

TOWN OF WHITESTOWN, INDIANA
STANDARD SPECIFICATIONS & DETAILS



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Standard Town of Whitestown Documents

Standard Town of Whitestown Details



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, pump 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 Utilities Manager 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 is to 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 is to 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 is to 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):

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:

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:

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:

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, pump 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 Manger 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:
 - Polyvinyl Chloride Pipe (PVC)
 - Ductile Iron Pipe (DIP)
 - High Density Polyethylene Pipe (HDPE)
2. 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. Ductile Iron Pipe and Fittings

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 cement-mortar lined with bituminous seal coat in accordance with the current requirements of AWWA C104. Thickness of the lining shall be set at 40 mils unless directed otherwise by the Town.
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 or sheet form conforming to AWWA C105 (latest edition).
 - a. The raw material used to manufacture polyethylene film shall be:
 - i. Type: I
 - ii. Class: Grade A or C
 - iii. Grade: E-1
 - iv. Flow Rate: 0.4 maximum
 - b. The polyethylene film shall have the following characteristics:
 - i. Tensile Strength: 1,200 psi minimum
 - ii. Elongation: 300 percent minimum
 - iii. Thickness: 0.008 inches minimum (8 mil)
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.

C. Polyvinyl Chloride (PVC) Pipe and Fittings

1. Pipe: PVC Pipe shall be installed where indicated on the Contract Drawings.
2. 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.
3. 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.
4. The PVC pipe manufacturer shall provide special fittings, acceptable to the Town to make watertight connections to manholes.
5. Pipe manufacturer shall furnish notarized certificate of compliance with applicable specifications.
6. PVC Pipe installed at depths greater than and including 16-feet deep shall be SDR-26 (PS115 for diameters larger than 15").
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:

- i. ASTM D 3034 Standard Dimension Ratio SDR-35.
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. 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 Gravity Lateral Service Connection Piping (6").
 - c. 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.
 - d. 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. For laterals with no existing stub out connection, use Inserta-Tee or approved equal when tapping into an existing sewer main.
 - d. The repair of laterals shall utilize the "Indiana Seal Shear Guard" or approved equal. Fernco Repair fittings will not be acceptable.

D. High Density Polyethylene (HDPE) Pipe and Fittings

1. Pipe: 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,
 - e. POLYPIPE,
 - f. or approved equal.
2. HDPE pipe and fittings shall be made of polyethylene resins having a cell classified in ASTM D 3350-84 as 345434C, having specific base resin densities of at least 0.941 g/cc minimum and 0.955 g/cc maximum respectively; and having melt index less than 0.15 grams/10 min. 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.
 3. Pipe made from these resins must have a long-term strength rating of 1,600 psi or more.
 4. 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.
 5. 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.
 7. All pipe shall be made from virgin material. No rework compound.
 8. 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 - PE3408 Pipe Pressure Rating
 - c. Manufacturer's Name, Trademark and Code
 9. Pipe shall be homogenous throughout, and be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.
 10. Fittings for the polyethylene pipe line shall be molded or fabricated from the same material as specified hereinbefore for the high density polyethylene pipe.
 11. 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. 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 Joints:

- a. 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.
- b. The fusion machine shall have hydraulic pressure control for fusing 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.
- c. 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.
- d. Threaded or solvent cement joints and connections are not permitted.

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.
 - Polyvinyl Chloride Pipe (PVC)
 - High Density Polyethylene Pipe (HDPE)

B. Polyvinyl Chloride (PVC) Pressure Pipe

1. Pipe: AWWA C-900 and C-905:
 - a. 4-inch through 12-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 to the requirements of ASTM F-477. The seal of the National Sanitation Foundation Testing Laboratory must appear on each pipe.
 - b. 16-inch through 30-inch - PVC plastic pipe shall conform to ANSI/AWWA C-905, 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.
2. 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.

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.,
 - b. "PLEXCO" as manufactured by Chevron,
 - c. POLYPIPE,
 - d. or Approved equal.
2. HDPE pipe and fittings shall be made of polyethylene resins having a cell classified in ASTM D 3350-05 as 345464C, having specific base resin densities of at least 0.941 g/cc minimum and 0.955 g/cc maximum respectively; and having melt index less than 0.15 grams/10 min. 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.
3. Pipe made from these resins must have a long-term strength rating of 1,600 psi or more.
4. 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.
5. 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. 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 – PE3408 Pipe Pressure Rating
 - c. 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.

D. Pipe Jointing:

1. 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.
2. The fusion machine shall have hydraulic pressure control for fusing 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.
3. 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.
4. Threaded or solvent cement joints and connections are not permitted.

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 trackhead 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 1' 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 one of the following products:
 - a. ASTM C 443 rubber gaskets
 - b. AASHTO M-198-75 preformed flexible butyl type joint sealant Hamilton-Kent "Kent-Seal No. 2"
 - c. K.T. Snyder Co. "Rub'r-Nek" Press
 - d. Seal Gasket "E-Z stik" Concrete
 - e. Sealants, Inc. "Conseal"
 - f. 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. Manhole Inverts: Manhole inverts shall be formed with 3,000 psi concrete. Inverts shall be constructed as shown on the Contract Drawings 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 and Engineer the table and trough may be cast as part of the base unit. 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.
8. Manhole Steps: Steps shall be included in the structures.
9. Manhole Frames and Covers: Manhole castings shall consist of cast iron frames with a minimum clear opening of twenty-two (22) 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.
10. 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 pick holes. Covers on sanitary sewer manholes shall not be perforated.
11. Acceptable manufacturers are East Jordan Iron Works, Inc., East Jordan, MI, Neenah Foundry Company, Neenah, WI. or equal.

12. 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.
13. Non-Traffic Weight: Manhole frame and cover weight to be minimum of 250 pounds.
14. 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".
15. 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.
16. 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.
17. 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.
18. Forcemain Discharge Manholes: The forcemain discharge manhole, as well as the two proceeding 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.
19. Precast Concrete Manhole Base Sections: Base sections shall follow INDOT requirements.
20. 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 use Fernco Compression Couplings, or equal; that are resistant to corrosion by soil and sewage and that will provide a permanent watertight joint. The compression coupling shall meet the physical test and joint-leak requirements specified in ASTM C-594. The bands for attaching pipes shall be stainless steel conforming to ASTM C-594. Each coupling shall bear the manufacturer's name and an indication of its size.

2.05 Sanitary Sewer Valves

A. 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 O-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.

B. 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.

C. Plug Valves (Submerged Forcemains Only)

1. Submerged plug valves shall comply with Specifications of Chapter 1, Section 1.07, Paragraph B 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.

D. 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. The swing check valve shall be constructed with heavy cast iron or cast steel body with a bronze or stainless steel seat ring, a non-corrosive shaft for attachment of weight and lever, and complete non-corrosive shockless chamber.
3. 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.
4. 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.
5. The valve disc shall be of cast iron or cast steel and shall be suspended from a non-corrosive shaft which will pass through a stuffing box and be connected to the cushion chamber on the

outside of the valve.

6. All material and workmanship shall be first class throughout and the purchaser reserves the right to inspect this valve before shipment.
7. The valves will be Golden-Anderson Industries, Inc. Fig. No. 250-D, 125# or equal.

E. 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 22 inch clear opening. 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.

F. 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. Valve boxes and covers shall be as manufactured by Tyler Corporation, Opelika Foundry, Bingham & Taylor, or equal.
3. 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.
4. Valve boxes shall have extension stems, where necessary when operating nut is raised to be within 4 feet of the existing grade.

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 Manger 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.
 - Polyvinyl Chloride Pipe (PVC)
 - High Density Polyethylene Pipe (HDPE)
 - Ductile Iron Pipe(DI)
2. Standard pipe sizes are 3", 6", 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. Restrained Joint 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 restrained push-on joints unless otherwise noted on Drawings.
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. Joints and Fittings: Fittings shall be Pressure Class 350 ductile iron and have restrained push-on joints 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.

5. The use of restrained joints utilizing a friction type connection shall not be accepted. Joints for ductile iron pipe and fittings, as described hereinbefore, shall be rubber-gasket joints and be in accordance with ANSI/AWWA C111/A21.11, latest revision.
6. Joints shall have the same pressure rating as the pipe of fitting of which they are a part. Joints shall be installed per the manufacturer's recommendations.
7. All pipe in the vicinity of a series of bends shall have restrained push-on joints, with lengths as recommended by the Engineer or pipe manufacturer. Pipe at ends left for future connections shall also have restrained push-on joints. All other tees, bends, and dead-ends shall have concrete thrust blocking.
8. Restrained joint pipe and fittings shall be FLEX-RING Restrained Joint by American Ductile Iron Pipe, TR FLEX Restrained Joint by U.S. Pipe, SUPER-LOCK Restrained Joint by Clow Water Systems, SNAP-LOCK Restrained Joint by Griffin Pipe, or approved equal.
9. Restrained push-on joint pipe and fittings shall be capable of being deflected after assembly.
10. All restrained joint pipe and fittings shall be fabricated by the same pipe manufacturer.
11. Where spigot end of restrained joint pipe connect with valves or other items that have mechanical-joint ends, connection shall be made with a restrained mechanical-joint gland. Restrained mechanical-joint connection shall be Mechanical- Joint Coupled- Joint by American Ductile Iron Pipe, MECH-LOK Restrained Joint by Griffin Pipe, or approved equal.

C. Polyvinyl Chloride (PVC) Pipe

1. Pipe: AWWA C-900 and C905 (Outside Diameter compatible with Cast Iron O.D.)
2. 4-inch through 12-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.
3. 16-inch through 30-inch - PVC plastic pipe shall conform to ANSI/AWWA C-905, 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.
4. 3-inch through 12-inch - PVC plastic pipe shall conform to ASTM Specification - D2241 (latest edition); Product Standards PS-22-70 NBS; Standard Dimension Ratio SDR 21 (200 psi); Maximum Length - 20 feet; Pressure Rating - 200 psi at 73.4o F. (SDR-21). 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.

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.

Joints shall be push-on joints conforming to ASTM D-3139.

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 Engineer's or Owner'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 Engineer or Owner upon request.

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.

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.

D. High Density Polyethylene (HDPE) Pipe and Fittings

1. Pipe: High density polyethylene pipe shall be by one of the following:
 - "Driscopipe" as manufactured by Phillips Product Company, Inc.,
 - "PLEXCO" as manufactured by Chevron,
 - POLYPIPE,
 - or Approved Equal.
2. Pipe shall meet the requirements of AWWA C906 (latest revision) and be manufactured from a PE 3408 resin listed with the Plastic Pipe Institute (PPI) as TR-4.
3. The resin material shall meet the requirements of ASTM D3350 with a minimum cell classification of PE 345464C. Pipes having an outside diameter of 3.5" and larger shall have a manufacturing standard of ASTM F-714.
4. All pipe diameter sizes shall be ductile iron pipe sizes (DIPS).
5. 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.

