cylinder actuators shall be equipped with a 2-inch operating nut to allow manual valve operation in case of supply failure.

11. Valves shall provide drip tight shutoff up to the full pressure rating. Valves shall be provided with adjustable limit stops and rotate 90 degrees from fully opened to fully closed.

12. Valves shall have rectangular port openings for throttling service, and shall open to 100% of the corresponding pipe diameter.

13. All buried service plug valves shall have mechanical joint ends and have all exterior surfaces shop painted with two coats of Fed. Spec. TT-C-494A Asphalt Varnish.

14. All valves and actuators shall be as manufactured by DEZURIK or approved equal.

B. Plug Valves (Submerged Forcemains Only)

1. Submerged plug valves shall comply with Specifications of Chapter 1, Section 1.07, Paragraph A, except plug valves shall be suited for submerged service in sewage and shall have a bonnet with stainless steel extension stem, hardware and fasteners. Bonnet shall extend to extent indicated on the plans.

C. Check Valves

1. The valve is a counterweighted, rubber seated check valve with attached cushion chamber whose function is to permit flow in only one direction, close tightly when its discharge side pressure exceeds its inlet pressure, and to close without a slam or bang.

2. Valve shall meet or exceed the latest revision of AWWA standard C508.

3. The swing check valve shall be constructed ASTM A536 ductile iron. End connections shall be flat faced, flanged per ASME/ANSI 125/150 lb. standard, with a 316 stainless steel per ASTM A743, Grade CF-8M seat ring, a non-corrosive shaft for attachment of ductile iron A536 grade 65-45-12 weight and lever, and complete non-corrosive shockless chamber.

4. The valve shall be rated for 250 psi CWP.

5. It shall absolutely prevent the return of water, oil or gas back through the valve when the inlet pressure decreases below the delivery pressure. The valve must be tight seating, and must be shockless in operation. The seat ring must be renewable.

6. The cushion chamber shall be attached to the side of the valve body externally and so constructed with a piston operating in a chamber that will effectively permit the valve to be operated without any hammering action. The shock absorption shall be by air, and the cushion chamber shall be so arranged that the closing speed will be adjustable to meet the service requirements.

7. The valve disc shall be of ASTM A536 ductile iron and shall be suspended from a 303 stainless steel per ASTM A582 shaft which will pass through a stuffing box and be connected to the cushion chamber on the outside of the valve.

8. All material and workmanship shall be first class throughout and the purchaser reserves the right to inspect this valve before shipment.

9. Check valves shall be DeZurik/APCO Series CVS-250/250A, or approved equal.

D. **Sewage Combination Air/Vacuum Release Valves Manholes**

1. Sewage Combination Air Valves and Boxes shall be installed at the high points of the force main and at various locations as shown on the Contract Drawings. Sewage Combination Air Valve shall be installed as shown on Standard Detail Drawing in the Appendices.

2. Air valves shall be automatic float operated valves designed to exhaust air during the filling of a piping system and close upon liquid entry. The valve shall open during draining or if a negative pressure occurs. The valve shall also release accumulated air from a piping system while the system is in operation and under pressure.

3. The valve seat shall provide complete shut off to the full valve pressure rating.

4. Valves shall incorporate a full port orifice, a seal plug assembly, and an upper and lower float to provide a rolling resilient seal.

5. The seal shall be a one-piece design and include a large orifice and a small orifice and each shall open or close as needed to allow release or intake of air as the demand on the system regulates.

6. Valve shall be designed to intake or discharge a minimum of 100 SCFM of air with a 3.5-psi differential pressure.

7. Materials: Valve cover, lower float, stem, washer, spring, nuts and bolts: 316 Stainless Steel.

8. Upper float: Foamed polypropylene. O-rings: Buna-N.

9. Seal plug assembly and base and body: 316 Stainless Steel.

10. All Sewage Combination Air Valves on the force main shall be ARI model no. D-025 as manufactured by A.R.I. Flow Control Accessories, Kfar Charuv, Israel, or equal.

11. Sizes shall be based on the pipeline diameter as noted herein:

Pipe Diameter	3" – 8"	10" – 16"	18" – 20"	24" – 48"
Air Valve Size	2"	3"	4"	6"

12. The Sewage Combination Air Valve Access Manhole shall be a 4-foot diameter precast manhole barrel section and shall be set on a concrete footer supported with crushed stone. The cover and frame shall be cast iron, with a 24 inch clear opening as indicated for Sanitary Manhole hereinbefore. Care shall be taken to ensure that manhole barrel does not rest on top of pipe.

13. Contractor to install pipe at sufficient depth to accommodate Valve height so that top of Valve Box is at existing ground level.

14. Spare Parts:

    a. Contractor is required to supply the following spare parts:

        i. One (1) Air Release Valve per project.

E. **Valve Boxes – Buried Valves (Except Sewage Combination Air/Vacuum Release Valves)**

1. A solid ribbed 8" diameter PVC riser shall be required and shall be centered over the valve. If the valve is 6 feet deep or greater, a valve nut extension shall be installed to bring the nut to a depth 4 feet below finished grade.

2. Valve boxes shall be accurately centered over valve operating nut, and backfill thoroughly tamped about them. Valve boxes shall not rest on the valves but shall be supported on crushed stone fill. They shall be set vertically and properly cut and/or adjusted so that the tops of boxes will be at grade in any paving, walk or road surface, and in grass plots, fields, woods or other open terrain.

3. Valve boxes and covers shall be marked "SEWER" and shall be as manufactured by Tyler Corporation, Opelika Foundry, Bingham & Taylor, or equal.

4. Contractor shall furnish one (1) 6-foot T-handle operating wrenches for underground valves. Nut operator extensions for all valves buried deeper than 3 feet shall be provided with stem extensions sufficient to raise operator nut to within 3 feet of finished grade.

F. **Elastomeric ("Duckbill") Check Valve (Wetwell Only – Valve Vault Drain Line)**

1. Elastomeric "Duckbill" check valves shall be all rubber of the flow-operated type, with slip-on end and stainless steel backup ring connection.

2. The port area shall contour down to a duckbill, allowing passage of flow in one direction while preventing reverse flow. The valve shall be one-piece rubber construction with nylon reinforcement of material suitable for the intended service.

3. When line pressure inside valve exceeds the backpressure outside the valve by a certain amount, the line pressure forces the bills of the valve open, allowing flow to pass. When backpressure exceeds the line pressure by the same amount, the bill of the valve is forced closed. Upon request by the Engineer, flow test data shall be made available for review from an accredited hydraulics laboratory to confirm pressure drop data.

4. The valve shall open on ½" level of flow and shall be able to withstand 10' of submergence without damage.

5. Elastomeric check valves shall be Series TF-2 as manufactured by the Red Valve Co., Inc.; Cla-Val Series DBO; or equal.

G. **Stainless Steel Slide Gate (Wetwell Only)**

1. Gates and operators shall be supplied with all the necessary parts and accessories indicated on the Drawings, specified or otherwise required for a complete, properly operating installation, and shall be the latest standard product of a manufacturer regularly engaged in the production of fabricated gates. Except as modified or supplemented herein, all gates and operators shall

conform to the applicable requirements of AWWA C561, latest edition.

2. Sluice gates shall be ASTM A240 Type 304L stainless steel, non self-contained of the rising stem configuration, wall thimble mounted. All gate components shall be designed to safely withstand the maximum seating and unseating heads based on the Drawings. Sluice gates shall be substantially watertight under design head conditions. Leakage shall not exceed 0.05 gpm per foot of seating perimeter. Under the unseating head, the leakage for heads of 20 feet or less shall not exceed 0.1 gpm per foot. For unseating heads greater than 20 feet, the allowable leakage shall not exceed the rate per foot of perimeter specified by the following equation:

    a. Maximum allowable leakage: Gallons per minute per foot of perimeter = 0.10 + [0.0025 x (unseating head in feet – 20)]
    b. The gate's sealing system shall have been tested through a cycle test in an abrasive environment and should show that the leakage requirements are still obtained after 25,000 cycles with a minimum deterioration. Certification of this testing shall be provided to **the Town** upon request.

3. Frames shall be ASTM A-240 Type 304L stainless steel, constructed of structural members or formed plate welded to a rigid one piece frame with mounting flange and rectangular opening as indicated on the Drawings. The guide slot shall be made of UHMWPE (ultra-high molecular weight polyethylene).

4. The slide shall be ASTM A-240 Type 304L stainless steel, constructed of flat plate reinforced with formed plates or structural members to limit its deflection to 1/720 of the gate's span under the design head.

5. Guides shall be made of UHMWPE per ASTM D-4020 and shall be of such length as to retain and support at least two-thirds (2/3) of the vertical height of the slide in the fully open position. Side and top seals shall be made of UHMWPE of the self-adjusting type. A continuous compression cord or J-bulb type of Nitrile ASTM D-2000 or EPDM shall ensure contact between the UHMWPE guide and the gate in all positions. The sealing system shall maintain efficient sealing in any position of the slide and allow the water to flow only in the opened part of the gate. The bottom seal shall be made of resilient neoprene ASTM D-2000, set into the bottom member of the frame and shall form a flush-bottom.

6. The operating stem shall be ASTM A-276 Type 316 stainless steel designed to transmit in compression at least two (2) times the rated output of the operating manual mechanism with a 40 lbs. effort on the crank. The stem shall have a slenderness ratio (L/r) less than 200. The threaded portion of the stem shall have machined cut or rolled threads of the Acme type. For stems in more than one piece and with a diameter of 1¾ inches and larger, the different sections shall be joined together by solid bronze couplings. Stems with a diameter smaller than 1¾ inches shall be pinned to an extension tube. The couplings shall be grooved and keyed and shall be of greater strength than the stem.

7. Stem guides shall be fabricated from ASTM A-240 Type 304L stainless steel. The guide shall be equipped with an UHMWPE bushing. Guides shall be adjustable and spaced in accordance with the manufacturer's recommendation. The L/r ratio shall not be greater than 200. Rising stem gates shall be provided with a clear polycarbonate stem cover. The stem cover shall have a cap and condensation vents and a clear mylar position indicating tape. The tape shall be field applied to the stem cover after the gate has been installed and positioned.

8. For new and existing concrete structures, sluice gates shall be mounted directly on the concrete vertical surface in front of a flush pipe of size and type as shown on the Drawings. Wall thimbles are not necessary for new concrete structures provided the sluice gate concrete mounting surface is square and plumb within sluice gate manufacturer's minimum tolerances. A permanent EPDM gasket of uniform thickness shall be provided between the sluice gate frame and concrete surface.

9. Fasteners: All anchor bolts for guides and gates and all bolts and studs for connecting gates to adjacent flanges or thimbles shall be Type 304 stainless steel and shall be furnished by the gate manufacturer.

10. Operators:

    i. Manual operation shall be by crank-operated floorstand of the type specified herein and shown on the Drawings and provided by the gate manufacturer. All bearings and gears shall be totally enclosed in a weather-tight housing. The pinion shaft of crank-operated mechanisms shall be constructed of stainless steel and supported by roller or needle bearings. Each manual operator shall be designed to operate the gate under the maximum specified seating and unseating heads by using a maximum effort of 40 lbs. on the crank, and shall be able to withstand, without damage, an effort of 80 lbs. The crank shall be removable and fitted with a corrosion-resistant rotating handle. The maximum crank radius shall be 15 inches.

    ii. Floorstand pedestals shall be ASTM A-126 cast iron Class B designed to position the input shaft approximately 36" above the operating floor. An arrow with the word "Open" shall be permanently attached or cast on the floorstand, indicating the direction of rotation to open the gate. Finish painting of cast iron components shall be in accordance with Chapter 9.

11. Stainless steel sluice gates shall be Series 20 as manufactured by Rodney Hunt-Fontaine; or approved equal.

3.01 Introduction

The following Chapter provides a description of materials acceptable for the construction of water distribution piping and their appurtenances within the **Town of Whitestown**. Use of other materials not specified herein will be allowed only with the written approval and authorization of the Utilities Manager of the **Town of Whitestown**.

3.02 Water Distribution Piping Materials

A. General

1. The **Town of Whitestown** allows the use of the following pipe materials meeting or exceeding the minimum requirements set forth herein, for the construction of water force mains.

    a. Polyvinyl Chloride Pipe (PVC)
    b. Ductile Iron Pipe (DI)
    c. High Density Polyethylene Pipe (HDPE) (**with Town Approval Only**)

2. Standard pipe sizes are 4", 6", 8", 12", 16", 20", and 24" diameter. The pipe sizes to be used throughout the proposed development shall be established by the Utility as determined by hydraulic analysis and comparison to the **Town's Master Plan**.

B. Ductile Iron Pipe and Fittings (4-inch Diameter and Larger)

1. Pipe: Restrained joint ductile iron pipe shall conform to ANSI/AWWA C151/A21.51, latest revision, Pressure Class 350, with push-on joints unless otherwise approved by the **Town**. To ensure uniformity of installation and appearance, all system ductile iron piping shall be the products of one manufacturer.

2. The interior of the pipe shall be cement-mortar lined with bituminous seal coat in accordance with ANSI/AWWA C104/A21.4, latest revision. Thickness of the lining shall be set forth in the aforementioned specification unless otherwise directed by the Engineer. The exterior of all pipe, unless otherwise specified, shall receive either coal tar or asphalt base coating a minimum of 1 mil thick.

3. Each piece of pipe shall bear the manufacturer's name or trademark, the year in which it was produced and the letters "DI" or the word "DUCTILE". Pipe manufacturer shall furnish notarized certificate of compliance to the above AWWA or ANSI specifications.

4. Fittings: Fittings shall be Pressure Class 350 ductile iron in accordance with ANSI/AWWA C110/A21.10, latest revision with the exception of the manufacturer's proprietary design dimensions. Fittings shall have interior cement-mortar lining as specified hereinbefore for the pipe. Fittings shall be restrained as specified herein. To ensure uniformity of installation and appearance, all system ductile iron fittings shall be the products of one manufacturer.

5. Restrained Joints: Restrained joints for pipe, fittings, and valves shall be required where shown on the Drawings, and applies to restrained joints at ductile iron fittings, across the joints of bell and spigot pipe joint, and where the spigot end of pipe connect with valves or other items that have mechanical joint ends. Mechanically restrained joints for sanitary forcemains shall be as follows:

    a. Ductile Iron Pipe: Pipe restraint shall be accomplished by Restraint devices for nominal pipe sizes 3 inch through 54 inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10. Restraining devices shall be Mega-Lug Series 1100, 1100SD, 1100HD, and 1700 (as applicable) as manufactured by EBAA Iron Sales, Inc., Eastland, Texas; or approved equal.

        i. Alternatively, in lieu of mechanical joint retainer glands, restrained push-on ductile iron pipe may be used including FLEX-RING Restrained Joint by American Ductile Iron Pipe; TR FLEX Restrained Joint by U.S. Pipe; or equal.

    b. Restrained joints shall have a minimum working pressure equal to that of the pipe, with a minimum 2:1 safety factor.

    c. All bolts, nuts, and studs for mechanical joint restraint devices shall be coated with FluoroKote#1 or be 300 Series stainless steel.

    d. To ensure uniformity of installation and appearance, all restraint devices shall be the products of one manufacturer.

    e. The use of restrained joints utilizing a friction type gasket connection shall not be accepted.

6. All pipe in the vicinity of fittings shall be restrained in accordance with the **Town's Standard Details**. Pipe at ends left for future connections shall also be restrained as a dead end in accordance with the **Town's Standard Details**.

7. Restrained push-on joint pipe and fittings shall be capable of being deflected after assembly.

8. All underground ductile iron pipe and fittings shall be encased with polyethylene film in tube form conforming to AWWA C105 (latest edition).

    a. Polyethylene encasement for use with ductile iron pipe systems shall consist of three layers of co-extruded linear low density polyethylene (LLDPE), fused into a single thickness of not less than eight (8) mils.
    b. The inside surface of the polyethylene wrap to be in contact with the pipe exterior shall be infused with a blend of antimicrobial compound to mitigate antibiological influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion.
    c. The polyethylene film shall have the following characteristics:

        i. Impact Resistance: 600 grams per ASTM D1709 Method B

ii. Propagation Tear Resistance: 2,550 grams force per ASTM D1922
iii. Thickness: 0.008 inches minimum (8 mil)

d. Polyethylene encasement shall be installed per ANSI/AWWA C105 Modified Method A.
e. Polyethylene encasement shall be V-Bio as manufactured by DIPRA.

C. **Polyvinyl Chloride (PVC) Pipe**

1. Pipe: AWWA C-900 (Outside Diameter compatible with Cast Iron O.D.)

2. Pipe: 4-inch through 30-inch - PVC plastic pipe shall conform to ANSI/AWWA C-900, Class 235 (DR 18). PVC pipe shall have a maximum laying length of 20 feet, with bell end and elastomeric gasket, and with plain end for cast-iron or ductile-iron fittings. Elastomeric gasket shall conform with the requirements of ASTM F-477. The seal of the National Sanitation Foundation Testing Laboratory must appear on each pipe. Joints shall be push-on joints conforming to ASTM D-3139.

3. Pipe shall be "Blue" in Color.

4. Each length of pipe shall be marked, at no more than 10 foot intervals, with the following information:

   a. Nominal Pipe Size
   b. Type Plastic Material – AWWA C900
   c. Manufacturer's Name, Trademark and Code
   d. and the National Sanitation Foundation NSF 14 Seal of Approval for drinking water.

5. Joints:

   a. Joints for PVC mains shall be integral bell and spigot type joints with rubber- o-ring gasket. The cleaning and assembling of the pipe joints shall be in accordance with manufacturer's recommendations. Joints shall conform to ASTM D3139.
   b. Joints shall be restrained as required in the Restrained Joint Tables for PVC pipe included in the Standard Details.

6. Fittings, adaptors or specials shall be furnished, as required, to connect the plastic pipe to the cast or ductile iron mechanical joint valves, fittings, and pipe.

7. The basis of acceptance of PVC plastic water main pipe will be a written, notarized certification, accompanied by a copy of test results, that the pipe and pipe material has been sampled, tested and inspected in accordance with the designated standard specifications. These certifications shall be obtained from the manufacturer and delivered to **the Town's** representative on the project site. A sufficient number of tests and certifications shall be made so as to be representative of the complete project. Copies of the test results shall be kept on file by the manufacturer and shall be available for review by **the Town** upon request.

8. Pipe shall be visually inspected on the project site for proper markings which shall include manufacturer's name or trademark, nominal pipe size, pressure rating for water at 73.4 degrees F., plastic pipe material designation code (e.g. PVC 1120), dimension ratio, AWWA or ASTM designation and pressure class with which the pipe complies, and the National Sanitation Foundation NSF 14 Seal of Approval for drinking water.

9. Fittings: Fittings shall be pressure class 350 ductile iron and have mechanical-joints or push-on joints in accordance with ANSI/AWWA C110/A21.10, latest revision, and shall conform to the details and dimensions shown therein. Fittings shall have interior cement-mortar lining as specified hereinbefore for the pipe. Compact ductile iron fittings meeting the requirements of ANSI/AWWA C153/A21.53, latest revision, will also be acceptable.

10. Restrained Joints: Restrained joints for pipe, fittings, and valves shall be required where shown on the Drawings, and applies to restrained joints at ductile iron fittings, across the joints of bell and spigot pipe joint, and where the spigot end of pipe connect with valves or other items that have mechanical joint ends. Mechanically restrained joints for sanitary forcemains shall be as follows:

    a. PVC Pipe: Pipe restraint shall be accomplished by Restraint devices for nominal pipe sizes 4 inch through 54 inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10. Restraining devices shall be Mega-Lug Series 2000PV, 2200, 1900, 1600, 2800, and 1100HV (as applicable) as manufactured by EBAA Iron Sales, Inc., Eastland, Texas; or approved equal.
    b. Restrained joints shall have a minimum working pressure equal to that of the pipe, with a minimum 2:1 safety factor.
    c. All bolts, nuts, and studs for mechanical joint restraint devices shall be coated with FluoroKote#1 or be 300 Series stainless steel.
    d. To ensure uniformity of installation and appearance, all restraint devices shall be the products of one manufacturer.
    e. The use of restrained joints utilizing a friction type gasket connection shall not be accepted.

11. All pipe in the vicinity of fittings shall be restrained in accordance with the **Town's Standard Details**. Pipe at ends left for future connections shall also be restrained as a dead end in accordance with the **Town's Standard Details**.

12. All underground fittings for PVC Pipe shall be encased with polyethylene film in tube form conforming to AWWA C105 (latest edition).

    a. Polyethylene encasement for use with ductile iron pipe systems shall consist of three layers of co-extruded linear low density polyethylene (LLDPE), fused into a single thickness of not less than eight (8) mils.
    b. The inside surface of the polyethylene wrap to be in contact with the pipe exterior shall be infused with a blend of antimicrobial compound to mitigate antibiological influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion.
    c. The polyethylene film shall have the following characteristics:

i.	Impact Resistance:	600 grams per ASTM D1709 Method B
ii.	Propagation Tear Resistance:	2,550 grams force per ASTM D1922
iii.	Thickness:	0.008 inches minimum (8 mil)

    d. Polyethylene encasement shall be installed per ANSI/AWWA C105 Modified Method A.
    e. Polyethylene encasement shall be V-Bio as manufactured by DIPRA.

D. **High Density Polyethylene (HDPE) Pipe and Fittings (with Town Approval Only)**

1. Except around cul-de-sac, HDPE for water main shall only be used if approved by the Town.

2. High density polyethylene pipe shall be manufactured by the following:
   a. "Driscopipe" as manufactured by Phillips Product Company, Inc.,
   b. "PLEXCO" as manufactured by Chevron,
   c. POLYPIPE,
   d. or Approved equal.

3. Pipe shall have "Blue" stripe.

4. Dimension Ratio (DR) for Pipe:

   a. All HDPE pipe for water main applications shall be DIPS DR 11 (200 psi WPR), unless otherwise directed by the **Town**.

5. Materials for Polyethylene Pipe:

   a. Pipe shall be manufactured from a PE 4710 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material shall meet the requirements of ASTM D3350 with a minimum cell classification of PE 445574C. Pipes having an outside diameter of 4" and larger shall have a manufacturing standard of ASTM F-714. Pipes smaller than 4" shall have a manufacturing standard of ASTM D 3035. All pipe diameter sizes shall be in ductile iron pipe sizes (DIPS) with DR (11) minimum wall thickness. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.
   b. Pipe made from these resins must have a long-term strength rating of 1600 psi or more.
   c. The polyethylene resin shall contain antioxidants and shall be stabilized with carbon black against ultra-violet degradation to provide protection during processing and subsequent weather exposure
   d. The polyethylene resin compound shall have a resistance to environmental stress cracking as determined by the procedure detailed in ASTM D 1693, Condition B with sample preparation by procedure C of not less than 200 hours

6. Polyethylene Pipe and Fittings:

   a. Butt fusion fittings shall be in accordance with ASTM D3261, Cell Classification of 445574C, and shall be manufactured by injection molding, a combination of extrusion and machining, or fabricated from HDPE pipe conforming to this specification. All fittings shall be pressure rated to provide a working pressure rating no less than that of the pipe. Fabricated fittings shall be manufactured using a McElroy Datalogger to record fusion pressure and temperature. A graphic representation of the temperature and pressure data for all fusion joints made producing fittings shall be maintained as part of the quality control. The fitting shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.
   b. Electrofusion Fittings shall be PE 4710 HDPE, Cell Classification of 445574C as determined by ASTM D3350 and be the same base resin as the pipe. Electrofusion Fittings shall have a manufacturing standard of ASTM F1055.
   c. Flanged and Mechanical Joint Adapters: Flanged and Mechanical Joint Adapters shall be PE 4710 HDPE, Cell Classification of 445574C as determined by ASTM D3350 and

be the same base resin as the pipe. Flanged and mechanical joint adapters shall have a manufacturing standard of ASTM D3216. All adapters shall be pressure rated to provide a working pressure rating no less than that of the pipe.

d. The pipe shall be designed for a normal internal working pressure and earth cover over top of the pipe to suit the conditions of proposed use.
e. Each length of pipe shall be marked, at no more than 10 foot intervals, with the following information:

    i. Nominal Pipe Size
    ii. Type Plastic Material – PE4710
    iii. Pipe Pressure Rating
    iv. Manufacturer's Name, Trademark and Code

7. All pipe shall be made from virgin material. No rework compound. Pipe shall be homogenous throughout, and be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.

8. Fittings for the polyethylene pipe line shall be molded or fabricated from the same material as specified hereinbefore for the high density polyethylene pipe.

9. Fittings for bends 22-1/2° or greater shall be provided as shown on the Drawings. For alignment changes of less than 20° deflection, the pipe may be laid in curves with a radius of 100 feet or greater.

10. All run-of-the-pipe fittings shall be fusion welded into the pipeline.

11. Tee branches shall be of the size shown on the Drawings and shall be furnished with flanged ends per ANSI B-16.1. All fittings shall be factory made.

12. Fittings shall be capable of withstanding the same pressure and loading conditions specified for the pipe.

13. Wye branches shall be true wyes.

14. HDPE Pipe Jointing:

15. Pipe to be joined by leak proof, thermal, butt fusion joints. All fusion must be done by personnel trained by the pipe supplier using tools approved by the pipe supplier.

16. The fusion machine shall have hydraulic pressure control for fusing two (2) pipe ends together; it shall include pressure fusion indicating gauges to correctly monitor fusion pressures. The machines correctly monitor fusion pressures. The machines shall be equipped with an electric or gasoline engine powered facing unit to trim irregularities from the pipe ends. The heating plate on the fusion machine shall be electrically heated and thermostatically controlled and shall contain a temperature gauge for monitoring temperature.

17. Joint strength must be equal to that of adjacent pipe as demonstrated by tensile test. In addition, results of tensile impact testing of joint should indicate a ductile rather than a brittle fracture. External appearance of fusion bead should be smooth without significant juncture groove.

18. Tools and Procedures:

a. Fusion jointing and other procedures necessary for correct assembly of the polyethylene pipe and fittings will be done only by personnel trained in those skills by the pipe supplier.
b. Only those tools designed for aforementioned procedures and approved by the pipe supplier shall be used for assembly of pipe and fittings to insure proper installation

20. Threaded or solvent cement joints and connections are not permitted

21. Joining, Terminating or Adapting by Mechanical Means:

a. The polyethylene pipe shall be connected to systems or fittings of other materials by means of an assembly consisting of a polyethylene flange adapter butt-fused to the pipe, a backup ring of either cast iron, steel, or high silica aluminum alloy made to ANSI B-16.1 dimensional standards (with modified pressure ratings), bolts of compatible material (insulated from the fittings where necessary) and a gasket of reinforced black rubber, or other material approved by the Engineer, cut to fit the joint. In all cases, the bolts shall be drawing up evenly and in line.
b. Termination of valves, or fittings such as tees, bonds, etc., made of other materials shall be by the flange assemblies specified hereinbefore. The pipe adjacent to these joints and to joints themselves must be rigidly supported for a distance of one pipe diameter or 1 foot, whichever is greater, beyond the flange assembly.
c. Appurtenances must be placed on their own foundations, unsupported by the pipe.
d. All bolts, nuts, and studs for mechanical joint restraint devices shall be coated with FluoroKote#1 or be 300 Series stainless steel.

E. **Couplings and Adapters**

1. Couplings and Adaptors:

a. Couplings shall be of the sleeve type with a middle ring, two wedge shaped resilient gaskets at each end, two follower rings, and a set of steel track head bolts. The middle ring shall be flared at each end to receive the wedge portion of the gaskets. The follower rings shall confine the outer ends of the gaskets, and tightening of the bolts shall cause the follower rings to compress the gaskets against the pipe surface, forming a leak-proof seal.
b. Flexible couplings shall be steel with minimum wall thickness of the middle ring or sleeve installed on pipe being 5/16-inch for pipe smaller than 10 inches, 3/8-inch for pipe 10 inches or larger. The minimum length of the middle ring shall be 5-inches for pipe sizes up to 10 inches and 7 inches for pipe 10 inches to 30 inches. The pipe stop shall be removed.
c. Gaskets shall be suitable for 250 psi pressure rating or at rated working pressure of the connecting pipe. Couplings shall be harnessed and be designed for 250 psi.
d. Flanged adapters shall have one end suitable for bolting to a pipe flange and the other end of flexible coupling similar to that described hereinbefore. All pressure piping with couplings or adapters shall be harnessed with full threaded rods spanning across the couplings or adapters. The adapters shall be furnished with bolts of an approved corrosion resistant steel alloy, extending to the adjacent pipe flanges. Flanges on flanged adapter (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.

e. Flexible couplings and flanged adapters shall be as manufactured by Dresser, per the following, unless otherwise specified and/or noted on the Drawings:

i. Steel couplings for joining same size, plain-end, steel, cast iron, and PVC plastic pipe:
- Style 138 by Dresser

ii. Transition couplings for joining pipe of different outside diameters:
- Style 162 by Dresser (4"-12")
- Style 62 by Dresser (2"-24")

iii. Flanged adapters for joining plain-end pipe to flanged pipe, fittings, valves and equipment:
- Style 127 by Dresser cast (3"-12")
- Style 128 by Dresser steel (3"-48" C.I. Pipe)
- Style 128 by Dresser steel (2"-96" steel pipe)

F. **Identification Tape**

1. Identification Tape shall be constructed of an aluminum foil core with an acid and alkali resistant polyethylene film. The tape shall be imprinted with a warning legend that is completely incased to prevent ink rub-off. The tape shall be a minimum of 5 mils thickness. The tape shall be "blue" in color to meet APWA color standards.

G. **Tracer Wire**

1. Open Cut Excavation tracer wire shall be 10 gauge copper wire with 30-mil polyethylene jacket. Tracer wire shall be installed with all buried sanitary and water piping, "duct" taped to top of pipe.

2. Horizontal Direction Drilling tracer wire shall be 10 gauge copper wire with 45-mil polyethylene jacket. Tracer wire shall be installed with all buried sanitary and water piping, "duct" taped to top of pipe. Three tracer wires shall be installed for directional drilling and jack-and-bore operations.

3. Tracer wire shall be "blue" in color to APWA standards.

4. Dryconn Direct Bury Lug Aqua water proof connectors are required when connecting two (2) pieces of tracer wire. Wire and connector shall be wrapped with electrical tape.

5. Tracer wire shall be brought up into locator boxes with grounding devices. Locator boxes shall be valve boxes with a polystyrene donut that fits around the box to serve as a termination point for tracer wire. Locator boxes shall be installed at a maximum of 500 linear feet apart, or where shown on the Drawings.

H. **Polyethylene Tubing – Service Lines**

1. Customer service tubing, sizes 3/4-inch and 1-inch, shall be Polyethylene (PE) SODR-9 (250 psi) and conform to AWWA C901, ASTM D3350 with a pipe designation of PE 4710 defined

per ASTM D 2737 for CTS sizes.

2. Tubing color shall be Blue (with clear core) EndoPure Poly as manufactured by ENDOT Industries, Inc.

I. Corporation Stops, Fittings, and Tapping Saddle for Water Service Lines

1. Corporation stops, of the size required, shall be tapped directly into the water main for Ductile Iron Pipe or by the use of a tapping saddle for PVC pipe.

2. Corporation stops shall have AWWA C800-66 C.S. threaded inlet. Outlets shall be suitable for the type of service piping furnished and laid, and the Contractor shall verify compatibility with "iron pipe size" or "copper tubing size" service piping as required before ordering stops.

3. Corporation stops shall be Mueller H-15005, H-15006, H-15008, H-15009 (as required); or equal.

4. Fittings shall be brass.

5. Tapping saddle for PVC pipe shall be epoxy coated ductile iron with double stainless steel bands shall be Model “317” as manufactured by Smith-Blair, or approved equal.

J. Meter Boxes

1. Meter boxes shall adhere to **Town Standard Details**.

2. No dual meter pits allowed.

3. 5/8”, 3/4”, and 1” Single Services:

    a. Lid shall be as manufactured by Mueller:

        i. 11” lid and diameter opening with one 2” touch read hole: Part No. 550525
        ii. 20” diameter frame: Part No. 063601-1.

    b. Meter box shall be as manufactured by TZ Products, Inc.:

        i. 5/8” Service: Model “T-Z-WH 5/8 x 3/4 SIN”
        ii. 3/4” Service: Model “T-Z-WH 3/4 x 3/4 SIN”
        iii. 1” Service: Model “T-Z-WH 1 x 1 SIN”

4. 1-1/2” and 2” Single Services:

    a. Lid shall be as manufactured by Vestal:

        i. 20” lid and diameter opening with two 2” touch read hole: #21 Extra Heavy Monitor Cover w/TR.
        ii. Expanda Ring: Model #ER-2036.

    b. Meter box shall be as manufactured by TZ Products, Inc.:

i. 1-1/2" Service: Model "T-Z WH 1-1/2" SINGLE".
ii. 2" Service: Model "T-Z WH 2" SINGLE".

5. All meter setters shall be set within 14" of the top of the meter pit lid.

6. All irrigation connections shall be after the meter and outside of the meter pit.

7. Service taps larger than 3-inches shall adhere to **Town Standard Details.**

K. **Cross Connection and Backflow Prevention**

1. Backflow preventers shall be installed on customer service lines to prevent cross connections per Indiana Law.

2. All backflow devices require regular annual testing by a certified backflow device technician to ensure their viability. Indiana requires **Town of Whitestown**, as a public conveyor of water, to maintain an inventory of all backflow devices connected to the system, as well as to ensure these devices are properly tested. All customers with backflow preventers shall provide 3rd party annual testing at customer's expense to the **Town of Whitestown.**

3.03 Water Valves

A. **General**

1. The **Town of Whitestown** currently allows the use of the following valves meeting or exceeding the minimum requirements/specifications set forth herein.

B. **Gate Valves**

1. All gate valves shall be furnished with mechanical joint end connections, unless otherwise shown on the Drawings or specified hereinafter. Plastic pipe "stub-joint" ends on valves for PVC water mains will not be accepted. All gate valves shall have the name or monogram of the manufacturer, the year the valve casting was made, the size of the valve, and the working pressure case on the body of the valve.

2. Gate valves shall be resilient seated manufactured to meet or exceed the requirements of AWWA C509 (4" to 12" size) or AWWA C515 (14" and larger). Valves shall have a clear, unobstructed water way when fully opened shall be at least as large as the pipe inside diameter for which it is intended.

3. All internal and external surfaces shall be coated with a fusion bonded epoxy to a minimum thickness of eight mils. Said coating shall be non-toxic, impart no taste to water and shall conform to AWWA C550 of latest revision. Said coating shall be applied to assembly such that all exposed areas, including end connection bolt holes, body-to-bonnet bolt holes, etc., shall be coated with epoxy. All nuts and bolts shall be stainless steel.

4. Valves shall be provided with two O-ring stem seals located above the thrust collar. The two rings shall be replaceable with the valve fully open and subject to full rated working pressure. The area between the 0-ring shall be filled with lubricant to provide lubrication to the thrust collar bearing surfaces each time the valve is operated. One anti-friction washer shall be located below and one anti-friction washer above the thrust collar.

5. The sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either seat direction, and shall consist of a cast iron gate with a resilient urethane rubber seat completely encapsulated to the gate.

6. Further, it shall be designed such that no sliding of rubber on the seating surfaces is required to compress the rubber. It shall also be designed such that compression-set of the rubber shall not affect the ability of the valve to seal when pressure is applied to either side of the gate.

7. All valves shall be seat tested at the rated working pressure of 250 psi and shall test at 500 psi in accordance with AWWA C509/C515. All valves shall be satisfactory for applications involving valve operation after long periods of inactivity.

8. Gate valves set with valve boxes shall be provided with two inch square operating nut and shall be opened by turning to the left (counterclockwise). Each gate valve shall be installed in a vertical position with a valve box. Contractor must use extension stems, if necessary, to raise operator nut within 3 ft. of final grade. A "Posi-Cap" high- strength plastic valve box aligner shall be installed within the valve box, centered about the extension stem and located under the operating nut. All gate valves shall be encased in polyethylene film.

9. Gate valves shall be Model Series 2360 resilient wedge gate valves as manufactured by Mueller Company; or approved equal.

C. **Tapping Sleeves and Valves**

1. Tapping Sleeves: Tapping sleeves for connections to existing water lines shall be of the stainless steel type with ANSI 125# stainless steel outlet flange, suitable for maximum working pressures of 250 psi (4"–12" sizes) and shall be Mueller No. H-304, or approved equal.

2. Tapping Valves: Tapping valves shall be resilient wedge gate valve conforming to AWWA C509 standard (4" to 12" size), with iron body, fully bronze mounted, non- rising stem and have a maximum working pressure of 250 psi and static test pressure of 500 psi. Tapping valves shall have one end flanged with alignment lip to attach to tapping sleeve and other end mechanical joint type complying with AWWA C111 standard.

3. Tapping valve shall be installed in a vertical position with a roadway type valve box and shall be provided with a 2-inch square operating nut and shall be opened by turning to the left (counterclockwise). Contractor shall use extension stems, if necessary, to raise operator nut within 3 feet of final grade.

4. Tapping valves for sizes 4" through 12" shall be Mueller A-2361, or approved equal.

5. All existing water mains to be tapped shall be exposed in order to verify line sizes prior to ordering tapping sleeves and valves.

6. All tapping valves must be sized to match the water main being extended. All tapping sleeves and valves shall be encased in polyethylene film.

D. **Insertion Valves**

1. General: The valve shall be ANSI/NSF 61 & 372 certified for drinking water components.

Insertion Valve shall be restrained as specified for Ductile Iron Fittings.

2. Valves shall have an AWWA working pressure rating 4"-12" 350PSIG (250PSIG for 4"-12" asbestos cement and 10"-12" cast iron class C,D). After manufacture, each gate valve shall be subjected to operation and hydrostatic tests at the manufacturer's facility. Each valve shall be operated through a complete cycle and production seat tested to 350PSIG (250PSIG for asbestos cement and 10"-12" cast iron class C,D) drip-tight from each direction, in addition to shell testing to 700PSIG (500PSIG for asbestos cement and 10"-12" cast iron class C,D).

3. Materials: The valve body, bonnet, stuffing box and operating nut shall be made of ASTM A536 ductile iron. The body and bonnet shall adhere to the minimum wall thickness as set forth in AWWA C515-15 Table 3, section 4.4.1.2. Wall thicknesses that do not meet AWWA minimums are not acceptable.

4. Flange: A special flange shall be used in the installation of equipment and insertion valve.

5. Body: The body shall be manufactured to precision tolerances to assure proper alignment, support, and sealing of the insertion valve. Valve type shall be NRS (Non-Rising Stem) with the MJ x MJ (Mechanical Joint) end connection. Bury depth (waterway centerline to top of the operating nut) of the insertion valve shall be same as NRS A-2300 series Mueller resilient wedge gate valve of an equivalent nominal valve size.

6. Disc and Lugs: The valve disc and guide lugs shall be composed of ASTM A536 ductile iron and fully encapsulated in EPDM ASTM D2000 rubber. Guide caps of an acetal bearing material shall be placed over solid guide lugs to prevent abrasion and to reduce the operating torque. Guide lugs placed over bare metal are not acceptable.

7. Bolts and Nuts: Valves shall have Type 316 stainless steel bolts and nuts for the stuffing box, bonnet, and body.

8. Gaskets: All gaskets shall be made of Styrene Butadiene Rubber (SBR) compounded for potable water service in accordance with ASTM D2000 3 BA715. The gaskets shall provide a positive 360° seal on the pipe and assure a tight, durable and resilient seal at the pipe sleeve – valve insert junction.

9. Coating: Valves shall have all internal and external ferrous surfaces coated with a fusion bonded thermosetting powder epoxy coating of 10 mils nominal thickness. The coating shall conform to AWWA C550.

10. Gate: Valve gate shall seat on the precision cast surface that is an integral part of the removable valve body (not on host pipe or sleeve assembly) that is clean and unobstructed of buildup/tuberculation to provide for reliable watertight shutoff. To assure for service with long-term capability of repeat watertight shutoff no recess/pocket is allowed in bottom of seat area to trap sediment or debris.

11. Valve Stem: The stem diameter and number of turns to open shall be as set forth in AWWA C515-15 Table 8, section 4.4.5.7. Valve stems shall be made of bronze ASTM B98 alloy C66100 H02 bar stock material. The bronze stem collar is to be hot forge upset; collars not integral with the stem are not acceptable. The stem material shall provide a minimum 70,000psi tensile strength, yield strength of 38,000psi and 20% minimum elongation. Optional bronze stems material may be ASTM B138 alloy C67600 H04. Optional stainless-steel stems

may be hot forge upset or machined from bar stock in the following grades: 304 or 316. Valve stems shall have "anti-friction" thrust washers, one above and one below the stem thrust collar to reduce operating torque. Valve stem design shall be such that if excessive input torque is applied, stem failure shall occur above the stuffing box at such a point as to enable the operation of the valve with a pipe wrench or other readily available tool.

12. Manufacturer: Insertion valve, equipment, and sleeves shall be H-2361 Permaseal Resilient Wedge Insertion Gate Valve as manufactured by Mueller Co., or approved equal.

E. **Ball Valves**

1. Plastic ball valves (shut-off valves) shall be Chemtrol TU Series 150 psi threaded true union ball valves as manufactured by Chemtrol Industrial Products NIBCO, Inc., Louisville, Kentucky; Hayward Manufacturing Co., Inc., Elizabeth, New Jersey; or equal, NSF listed for potable water.

2. Valves for PVC shall be manufactured of PVC material and valves for CPVC lines shall be manufactured CPVC material. Install so indicator arrow is in direction of flow.

F. **Butterfly Valves**

1. Butterfly valves are only permitted on water mains 16-inch in diameter and larger.

2. All butterfly valves shall be of the tight closing, rubber seat type with Buna-N rubber seats, which are recess mounted and securely fastened to the valve body or to the valve disc. Seating surfaces shall be stainless steel. Valves shall be rated for 250 psi pressure (Class 250B) and shall be satisfactory for applications involving valve operation after long periods of inactivity. Valve discs shall rotate 90 degrees from the full open position to the tight shut position. Valves shall meet the full structural, hydrostatic and leakage test requirements of the application class of AWWA C504. Valves shall have mechanical joint ends and mechanical joint accessories meeting the requirements of ANSI/AWWA C111/A21.11.

3. Valve bodies shall be constructed of ductile and shall have integrally cast mechanical joint ends. Two trunnions for shaft bearings shall be integral with each valve body. Body thickness shall be strictly in accordance with AWWA C504. Valve shafts shall be constructed of 18-8 stainless steel or of approved construction.

4. Disc shall be furnished with a 316 stainless steel seating edge to mate with the rubber seat. All disc seating edges shall be smooth and polished. Valve shafts shall be a one piece unit extending full size through the valve disc and bearings or a two piece unit (stub-shaft type). Disc mounted seats shall be mechanically retained; body mounted seats shall be bonded to the valve body. Bonded-in seats must be simultaneously molded in, vulcanized and bonded to the body and the seat. Bearings shall be corrosion resistant and self-lubricating.

5. Operator shall be the traveling 2-inch nut type, AWWA C504. All operators shall be fully gasketed and grease packed and designed to withstand submersion in water to 10 psi. Valve shall open with a counterclockwise rotation of the operator, and operation shall closely resemble conventional distribution valve practice and shall minimize water hammer. Operator shall be equipped for buried service.

6. All surfaces of the valve shall be clean, dry and free from grease before painting. An epoxy

coating conforming to AWWA C550 shall be factory applied to the interior ferrous surfaces of the valve except for finished or seating surfaces.

7. Butterfly valves installed in the ground shall have the operator nut in a vertical position for use in a roadway type valve box. There shall be a maximum 36" depth to valve operator nut. Contractor must use extension stems, if necessary, to raise operator nut within 36" of the final grade. A “Posi-Cap” high-strength plastic valve box aligner shall be installed within the valve box, centered about the extension stem and located under the operating nut. All butterfly valves shall be encased in polyethylene film as specified herein. Butterfly valve shall be restrained as specified for Ductile Iron Fittings.

8. Butterfly valves shall be Lineseal XPII (Class 250B) as manufactured by Mueller Co.; or approved equal.

G. **Water Air Release Valve**

1. Water Air Release Valves shall be installed at the high points of the water main when fire hydrants are not possible or as directed by the Town). Water Air Release Valves shall be installed as shown on Standard Detail Drawing in the Appendices.

2. Air Release Valves shall automatically release small pockets of air which accumulate at high points of a system after it is filled and under pressure.

3. Air Release Valves shall have the ability to open against internal pressure because it has a small orifice and a leverage mechanism which multiplies the force of the float. This force must be greater than the internal pressure across the orifice in order to open the valve when a pocket of air needs to be vented.

4. Air Release Valves shall be manufactured and tested in accordance with American Water Works Association (AWWA) Standard C512.

5. Valve cover shall be bolted to the valve body and sealed with a flat gasket.

6. Mechanical linkage shall provide sufficient mechanical advantage so that the valve will open under full operating pressure.

7. Materials:

   a. Body/Cover: Stainless Steel.
   b. Cover Bolts: Stainless Steel
   c. Cover Washer: Stainless Stel
   d. Float: Stainless Steel

8. All Water Air Valves on the water main shall be APCO model ARV-50A as manufactured by DeZurik, or approved equal.

9. Valve size shall be 1”.

10. The Water Air Release Valve shall be installed with meter pit, ½” PVC piping, check valve, drain, and plastic housing t per the Standard Detail.

11. Contractor to install pipe at sufficient depth to accommodate Valve height so that top of meter

pit is at existing ground level.

12. Spare Parts:

    a. Contractor is required to supply the following spare parts:

        iii. One (1) Air Release Valve per project.

H. **Valve Boxes – Buried Valves (Except Air Release Valves) Greater than 4" Valves**

1. 8" diameter corrugated HDPE waffle pipe riser shall be required and shall be centered over the valve. If the valve is 6 feet deep or greater, a valve nut extension shall be installed to bring the nut to a depth 4 feet below finished grade.

2. Valve boxes shall be accurately centered over valve operating nut with valve box alignment device, and backfill thoroughly tamped about them. Valve boxes shall not rest on the valves but shall be supported on crushed stone fill. They shall be set vertically and properly cut and/or adjusted so that the tops of boxes will be at grade in any paving, walk or road surface, and in grass plots, fields, woods or other open terrain.

3. Valve box cover and frame shall be marker "WATER" and shall be as manufactured by EJ (formerly East Jordan), or equal.

4. Valve box alignment device shall be Posi-Cap by Pollardwater or approved equal.

5. Contractor shall furnish one (1) 6-foot T-handle operating wrenches for underground valves. Nut operator extensions for all valves buried deeper than 3 feet shall be provided with stem extensions sufficient to raise operator nut to within 3 feet of finished grade.

6. A special utility 5-1/4" cast iron valve box lid marker "WATER" as manufactured by Tyler Union, and 4" diameter PVC riser shall be installed for each 1-1/2" and 2" curb stop. Center the riser and lid over the valve.

3.04 Hydrants

A. **Yard Hydrants**

1. Yard hydrants shall be installed where described on the Details or directed by the **Town** in accordance with the details shown. Hydrants shall be of the frostproof, compression type with all working parts removable without digging up the hydrants. Hydrants shall be equipped with 2-1/8" main valve opening one way with one 2-1/2" hose nozzle.

2. All hydrants shall be backfilled around shoe with min. 6 cu. ft. of #8 washed stone to allow barrel drainage.

3. Exposed portions of hydrants shall be factory painted with one coat of UV resistant high gloss 2-part polyurethane enamel. Color charts shall be furnished with Shop Drawings for color selection by the **Town**.

4. Hydrants shall be Model A-411 Post Type Fire Hydrant by Mueller or approved equal.

B. **Fire Hydrants**

1. The Contractor shall furnish and install fire hydrants and auxiliary gate valves where shown on the Drawings or directed by the **Town**. Hydrants shall conform in all respects to the most recent requirements of AWWA C502. Hydrant barrel shall have safety breakage feature above the ground line. All hydrants shall have 6-inch mechanical joint shoe connection, two (2) 2-1/2-inch discharge nozzles, and one (1) Storz 5-inch pumper nozzle with rubber gasketed caps fitted with cap chains. Cap nuts are to be five (5) sided. Connection threads shall be National Standard Thread. Main valve shall have 5-1/4-inch full opening and be of the compression type opening against water pressure so that valve remains closed should barrel be broken off.

2. Hydrants shall be fully bronze mounted. Main valve shall have a threaded bronze seat ring assembly of such design that it is easily removable by unscrewing from a threaded bronze drain ring. Bronze drain ring shall have multiple ports providing positive automatic drainage as the main valve is opened or closed. Drainage waterways shall be completely bronze to prevent rust and corrosion.

3. The operating nut shall be five (5) sided bronze or bronze with a five (5) sided ductile iron cap, and mounted so that a counter clockwise motion will open the valve. There must be cast on top an arrow and the word “Open” indicating the direction of turn to open the hydrant.

4. Operating stem shall be equipped with anti-friction thrust bearing to reduce operating torque and assure easy opening. Stop shall be provided to limit stem travel. Stem threads shall be enclosed in a permanently sealed lubricant reservoir protected from weather and the waterway with O-ring seals.

5. Hydrants shall be shop tested to 300 psi pressure with main valve both opened and closed. Under test the valve shall not leak, the automatic drain shall function and there shall be no leakage into the bonnet.

6. Type of shoe connection shall be mechanical joint and size shall be six inches (6").

7. All hydrants shall be backfilled around shoe with min. 6 cu. ft. of #8 washed crushed stone to allow barrel drainage.

8. Hydrants shall be given one coat of UV resistant high gloss 2-part polyurethane enamel at factory (two (2) coats of enamel high visibility paint in field to be approved on case-by-case basis) as follows:

    a. Public Hydrants shall be Red.
    b. Private Hydrants shall be Yellow.

9. Hydrants shall be Mueller Super Centurion 250, Model A-423.

10. Hydrants shall be installed with tracer wire and tracer wire boxes with conduit covering exposed tracer wire to 24” below grade. Tracer wire boxes shall be Cobra Hydrant Flange as manufactured by Copperhead Industries, Inc. or approved equal.

C. **Flush/Blow-off Hydrants**

1. Flush type fire hydrants shall comply, where applicable, to AWWA Standard C-502, latest revision. Flush type fire hydrants shall be of the compression type, with the main valve

opening against the pressure and closing with the pressure. The main valve opening shall be 2-1/4" diameter. Flush type fire hydrants shall be of a dry barrel design.

2. Flush type fire hydrants shall be rated at 150 psi water working pressure, tested at 300 pounds hydrostatic for structural soundness in the following manner; 300 pound hydrostatic test supplied from the inlet side, first with the main valve closed for the testing of the valve seat; second, with the main valve open for testing of the drain valves and the hydrant barrel.

3. Hydrants shall be constructed of ASTM A-126 Class B cast iron. The main valve of the hydrant shall be made of rubber.

4. The bottom stem threads of the main valve rods shall be fitted with a cap nut for sealing the threads away from the water.

5. Changes in size or shape of the waterway shall be accomplished by means of easy curves. Exclusive of the main valve opening, the net area of the waterway of the barrel and the foot piece at the smallest part shall not be less than 120% of that of the net opening of the main valve, except for hydrants with 2-1/4" valve opening.

6. Hose and steamer caps shall be individually chained to the hydrant.

7. The operating threads of the hydrant shall be so designed as to avoid the working of any iron or steel parts against either iron or steel. The operating stem and operating nut threads shall be square or acme type.

8. Bonnet shall be weatherproof, free draining, and of a type that will maintain the operating mechanism in readiness for use under freezing conditions.

9. The operating nut shall be provided with a convenient means to afford lubrication to insure ease of operating and the prevention of wear and corrosion. Hydrants shall be of dry barrel type. Hydrant shoe shall have two (2) positive acting non-corrodible drain valves that shall drain the hydrant completely by opening when the main valve is closed, and also to close tightly when the main valve is open.

10. All like parts of hydrants of the same size and model produced by the same manufacturer shall be interchangeable.

11. Hydrants shall open by turning to the left.

12. Threads on hose and steamer nozzles shall be National Standard unless otherwise specified.

13. Operating nuts and cap nuts shall conform to National Standard unless otherwise specified.

14. Bury shall be 30" measuring depth from grade line to bottom of connecting pipe. Auxiliary shut-off (isolation) gate valves shall be of the same manufacturer as the hydrant when required.

15. Hydrants with a 2", 2-1/4" 2-1/2", or 3" shoe (Style 333) shall be supplied with one 2-1/2" hose outlet. Hydrant assembly shall include a cast iron box and cover for installation flush with grade level.

16. The inside of all hydrants shall be coated in accordance with AWWA standards except for

bronze and machined surfaces. Exterior on hydrant nozzle section shall be painted fire hydrant red (or as specified).

17. Hydrant shoe shall have protective, thermosetting epoxy coating applied inside and out before assembly. Prior to application of coating, shoes shall be mechanically and chemically cleaned in compliance with SSPC Standards SP-5 and SP-8. A minimum average dry film thickness of 3 mils shall be applied on interior and exterior surfaces of hydrant shoe. Coating designation to be M&H 0271 epoxy and conform fully to AWWA C550-81, Section 3.

18. Hydrants shall be marked with name of manufacturer, year of manufacture, and size.

D. **Flush Hydrant Box**

1. 1. Hydrant box and cover shall be cast iron with a minimum diameter of 16" and a minimum depth of 10".

2. 2. The hydrant box shall not be attached to the hydrant at any point thus prohibiting loads from being transferred to the hydrant, standpipe, or connecting pipe. Hydrant box, when properly installed with cover, shall withstand a 25,000 pound load.

4.01 General

This section provides for all surface removal, excavation, compaction, and disposal of surplus materials within the public right-of-way.

All excavations shall be backfilled to the original surface of the ground or such grades as shown on the design plans or as directed. In general, the backfilling shall be carried along as speedily as possible and as soon as the concrete, mortar, and/or other masonry work and pipe joints have sufficient strength to resist imposed load without damage.

4.02 Earthwork

A. Job Conditions

1. Weather

a. Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained on account of rain, snow, ice, drought or other adverse weather conditions.

2. Existing Utilities

a. Prior to commencement of work, the Contractor shall locate existing underground utilities in areas of the work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.

3. Use of Explosives

a. The Contractor (or any of his Subcontractors) shall not bring explosives onto site or use in work without prior written permission from the Owner. All activities involving explosives shall be in compliance with the rules and regulations of the State Department of Mines, and Minerals, Division of Explosives and Blasting. Contractor is solely responsible for handling, storage, and use of explosive materials when their use is permitted.

4. Protection of Persons and Property

a. Barricade open excavations occurring as part of this work and post with warning lights.

b. Operate warning lights as recommended by authorities having jurisdiction.

c. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

5. Dust Control

a. Use all means necessary to control dust on or near the project site where such dust is caused by the Contractor's operations or directly results from conditions left by the Contractor.

B. **Products**

1. **Soil Materials**

a. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, SP, GC, SC, ML, and CL.

b. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups MH, CH, OL, OH and PT. The Contractor shall notify the Engineer if these soil materials are encountered.

c. Sub-base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or crushed sand.

d. Drainage Fill: Washed, evenly graded mixture of crushed stone, or uncrushed gravel, with 100 percent passing a 1/2 inch sieve and not more than 5 percent passing a No. 4 sieve.

e. Backfill and Fill Materials: Satisfactory soil materials free of debris, waste, frozen materials, vegetable, and other deleterious matter.

2. **Clearing & Grubbing**

a. Work shall consist of cutting and removing designated trees, stumps, brush, logs, removal of fences, or other loose and projecting material. Unless otherwise specified, it shall also include the grubbing of stumps, roots, and other natural obstructions which, in the opinion of the Engineer, must be removed to execute properly the construction work and operate properly the facility upon the completion of construction.

b. Trees, bushes, and all natural vegetation shall only be removed with the approval of the Engineer. No cleared or grubbed materials shall be used in backfills or embankment fills. All stumps, roots, and other objectionable material shall be grubbed up so that no roots larger than 3 inches in diameter remain less than 18 inches below the ground surface. All holes and depressions left by grubbing operations shall be filled with suitable material and compacted to grade.

c. Disposal shall be by burning or other methods satisfactory to the Engineer; however, burning will be permitted only when the Contractor has obtained written permission from the local regulatory agency.

d. The Contractor shall also remove from the site and satisfactorily dispose of all miscellaneous rubbish including, but not limited to, masonry, scrap metal, rock, pavement, etc., that is under the fill or to be removed as shown on the Drawings, specified herein, or directed by the Engineer.

e. Existing improvements, adjacent property, utility and other facilities, and trees, plants, and brush that are not to be removed shall be protected from injury or damage resulting from the Contractor's operations.

f. Trees and shrubs, designated to remain or that are beyond the clearing and grubbing limit, which are injured or damaged during construction operations shall be treated or replaced at the Contractor's expense by experienced tree surgery personnel.

3. Excavation

a. Excavation of every description and of whatever substances encountered within the grading limits of the project shall be performed to the lines and grades indicated on the Drawings. All excavation shall be performed in the manner and sequence as required for the work.

b. All excavated materials that meet the requirements for fill, subgrades or backfill shall be stockpiled within the site for use as fill or backfill, or for providing the final site grades. Where practicable, suitable excavated material shall be transported directly to any place in the fill areas within the limits of the work. All excavated materials that are not suitable for fill, and any surplus of excavated material that is not required for fill shall be disposed of by the Contractor.

c. The site shall be kept free of surface water at all times. The Contractor shall install drainage ditches, dikes and shall perform all pumping and other work necessary to divert or remove rainfall and all other accumulations of surface water from the excavations. The diversion and removal of surface water shall be performed in a manner that will prevent flooding and/or damage to other locations within the construction area where it may be detrimental. The Contractor shall provide, install and operate sufficient trenches, sumps, pumps, hose piping, well points, deep wells, etc., necessary to depress and maintain the ground water level at least two (2) feet below the base of the excavation during all stages of construction operations. The ground water table shall be lowered in advance of excavation and maintained a minimum of two (2) feet below the lowest excavation subgrade made until the excavation is backfilled or the structure has sufficient strength and weight to withstand horizontal and vertical soil and water pressures from natural ground water.

d. Excavations for concrete structural slabs on grade shall extend two (2) feet below the indicated bottom of slabs. The over-excavation shall be backfilled with 18 inches, compacted thickness, of over lot fill material or suitable material as herein specified.

The remaining six (6) inches of over-excavation shall be backfilled with porous fill material. The porous fill layer shall extend beyond the limits of the concrete slab a minimum of two (2) feet on all sides as indicated on the Drawings. The porous fill shall be crushed stone or gravel and shall have the following U.S. Standard Sieve gradation:

Sieve	1-1/2	1	3/4	1/2	3/8
% Passing	Min 100	95±5	58±17	Max 15	Max 5

e. Excavations for the construction shall be carefully made to the depths required. Bottoms for footings and grade beams shall be level, clean and clear of loose material, the lower sections true to size. Bottoms of footings and grade beams, in all locations, shall be at a minimum depth of 30 inches below adjacent exterior finished grade or 30 inches below adjacent existing grade, whichever is lower, whether so indicated or not. Footings and grade beam bottoms shall be inspected by the Engineer before any concrete is placed thereon.

f. In excavations for structures where, in the opinion of the Engineer, the ground is spongy or otherwise unsuitable for the contemplated foundation, the Contractor shall remove such unsuitable material and replace it with suitable material properly compacted.

g. Sheeting and shoring shall be provided as necessary for the protection of the work and for the safety of the personnel. The clearances and types of the temporary structures, insofar as they affect the character of the finished work, will be subject to the review of the Engineer, but the Contractor shall be responsible for the adequacy of all sheeting, bracing and coffer damming. All shoring, bracing and sheeting shall be removed as the excavations are backfilled in a manner such as to prevent injurious caving; or, if so directed by the Engineer, shall be left in place. Sheeting left in place shall be cut off 18 inches below the surface.

h. Excavation for structures which have been carried below the depths indicated without specific instructions shall be refilled to the proper grade with suitable material properly compacted, except that in excavation for columns, walls or footings, the concrete footings shall extend to this lower depth. All work of this nature shall be at the Contractor's expense.

4. Erosion Control

a. Temporary measures shall be applied throughout the construction period to control and to minimize siltation to adjacent properties and waterways. Such measures shall include, but not be limited to, the use of berms, silt barriers, gravel or crushed stone, mulch, slope drains and other methods.

b. These temporary measures shall be applied to erodible material exposed by any

activity associated with the construction of this project.

5. Fill

   a. All existing fill below structures and paved areas must be stripped. The upper six (6) inches of the natural subgrade below shall be scarified and re-compacted at optimum moisture to at least ninety-five percent (95%) of Standard Proctor Density ASTM D 698 (latest revision).

   b. All vegetation, such as roots, brush, heavy sods, heavy growth of grass and all decayed vegetable matter, rubbish and other unsuitable material within the area upon which fill is to be placed shall be stripped or otherwise removed before the fill is started. In no case will such objectionable material be allowed to remain in or under the fill area. Existing fill from excavated areas on site shall be used as fill for open and/or planted areas. Additional fill stockpiled at the site can be used for structural fill if approved by the Engineer. Any additional material necessary for establishing the indicated grades shall be furnished by the Contractor and approved by the Engineer. All fill material shall be free from trash, roots and other organic material. The best material to be used in fills shall be reserved for backfilling pipe lines and for finishing and dressing the surface. Material larger than 3 inches maximum dimension shall not be permitted in the upper 6 inches of the fill area. Fill material shall be placed in successive layers and thoroughly tamped or rolled in a manner approved by the Engineer, each layer being moistened or dried such that the specified degree of compaction shall be obtained. No fill shall be placed or compacted in a frozen condition or on top of frozen material. No fill material shall be placed when free water is standing on the surface of the area where the fill is to be placed and no compaction of fill will be permitted with free water on any point of the surface of the fill to be compacted.

   c. Where concrete slabs are placed on earth, all loam and organic or other unsuitable material shall be removed. Where fill is required to raise the subgrade for concrete slabs to the elevations as indicated on the Drawings or as required by the Engineer, such fill shall consist of suitable material and shall be placed in layers. Each layer shall be moistened or dried such that the specified degree of compaction shall be obtained. All compaction shall be accomplished in a manner and with equipment as approved by the Engineer. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for adjacent fill.

6. Backfilling

   a. After completion of footings, grade beams and other construction below the elevation of the final grades and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all trash and debris. Material for backfilling shall be as specified for

suitable material, placed and compacted as specified hereinafter. Backfill shall be placed in horizontal layers of the thickness specified and shall have a moisture content such that the required degree of compaction is obtained. Each layer shall be compacted by mechanical tampers or by other suitable equipment approved by the Engineer to the specified density. Special care shall be taken to prevent wedging action or eccentric loading upon or against the structure. Trucks and machinery used for grading shall not be allowed within 45 degrees above the bottom of the footings or grade beams.

b. The trenches shall be backfilled following visual inspection by the Engineer and prior to pressure testing. The trenches shall be carefully backfilled with the excavated materials approved for backfilling, or other suitable materials, free from large clods of earth or stones. Each layer shall be compacted to a density at least equal to that of the surrounding earth and in such a manner as to permit the rolling and compaction of the filled trench with the adjoining earth to provide the required bearing value, so that paving, if required, can proceed immediately after backfilling is completed.

7. Compaction

a. Suitable material as hereinbefore specified shall be placed in maximum 8" horizontal layers. Compaction shall be performed by rolling with approved tamping rollers, pneumatic-tired rollers, three wheel power rollers or other approved equipment. The degree of compaction required is expressed as a percentage of the maximum dry density obtained by the test procedure presented in ASTM D-698. Laboratory moisture density tests shall be performed on all fill material. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction. Compaction requirements shall be as specified below:

Fill Utilized for:	**Required Density (%)**	**Max. Permissible Lift Thickness as Compacted, Inches**
Backfill & Utility Trenches Under Foundations & Pavements	95-100	8
Backfill Around Structures	95-100	8
Field and Utility Trench Backfill Under Sidewalks and Open Areas	90-100	8

b. Field density tests shall be performed in sufficient number to insure that the specified density is being obtained. Tests shall be in accordance with ASTM Standards D 1556 or D 2922/D 3017 and shall be performed as authorized by the Engineer. Payment for field density tests shall be by the Contractor. Contractor shall provide suitable notification for coordination of testing. Delays due to the lack of adequate advance notification shall be the responsibility of the Contractor.

8. Site Grading

a. Where indicated or directed, topsoil shall be removed without contamination with subsoil and spread on areas already graded and prepared for topsoil, or transported and stockpiled convenient to areas for later application, or at locations specified. Topsoil shall be stripped to full depth and, when stored, shall be kept separate from other excavated materials and piled free of roots, stones, and other undesirable materials.

b. Following stripping, fill areas shall be scarified to a minimum depth of six (6) inches to provide bond between existing ground and the fill material. Material should be placed in successive horizontal layers not exceeding twelve (12) inches uncompacted thickness. In general, layers shall be placed approximately parallel to the finished grade line.

c. In general and unless otherwise specified, the Contractor may use any type of earth moving equipment he has at his disposal, provided such equipment is in satisfactory condition and of such type and capacity that the work may be accomplished properly and the grading schedule maintained. During construction, the Contractor shall route equipment at all times, both when loaded and empty, over the layers as they are placed, and shall distribute the travel evenly over the entire area.

d. The material in the layers shall be of the proper moisture content before rolling or tamping to obtain the prescribed compaction. Wetting or drying throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on the fill thus affected shall be delayed until the material has dried to the required moisture content. If the material is too dry, it shall be sprinkled with water and manipulated to obtain the uniform moisture content required throughout a layer before it is compacted.

e. Each layer of the fill shall be compacted by rolling or tamping to the standard specified in the Compaction section above and not less than 90% maximum density at optimum moisture content as determined by field density tests made by the Standard Proctor method. In general and unless otherwise specified, the Contractor may use any type of compaction equipment such as sheepsfoot rollers, pneumatic rollers, smooth rollers and other such equipment he has at his disposal, provided such equipment is in satisfactory condition and is of such design, type, size, weight, and quantity to obtain the required density in the embankment. If at any time the required density is not being obtained with the equipment then in use by the Contractor, the Engineer may require that different and/or additional compaction equipment be obtained and placed in use at once to obtain the required compaction.

f. The Contractor shall be responsible for the stability of all embankments and shall replace any portion which, in the opinion of the Engineer, has become displaced due to carelessness or negligence on the part of the Contractor.

9. Top Soil

a. Provide all labor, materials, equipment and services required for furnishing and placing topsoil. Samples of topsoil shall be submitted to the Engineer for review before topsoil is placed. The material shall be good quality loam and shall be fertile, friable, mellow; free from stones larger than one (1) inch, excessive gravel, junk metal, glass, wood, plastic articles, roots and shall have a liberal amount of organic matter. Light sandy loam or heavy clay loam will not be acceptable.

b. The topsoil shall be 3 inches thick in all areas to be seeded. No topsoil shall be placed until the area to be covered is excavated or filled to the required grade. Imported backfill material will be stockpiled on site for structure backfilling and top soiling.

C. **Excavation Support & Protection**

1. **Materials**

a. General: Provide adequate shoring and bracing materials which will support loads imposed. Materials need not be new, but should be in serviceable condition.

b. Structural Steel: ASTM A 36.

c. Steel Sheet Piles: ASTM A 328.

d. Timber Lagging: Any species, rough-cut, mixed hardwood, nominal 3 inches thick, unless otherwise indicated.

e. Portable Steel Trench Box Shall be OSHA Approved.

2. **Shoring**

a. Wherever shoring is required, locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system adequately anchored and braced to resist earth and hydrostatic pressures.

b. Shoring systems retaining earth on which the support or stability of existing structures is depending must be left in place at completion of work.

3. **Bracing**

a. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move a brace, install new bracing prior to removal of original brace.

b. Do not place bracing where it will be cast into or included in permanent concrete work, except as otherwise acceptable to Engineer.

c. Install internal bracing, if required, to prevent spreading or distortion of braced frames.

d. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

e. Remove sheeting, shoring, and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.

f. Repair or replace, as acceptable to Engineer, adjacent work damaged or displaced through installation or removal of shoring and bracing work.

5.01 Introduction

The following Chapter addresses the minimum requirements for the installation of sanitary sewers and sewer force mains.

5.02 Sanitary Sewer Installation (Gravity and Forcemain)

A. Excavation for Pipeline Trenches

1. Unless otherwise directed by the Engineer, trenches in which pipes are to be laid shall be excavated in open cut to the depths required by field conditions or as specified by the Engineer. In general this shall be interpreted to mean that machine excavation in earth shall not extend below an elevation permitting the pipe to be properly bedded. Installation shall be in accordance with ASTM-D-2321 except as modified herein.

2. Excavation may be undercut to a depth below the required invert elevation that will permit laying the pipe in a bed of granular material to provide continuous support for the bottom quadrant of the pipe.

3. Trenches shall be of sufficient width to provide free working space on each side of the pipe and to permit proper backfilling around the pipe, but unless specifically authorized by the Engineer, trenches shall in no case be excavated or permitted to become wider than 2'-0" plus the nominal diameter of the pipe at the level of or below the top of the pipe. If the trench does become wider than 2'-0" at the level of or below the top of the pipe, special precaution may be necessary, such as providing compacted, granular fill up to top of the pipe or providing pipe with additional crushing strength as determined by the Engineer after taking into account the actual trench loads that may result and the strength of the pipe being used. The Contractor shall bear the cost of such special precautions as are necessary.

4. All excavated materials shall be placed a minimum of two feet (2') back from the edge of the trench.

5. Before laying the pipe, the trench shall be opened far enough ahead to reveal obstructions that may necessitate changing the line or grade of the pipeline.

6. The trench shall be straight and uniform so as to permit laying pipe to lines and grades given by the Engineer. It shall be kept free of water during the laying of the pipe and until the pipeline has been backfilled. Removal of trench water shall be at the Contractor's expense. Dry conditions shall be maintained in the excavations until the backfill has been placed. During the excavation, the grade shall be maintained so that it will freely drain and prevent surface water from entering the excavation at all times. When directed by Engineer, temporary drainage ditches shall be installed to intercept or direct surface water which may affect work. All water shall be pumped or drained from the excavation and disposed of in a suitable manner without damage to adjacent property or to other work.

7. Minimum cover of 30" shall be provided for all pipelines, except those located in the State Highway Right of Way. Those shall have a minimum cover of 42”.

B. **Pipe Bedding**

1. All sewer pipe shall be supported on a bed of granular material. In no case shall pipe be supported directly on rock. Bedding shall be provided in earth bottom trenches, as well as rock bottom trenches. Bedding material shall be free from rock, foreign material, frozen earth, and be acceptable to the Engineer. Bedding shall be a minimum of 4" below pipe barrel.

2. In all cases the foundation for pipes shall be prepared so that the entire load of the backfill on top of the pipe will be carried on the barrel of the pipe and insofar as possible where bell and spigot pipe is involved so that none of the load will be carried on the bells.

3. Where flexible pipe is used, the granular bedding shall be placed up to at least the spring line (horizontal center line) of the pipe. The bedding material and procedures shall conform to ASTM D 2321 and any Technical Specifications set out hereinafter. If conditions warrant, the Engineer may require the bedding to be placed above the springline of the pipe. Granular bedding shall be Size #8 crushed stone and is not a separate pay item.

4. Where undercutting and granular bedding are involved the undercutting shall be of such depth that the bottom of the bells of the pipe will be at least three inches above the bottom of the trench as excavated. Undercutting is not a separate pay item.

5. In wet, yielding mucky locations where pipe is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of the pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective. When ordered by the Engineer, yielding and mucky materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe. Crushed stone or other such granular material, if necessary, as determined by the Engineer to replace poor subgrade material, shall be a separate pay item and classified as "Special Granular Fill". Removal of poor material is not a separate pay item.

6. Installation shall be in accordance with ASTM D 2321 except as modified hereinafter.

C. **Special Granular Fill**

1. “Special Granular Fill” when directed by the Engineer shall be Department of Transportation crushed limestone, Size #57. Payment for "Special Granular Fill" must have approval from the Engineer prior to installation.

D. **Laying Pipe**

1. The laying of pipe in finished trenches shall be commenced at the lowest point so the spigot ends point in the direction of flow.

2. All pipes shall be laid with ends abutting and true to line and grade as given by the Engineer. Supporting of pipes shall be as set out hereinbefore under "Pipe Bedding" and in no case shall the supporting of pipes on blocks be permitted.

3. Before each piece of pipe is lowered into the trench, it shall be thoroughly inspected to insure its being clean. Each piece of pipe shall be lowered separately unless special permission is given otherwise by the Engineer. No piece of pipe or fitting which is known to be defective

shall be laid or placed in the lines. If any defective pipe or fitting shall be discovered after the pipe is laid, they shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe.

4. Pipe shall not be laid on solid rock. A pad of granular material as specified in "Pipe Bedding", shall be used as a pipe bedding. Pipe bedding is not a separate pay item. Irregularities in sub-grade in an earth trench shall be corrected by use of granular material.

5. When ordered by the Engineer, unsuitable materials in sub-grades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe.

6. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood or fabricated plug fitted into the pipe bell, so as to exclude earth or other material, and precautions taken to prevent flotation of pipe by runoff into trench.

7. No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has had an opportunity to make an inspection of the joints, alignment and grade, in the section laid.

E. **Tracer Wire and Identification Tape**

1. Tracer Wire and Identification Tape shall be installed per standard details and manufacturer's instructions.

F. **Backfilling Pipeline Trenches**

1. **General**

a. Backfilling of pipeline trenches shall be accomplished with the requirements set forth in ASTM D 2321, in accordance with the details as shown on the Standard Details, and as described hereinafter.

2. **Method "A" – Backfilling in Open Trench**

a. The lower portion of the trench, from the pipe bedding to a point 12" above the top of the pipe, shall be backfilled with #8 crushed stone. This material shall be placed in 6" lifts and shall be carefully compacted to avoid displacement of the pipe. Compaction shall be accomplished by hand-tamping or by approved mechanical methods.
b. The upper portion of the trench above the compacted portion shall be backfilled with Class 1, 2, 3, or 4A materials. Incorporation of rock larger than 3" is prohibited. Backfilling this portion of the trench may be accomplished by any means approved by the Engineer. The trench backfill shall be heaped over or leveled as directed by the Engineer.
c. Final grading and seeding or sodding shall be in accordance the specifications herein.

3. **Method "B" – Backfilling under Sidewalk & Unpaved Gravel Drives**

a. The lower portion of the trench, from the pipe bedding to a point 12 inches above the top of the pipe, shall be backfilled with #8 crushed stone. This material shall be placed in 6"

lifts to avoid displacement of the pipe. Compaction shall be accomplished by hand-tamping or by approved mechanical methods.

b. The middle portion of the trench, from a point 12" above the top of the pipe to a point 6" below the grade line, shall be backfilled with Class 1, 2, 3, material free from rock. This material shall be placed and compacted in layers of approximately 6 inches.

c. The upper portion of the trench shall be temporarily backfilled and maintained with crushed stone or gravel until such time as the sidewalk is constructed or the driveway surface is restored.

4. **Method "C" – Backfilling under Streets, Roads, and Paved Drives**

a. The lower portion of the trench from the pipe bedding to a point 6" below the bottom of the pavement or concrete sub-slab, shall be backfilled with #8 crushed stone. This material shall be placed in 6" lifts to avoid displacement of the pipe.

b. Compaction shall be accomplished by hand tamping or approved mechanical methods.

c. The upper portion of the trench, from a point 6" below the bottom of the pavement or concrete sub-slab to grade, shall be backfilled with Class 1B Crushed Stone. At such time that pavement replacement is accomplished, the excess base course shall be removed as required.

5. **Trenches**

a. Trenches outside existing sidewalks, driveways, streets, and highways shall be backfilled in accordance with Method "A". Trenches within the limits of sidewalk and unpaved driveways shall be backfilled in accordance with Method "B". Trenches within the paving limits of existing streets, highways, driveways and paved areas shall be backfilled in accordance with Method "C". When directed by the Engineer, the Contractor shall wet backfill material to assure maximum compaction.

b. Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-ways and/or private property all excess earth or other materials resulting from construction.

c. In the event that pavement is not placed immediately following trench backfilling in streets and highways, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times.

G. **Settlement of Trenches**

1. Whenever lines are in, or cross, driveways and streets, the Contractor shall be responsible for any trench settlement that occurs within these rights-of-way within one year from the time of final acceptance of the work. If paving shall require replacement because of trench settlement within this time, it shall be replaced by the Contractor at no extra cost to the Owner. Repair of settlement damage shall meet the approval of the Owner and/or the State Department of Transportation.

H. **Pre-Fabricated Trench Baffles**

1. Pre-fabricated trench baffles shall be installed where shown on the Drawings, required by the specifications or as directed by the Engineer. The product shall be installed according to the manufacturer's recommendations, and shall provide a watertight seal around the pipe.

Contractor shall insure that the correct line and grade of the pipe is maintained before backfilling around the trench baffle.

I. Concrete Highway, Street, and Drive Replacement

1. The Contractor shall replace those sections of existing roads, streets and driveways required to be removed to install the pipe lines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.

2. Prior to trenching, the pavement shall be scored or cut to straight edges at least twelve (12) inches outside each edge of the proposed trench to avoid unnecessary damage to the remainder of the paving. Edges of the existing pavement shall be re- cut and trimmed to square, straight edges after the pipeline has been installed and prior to placing the new base and pavement.

3. Backfilling of the trench shall be in accordance with Method "C" as described hereinbefore.

4. A subslab of reinforced concrete shall be placed for state maintained highways as indicated on the Standard Details. The subslab shall have a minimum thickness of 6 inches. Concrete for the subslab shall be 3000 psi, in accordance with the Details shown on the Standard Details.

5. Prior to placing the HMA binder course, the granular base course shall be thoroughly cleaned and broomed and a prime coat of Refined Tar RT-2 shall be uniformly applied at the rate of 0.35 gallons per square yard.

6. The HMA binder course patch shall be hot mixed, hot laid, bituminous concrete base, furnished and placed in accordance with Section 402 of the INDOT Standard Specifications, and to match the existing depth or to a minimum compacted thickness of 3 inches.

7. The HMA surface course shall be hot mixed, hot laid, bituminous concrete, furnished and placed in accordance with Section 402 of the INDOT Standard Specifications, and to match the existing depth or to a minimum compacted thickness of 1-1/2 inches.

J. Portland Cement Concrete Drive Replacement

1. Wherever Portland cement concrete driveways are removed, they shall be reconstructed to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than existed prior to the operation.

2. The existing concrete paving shall be sawed or cut to straight edges 12-inches outside the edges of the trench or broken out to an existing joint, as directed by the Engineer. The concrete pavement shall be equal to the existing pavement thickness but not less than 6-inches in thickness for driveways.

3. Pavement shall be reinforced with 6 x 6 #10-10 wire mesh and shall be constructed with 3000 psi concrete.

K. Concrete Curb and Gutter Replacement

1. The Contractor shall remove the curb and gutter when encountered when required for laying

the sewer. Only that portion of the curb and gutter needed to lay the sewer line shall be removed.

2. Where concrete curb and gutter removed or disturbed during the construction work, it shall be replaced, using 3000 psi concrete, in fully as good or better condition than which existed prior to the Contractor's operation.

L. **Mailbox, Culvert, Clothes Line Posts, Fences and other Replacements**

1. Existing mail boxes, drainage culverts, clothes line posts, fences and the like shall not be damaged or disturbed unless necessary, in which case, they shall be replaced in as good condition as found as quickly as possible. Existing materials shall be reused in replacing such facilities when materials have not been damaged by the Contractor's operations. Existing facilities damaged by Contractor's operation shall be replaced with new materials of the same type at the Contractor's expense. Work in this category is not a pay item.

2. Replacement of paved drainage ditches within highway right-of-way shall be accomplished in accordance with Department of Transportation specifications.

M. **Rip-Rap Stream Bank Slope Protection**

1. The Contractor shall install rip-rap stream bank slope protection at locations directed by the Engineer. Rip-rap slope protection shall be 12-inches thick and shall meet State D.O.T. Standard Specifications.

N. **New Sanitary Sewer to Existing Manhole Connection (Gravity Sewer)**

1. New sanitary sewer shall be extended through the wall of the existing manhole, a grout ring installed, sealed and patched with an expansive cement mortar and pipe sealed with a test plug. Test plug shall be a wing nut style as manufactured by Richmond Foundry, Richmond, Virginia, or equal. Plug shall be chained to top step. Apron and invert shall be removed in its entirety where required to allow placement of the new sewer at the specified invert elevation.

2. At the time the new sewer is placed into permanent service, as designated by the Owner, the Contractor shall remove the old sewer pipe from the manhole, patch and seal the wall with an expansive cement mortar, construct new apron and invert in accordance with the standard details, and remove plug from the new sewer. All temporary pumping, piping, excavation, etc. as required to maintain or divert the sewage flow shall be included by the Contractor.

5.03 Sanitary Sewer Manhole Installation

A. **Excavation for Manhole Installation**

1. Unless otherwise directed by the Engineer, excavation in which manholes are to be installed shall be excavated in open cut to the depths required by field conditions or as specified by the Engineer. In general this shall be interpreted to mean that machine excavation in earth shall not extend below an elevation permitting the manhole to be properly bedded.

2. Excavation may be undercut to a depth below the required invert elevation that will permit

installing the manhole on a bed of granular material to provide continuous support for the manhole base.

3. Excavations shall be of sufficient dimensions to provide free working space on all sides of the manhole and to permit proper backfilling around the manhole. All excavated materials shall be placed a minimum of two feet (2') back from the edge of the excavation.

4. The excavation shall be straight and uniform so as to permit installation of the manhole to lines and grades given by the Engineer. It shall be kept free of water during the installation of the manhole and until the manhole has been backfilled. Removal of water shall be at the Contractor's expense. Dry conditions shall be maintained in the excavations until the backfill has been placed. During the excavation, the grade shall be maintained so that it will freely drain and prevent surface water from entering the excavation at all times. When directed by the Owner or the Engineer, temporary drainage ditches shall be installed to intercept or direct surface water which may affect work. All water shall be pumped or drained from the excavation and disposed of in a suitable manner without damage to adjacent property or to other work.

B. **Manhole Bedding**

1. All manholes shall be supported on a bed of granular material. In no case shall manhole be supported directly on rock. Bedding shall not be a separate pay item unless otherwise set out in the Detailed Specifications. Bedding shall be provided in earth bottom excavations, as well as rock bottom excavations. Bedding material shall be free from rock, foreign material, frozen earth, and be acceptable to the Engineer. Bedding shall be a minimum of 4" below manhole base.

2. Granular bedding shall be Size #8 crushed stone. A minimum 4” layer of Size #2 crushed stone over filter fabric shall be used in wet conditions.

3. Where undercutting and granular bedding is involved it shall be of such depth that the bottom of the manhole will be at least six inches above the bottom of the excavation. Undercutting is not a separate pay item.

4. In wet, yielding, mucky locations where the manhole is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of the pipe and/or manhole might take place during the placing of the backfill, the pipe and/or manhole must be weighted or secured permanently in place by such means as will prove effective. When ordered by the Engineer, yielding and mucky materials in sub-grades shall be removed below ordinary excavation depth in order to prepare a proper bed for the manhole. Crushed stone or other such granular material, if necessary, as determined by the Engineer to replace poor sub-grade material, shall be a separate pay item and classified as "Special Granular Fill". Removal of poor material is not a separate pay item.

C. **Manhole Lining**

1. All manholes with a forcemain discharge connection, and three manholes downstream of such a connection shall receive a protective lining.

2. Protective Lining system shall be Mainstay Composite Liner System by Madewell Products Corporation or Town approved equal.

3. The liner system shall be comprised of the following:

    a. Hydraulic Cement Mortar: Mainstay ML-10
    b. Restoration Mortar: Mainstay ML-72
    c. Corrosion Barrier: Mainstay DS-5
    d. Manhole Frame Seal: Madewell 806 Flexible Epoxy

4. The liner system shall be accompanied by a warranty against failure for a minimum of 10-years and be transferable to the **Town**. This warranty shall, at a minimum, cover the following:

    a. Failure of the liner to protect against the interior deterioration or corrosion of the structure.
    b. Failure to protect the substrate and environment from contamination by effluent.
    c. Failure to prevent groundwater infiltration.
    d. Any such failures shall be repaired and restored at no cost to the **Town** within 60 days.

D. **Converting Existing Lift Station Wetwell to Manhole**

1. Where noted on the Contract Drawings, wetwells shall be converted to manholes as described herein. Structure shall be filled with crushed stone or sand to a level approximately one foot below the invert elevation shown on the Contract Drawings.

2. The invert shall be constructed with 3000 psi concrete, approximately one foot thick, with apron and channel(s) formed and finished. New outlet pipe openings shall be core drilled in the wall of the structure, and the pipe installed with a Fernco Concrete Manhole Adapter or equal. Areas around pipe shall be grouted to achieve a smooth surface.

E. **Concrete Highway, Street, and Drive Replacement**

1. Reference Section 5.02 H of this document.

F. **Concrete Curb and Gutter Replacement**

1. Reference Section 5.02 J of this document.

G. **Mailbox, Culvert, Clothes Line Posts, Fences and other Replacements**

1. Reference Section 5.02 K of this document.

H. **Manhole Frame Installation**

1. The manhole frame casting shall be centered over the opening in the cone or grade ring of the manhole, with a bituminous mastic joint sealing compound applied between the concrete and the casting.

2. The frame shall be bolted to the cone or grade ring with wedge anchors.

5.04 Horizontal Directional Drilling

A. Equipment

1. The directional drilling equipment shall consist of a directional drilling rig of sufficient

capacity to perform the bore and pullback the pipe, a mixing and delivery system for drilling fluid of sufficient capacity to successfully complete the installation, a guidance system to accurately guide boring operations, control and containment of drilling fluid, along with trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of the project.

B. Drilling System

1. Drilling Rig - The directional drilling machine shall consist of a hydraulically powered system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the installation. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations.

2. Drill Head - The drill head shall be steerable by changing its rotation and shall provide the necessary cutting surfaces and drilling fluid jets.

3. Mud Motors (if required) - Mud motors shall be of adequate power to turn the required drilling tools.

4. Drill Pipe - Shall be constructed of high quality 4130 seamless tubing, grade D or better, with threaded box and pins. Tool joints should be hardened to 32-36 RC.

C. Guidance System

1. The Guidance System shall be of a proven type and shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. The guidance system shall be capable of tracking all required depths in any soil condition and rock encountered along the proposed installation route.

2. The guidance system shall be setup and operated by personnel trained and experienced with this system. The Operator shall be aware of any magnetic anomalies and shall consider such influences in the operation of the guidance system if using a magnetic system.

D. Drilling Fluid (MUD) System

1. Mixing System - A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid composed of bentonite clay, potable water and appropriate additives. Mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. The drilling fluid reservoir tank shall be sized for adequate storage of the mud mixture. Mixing system shall continually agitate the drilling fluid during drilling operations.

2. Drilling Fluids - Drilling fluid shall be composed of clean water and an appropriate additive. Water shall be from a clean source with a pH of 8.5 – 10 and/or as per mixing requirements of the Manufacturer. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. No hazardous additives may be used. Drilling

fluid shall be maintained at a viscosity sufficient to suspend cuttings and maintain the integrity of bore wall.

3. Delivery System - The mud pumping system shall have a minimum capacity to supply mud in accordance with the drilling equipment pull-back rating at a constant required pressure. The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and properly disposed of. A berm, minimum of 12" high, shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid recycling system (if used) to prevent spills into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey excess drilling fluid from containment areas to storage facilities.

E. Other Equipment

1. Pipe Rollers - Pipe rollers, if required, shall be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. Sufficient number of rollers shall used to prevent excess sagging of pipe.

2. Pipe Rammers - Hydraulic or pneumatic pipe rammers may only be used if necessary and with the authorization of Engineer.

3. Restrictions - Other devices or utility placement systems for providing horizontal thrust other than those previously defined in the preceding sections shall not be used unless approved by the Engineer prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the utility placement satisfactorily without undue stoppage and to maintain line and grade within the tolerances prescribed by the particular conditions of the project.

6.01 Introduction

The following Chapter addresses the minimum requirements for the installation of water distribution facilities.

6.02 Hydrant Installation

A. Valves

1. Location

   a. Valves shall be spaced no greater than 600 feet apart on water mains 12-inches and smaller.

   b. Valves shall be spaced no greater than 1,200 feet apart on water mains 16-inches and larger.

2. Position: All hydrants shall be set plumb with not less than two (2) cubic feet of crushed stone and shall have their nozzles parallel with the roadway, with the pumper nozzle facing toward the roadway. Hydrants shall be set to the established grade, with nozzles at least eighteen inches (18") above the ground, as shown or as directed by the Engineer.

B. Fire Hydrants

1. Location

   a. Fire hydrants shall be spaced no greater than 500 feet apart.

   b. Hydrants shall be located as shown or as directed so as to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians.

   c. When placed behind the curb, the hydrant barrel shall be set so that the pumper or hose nozzle cap will be a minimum of 18-inches and a maximum of 24-inches from the back of curb in developed areas.

   d. When placed behind the edge of pavement, the hydrant barrel shall be set so that the pumper or hose nozzle cap will be a minimum of 3-feet and a maximum of 5-feet from the edge of pavement in undeveloped areas. Deviations from these standards will only be allowed at the **Town**'s discretion on a case-by-case basis.

   e. When set in the lawn space between the curb and the sidewalk or between the sidewalk and the property line, no portion of the hydrant or nozzle cap shall be within six inches (6") of the sidewalk.

   f. Hydrants shall not be installed behind sidewalks without approval from the Town.

2. Position: All hydrants shall be set plumb with not less than two (2) cubic feet of crushed stone and shall have their nozzles parallel with the roadway, with the pumper nozzle facing toward the roadway. Hydrants shall be set to the established grade, with nozzles at least eighteen inches (18") above the ground, as shown or as directed by the Engineer.

3. Connection to Water Main Each hydrant shall be connected to the main with a six-inch (6") restrained joint ductile iron branch controlled by an independent six -inch (6") gate valve, unless otherwise specified.

4. Hydrant Drain (Pervious Soil): Whenever a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing #8 crushed stone from the bottom of the trench to at least six inches (6") above the drain opening in the hydrant and to a distance of one foot (1') around the elbow. No drainage system shall be connected to a sewer.

5. Hydrant Drain (Impervious Soil): Whenever a hydrant is set in clay or impervious soil, a drainage pit two feet (2') in diameter and three feet (3') deep shall be excavated below each hydrant and filled compactly with #8 crushed stone under and around the elbow of the hydrant and to a level of six inches (6") above the drain opening. No drainage pit shall be connected to a sewer (see Standard Details).

C. **Yard Hydrants**

1. Location: Hydrants shall be located as shown on the Contract Drawings or as directed by the Owner or Engineer so as to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians.

2. Position: All hydrants shall be set plumb with not less than two (2) cubic feet of crushed stone. Hydrants shall be set to the established grade, with nozzles at least thirty-six inches (36") above the ground, as shown on the Details in the Drawings, or as directed by the Owner or Engineer. Hydrants shall be backfilled with crushed stone, which in encased by a section of an 18" diameter concrete pipe.

3. Connection to Water Main: Each hydrant shall be connected to the main with a tapping saddle, two (2) inch poly line and be controlled by an independent two (2) inch gate valve, unless otherwise specified.

    a. Yard hydrants located on sanitary sewer lift station sites are not required to be metered.

    b. Other yard hydrant installations may require metering as determined by the **Town**.

4. Hydrant Drain (Pervious Soil): Whenever a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing #8 crushed stone from the bottom of

the trench to at least six inches (6") above the drain opening in the hydrant and to a distance of one foot (1') around the elbow. No drainage system shall be connected to a sewer.

5. Hydrant Drain (Impervious Soil): Whenever a hydrant is set in clay or impervious soil, a drainage pit two feet (2') in diameter and three feet (3') deep shall be excavated below each hydrant and filled compactly with #8 crushed stone under and around the elbow of the hydrant and to a level of six inches (6") above the drain opening. No drainage pit shall be connected to a sewer (see Standard Details).

D. **Flush Hydrants**

1. Location: Hydrants shall be located as shown on the Contract Drawings or as directed by the Owner or Engineer so as to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians.

2. Position: Hydrants shall be set plumb and to the established grade.

3. Connection to Water Main: Hydrants shall be connected to the main by mechanical joint, screwed or flanged shoe. Mechanical joint shoes shall be fitted with strapping lugs.

4. Hydrant Drain (Pervious Soil): Whenever a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing #8 crushed stone from the bottom of the trench to at least six inches (6") above the drain opening in the hydrant and to a distance of one foot (1') around the elbow. No drainage system shall be connected to a sewer.

5. Hydrant Drain (Impervious Soil): Whenever a hydrant is set in clay or impervious soil, a drainage pit two feet (2') in diameter and three feet (3') deep shall be excavated below each hydrant and filled compactly with #8 crushed stone under and around the elbow of the hydrant and to a level of six inches (6") above the drain opening. No drainage pit shall be connected to a sewer (see Standard Details).

6. Hydrant Box: Hydrant box shall be installed at grade and per manufacturer's recommendations. Box shall not be attached to the hydrant at any point.

E. **Hydrant Anchorage:**

1. The bowl of each hydrant shall be tied to the pipe with suitable anchor couplings, as directed by the Owner or Engineer.

F. **Fire Hydrant Wrenches:**

1. One (1) hydrant wrench shall be furnished for each ten (10) hydrants or less. When the number of hydrants furnished and installed exceeds ten (10), one (1) hydrant repair kit shall be supplied at no additional cost to the Owner.

6.03 Water Distribution Pipe Installation (Open Cut)

A. **Location**

1. The water main shall be installed within utility strip between roadway curb and sidewalk wherever possible. Water main shall not be installed underneath sidewalk without approval from the Town.

B. **Excavation for Pipeline Trenches**

1. Unless otherwise directed by the Engineer, trenches in which pipes are to be laid shall be excavated in open cut to the depths required by field conditions or as specified by the Engineer. In general this shall be interpreted to mean that machine excavation in earth shall not extend below an elevation permitting the pipe to be properly bedded. Installation shall be in accordance with ANSI/AWWA C600 for ductile iron and Cast Iron O.D. (AWWA) PVC pipe or ASTM F-645 for Iron Pipe O.D. (ASTM) PVC pipe except as modified herein.

2. If the foundation is good firm earth and the machine excavation has been accomplished as set out hereinbefore, the remainder of the material shall be excavated by hand, then the earth pared or molded to give full support to the lower quadrant of the barrel of each pipe. Where bell and spigot is involved, bell holes shall be excavated during this latter operation to prevent the bells from being supported on undisturbed earth. If for any reason the machine excavation in earth is carried below an excavation that will permit the type of bedding specified above, then a layer of granular material shall be placed so that the lower quadrant of the pipe will be securely bedded in compact granular fill.

3. Excavation may be undercut to a depth below the required invert elevation that will permit laying the pipe in a bed of granular material to provide continuous support for the bottom quadrant of the pipe.

4. Trenches shall be of sufficient width to provide free working space on each side of the pipe and to permit proper backfilling around the pipe, but unless specifically authorized by the Engineer, trenches shall in no case be excavated or permitted to become wider than 2'-0" plus the nominal diameter of the pipe at the level of or below the top of the pipe. If the trench does become wider than 2'-0" at the level of or below the top of the pipe, special precaution may be necessary, such as providing compacted, granular fill up to top of the pipe or providing pipe with additional crushing strength as determined by the Engineer after taking into account the actual trench loads that may result and the strength of the pipe being used. The Contractor shall bear the cost of such special precautions as are necessary.

5. All excavated materials shall be placed a minimum of two feet (2') back from the edge of the trench.

6. Before laying the pipe, the trench shall be opened far enough ahead to reveal obstructions that may necessitate changing the line or grade of the pipeline.

7. The trench shall be straight and uniform so as to permit laying pipe to lines and grades given by the Engineer. It shall be kept free of water during the laying of the pipe and until the pipeline has been backfilled. Removal of trench water shall be at the Contractor's expense. Dry conditions shall be maintained in the excavations until the backfill has been placed. During the excavation, the grade shall be maintained so that it will freely drain and prevent surface water from entering the excavation at all times. When directed by Owner, temporary drainage ditches shall be installed to intercept or direct surface water which may affect work. All water shall be pumped or drained from the excavation and disposed of in a suitable manner without damage to adjacent property or to other work.

1. Minimum cover of 54" shall be provided for all pipelines.

C. **Pipe Bedding**

1. Reference Section 5.02 B of this document.

D. **Special Granular Fill**

1. Reference Section 5.02 C of this document.

E. **Laying Pipe**

1. Reference Section 5.02 D of this document.

F. **Tracer Wire and Identification Tape**

1. Reference Section 5.02 E of this document.

G. **Backfilling Pipeline Trenches**

1. Reference Section 5.02 F of this document.

H. **Settlement of Trenches**

1. Reference Section 5.02 G of this document.

I. **Portland Cement Concrete Drive Replacement**

1. Reference Section 5.02 J of this document.

J. **Concrete Curb and Gutter Replacement**

1. Reference Section 5.02 K of this document.

K. **Mailbox, Culvert, Clothes Line Posts, Fences and other Replacements**

1. Reference Section 5.02 L of this document.

L. **Rip-Rap Stream Bank Slope Protection**

1. Reference Section 5.02 M of this document.

M. **Water Main Termination**

1. All water mains shall be terminated with a Gate Valve the size of the water main and end with a full size hydrant.

6.04 Water Distribution Pipe Installation (Horizontal Directional Drilling)

A. **General**

1. The Engineer must be notified 48 hours in advance of starting work. The Engineer's approval for beginning the installation shall in no way relieve the Contractor of the ultimate responsibility for the satisfactory completion of the work as authorized under the Contract. It shall be the responsibility of Engineer to provide inspection personnel at such times as appropriate.