6. Pipe made from these resins must have a long-term strength rating of 1,600 psi or more.
7. Pipe shall be designed for a working pressure rating of 200 psi.
8. 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.
9. 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.
10. Fittings: Butt fusion fittings shall be in accordance with ASTM D3261 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.
11. Electrofusion Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-02 and be the same base resin as the pipe. Electrofusion Fittings shall have a manufacturing standard of ASTM F1055.
12. Flanged and Mechanical Joint Adapters: Flanged and Mechanical Joint Adapters shall be PE 3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-02 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.
13. 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.
14. Each length of pipe shall be marked, at no more than 10 foot intervals, with the following information:
 - Nominal Pipe Size
 - Type Plastic Material - PE3408
 - Pipe Pressure Rating
 - Manufacturer's Name, Trademark and Code
15. All pipe shall be made from virgin material. No rework compound.
16. Pipe shall be homogenous throughout, and be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.

17. Fittings for the polyethylene pipe line shall be molded or fabricated from the same material as specified hereinbefore for the high density polyethylene pipe.
18. Fittings for bends 22-1/2° or greater shall be provided as shown on the Drawings.
19. For alignment changes of less than 20° deflection, the pipe may be laid in curves with a radius of 100 feet or greater.
20. All run-of-the-pipe fittings shall be fusion welded into the pipeline. 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.
21. Fittings shall be capable of withstanding the same pressure and loading conditions specified for the pipe.
22. Pipe Jointing: Pipe to be joined by leakproof , thermal, butt fusion joints. All fusion must be done by personnel trained by the pipe supplier using tools approved by the pipe supplier.
23. The fusion machine shall have hydraulic pressure control for fusing 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.
24. 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.
25. Threaded or solvent cement joints and connections are not permitted.
26. Dimension Ratio (DR) for Pipe:
27. All HDPE pipe for water main applications shall be DR 9 (200 psi WPR).
28. Restrained Joint Ductile Iron Pipe and Fittings (4-inch diameter and larger)

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 trackhead 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. Tracer Wire

1. 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. Three tracer wires shall be installed for directional drilling and jack-and-bore operations.
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. Polyethylene Tubing

1. Customer service tubing, sizes 3/4-inch and 1-inch, shall be Polyethylene (PE) DR-9 (200 psi) and conform to AWWA C901, ASTM F 741 with a pipe designation of PE 3408 defined per ASTM D 3035 for IPS sizes and ASTM D 2737 for CTS sizes.

H. Corporation Stops and Fittings for House Service Reconnections

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.

I. Meter Boxes

1. Meter boxes shall adhere to Town Standard Details.
2. Meter boxes shall be TZ Products meter pit.
3. Service taps larger than 3-inches shall adhere to Town Standard details.

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 O-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 mechanical joint type with ANSI 125# outlet flange, suitable for maximum working pressures of 250 psi (4"-12" sizes) and shall be Mueller No. H-615, American-Darling No. 565, M&H No. 751, 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-2360, American-Darling No. 565, M&H No. 751; or approved equal.
5. All existing water mains to be tapped under this Contract 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 sleeve shall be fabricated to assure a 360° seal around the pipe under working pressures up to 200 psi. It shall be designed to accommodate the equipment and fixtures necessary to drill and ream the pipe and install the insertion valve without any interruption in water distribution service.
2. The valve assembly, when installed in the sleeve, shall perform as a water control device with an effective shutoff of the flow of water. The valve shall be installed in the open position, under water pressure without any interruption of water service. The valve shall give a full unobstructed full flow waterway after installation.
3. Materials: The sleeve shall be made of ASTM A-36 steel, epoxy coated to 10 - 12 mils.
4. Flange: A special flange shall be used in the installation of equipment and insertion valve.
5. Neck: The neck shall be manufactured to precision tolerances to assure proper alignment, support, and sealing of the insertion valve.
6. Lugs: Lugs on the sleeve are to be configured to properly align the sleeve halves during installation, provide a bolting surface and assure a 360° seal. The lugs are to be designed to prevent excessive stress on the pipe.
7. Bolts and Nuts: High strength low alloy steel bolts and nuts meeting AWWA Standard C-111 shall be furnished. Type 304 stainless steel bolts with SDC nuts are optional.
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: The sleeve shall be lined and coated with fusion bonded epoxy meeting the requirements of AWWA-C213.
10. Armors: Heavy gauge type 304 stainless steel armor plates shall be used to bridge the gap between the sleeve halves.
11. Insert: The insert shall consist of a ductile iron casting coated with SBR rubber compounded for water service with a durometer of 60 Shore A. The insert shall seal on the inside diameter of the sleeve and the lower half of the water main.
12. Valve Stem: The stem and nut assembly shall be in accordance with AWWA C-500- 80, Section 3.12.
13. Manufacturer: Insertion valve, equipment, and sleeves shall be as manufactured by Romac Industries, Seattle, WA, or 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 150 psi pressure (Class 150B) 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 cast iron ASTM A126, Class B 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 constructed of any material described in AWWA C504, Section 3.4. 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, Class 150. 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. Exterior surfaces shall be shop painted with two (2) coats of Fed. Spec. TT-V-51F Asphalt Varnish.
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 in Section 02505.
8. Butterfly valves shall be as manufactured by Dezurik; or approved equal.

G. Air Release Valves and Boxes

1. Air release valves are only permitted on water mains 16-inch in diameter and larger.
1. Air release valves and boxes shall be installed at locations to be determined in the field by the Engineer. Air release valve stems shall be connected to the main by a corporation stop and a tapping saddle. An isolation ball valve shall be furnished and installed between the air release valve and corporation stop. Valves shall be suitable for average working water pressure of 200 psi. Valves shall be equipped with cast iron body and cove, stainless steel float, Buna-N seat and bronze linkage.
2. Air release valves installed on water mains shall have a 1-inch inlet. All air release valves shall be APCO No. 200-A (with 5/32 inch orifice) as manufactured by Valve and Primer Corporation Schaumburg, Illinois or equal.
3. Air release valves shall be installed at the high point of the water main and shall be connected on the main by a corporation stop with a female I.P.S. threaded outlet. The inlet pipe to the valve shall be ASTM B 43 extra strong seamless red brass pipe with I.P.S. male threaded ends.
4. The air release valve box shall be a standard meter pit and cover with pipe cut-outs as shown in the standard details.

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

1. Valve boxes shall be a solid ribbed 8-inch diameter PVC riser centered over the valve with drop cover marked "WATER". 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. Valve boxes and covers shall be as manufactured by Tyler Corporation, Opelika Foundry, Bingham & Taylor, or equal.
2. 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.
3. Valve boxes shall have extension stems, where necessary when operating nut is raised to be within 4 feet of the existing grade.
4. A special utility 5-1/4” cast iron valve box lid, 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 Drawings or directed by the Engineer or Owner 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 hose connections (2-1/2" size), steamer connection (4-1/2” size) and bottom connection for 2-inch water line. Hydrants shall be Model A423 Centurion by Mueller or equal.
2. All hydrants shall be backfilled to the ground surface with crushed stone.
3. Exposed portions of hydrants shall be factory painted with an enamel finish. Color charts shall be furnished with Shop Drawings for color selection by the Engineer.
4. Below ground portions shall have two (2) coats of Fed. Spec. TT-V-51F Asphalt Varnish.

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 4 1/2-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. Hydrants shall be given two (2) coats of enamel high visibility paint as follows:
 - a. Public Hydrants shall be Red.
 - b. Private Hydrants shall be Yellow.
8. Hydrants shall be Mueller Super Centurion 250, Model A-423.

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. Hydrant box and cover shall be cast iron with a minimum diameter of 16" and a minimum depth of 10".
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. Sheet piling 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 sheet piling, bracing and coffer damming. All shoring, bracing and sheet piling 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. Sheet piling 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	90-100	8

Sidewalks and Open Areas

- 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 sheepfoot 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**

- a. 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.
- b. 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.
- c. 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.
- d. All excavated materials shall be placed a minimum of two feet (2') back from the edge of the trench.
- e. 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.
- f. 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.

- g. 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

- a. 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.
- b. 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.
- c. 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.
- d. 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.
- e. 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.
- f. Installation shall be in accordance with ASTM D 2321 except as modified hereinafter.

C. Special Granular Fill

- a. "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

- a. The laying of pipe in finished trenches shall be commenced at the lowest point so the spigot ends point in the direction of flow.
- b. 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.
- c. 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.
- d. 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.
- e. 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.
- f. 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.
- g. 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. 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.

F. 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.

G. 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.

H. 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.

I. 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.

J. 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.

K. 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.

L. 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.

M. 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. 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
3. 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.Any such failures shall be repaired and restored at no cost to the Town within 60 days.

D. Converting Existing Pump Station to Manhole

1. Where noted on the Contract Drawings, wet wells 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

1. Equipment: 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.
2. Drilling System
 - a. 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.
 - b. Drill Head - The drill head shall be steerable by changing its rotation and shall provide the necessary cutting surfaces and drilling fluid jets.
 - c. Mud Motors (if required) - Mud motors shall be of adequate power to turn the required drilling tools.
 - d. 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.
3. Guidance System
 - a. 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.
 - b. 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.

4. Drilling Fluid (MUD) System

- a. 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.
- b. 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.
- c. 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.

5. Other Equipment

- a. 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 be used to prevent excess sagging of pipe.
- b. Pipe Rammers - Hydraulic or pneumatic pipe rammers may only be used if necessary and with the authorization of Engineer.
- c. 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.
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 is 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:

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:

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. 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.

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

B. Pipe Bedding

1. Reference Section 5.02 B of this document.

C. Special Granular Fill

1. Reference Section 5.02 C of this document.

D. Laying Pipe

1. Reference Section 5.02 D of this document.

E. Backfilling Pipeline Trenches

1. Reference Section 5.02 E of this document.

F. Settlement of Trenches

1. Reference Section 5.02 F of this document.

G. Concrete Curb and Gutter Replacement

1. Reference Section 5.02 J of this document.

H. Mailbox, Culvert, Clothes Line Posts, Fences and other Replacements

1. Reference Section 5.02 K of this document.

I. Portland Cement Concrete Drive Replacement

1. Reference Section 5.02 I of this document.

J. Rip-Rap Stream Bank Slope Protection

1. Reference Section 5.02 L of this document.

K. 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 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.
4. 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.

5. 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.
6. 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.
7. 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.
8. 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. 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 CD/DVD or portable external hard drive (flash media).
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. 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. 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 Pi pe	2 Mini mum Time	3 Length for Minim	4 Time for Long	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	3:4	59	.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:4	39	.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:3	29	1.520	7:34	7:34	7:34	7:34	7:36	8:52	10:0	11:2
1	9:2	23	2.374	9:26	9:26	9:26	9:53	11:5	13:5	15:4	17:4
1	11:20	19	3.418	11:2	11:2	11:2	14:1	17:0	19:5	22:4	25:3
1	14:10	15	5.342	14:1	14:1	17:4	22:1	26:4	31:0	35:3	40:0
1	17:00	13	7.692	17:0	19:1	25:3	32:0	38:2	44:5	51:1	57:4
2	19:50	11	10.470	19:5	26:1	34:5	43:3	52:2	61:0	69:4	78:3
2	22:40	99	13.674	22:4	34:1	45:3	56:5	68:2	79:4	91:1	102:3
2	25:30	88	17.306	28:5	43:1	57:4	72:0	86:3	100:5	115:2	129:4
3	28:20	80	21.366	35:3	53:2	71:1	89:0	106:5	124:3	142:2	160:1
3	31:10	72	25.852	43:0	64:3	86:1	107:4	129:1	150:4	172:2	193:5
3	34:00	66	30.768	51:1	76:5	102:3	128:1	153:5	179:2	205:0	230:4
4	39:48	57	41.88L	69:48	104:42	139:37	174:30	209:24	244:19	279:13	314:07
4	45:34	50	54.705 L	91:10	136:45	182:21	227:55	273:31	319:06	364:42	410:17
5	51:02	44	69.236 L	115:24	173:05	230:47	288:29	346:11	403:53	461:34	519:16
6	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.

6. 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.
7. **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 conducive 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.
 8. **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.
 9. **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 Force mains

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.

C. Sanitary Sewer Manholes

1. 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.

2. 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: 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.
1. Disinfection of Water Piping
 - a. Disinfection:
 - (1) 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.
 - (2) The chlorination point and supply shall be accessible above grade.
 - (3) 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.

9.01 Introduction

This Chapter pertains to the requirements for the design and construction of submersible type pump 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.**

Pump stations meeting or exceeding the requirements set herein will be approved. Any proposed alteration of the pump 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 Pump Station and a Type II Pump Station. Pump 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- $\frac{5}{8}$ " 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 6-⁵/₈” 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 Pump 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. National Fire Protection Association (NFPA).
 - vii. National Electrical Manufacturers Association (NEMA).
 - viii. Manufacturer’s published recommendations and specifications.

2. Submittals

- a. 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:

 - i. Descriptive literature including materials of construction, equipment weight, motor data, pressure ratings, certification of all applicable ASTM standards;
 - ii. 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;

- iii. Dimensional factory drawings including cross sectional views of pumps and all equipment showing details of construction;
- iv. Written report on the factory test results;
- v. Manufacturer's installation instructions.

b. Operation and Maintenance Manuals:

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:

- i. Warranty Statement
- ii. Pump down test procedures and results from the start-up tests;
- iii. Operation Instructions;
- iv. Maintenance Instructions;
- v. Recommended spare parts list;
- vi. Lubrication schedules;
- vii. Structural diagrams;
- viii. As-built wiring diagrams;
- ix. Piping and Instrumentation Drawings (P&ID); and
- x. Bill of materials

3. Experience Qualifications:

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.

2. Factory Testing:

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.

B. Products

1. Manufacturers:

- a. Hydromatic
- 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	Hydromatic
Pump Model	XXXXXXXXXXXXXXXX
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%
Maximum NPSH Required	XX ft.
NEC Classification	Above min. pump submergence level = Class 1, Div 2, Groups C & D
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-foot 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 pump 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. Piping shall be coated with a protective coating as follows, or as approved in

writing by the Town:

Piping Inside the Wetwell:

	Product	Dry Thickness (mils)
Surface Preparation	Per Manufacturer Recommendation	Per Manufacturer Recommendation
Primer	Per Manufacturer Recommendation	Per Manufacturer Recommendation
Field Preparation	Per Manufacturer Recommendation	---
Field 1 st Coat	Tnemec Perma-Shield Series 435-5020	15 – 20
Field 2 nd Coat	Tnemec Perma-Shield Series 435-5020	15 - 20

Piping Above the Wetwell/Valve Vault & Inside the Valve Vault:

	Product	Dry Thickness (mils)
Surface Preparation	Per Manufacturer	Per Manufacturer
Primer	Per Manufacturer	Per Manufacturer
Field Preparation	Scarify per Manufacturer's Recommendations	---
Field 1 st Coat	Tnemec 73U-34GR	2-3
Field 2 nd Coat	Tnemec 73U-34GR	2-3

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-Zurk
- 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 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.

b. Pump Construction:

Pump volute, motor and seal housing are to be high quality gray cast iron ASTM A-48, Class 30 (Hydromatic). All mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton/FKM rubber O-rings. Sealing shall be accomplished when metal-to-metal contact is made, resulting in controlled compression of the rubber O-rings without requirement of a specific torque limit.

c. 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.

d. Motor:

(1) Hydromatic:

- (a) The stator winding, rotor and bearings are to be mounted in a sealed submersible type housing. Insulation utilized in the stator windings shall be Class H with maximum temperature capability of 155°C. Motor housing shall be filled with a high-dielectric oil, NEMA B design, to give superior heat transfer and allow the bearings to run in a clean, well lubricated environment; or the housing shall be air filled with grease lubricated bearings. The pump and motor are to be specifically designed so that they may be operated partially or completely submerged in the liquid being pumped. Stators shall be securely held in place with a removable end ring and threaded fasteners so that it may be easily removed in the field without use of heat or a press. Motor shall be provided with heat sensing units attached to the motor windings, which shall be connected to the control panel to shut down the pump if overheating occurs.
- (b) The minimum 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.

- (2) Power Cable: The power cable shall be sized according to the NEC standards and shall be of sufficient length to reach the junction box without the need of any splices. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity. The motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire pump performance curve, from shut-off through run-out.

e. Hydromatic Bearings and Shaft:

- (1) An upper radial bearing and a lower thrust bearing shall be required. These shall be heavy-duty single row ball bearings that are permanently lubricated by the dielectric oil that fills the motor housing. The upper radial bearing shall have a minimum B-10 life at the specified condition of 50,000 hours, and the lower thrust bearing shall have a minimum B-10 life at the specified condition of 50,000 hours.

- (2) The shaft shall be machined from a solid 303 stainless steel forging and be a design that is of large diameter with minimum overhang to reduce shaft deflection and prolong bearing life.

f. Hydromatic Mechanical Seals:

The pump shall be provided with a mechanical rotating shaft seal system running in an oil reservoir having separate, constantly lubricated lapped seal faces. The lower seal unit between the pump and oil chamber shall consist of one (1) stationary seat and one (1) rotating ring held in place by its own spring. The lower seal shall be removable without disassembling the seal chamber. The upper seal between the motor and the seal chamber shall be of the same design with its own separate spring system. The lower and upper seals shall be tungsten-carbide. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. The shaft sealing system shall be capable of operating submerged to pressures equivalent to two hundred (200) feet. No seal damage shall result from operating the pump unit out of its liquid environment. The seal system shall not rely upon the pumped media for lubrication. The seal chamber shall also be equipped with a seal failure sensor probe which will sense water intrusion through the lower seal. This sensor is to be connected to an alarm in the control panel to indicate lower seal failure.

g. Hydromatic Impeller:

- (1) Impeller shall be ductile iron ASTM A-536 of a non-clog design capable of handling minimum three (3) inch sphere solids, fibrous material, heavy sludge and other matter found in normal sewage applications. Impeller shall be of the two-vane, enclosed non-clogging design and have pump-out vanes on the front and backside of the impeller to prevent grit and other materials from collecting in the seal area.
- (2) Impellers shall be dynamically balanced. The tolerance values shall be listed below according to the International Standard Organization grade 6.3 for rotors in rigid frames. The tolerance is to be split equally between the two balance planes that are the two impeller shrouds.

	Tolerance
1750	.02 in. – oz./lb. of impeller weight

- (3) Impeller shall be either slip fit or taper fit with key to securely lock the impeller to the driving shaft. A 300 series stainless steel washer and impeller bolt shall be used to secure the impeller to the shaft for both threaded and tapered shafts. Straight end shafts for attachment of the impeller shall not be acceptable.

h. Hydromatic Volute:

- (1) The casing shall be of the end suction volute type, cast iron ASTM A-48 Class 30,

having sufficient strength and thickness to withstand all stress and strain from service at full operating pressure and load. The casing shall be of the centerline discharge type equipped with an automatic pipe coupling arrangement for ease of installation and piping alignment. The design shall be such that the pumps will be automatically connected to the discharge piping when lowered into position with the guide rails. The casing shall be accurately machined and bored for register fits with the suction and casing covers.

- (2) A volute case wear ring shall be provided to minimize impeller wear. The wear ring shall be Alloy 230 brass, ASTM B-43 and held by 300 series stainless steel fasteners. The wear ring shall be easily replaceable in the field.
- (3) The impeller and volute case coating shall be as follows:

	Product	Dry Thickness (mils)
Surface Preparation	Per Manufacturer Recommendation	Per Manufacturer Recommendation
Shop 1 st Coat	Chesterton ARC 855 – Grey	15 – 20
Shop 2 nd Coat	Chesterton ARC 855 – Black	15 – 20

i. Lifting Systems:

Each submersible pump shall be provided with a Type 316 stainless steel lifting chain and bale of sufficient length extending from the top of the station to the pump unit. The working load of the lifting system shall be 50% greater than the pump unit weight.

- j. Protection: Each pump motor starter shall incorporate three thermal switches, one per stator phase winding and be connected in series, to monitor the temperature of the motor. Should the thermal switches open, the motor shall stop and activate an alarm. A seal probe shall be installed to signal if moisture is present in the seal chamber, and indicate an alarm on the control panel.

- k. Flow Meter: 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. SCADA System

- a. OmniSite Crystal Ball Cellular Dialer
- b. Power: 12 VDC or 120 VAC
- c. Communications: Cellular GSM 850/900/1800/1900 MHZ
- d. Access Key: Smart security key to identify personnel on site
- e. Terminal Blocks: Removable style accepts #14-18 AWG solid or stranded wire.
- f. Operating Temperature -20/150 Deg. F
- g. Operating Humidity: 0-90% RH Non-condensing

- h. Certifications: UL Pending
- i. Dimensions: 8.9"H x 9.4"W x 3.8"D
- j. Memory Stick: Shall have one (1) gigabyte storage space
- k. LCD Display: 4x20 rugged operation
- l. Keypad: Eight (8) universal navigation buttons
- m. Analog Inputs: Four (4) 4-20mA, isolated, 10 bit resolution
- n. Pump No. 1 Amperage
- o. Pump No. 2 Amperage
- p. Relay Outputs: Four (4) 20A @ 120 VAC resistive.
- q. Digital Inputs: 14 Universal inputs accept 12 VAC/VDC – 120 VAC/VDC
- r. High Level Alarm for Primary and backup Level Control System (Normally Open Contact)
- s. High Level Alarm dedicated float wired directly to OmniSite
- t. Pump No. 1 Run (Normally Open Contact)
- u. Pump No. 2 Run (Normally Open Contact)
- v. Pump No. 1 Over Temperature/Load Combined (Normally Closed Contact)
- w. Pump No. 2 Over Temperature/Load Combined (Normally Closed Contact)
- x. Pump No. 1 Seal Fail (Normally Open Contact)
- y. Pump No. 2 Seal Fail (Normally Open Contact)
- z. Phase Failure Alarm (Each Phase)
- aa. Level Control Fail Alarm
- bb. 24V DC Fail Alarm

3. Control Panel

- (1) 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.
- (2) Pump station controls shall be manufactured by USEMCO, Inc., Tomah, Wisconsin. The controls shall have the following features.
 - (a) General Information
 - i. The pumps shall be engaged electrically by NEMA rated across the line starters with bi-level overloads. Size the overloads for the pump horsepower per the pump manufacturer's recommendations.
 - ii. The pump station power shall be routed from the Electrical Utility's meter through a service rated main switch, than into the control panel with a main breaker. In addition, an emergency main breaker shall be located inside the control panel to allow for the manual transfer of power to an emergency generator through the use of a Kirk Key interlock.
 - iii. The pump station shall include a TriStar Docking Station for emergency generator connection.