2. The Contractor shall be fully responsible for all damages resulting from his failure to comply with all applicable state, federal and local regulations, and requirements of these specifications.

B. **Drilling Procedure**

1. Site Preparation - Prior to any alterations to work-site, contractor shall photograph or video tape entire work area, including entry and exit points. One copy shall be given to the Engineer and one copy to remain with contractor for a period of one year following the completion of the project. Work site as indicated on drawings, within right-of-way, shall be graded or filled to provide a level working area. No alterations beyond what is required for operations are to be made. Contractor shall confine all activities to designated work areas.

2. Drill Path Survey - Entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on drawings. If contractor is using a magnetic guidance system, drill path will be surveyed for any surface geomagnetic variations or anomalies.

3. Environmental Protection – Contractor shall have in place silt fence between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by contract documents, state, federal and local regulations. Additional environmental protection necessary to contain any hydraulic or rilling.

4. Fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. Contractor shall adhere to all applicable environmental regulations. Also, all erosion control facilities shall be in accordance with Chapter 2, Section 2.02, Paragraph E., hereinbefore.

5. Safety - Contractor shall adhere to all applicable state, federal and local safety regulations and all operations shall be conducted in a safe manner. Safety meetings shall be conducted at least weekly with a written record of attendance and topic submitted to Engineer.

6. Pipe Joining shall be as required in the piping specifications, hereinbefore. Pipe will be placed on pipe rollers before pulling into bore hole with rollers spaced close enough to prevent excessive sagging of pipe.

7. Pilot Hole - Pilot hole shall be drilled on bore path with no deviations greater than 5% of depth over a length of 100'. In the event that pilot does deviate from bore path more than 5% of depth in 100', contractor will notify Engineer and Engineer may require contractor to pull-back and re-drill from the location along bore path before the deviation. In the event that a drilling fluid fracture, inadvertent returns or returns loss occurs during pilot hole drilling operations, contractor shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a March funnel and then wait another 30 minutes. If mud fracture or returns loss continues, contractor will cease operations and notify Engineer. Engineer and contractor will discuss additional options and work will then proceed accordingly.

8. Reaming - Upon successful completion of pilot hole, contractor will ream bore hole to a minimum of 25% greater than outside diameter of pipe using the appropriate tools. Contractor will not attempt to ream at one time more than the drilling equipment and mud system are designed to safely handle.

9. Pull-Back - After successfully reaming bore hole to the required diameter, contractor will pull the pipe through the bore hole. In front of the pipe will be a swivel. Once pullback operations have commenced, operations must continue without interruption until pipe is completely pulled into bore hole. During pull-back operations contractor will not apply more than the maximum safe pipe pull pressure at any time. In the event that pipe becomes stuck, contractor will cease pulling operations to allow any potential hydro-lock to subside and will commence pulling operations. If pipe remains stuck, contractor will notify Engineer. Engineer and contractor will discuss options and then work will proceed accordingly.

7.01 Introduction

The following Chapter describes the minimum requirements and general procedures for the inspection and testing of sanitary and storm sewers to be dedicated to the **Town of Whitestown**.

Any section of sewer not passing the tests prescribed herein shall be repaired to the satisfaction and approval of the **Town of Whitestown**, retested and re-inspected.

7.02 Testing

A. Gravity Sanitary Sewers

1. Cleanup: Upon completion of installation of the piping and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the Work. The Contractor shall grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

2. Inspect Lines: Provide post installation sanitary sewer line jet cleaning and television inspection of the sewer line prior to acceptance of sewer by the Town and an additional time prior to the release of 3 year maintenance bond. All video recordings are to be turned over to the Town for Engineer review and final approval. Any video deemed incomplete or otherwise deficient shall be re-televised before Town acceptance. Televising will be on an acceptable form of digital media, such as portable external hard drive (flash media). The town will televise and clean new private laterals prior to and after construction. Home-builders will be invoiced and payment required prior to release of 3 year maintenance bond.

3. Deflection Test : Deflection tests shall be performed on a flexible pipe. The test shall be conducted after the final backfill has been in place at least 30 days to permit stabilization of the soil-pipe system. No pipe shall exceed a deflection of 5 percent. If deflection exceeds 5 percent, pipe shall be replaced or corrected. The mandrel used for the deflection test shall have a diameter not less than 95 percent of the base inside diameter or average inside diameter of the pipe depending on which is specified in the ASTM Specification, including the appendix, to which the pipe is manufactured. The pipe shall be measured in compliance with ASTM D2122 Standard Test Method of Determining Dimensions of Thermoplastic Pipe and Fittings. The test shall be performed without mechanical pull devices.

4. Replacement of Defective Lines: All lines or sections of lines that are found to be laid improperly with respect to line or grade, that are found to contain broken or leaking sections of pipe, or are obstructed in such a manner that they cannot be satisfactorily corrected otherwise, shall be removed and replaced at the Contractor's expense.

5. Continuity Test: All tracer wire shall tested for continuity at the Developer/Contractor expense by a 3rd party tester. All test results shall be provided to the Town prior to acceptance.

6. **Low Pressure Air Test:**

a. To test for leaks, the Engineer will require that all completed piping as specified herein after back filling be tested by low-pressure air test, exfiltration, or infiltration test. Should the low pressure air test results be inconclusive, or at the request of the Engineer, an exfiltration or infiltration test will be required on the low pressure air tested segments. Labor, equipment and supplies required for all tests shall be furnished by the Contractor.

b. The low pressure air test shall consist of meeting a required holding time during a measured pressure drop. Plugs shall be chained to the top manhole step. The initial test pressure shall be 5.0 psi, with the allowable pressure loss being 1.0 psi during the calculated holding time. Holding time shall be as indicated in the following table:

SPECIFICATION TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q = 0.0015*

1 Pipe	2 Minimum Time (min:sec)	3 Length for Minimum	4 Time for Longer	Specified Minimum for Length (L) Shown (min:sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:30	297	1.520	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:20	239	2.374	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674	22:47	34:10	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306	28:51	43:11	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46
42	39:48	57	41.88L	69:48	104:42	139:37	174:30	209:24	244:19	279:13	314:07
48	45:34	50	54.705 L	91:10	136:45	182.21	227:55	273:31	319:06	364:42	410:17
54	51:02	44	69.236 L	115:24	173:05	230:47	288:29	346:11	403:53	461:34	519:16
60	65:40	40	85.476 L	142:28	213:41	284:55	356:09	427:23	498:37	569:50	641:04

* If there is no leakage (0 psi drop) after one hour of testing, the tested section shall be accepted.

7. Exfiltration Test: In order to test for infiltration the Engineer may also require exfiltration tests on each section of pipe between manholes after it has been laid but prior to back filling of joints. Exfiltration tests shall be conducted by plugging the lower end of the section of sewer to be tested and filling the sewer with water to a point approximately five feet above the invert at the lower end and at least one foot above the pipe at the upper end, observing for leakage at all joints and measuring the amount of leakage for a given interval of time.

Exfiltration shall not exceed 110 percent times the infiltration limits set out hereinbefore. All observed leaks shall be corrected even though exfiltration is within the allowable limits.

8. Infiltration Test: To test for infiltration, the Engineer may also require that the Contractor plug the open ends of all lines at the manhole so that measurements may be made at each section of the sewer line. Infiltration tests shall consist of weir measurement to determine quantities of any infiltration. Measurements shall be taken at line locations directed by the Engineer. This infiltration test will not be made until the sewer line is completed, and the Contractor will be required to correct all conditions that are conductive to excessive infiltration and may be required to relay such sections of the line that may not be corrected even though infiltration is within allowable limits.

9. Smoke Test: Smoke testing may be used only to locate leaks and in no case shall be considered conclusive. In all cases the smoke test shall be accompanied by an air test, exfiltration test or infiltration test. Smoke testing may only be performed where ground water is low and smoke is blown into a conduit that is properly sealed. All such leaks or breaks discovered by the smoke tests shall be repaired and/or corrected by the Contractor at his own expense. Equipment and supplies required from smoke tests shall be furnished by the Contractor. The Contractor may also be required to smoke test the first section (manhole-to-manhole) of each size of pipe and type of joint on each construction contract prior to backfilling to establish and check laying and jointing procedures. Other supplementary smoke tests prior to backfilling may be performed by the Contractor at his option; however, any such tests shall not supplant the final tests of the completed work unless such final tests are waived by the Engineer.

10. I & I Limit Test: I & I Limits: The Contractor shall lay sewer lines, including house connections so that the access of ground water or loss of water from the sewer system or other gravity flow piping which does not normally flow full will be limited to 10 gallons per inch diameter per mile per day. This limitation is inclusive of manholes, sewers, house connections, and appurtenances. This requirement may be applied to a portion of the contract work, such as the sewers in a separate drainage area or to a single section of the line between two manholes.

B. **Sanitary Sewer Forcemains**

1. Hydrostatic Test

   a. Water piping shall be tested and proved tight under pressure not less than 1-1/2 times the working pressure under which it is to be used, but not less than 150 psig for 2 hours with no loss of pressure.

   b. Contractor shall furnish a recording gauge and water meter for measuring water used during leakage test and recording pressure charts during duration of test. Recording pressure charts shall be turned over to the Engineer at conclusion of tests. The pressure recording device shall be suitable for outside service, with a range from 0-200 psig, 24-hour spring wound clock, designed for 9-inch charts, and shall be approved by the Engineer.

   c. Pipelines shall be tested before backfilling at joints except where otherwise required by necessity or convenience.

d. Where leaks are visible at exposed joints, evident on the surface where joints are covered, and/or identified by isolating a section of pipe, the joints shall be repaired and leakage must be minimized, regardless of total leakage as shown by test.

e. All pipe, fittings, valves, and other materials found to be defective under test shall be removed and replaced at no additional expense to the Owner.

f. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with.

g. Where nonmetallic joint compounds are used, pipelines should be held under normal operating pressure for at least three days before testing.

h. The Owner will provide initial water for testing the pressure piping. Should the first test fail to pass, all additional water required for subsequent tests shall be furnished at the Contractor's expense.

i. The cost of testing of pressure piping is incidental and is to be included in the Contractor's unit Contract Price.

2. Tracer Wire Continuity Test:

a. All tracer wire shall tested for continuity at the developer's expense by a 3rd party tester. All test results shall be provided to the town prior to acceptance.

C. **Sanitary Sewer Manholes**

1. Prior to testing, all manholes shall be cleaned free of mud and debris on all surfaces including manhole steps. Mandrel strings shall be removed and disposed of. Manholes shall be televised after cleaning. All video recordings are to be turned over to the Town for Engineer review and final approval. Any video deemed incomplete or otherwise deficient shall be re-televised before Town acceptance. Televising will be on an acceptable form of digital media, such as portable external hard drive (flash media). Manholes shall be inspected after manholes are cleaned/televised prior to acceptance by the Town and an additional time prior to the release of 3 year maintenance bond.

2. Testing Prior to Backfilling

a. This specification shall govern the vacuum testing of sanitary sewer manholes and structures and shall be used as a method of determining acceptability by the Owner, in accepting maintenance of a sanitary sewer manhole or structure on behalf of the public. This test shall be performed in accordance with ASTM C 1244 prior to backfilling. Other forms of testing of some manholes may be required, as deemed necessary by the Owner.

b. Manholes shall be tested after installation with all connections in place.

c. Lift holes, if any, shall be plugged with an approved, non-shrinkable grout prior to testing.

d. Drop connections shall be installed prior to testing.

e. The vacuum test shall include testing of the seal between the cast iron frame and the concrete cone, slab or grade rings.

f. Test Procedure

(1) Temporarily plug, with the plugs being braced to prevent the plugs or pipes from being drawn into the manhole, all pipes entering the manhole at least eight inches into the sewer pipe(s). The plug must be inflated at a location past the manhole/pipe gasket.

(2) The test head shall be placed inside the frame at the top of the manhole and inflated, in accordance with the manufacturer's recommendations.

(3) A vacuum of 10" of mercury shall be drawn on the manhole. Shut the valve on the vacuum line to the manhole and disconnect the vacuum line.

(4) The pressure gauge shall be liquid filled, having a 3.5 inch diameter face with a reading from zero to thirty inches of mercury.

(5) The manhole shall be considered to pass the vacuum test if it holds at least 9 inches of mercury for the following time durations:

	Time (Seconds)		
Manhole Depth	4’ Diameter	5' Diameter	6' Diameter
20 Feet or Less	50	65	81
20.1 to 30 Feet	74	98	121

(6) If a manhole fails the vacuum test, the manhole shall be repaired with a non-shrinkable grout or other suitable material based on the material of which the manhole is constructed and retested, as stated above.

(7) All temporary plugs and braces shall be removed after each test. Manholes will be accepted as having passed the vacuum test requirements if they meet the criteria stated above.

3. Testing After Backfilling

a. This specification shall govern the vacuum testing of sanitary sewer manholes and structures and shall be used as a method of determining acceptability by the Owner, in accepting maintenance of a sanitary sewer manhole or structure on behalf of the public. This test shall be performed AFTER backfilling. Other forms of testing of some

manholes may be required, as deemed necessary by the Owner.

b. Manholes shall be tested after installation with all connections in place.
c. Lift holes, if any, shall be plugged with an approved, non-shrinkable grout prior to testing.
d. Drop connections shall be installed prior to testing.
e. The vacuum test shall include testing of the seal between the cast iron frame and the concrete cone, slab or grade rings.
f. Manhole shall be backfilled to final grade.
g. Test Procedure for Manholes 0 to 12 feet deep:

(1) Temporarily plug, with the plugs being braced to prevent the plugs or pipes from being drawn into the manhole, all pipes entering the manhole at least eight inches into the sewer pipe(s). The plug must be inflated at a location past the manhole/pipe gasket.

(2) The test head shall be placed inside the frame at the top of the manhole and inflated, in accordance with the manufacturer's recommendations.

(3) A vacuum of 10" of mercury shall be drawn on the manhole. Shut the valve on the vacuum line to the manhole and disconnect the vacuum line.

(4) The pressure gauge shall be liquid filled, having a 3.5 inch diameter face with a reading from zero to thirty inches of mercury.

(5) The manhole shall be considered to pass the vacuum test if it holds at least 9 inches of mercury for the following time durations:

Time (Seconds)

Manhole Depth	4’ Diameter	5' Diameter	6' Diameter
20 Feet or Less	50	65	81
20.1 to 30 Feet	74	98	121

(6) If a manhole fails the vacuum test, the manhole shall be repaired with a non-shrinkable grout or other suitable material based on the material of which the manhole is constructed and retested, as stated above.

(7) All temporary plugs and braces shall be removed after each test.

h. Test Procedure for Manholes 12.1 to 22 feet deep:

(1) Follow the procedures listed above, except the vacuum pressure shall be dependent on the depth of the manhole in accordance with the following table:

Depth (ft)	12	13	14	15	16	17	18	19	20	21
Vacuum Pressure (inches Hg)	10	9	8	7	6	5	4	3	2	1

(2) Manholes will be accepted as having passed the vacuum test requirements if they meet the criteria stated above.

8.01 Introduction

The following Chapter describes the minimum requirements and general procedures for the inspection and testing of water distribution systems to be dedicated to the **Town of Whitestown**.

Any section of the system not passing the tests prescribed herein shall be repaired to the satisfaction and approval of the **Town of Whitestown**, retested and re-inspected.

8.02 Testing

A. Water Distribution Systems

1. Cleanup

    a. Upon completion of installation of the piping and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the Work. The Contractor shall grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

2. Water Pressure Testing

    a. Water piping shall be tested and proved tight under a pressure not less than 1-1/2 times the working pressure under which it is to be used, but not less than 150 psig for 2 hours with no loss of pressure.

    b. Potable water shall be used for testing potable water systems. Non-potable water shall be used for testing non-potable water systems.

3. Disinfection of Water Piping

    a. Disinfection:

        i. All pipe installed by a contractor shall be disinfected in accordance with AWWA C651 and all applicable Federal, State and Local requirements. If required, the trench/point(s) of access shall be prepared in such a manner as to comply with all applicable OSHA regulations and as directed by the Town.

        ii. The chlorination point and supply shall be accessible above grade.

        iii. All flushing water shall be dechlorinated prior to disposal of flushing water.

    b. Bacteriological Samples: The Town will collect water samples for bacteriological testing. The main will not be approved for final connection to the existing distribution system until sampling results are obtained and approved by the Town. Sampling requirements for service lines 2” and larger shall be conducted consistent with AWWA C651.

4. Tracer Wire Continuity Test:

    a. All tracer wire shall tested for continuity at the developer's expense by a 3rd party tester. All test results shall be provided to the town prior to acceptance.

9.01 Introduction

This Chapter pertains to the requirements for the design and construction of submersible type lift stations, which are the primary type typically constructed as part of private development. Wet well stations are acceptable, **and their design and approval will be handled on a case- by-case basis by the Town of Whitestown.**

Lift stations meeting or exceeding the requirements set herein will be approved. Any proposed alteration of the lift station dimensions, equipment, controls, etc. from the standards set forth herein will be approved only upon the submittal of plans and specifications of the proposed changes to the **Town of Whitestown**, and upon the Town's written approval. The **Town of Whitestown** reserves the right to alter any standard set forth hereinafter.

This Chapter is divided into two sections designated by a Type I Lift Station and a Type II Lift Station. Lift Stations, in general, shall be submersible type including a minimum of two (2) pumps and motors, wetwell basin, separate valve pit, valves, piping hatches, guide rails, pump removal components, control center, level control switches, remote monitor package, interconnecting electrical wiring, incoming power and radio supply, and all other features regularly and normally required as a part of a complete and functional facility. All work shall be in accordance with site requirements, details in the Plans, these Standards and the manufacturer's recommendations.

9.02 Lift Station Site Requirements

A. Security Fencing

1. A security fence shall be installed at all lift station sites. The type of fencing to be used shall be determined by the Town and shall consist of the following.

    a. Chain Link Fencing:

        i. Fencing shall be a minimum of 6-feet tall, commercial grade, black PVC coated steel chain link fencing. Fencing shall also include 3-strand barbed wire and black privacy slats.

        ii. Access gate shall consists of a double swing type gate with black PVC coated chain link fabric and black privacy slats. Access gate shall also have 3-strand barbed wire. Each gate shall have a black PVC coated strong arm latch and "hold back" to prevent the gate from inadvertently closing. An additional 4-foot wide access gate shall also be installed adjacent to the double swing gate. This gate shall be constructed of black PVC coated chain link fabric, black privacy slats and 3-strand barbed wire.

        iii. Minimum gate post diameter shall be 6-⅝" with black powder coated finish.

b. Privacy Fencing:

i. Fencing shall be a minimum of 6-feet tall, commercial grade, board on board cedar privacy fencing with galvanized steel posts, and three stringers per section of fencing.

ii. Access gates shall conform to the requirements of 9.02 A.1.a.

iii. Minimum gate post diameter shall be 6-⅝" with black powder coated finish.

B. General Site

1. Areas inside of the security fencing and not paved shall be covered with landscaping fabric and 3-inches of river rock.

2. Provide a yard hydrant for wash down maintenance of the lift station.

9.03 Type I Lift Station (≤15 Horsepower)

A. Scope of Work

1. Quality Assurance:

a. All similar components shall be manufactured and furnished by one manufacturer unless specifically approved by Engineer in writing.

b. Equipment shall be in accordance with the following standards, as applicable and as indicated in each equipment specification:

i. American Society for Testing and Materials (ASTM).
ii. American National Standards Institute (ANSI).
iii. American Society of Mechanical Engineers (ASME).
iv. American Water Works Association (AWWA).
v. American Welding Society (AWS).
vi. Hydraulic Institute (HI).
vii. National Fire Protection Association (NFPA).
viii. National Electrical Manufacturers Association (NEMA).
ix. Manufacturer's published recommendations and specifications.

2. Submittals:

a. Shop Drawings:

i. Shop Drawings for the lift station and associated equipment shall be submitted. Submittals shall include, but not be limited to, the following documentation:

(2) Descriptive literature including materials of construction, equipment weight, motor data, pressure ratings, certification of all applicable ASTM standards;

(3) Predicted performance curves developed for the specific application. Performance curves shall plot speed, capacity, head, horsepower, efficiency, and NPSH requirements over the manufacturer's recommended range of operation;

(4) Dimensional factory drawings including cross sectional views of pumps and all equipment showing details of construction;

(5) Written report on the factory test results;

(6) Manufacturer's installation instructions.

b. Operation and Maintenance Manuals:

i. Contractor shall submit one (1) hard copy and one (1) USB flash memory stick copy of the Operation and Maintenance Manuals to the Owner. Manuals shall include, at a minimum, the following:

(1) Warranty Statement
(2) Pump down test procedures and results from the start-up tests;
(3) Operation Instructions;
(4) Maintenance Instructions;
(5) Recommended spare parts list;
(6) Lubrication schedules;
(7) Structural diagrams;
(8) As-built wiring diagrams;
(9) Piping and Instrumentation Drawings (P&ID); and
(10) Bill of materials

3. Experience Qualifications:

a. The equipment to be furnished hereunder shall be made by a manufacturer regularly engaged in such work, and who has furnished similar installations and had them in successful and continuous operation for a period of 10 years.

4. Factory Testing:

a. Each pump to be delivered under this Section shall be tested for performance at the pump manufacturer's factory to determine head versus capacity, efficiencies, and kilowatt draw required for the operating points that are specified. All tests shall be run in accordance with the latest edition of the American Hydraulic Institute Standards and Submersible Wastewater Pump Association and at the appropriate voltage and frequency. Testing shall also include, but not be limited to, the following:

i. Head vs. flow with five (5) equally spaced points including shutoff and maximum flow shall be certified.

ii. The input KW, speed, power factor, no load current, and torque characteristics shall be certified.

iii. Impeller, motor rating, and electrical connections shall first be checked for compliance to the specifications.

iv. Insulation Test: A motor and cable insulation test for moisture content or insulation defects shall be made.

v. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.

vi. Operational Test: The pump shall be run for 30 minutes submerged, under a minimum of six feet of water.

vii. After the operational test (described in line F) has been conducted, the insulation test (described in line D above) shall be performed again.

viii. After testing, the pump shall be inspected to insure that the pump maintains full watertight integrity.

ix. A written report stating the tests have successfully been completed and providing the results of the test shall be provided for each pump. The pump manufacturer shall also certify that similar tests have been conducted on pumps of a similar size for a period of not less than five (5) years.

B. **Products**

1. Manufacturers:

   a. Flygt
   b. Alternates and substitutions to be approved by Town of Whitestown.

2. Schedule:

   a. Include the following example schedule in the construction drawings:

Parameter	**Pump Schedule**
Manufacturer	Flygt
Pump Model	N 3XXX
Quantity	Two (2)
Impeller Size	XX.XXX inch
Motor HP	XX
RPM	X,XXX
Electric Service	460 volt / 60 Hz / 3 phase
Operating Point (1 pump)**	X,XXX gpm @ XXX' TDH
Operating Point (2 Pumps)	X,XXX gpm @ XXX' TDH
Minimum Pump Efficiency	XX%

NPSHr	XX ft.
NEC Classification	Above min. pump submergence level = Class 1, Div 1, Groups C & D Below min. pump submergence level = Unclassified
Cooling Jacket Equipped	No
Discharge Connection	X inch
Shut-Off Head	XXX ft.

(**) Basis of Design at full speed

3. Wetwell & Valves Pits:

   a. Wetwell Design

      i. Minimum wetwell dimensions shall be equivalent to a minimum diameter of 8-feet internal diameter, or approved alternative from the Town in writing.

      ii. All hardware shall be stainless steel.

      iii. All piping connections inside the wetwell shall be bolted flange connections. Mechanical joint connections are not permitted.

      iv. Provide a stainless steel cable hanger assembly, mounted to the lift station lid, opposite the pump discharge piping. The assembly shall provide one double hook for each power cable(s) and level control cable(s). The hanging of multiple cables on one hook will not be permitted.

      v. Pump power cords shall be stainless steel double hook style with stainless steel Hubbel Kellem Heavy Duty Single Eye strain relief.

      vi. Control Cable cords shall be stainless steel double hook style with stainless steel Hubbel Kellem Light Duty Single Eye strain relief.

      vii. The wetwell vent shall consist of a Purafil Vent PV40 with Rain Shield or approved equal.

      viii. The interior wetwell walls shall be coated using the same system as specified for sanitary sewer manholes in Section 5.02 C. Coat the interior walls and ceiling of the wetwell down to within 6” of the grouted fillet. The floor of the wetwell shall not be coated.

      ix. Provide a slide gate on interior of the wetwell, mounted to the face of the concrete wall. All hardware shall be stainless steel. Gate shall be manufactured by Rodney Hunt or approved equal.

      x. Piping shall be coated with a protective coating as follows, or as approved in writing by the Town:

(1) Piping and fittings in wetwell shall have the following coatings:

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils
Surface Prep	Per Manufacturer Recommendation		Per Manufacturer Recommendation	
Primer	Per Manufacturer Recommendation		Per Manufacturer Recommendation	
Field Preparation	Per Manufacturer Recommendation		Per Manufacturer Recommendation	
Field 1st Coat	Tnemec Perma-Shield Series 435-5020	30-40	SW Dura-Plate 6000	30-40

(2) Piping, fittings, valves in valve vault shall have the following coatings:

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils
Surface Prep	Per Manufacturer Recommendation		Per Manufacturer Recommendation	
Primer	Per Manufacturer Recommendation		Per Manufacturer Recommendation	
Field Preparation	Per Manufacturer Recommendation		Per Manufacturer Recommendation	
Field 1st Coat	N69 Hi-Build Epoxoline II	4.0 – 6.0	Macropoxy 646 FC	4.0 – 6.0
Field 2nd Coat	N69 Hi-Build Epoxoline II – 34GR	2.0 – 3.0	Macropoxy 646 FC – SW4025	2.0 – 3.0

(3) Exterior Piping and fittings above wetwell and valve vault shall have the following coatings:

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils
Surface Prep	Per Manufacturer Recommendation		Per Manufacturer Recommendation	
Primer	Per Manufacturer Recommendation		Per Manufacturer Recommendation	
Field Preparation	Per Manufacturer Recommendation		Per Manufacturer Recommendation	
Field 1st Coat	N69 Epoxoline II	4.0 – 6.0	Macropoxy 646 FC	4.0 – 6.0
Field 2nd Coat	1074U Endura –Shield II – 34GR	2.0 – 3.0	HiSolids Polyurethane or Acrolon 218 HS - SW4025	2.0 – 3.0

b. Valve vault Design:

i. All piping connections inside the valve vault shall be bolted flange connections. Mechanical joint connections are not permitted.

ii. All hardware shall be stainless steel.

iii. All valves are to be manufactured by DeZurik

iv. Minimum valve vault dimensions shall be equivalent to a minimum diameter of 8-feet internal diameter, or approved alternative from the Town in writing.

v. All forcemain piping shall be a minimum of 54-inches in depth from finished grade.

vi. Piping shall be coated with a protective coating as outlined for the valve vault above, or as approved in writing by the Town:

4. Submersible Pumps and Appurtenances

a. Pump Design:

i. The pump shall be centrifugal, non-clog, solids handling (3" diameter solids), submersible type capable of handling raw water or unscreened sewage. The discharge connection elbow shall be permanently installed in the wetwell along with the discharge piping. The pump shall be automatically and firmly connected to the discharge connection elbow when lowered into place and shall be easily removed for inspection or service. There shall be no need for personnel to enter the wetwell. Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple linear downward motion of the pump.

ii. The pump mounting base shall include guide rail supports and a discharge connection with a 125-lb. standard flange, faced and drilled. The base and the discharge piping shall be permanently mounted in place. The base plates shall be anchored in place utilizing epoxy type anchors with stainless steel studs and nuts as manufactured by HILTI Fasteners, Inc. or equal. No portion of the pump shall bear directly on the floor of the sump.

b. Materials of Construction

Materials of Construction [Motor HP < 11 HP]	
Pump Housing	ASTM A-48, Class 35B
Impeller and Insert Ring	ASTM A-532 Alloy III A (25% Chrome)
Stator Housing	ASTM A-48, Class 35B
Shaft	ASTM A479 S43100-T
Shaft Seal: Pump side	Corrosion Resistant Tungsten Carbide
Shaft Seal: Motor Side	Corrosion Resistant Tungsten Carbide
Coating System	Two-pack Oxyrane Ester Duosolid 50

c. Pump Construction:

i. Volute

(1) The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have integral spiral-shaped, sharp-edged groove(s) that is cast into the suction cover. The spiral groove(s) shall

provide the sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The internal volute bottom shall provide effective sealing between the multi-vane semi-open impeller and the volute.

(2) Critical mating surfaces where watertight sealing is required shall be machined and fitted with nitrile O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and I-ring contact of four sides without the requirement of a specific torque limit. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as equal. No secondary sealing compounds, elliptical O-rings, grease, or other devices shall be used.

ii. Impeller

(1) The impeller blades shall be self-cleaning upon each rotation as they pass across a sharp relief groove in the Insert ring and shall keep the impeller blades clear of debris. The insert ring shall have a guide pin which moves fibers from the center of the impeller to the leading edges of the impeller. The impeller shall move axially upwards to allow larger debris to pass through and immediately return to normal operating position. The clearance between the insert ring and the impeller leading edges shall be adjustable.

iii. Discharge Connection

(1) The pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet well. Sealing of the pump to the discharge connection shall be accomplished by a machined metal-to-metal watertight contact. No portion of the pump shall bear directly on the sump floor.

iv. Mechanical Seal

(1) Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion and abrasion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber shall be a leakage-free seal. The upper seal shall contain one stationary and one positively driven rotating corrosion and abrasion resistant tungsten-carbide seal ring. The rotating seal ring shall have small back-swept grooves laser inscribed upon its face to act as a pump as it rotates, returning any fluid that should enter the dry motor chamber back into the lubricant chamber. All seal rings shall be individual solid sintered rings. Each seal interface shall

be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance. Any leakage passing the sealing shall not pass the bearings. Before it reaches the bearings the liquid shall create an alarm via the floating leakage sensor.

(2) Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. Seal lubricant shall be non-hazardous.

(3) The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.

d. Motor Design:

i. Electrical design:

(1) The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31.The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F. The motor shall be capable of withstanding at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel. The

junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer.

(2) The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C. ambient and shall have a NEMA Class B maximum operating temperature rise of 80° C. A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.

(3) Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

ii. Power Cable:

(1) The motor shall be equipped with a minimum of 50 feet of screened cable suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.

(2) The cable entry shall consist of dual cylindrical elastomer sleeves, flanked by washers, all having a close tolerance fit against the cable and the cable entry. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

iii. Bearings and Shaft:

(1) The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated and have a nominal L10 lifetime of 50.000 hours. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. Single row lower bearings are not acceptable.

(2) The pump and motor shaft shall be a single piece unit. The pump shaft is an extension of the motor shaft. Shafts using mechanical couplings shall not be acceptable. The shaft shall be stainless steel – ASTM A479 S43100-T. Shaft sleeves will not be acceptable.

iv. Cooling System

(1) The pump shall be capable of operating in a continuous condition in a liquid with a temperature up to 104°F even when the motor is not submerged.

(2) The motor shall be capable of no less than 30 evenly spaced starts per hour and be able to operate throughout the entire pump performance curve from shut-off through run-out even when the motor is not submerged.

v. Motor Protection

(1) The motor shall be protected by 3 thermal switches embedded in the stator set to open at 260°F and one leakage sensor floating type located in the stator chamber. The sensor and the switches shall be connected to the control panel which shall stop the motor and send an alarm when the sensors are activated.

(2) The thermal switches and float switch shall be connected to a Mini CAS control and status monitoring unit. The Mini CAS unit shall be designed to be mounted in the pump control panel.

e. Rail System:

i. A rail system shall be provided for easy removal of the pump and motor assembly for inspection and service. The entire weight of the pump shall be guided by no less than two (2) stainless steel guide rails, size as recommended by pump manufacturer, extending from the top of the station to the discharge connection. The guide rails shall be positioned and supported by the pump mounting base. The guide rails shall be aligned vertically and supported at the top by an attachment to the access hatch frame. Stainless steel intermediate guide rail support(s) shall be required in accordance with pump manufacturer's spacing recommendations.

ii. The rails shall function to allow the complete weight of the pumping unit to be lifted on dead center without binding and stressing the pump housing. The rail system shall function to automatically align the pumping unit to the discharge connection by a simple downward movement of the pump. No twisting or angle approach will be considered acceptable.

f. Lifting Systems:

i. Each submersible pump shall be provided with and set-up for a Flygt "Grip-Eye" lifting system. Each pump shall then be fitted with a 316 stainless steel lifting chain extending from the top of the station to the stainless steel "Grip-Eye" safety hook attached to the pump unit. The working load of the lifting system shall be 50% greater than the pump unit weight.

g. Flow Meter:

i. SITRANS F M MAG 5100 W electromagnetic flow meter manufactured by Siemens shall be installed in the valve box of the lift station. The flow meter shall be combined with SITRANS F M MAG 5000 transmitter.

5. Station Power

   a. Lift station power shall be coordinated with the electric utility. Preferred voltage is 480/277V, 3phase, 4wire. Alternate power source configurations should be consulted with the Town.

   b. Power shall enter through a Service Entrance Rated Manual Transfer Switch with the following specs:

      i. 3 – position rotary (on-off-on)

      ii. Generator Connections: CamLok 16 Series

      iii. Service Entrance rated with main circuit breaker

      iv. Enclosure: NEMA 4X Stainless Steel

      v. Strip heater with thermostat

      vi. Door Safety Interlock

      vii. Utility Indicator Lights

   c. Manufacturer: Trystar, Model TMTS

6. Control Panel

   a. All of the automatic control equipment is to be supplied by one manufacturer. It shall be factory assembled, wired, tested and covered by complete electrical drawings and instructions.

   b. Lift station controls shall be manufactured by Toric Engineering, Indianapolis, Indiana. The controls shall have the following features.

      i. Incoming Power: Main Circuit Breaker

      ii. Accessory Circuit breakers as required.

      iii. Enclosure Type: NEMA 4X Stainless Steel

      iv. Controller: Allen Bradley CompactLogix

      v. HMI: Allen Bradley PanelView Plus

      vi. Network Switch: Phoenix Contact

      vii. Cell Modem: 4RF Aprisa

      viii. UPS: APC, BR700G

ix. Indicators: LED push to test

x. Variable Frequency Drives: ABB, ACQ580 (Harmonic mitigation required, include ULH)

xi. Pump Protection Relays: Mounted inside of control panel

xii. Panel Air conditioner (if using VFDs): IceQube or equal.

xiii. Level Control

(1) Primary Level control of the lift station shall be by Vega radar level sensor.

(2) Backup Level control of the lift station shall be by four mechanical ball floats, wired independently of the Primary Level Control system. A ball float shall be provided for the following:

- Pump Off Float
- Pump On Float (Lead)
- Pump On Float (Lag)
- High Level Alarm Float which activates the backup control system.
- Panel controls and ball floats shall utilize relay logic outside of PLC controller.

C. Execution

1. Preparation

a. Coordinate with other trades, equipment and systems to the fullest extent possible.

b. Take all necessary measurements in the field to determine the exact dimensions for all work and the required sizes of all equipment under this contract. All pertinent data and dimensions shall be verified by the Contractor.

2. Installation

a. Installation shall be in strict accordance with the manufacturer's instructions and recommendations in the locations shown on the Contract Drawings. Anchor bolts shall be set in accordance with the manufacturer's recommendations and setting plans.

b. The Contractor shall also provide from the submersible pump supplier the service of a qualified start-up engineer (factory representative) who has had prior on- site start-up experience to assist in performing start-up, check-out and initial operation services of the pumping units. The start-up engineer shall also instruct the Owner's personnel on the operation and maintenance procedures for the station. Qualified supervisory services, including manufacturers' engineering representatives, shall be provided for a minimum of two (2) full working days to ensure that the work is done in a manner fully approved by the respective equipment manufacturer. The pump manufacturer's representatives shall specifically supervise the installation of the pump and the alignment of the connection piping. If there are difficulties in the start-up or operation of the equipment

due to the manufacturer's design or fabrication, additional service shall be provided at no cost to the Owner.

c. The test shall demonstrate to the satisfaction of the Town and manufacturer that the equipment meets all specified performance criteria, is properly installed and anchored, and operates smoothly without exceeding the full load amperage rating of the motor.

d. A certificate from the pump manufacturer shall be submitted stating that the installation of his/her equipment is satisfactory, that the equipment is ready for operation and that the operating personnel have been suitably instructed in the operation, lubrication and care of each unit.

3. Field Tests:

a. Plug all inlet lines before starting presoak period.

b. Presoak period shall be at least 4.0 hours.

c. Following the presoak period, fill the structure to a depth of 6-inches below the top structure joint.

d. The test period shall be a minimum of 2.0 hours. Any detectable leakage shall be cause for rejection and the leakage shall be corrected prior to retesting.

e. After installation of the pumping equipment, and after inspection, operation, testing, and adjustment have been completed by the qualified start-up engineer, each pump shall be given a running test in the presence of the OWNER. Testing shall be conducted to indicate that the pumps, motors, and drives generally conform to the efficiencies and operating conditions specified and its ability to operate without vibration, overheating, or over-loading. The pumps and motors shall operate at the specified capacities in the range of heads and capacity specified without undue noise or vibration. Any undue noise or vibration in the pumps or motors, which is objectionable, will be sufficient cause for rejection of the units.

4. Pump Warranty:

a. Pump warranty shall be provided by the pump manufacturer and shall warrant the units against defects in workmanship and materials for a period of five (5) years under normal use, operation and service. The warranty shall be in printed form and apply to all similar units. A copy of the warranty statement shall be submitted with the approved shop drawings.

5. Spare Parts:

a. Contractor is required to supply the following spare parts:

i. Two (2) Impellers
ii. Two (2) Seal Kits
iii. One (1) Vega radar sensor
iv. One (1) Mechanical Ball Float
v. One (1) Control Panel Relay of each type

vi. Three (3) Control Panel Fuses of each type

9.03 Type II Lift Station (>15 Horsepower)

A. Scope of Work

1. The Work specified in this Section consists of furnishing, installing, testing, and placing into service all pumping equipment including pumps, motors, bases, and appurtenances. Unless otherwise specified, the pump manufacturer shall furnish each pumping unit complete with drive motor and all other components and shall be held entirely responsible for the compatibility in all respects of all components furnished. Pumping units shall be as specified herein, and shown on the Drawings.

2. Equipment Arrangement: Unless specifically indicated otherwise, the arrangement of equipment shown on the Drawings is based upon information available at the time of design and is not intended to show exact dimensions particular to a specific manufacturer. Some aspects of the Drawings are diagrammatic and some features of the illustrated equipment arrangement may require revision to meet the actual equipment requirements. Structural supports, foundations, piping and valve connections, and electrical and instrumentation connections indicated may have to be altered to accommodate the equipment provided. No additional payment will be made for such revisions and alterations. Substantiating calculations and drawings shall be signed and sealed by licensed professional engineer in the State of Indiana and be submitted to the Town prior to commencing construction.

B. Quality Assurance

1. All similar components shall be manufactured and furnished by one manufacturer unless specifically approved by Engineer in writing.

2. Equipment shall be in accordance with the following standards, as applicable and as indicated in each equipment specification:

   a. American Society for Testing and Materials (ASTM).
   b. American National Standards Institute (ANSI).
   c. American Society of Mechanical Engineers (ASME).
   d. American Water Works Association (AWWA).
   e. American Welding Society (AWS).
   f. Hydraulic Institute (HI).
   g. National Fire Protection Association (NFPA).
   h. National Electrical Manufacturers Association (NEMA).
   i. Manufacturer's published recommendations and specifications.

C. Submittals

1. Shop Drawings: Shop Drawings for the lift station and associated equipment shall be submitted. Submittals shall include, but not be limited to, the following documentation:

a. Descriptive literature including materials of construction, equipment weight, motor data, pressure ratings, certification of all applicable ASTM standards;

b. Predicted performance curves developed for the specific application. Performance curves shall plot speed, capacity, head, horsepower, efficiency, and NPSH requirements over the manufacturer's recommended range of operation;

c. Dimensional factory drawings including cross sectional views of pumps and all equipment showing details of construction;

d. Written report on the factory test results;

e. Manufacturer's installation instructions.

2. Operation and Maintenance Manuals: Contractor shall submit one (1) hard copy and one (1) digital submission on USB flash drive of the Operation and Maintenance Manuals to the Owner. Manuals shall include, at a minimum, the following:

a. Warranty Statement
b. Pump down test procedures and results from the start-up tests;
c. Operation Instructions;
d. Maintenance Instructions;
e. Recommended spare parts list;
f. Lubrication schedules;
g. Structural diagrams;
h. As-built wiring diagrams;
i. Piping and Instrumentation Drawings (P&ID); and
j. Bill of materials

D. Experience Qualifications:

1. The equipment to be furnished hereunder shall be made by a manufacturer regularly engaged in such work, and who has furnished similar installations and had them in successful and continuous operation for a period of 10 years.

C. **Factory Testing:**

1. Each pump to be delivered under this Section shall be tested for performance at the pump manufacturer's factory to determine head versus capacity, efficiencies, and kilowatt draw required for the operating points that are specified. All tests shall be run in accordance with the latest edition of the American Hydraulic Institute Standards and Submersible Wastewater Pump Association and at the appropriate voltage and frequency. Testing shall also include, but not be limited to, the following:

a. Head vs. flow with five (5) equally spaced points including shutoff and maximum flow shall be certified.
b. The input KW, speed, power factor, no load current, and torque characteristics shall be certified.
c. Impeller, motor rating, and electrical connections shall first be checked for compliance to the specifications.

d. Insulation Test: A motor and cable insulation test for moisture content or insulation defects shall be made.
e. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.
f. Operational Test: The pump shall be run for 30 minutes submerged, under a minimum of six feet of water.
g. After the operational test (described in line F) has been conducted, the insulation test (described in line D above) shall be performed again.
h. After testing, the pump shall be inspected to insure that the pump maintains full watertight integrity.
i. A written report stating the tests have successfully been completed and providing the results of the test shall be provided for each pump. The pump manufacturer shall also certify that similar tests have been conducted on pumps of a similar size for a period of not less than five (5) years.

D. **Products**

1. Manufacturers

a. Flgyt
b. Alternates and substitutions to be approved by **Town of Whitestown**.

2. Schedule

a. Include the following example schedule in the construction drawings.

Parameter	**Pump Schedule**
Manufacturer	Flygt
Pump Model	N 3XXX
Quantity	Two (2)
Impeller Size	XX.XXX inch
Motor HP	XXX
RPM	X,XXX
Electric Service	460 volt / 60 Hz / 3 phase
Operating Point (1 pump)**	X,XXX gpm @ XXX' TDH
Operating Point (2 Pumps)	X,XXX gpm @ XXX' TDH
Minimum Pump Efficiency	XX%
NPSHr	XX ft.
NEC Classification	Above min. pump submergence level = Class 1, Div 1, Groups C & D Below min. pump submergence level = Unclassified
Cooling Jacket Equipped	Yes
VFD Operation	Yes
Discharge Connection	X inch

Shut-Off Head	XXX ft.

(**) Basis of Design at full speed

3. Wetwell & Valves Pits

   a. Wetwell Design:

      i. Minimum wetwell dimensions shall be equivalent to a minimum diameter of 10-feet internal diameter, or approved alternative from the Town in writing.

      ii. All piping connections inside the wetwell shall be bolted flange connections. Mechanical joint connections are not permitted.

      iii. All hardware shall be stainless steel.

      iv. Provide a stainless steel cable hanger assembly, mounted to the lift station lid, opposite the pump discharge piping. The assembly shall provide one double hook for each power cable(s) and level control cable(s). The hanging of multiple cables on one hook will not be permitted.

      v. Pump power cords shall be stainless steel double hook style with stainless steel Hubbel Kellem Heavy Duty Single Eye strain relief.

      vi. Control Cable cords shall be stainless steel double hook style with stainless steel Hubbel Kellem Light Duty Single Eye strain relief.

      vii. The wetwell vent shall consist of a Purafil Vent PV40 with Rain Shield or approved equal.

      viii. The interior wetwell walls shall be coated using the same system as specified for sanitary sewer manholes in Section 5.03 C. Coat the interior walls and ceiling of the wetwell down to within 6” of the grouted fillet. The floor of the wetwell shall not be coated.

      ix. Provide a slide gate on interior of the wetwell, mounted to the face of the concrete wall. All hardware shall be stainless steel. Gate shall be manufactured by Rodney Hunt or approved equal.

   b. Valve Vault Design:

      i. All piping connections inside the valve vault shall be bolted flange connections. Mechanical joint connections are not permitted.

      ii. All hardware shall be stainless steel.

      iii. All valves are to be manufactured by De-Zurik

      iv. Minimum valve vault dimensions shall be equivalent to a minimum diameter of 10-feet internal diameter, or approved alternative from the Town in writing.

v. All forcemain piping shall be a minimum of 54-inches in depth from finished grade.

vi. Piping shall be coated with a protective coating as outlined for the wetwell above, or as approved in writing by the Town.

4. Submersible Pumps and Appurtenances

a. Pump Design:

i. The pump shall be centrifugal, non-clog, solids handling, submersible type capable of handling raw water or unscreened sewage. The discharge connection elbow shall be permanently installed in the wetwell along with the discharge piping. The pump shall be automatically and firmly connected to the discharge connection elbow when lowered into place and shall be easily removed for inspection or service. There shall be no need for personnel to enter the wetwell. Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple linear downward motion of the pump.

ii. The pump mounting base shall include guide rail supports and a discharge connection with a 125-lb. standard flange, faced and drilled. The base and the discharge piping shall be permanently mounted in place. The base plates shall be anchored in place utilizing epoxy type anchors with stainless steel studs and nuts as manufactured by HILTI Fasteners, Inc. or equal. No portion of the pump shall bear directly on the floor of the sump.

iii. A chopper style pump may be required and will be determined by the Town on a case by case basis.

b. Materials of Construction

Materials of Construction [Motor HP > 11 HP]	
Pump Housing	ASTM A-48, Class 35B
Impeller and Insert Ring	ASTM A-532 Alloy III A (25% Chrome)
Cooling Jacket	Stainless Steel AISI 316
Stator Housing	ASTM A-48, Class 35B
Shaft	ASTM A479 S43100-T
Shaft Seal: Pump side	Corrosion Resistant Tungsten Carbide
Shaft Seal: Motor Side	Corrosion Resistant Tungsten Carbide
Coating System	Two-pack Oxyrane Ester Duosolid 50

c. Pump Construction:

i. Volute

(1) The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have integral spiral-shaped, sharp-edged groove(s) that is cast into the suction cover. The spiral groove(s) shall

provide the sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The internal volute bottom shall provide effective sealing between the multi-vane semi-open impeller and the volute.

(2) Critical mating surfaces where watertight sealing is required shall be machined and fitted with nitrile O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and I-ring contact of four sides without the requirement of a specific torque limit. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as equal. No secondary sealing compounds, elliptical O-rings, grease, or other devices shall be used.

ii. Impeller

(1) The impeller blades shall be self-cleaning upon each rotation as they pass across a sharp relief groove in the Insert ring and shall keep the impeller blades clear of debris. The clearance between the insert ring and the impeller leading edges shall be adjustable.

iii. Discharge Connection

(1) The pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet well. Sealing of the pump to the discharge connection shall be accomplished by a machined metal-to-metal watertight contact. No portion of the pump shall bear directly on the sump floor.

iv. Mechanical Seal

(1) Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion and abrasion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber shall be a leakage-free seal. The upper seal shall contain one stationary and one positively driven rotating corrosion and abrasion resistant tungsten-carbide seal ring. The rotating seal ring shall have small back-swept grooves laser inscribed upon its face to act as a pump as it rotates, returning any fluid that should enter the dry motor chamber back into the lubricant chamber. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating

members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance. Any leakage passing the sealing shall not pass the bearings. Before it reaches the bearings the liquid shall create an alarm via the floating leakage sensor.

(2) Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. Seal lubricant shall be non-hazardous.

(3) The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.

d. Motor Design:

i. Electrical design:

(1) The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31.The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F. The motor shall be capable of withstanding at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel. The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. The use of wire nuts or crimp-

type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer.

(2) The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C. ambient and shall have a NEMA Class B maximum operating temperature rise of 80° C. A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.

(3) Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

ii. Power Cable:

(1) The motor shall be equipped with 50 feet of screened cable suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.

(2) The cable entry shall consist of dual cylindrical elastomer sleeves, flanked by washers, all having a close tolerance fit against the cable and the cable entry. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

iii. Bearings and Shaft:

(1) The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated and have a nominal L10 lifetime of 50.000 hours. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. Single row lower bearings are not acceptable.

(2) The pump and motor shaft shall be a single piece unit. The pump shaft is an extension of the motor shaft. Shafts using mechanical couplings shall not be acceptable. The shaft shall be stainless steel – ASTM A479 S43100-T. Shaft sleeves will not be acceptable.

iv. Cooling System

(1) The pump shall be capable of operating in a continuous condition in a liquid with a temperature up to 104°F even when the motor is not submerged.