(b) Level Control

- i. Primary Level control of the pump station shall be by Fogrod (LIT controller) with level rod.
- ii. Backup Level control of the pump 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 have IDEC type relays.

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. 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:

- (1) Plug all inlet lines before starting presoak period.
- (2) Presoak period shall be at least 4.0 hours.
- (3) Following the presoak period, fill the structure to a depth of 6-inches below the top structure joint.
- (4) 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:

- Two (2) Impellers
- Two (2) Seal Kits
- One (1) Fog Rod
- One (1) Fog Rod Controller
- One (1) Mechanical Ball Float
- One (1) Control Panel Relay of each type
- Three (3) Control Panel Fuses of each type

9.03 Type II Pump 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. National Fire Protection Association (NFPA).
 - g. National Electrical Manufacturers Association (NEMA).
 - h. 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:

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.

B. Factory Testing:

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:

- 1. Head vs. flow with five (5) equally spaced points including shutoff and maximum flow shall be certified.
- 2. The input KW, speed, power factor, no load current, and torque characteristics shall be certified.
- 3. Impeller, motor rating, and electrical connections shall first be checked for compliance to the specifications.
- 4. Insulation Test: A motor and cable insulation test for moisture content or insulation defects shall be made.

5. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.
6. Operational Test: The pump shall be run for 30 minutes submerged, under a minimum of six feet of water.
7. After the operational test (described in line F) has been conducted, the insulation test (described in line D above) shall be performed again.
8. After testing, the pump shall be inspected to insure that the pump maintains full watertight integrity.
9. 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.

C. Products

1. Manufacturers
 - a. Hydromatic
 - 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	Hydromatic
Pump Model	S8LA1000M4-4
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%
Maximum NPSH Required	XX ft.
NEC Classification	Above min. pump submergence level = Class 1, Div 2, Groups C & D
Cooling Jacket Equipped	No
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 pump 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.

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-foot 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. Pump Construction: Pump volute, motor and seal housing are to be high quality gray cast iron ASTM A-48, Class 30 (Hydromatic). All mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton/FKM rubber O-rings. Sealing shall be accomplished when metal-to-metal contact is made, resulting in controlled compression of the rubber O-rings without requirement of a specific torque limit.
 - c. 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.

d. Hydromatic Motor:

- i. The stator winding, rotor and bearings are to be mounted in a sealed submersible type housing. Insulation utilized in the stator windings shall be Class H with maximum temperature capability of 155°C. Motor housing shall be filled with a high-dielectric oil, NEMA B design, to give superior heat transfer and allow the bearings to run in a clean, well lubricated environment; or the housing shall be air filled with grease lubricated bearings. The pump and motor are to be specifically designed so that they may be operated partially or completely submerged in the liquid being pumped. Stators shall be securely held in place with a removable end ring and threaded fasteners so that it may be easily removed in the field without use of heat or a press.
- ii. Motor shall be provided with heat sensing units attached to the motor windings, which shall be connected to the control panel to shut down the pump if overheating occurs.
- iii. The minimum 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.

iv. Power Cable:

The power cable shall be sized according to the NEC standards and shall be of sufficient length to reach the junction box without the need of any splices. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity. The motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire pump performance curve, from shut-off through run-out.

e. Hydromatic Bearings and Shaft:

- i. An upper radial bearing and a lower thrust bearing shall be required. These shall be heavy-duty single row ball bearings that are permanently lubricated by the dielectric oil that fills the motor housing. The upper radial bearing shall have a minimum B-10 life at the specified condition of 50,000 hours, and the lower thrust bearing shall have a minimum B-10 life at the specified condition of 50,000 hours.
- ii. The shaft shall be machined from a solid 303 stainless steel forging and be a design that is of large diameter with minimum overhang to reduce shaft deflection and prolong bearing life.

f. Hydromatic Mechanical Seals:

- i. The pump shall be provided with a mechanical rotating shaft seal system running in an oil reservoir having separate, constantly lubricated lapped seal faces. The lower seal unit between the pump and oil chamber shall consist of one (1) stationary seat and one (1) rotating ring held in place by its own spring. The lower seal shall be removable without disassembling the seal chamber. The upper seal between the motor and the seal chamber shall be of the same design with its own separate spring system. The lower and upper seals shall be tungsten-carbide. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. The shaft sealing system shall be capable of operating submerged to pressures equivalent to two hundred (200) feet. No seal damage shall result from operating the pump unit out of its liquid environment. The seal system shall not rely upon the pumped media for lubrication. The seal chamber shall also be equipped with a seal failure sensor probe which will sense water intrusion through the lower seal. This sensor is to be connected to an alarm in the control panel to indicate lower seal failure.

g. Hydromatic Impeller:

- i. Impeller shall be ductile iron ASTM A-536 of a non-clog design capable of handling minimum three (3) inch sphere solids, fibrous material, heavy sludge and other matter found in normal sewage applications. Impeller shall be of the two-vane, enclosed non-clogging design and have pump-out vanes on the front and backside of the impeller to prevent grit and other materials from collecting in the seal area.
- ii. Impellers shall be dynamically balanced. The tolerance values shall be listed below according to the International Standard Organization grade 6.3 for rotors in rigid frames. The tolerance is to be split equally between the two balance planes that are the two impeller shrouds.

RPM Tolerance

1750 .02 in. – oz./lb. of impeller weight

- iii. Impeller shall be either slip fit or taper fit with key to securely lock the impeller to the driving shaft. A 300 series stainless steel washer and impeller bolt shall be used to secure the impeller to the shaft for both threaded and tapered shafts. Straight end shafts for attachment of the impeller shall not be acceptable.
- h. Hydromatic Volute:
 - i. The casing shall be of the end suction volute type, cast iron ASTM A-48 Class 30, having sufficient strength and thickness to withstand all stress and strain from service at full operating pressure and load. The casing shall be of the centerline discharge type equipped with an automatic pipe coupling arrangement for ease of installation and piping alignment. The design shall be such that the pumps will be automatically connected to the discharge piping when lowered into position with the guide rails. The casing shall be accurately machined and bored for register fits with the suction and casing covers.
 - ii. A volute case wear ring shall be provided to minimize impeller wear. The wear ring shall be Alloy 230 brass, ASTM B-43 and held by 300 series stainless steel fasteners. The wear ring shall be easily replaceable in the field.
- i. Lifting Systems: Each submersible pump shall be provided with a Type 316 stainless steel lifting chain and bale of sufficient length extending from the top of the station to the pump unit. The working load of the lifting system shall be 50% greater than the pump unit weight.
- j. Protection: Each pump motor starter shall incorporate three thermal switches, one per stator phase winding and be connected in series, to monitor the temperature of the motor. Should the thermal switches open, the motor shall stop and activate an alarm. A seal probe shall be installed to signal if moisture is present in the seal chamber, and indicate an alarm on the control panel.
- k. Flow Meter: 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.
- l. SCADA System:
 - i. OmniSite Crystal Ball Cellular Dialer
 - ii. Power: 12 VDC or 120 VAC
 - iii. Communications: Cellular GSM 850/900/1800/1900 MHZ
 - iv. Access Key: Smart security key to identify personnel on site
 - v. Terminal Blocks: Removable style accepts #14-18 AWG solid or stranded wire.
 - vi. Operating Temperature -20/150 Deg. F

- vii. Operating Humidity: 0-90% RH Non-condensing
- viii. Certifications: UL Pending
- ix. Dimensions: 8.9"H x 9.4"W x 3.8"D
- x. Memory Stick: Shall have one (1) gigabyte storage space
- xi. LCD Display: 4x20 rugged operation
- xii. Keypad: Eight (8) universal navigation buttons
- xiii. Analog Inputs: Four (4) 4-20mA, isolated, 10 bit resolution
- xiv. Wetwell Level
- xv. Pump No. 1 Amperage
- xvi. Pump No. 2 Amperage
- xvii. Mag Meter Flow
- xviii. Relay Outputs: Four (4) 20A @ 120 VAC resistive.
- xix. Digital Inputs: 14 Universal inputs accept 12 VAC/VDC – 120 VAC/VDC
- xx. Dedicated High Level Alarm for Primary/Backup Level Control System (Normally Open Contact)
- xxi. Dedicated Float High Level Alarm wired directly to OmniSite (Normally Open Contact)
- xxii. Primary Level Control Failure (Normally Open Contact)
- xxiii. Pump No. 1 Run (Normally Open Contact)
- xxiv. Pump No. 2 Run (Normally Open Contact)
- xxv. Pump No. 1 Over Temperature/Load Combined (Normally Closed Contact)
- xxvi. Pump No. 2 Over Temperature/Load Combined (Normally Closed Contact)
- xxvii. Pump Seal Fail for both Pump (Normally Open Contact)
- xxviii. Phase Failure Alarm (Each Phase)

5. Control Panel

- i. 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.
- ii. Pump station controls shall be manufactured by USEMCO, Inc., Tomah, Wisconsin. The controls shall have the following features.
 - a. General Information
 - i. The pumps shall be engaged electrically by NEMA rated across the line starters with bi-level overloads. Size the overloads for the pump horsepower per the pump manufacturer's recommendations.
 - ii. The pump station power shall be routed from the Electrical Utility's meter through a service rated main switch, than into the control panel with a main breaker. In addition, an emergency main breaker shall be located inside the control panel to allow for the manual transfer of power to an emergency generator through the use of a Kirk Key interlock.

- iii. An emergency generator power connection shall be installed and consist of a Tri-Star docking station.
 - b. Level Control
 - i. Primary Level control of the pump station shall be by Endress+Hauser WaterPilot level transducer. When a transducer failure occurs, the backup system shall be automatically activated.
 - ii. Backup Level control of the pump station shall be independent of the Primary Level Controls. The system shall be composed of a FogRod with settings for Off Level, Lead On Level, Lag On Level and High Level. In the event where the High Level sensor on the FogRod is activated, the level control shall automatically be switched to the backup system.
 - iii. Relays shall be IDEC type.
- 6. Variable Frequency Drives
 - a. General Information
 - i. VFD shall be Mitsubishi Drives
 - ii. This section provides specification for AC variable frequency drives or herein identified as VFD's for use with {NEMA A, NEMA B} design AC induction motors.
 - iii. Any exceptions / deviations to this specification shall be indicated in writing and submitted with the quotation.
 - b. References: The products covered in this section shall be designed, manufactured, and tested in accordance with the latest applicable standards as follows:
 - i. CSA 22.2 N14-95 Industrial control equipment EN 50178 Low Voltage Directive
 - ii. EN 60204-1 Safety of machinery-electrical equipment of machines. Part 1 -
 - iii. Specification for general requirement.
 - iv. EN 60950 Safety of information technology equipment including electrical business equipment.
 - v. EN 61010-1 Safety requirement for electrical equipment for measurement, control, and laboratory use. Part 1 – general requirement.