(2) The motor shall be provided with an integral motor cooling system. A stainless-steel cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid through the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket.

(3) The motor shall be capable of no less than 30 evenly spaced starts per hour and be able to operate throughout the entire pump performance curve from shut-off through run-out even when the motor is not submerged.

v. Motor Protection

(1) The motor shall be protected by 3 thermal switches embedded in the stator set to open at 285°F (140°C) and one leakage sensor floating type located in the stator chamber. The sensor and the switches shall be connected to the control panel which shall stop the motor and send an alarm when the sensors are activated.

(2) The thermal switches and float switch shall be connected to a Mini CAS control and status monitoring unit. The Mini CAS unit shall be designed to be mounted in the pump control panel.

e. Rail System:

i. A rail system shall be provided for easy removal of the pump and motor assembly for inspection and service. The entire weight of the pump shall be guided by no less than two (2) stainless steel guide rails, size as recommended by pump manufacturer, extending from the top of the station to the discharge connection. The guide rails shall be positioned and supported by the pump mounting base. The guide rails shall be aligned vertically and supported at the top by an attachment to the access hatch frame. Stainless steel intermediate guide rail support(s) shall be required in accordance with pump manufacturer's spacing recommendations.

ii. The rails shall function to allow the complete weight of the pumping unit to be lifted on dead center without binding and stressing the pump housing. The rail system shall function to automatically align the pumping unit to the discharge connection by a simple downward movement of the pump. No twisting or angle approach will be considered acceptable.

f. Lifting Systems:

i. Each submersible pump shall be provided with and set-up for a Flygt "Grip-Eye" lifting system. Each pump shall then be fitted with a 316 stainless steel lifting chain extending from the top of the station to the stainless steel "Grip-Eye" safety hook attached to the pump unit. The working load of the lifting system shall be 50% greater than the pump unit weight.

g. Flow Meter:

i. SITRANS F M MAG 5100 W electromagnetic flow meter manufactured by Siemens shall be installed in the valve box of the lift station. The flow meter shall be combined with SITRANS F M MAG 5000 transmitter.

5. Station Power

a. Lift station power shall be coordinated with the electric utility. Preferred voltage is 480/277V, 3phase, 4wire. Alternate power source configurations should be consulted with the Town.

b. Power shall enter through a Service Entrance Rated Manual Transfer Switch with the following specs:

i. 3 – position rotary (on-off-on)

ii. Generator Connections: CamLok 16 Series

iii. Service Entrance rated with main circuit breaker

iv. Enclosure: NEMA 4X Stainless Steel

v. Strip heater with thermostat

vi. Door Safety Interlock

vii. Utility Indicator Lights

6. Control Panel

a. All of the automatic control equipment is to be supplied by one manufacturer. It shall be factory assembled, wired, tested and covered by complete electrical drawings and instructions.

b. Lift station controls shall be manufactured by Toric Engineering, Indianapolis, Indiana. The controls shall have the following features.

i. Incoming Power: Main Circuit Breaker

ii. Accessory Circuit breakers as required.

iii. Enclosure Type: NEMA 4X Stainless Steel

iv. Controller: Allen Bradley CompactLogix

v. HMI: Allen Bradley PanelView Plus

vi. Network Switch: Phoenix Contact

vii. Cell Modem: 4RF Aprisa

viii. UPS: APC, BR700G

ix. Indicators: LED push to test

x. Variable Frequency Drives: ABB, ACQ580 (Harmonic mitigation required, include ULH)

xi. Pump Protection Relays: Mounted inside of control panel

xii. Panel Air conditioner (if using VFDs): IceQube or equal.

xiii. Level Control

(3) Primary Level control of the lift station shall be by Vega radar level sensor.

(4) Backup Level control of the lift station shall be by four mechanical ball floats, wired independently of the Primary Level Control system. A ball float shall be provided for the following:

- Pump Off Float
- Pump On Float (Lead)
- Pump On Float (Lag)
- High Level Alarm Float which activates the backup control system.
- Panel controls and ball floats shall utilize relay logic outside of PLC controller.

E. **Execution**

1. Preparation

a. Coordinate with other trades, equipment and systems to the fullest extent possible.

b. Take all necessary measurements in the field to determine the exact dimensions for all work and the required sizes of all equipment under this contract. All pertinent data and dimensions shall be verified by the CONTRACTOR.

2. Installation

a. Installation shall be in strict accordance with the manufacturer's instructions and recommendations in the locations shown on the Contract Drawings. Anchor bolts shall be set in accordance with the manufacturer's recommendations and setting plans.

b. The Contractor shall also provide from the submersible pump supplier the service of a qualified start-up engineer (factory representative) who has had prior on- site start-up experience to assist in performing start-up, check-out and initial operation services of the pumping units. The start-up engineer shall also instruct the Owner's personnel on the

operation and maintenance procedures for the station. Qualified supervisory services, including manufacturers' engineering representatives, shall be provided for a minimum of two (2) full working days to ensure that the work is done in a manner fully approved by the respective equipment manufacturer. The pump manufacturer's representatives shall specifically supervise the installation of the pump and the alignment of the connection piping. If there are difficulties in the start-up or operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no cost to the Owner.

c. A certificate from the pump manufacturer shall be submitted stating that the installation of his/her equipment is satisfactory, that the equipment is ready for operation and that the operating personnel have been suitably instructed in the operation, lubrication and care of each unit.

3. Field Tests

a. All mud, gravel and foreign objects shall be removed from the lift station and sewer lines prior to testing.
b. Exfiltration Testing:

i. Plug all inlet lines before starting presoak period.
ii. Presoak period shall be at least 4.0 hours.

iii. Following the presoak period, fill the structure to a depth of 6-inches below the top structure joint.

iv. The test period shall be a minimum of 2.0 hours. Any detectable leakage shall be cause for rejection and the leakage shall be corrected prior to retesting.

c. After installation of the pumping equipment, and after inspection, operation, testing, and adjustment have been completed by the qualified start-up engineer, each pump shall be given a running test in the presence of the OWNER. Testing shall be conducted in accordance with Chapter 605.04 of the Citizens Energy Group Sanitary Standards Manual to indicate that the pumps, motors, and drives generally conform to the efficiencies and operating conditions specified and its ability to operate without vibration, overheating, or over-loading. The pumps and motors shall operate at the specified capacities in the range of heads and capacity specified without undue noise or vibration. Any undue noise or vibration in the pumps or motors, which is objectionable, will be sufficient cause for rejection of the units.

4. Pump Warranty

Pump warranty shall be provided by the pump manufacturer and shall warrant the units against defects in workmanship and materials for a period of five (5) years under normal use, operation and service. The warranty shall be in printed form and apply to all similar units. A copy of the warranty statement shall be submitted with the approved shop drawings.

5. Spare Parts: Contractor is required to supply the following spare parts:

a. Two (2) Impellers
b. Two (2) Seal Kits

c. One (1) Vega radar sensor
d. One (1) Mechanical Ball Float
e. One (1) Relay of each type used in Control Panel
f. Three (3) fuses of each type used in Control Panel

Appendices

MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS, THAT WE _____

_____

as Contractor, and _____

as Surety are held and firmly bound unto_____ as Obligee in the penal sum of _____

_____Dollars ($_____), for the

payment of which well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

WHEREAS, the Contractor entered into a contract dated _____

with the Obligee for the **Town of Whitestown** in accordance with the Contract Drawings, Plan and Specifications of the Obligee.

WHEREAS, the Specifications pertaining to said work require that the same shall be free from all defects caused by inferior materials or the result of poor workmanship for the period of three (3) years from the date of acceptance of the whole work of this contract. The bond shall be for 10% of the total contract amount.

NOW, THEREFORE, if the Principal shall in all things observe the guarantee described in the foregoing paragraph, and shall protect and indemnify said Obligee from an against any and all loss, costs, attorneys fees and expense of whatsoever kind and character which said Obligee shall sustain by reason for the failure of said Principal to faithfully observe the guarantee hereinbefore described that this obligation shall be void: otherwise the same shall be and remain in full force and effect.

Signed, Sealed and Dated this _____ day of _____,

20_____.

_____

(Name of Contractor)

_____

(Name of Surety)

_____

(Address)

By:_____

_____

(Officer of Surety)

Title:_____

_____

(Witness)

ATTEST

_____

(Officer of Surety)

_____

(Address)

APPROVED AS TO FORM

BY_____

PERFORMANCE BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER *(name and address)*:

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location)*:

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:

Amount:

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

_____ *(seal)*

Contractor's Name and Corporate Seal

By: _____

Signature

_____

Print Name

_____

Title

Attest: _____

Signature

_____

Title

SURETY

_____ *(seal)*

Surety's Name and Corporate Seal

By: _____

Signature *(attach power of attorney)*

_____

Print Name

_____

Title

Attest: _____

Signature

_____

Title

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:

3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

7.2 additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

Standard Town of Whitestown Details

TOWN OF WHITESTOWN
BOONE COUNTY, INDIANA

STANDARD CONSTRUCTION DETAILS

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DRAWING SHEET INDEX

STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. I-0

WATER MAIN GENERAL NOTES

1. WATER MAINS TO BE EITHER DUCTILE IRON, PVC, OR HDPE (WITH TOWN APPROVAL ONLY). WATER MAINS MATERIAL SHALL CONFORM TO SECTION 3.02 OF THE TOWN'S SPECIFICATIONS. JOINTS SHALL BE PUSH ON ELASTOMERIC TYPE. SEE SPECIFICATIONS FOR MORE DETAILS.

2. ALL FITTINGS TO BE DUCTILE IRON, CLASS 350 (AWWA C153) MECHANICAL JOINT (ANSI/AWWA C110/A21.10) WITH RESTRAINED OR LOCK JOINT. THRUST BLOCKS NOT ACCEPTABLE.

3. TERMINATE LOCATION WIRE AT WATER MAIN GATE VALVE WITH TERMINAL CONNECTION.

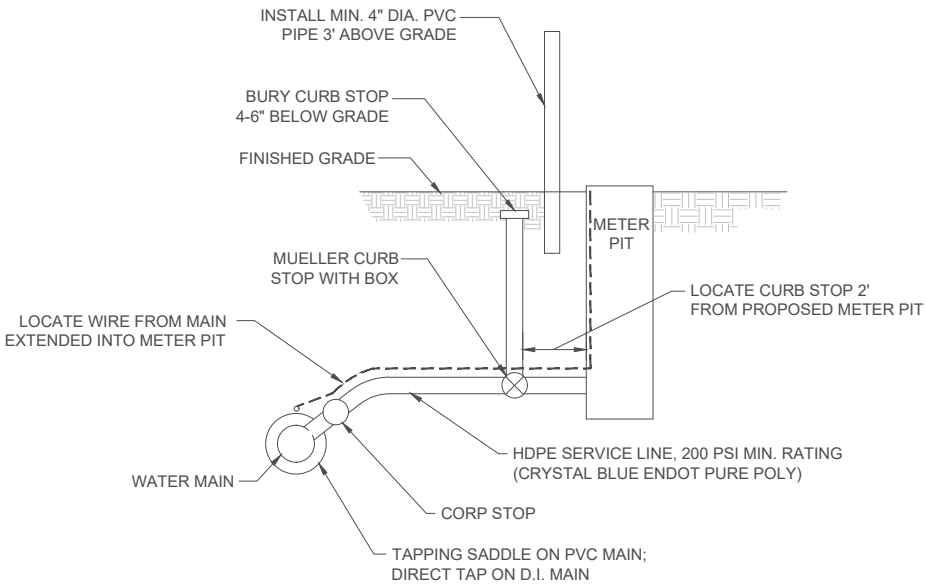
4. LOCATION WIRE SHALL BE COLORED BLUE FOR WATER AND GREEN FOR SANITARY SEWER. JOINTS IN LOCATE WIRES SHALL BE OVERHAND KNOTTED AND CONNECTED WITH DRYCONN DIRECT BURY LUG AQUA WATER PROOF CONNECTOR. WIRE AND CONNECTOR SHALL BE WRAPPED WITH ELECTRICAL TAPE.

5. ALL NEW OR REPAIRED WATER MAIN SHALL BE DISINFECTED IN ACCORDANCE WITH AWWA 651 AND HYDROSTATIC TESTED IN ACCORDANCE WITH AWWA C600 PRIOR TO BEING PLACED IN SERVICE.

6. FIRE HYDRANTS SHALL BE PROVIDED AT MAXIMUM 500' INTERVALS ALONG WATER MAINS.

7. ALL WATER MAINS PROVIDING FIRE SERVICE SHALL BE MIN. 6" DIAMETER.

8. IN UNDEVELOPED AREAS, WATER MAIN MARKER POSTS MAY BE REQUIRED AT 400' INTERVALS OR AS REQUIRED FOR LINE OF SIGHT. HANDLEY INDUSTRIES OR EQUAL.



REVISIONS			
NO.	DESCRIPTION	DATE	BY

WATER SERVICE CONNECTION DETAIL

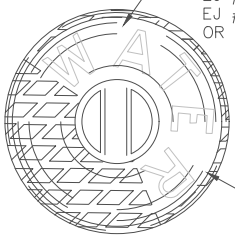
STANDARD DETAILS

TOWN OF WHITESTOWN

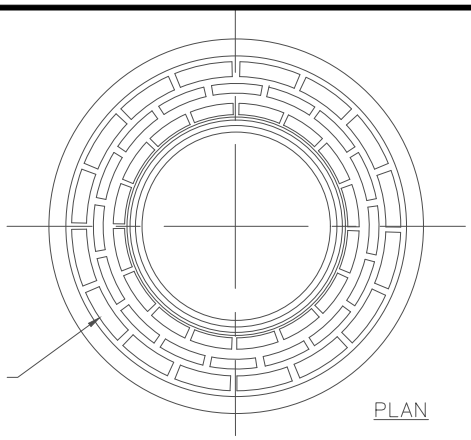
DATE: 06/30/25

SCALE: NTS

SHEET NO. 1



PLAN



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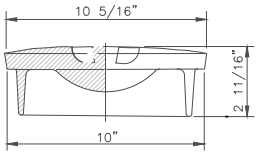
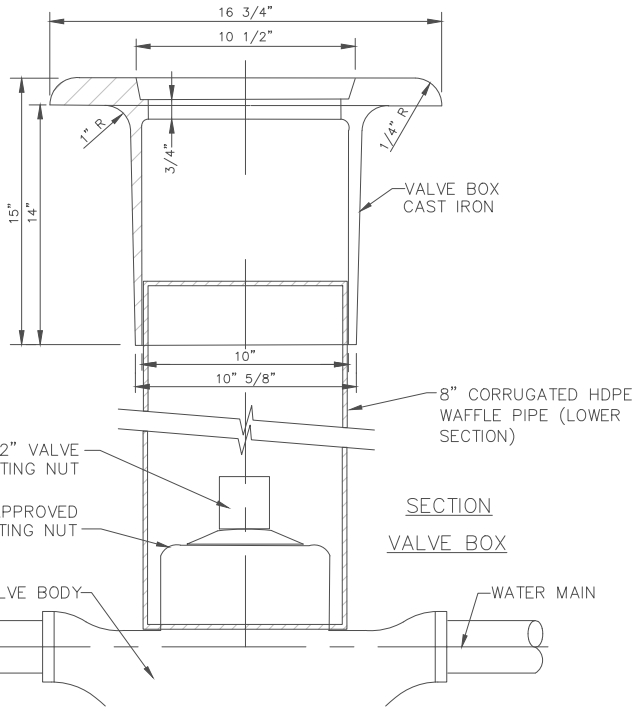


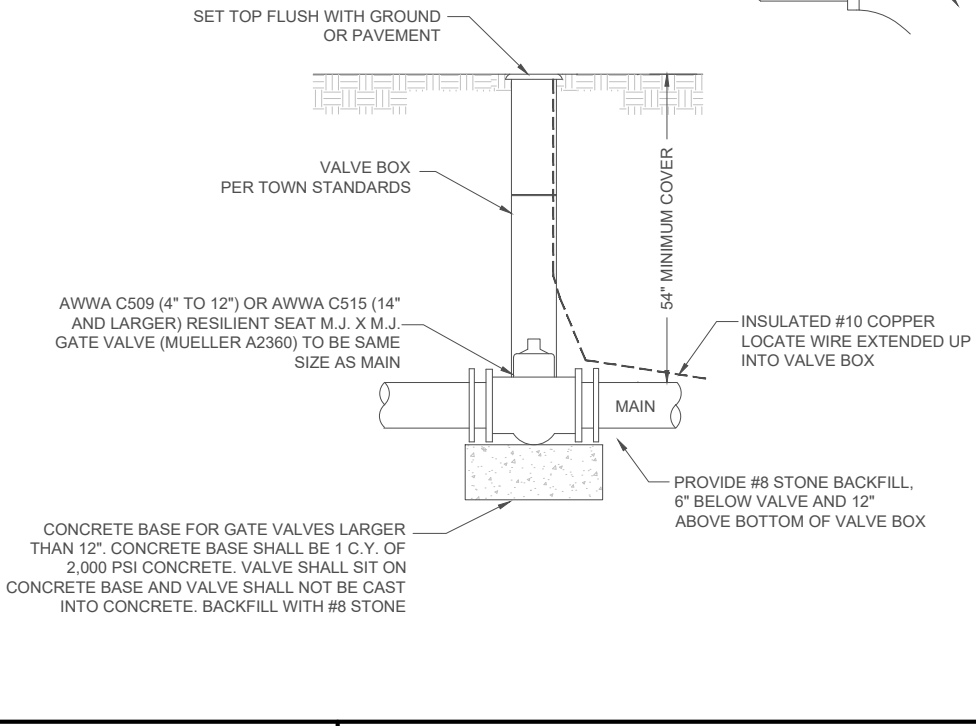
SECTION

VALVE BOX LID



SECTION

VALVE BOX



REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPICAL GATE VALVE & VALVE BOX

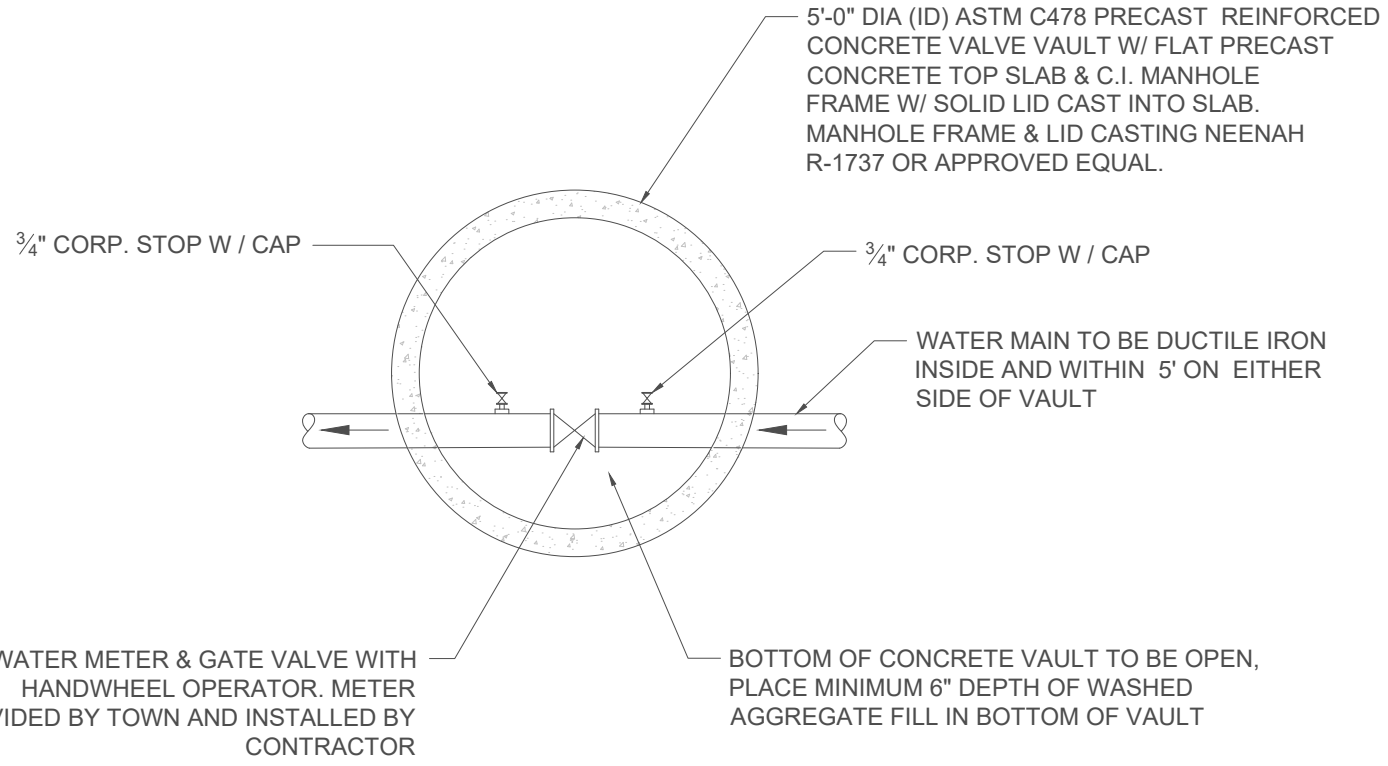
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 2



NOTE:
1. GATE VALVE SHALL BE MODEL SERIES 2360 BY MUELLER COMPANY.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

LEAK DETECTION METER DETAIL

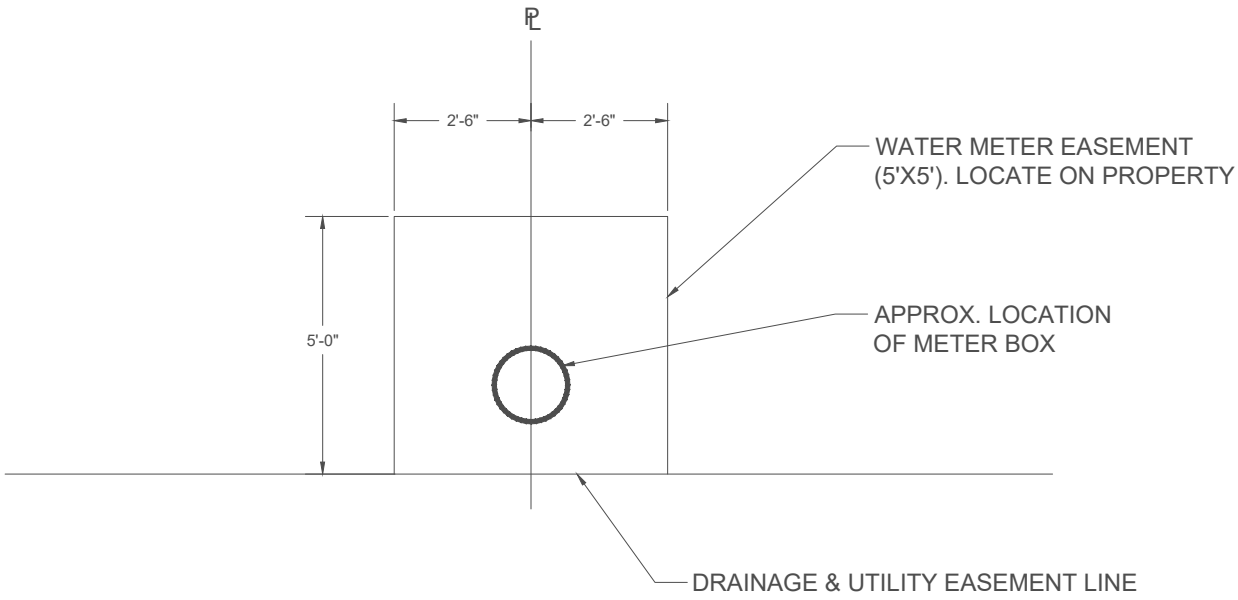
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 3



DANIEL R. CUTSHAW
REGISTERED
No.
11200431
STATE OF
INDIANA
PROFESSIONAL ENGINEER

REVISIONS			
NO.	DESCRIPTION	DATE	BY

METER PIT EASEMENT DIAGRAM

STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

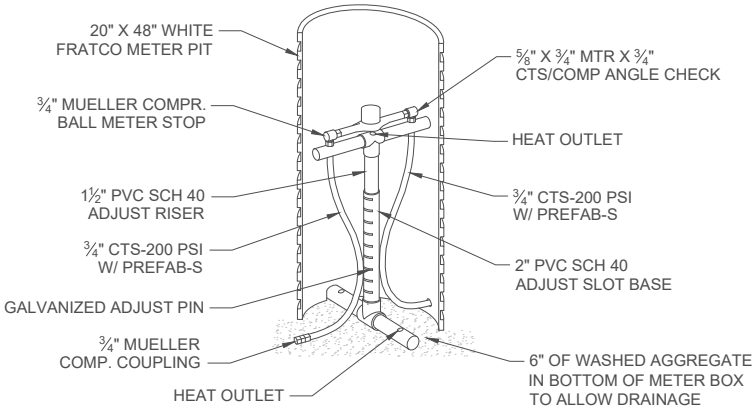
SCALE: NTS

SHEET NO. 4

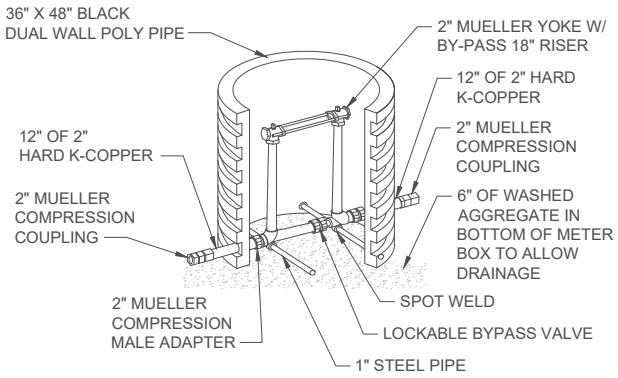
WATER METER AND SERVICE NOTES:

1. ALL 1"-2" TAPS TO PVC PIPE WILL USE A SMITH BLAIR #317 STYLE EPOXY COATED DUCTILE IRON SERVICE SADDLE WITH DOUBLE STAINLESS STEEL BANDS OR APPROVED EQUAL. DUCTILE IRON PIPE MAY BE DIRECT TAPPED. TAPS SHALL BE ANGLED UP 45° AT CONNECTION TO MAIN.
2. MINIMUM 6" OF WASHED AGGREGATE WILL BE USED UNDER ALL METER PITS FOR DRAINAGE.
3. ALL METERS LARGER THAN 2" WILL BE SUPPLIED AND INSTALLED BY THE CONTRACTOR, FROM TOWN'S VENDOR. METER(S) MUST BE SUBMITTED TO TOWN FOR APPROVAL PRIOR TO ORDERING.
4. ALL TUBING CONNECTIONS WILL BE DONE WITH MUELLER OR MCDONALD BRASS COMPRESSION FITTINGS.
5. ALL CORPORATION AND CURB STOPS WILL BE MUELLER 300 BALL VALVE OR MCDONALD EQUIVALENT.
6. FINAL GRADE OF METER PIT IS THE SOLE RESPONSIBILITY OF THE DEVELOPER. NO MORE THAN MAX. 12" RISER MAY BE ADDED IN ORDER TO BRING PIT TO GRADE.
7. METER PIT LIDS SHALL BE CAST IRON WITH LARGE PENTAGON NUT (MUELLER OR H-15000 SERIES OR APPROVED EQUAL). METER PIT LIDS SHALL HAVE HOLES FOR RADIO READ ANTENNA MOUNTING.
8. ALTERNATE FOR MUELLER, IF APPROVED, SHALL BE A.Y. MCDONALD BRASS. A LIST OF THOSE SPECIFICATION NUMBERS IS AVAILABLE UPON REQUEST FROM THE TOWN OF WHITESTOWN UTILITY MANAGER.
9. THE DEVELOPER SHALL SUBMIT FIXTURE UNIT FLOW AND PRESSURE LOSS CALCULATIONS FOR THE TOWN'S REVIEW AND APPROVAL FOR ANY PLANNED MULTI-FAMILY, COMMERCIAL, OR INDUSTRIAL CONNECTION.
10. METER PITS SHALL BE SINGLE INSTALL METER ONLY, NO DUAL METERS ARE PERMITTED.
11. ALL METER SETTERS SHALL BE SET WITHIN 14" OF THE TOP OF THE METER PIT LID.
12. ALL IRRIGATION CONNECTIONS SHALL BE AFTER THE METER AND OUTSIDE OF THE METER PIT.

WATER METER SETTING SCHEDULE					
STYLE	SINGLE 5/8"	SINGLE 3/4"	SINGLE 1"	SINGLE 1 1/2"	SINGLE 2"
INLET	3/4" COMP.	3/4" COMP.	1" COMP.	1 1/2" COMP.	2" COMP.
OUTLET	3/4" COMP.	3/4" COMP.	1" COMP.	1 1/2" COMP.	2" COMP.
METER BOX	T-Z-WH 5/8 X 3/4 SIN	T-Z-WH 3/4 X 3/4 SIN	T-Z-WH 1 X 1 SIN	T-Z-WH 1-2" SINGLE	T-Z-WH 2" SINGLE
LID	MUELLER - 11" LID AND DIA. OPENING W/(1) 2" TOUCH READ HOLE: PART NO. 55025			VESTAL - 20" LID & DIA. OPENING W/(2) 2" TOUCH READ HOLE: #21 EXTRA HEAVY MONITOR COVER W/TR.	
FRAME	MUELLER - 20" DIA. FRAME: PART NO. 063601-1			EXPANDA RING: MODEL #ER-2036	



TZ PRODUCTS SINGLE METER BOX



TZ PRODUCTS 2" SINGLE METER BOX

REVISIONS			
NO.	DESCRIPTION	DATE	BY

METER BOX AND METER SETTING

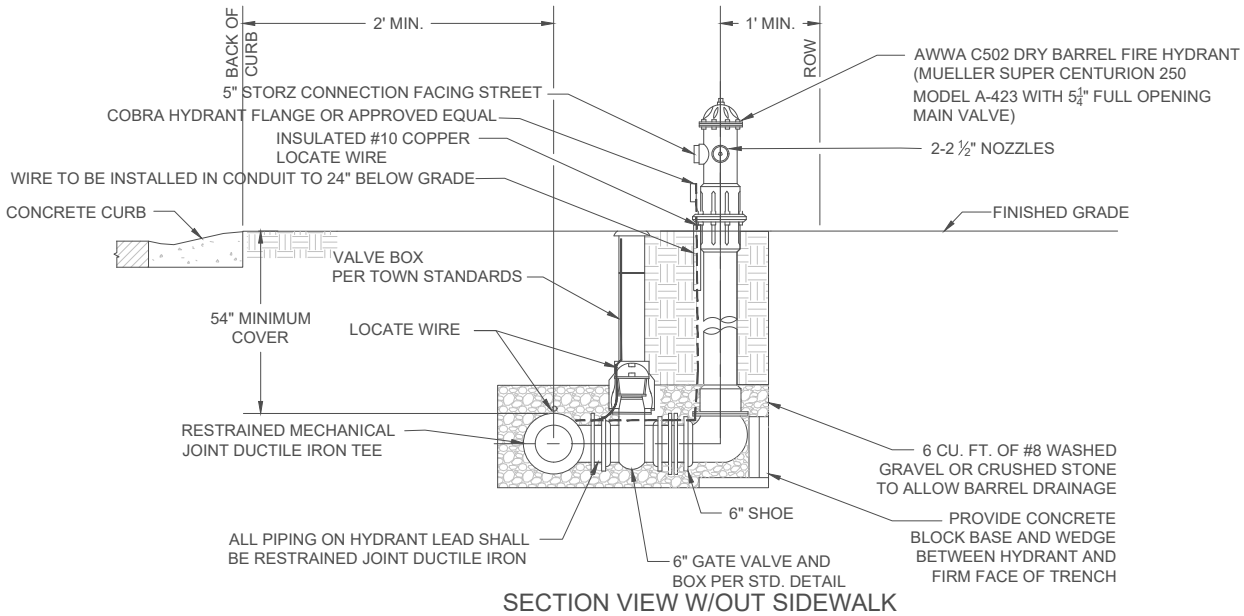
STANDARD DETAILS

TOWN OF WHITESTOWN

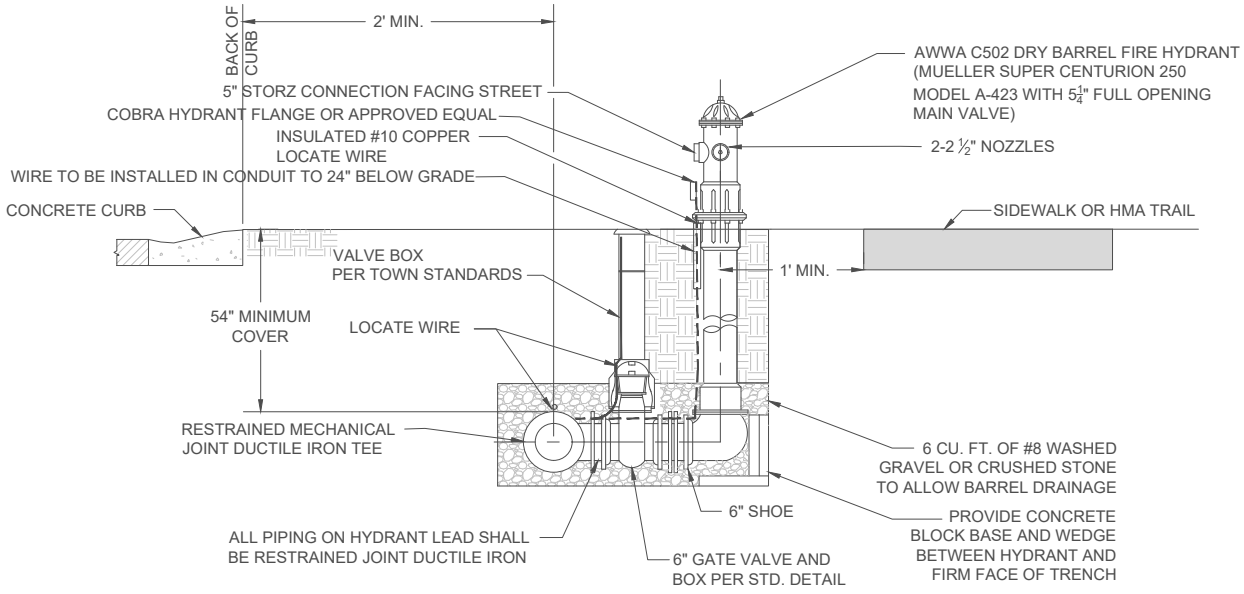
DATE: 06/30/25

SCALE: NTS

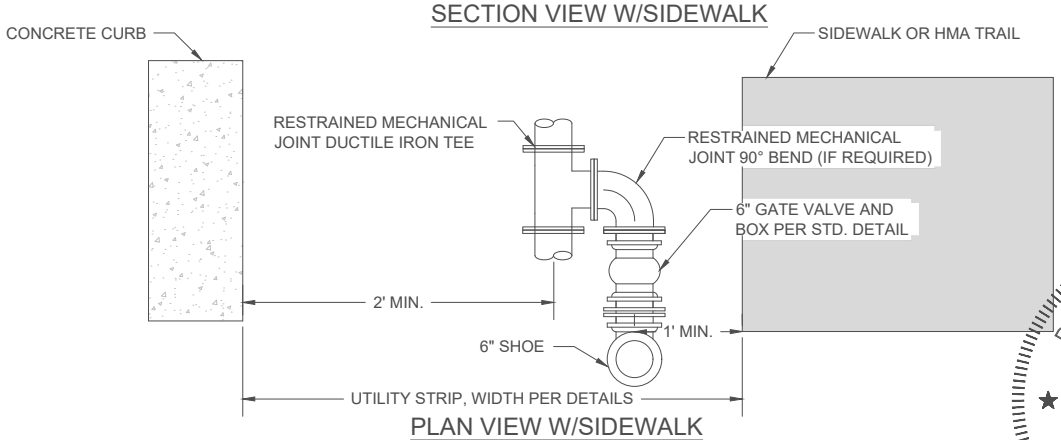
SHEET NO. 5



SECTION VIEW W/OUT SIDEWALK



SECTION VIEW W/SIDEWALK



PLAN VIEW W/SIDEWALK

NOTE:
1. SNOWPLOWABLE BLUE REFLECTORS SHALL BE INSTALLED IN CENTER OF ROAD AT ALL FIRE HYDRANTS; PROVIDE TOWN WITH AN OPERATING WRENCH AND TRAFFIC DAMAGE REPAIR KIT(S). SEE TOWN SPECIFICATIONS.
2. COLOR: PUBLIC HYDRANTS SHALL BE RED. PRIVATE HYDRANTS SHALL BE YELLOW.

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STATE OF
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REVISIONS			
NO.	DESCRIPTION	DATE	BY

STANDARD FIRE HYDRANT

STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 6

NOTES:

1. VAULT IS A GENERAL REPRESENTATION ONLY. THE DEVELOPER'S ENGINEER SHALL SUBMIT A SPECIFIC VAULT DETAIL FOR THE PLANNED FACILITY.

2. ALL METER ASSEMBLIES SHALL BE SPECIFIED BY THE TOWN OF WHITESTOWN. THE DEVELOPER'S ENGINEER SHALL PROVIDE FIXTURE UNIT FLOW AND PRESSURE LOSS CALCULATIONS FOR THE TOWN'S REVIEW AND ACCEPTANCE TO ALLOW A PROPER METER TO BE SELECTED.

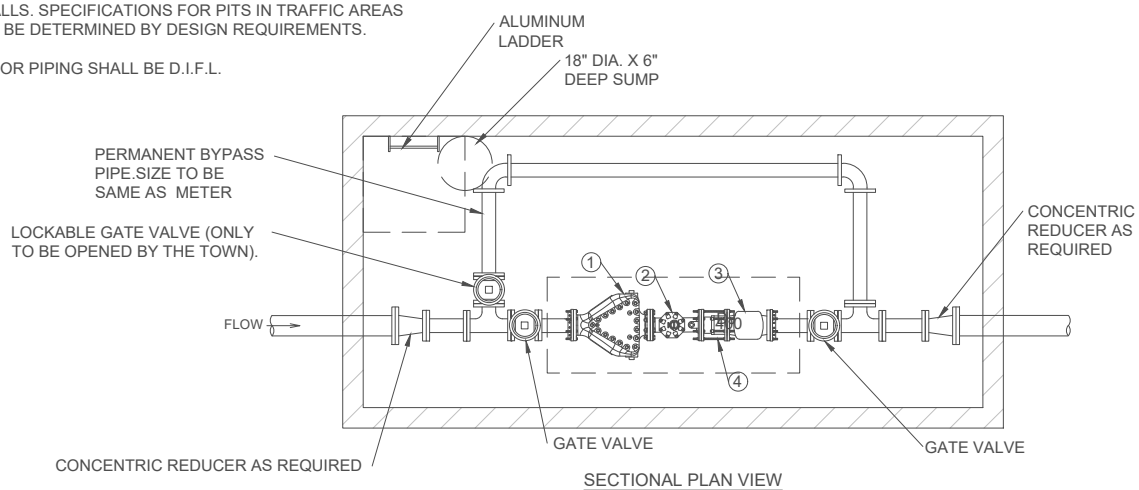
3. EACH METER VAULT SHALL BE EQUIPPED WITH A DOOR MOUNTED ELECTRONIC DEVICE FOR USE WITH A RADIO READING SYSTEM.

4. ALL FITTINGS SUCH AS BENDS AND TEES SHALL BE PROPERLY RESTRAINED.

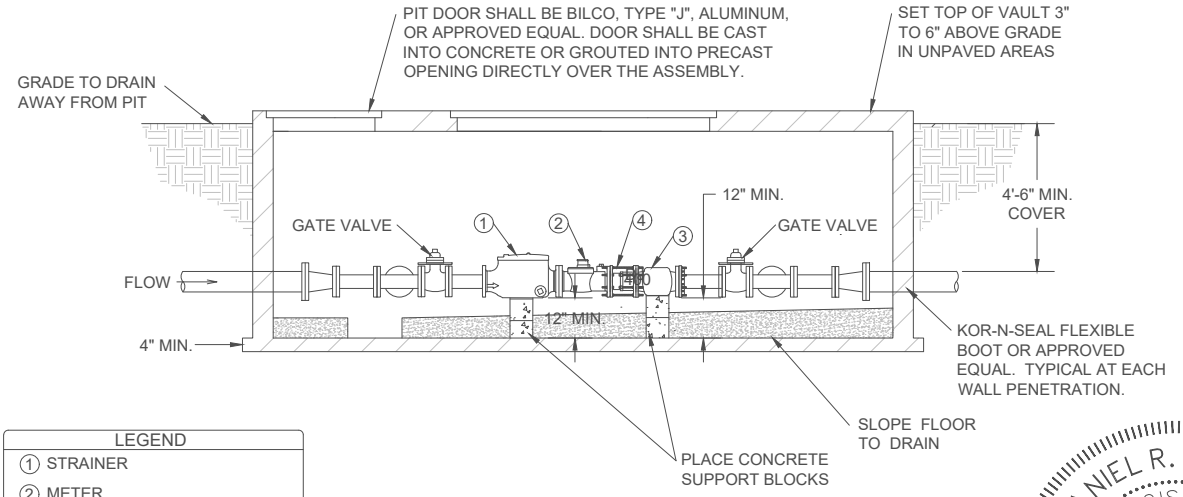
5. VAULT SIZE TO PROVIDE 12" MINIMUM CLEARANCE FROM ALL PIPING AND FITTINGS.

6. PIT/VAULT (NON-TRAFFIC AREA)
   PIT SHALL BE REINFORCED CAST-IN-PLACE CONCRETE, PRECAST CONCRETE, OR LAID BLOCK. APPLY APPROVED WATERPROOFING AGENT TO INTERIOR AND EXTERIOR OF WALLS. SPECIFICATIONS FOR PITS IN TRAFFIC AREAS SHALL BE DETERMINED BY DESIGN REQUIREMENTS.

7. INTERIOR PIPING SHALL BE D.I.F.L.



SECTIONAL PLAN VIEW



LEGEND
① STRAINER
② METER
③ CHECK VALVE
④ DISMANTLING JOINT ROMAC DJ400 OR DJ405. (SET AT NOMINAL LENGTH)

REVISIONS			
NO.	DESCRIPTION	DATE	BY

LARGE DIAMETER DOMESTIC METER
ASSEMBLY 3"-6"
METER INSTALLATION
STANDARD DETAILS

TOWN OF WHITESTOWN

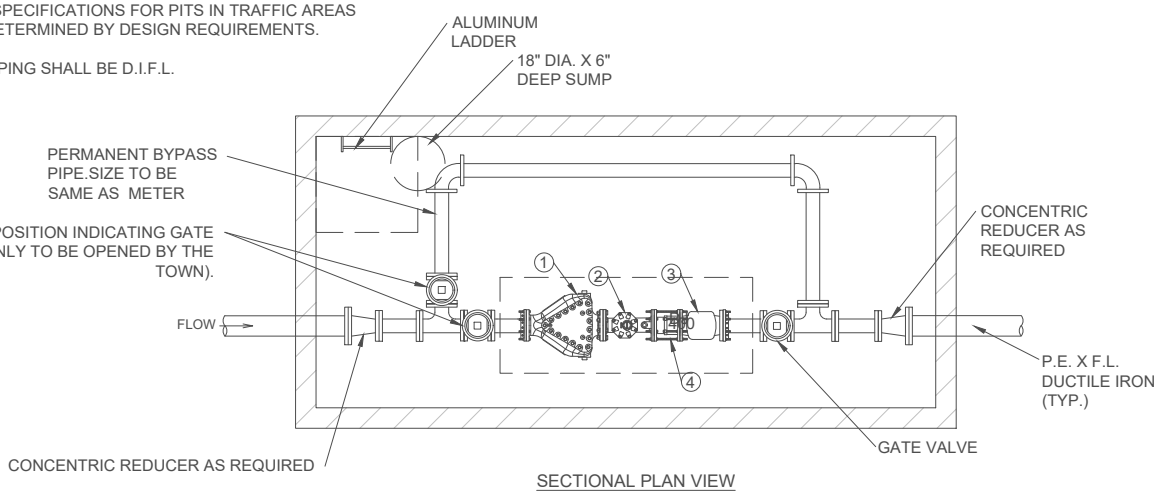
DATE: 06/30/25

SCALE: NTS

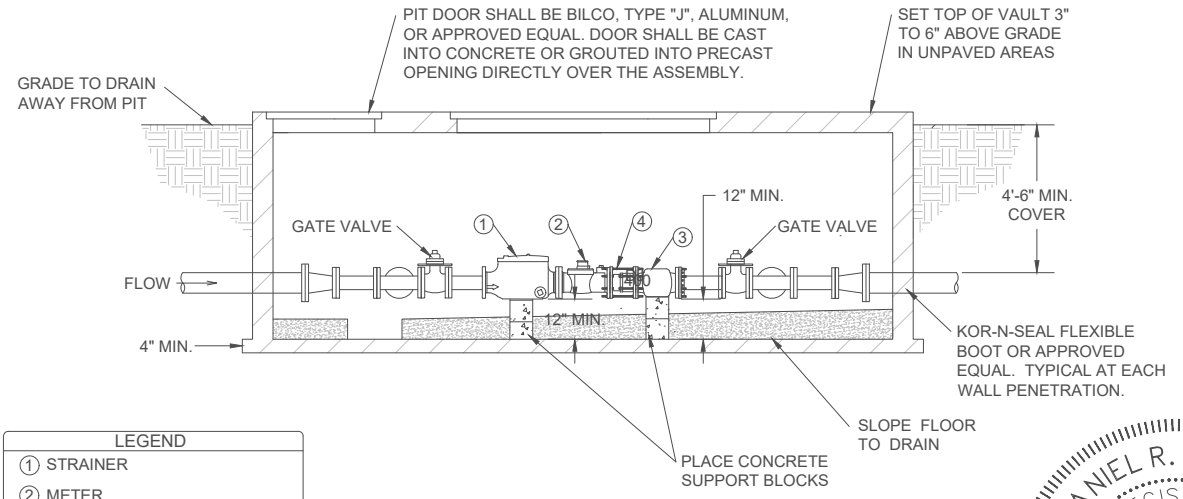
SHEET NO. 7A

NOTES:

1. VAULT IS A GENERAL REPRESENTATION ONLY. THE DEVELOPER'S ENGINEER SHALL SUBMIT A SPECIFIC VAULT DETAIL FOR THE PLANNED FACILITY.
2. ALL METER ASSEMBLIES SHALL BE SPECIFIED BY THE TOWN OF WHITESTOWN. THE DEVELOPER'S ENGINEER SHALL PROVIDE FIXTURE UNIT FLOW AND PRESSURE LOSS CALCULATIONS FOR THE TOWN'S REVIEW AND ACCEPTANCE TO ALLOW A PROPER METER TO BE SELECTED.
3. EACH METER VAULT SHALL BE EQUIPPED WITH A DOOR MOUNTED ELECTRONIC DEVICE FOR USE WITH A RADIO READING SYSTEM.
4. ALL FITTINGS SUCH AS BENDS AND TEES SHALL BE PROPERLY RESTRAINED.
5. VAULT SIZE TO PROVIDE 12" MINIMUM CLEARANCE FROM ALL PIPING AND FITTINGS.
6. PIT/VAULT (NON-TRAFFIC AREA)
   PIT SHALL BE REINFORCED CAST-IN-PLACE CONCRETE, PRECAST CONCRETE, OR LAID BLOCK. APPLY APPROVED WATERPROOFING AGENT TO INTERIOR AND EXTERIOR OF WALLS. SPECIFICATIONS FOR PITS IN TRAFFIC AREAS SHALL BE DETERMINED BY DESIGN REQUIREMENTS.
7. INTERIOR PIPING SHALL BE D.I.F.L.



SECTIONAL PLAN VIEW



LEGEND
① STRAINER
② METER
③ CHECK VALVE
④ DISMANTLING JOINT ROMAC DJ400 OR DJ405. (SET AT NOMINAL LENGTH)

REVISIONS			
NO.	DESCRIPTION	DATE	BY

FIRE METER ASSEMBLY 6"-12"
METER INSTALLATION

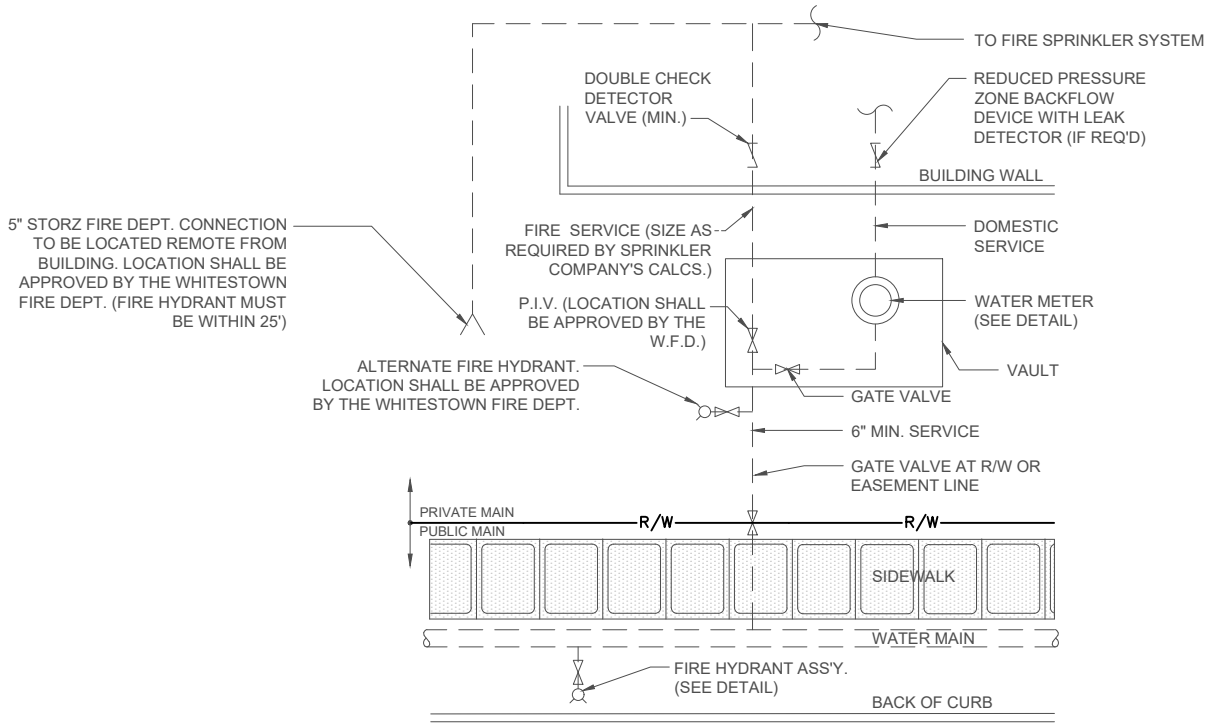
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 7B



NOTES FOR FIRE SERVICES AND OTHER PRIVATE MAINS

1. PRIVATE FIRE SERVICE MAINS SHALL BE OWNED AND MAINTAINED BY THE PROPERTY OWNER EITHER BEYOND THE SHUT-OFF VALVE LOCATED AT THE R/W/EASEMENT LINE OR BEYOND THE METER.
2. MULTI-UNIT RESIDENTIAL COMPLEXES MAY BE SERVED WITH A COMMON MAIN FOR FIRE AND DOMESTIC SERVICE, MASTER-METERED AT THE ENTRANCE TO THE PROPERTY, WITH FIRE DEPARTMENT CONNECTIONS FOR EACH BUILDING. A FIRE-SERVICE-RATED METER SHALL BE REQUIRED FOR SUCH A CONFIGURATION.
3. ALL PRIVATE MAINS SHALL BE CONSTRUCTED TO MEET OR EXCEED THE SAME STANDARDS AS PUBLIC MAINS IN ADDITION TO ANY APPLICABLE STANDARDS OF THE NFPA, AND SHALL BE HYDROSTATIC TESTED AND DISINFECTED PRIOR TO BEING PLACED INTO SERVICE.
4. THE OWNER SHALL REPAIR ANY LEAKS ON PRIVATE MAINS WITHIN 48 HOURS OF THEIR DISCOVERY. IF THE REPAIR IS NOT COMPLETED WITHIN THIS TIME, THE UTILITY CAN FIX THE LEAK AND CHARGE THE OWNER FOR THE COST OF REPAIRS OR SHUT OFF SERVICE UNTIL THE REPAIR IS MADE.
5. THE DEVELOPER'S ENGINEER SHALL SUBMIT DESIGN CALCULATIONS OF THE PLANNED SYSTEM FOR THE TOWN'S REVIEW.
6. AN APPROVED BACK FLOW PREVENTION DEVICE SHALL BE REQUIRED AT THE CONNECTION TO THE MAIN IF THERE ARE ANY POTENTIAL CROSS CONNECTION SOURCES WITHIN THE PRIVATE MAIN SYSTEM.
7. BACKFLOW PREVENTION AND CROSS-CONNECTION CONTROL SHALL COMPLY WITH 327IAC 8-10.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

FIRE SERVICE CONNECTION DETAIL
INTERNAL SPRINKLERS

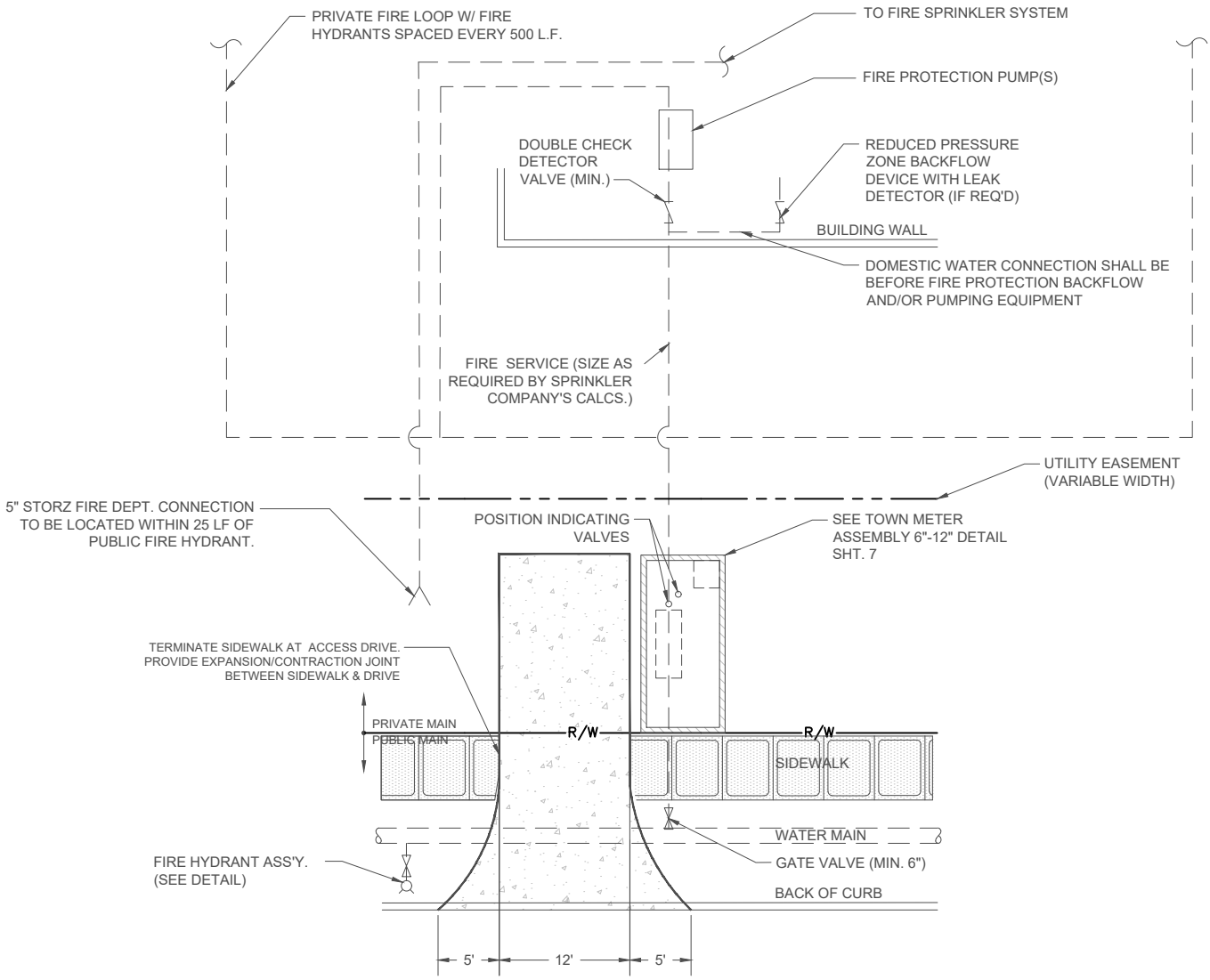
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 8A



NOTES FOR FIRE SERVICES AND OTHER PRIVATE MAINS

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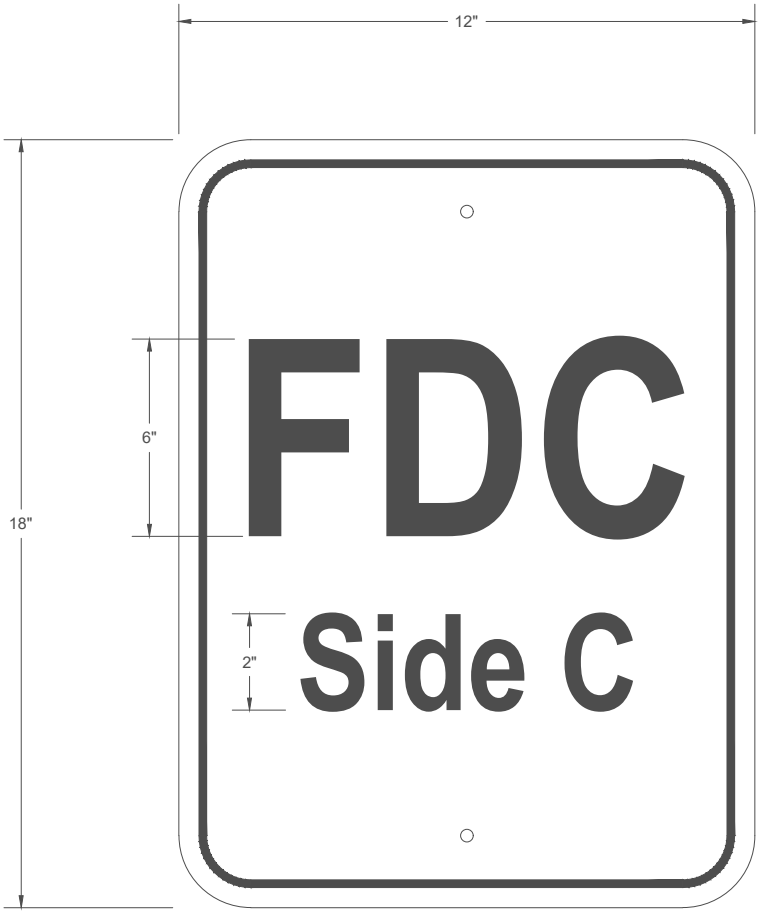
6. AN APPROVED BACK FLOW PREVENTION DEVICE SHALL BE REQUIRED AT THE CONNECTION TO THE MAIN IF THERE ARE ANY POTENTIAL CROSS CONNECTION SOURCES WITHIN THE PRIVATE MAIN SYSTEM.
7. BACKFLOW PREVENTION AND CROSS-CONNECTION CONTROL SHALL COMPLY WITH 327IAC 8-10.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

FIRE SERVICE CONNECTION DETAIL
PRIVATE FIRE LOOP(S)

STANDARD DETAILS
TOWN OF WHITESTOWN

DATE: 06/30/25
SCALE: NTS
SHEET NO. 8B



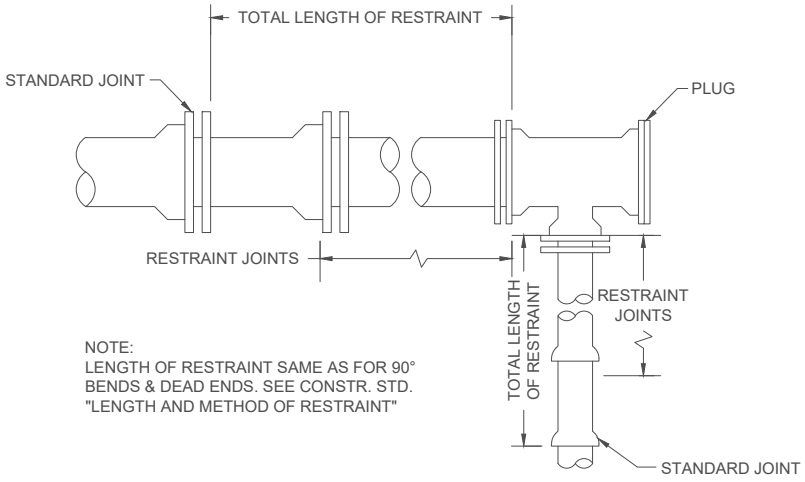
NOTES:

1. SIGN SIZE SHALL BE 18" X 12" WITH WHITE LETTERING ON RED REFLECTIVE BACKGROUND.
2. SIGN CHARACTER SIZE SHALL BE 6" AND 2"
3. SIGN SHALL BE PLACED ON ADDRESS SIDE OF BUILDING.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPICAL FIRE DEPARTMENT
CONNECTION SIGNAGE
STANDARD DETAILS
TOWN OF WHITESTOWN

DATE: 06/30/25
SCALE: NTS
SHEET NO. 9



NOTE:
LENGTH OF RESTRAINT SAME AS FOR 90° BENDS & DEAD ENDS. SEE CONSTR. STD. "LENGTH AND METHOD OF RESTRAINT"

REVISIONS			
NO.	DESCRIPTION	DATE	BY

RESTRAINT OF TEES-DETAIL

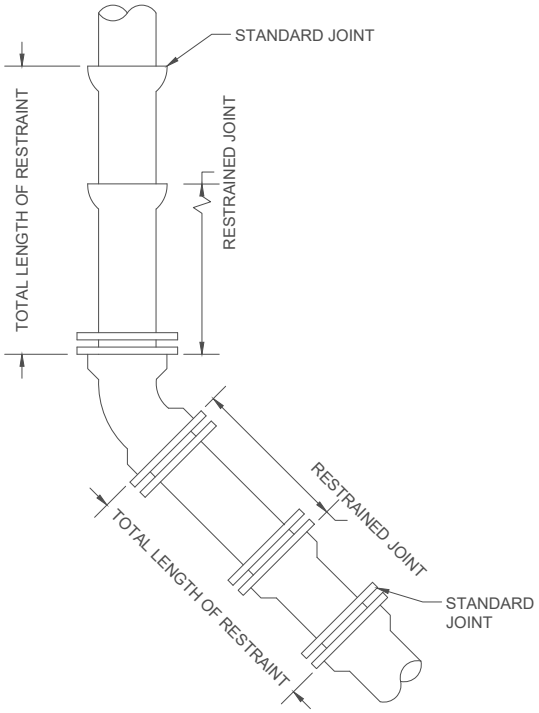
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 10



NOTE:
SEE CONSTRUCTION STD. FOR "LENGTH AND METHOD OF RESTRAINT"

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RESTRAINT OF BENDS-DETAIL

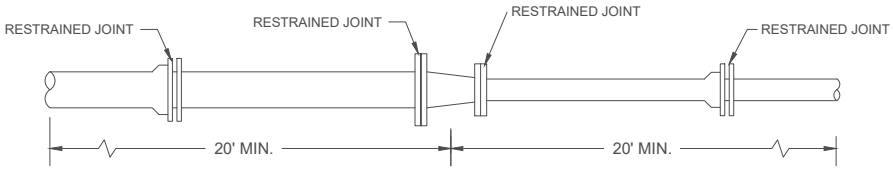
STANDARD DETAILS

TOWN OF WHITESTOWN

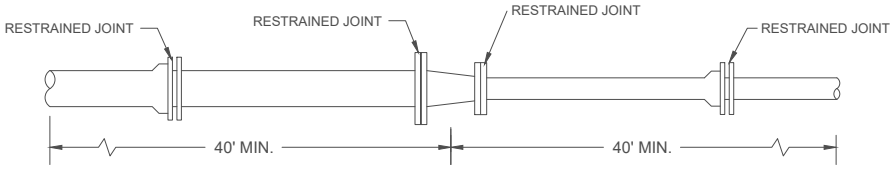
DATE: 06/30/25

SCALE: NTS

SHEET NO. 11



REDUCERS, LARGER PIPE DIAMETER IS 8" OR SMALLER



REDUCERS, LARGER PIPE DIAMETER IS 12" OR LARGER

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REVISIONS			
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RESTRAINT OF REDUCERS

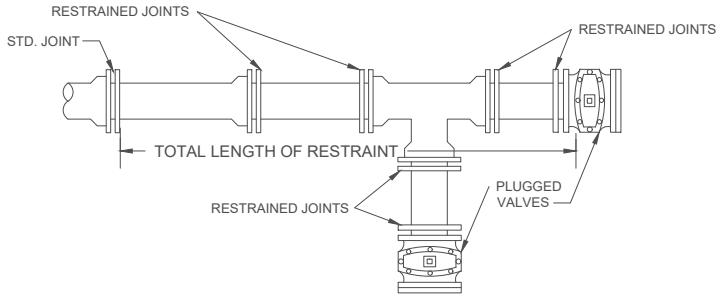
STANDARD DETAILS

TOWN OF WHITESTOWN

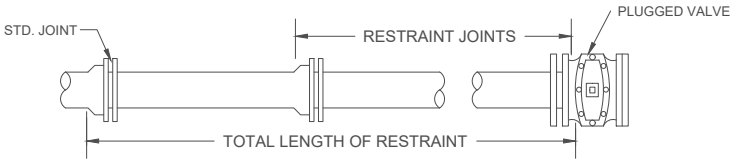
DATE: 06/30/25

SCALE: NTS

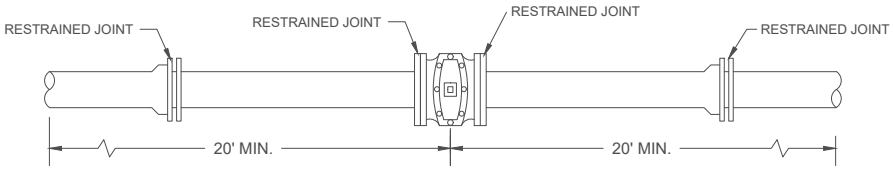
SHEET NO. 12



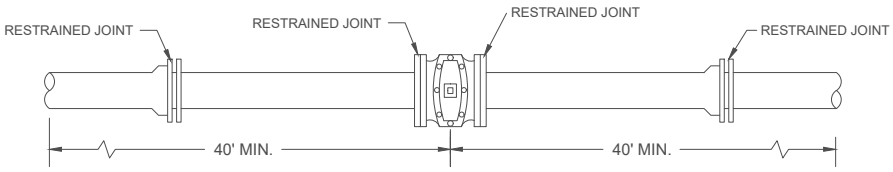
DEAD ENDS OF TEES



DEAD ENDS OF MAINS



VALVES (NON-DEAD END) 8" AND SMALLER



VALVES (NON-DEAD END) 12" AND LARGER

REVISIONS			
NO.	DESCRIPTION	DATE	BY

RESTRAINT OF VALVES

STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 13

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 4" DI PIPE W/ POLY						
TYPE OF BEND	4" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	44	18	10	10	10	53
VERT. BEND			22 UPPER	11 UPPER	10 UPPER	
			10 LOWER	10 LOWER	10 LOWER	

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 12" DI PIPE W/ POLY										
TYPE OF BEND	4" TEE	6" TEE	8" TEE	10" TEE	12" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	28	58	89	116	144	49	21	10	10	152
VERT. BEND							63 UPPER	31 UPPER	15 UPPER	
							17 LOWER	10 LOWER	10 LOWER	

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 6" DI PIPE W/ POLY							
TYPE OF BEND	4" TEE	6" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	39	66	25	11	10	10	74
VERT. BEND				31 UPPER	15 UPPER	10 UPPER	
				10 LOWER	10 LOWER	10 LOWER	

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 16" DI PIPE W/ POLY											
TYPE OF BEND	4" TEE	6" TEE	8" TEE	10" TEE	12" TEE	16" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	19	48	79	105	133	188	63	26	13	10	196
VERT. BEND								82 UPPER	39 UPPER	20 UPPER	
								22 LOWER	11 LOWER	10 LOWER	

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 8" DI PIPE W/ POLY								
TYPE OF BEND	4" TEE	6" TEE	8" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	34	62	89	32	14	10	10	97
VERT. BEND					41 UPPER	20 UPPER	11 UPPER	
					12 LOWER	10 LOWER	10 LOWER	

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 20" DI PIPE W/ POLY											
TYPE OF BEND	6" TEE	8" TEE	10" TEE	12" TEE	16" TEE	20" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	27	35	42	50	65	80	55	23	11	10	80
VERT. BEND								45 UPPER	22 UPPER	11 UPPER	
								20 LOWER	10 LOWER	10 LOWER	

1. CONTRACTOR SHALL INSTALL RJDI FITTINGS FOR ALL VERTICAL AND HORIZONTAL BENDS.
2. RESTRAINED LENGTHS WERE CALCULATED ASSUMING 54" DEPTH OF BURY, A 2.0 FACTOR OF SAFETY, TYPE 3 TRENCH CONDITIONS, "CL" SOIL CLASSIFICATION, AND 150 PSI HYDROSTATIC TEST PRESSURES. DESIGNER AND CONTRACTOR SHALL VERIFY INSTALLATION CONDITIONS AND MODIFY RESTRAINT LENGTHS AS REQUIRED TO MEET ACTUAL CONDITIONS SUBJECT TO REVIEW BY THE TOWN OF WHITESTOWN.
3. ALL WATER MAIN APPURTENANCES WITHIN RJDI LIMITS MUST BE RESTRAINED AT EACH JOINT.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

DUCTILE IRON RESTRAINED JOINT TABLES

STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 14

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 4" PVC						
TYPE OF BEND	4" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	28	17	7	4	2	33
VERT. BEND			19 UPPER	10 UPPER	5 UPPER	
			7 LOWER	3 LOWER	2 LOWER	

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 12" PVC										
TYPE OF BEND	4" TEE	6" TEE	8" TEE	10" TEE	12" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	18	37	54	69	84	44	19	9	5	89
VERT. BEND							51 UPPER	25 UPPER	13 UPPER	
							17 LOWER	8 LOWER	4 LOWER	

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 6" PVC							
TYPE OF BEND	4" TEE	6" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	26	42	24	10	5	3	47
VERT. BEND				27 UPPER	13 UPPER	7 UPPER	
				9 LOWER	5 LOWER	3 LOWER	

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 16" PVC											
TYPE OF BEND	4" TEE	6" TEE	8" TEE	10" TEE	12" TEE	16" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	13	33	52	66	82	111	57	24	12	6	116
VERT. BEND								67 UPPER	32 UPPER	16 UPPER	
								22 LOWER	11 LOWER	6 LOWER	

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 8" PVC								
TYPE OF BEND	4" TEE	6" TEE	8" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	23	40	57	31	13	7	4	62
VERT. BEND					36 UPPER	18 UPPER	9 UPPER	
					12 LOWER	6 LOWER	3 LOWER	

LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 20" PVC											
TYPE OF BEND	6" TEE	8" TEE	10" TEE	12" TEE	16" TEE	20" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	30	49	64	80	109	138	69	29	14	7	143
VERT. BEND								82 UPPER	40 UPPER	20 UPPER	
								26 LOWER	13 LOWER	7 LOWER	

1. CONTRACTOR SHALL INSTALL RJDI FITTINGS FOR ALL VERTICAL AND HORIZONTAL BENDS.
2. RESTRAINED LENGTHS WERE CALCULATED ASSUMING 54" DEPTH OF BURY, A 2.0 FACTOR OF SAFETY, TYPE 3 TRENCH CONDITIONS, "CL" SOIL CLASSIFICATION, AND 150 PSI HYDROSTATIC TEST PRESSURES. DESIGNER AND CONTRACTOR SHALL VERIFY INSTALLATION CONDITIONS AND MODIFY RESTRAINT LENGTHS AS REQUIRED TO MEET ACTUAL CONDITIONS SUBJECT TO REVIEW BY THE TOWN OF WHITESTOWN.
3. ALL WATER MAIN APPURTENANCES WITHIN RJDI LIMITS MUST BE RESTRAINED AT EACH JOINT.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

PVC RESTRAINED JOINT TABLES

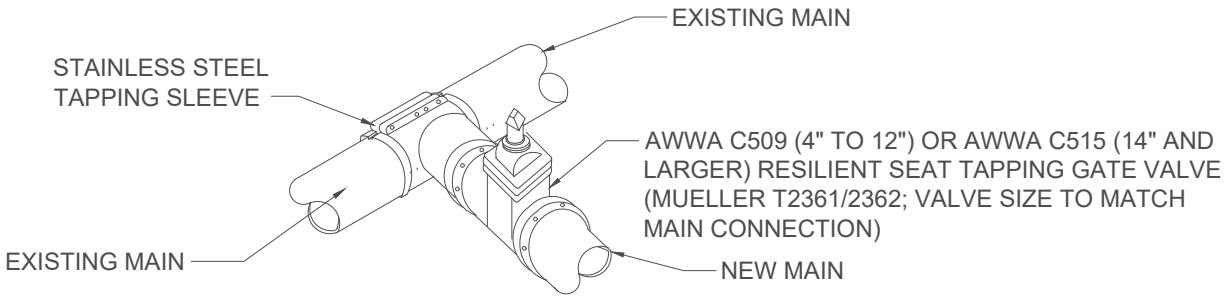
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 14A



NOTE:

1. MECHANICAL JOINT TAPPING SLEEVES SHALL NOT BE ACCEPTED.
2. BOLTS, NUTS, & WASHERS SHALL BE 304 STAINLESS STEEL.

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WET TAP TO EXISTING MAIN

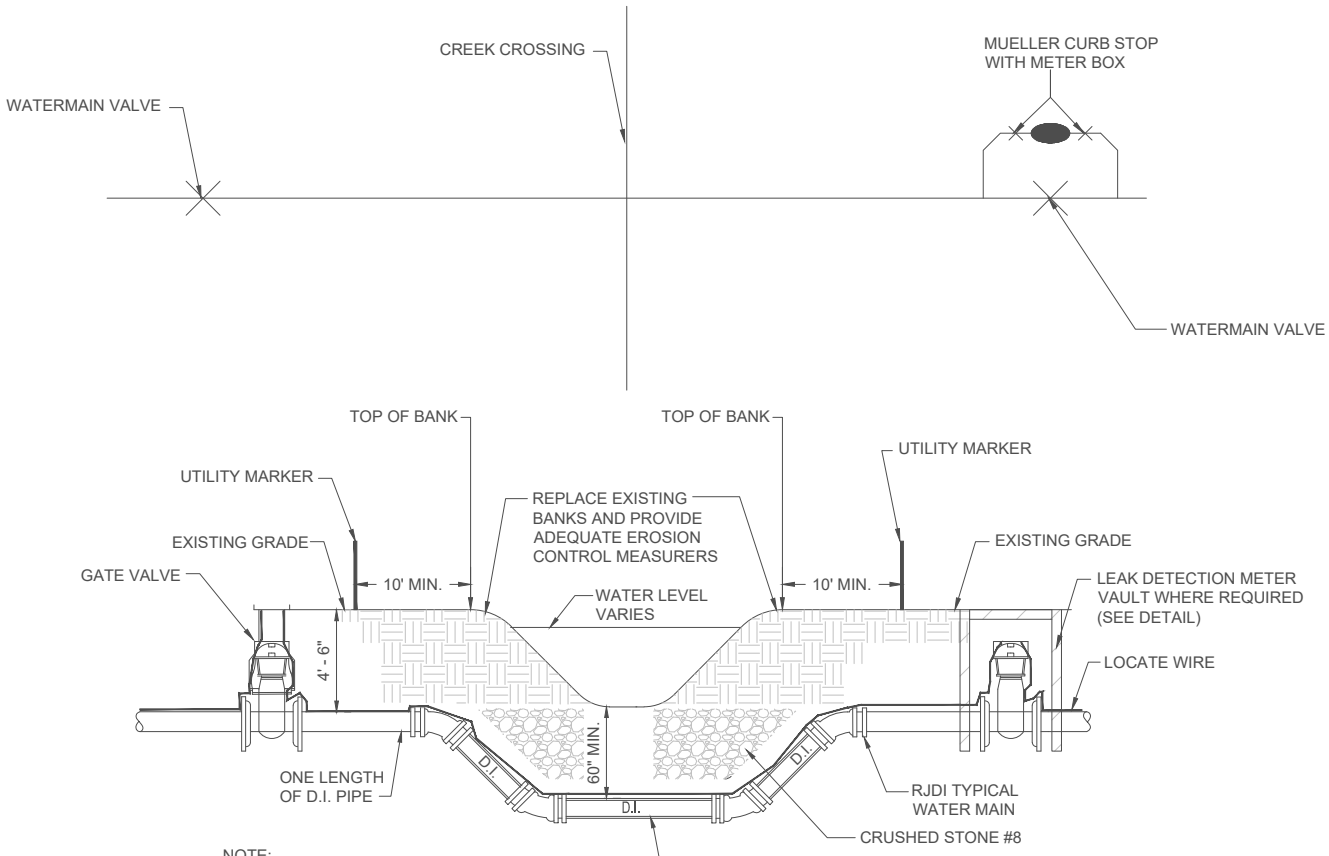
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 15



NOTE:

1. DEPTH MAY EXCEED 60"; COORDINATE W/ TOWN OF WHITESTOWN
2. LEAK DETECTION METER VAULT REQUIRED ON UPSTREAM SIDE FOR ALL CREEK CROSSINGS GREATER THAN 15' IN WIDTH (SEE DETAIL).
3. DEVELOPER / CONTRACTOR SHALL OBTAIN ALL APPLICABLE PERMITS IF PIPE IS TO BE INSTALLED BY OPEN CUT.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

WATER MAIN TYPICAL STREAM CROSSING DETAIL

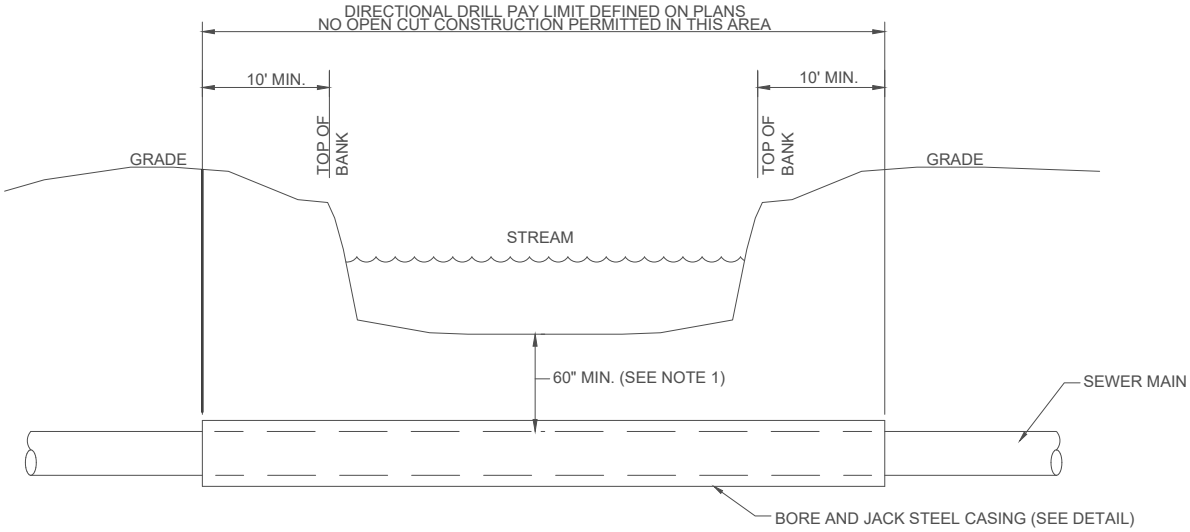
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 16



NOTE:
1: DEPTH MAY EXCEED 60"; COORDINATE W/ CCU.
2: FORCEMAIN TO BE INSTALLED SIMILAR TO WATER MAIN.

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GRAVITY SEWER TYPICAL STREAM CROSSING DETAIL

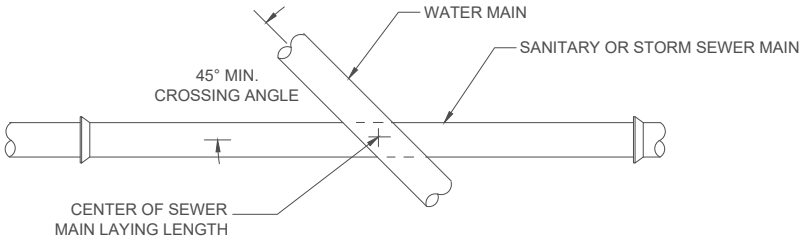
STANDARD DETAILS

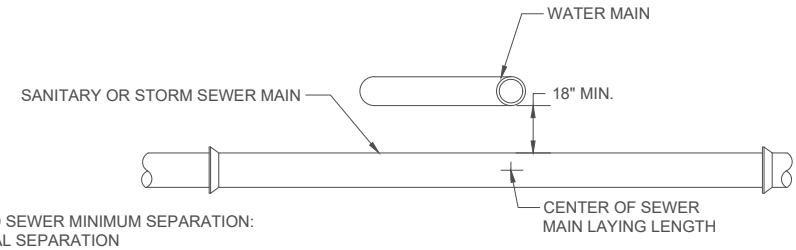
TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 16A





WATER MAIN AND SEWER MINIMUM SEPARATION:
18" VERTICAL SEPARATION
10'-0" HORIZONTAL SEPARATION

WATER MAIN GRADE PIPE TO BE USED FOR SANITARY OR STORM SEWER IF REQUIRED SEPARATION CANNOT BE MET.

PIPE CROSSING AT 45° ANGLE

REVISIONS			
NO.	DESCRIPTION	DATE	BY

MINIMUM PIPE CROSSING &
SEPARATION REQUIREMENTS

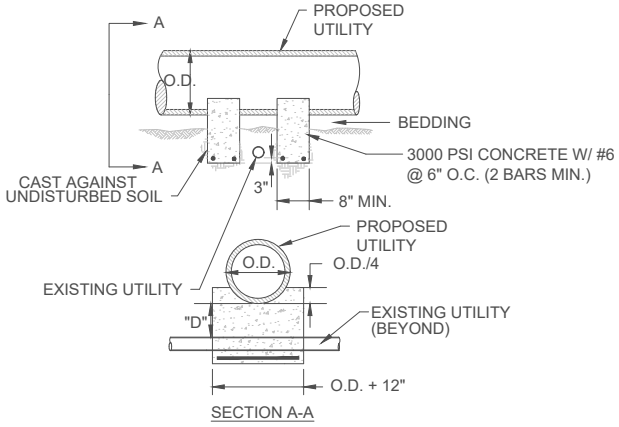
STANDARD DETAILS

TOWN OF WHITESTOWN

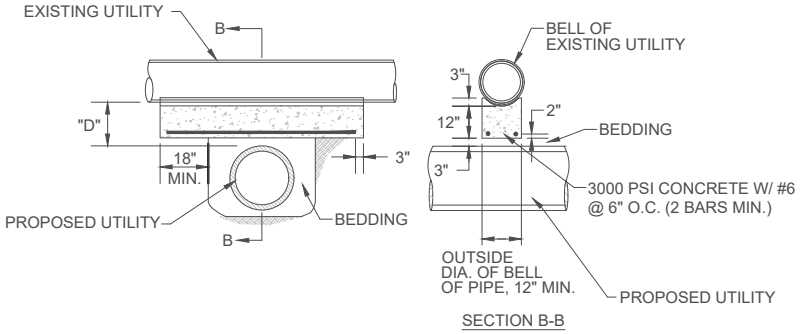
DATE: 06/30/25

SCALE: NTS

SHEET NO. 17



PROPOSED UTILITY CROSSING ABOVE EXISTING UTILITY



PROPOSED UTILITY CROSSING BELOW EXISTING UTILITY

NOTES:

1. PROVIDE SUPPORT WHEN "D" IS LESS THAN 12 INCHES
2. EXISTING UTILITIES SHALL MEAN: STEEL GAS MAINS, ELECTRIC/TELEPHONE CONDUITS, FIBER OPTIC BANKS, SANITARY SEWER PIPING, STORM SEWER PIPING, WATER MAIN PIPING, ETC.
3. USE OF A CONCRETE CRADLE WILL BE AUTHORIZED BY THE TOWN ON A CASE-BY-CASE BASIS
4. EXISTING UTILITIES SHALL MEAN: STEEL GAS MAINS, ELECTRIC/TELECOM CONDUITS, FIBER OPTIC BANKS, SANITARY SEWER PIPING, STORM SEWER PIPING, AND WATER PIPING.
5. SDR 26 PIPE SHALL BE USED FOR THE SEWER PIPE IF SPACING REQUIREMENTS CANNOT BE MET
6. WATER GRADE PIPE MAY BE REQUIRED FOR SEWER MAIN PIPE IF SEPARATION REQUIREMENTS CANNOT BE MET

REVISIONS			
NO.	DESCRIPTION	DATE	BY

PIPE CROSSING CRADLE

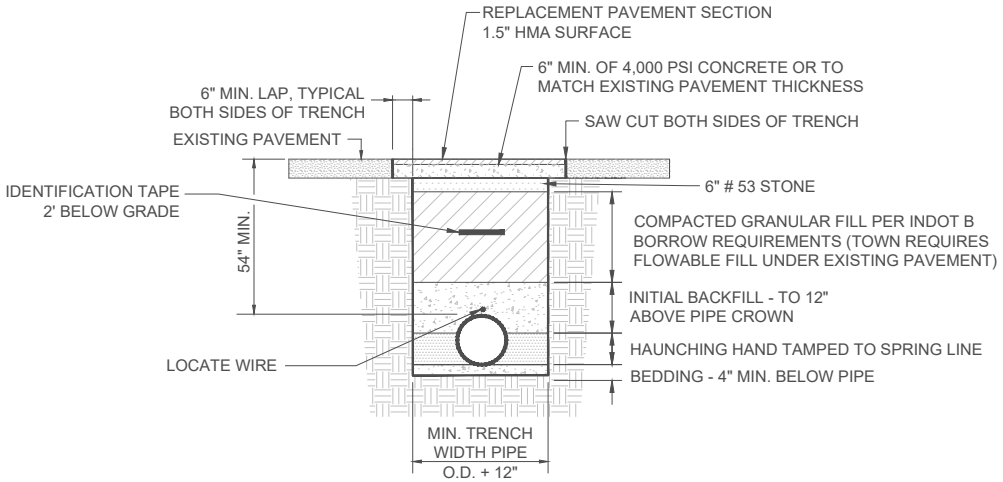
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 17A



NOTES:

1. EXISTING PAVEMENT IS TO BE SAW CUT FOR A CLEAN BREAK.
2. TRENCH SPOIL IS TO BE REMOVED FROM THE WORK SITE.
3. NEW SURFACE TO BE SLOPED AT SAME RATE AS THE EXISTING SURFACE.
4. GRANULAR FILL SHALL BE PROVIDED WITHIN 5' OF PAVED SURFACE.
5. EXISTING PAVEMENT SHALL BE BACKFILLED WITH FLOWABLE FILL.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPICAL TRENCH DETAIL FOR D.I. AND PVC C900
PIPE 12" DIA. OR LESS IN PAVED AREAS

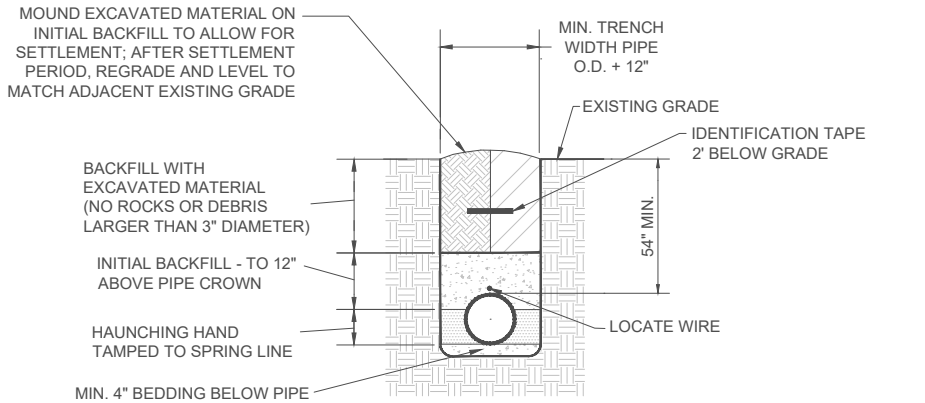
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 18



BEDDING, HAUNCHING AND INITIAL BACKFILL SHALL BE CLASS II CLEAN SAND (PER ASTM C12)

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TYPICAL TRENCH DETAIL FOR D.I. OR PVC C900
PIPE 12" DIA. OR LESS IN UNPAVED AREAS

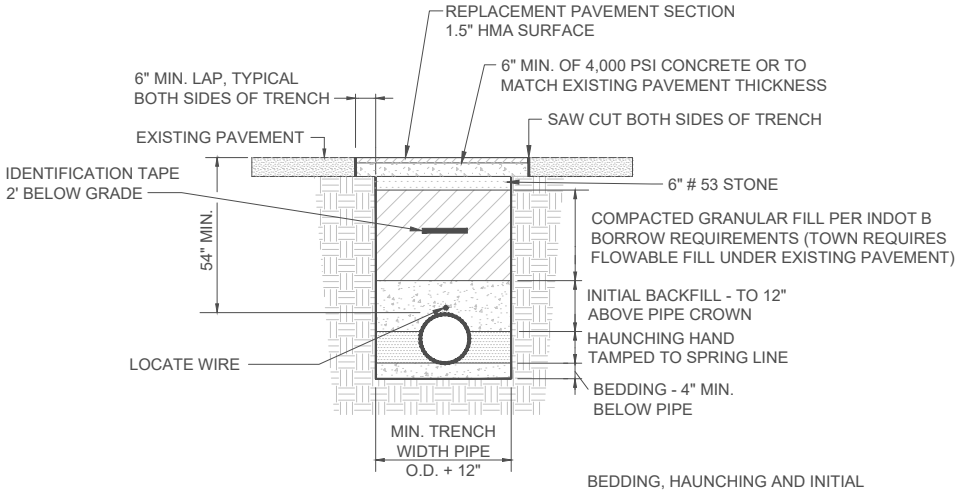
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 19



NOTES:

1. EXISTING PAVEMENT IS TO BE SAW CUT FOR A CLEAN BREAK.
2. TRENCH SPOIL IS TO BE REMOVED FROM THE WORK SITE.
3. NEW SURFACE TO BE SLOPED AT SAME RATE AS THE EXISTING SURFACE.
4. GRANULAR FILL SHALL BE PROVIDED WITHIN 5' OF PAVED SURFACE.
5. EXISTING PAVEMENT SHALL BE BACKFILLED WITH FLOWABLE FILL.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPICAL TRENCH DETAIL FOR D.I. OR PVC C905
PIPE LARGER THAN 12" DIA. IN PAVED AREAS

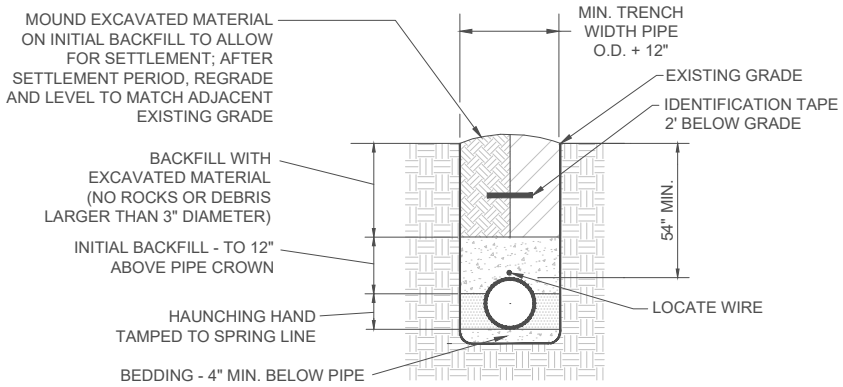
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 20



BEDDING, HAUNCHING AND INITIAL BACKFILL SHALL BE CLASS II CLEAN SAND (PER ASTM C12)

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TYPICAL TRENCH DETAIL FOR D.I. OR PVC C905
PIPE LARGER THAN 12" DIA. IN UNPAVED AREAS

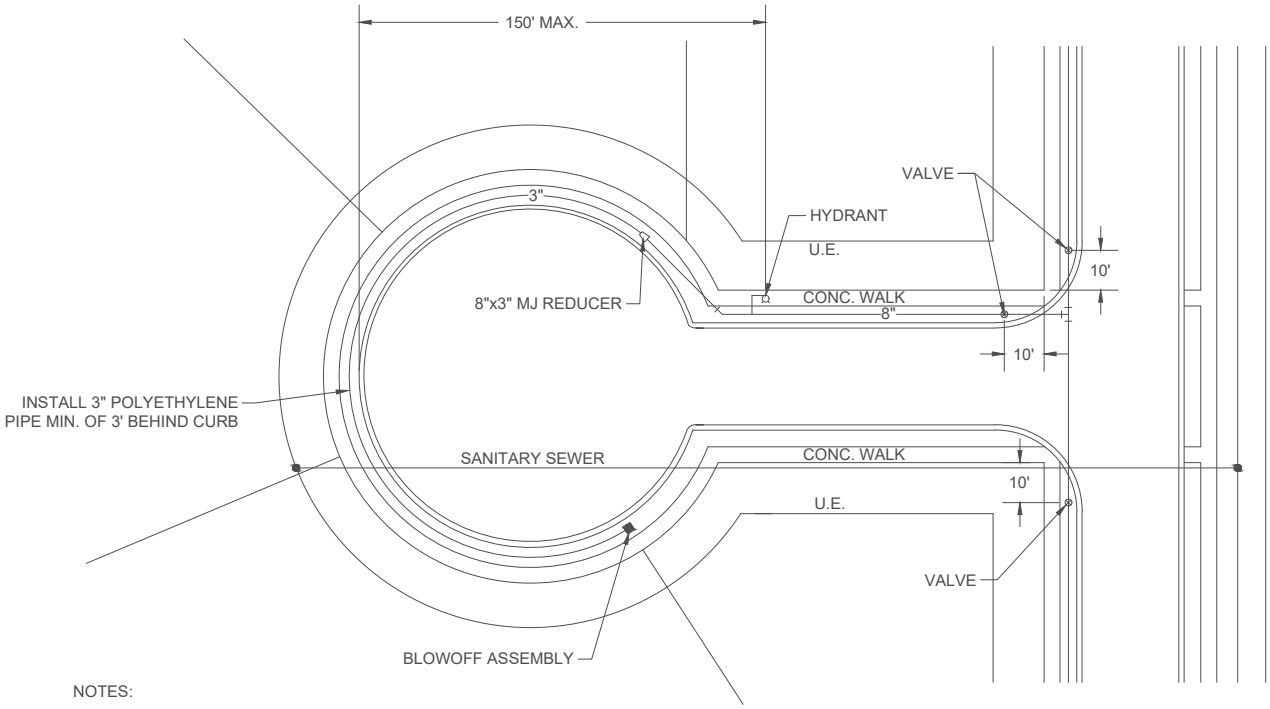
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 21



NOTES:

1. VALVE REQUIRED AT EACH CUL-DE-SAC. VALVE SHALL BE INSTALLED TO AVOID CURBS AND SIDEWALKS.
2. HYDRANT SHALL BE INSTALLED WITHIN 150' OF THE BACK EDGE OF PAVEMENT OF CUL-DE-SAC.
3. WATER MAINS SHALL BE INSTALLED ON OPPOSITE SIDE OF STREET FROM SANITARY SEWER.