- vi. EN 61800-3 Electro Magnetic Compliance UL 508 Industrial control equipment.
 - vii. UL 508C Power conversion equipment.
 - viii. IEC 664 Insulation coordination for equipment within low-voltage systems.
 - ix. IEC 60068-2-6 Environmental testing – Part 2 – Test Fc: vibration (sinusoidal).
IEC 60068-2-27 Environmental testing. Part 2: Tests. Test Ea and guidance: Shock
 - x. IEC 801-4 Electrical Fast Transient (Supplementary Wave). NEMA ICS6 Industrial control and systems enclosures. NEMA 250 Enclosures for electrical equipment.
- c. Quality Assurance
- i. The manufacturer of the VFD shall be a certified ISO 9001 and ISO 14000 facility.
 - ii. The VFD, including its internal electronic thermal overload protection circuit, shall be UL and cUL Listed in accordance to UL 508C - Power Conversion Equipment.
 - iii. UL / cUL labels shall be attached on the outside of each VFD as verification.
 - iv. The VFD shall be designed in accordance with NEMA, IEC, EN, UL and CSA standards.
 - v. The VFD manufacturer shall have 20 years of experience, minimum, in the design, construction and application of variable frequency drives.
 - vi. The VFD manufacturer shall have an existing service organization.
 - vii. The manufacturer of the VFD shall have the ability to design and manufacture insulated gate bipolar transistors (IGBT) to be incorporated into the construction of the VFD.
 - viii. The manufacturer of the VFD shall have the ability to evaluate any component failure at their own analysis lab. The services available shall include x-ray magnification of components, complete electrical testing, and the ability to analyze failures within the components.

d. Description

- i. The VFD shall convert the input AC mains power to an adjustable frequency and adjustable voltage as defined in the following sections.
- ii. The input power section shall utilize a full wave 6-pulse bridge design incorporating diode rectifiers. The diode rectifiers shall convert AC line power of fixed voltage and frequency to fixed DC voltage. This power section shall be insensitive to phase sequence of the AC line voltage.
- iii. The DC bus shall have external connections for external braking and allow for customer common DC Bus for multiple drive regeneration.
- iv. The output power section shall change fixed DC voltage to adjustable frequency AC voltage. This section shall utilize insulated gate bipolar transistors (IGBT's).
- v. VFDs shall include bypass controls with bi-metal overloads rated for the pumps size.

D. 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:
 - (1) Plug all inlet lines before starting presoak period.
 - (2) Presoak period shall be at least 4.0 hours.
 - (3) Following the presoak period, fill the structure to a depth of 6-inches below the top structure joint.
 - (4) 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:

- 1. Two (2) Impellers
- 2. Two (2) Seal Kits
- 3. One (1) FogRod
- 4. One (1) FogRod LIT Controller

5. One (1) Transducer
6. One (1) Relay of each type used in Control Panel
7. Three (3) fuses of each type used in Control Panel

10.01 Introduction

The asphalt concrete paving replacement work includes the construction of an aggregate base course, asphalt binder and wearing courses to match existing courses and as specified herein. This work is to replace paving disturbed by the construction and any damages to paving by Contractor's operations, as well as new pavement and driveways, within the limits shown on the plans.

10.02 Applicable Standards

- A. All references in this section to the standard specifications shall refer to the most recent Edition of Standard Specifications for Road and Bridge Construction with all amendments thereto as published by the Department of Transportation.

10.03 Environmental Requirements

- A. Weather Limitations: Apply prime and tack coats only when ambient temperature is above 50 degrees F., and when temperature has not been below 35 degrees F for 12 hours immediately prior to application. Do not apply when bases is wet or contains an excess of moisture.
- B. Construct asphalt concrete surface courses only when atmosphere temperature is above 40 degrees F., and when base is dry. Base course may be placed when air temperature is above 30 degrees F. and rising.
- C. Grade Control: Establish and maintain required lines and elevations.

10.04 Products

- A. All materials required for work in this section shall be as specified in the INDOT Standard Specifications as follows:
- B. Base Course: Section 303.
- C. Bituminous Concrete Surface and Bituminous Concrete Base: Section 402 and 403.

10.05 Execution

A. **Inspection:**

Pavement installer must examine the areas excavated and backfilled and conditions under which pavement is to be constructed. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until satisfactory embankments and subgrade have been established to a uniform line, properly shaped and compacted.

B. Base Course:

1. Base course for all new paving shall match existing depth or consist of a minimum nine (9) inches of dense graded aggregate.
2. Base courses shall be constructed in accordance with Section 303 of the Standard Specifications.

C. Prime Coat:

Prior to placing the bituminous 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 by pressure distributor or other approved pressure spray method.

D. Bituminous Concrete Courses:

1. The bituminous base course shall be hot mixed, hot laid, bituminous concrete base, furnished and placed in accordance to match the existing depth or to a minimum compacted thickness of 3 inches.
2. The surface course shall be hot mixed, hot laid, bituminous concrete in accordance to match existing depth or to a minimum compacted depth of 1-1/2 inches.
3. Standard Specifications: All bituminous concrete paving work shall comply with Section 402 of the INDOT Standard Specifications, including the removal of pavement samples to be tested by an independent laboratory for composition and density to insure quality control.

E. Field Testing:

1. Provide post installation television inspection of the subsurface drainage system. This shall include all roadway underdrains and storm sewer piping. 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 CD/DVD or portable external hard drive (flash media).

MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS, THAT WE _____

as Contractor, and _____

as Surety are held and firmly bound unto _____ as Oblige 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 Oblige for the Town of Whitestown in accordance with the Contract Drawings, Plan and Specifications of the Oblige.

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 Oblige from an against any and all loss, costs, attorneys fees and expense of whatsoever kind and character which said Oblige 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

SURETY

Contractor's Name and Corporate Seal

Surety's Name and Corporate Seal

By: _____
Signature

By: _____
Signature *(attach power of attorney)*

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

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

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2	TYPICAL GATE VALVE AND VALVE BOX
3	LEAK DETECTION METER DETAIL
4	METER PIT EASEMENT DIAGRAM
5	METER BOX AND METER SETTING
6	STANDARD FIRE HYDRANT
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STANDARD DETAILS

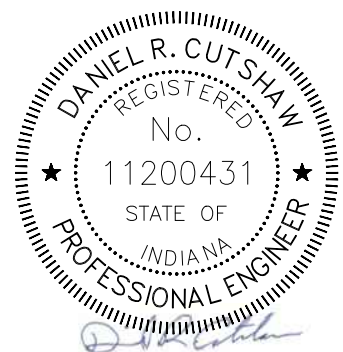
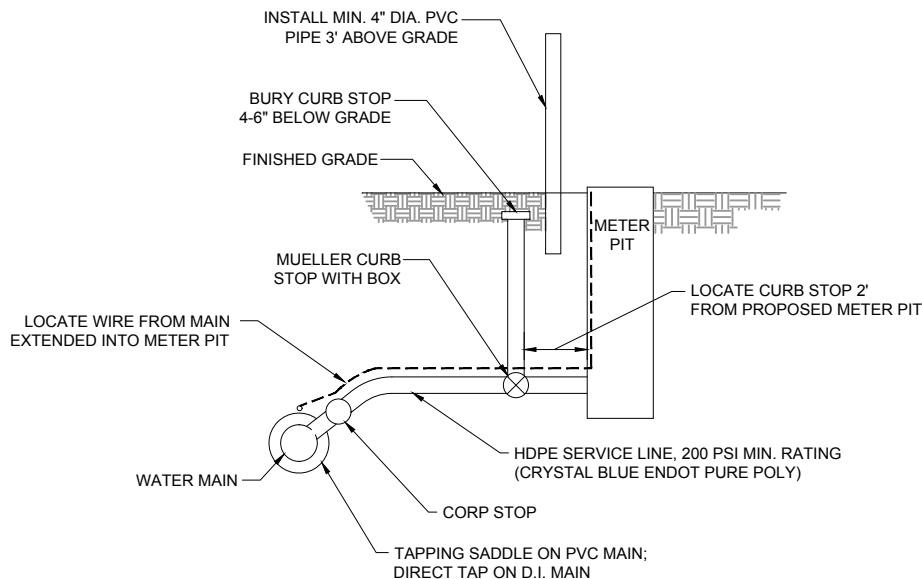
TOWN OF WHITESTOWN



DATE:	07/11/18
SCALE:	NTS
SHEET NO.	I-0

WATER MAIN GENERAL NOTES

1. WATER MAINS TO BE EITHER DUCTILE IRON, CLASS 350 PER AWWA C151, DOUBLE CEMENT MORTAR LINED, OR PVC C900, DR14. 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 (AWWA C111) 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 SOLDERED THEN COVERED WITH A WATER PROOF SEAL.
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. VALVES SHALL BE PROVIDED AT MAXIMUM 600' INTERVALS ALONG WATER MAINS.
7. FIRE HYDRANTS SHALL BE PROVIDED AT MAXIMUM 500' INTERVALS ALONG WATER MAINS.
8. ALL WATER MAINS PROVIDING FIRE SERVICE SHALL BE MIN. 6" DIAMETER.
9. 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

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WATER SERVICE CONNECTION DETAIL STANDARD DETAILS TOWN OF WHITESTOWN

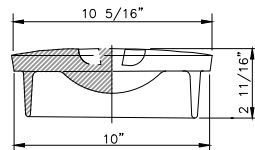


DATE: 07/11/18

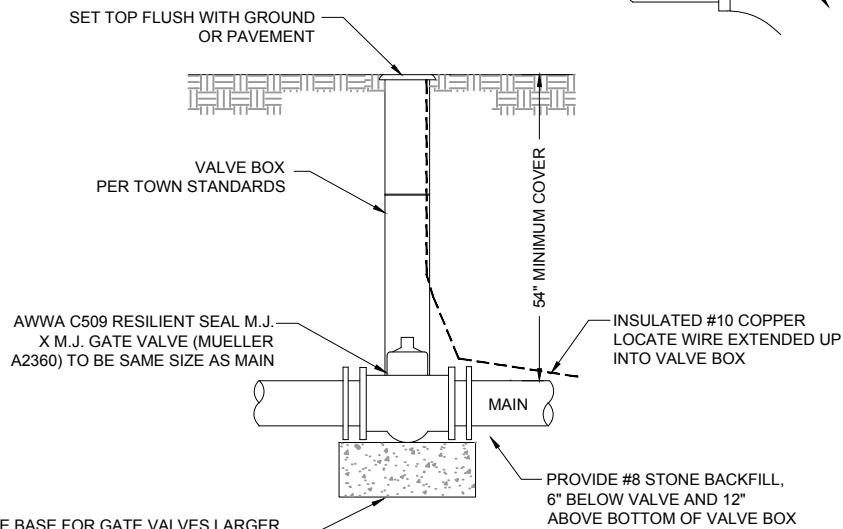
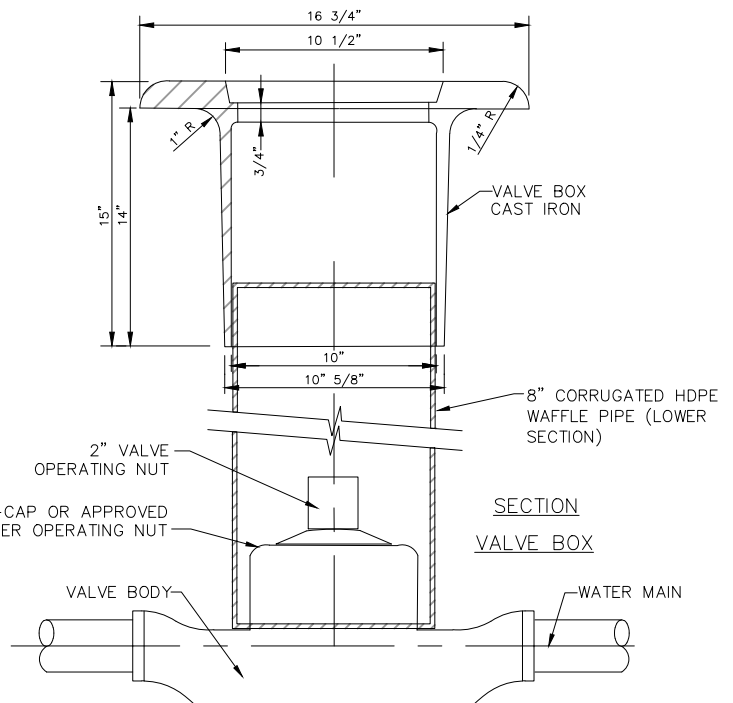
SCALE: NTS

SHEET NO.