4. FIVE (5) RESIDENTIAL PROPERTIES MAY RECEIVE WATER SERVICE FROM THE 3" HDPE PIPE OR A MAXIMUM FOOTAGE OF 300'.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

CUL-DE-SAC WATER MAIN WITH HYDRANT AT INTERSECTION

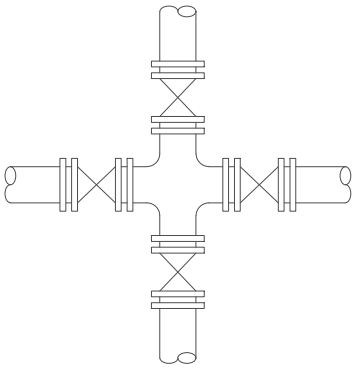
STANDARD DETAILS

TOWN OF WHITESTOWN

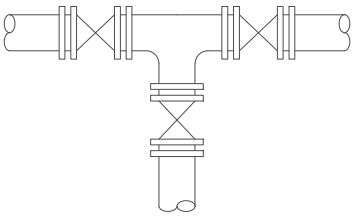
DATE: 06/30/25

SCALE: NTS

SHEET NO. 22



4 VALVES REQUIRED AT "CROSS"



3 VALVES REQUIRED AT "TEE"

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VALVE DETAILS AT INTERSECTIONS

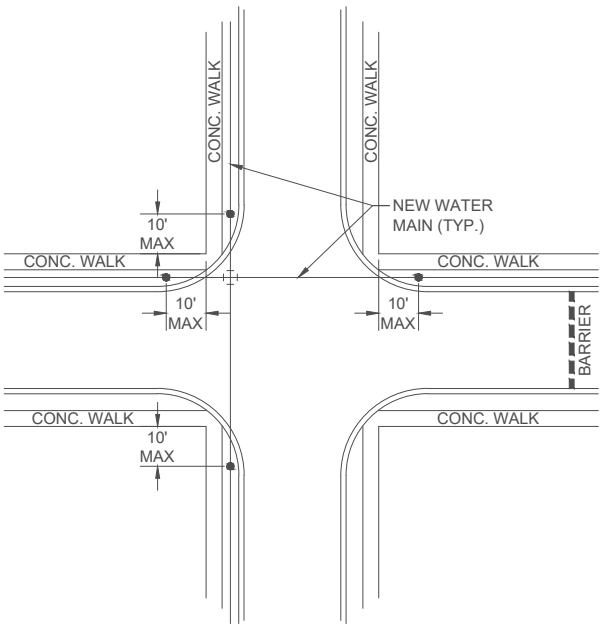
STANDARD DETAILS

TOWN OF WHITESTOWN

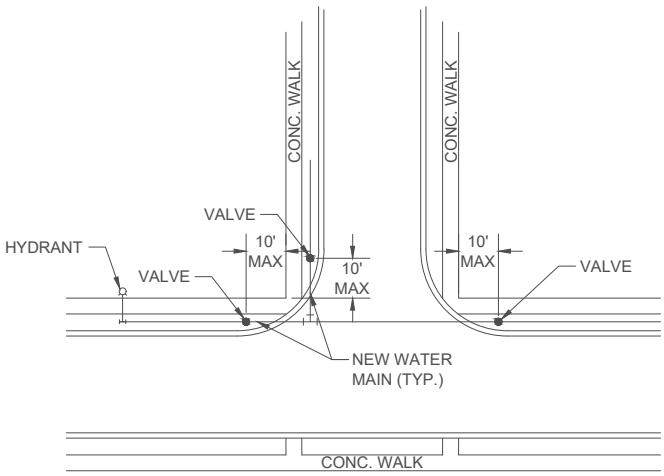
DATE: 06/30/25

SCALE: NTS

SHEET NO. 23



VALVE DESIGN AT INTERSECTION

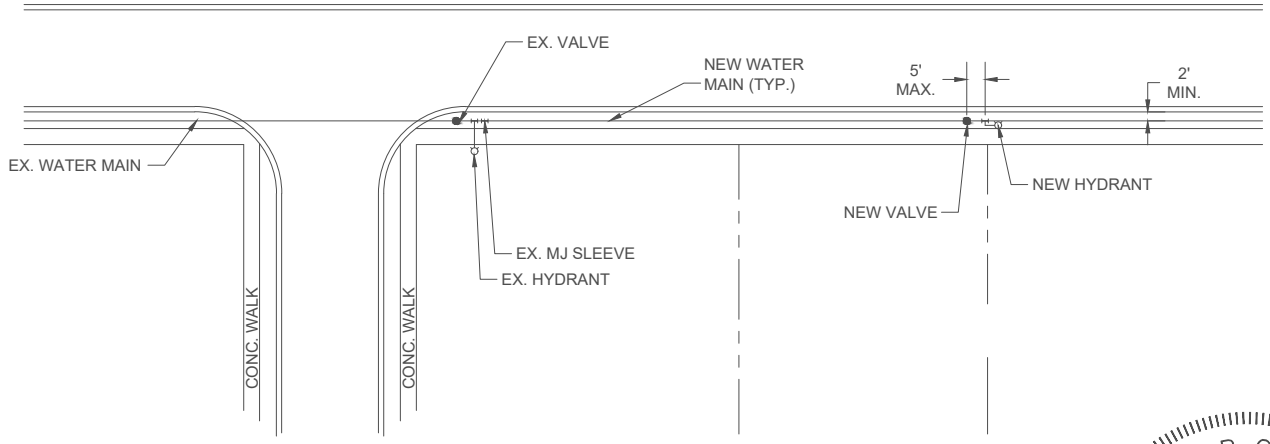


VALVE DESIGN AT TEE INTERSECTION

CONTINUOUS RUNS

VALVE SEPARATION: 6" THROUGH 12" VALVES, INSTALLATION EVERY 600'
16" THROUGH 24" VALVES, INSTALLATION EVERY 1200' TO 1800'
30" OR LARGER VALVES, MAXIMUM 1800'

FOR LARGER MAINS, THE VALVE SEPARATION MAY BE REDUCED WITHIN A DEVELOPMENT, AS APPROVED BY THE UTILITY.



VALVE DESIGN FOR EXTENSION

NOTES:

1. ALL VALVES ARE TO BE INSTALLED WITHIN 10' OF AN INTERSECTION.
2. HYDRANTS ARE TO BE INSTALLED WITHIN GRASS STRIPPING BETWEEN ROAD AND SIDEWALK.
3. WHERE POSSIBLE, WATER MAINS ARE TO BE INSTALLED WITHIN GRASS STRIPPING BETWEEN ROAD AND SIDEWALK. WATER MAINS ARE NOT TO BE INSTALLED UNDER SIDEWALK WITHOUT APPROVAL FROM THE TOWN.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPICAL VALVE PLACEMENT

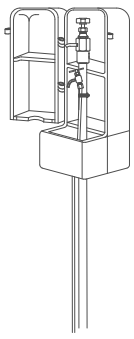
STANDARD DETAILS

TOWN OF WHITESTOWN

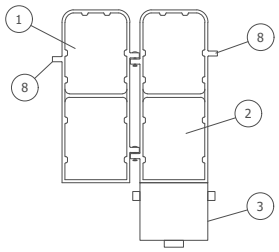
DATE: 06/30/25

SCALE: NTS

SHEET NO. 24



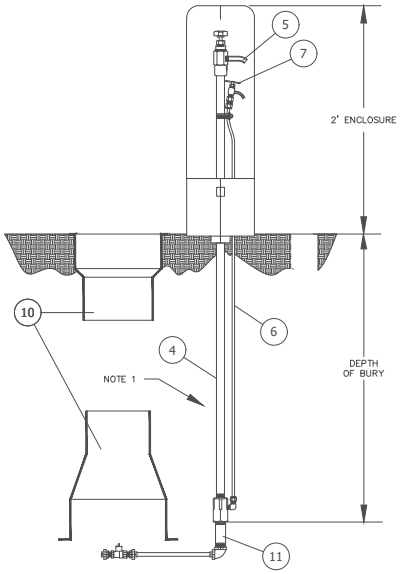
3D VIEW



ENCLOSURE OPEN VIEW

#88-SS SAMPLING STATION TO BE INSTALLED AT THE FOLLOWING LOCATIONS:

ITEM	ITEM / DESCRIPTION	NOTES
1	88 FRONT DOOR (COVER A)	
2	88 REAR DOOR (COVER B)	
3	88 BASE	2 PIECES
4	1/2" S.S. WATERWAY	
5	BLOW OFF & SAMPLING BIBB	
6	1/4" S.S. TUBING	
7	PET COCK	
8	LOCKING HOLE	
9	NOT USED	
10	VALVE BOX	BY OTHERS
11	3/4" S.S. NIPPLE	BY OTHERS



SAMPLING STATION SHALL BE 54" MIN. BURY, WITH A 3/4" FIP INLET, AND 7/16" UNTHREADED BLOW OFF AND SAMPLING BIBB.

STATION SHALL BE ENCLOSED IN A LOCKABLE, NON-REMOVABLE ALUMINUM BOX WITH HINGED OPENINGS.

WHEN OPEN, THE STATION SHALL REQUIRE NO KEY FOR OPERATION, AND ALL WATER FLOW SHALL PASS THRU AN ALL STAINLESS STEEL WATERWAY.

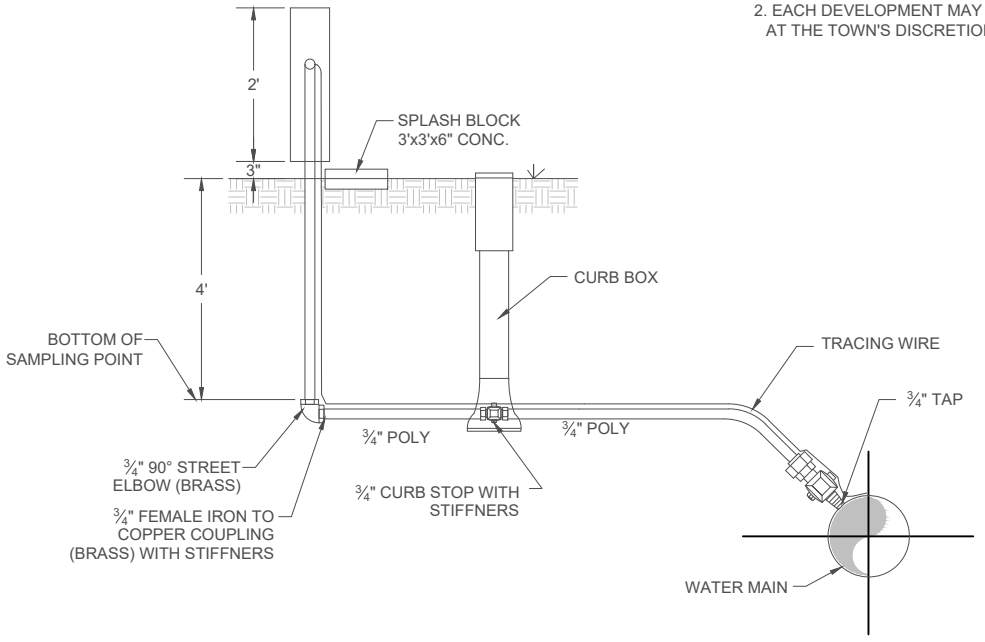
ALL WORKING PARTS SHALL BE OF STAINLESS STEEL AND SERVICEABLE FROM ABOVE GROUND WITH NO DIGGING OR REPLACEMENT NEEDED.

A STAINLESS STEEL PET COCK WILL BE LOCATED BELOW THE SAMPLING BIBB TO ALLOW PUMPING OF ANY WATER REMAINING INSIDE THE STATION TO INSURE NON-FREEZING.

THE STATION SHALL BE MODEL #88WC-SS AS MANUFACTURED BY THE KUPFERLE FOUNDRY, ST. LOUIS MO. 63102 OR APPROVED EQUAL.

NOTES:

1. IN CORROSIVE SOILS THE BURIED PIPE SHOULD BE PREPPED FOR ADDITIONAL RESISTANCE TO CORROSION. KUPFERLE RECOMMENDS SPRAYING ALL UNDERGROUND PIPING AND FITTINGS WITH BITUMINOUS SPRAY TAR, ALLOWING PROPER TIME TO DRY, AND THEN WRAPPING THE PARTS
2. EACH DEVELOPMENT MAY BE REQUIRED TO INSTALL AT THE TOWN'S DISCRETION.



REVISIONS			
NO.	DESCRIPTION	DATE	BY

SAMPLING STATION

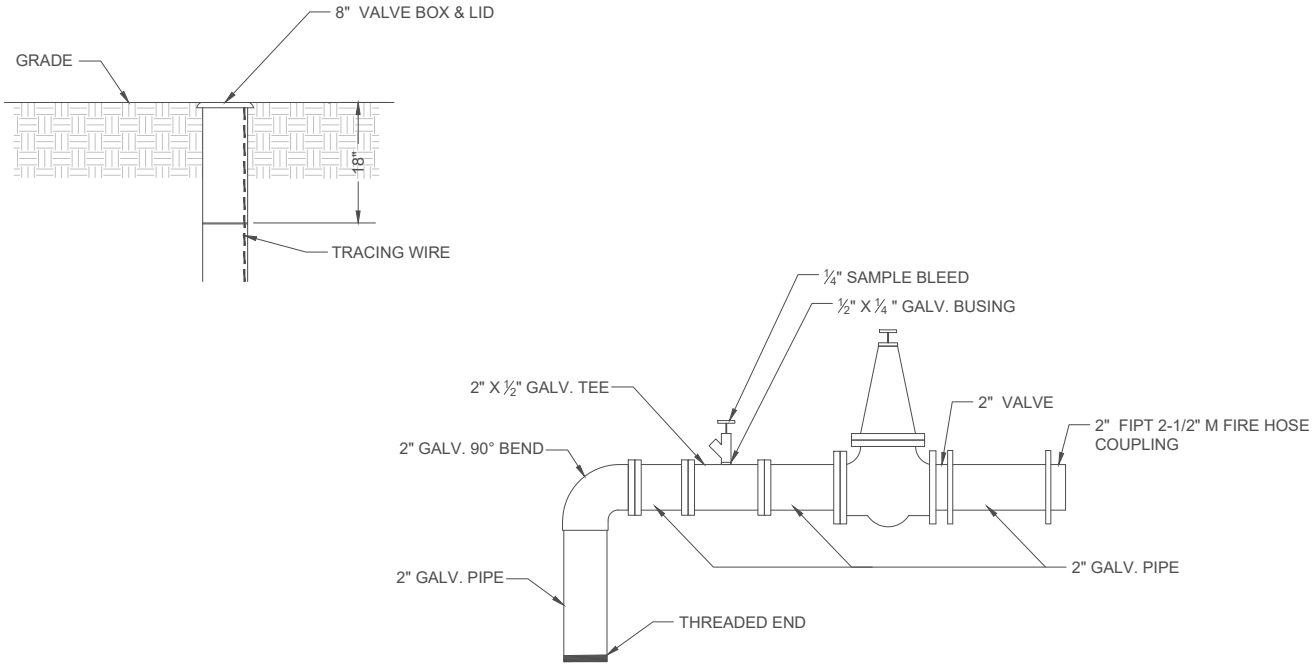
STANDARD DETAILS

TOWN OF WHITESTOWN

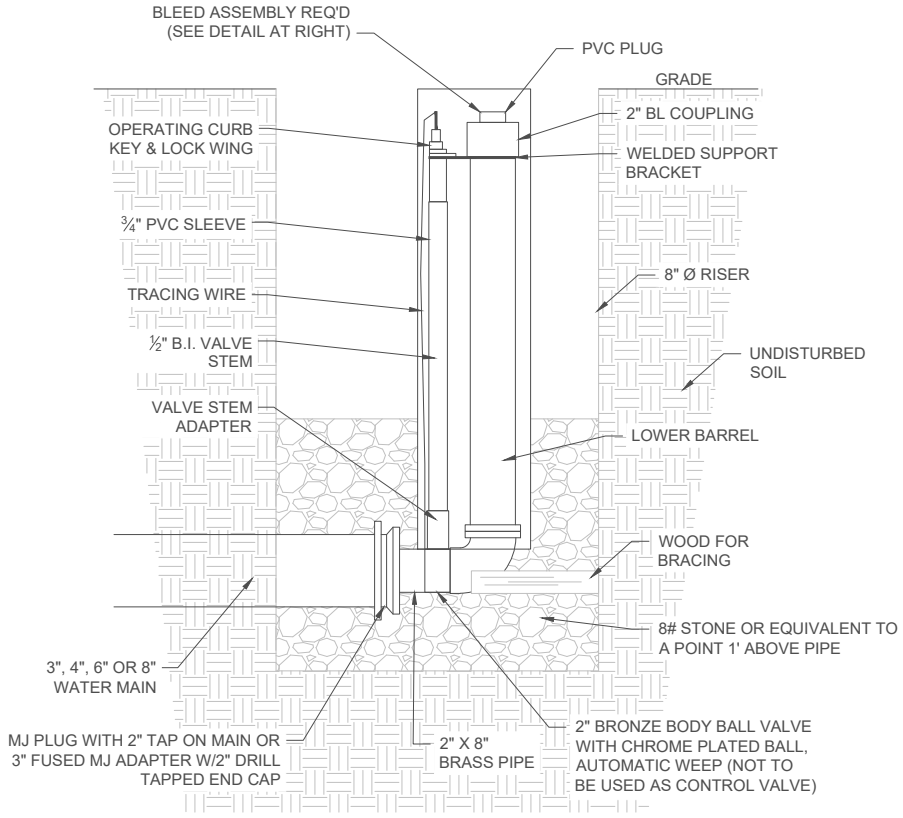
DATE: 06/30/25

SCALE: NTS

SHEET NO. 25



BLEED ASSEMBLY DETAIL



REVISIONS			
NO.	DESCRIPTION	DATE	BY

2" BLOW-OFF ASSEMBLY FOR 3" THROUGH 8" MAIN

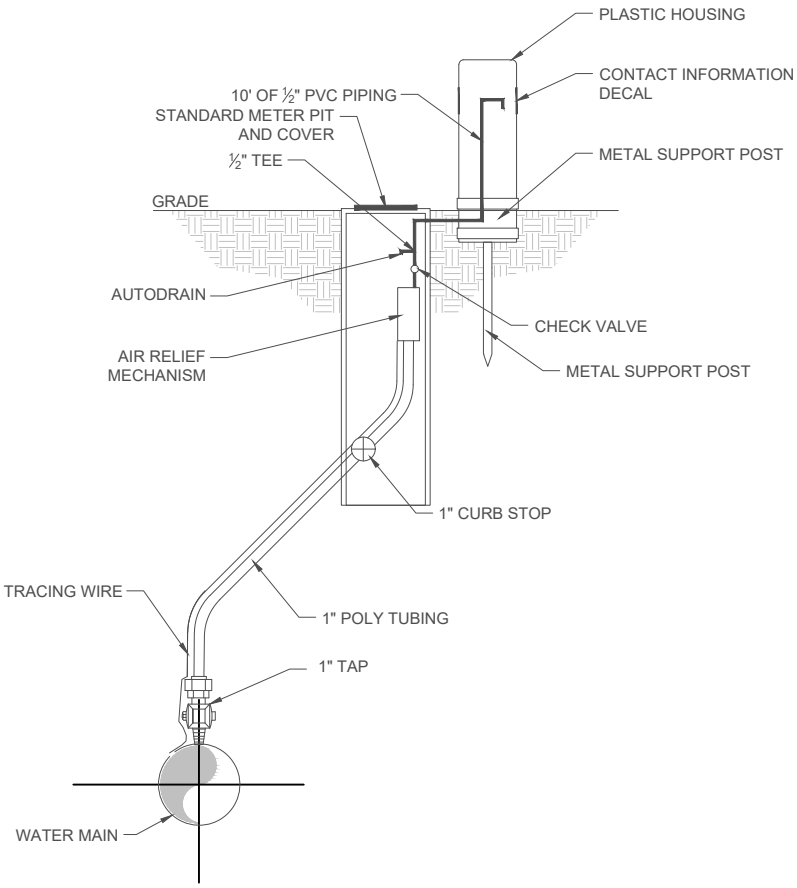
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 26



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WATER MAIN AIR RELEASE VALVE

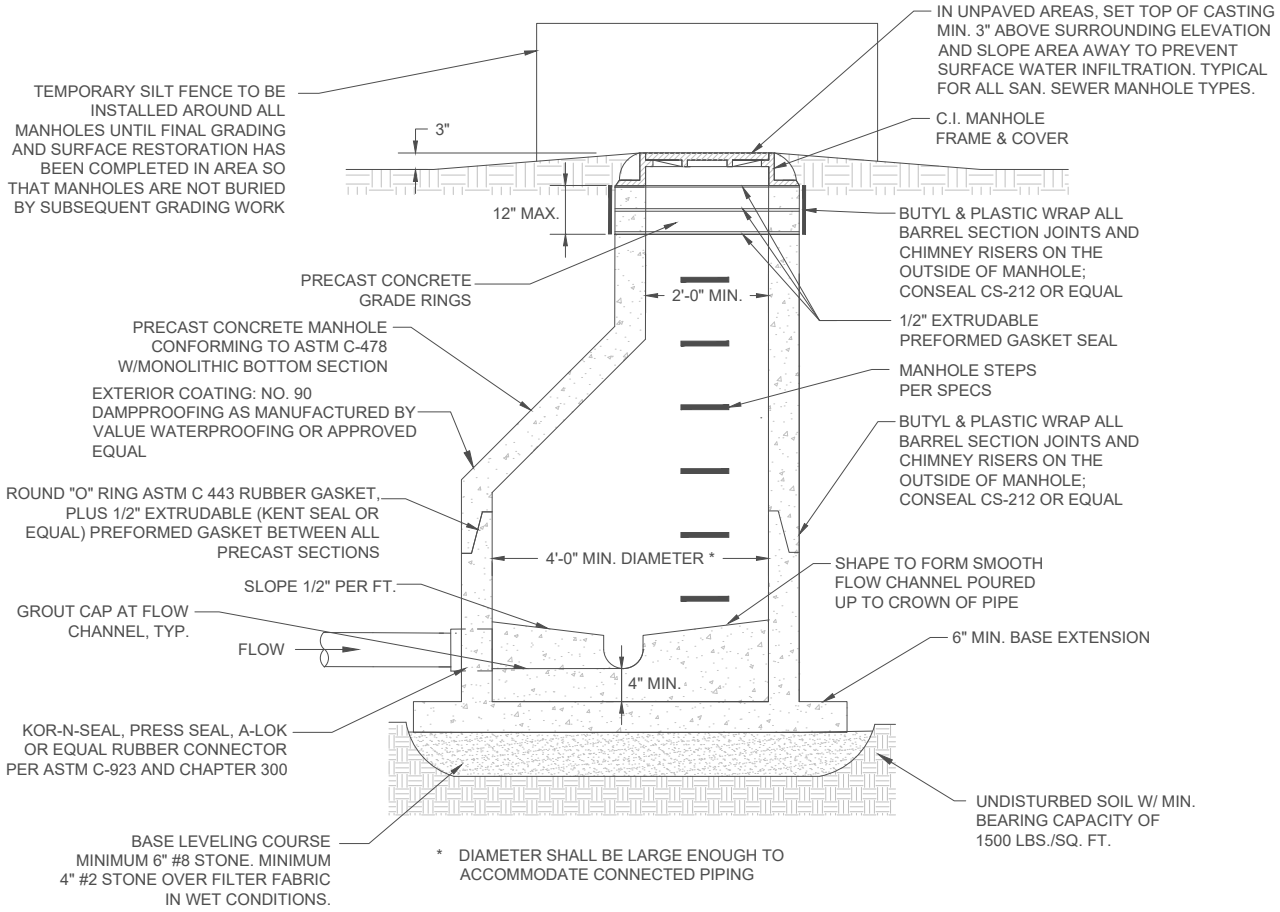
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 27



PIPE SIZE (INCHES)	MINIMUM MANHOLE DIAMETER (INCHES)	
	PIPES ENTERING OR LEAVING AT UP TO 45° ANGLE	PIPES ENTERING OR LEAVING AT 46°–90° ANGLE
18 OR LESS	48	48
LARGER THAN 18"	TO BE REVIEWED BY CCU	TO BE REVIEWED BY CCU

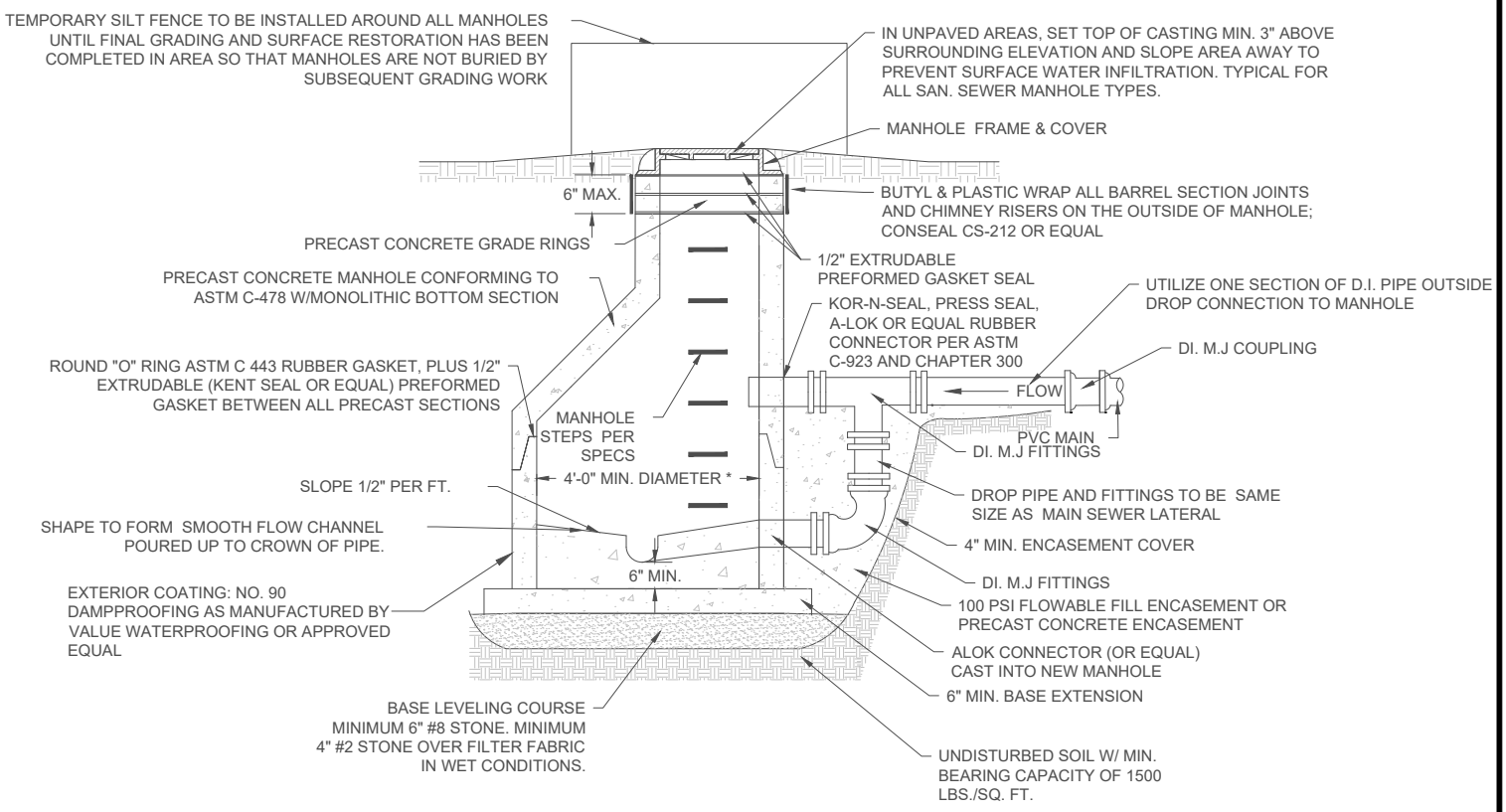
NOTES:
1. LIFT HOLES SHALL BE PLUGGED AFTER SETTING MANHOLE.
2. THE INSIDE WALL DISTANCE BETWEEN OPENINGS SHALL BE A MIN. OF 6".
3. MANHOLES SHALL BE VACUUM TESTED IN ACCORDANCE WITH ASTM C1244.

MIN. PIPE INVERT DROP THROUGH MANHOLE	
THROUGH DEFLECTION	MIN. DROP (FT.)
0–45	0.10
45–90	0.20

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "A" MANHOLE
STANDARD PRECAST MANHOLE
STANDARD DETAILS
TOWN OF WHITESTOWN

DATE: 06/30/25
SCALE: NTS
SHEET NO. 28



PIPE SIZE (INCHES)	MINIMUM MANHOLE DIAMETER (INCHES)	
	PIPES ENTERING OR LEAVING AT UP TO 45° ANGLE	PIPES ENTERING OR LEAVING AT 46°–90° ANGLE
18 OR LESS	48	48
LARGER THAN 18"	TO BE REVIEWED BY CCU	TO BE REVIEWED BY CCU

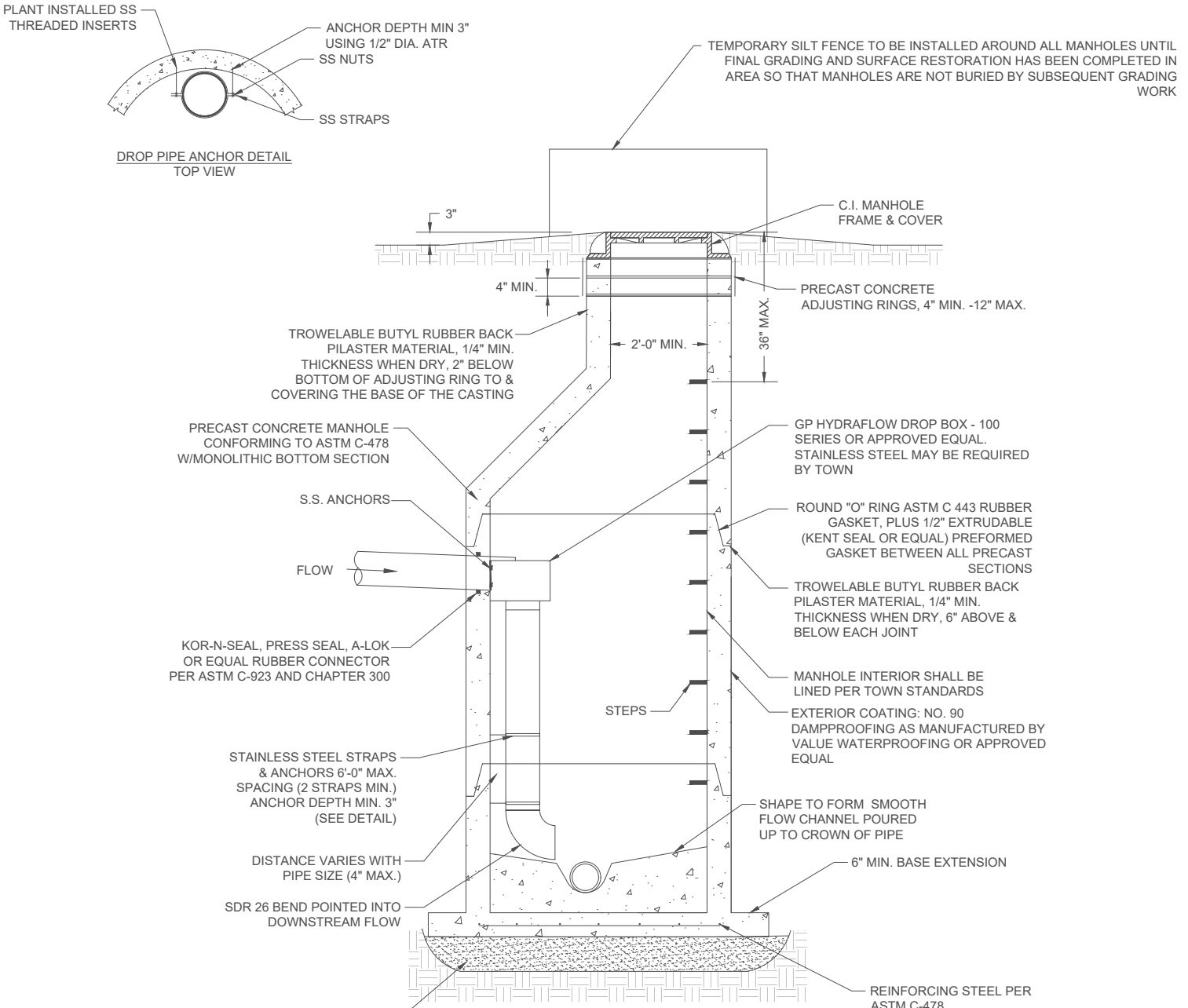
NOTES:
1. LIFT HOLES SHALL BE PLUGGED AFTER SETTING MANHOLE.
2. THE INSIDE WALL DISTANCE BETWEEN OPENINGS SHALL BE A MIN. OF 6".
3. MANHOLES SHALL BE VACUUM TESTED IN ACCORDANCE WITH ASTM C1244.

MIN. PIPE INVERT DROP THROUGH MANHOLE	
THROUGH DEFLECTION	MIN. DROP (FT.)
0–45	0.10
45–90	0.20

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "B" MANHOLE
OUTSIDE DROP MANHOLE CONNECTION
STANDARD DETAILS
TOWN OF WHITESTOWN

DATE: 06/30/25
SCALE: NTS
SHEET NO. 29



NOTES:
1. TOWN SHALL APPROVE USE OF INSIDE DROP.
2. DIAMETER SHALL BE LARGE ENOUGH TO ACCOMMODATE CONNECTED PIPING AND SHALL BE APPROVED BY TOWN.

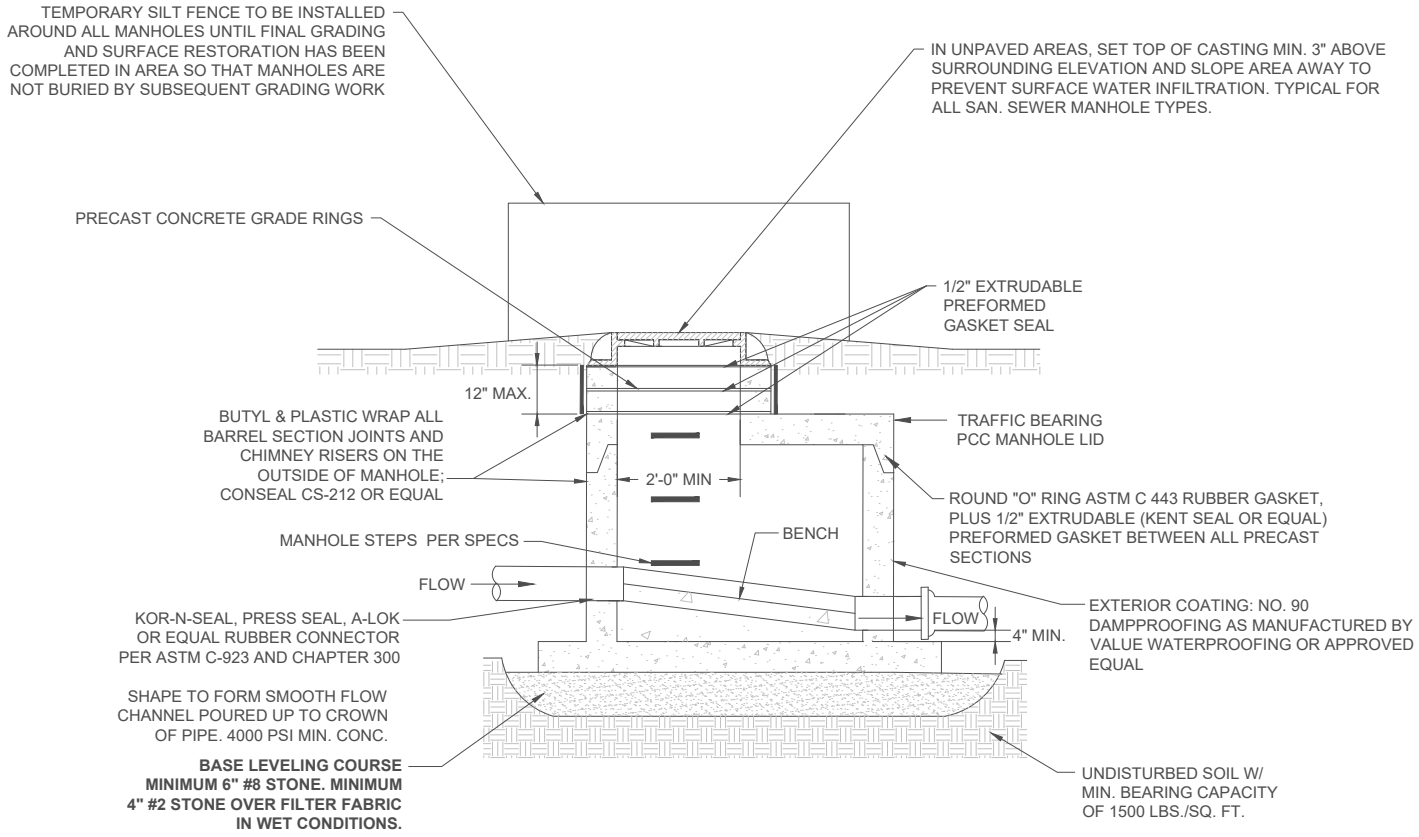
REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "B" MANHOLE
INSIDE DROP MANHOLE CONNECTION
STANDARD DETAILS
TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

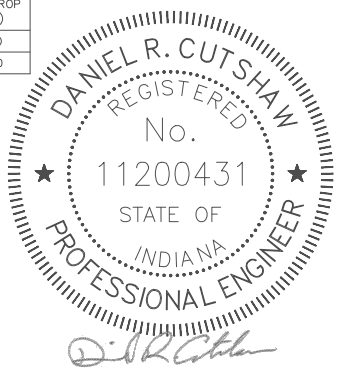
SHEET NO. 30



PIPE SIZE (INCHES)	MINIMUM MANHOLE DIAMETER (INCHES)	
	PIPES ENTERING OR LEAVING AT UP TO 45° ANGLE	PIPES ENTERING OR LEAVING AT 46°–90° ANGLE
18 OR LESS	48	48
LARGER THAN 18"	TO BE REVIEWED BY CCU	TO BE REVIEWED BY CCU

NOTES:
1. LIFT HOLES SHALL BE PLUGGED AFTER SETTING MANHOLE.
2. THE INSIDE WALL DISTANCE BETWEEN OPENINGS SHALL BE A MIN. OF 6".
3. MANHOLES SHALL BE VACUUM TESTED IN ACCORDANCE WITH ASTM C1244.

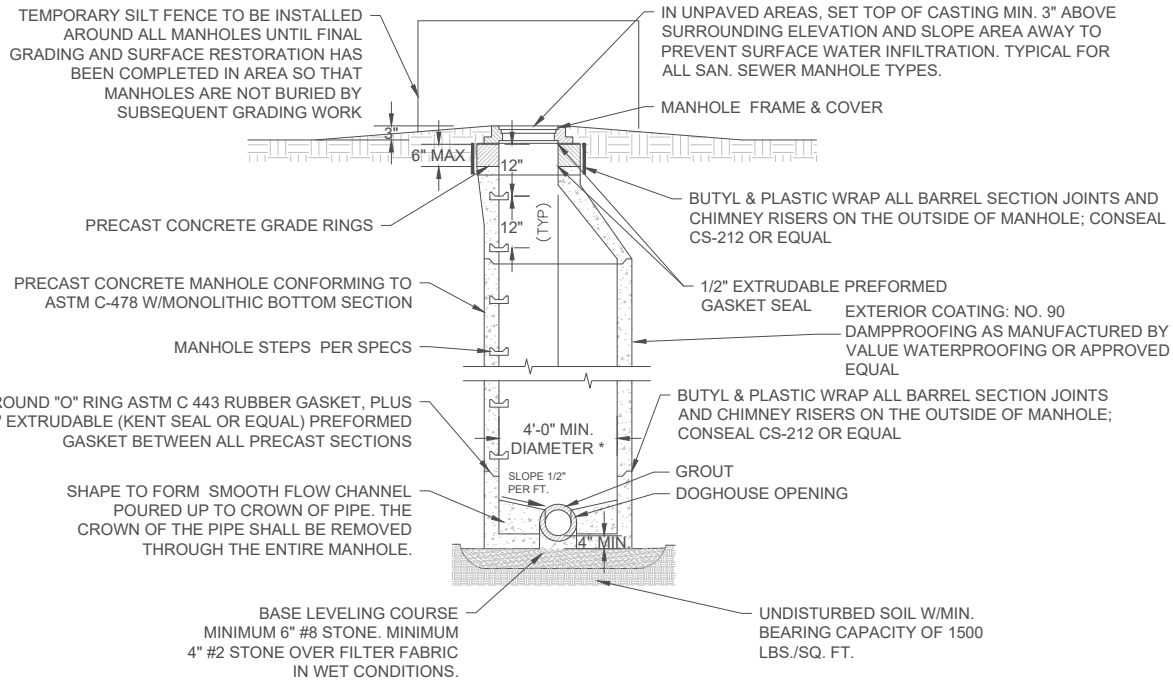
MIN. PIPE INVERT DROP THROUGH MANHOLE	
THROUGH DEFLECTION	MIN. DROP (FT.)
0–45	0.10
45–90	0.20



REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "C" MANHOLE
SHALLOW MANHOLE LESS THAN 5'
STANDARD DETAILS
TOWN OF WHITESTOWN

DATE: 06/30/25
SCALE: NTS
SHEET NO. 31



PIPE SIZE (INCHES)	MINIMUM MANHOLE DIAMETER (INCHES)	
	PIPES ENTERING OR LEAVING AT UP TO 45° ANGLE	PIPES ENTERING OR LEAVING AT 46°–90° ANGLE
18 OR LESS	48	48
LARGER THAN 18"	TO BE REVIEWED BY CCU	TO BE REVIEWED BY CCU

NOTES:
1. LIFT HOLES SHALL BE PLUGGED AFTER SETTING MANHOLE.
2. THE INSIDE WALL DISTANCE BETWEEN OPENINGS SHALL BE A MIN. OF 6".
3. MANHOLES SHALL BE VACUUM TESTED IN ACCORDANCE WITH ASTM C1244.

MIN. PIPE INVERT DROP THROUGH MANHOLE	
THROUGH DEFLECTION	MIN. DROP (FT.)
0–45	0.10
45–90	0.20

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "D" DOGHOUSE MANHOLE

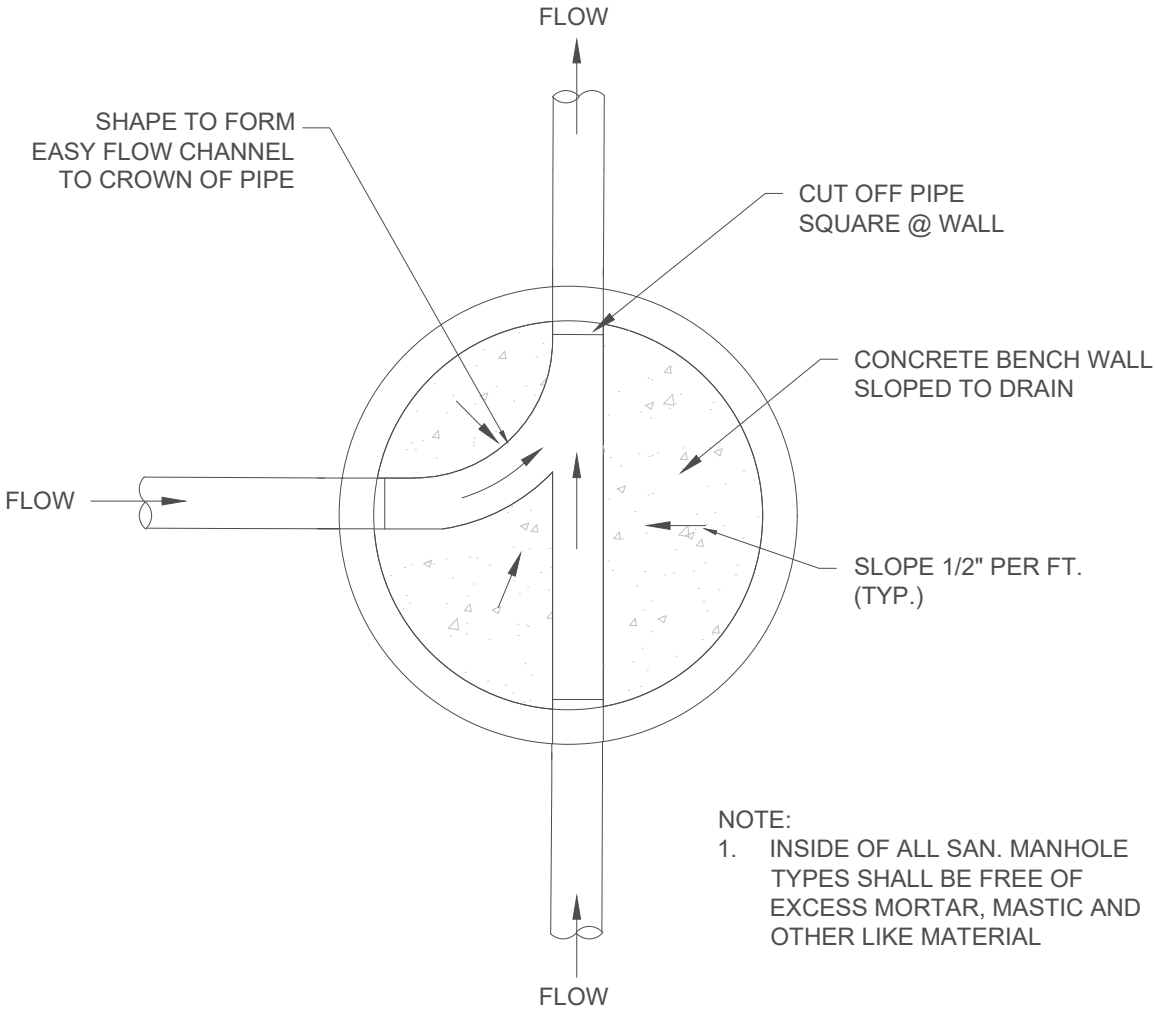
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 31A



NOTE:
1. INSIDE OF ALL SAN. MANHOLE TYPES SHALL BE FREE OF EXCESS MORTAR, MASTIC AND OTHER LIKE MATERIAL

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STANDARD MANHOLE BENCH WALL

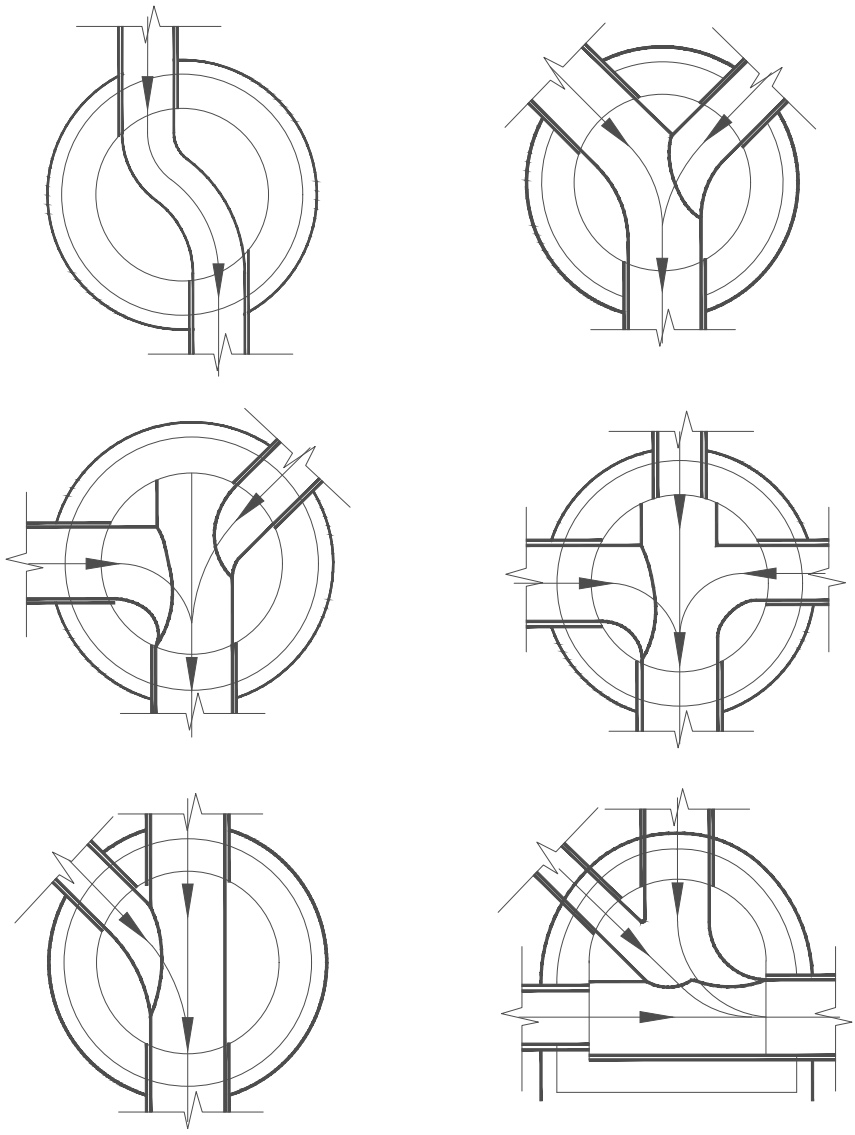
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 32



SANITARY SEWER
BENCH SLOPE: 1/2" PER FOOT

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NO.	DESCRIPTION	DATE	BY

STANDARD MANHOLE BENCHES

STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

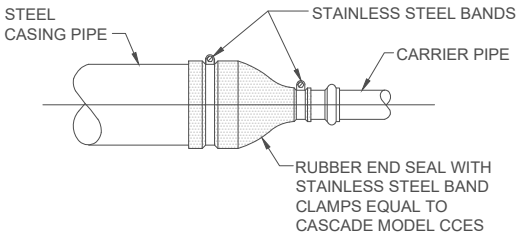
SCALE: NTS

SHEET NO. 33

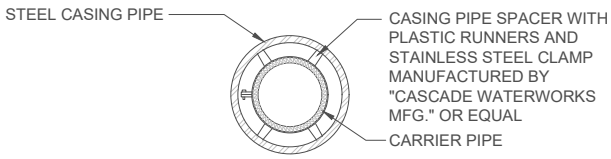
NOTES

1. CASING SHALL BE WELDED STEEL PIPE, NEW AND UNUSED MATERIAL IN ACCORDANCE WITH ASTM A-139; MINIMUM YIELD STRENGTH = 35,000 PSI.
2. CASING SPACERS REQUIRED. MAXIMUM 10'-0" SPACING FOR DUCTILE IRON CARRIER PIPES. MAXIMUM SPACING FOR PVC CARRIES PIPES SHALL BE 6'-0". FOLLOW MANUFACTURER'S RECOMMENDATIONS FOR PLACEMENT AND SPACING.
3. THE INSIDE DIAMETER OF THE CASING SHALL BE A MINIMUM OF SIX (6) INCHES LARGER THAN THE LARGEST DIAMETER OF THE CARRIER PIPE JOINT.
4. THE ABOVE GIVEN CASING SIZES DO NOT APPLY TO RAILROAD CROSSINGS. CONTACT SPECIFIC RAILROAD FOR REQUIREMENTS.