1



VALVE BOX LID



CONCRETE BASE FOR GATE VALVES LARGER THAN 12". CONCRETE BASE SHALL BE 1 C.Y. OF 2,000 PSI CONCRETE. VALVE SHALL SIT ON CONCRETE BASE AND VALVE SHALL NOT BE CAST INTO CONCRETE. BACKFILL WITH #8 STONE



REVISIONS			
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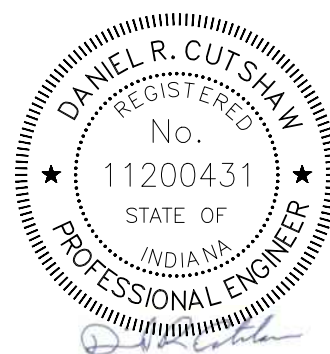
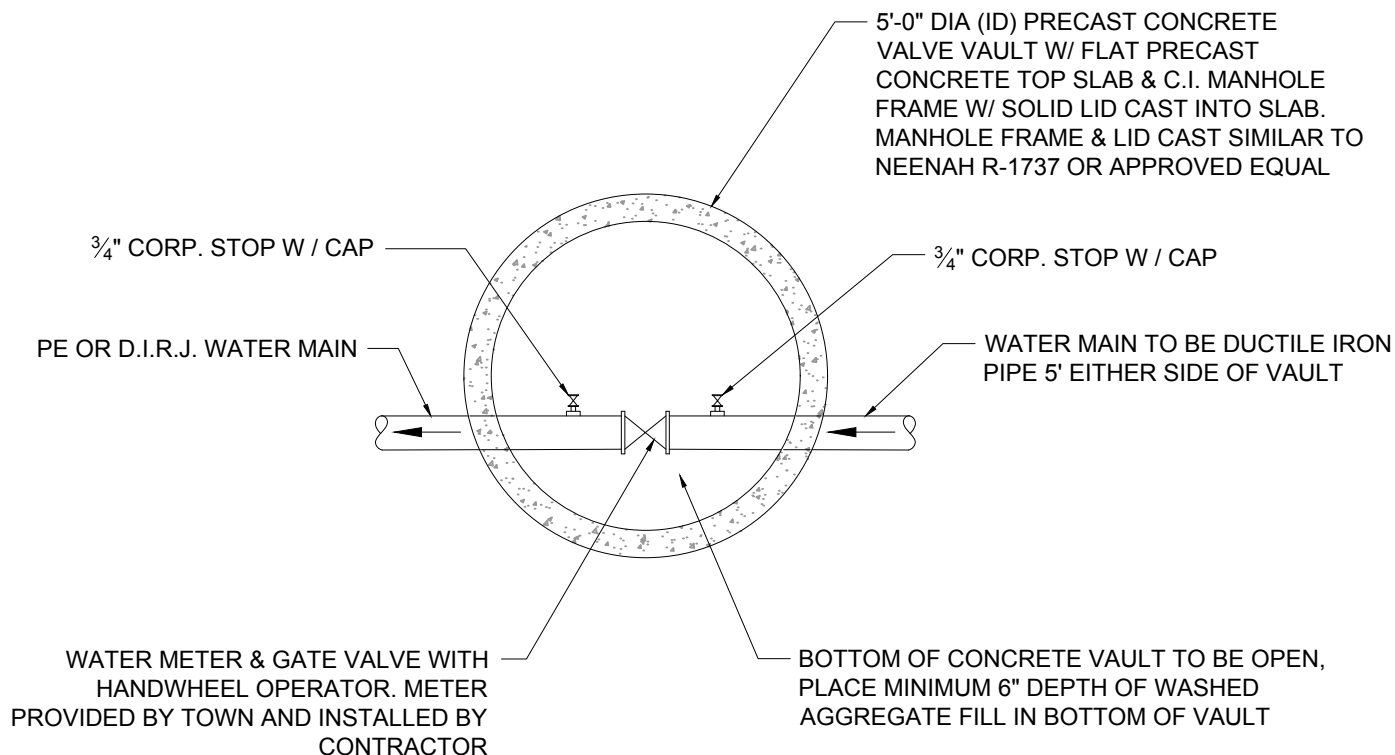
TYPICAL GATE VALVE & VALVE BOX

STANDARD DETAILS

TOWN OF WHITESTOWN



DATE:	07/11/18
SCALE:	NTS
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REVISIONS			
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LEAK DETECTION METER DETAIL

STANDARD DETAILS

TOWN OF WHITESTOWN

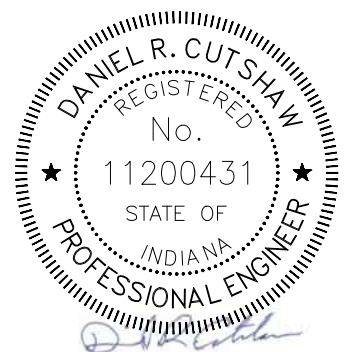
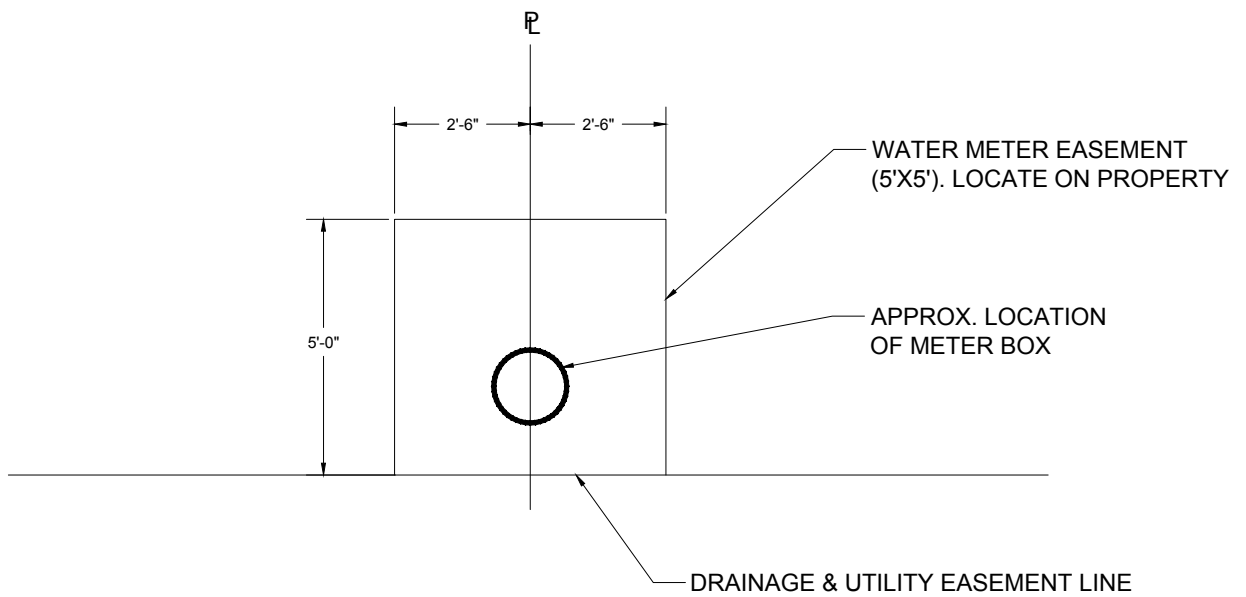


DATE: 07/11/18

SCALE: NTS

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3



REVISIONS			
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METER PIT EASEMENT DIAGRAM

STANDARD DETAILS

TOWN OF WHITESTOWN

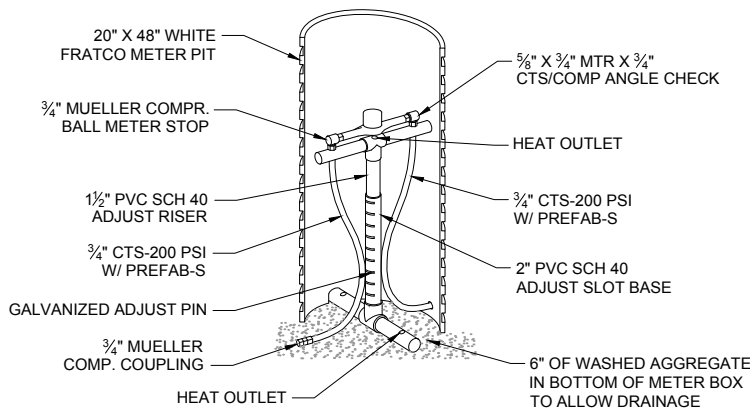


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SCALE:	NTS
SHEET NO.	4

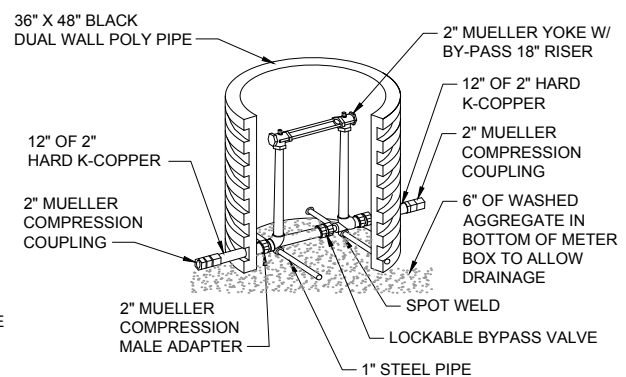
WATER METER AND SERVICE NOTES:

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 TYLER). METER PIT LIDS SHALL HAVE HOLES FOR RADIO READ ANTENNA MOUNTING.
8. ALTERNATE FOR MUELLER WILL 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.

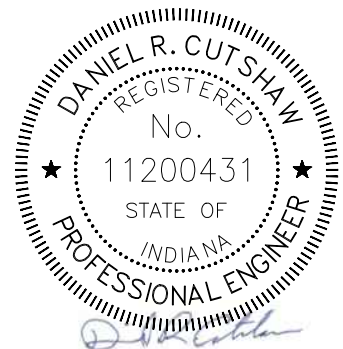
WATER METER SETTING SCHEDULE				
STYLE	SINGLE 5/8"	SINGLE 3/4"	SINGLE 1"	SINGLE 1 1/2"-2"
INLET	3/4" COMP.	3/4" COMP.	1" COMP.	1 1/2"-2" COMP.
OUTLET	3/4" COMP.	3/4" COMP.	1" COMP.	1 1/2"-2" COMP.