TABLE OF STEEL CASING SIZES		
CASING DIAMETER IN INCHES	WALL THICKNESS (WITH PROTECTIVE COATING) IN INCHES	WALL THICKNESS (WITHOUT PROTECTIVE COATING) IN INCHES
12"	0.188"	0.250"
16"	0.219"	0.281"
18"	0.250"	0.312"
20"	0.281"	0.344"
24"	0.312"	0.375"
30"	0.406"	0.469"
36"	0.469"	0.532"



CASING END SEAL DETAIL



NOTE: CONFIGURE CASING SPACERS PER MFGR. RECOMMENDATIONS FOR GRAVITY CARRIER PIPES TO CORRECT FOR GRADE.

CENTERING CARRIER PIPE WITH CASING SPACER (PRESSURE PIPES)

REVISIONS			
NO.	DESCRIPTION	DATE	BY

STEEL CASING DETAILS

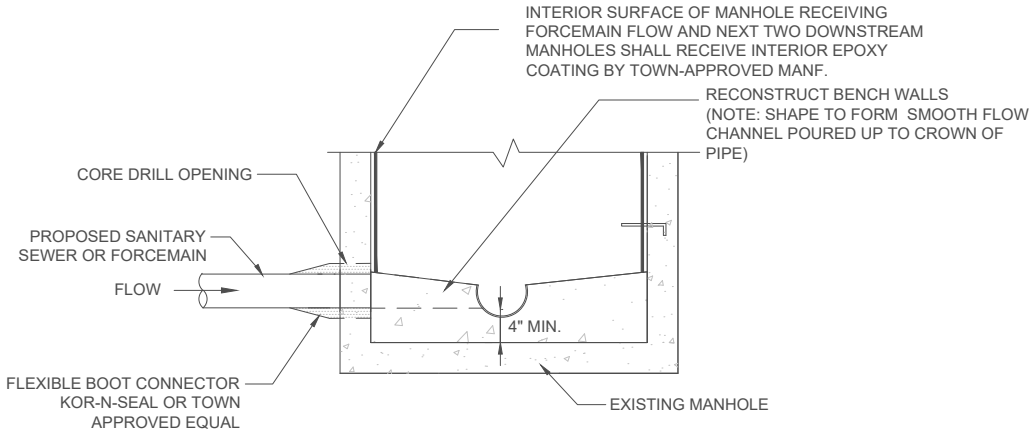
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 34



REVISIONS			
NO.	DESCRIPTION	DATE	BY

EXISTING MANHOLE CONNECTION DETAIL

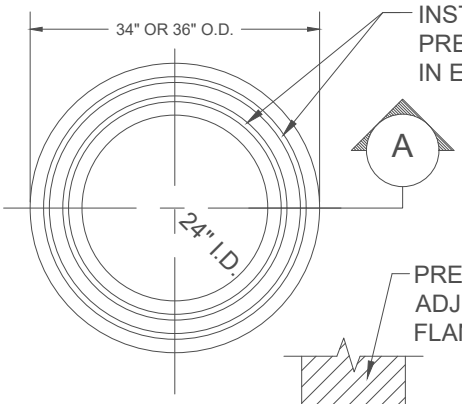
STANDARD DETAILS

TOWN OF WHITESTOWN

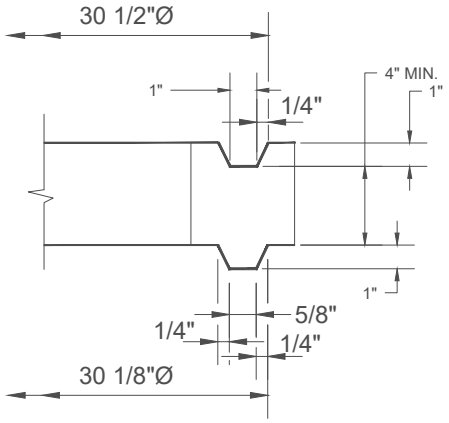
DATE: 06/30/25

SCALE: NTS

SHEET NO. 35



GASKET DETAIL



RISER RING THICKNESS 4" -
12" OUTSIDE DIA. 34" OR 36"

SECTION A-A

REVISIONS			
NO.	DESCRIPTION	DATE	BY

PRECAST ADJUSTING RING

STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

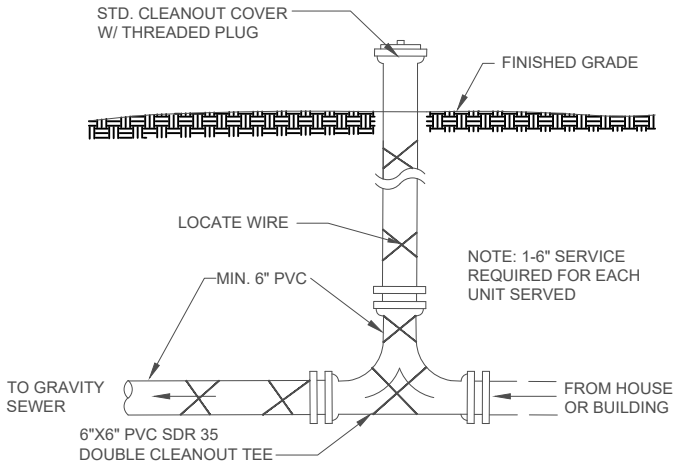
SCALE: NTS

SHEET NO. 36

GENERAL NOTES FOR CLEANOUTS:

1. CLEANOUTS SHALL BE INSTALLED NO MORE THAN A MAX. 5'-0" FROM OUTSIDE FACE OF BUILDING FOUNDATION WALL AND EVERY 100'-0" MAX. THEREAFTER OR WHERE SERVICE LATERAL CHANGES DIRECTION BEFORE REACHING MAIN SANITARY SEWER LINE.

2. CLEANOUT PLUGS SHALL NOT BE COVERED WITH CEMENT PLASTER, OR ANY OTHER PERMANENT FINISHING MATERIAL, WHERE IT IS NECESSARY TO CONCEAL A CLEAN OUT PLUG, A COVERING PLATE OR ACCESS DOOR SHALL BE PROVIDED WHICH WILL PERMIT READY ACCESS TO THE PLUG.



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TYPE "1" CLEANOUT

STANDARD DETAILS

TOWN OF WHITESTOWN

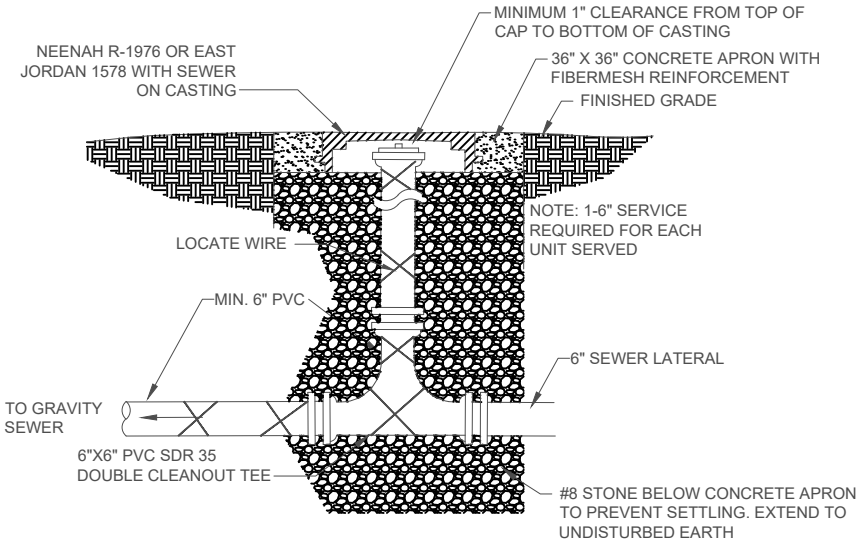
DATE: 06/30/25

SCALE: NTS

SHEET NO. 37

NOTES:

1. CONCRETE APRON AND CASTING SHALL BE INSTALLED SO THAT THEY DO NOT CONTACT THE LATERAL OR LATERAL CAP.
2. CLEANOUTS SHALL BE INSTALLED NO MORE THAN A MAX 5'-0" FROM OUTSIDE FACE OF BUILDING FOUNDATION WALL AND EVERY 100'-0" MAX. THEREAFTER OR WHERE SERVICE LATERAL CHANGES DIRECTION BEFORE REACHING MAIN SANITARY SEWER LINE.
3. TO BE USED IN PAVED AREAS OR SIDEWALKS.



REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "2" CLEANOUT

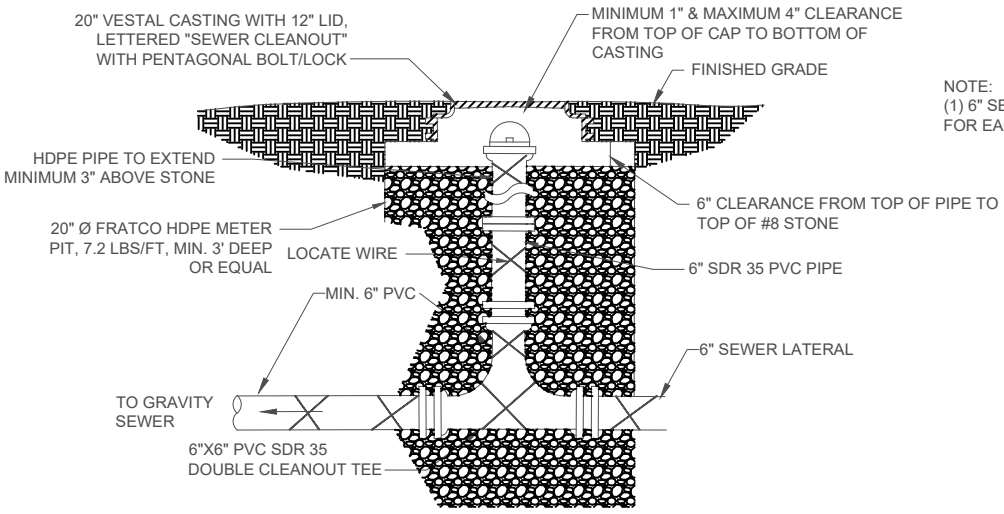
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 38



NOTE:
(1) 6" SERVICE REQUIRED FOR EACH UNIT SERVED

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TYPE "3" CLEANOUT DETAIL

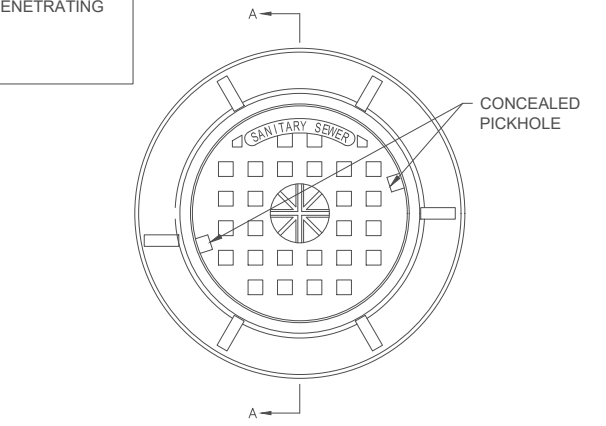
STANDARD DETAILS
TOWN OF WHITESTOWN

DATE: 06/30/25
SCALE: NTS
SHEET NO. 39

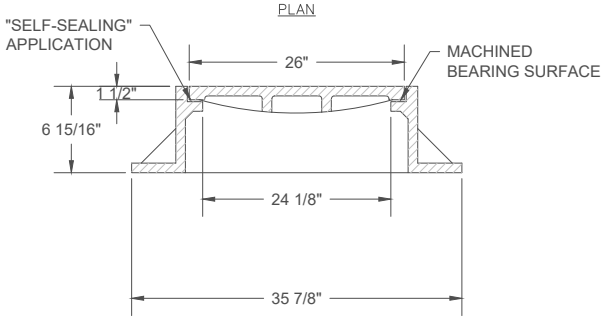
CASTING SCHEDULE

NEENAH FOUNDRY COMPANY	EAST JORDAN IRON WORKS
FRAME AND COVER R-1642	FRAME AND COVER 1045

*THE WORDS "SANITARY SEWER" SHALL BE CAST INTO THE COVER WITH 2" LETTER HEIGHT, HEAVY DUTY, SOLID, AND THE COVER SHALL BE SELF SEALING WITH NON-PENETRATING PICK HOLES



PLAN



SECTION A–A

DANIEL R. CUTSHAW
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REVISIONS			
NO.	DESCRIPTION	DATE	BY

STANDARD MANHOLE FRAME & CASTING

STANDARD DETAILS

TOWN OF WHITESTOWN

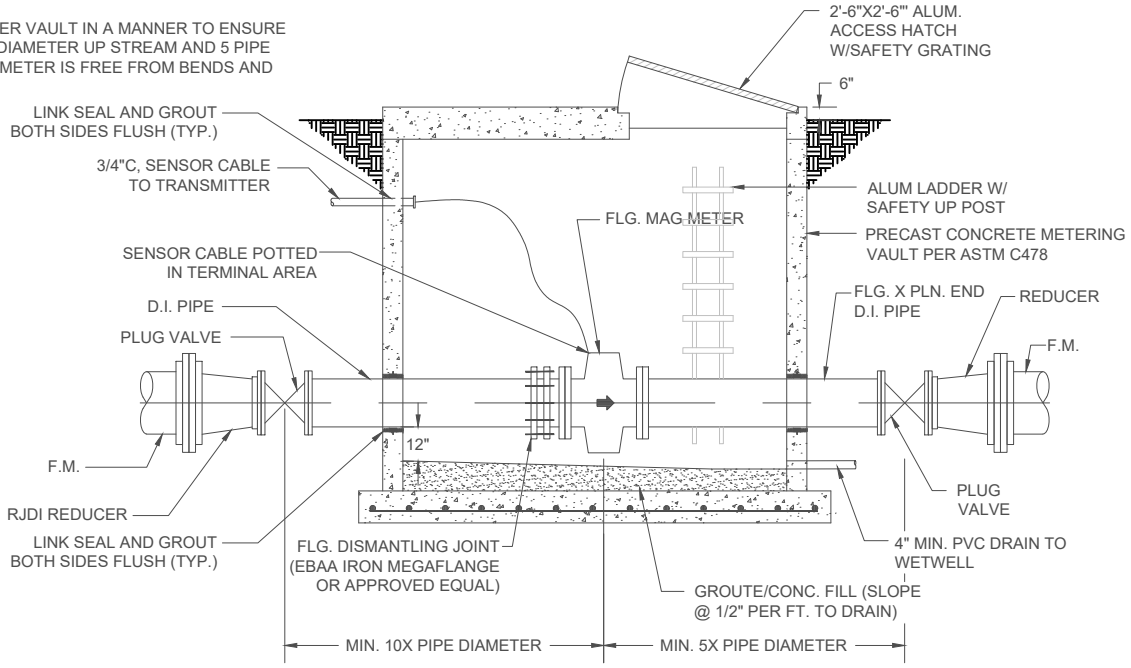
DATE: 06/30/25

SCALE: NTS

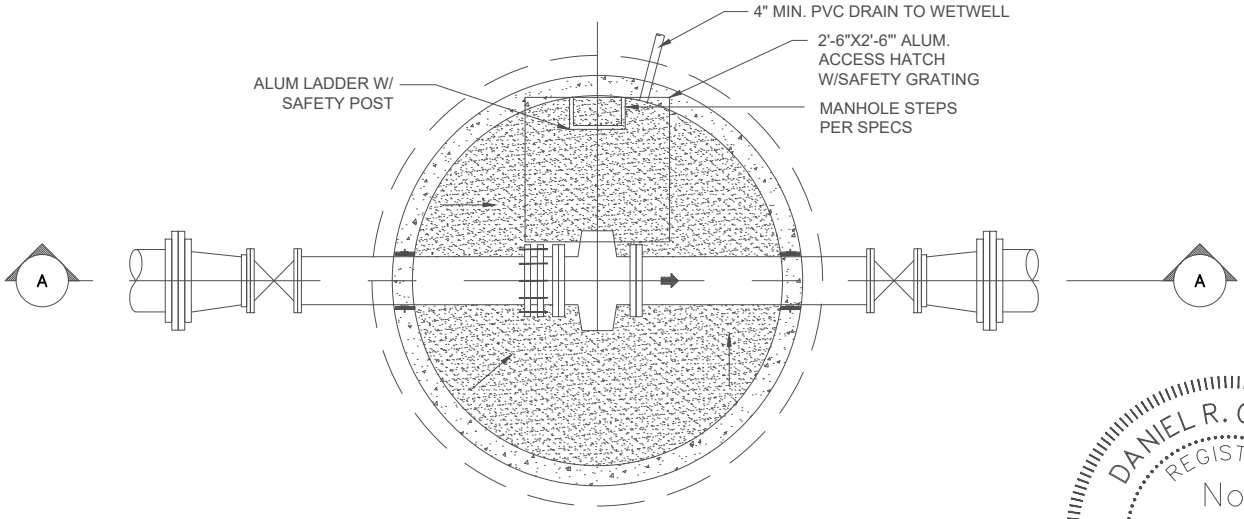
SHEET NO. 40

FLOW METER NOTES:

1. METER REQUIRED ON LIFT STATION DISCHARGES. DETAILS TO BE COORDINATED AND APPROVED WITH TOWN. SEE SHEETS 9 AND 10 FOR LIFT STATION DETAILS.
2. CONTRACTOR SHALL INSTALL MAG METER AND FORCEMAIN IN A MANNER TO ENSURE FULL PIPE FLOW/SUBMERGENCE AT ALL TIMES FOR PROPER MAG METER OPERATION.
3. PROVIDE A SPOOL PIECE TO REPLACE MAGMETER BODY IF REMOVAL IS REQUIRED FOR REPAIR/REPLACEMENT.
4. CONTRACTOR SHALL INSTALL MAG METER VAULT IN A MANNER TO ENSURE THAT A MINIMUM DISTANCE OF 10 PIPE DIAMETER UP STREAM AND 5 PIPE DIAMETER DOWN STREAM OF THE MAG METER IS FREE FROM BENDS AND OTHER APPURTENANCES.



SECTION A-A



REVISIONS			
NO.	DESCRIPTION	DATE	BY

MAG METER VAULT DETAIL

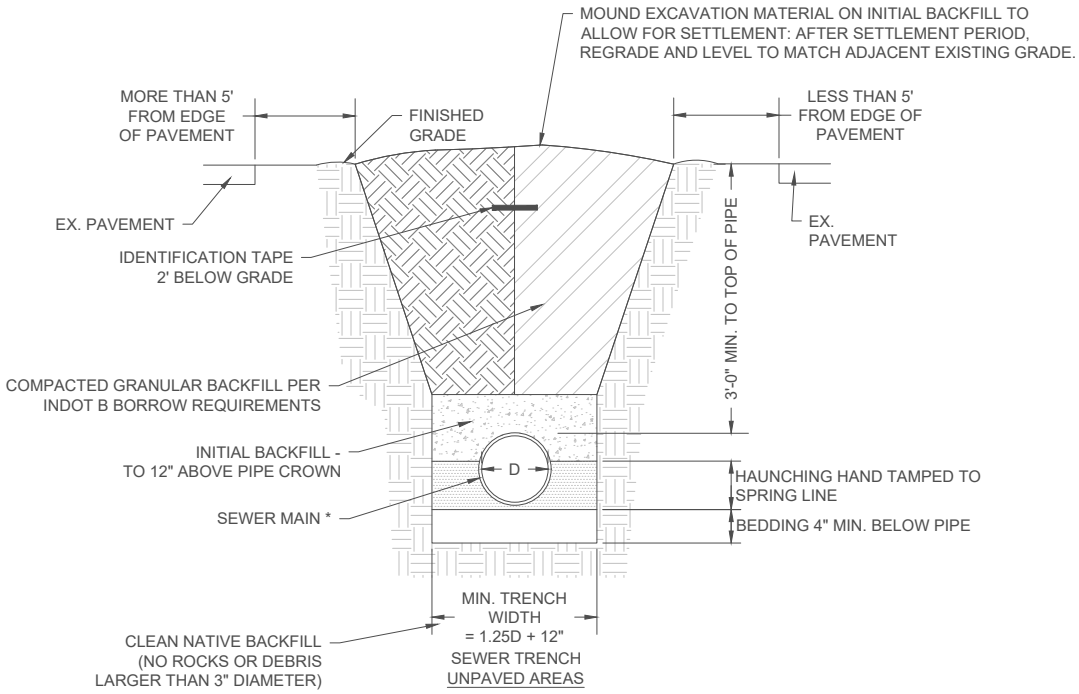
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 41



NOTE:
1. FORCEMAINS ARE TO BE INSTALLED PER THE TYPICAL TRENCH DETAILS FOR WATER MAINS
2. OVER EXCAVATE FOR PIPE BELL
3. BEDDING, HAUNCHING AND INITIAL BACKFILL SHALL BE (INDOT #8 STONE OR CLASS II CLEAN SAND PER ASTM C12)

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPICAL GRAVITY SANITARY SEWER TRENCH DETAILS

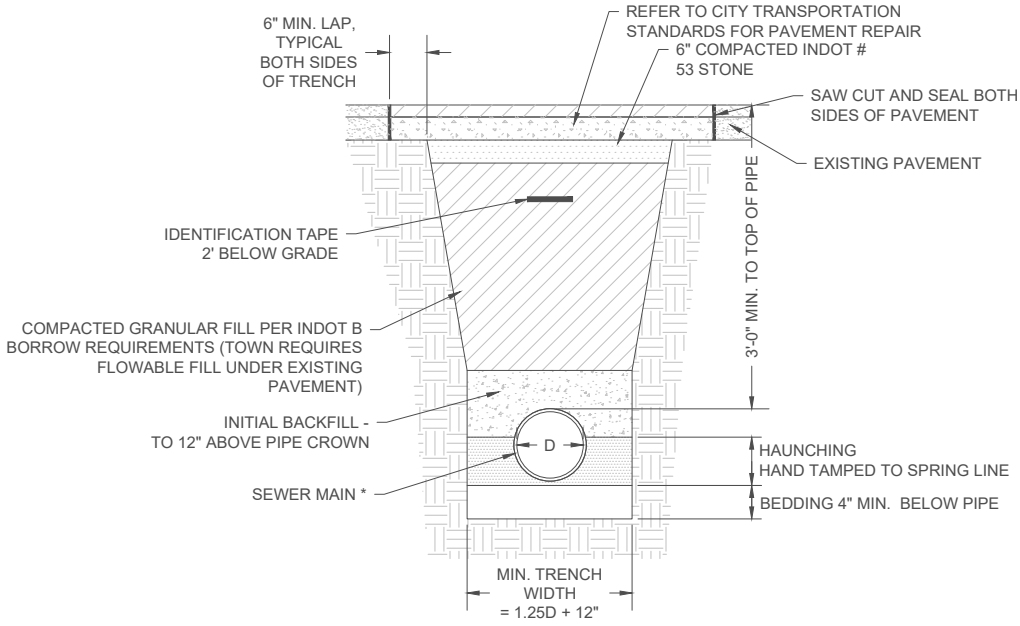
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 42



SEWER TRENCH
UNDER PAVEMENT

NOTES:

1. EXISTING PAVEMENT IS TO BE SAW CUT FOR A CLEAN BREAK.
2. TRENCH SPOIL IS TO BE REMOVED FROM THE WORK SITE
3. NEW SURFACE TO BE SLOPED AT SAME RATE AS THE EXISTING SURFACE.
4. GRANULAR FILL TO BE USED WITHIN 5' OF ALL PAVED AREAS.
5. EXISTING PAVEMENT SHALL BE BACKFILLED WITH FLOWABLE FILL.
6. OVER EXCAVATE FOR PIPE BELL.
7. FORCEMAIN TO BE INSTALLED PER THE TYPICAL TRENCH DETAILS FOR WATERMAINS
8. BEDDING, HAUNCHING AND INITIAL BACKFILL SHALL BE (INDOT #8 STONE OR CLASS II CLEAN SAND PER ASTM C12)

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPICAL GRAVITY SANITARY
SEWER TRENCH DETAILS

STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 42A

SANITARY SEWER TESTING:

1. ALL GRAVITY SANITARY SEWERS SHALL BE TESTED AS FOLLOWS (SEE SPECIFICATIONS):
   1.1. ALL MAINS SHALL BE TESTED FOR DEFLECTION WITH A GO-NO-GO MANDREL TEST CONDUCTED 30 DAYS AFTER BACKFILL.
   1.2. ALL MAINS SHALL BE TESTED FOR LEAKAGE WITH A LOW-PRESSURE AIR TEST.
   1.3. TELEVISION INSPECTION - SEWER SHALL BE FLOODED PRIOR TO INSPECTION.

2. ALL FORCEMAIN SHALL BE SUBJECT TO HYDROSTATIC TEST PRIOR TO BEING PLACED INTO OPERATION (SEE SPECIFICATIONS FOR REQUIREMENTS)

NOTES:

1. ROAD CURB TO BE STAMPED WITH AN "S" TO INDICATE SANITARY SEWER LOCATION.

2. FINISHED FLOOR ELEVATION OF ADJACENT BUILDINGS SHALL BE SET A MINIMUM OF 12" HIGHER THAN THE RIM ELEVATION OF THE UPSTREAM MANHOLE OF THE CONNECTED SEWER MAIN TO PREVENT SANITARY BACKUPS. OTHERWISE, BACKFLOW PREVENTION MUST BE PROVIDED ON THE SERVICE CONNECTIONS.

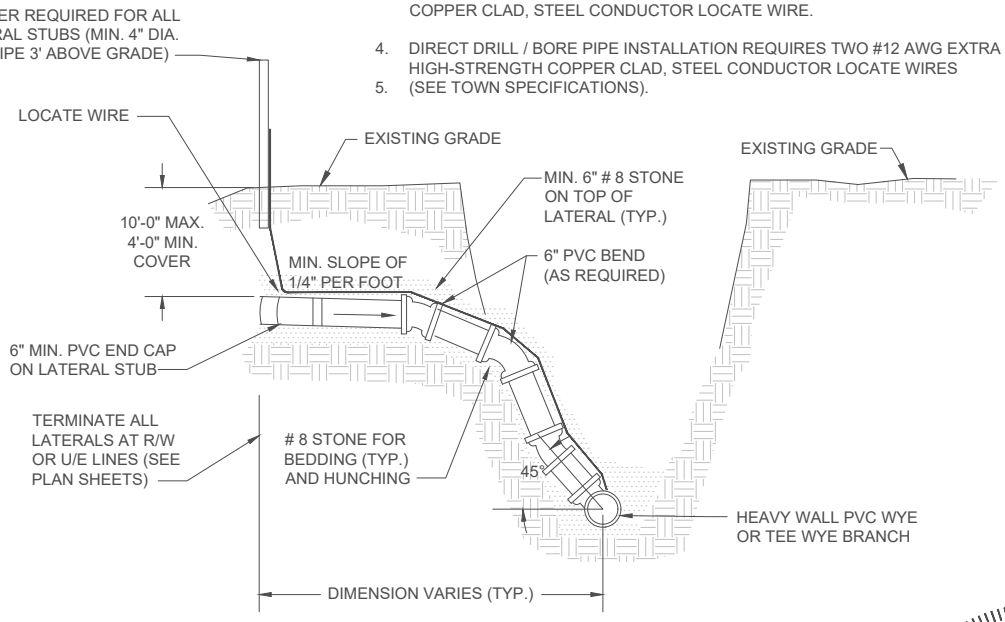
3. SAMPLE STATION MANHOLES AND GREASE TRAPS SHALL BE INCLUDED ON ALL COMMERCIAL AND INDUSTRIAL SERVICE CONNECTIONS.

4. CONTRACTOR SHALL NOT BACKFILL SERVICE CONNECTION UNTIL TOWN HAS INSPECTED AND TAKEN MEASUREMENTS AND OTHER INFORMATION REQUIRED FOR RECORDS.

FORCE MAIN LOCATION WIRE AND MARKERS:

1. LOCATION WIRE TO BE INSTALLED ON ALL UNDERGROUND PIPE; COLORED GREEN FOR SANITARY SEWER. INSTALL FORCE MAIN POST MARKER WITH TERMINAL CONNECTION EVERY 400'. FORCE MAIN MARKER SHALL BE EQUIVALENT TO HANDLEY INDUSTRIES MODEL PMP 7CE WITH LID C2. WIRE MUST BE CONTINUOUS BETWEEN MARKERS. ALL JOINTS SHALL BE OVERHAND KNOTTED AND SOLDERED THEN COVERED WITH A WATER PROOF SEAL.
2.
3. OPEN CUT PIPE INSTALLATION REQUIRES ONE #12 AWG HIGH-STRENGTH COPPER CLAD, STEEL CONDUCTOR LOCATE WIRE.

4. DIRECT DRILL / BORE PIPE INSTALLATION REQUIRES TWO #12 AWG EXTRA HIGH-STRENGTH COPPER CLAD, STEEL CONDUCTOR LOCATE WIRES
5. (SEE TOWN SPECIFICATIONS).



REVISIONS			
NO.	DESCRIPTION	DATE	BY

SANITARY SEWER SERVICE CONNECTIONS

STANDARD DETAILS

TOWN OF WHITESTOWN

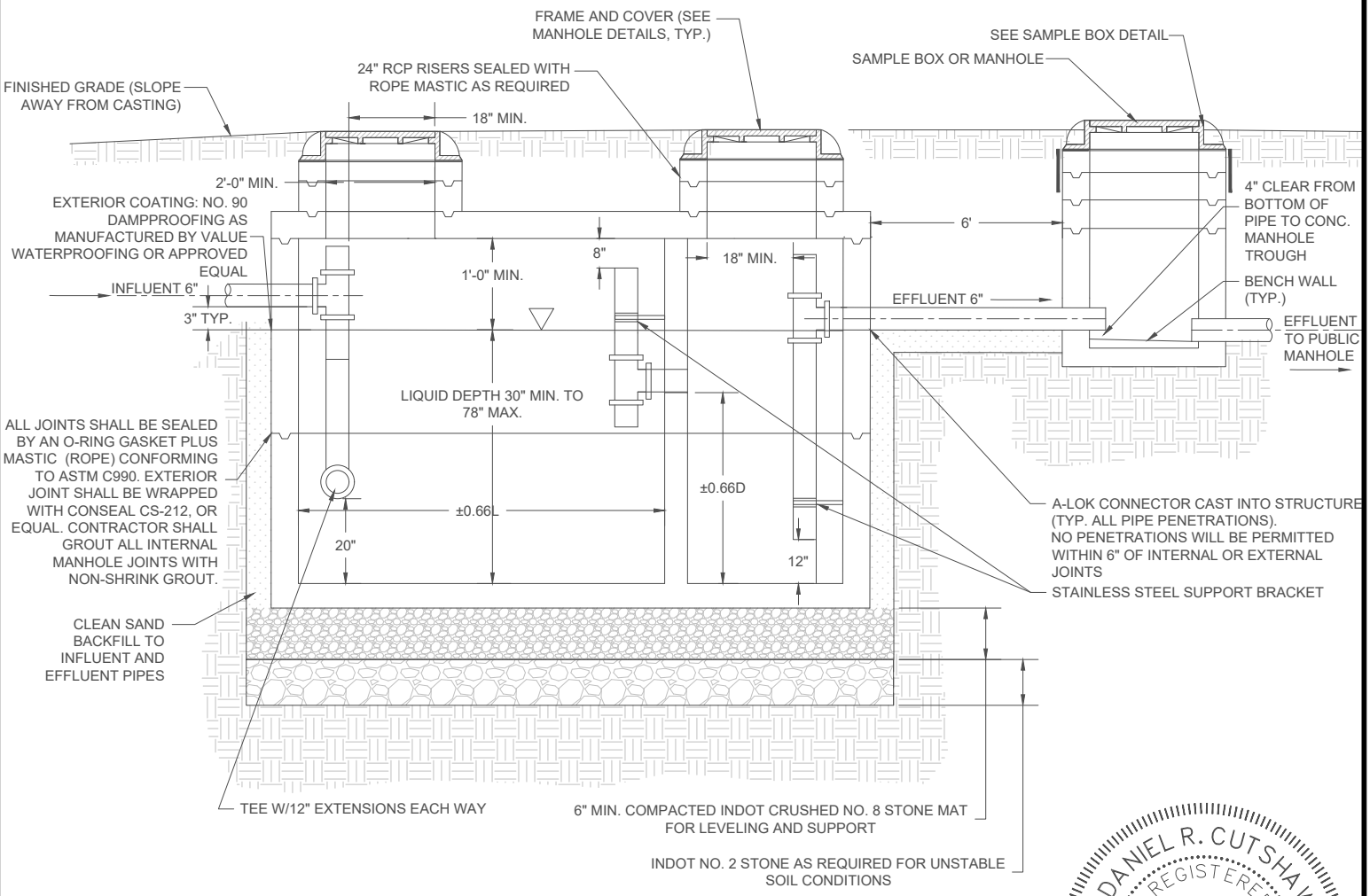
DATE: 06/30/25

SCALE: NTS

SHEET NO. 43

NOTES:

1. GREASE TRAP SHALL CONFORM TO ASTM 858 UTILIZING 4000 PSI CONCRETE. STRUCTURE SHALL BE DESIGNED TO SUPPORT LOADING IN PLANNED LOCATION.
2. EXTERIOR INSTALLATION MUST BE CONCRETE. STEEL GREASE TRAPS SHALL ONLY BE INSTALLED INSIDE BUILDING.
3. CONTRACTOR MAY SUPPLY GREASE TRAP AS MANUFACTURED BY ZURN SERIES Z-1170 OR JAY R. SMITH MANUFACTURING COMPANY SERIES 8000 IF INTERIOR INSTALLATION UTILIZED.
4. GREASE TRAPS MUST BE SIZED ACCORDING TO THE INDIANA STATE BOARD OF HEALTH BULLETIN S.E. 13, "ON-SITE WATER SUPPLY AND WASTEWATER DISPOSAL FOR PUBLIC AND COMMERCIAL ESTABLISHMENT" SECTION 501 "GREASE TRAPS" AND PER LOCAL REQUIREMENTS OR CODES. THE SIZING METHOD FOR ALL STRUCTURES MUST BE APPROVED BY THE TOWN.
5. SHOP DRAWINGS MUST BE SUBMITTED TO THE UTILITY ENGINEER FOR REVIEW AND APPROVAL.
6. TOP OF CASTING SHALL EXTEND 3" MIN. ABOVE FINISHED GRADE.
7. SAMPLE BOX SHALL BE PER TOWN STANDARDS.
8. INTERIOR PIPING SHALL BE 6" (MIN.) PVC.
9. GREASE TRAPS AND SAMPLING STRUCTURES ARE PROPERTY OF THE OWNER AND ARE NOT MAINTAINED BY THE TOWN.
10. ALL SAMPLING STRUCTURES ARE TO BE VACCUM TESTED PER TOWN STANDARDS



REVISIONS			
NO.	DESCRIPTION	DATE	BY

GREASE TRAP DETAIL

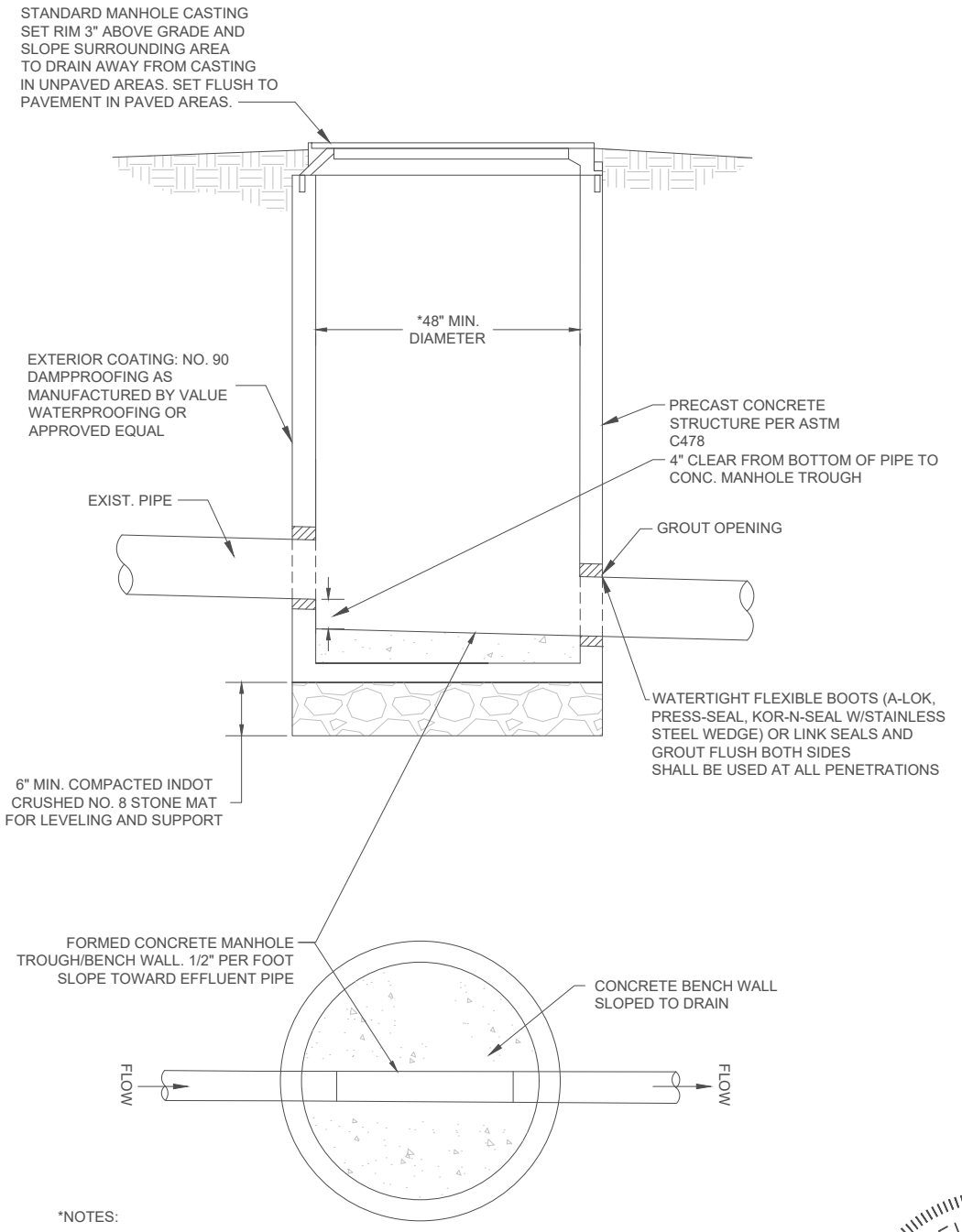
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 44



*NOTES:

1. WHERE DEPTH OF STRUCTURES EXCEEDS 4'-0", A 4FT. DIAMETER MANHOLE SHALL BE PROVIDED, THE PIPING CONFIGURATION SHALL BE THE SAME. MANHOLE STEPS SHALL BE INCLUDED.
2. SAMPLE MANHOLE STRUCTURES ARE PROPERTY OF THE OWNER AND WILL NOT BE MAINTAINED BY THE UTILITY.
3. SAMPLE MANHOLE SHALL BE VAC TESTED.
4. THE TROUGH SHALL BE INSTALLED WITH A 1/2" PER FOOT SLOPE TOWARDS THE EFFLUENT PIPE.
5. SAMPLING STATION MANHOLE IS REQUIRED FOR ALL INDUSTRIAL DEVELOPMENTS AND DEVELOPMENTS THAT REQUIRE A GREASE TRAP.
6. FOR NEW DEVELOPMENTS, SAMPLING STATION MANHOLE SHALL BE STANDARD 48" DIAMETER FLAT TOP MANHOLE. DOGHOUSE MANHOLE MAY BE APPROVED ON A CASE-BY-CASE BASIS.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

SAMPLE STATION MANHOLE
INSTALLATION DETAIL

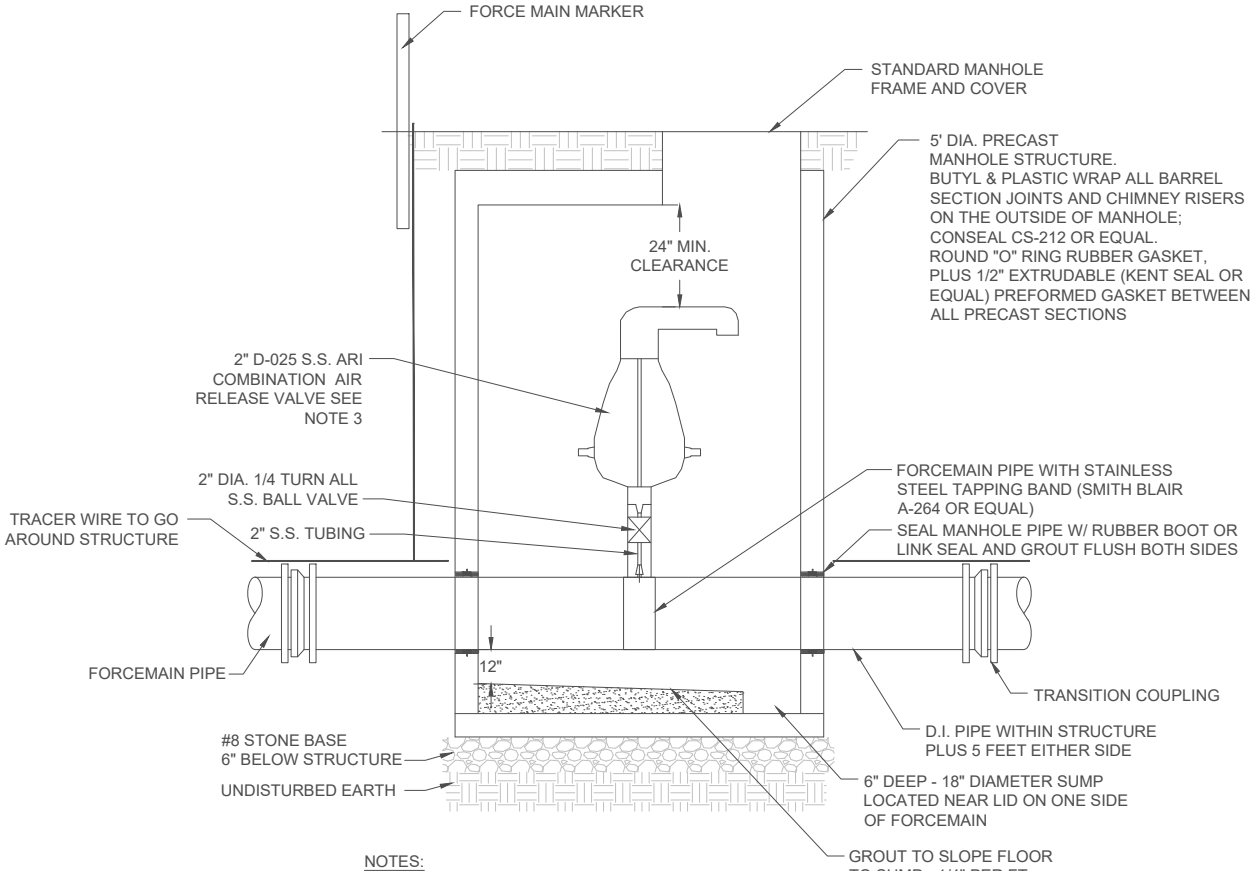
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 45



NOTES:

1. IF MORE THAN ONE AIR RELEASE VALVE IS INSTALLED WITH A FORCEMAIN, THE DEVELOPER SHALL PROVIDE ONE SPARE AIR RELEASE VALVE TO THE TOWN OF WHITESTOWN.
2. AIR RELEASE VALVES MUST BE INSTALLED AT ALL HIGH SPOTS IN PRESSURE PIPE.
3. THE DESIGN ENGINEER SHALL VERIFY ARV SIZING REQUIRED FOR THE FORCE MAIN SYSTEM BEING PLANNED
4. ARV TRACER WIRE TO BE TERMINATED AT MARKER POST AND WIRE RAN AROUND ARV PIT

REVISIONS			
NO.	DESCRIPTION	DATE	BY

FORCE MAIN AIR RELEASE VALVE

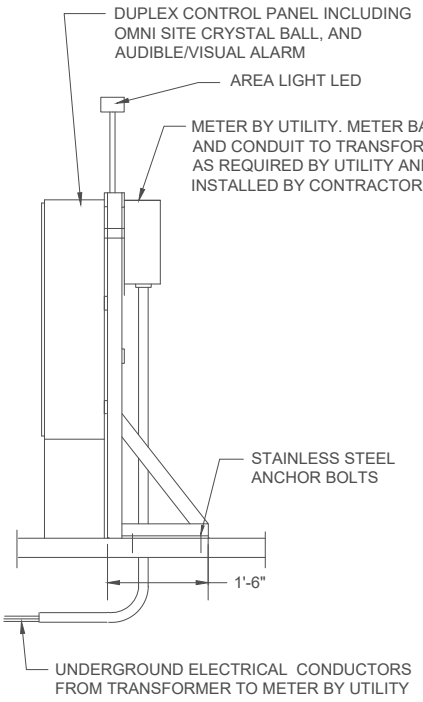
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

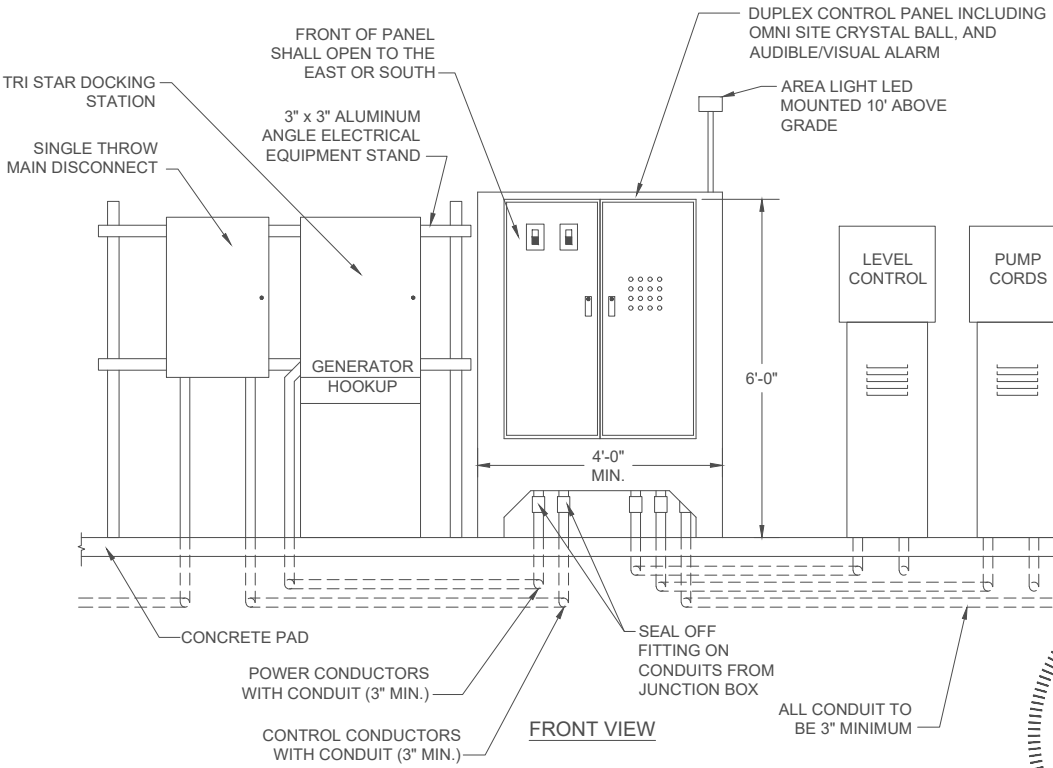
SHEET NO. 46



SIDE VIEW

NOTES:

1. SEE SITE PLAN FOR EXACT LOCATION OF CONTROL PANEL EQUIPMENT
2. ALL CONDUITS AND WIRING TO BE SIZED APPROPRIATELY BY DESIGN ENGINEER. CONDUIT SHALL BE SCHEDULE 80.
3. ALL PANELS SHALL BE NEMA 4X STAINLESS STEEL
4. ALL LIFT STATIONS SHALL BE 3PHASE , 460 VOLT IF UTILITY POWER IS AVAILABLE.
5. WIDTH OF CONCRETE PAD AS REQUIRED TO ACCOMMODATE PANELS PROVIDED.
6. PROVIDE APPROPRIATE BRACING SO THAT EQUIPMENT STAND IS STURDY ONCE ALL EQUIPMENT IS ATTACHED.
7. ALL CABINET PENETRATIONS SHALL BE FROM THE BOTTOM.
8. PROVIDE WIRING DIAGRAM INSIDE CONTROL PANEL DOOR.