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

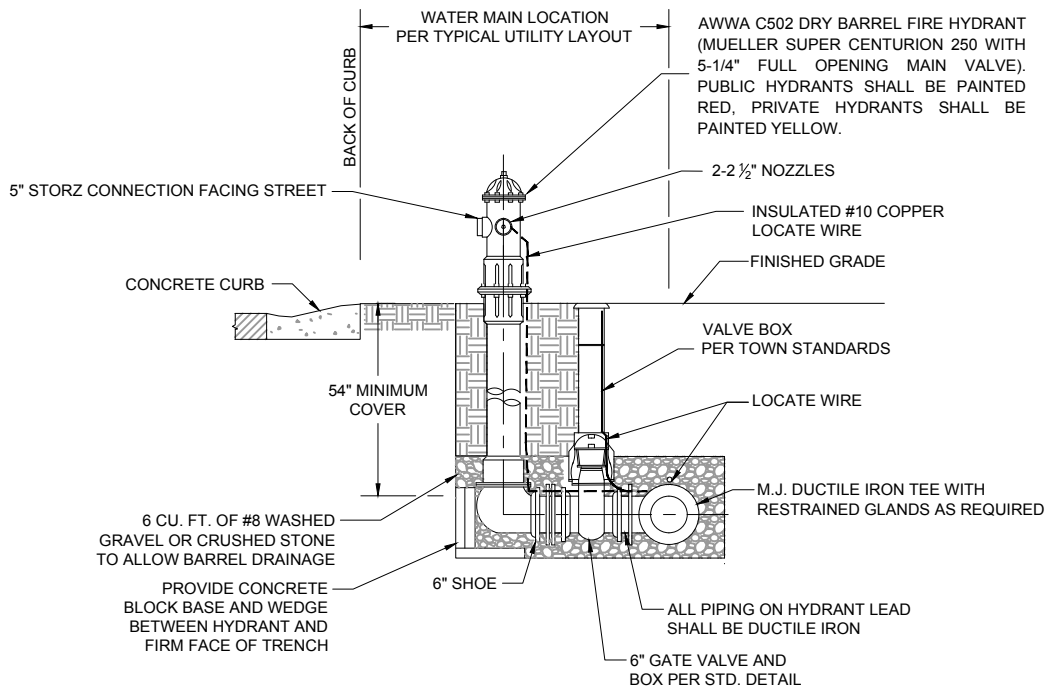


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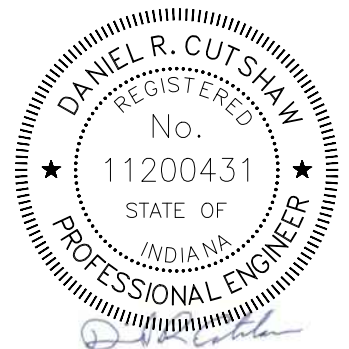
SCALE: NTS

SHEET NO.

5



NOTE:
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.



REVISIONS

NO.	DESCRIPTION	DATE	BY

STANDARD FIRE HYDRANT STANDARD DETAILS TOWN OF WHITESTOWN



DATE:
07/11/18

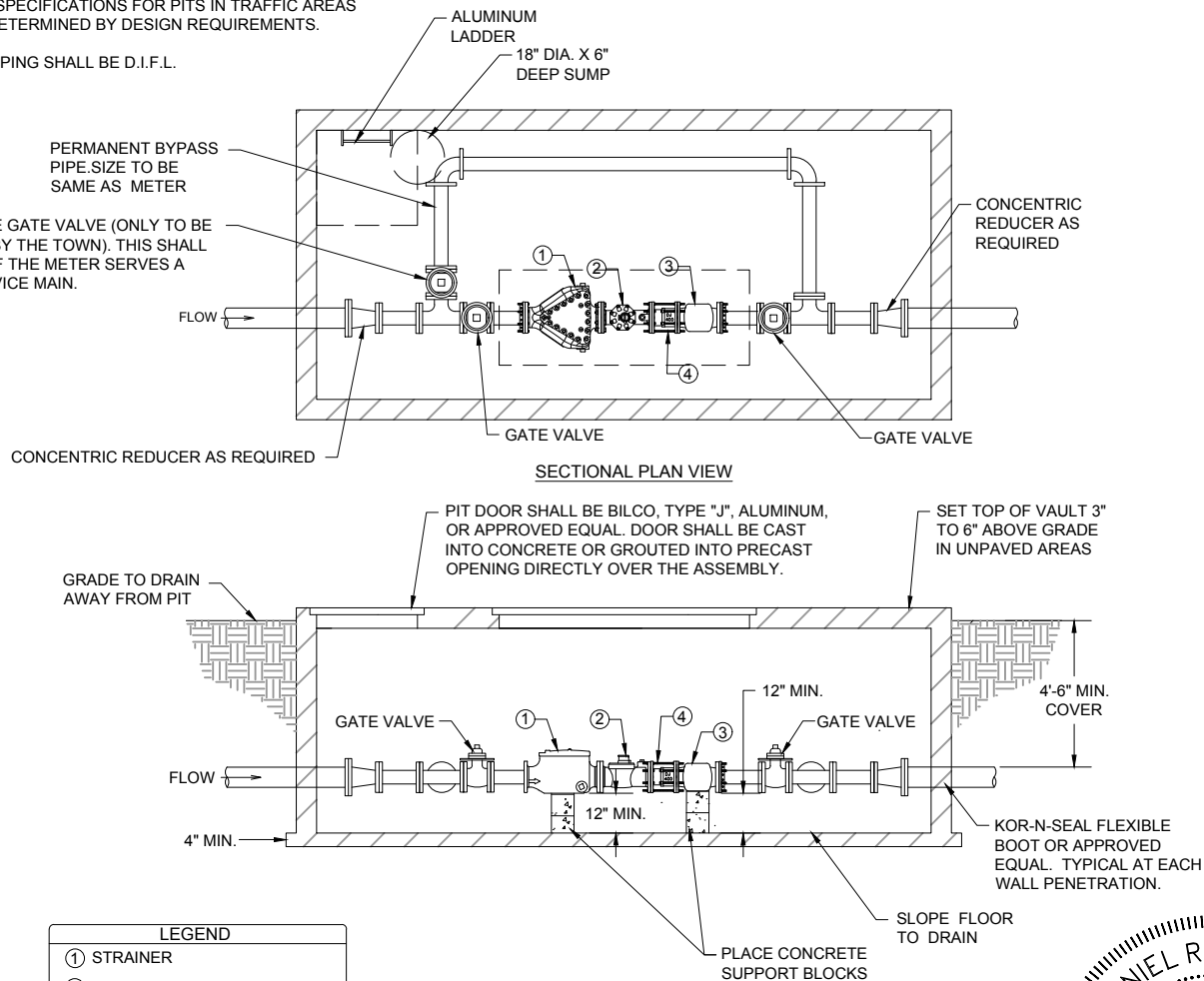
SCALE:
NTS

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.



LEGEND	
①	STRAINER
②	METER
③	CHECK VALVE
④	DISMANTLING JOINT ROMAC DJ400 OR DJ405. (SET AT NOMINAL LENGTH)



REVISIONS			
NO.	DESCRIPTION	DATE	BY

METER ASSEMBLY 3"-10"
METER INSTALLATION
STANDARD DETAILS
TOWN OF WHITESTOWN

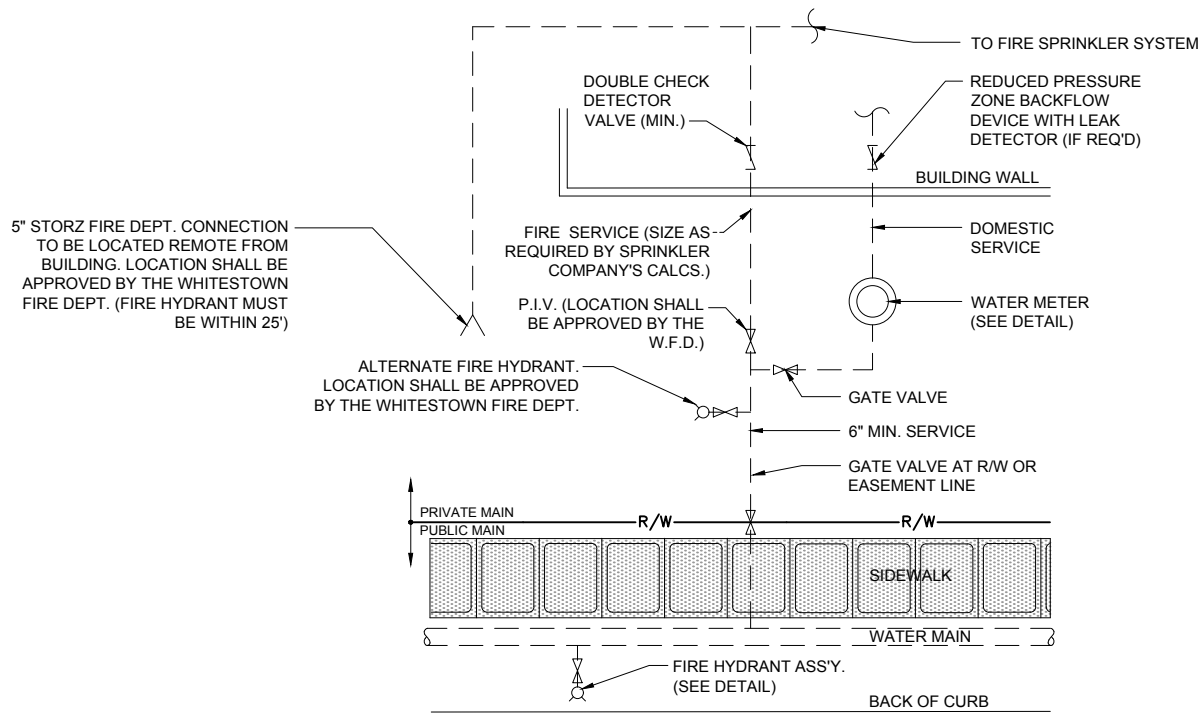


DATE: 07/11/18

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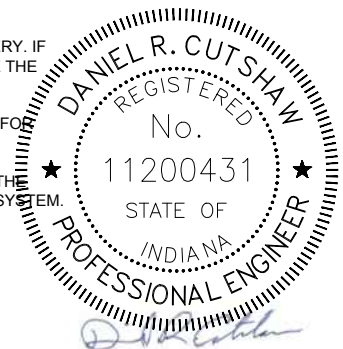
SHEET NO.

7



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.