FRONT VIEW

REVISIONS			
NO.	DESCRIPTION	DATE	BY

ELECTRICAL DIAGRAM

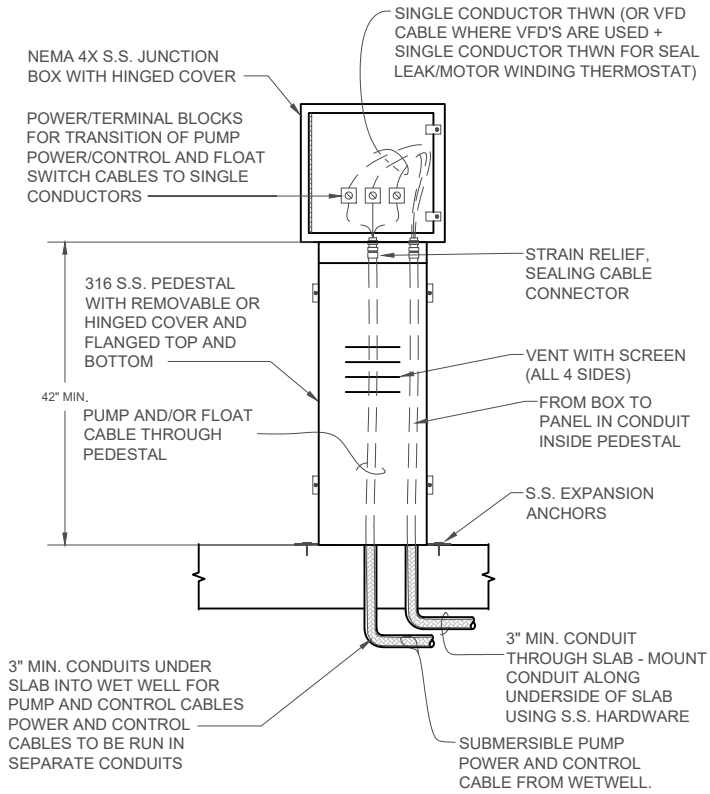
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 47



NOTES:

1. JUNCTION BOX SHALL BE SIZED AS REQUIRED TO ACCOMMODATE POWER/TERMINAL BLOCKS AND NUMBER OF CABLES.
2. PROVIDE ADEQUATE POWER AND TERMINAL BLOCKS FOR TRANSITION OF PUMP POWER/CONTROL OR FLOAT CABLES TO SINGLE CONDUCTORS.
3. CONVERT MULTITRODE FACTORY CABLE TO 24 STRAND/12 CONDUCTOR CABLE (GARLAND PART NO. TEM134802008) AT JUNCTION BOX AND EXTEND 12 CONDUCTOR CABLE IN 1" C TO PUMP CONTROL PANEL.
4. PROVIDE STRAIN RELIEF CABLE GRIP AND SEALING CABLE CONNECTORS FOR ALL CABLES ENTERING WETWELL.
5. SEALING CONNECTORS SHALL BE RATED FOR CLASS I, DIVISION 2, GROUP D HAZARDOUS LOCATIONS AND SHALL BE HAWKE 710, OR EQUAL.
6. GROUND LUG IS NOT SHOWN, BUT IS REQUIRED.
7. CONTRACTOR SHALL PROVIDE CONDUIT UNDER SLAB TO ALLOW ROUTING OF PUMP POWER/CONTROL CABLES, TRANSDUCER CABLE AND CAPACITANCE PROBE FROM WETWELL TO JUNCTION BOX. SEPARATE CONDUIT FOR EACH PUMP POWER CORD. ONE CONDUIT FOR PUMP CONTROL CORDS, ONE FOR LEVEL CONTROL.
8. CONTRACTOR SHALL FURNISH AND INSTALL SEALING CONNECTORS FOR PUMP POWER/CONTROL CABLE, TRANSDUCER CABLE AND LEVEL SENSING PROBE CABLE.
9. MANUFACTURER SUPPLIED CABLE FROM PRESSURE TRANSDUCER TO JUNCTION BOX.
10. ALL JUNCTION BOX TERMINAL BLOCKS NEED TO BE LUG TYPE TERMINAL BLOCKS.
11. BELOW GROUND CONDUIT SHALL BE SCHEDULE 80 PVC.
12. ALL CONDUIT SHALL BE SCHEDULE 80.
13. MINIMUM DIAMETER CONDUIT FOR POWER SHALL BE 4"DIA. CONTROL WIRE CONDUIT SHALL BE 3" DIA. MINIMUM

REVISIONS			
NO.	DESCRIPTION	DATE	BY

PUMP/FLOAT CABLE WETWELL JUNCTION BOX

STANDARD DETAILS

TOWN OF WHITESTOWN

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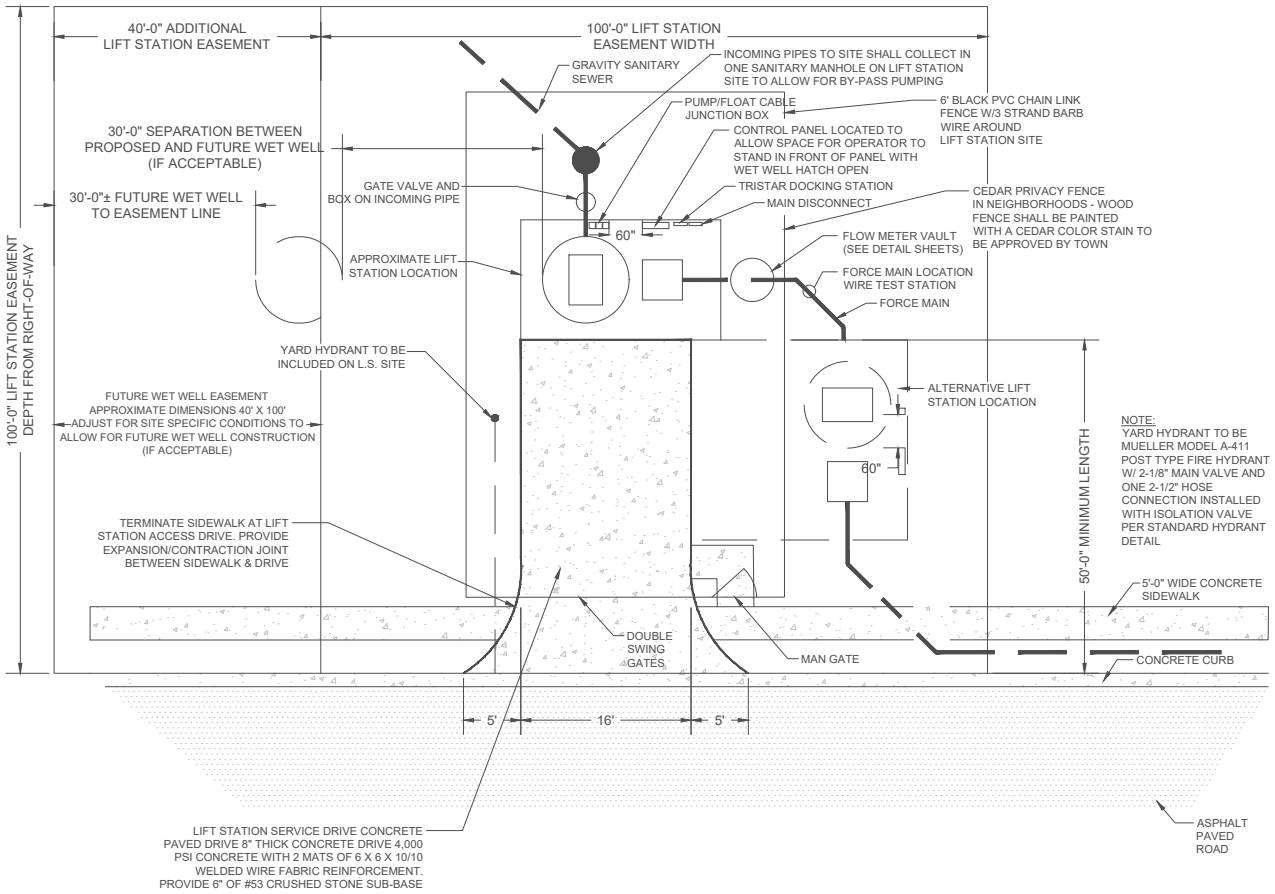
SHEET NO. 48



REVISIONS			
NO.	DESCRIPTION	DATE	BY

LIFT STATION SITE LAYOUT

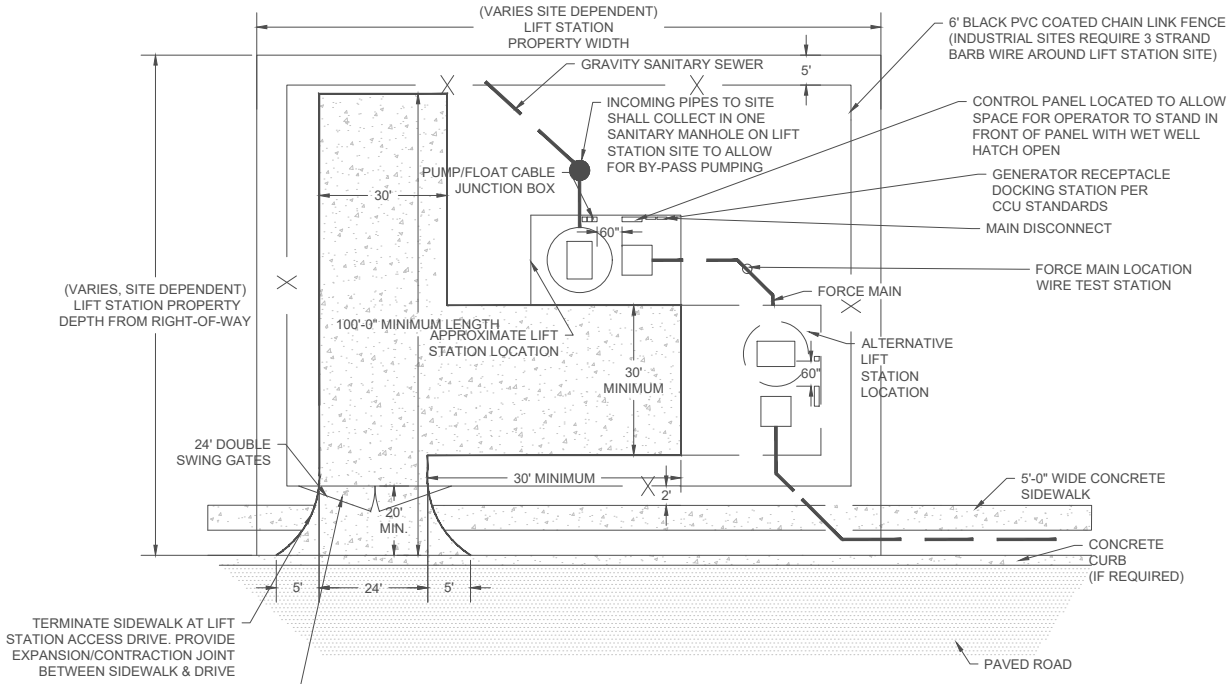
STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 49



LIFT STATION REQUIREMENTS:

1. ADDITIONAL LIFT STATION PROPERTY MAY BE REQUIRED IF LOCATION OF SITE HAS FUTURE POTENTIAL GROWTH THAT WOULD EXCEED THE CAPACITY OF THE LIFT STATION'S INITIAL DESIGN.
2. IF THE ROAD CLASSIFICATION IS PRINCIPLE ARTERIAL, MINOR ARTERIAL OR COLLECTOR, THEN TURN AROUND DRIVE ON LIFT STATION PROPERTY SHALL BE REQUIRED. IF ROAD CLASSIFICATION IS LOCAL STREET, THEN TURN AROUND DRIVE IS NOT REQUIRED.
3. DEPENDING ON THE LIFT STATION CAPACITY, AN ONSITE GENERATOR MAY BE REQUIRED FOR BACKUP POWER. TYPICALLY, A PORTABLE GENERATOR RECEPTACLE PER CCU STANDARDS WILL BE SUFFICIENT.
4. ALL LIFT STATION WIRING (I.E. POWER/TELCOM/SCADA) SHALL BE INSTALLED IN CONDUIT PER NEC CODE.
5. ALL CONDUITS FOR LIFT STATION SHALL BE INSTALLED UNDERGROUND PRIOR TO LIFT STATION CONC. APRON INSTALLATION AND LIFT STATION DRIVE PAVING.
6. ANY TREES SHALL BE MIN. 5' FROM FENCE
7. ONLY 1 INFLUENT SANITARY SEWER (12" MIN.) CONNECTION IS ALLOWED

REVISIONS			
NO.	DESCRIPTION	DATE	BY

LIFT STATION SITE LAYOUT II

STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 49A

LIFT STATION DESIGN DATA

DESCRIPTION	LIFT STATION ID NO. LS1 INITIAL DESIGN	DESCRIPTION	LIFT STATION ID NO. LS1 INITIAL DESIGN
NUMBER OF DWELLINGS		PLUG VALVE SIZE (IN.)	
GALLONS PER DAY PER RESIDENCE		VALVE VAULT DIMENSIONS	
TOTAL AVERAGE DAILY FLOW (GPD)		VALVE VAULT ACCESS HATCH SIZE	
TOTAL AVERAGE FLOW (GPM)		WETWELL INSIDE DIAMETER (FT.)	
PEAK FLOW RATE (GPM)		WETWELL DEPTH (FT.)	
PUMP FLOW RATE (GPM) * FUTURE		WETWELL ACCESS HATCH SIZE	
FORCE MAIN DIAMETER (IN.)		VISUAL LIGHT & AUDIBLE ALARM	
FORCE MAIN LENGTH (FT.)		EMERGENCY GENERATOR MALE END CONNECTION	
FORCE MAIN VELOCITY (FT./SEC.)		BUILT-IN EMERGENCY GENERATOR TRANSFER SWITCH	
C' VALUE		TOP OF LIFT STATION ELEVATION	
FORCE MAIN HEAD LOSS (FT.)		NORTH INVERT ELEVATION	
FORCE MAIN LIFT (FT.)		SOUTH INVERT ELEVATION	
PUMP WEAR ALLOWANCE (FT.)		EAST INVERT ELEVATION	
FITTING MINOR LOSSES (FT.)		WEST INVERT ELEVATION	
TOTAL DYNAMIC HEAD (FT.)		BOTTOM OF LIFT STATION ELEVATION	
MANUFACTURER & MODEL NUMBER		HIGH LEVEL ALARM ELEVATION	
PUMP HORSEPOWER		LAG PUMP ON ELEVATION	
PUMP SPEED (RPM)		LEAD PUMP ON ELEVATION	
IMPELLER DIAMETER (IN.)		BOTH PUMPS OFF ELEVATION	
POWER SUPPLY		VOL. BETWEEN OFF & LEAD PUMP ON (GAL.)	
NEMA STARTER SIZE		DETENTION TIME @ TOTAL AVERAGE FLOW (MIN.)	
CHECK VALVE SIZE (IN.)			

NOTE:
DEVELOPER SHALL COMPLETE AND SUBMIT ABOVE TABLE TO TOWN OF WHITESTOWN WHEN PLANNING A LIFT STATION.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

LIFT STATION DESIGN DATA

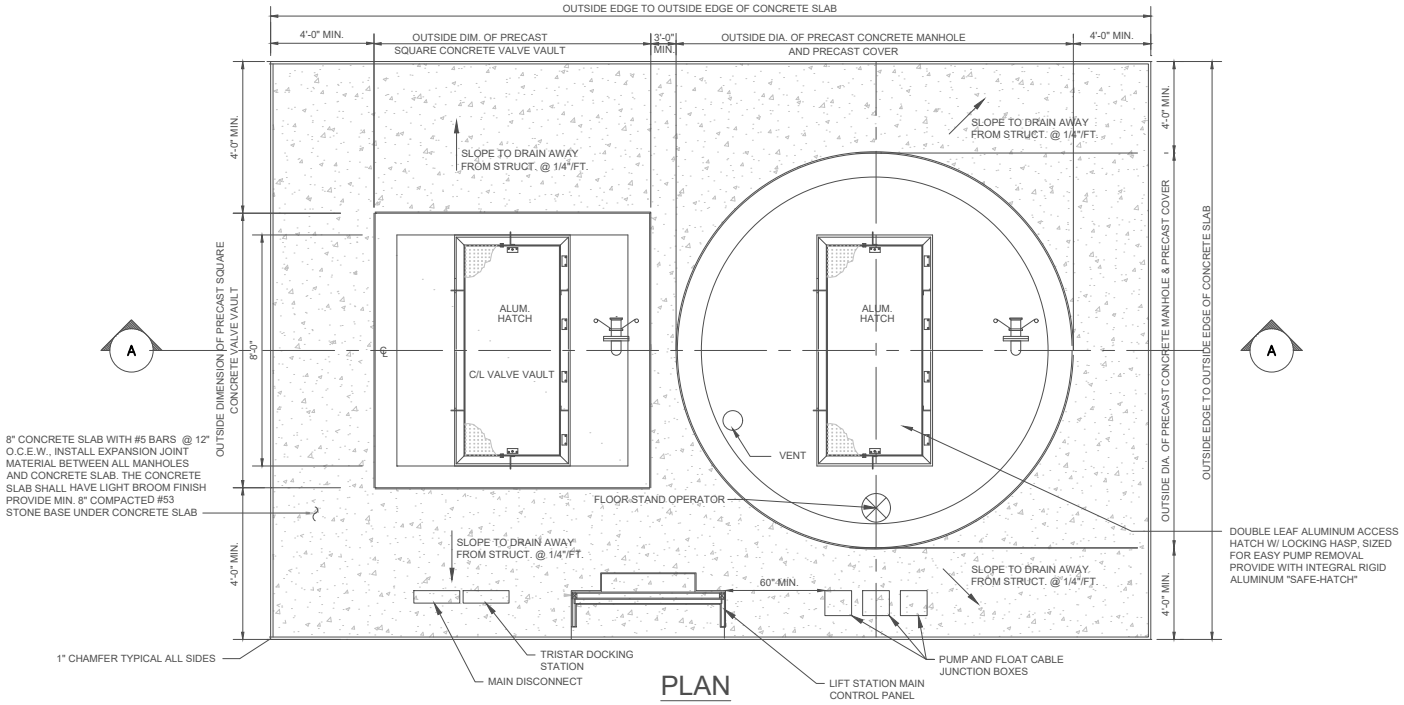
STANDARD DETAILS

TOWN OF WHITESTOWN

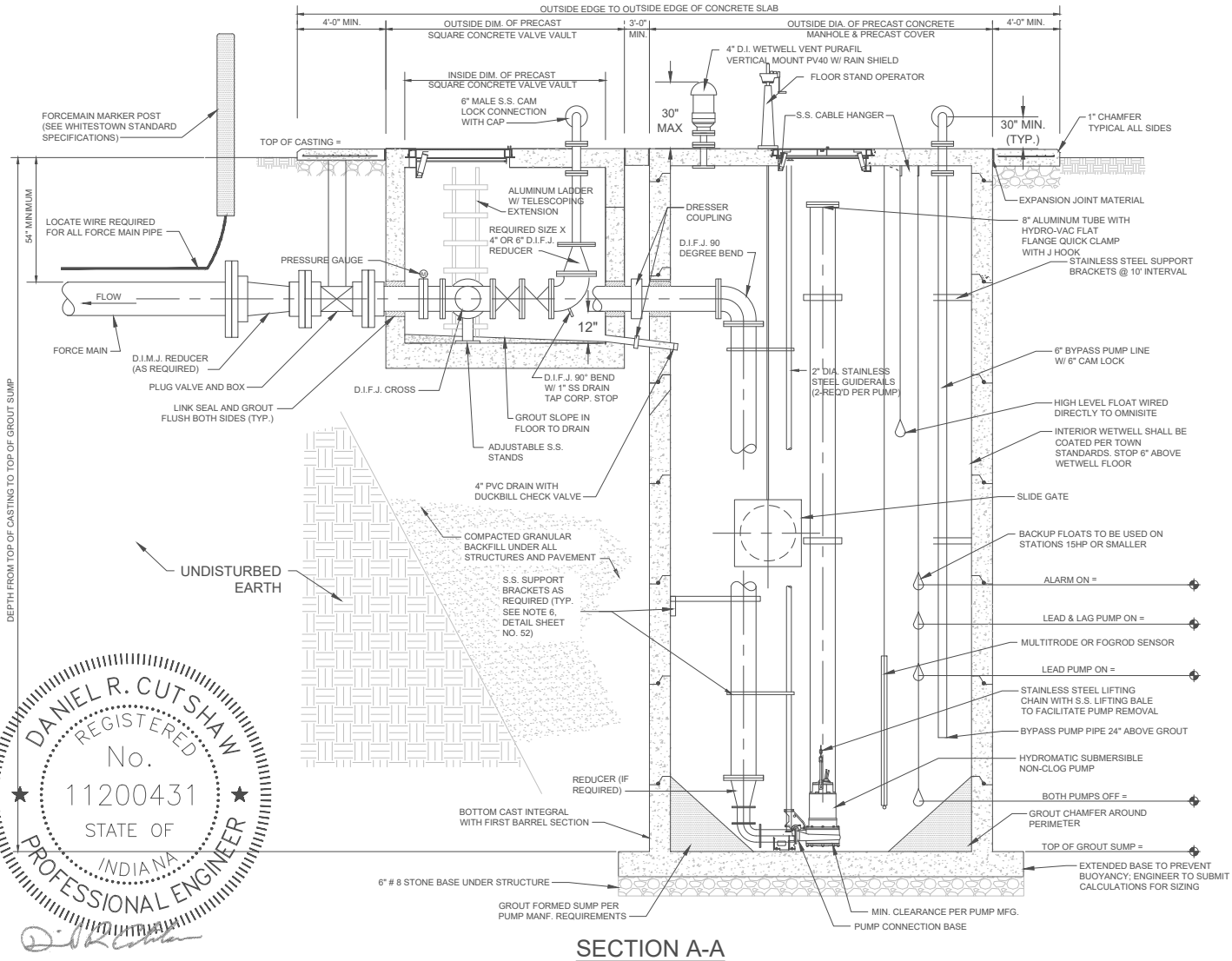
DATE: 06/30/25

SCALE: NTS

SHEET NO. 50



PLAN



SECTION A-A

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE I - LIFT STATION
GENERAL CONFIGURATION

STANDARD DETAILS

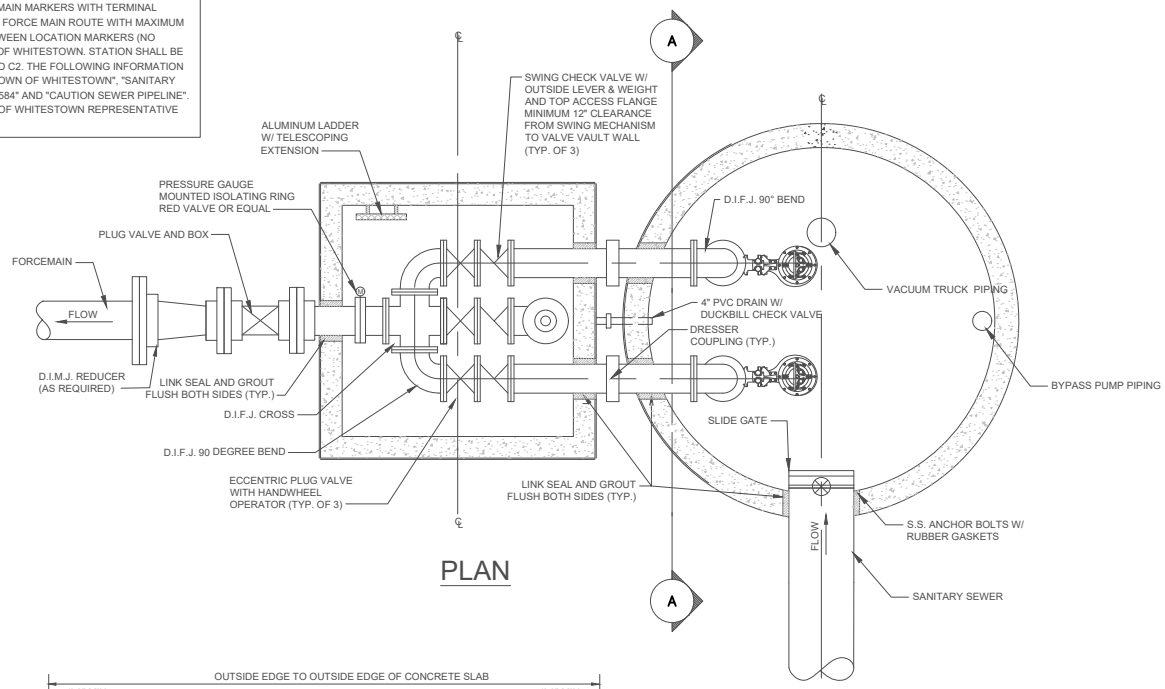
TOWN OF WHITESTOWN

DATE: 06/30/25

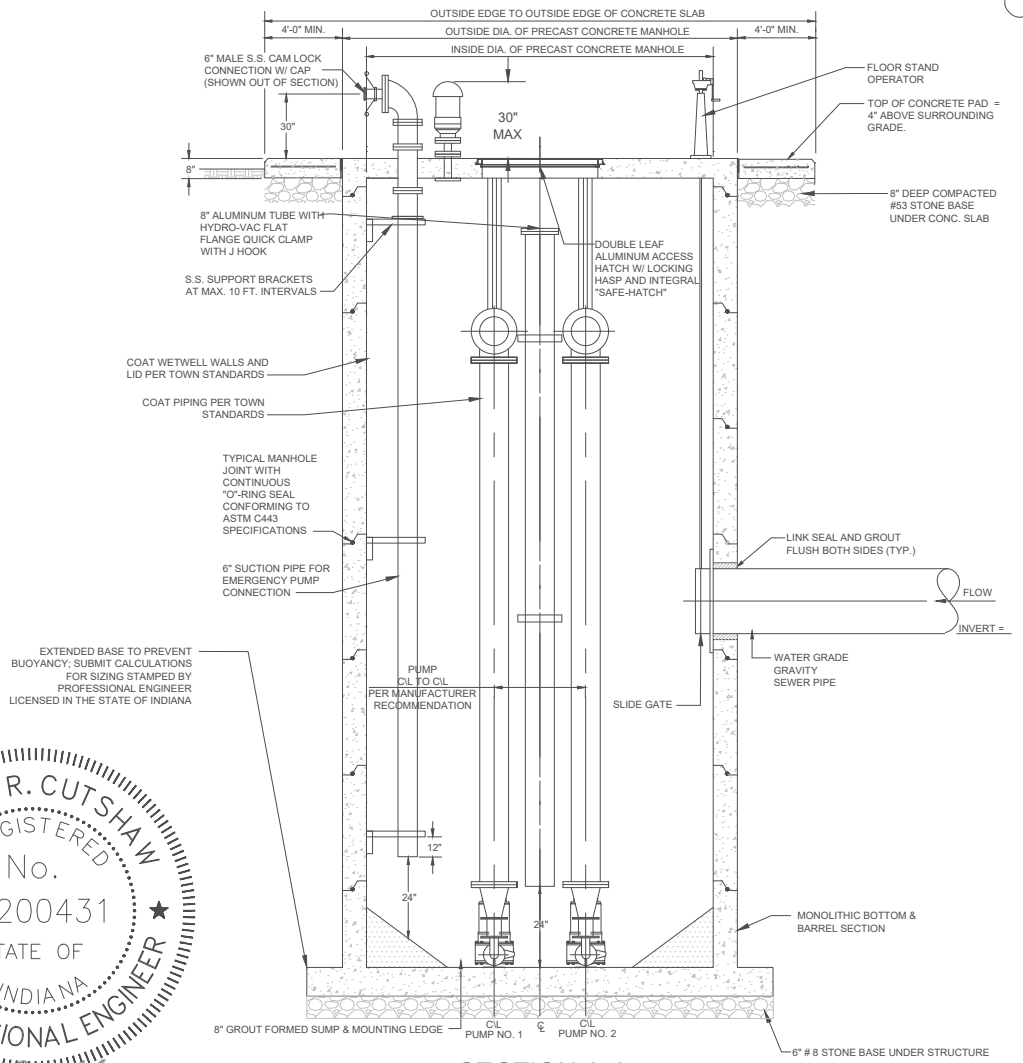
SCALE: NTS

SHEET NO. 51

FORCE MAIN LOCATION WIRE SHALL BE TERMINATED AT A FORCE MAIN MARKER POST INSTALLED ADJACENT TO THE VALVE VAULT. THE POST MARKER SHALL PROVIDE A TERMINAL CONNECTION POINT FOR FORCE MAIN LOCATION WIRE CONNECTION. FORCE MAIN MARKERS WITH TERMINAL CONNECTIONS TO LOCATION WIRE SHALL BE INSTALLED ALONG FORCE MAIN ROUTE WITH MAXIMUM 400 L.F. SPACING. LOCATION WIRE SHALL BE CONTINUOUS BETWEEN LOCATION MARKERS (NO SPLICING). COORDINATE MARKER LOCATIONS WITH THE TOWN OF WHITESTOWN. STATION SHALL BE EQUIVALENT TO HANDLEY INDUSTRIES MODEL PMP 7CE WITH LID C2. THE FOLLOWING INFORMATION SHALL BE CLEARLY PRINTED ON FORCE MAIN MARKER POST: "TOWN OF WHITESTOWN", "SANITARY SEWER LINE BURIED BELOW", "EMERGENCY CONTACT 317-733-8584" AND "CAUTION SEWER PIPELINE". CONTRACTOR SHALL LOCATE ALL PIPE IN PRESENCE OF TOWN OF WHITESTOWN REPRESENTATIVE FOLLOWING COMPLETION OF CONSTRUCTION.



PLAN



SECTION A-A

LIFT STATION REQUIREMENTS:

1. ALL BOLTS AND HARDWARE SHALL BE STAINLESS STEEL.
2. ENGINEER SHALL VERIFY THAT PUMPS CAN BE REMOVED FROM WETWELL VIA GUIDE RAILS THROUGH HATCH OPENING.
3. ALL PIPING WITH 5 FT. AND INSIDE LIFT STATION SHALL BE DUCTILE IRON. INTERIOR JOINTS SHALL BE FLANGED; EXTERIOR JOINTS SHALL BE MJ.
4. CONTRACTOR MUST PROVIDE TOWN OF WHITESTOWN - WHITESTOWN MUNICIPAL UTILITIES WITH SHUT OFF WRENCH FOR ALL NECESSARY VALVES.
5. FOG ROD AS PRIMARY AND FLOATS AS BACKUP.
6. ANCHOR PUMP DISCHARGE PIPE TO WALL AT MID POINT. IF LENGTH EXCEEDS 20FT., PROVIDE 2 ANCHOR BRACKETS EVENLY SPACED. ANCHOR GUIDE RAILS PER MANUFACTURES RECOMMENDATIONS.
7. ALL VALVES TO BE MANUFACTURED BY DEZURIK.
8. PUMP CHAIN, POWER, CONTROL AND LEVEL CONTROLS NEED TO BE ON SEPARATE SS HOOKS. CORDS NEED STRAIN RELIEF
9. VALVE VAULT PIPING SUPPORTS NEED TO BE ADJUSTABLE SS STANDS.

DANIEL R. CUTSHAW
REGISTERED
No.
11200431
STATE OF
INDIANA
PROFESSIONAL ENGINEER

REVISIONS

NO.	DESCRIPTION	DATE	BY

TYPE I - LIFT STATION GENERAL CONFIGURATION

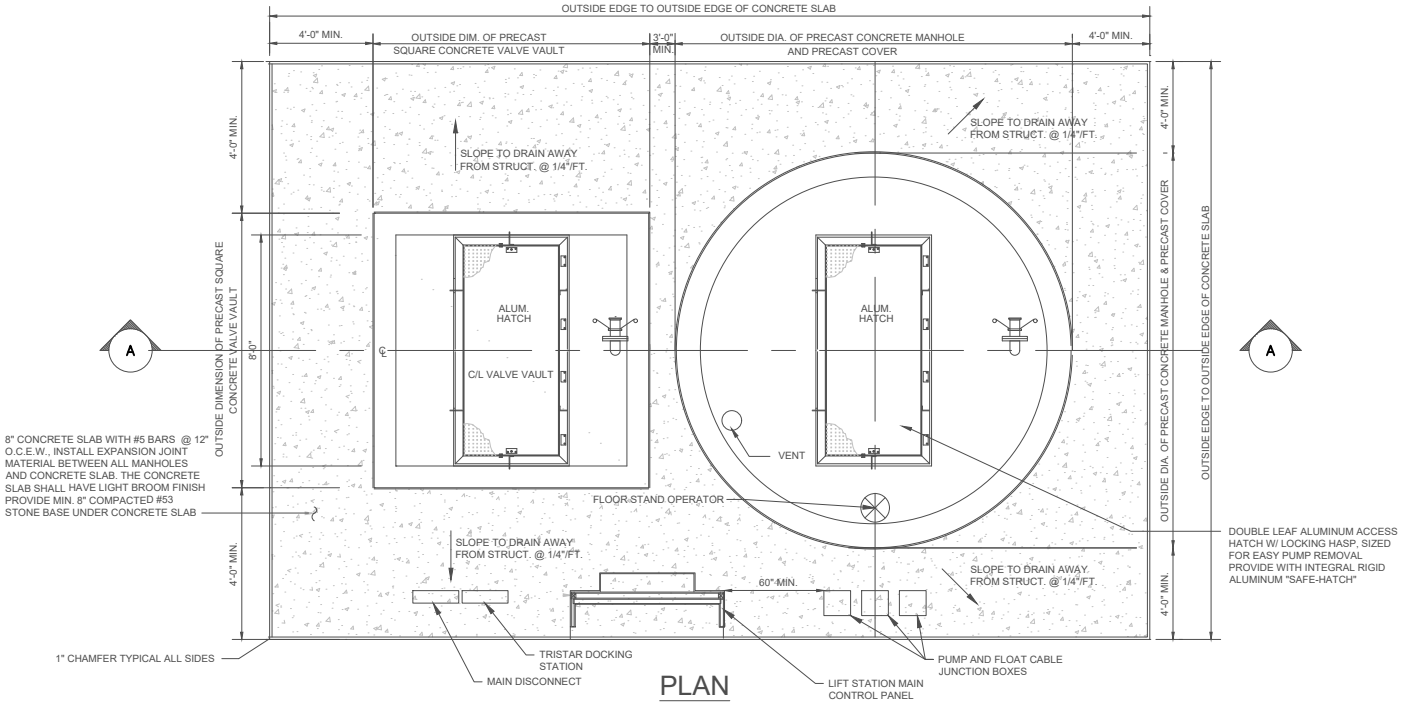
STANDARD DETAILS

TOWN OF WHITESTOWN

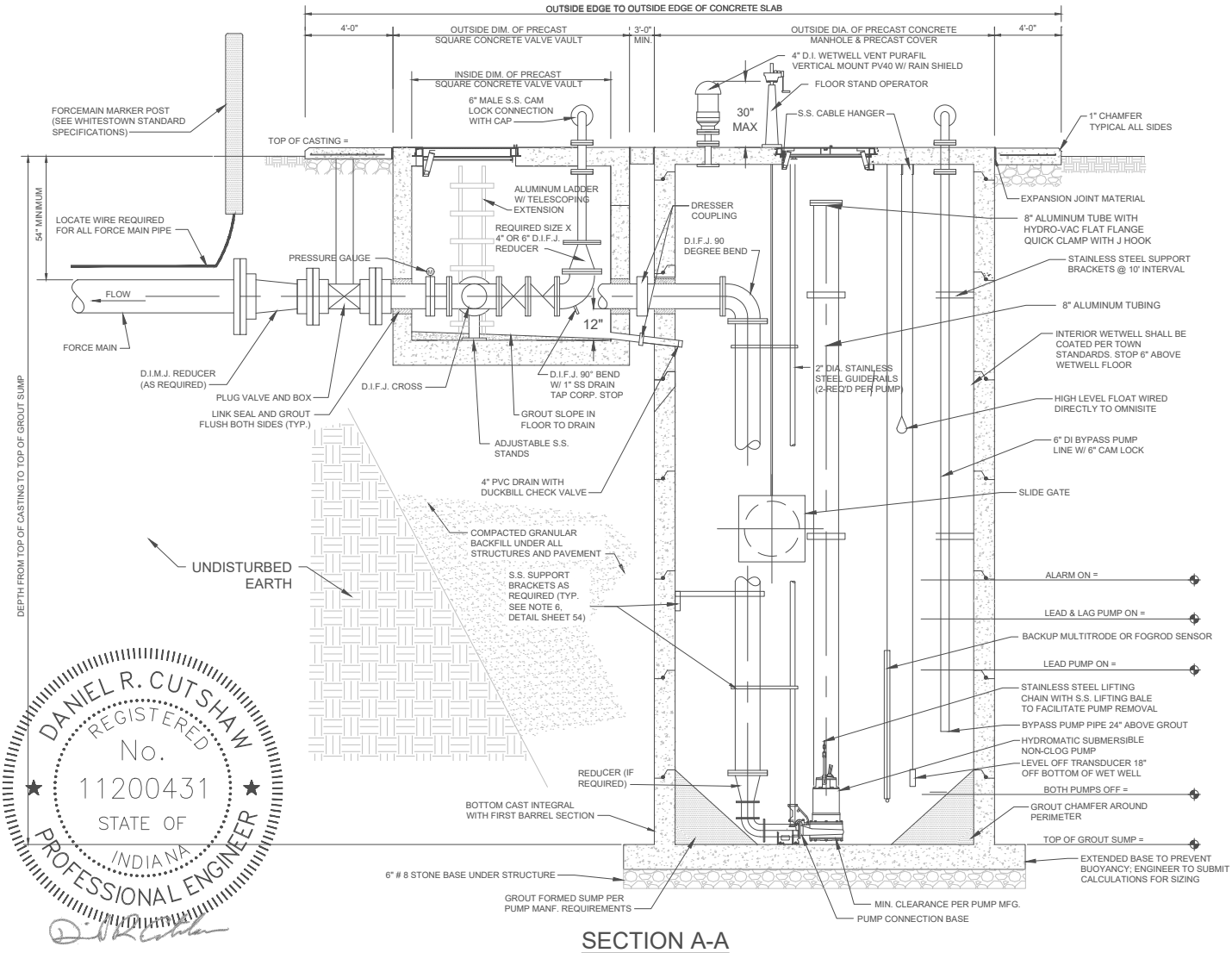
DATE: 06/30/25

SCALE: NTS

SHEET NO. 52



PLAN



SECTION A-A

DANIEL R. CUTSHAW
REGISTERED
No. 11200431
STATE OF INDIANA
PROFESSIONAL ENGINEER

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE II - LIFT STATION GENERAL CONFIGURATION

STANDARD DETAILS

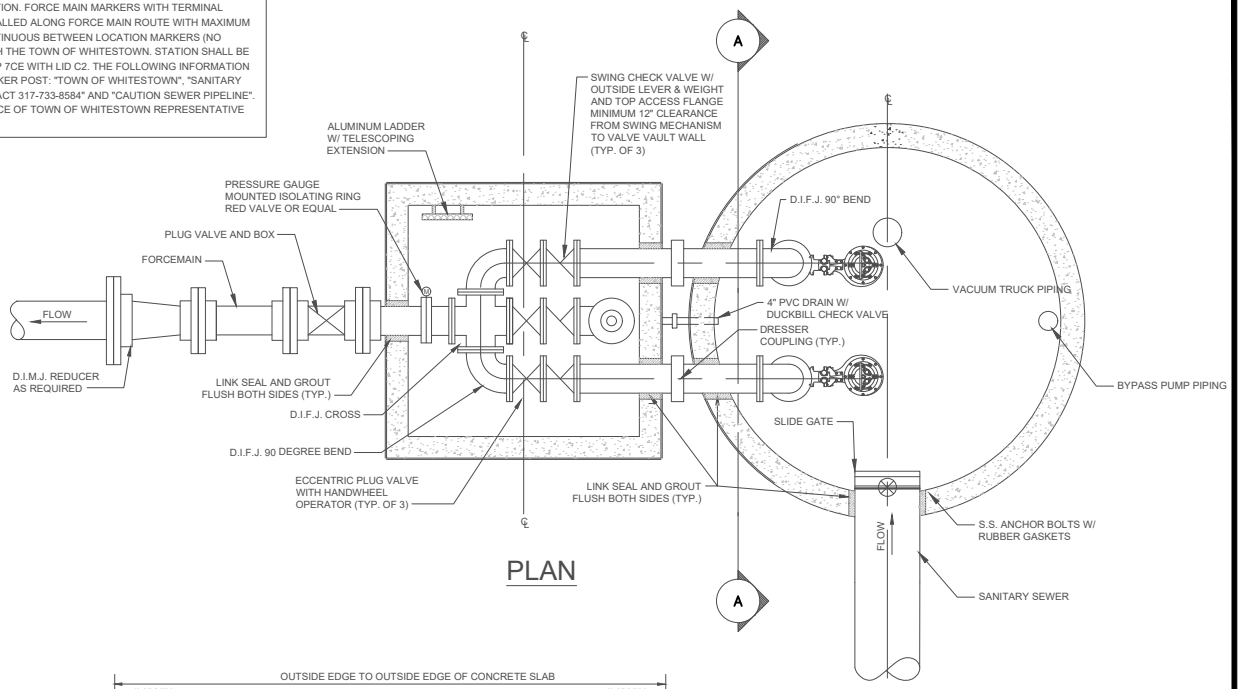
TOWN OF WHITESTOWN

DATE: 06/30/25

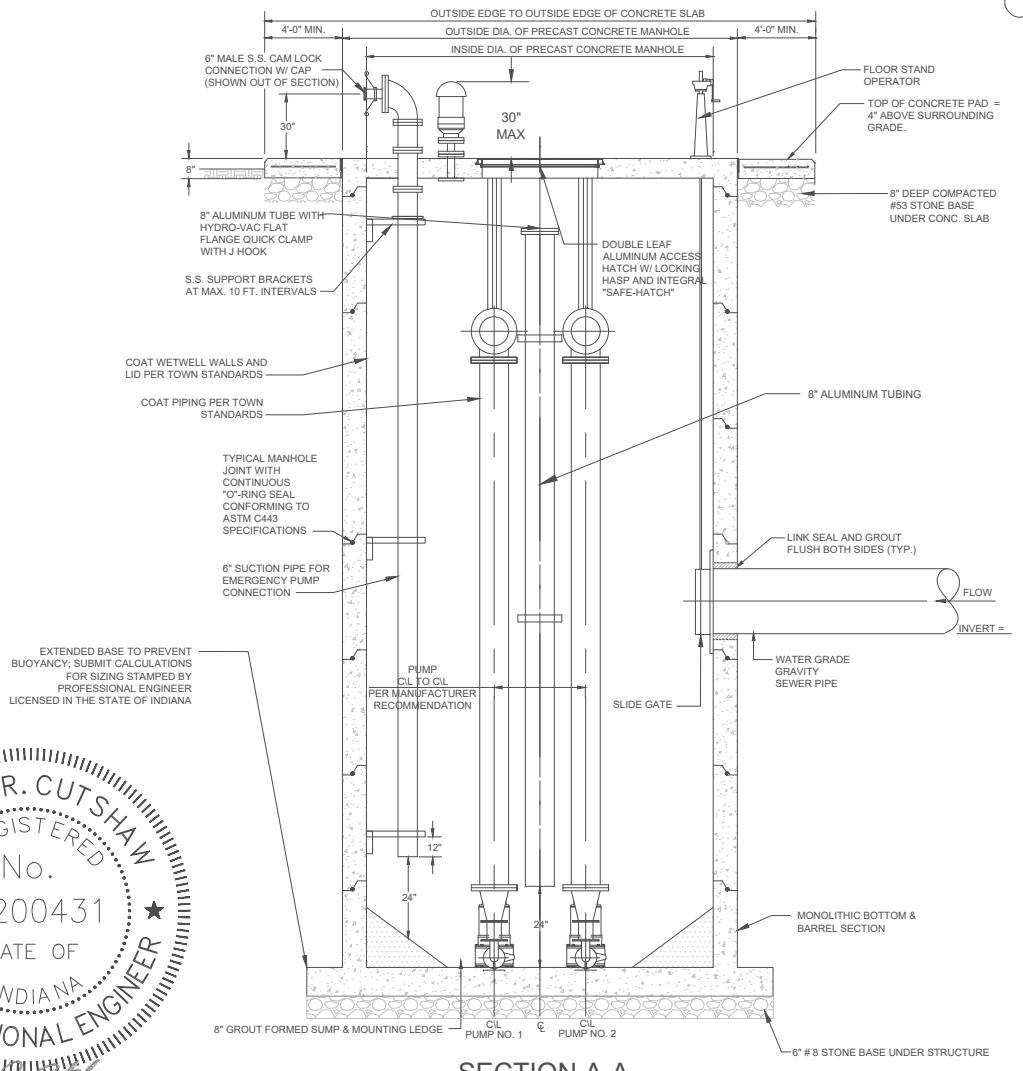
SCALE: NTS

SHEET NO. 53

FORCE MAIN LOCATION WIRE SHALL BE TERMINATED AT A FORCE MAIN MARKER POST INSTALLED ADJACENT TO THE VALVE VAULT. THE POST MARKER SHALL PROVIDE A TERMINAL CONNECTION POINT FOR FORCE MAIN LOCATION WIRE CONNECTION. FORCE MAIN MARKERS WITH TERMINAL CONNECTIONS TO LOCATION WIRE SHALL BE INSTALLED ALONG FORCE MAIN ROUTE WITH MAXIMUM 400 L.F. SPACING. LOCATION WIRE SHALL BE CONTINUOUS BETWEEN LOCATION MARKERS (NO SPLICING). COORDINATE MARKER LOCATIONS WITH THE TOWN OF WHITESTOWN. STATION SHALL BE EQUIVALENT TO HANDLEY INDUSTRIES MODEL PMP 7CE WITH LID C2. THE FOLLOWING INFORMATION SHALL BE CLEARLY PRINTED ON FORCE MAIN MARKER POST: "TOWN OF WHITESTOWN", "SANITARY SEWER LINE BURIED BELOW", "EMERGENCY CONTACT 317-733-8584" AND "CAUTION SEWER PIPELINE". CONTRACTOR SHALL LOCATE ALL PIPE IN PRESENCE OF TOWN OF WHITESTOWN REPRESENTATIVE FOLLOWING COMPLETION OF CONSTRUCTION.



PLAN



SECTION A-A

LIFT STATION REQUIREMENTS:

1. ALL BOLTS AND HARDWARE SHALL BE STAINLESS STEEL.
2. ENGINEER SHALL VERIFY THAT PUMPS CAN BE REMOVED FROM WETWELL VIA GUIDE RAILS THROUGH HATCH OPENING.
3. ALL PIPING WITH 5 FT. AND INSIDE LIFT STATION SHALL BE DUCTILE IRON. INTERIOR JOINTS SHALL BE FLANGED; EXTERIOR JOINTS SHALL BE MJ.
4. CONTRACTOR MUST PROVIDE TOWN OF WHITESTOWN - WHITESTOWN MUNICIPAL UTILITIES WITH SHUT OFF WRENCH FOR ALL NECESSARY VALVES.
5. TRANSDUCER AS PRIMARY AND FOG ROD AS BACKUP.
6. ANCHOR PUMP DISCHARGE PIPE TO WALL AT MID POINT. IF LENGTH EXCEEDS 20FT., PROVIDE 2 ANCHOR BRACKETS EVENLY SPACED. ANCHOR GUIDE RAILS PER MANUFACTURES RECOMMENDATIONS.
7. ALL VALVES TO BE MANUFACTURED BY DEZURIK.
8. PUMP CHAIN, POWER, CONTROL AND LEVEL CONTROLS NEED TO BE ON SEPARATE SS HOOKS. CORDS NEED STRAIN RELIEF
9. VALVE VAULT PIPING SUPPORTS NEED TO BE ADJUSTABLE SS STANDS.

REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE II - LIFT STATION GENERAL CONFIGURATION

STANDARD DETAILS

TOWN OF WHITESTOWN

DATE: 06/30/25

SCALE: NTS

SHEET NO. 54