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FIRE SERVICE CONNECTION DETAIL

STANDARD DETAILS

TOWN OF WHITESTOWN

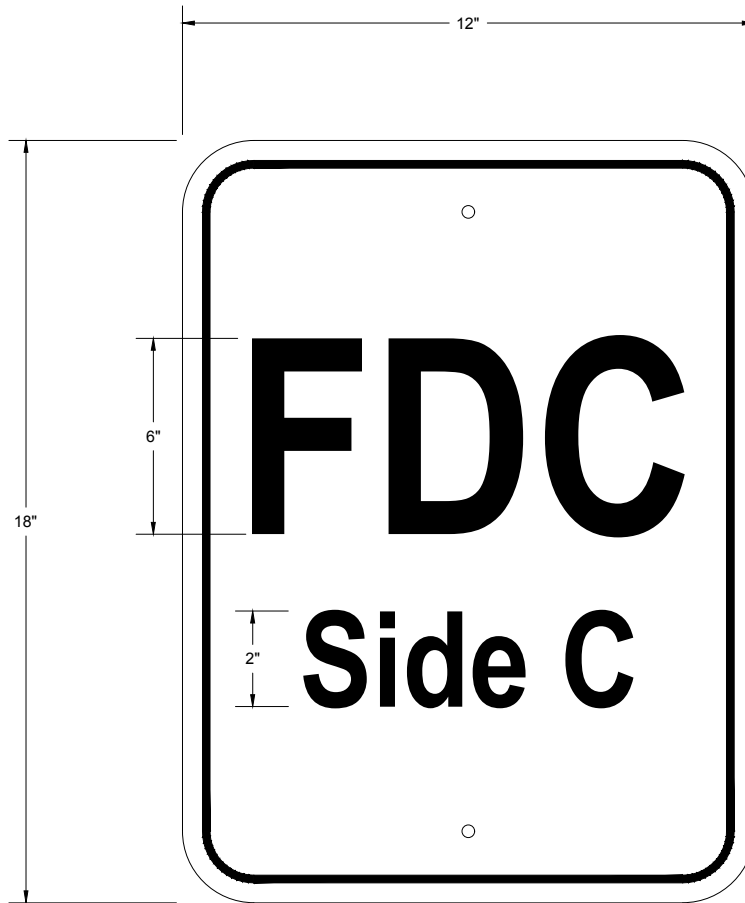


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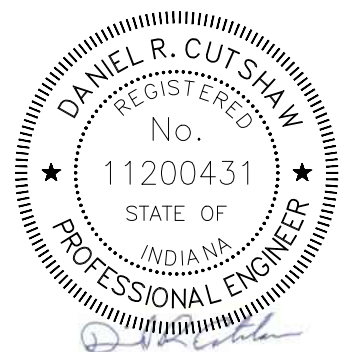
SHEET NO.

8



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.

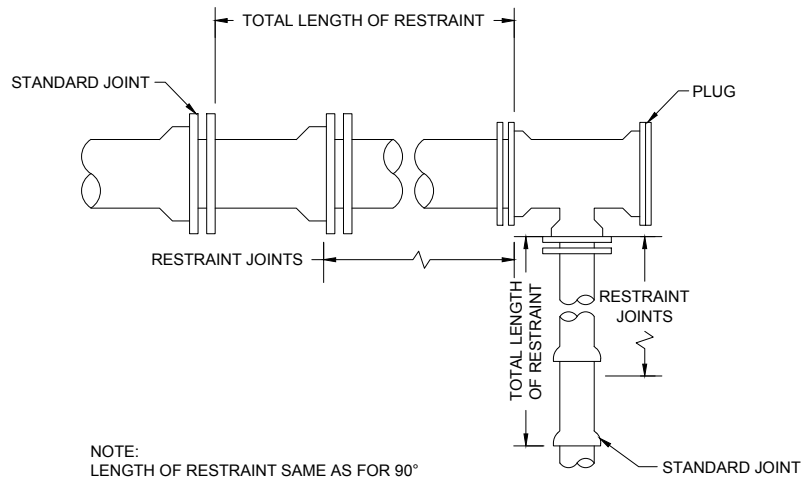


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NO.	DESCRIPTION	DATE	BY

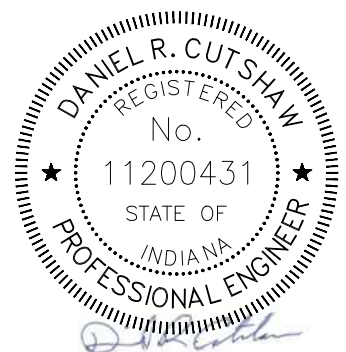
TYPICAL FIRE DEPARTMENT
CONNECTION SIGNAGE
STANDARD DETAILS
TOWN OF WHITESTOWN



DATE: 07/11/18
SCALE: NTS
SHEET NO. 9



NOTE:
LENGTH OF RESTRAINT SAME AS FOR 90°
BENDS & DEAD ENDS. SEE CONSTR. STD.
"LENGTH AND METHOD OF RESTRAINT"

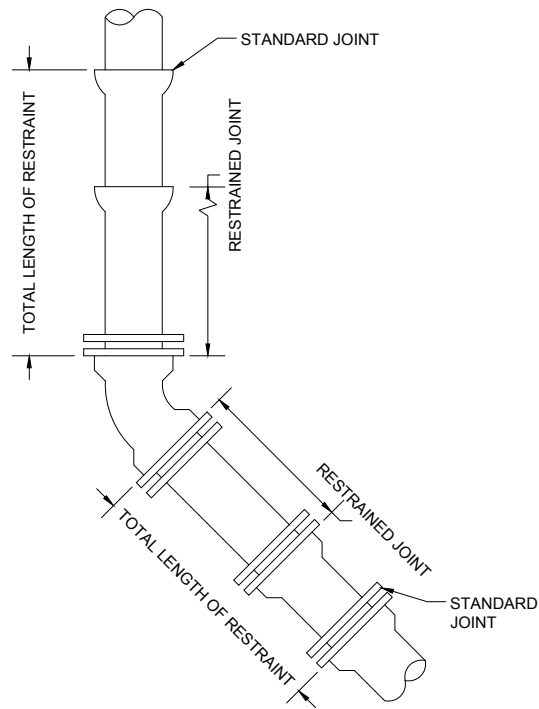


REVISIONS			
NO.	DESCRIPTION	DATE	BY

RESTRAINT OF TEES-DETAIL
STANDARD DETAILS
TOWN OF WHITESTOWN



DATE:	07/11/18
SCALE:	NTS
SHEET NO.	10



NOTE:
SEE CONSTRUCTION STD. FOR "LENGTH
AND METHOD OF RESTRAINT"

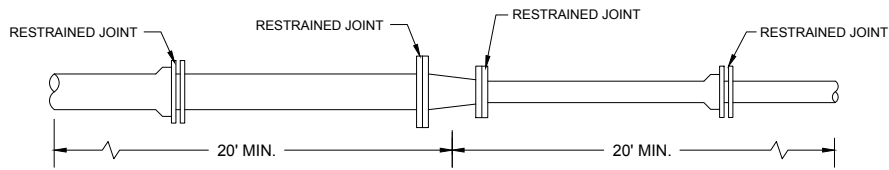


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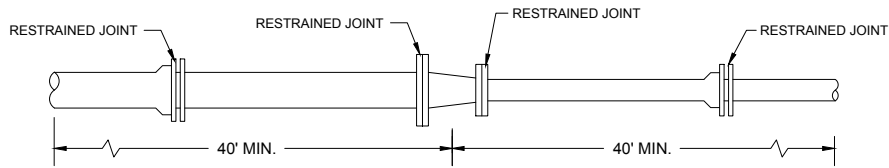
RESTRAINT OF BENDS-DETAIL
STANDARD DETAILS
TOWN OF WHITESTOWN



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REDUCERS, LARGER PIPE DIAMETER IS 8" OR SMALLER



REDUCERS, LARGER PIPE DIAMETER IS 12" OR LARGER



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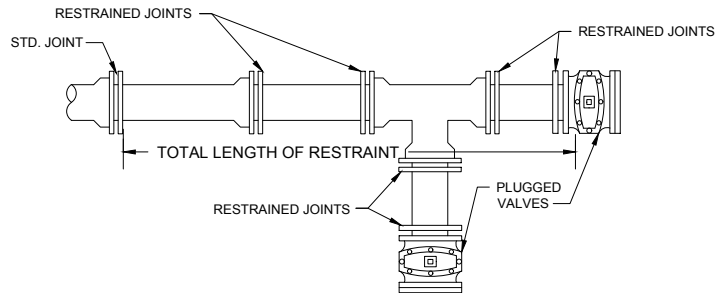
RESTRAINING REDUCERS-DETAIL

STANDARD DETAILS

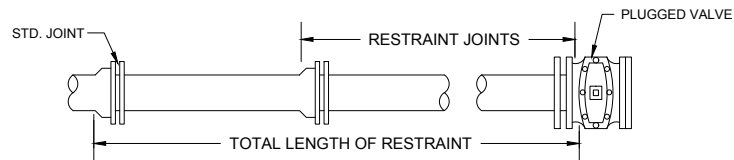
TOWN OF WHITESTOWN



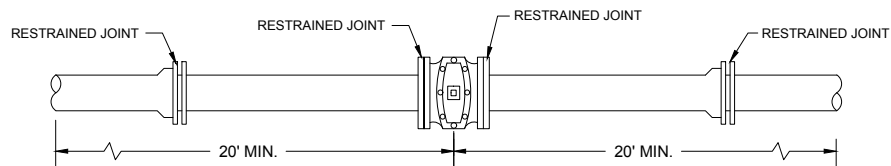
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SCALE:	NTS
SHEET NO.	12



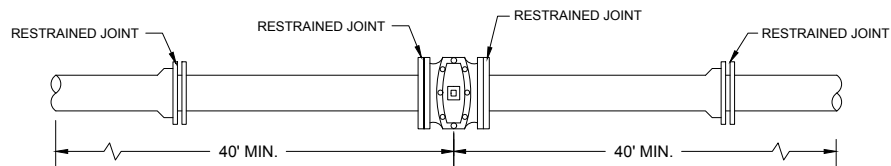
DEAD ENDS OF TEES



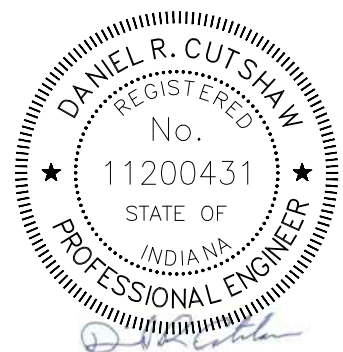
DEAD ENDS OF MAINS



VALVES (NON-DEAD END) 8" AND SMALLER



VALVES (NON-DEAD END) 12" AND LARGER



REVISIONS

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RESTRAINING VALVES-DETAIL
STANDARD DETAILS
TOWN OF WHITESTOWN



DATE:
07/11/18

SCALE:
NTS

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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 10 UPPER LOWER	11 10 UPPER LOWER	10 10 UPPER 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 17 UPPER LOWER	31 10 UPPER LOWER	15 10 UPPER LOWER	

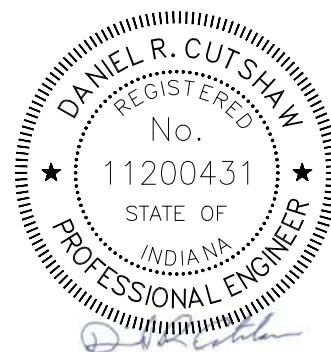
LENGTH IN FT. TO BE REST. ON EACH SIDE OF FITTING FOR 6" DI PIPE W/ POLY							
TYPE OF BEND	4" TEE	6" TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	DEADENDS
HORIZ. BEND	39	66	25	11	10	10	74
VERT. BEND				31 UPPER	15 UPPER	10 UPPER	
				10 LOWER	10 LOWER	10 LOWER	

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	
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

RESTRAINT JOINT TABLES
STANDARD DETAILS
TOWN OF WHITESTOWN

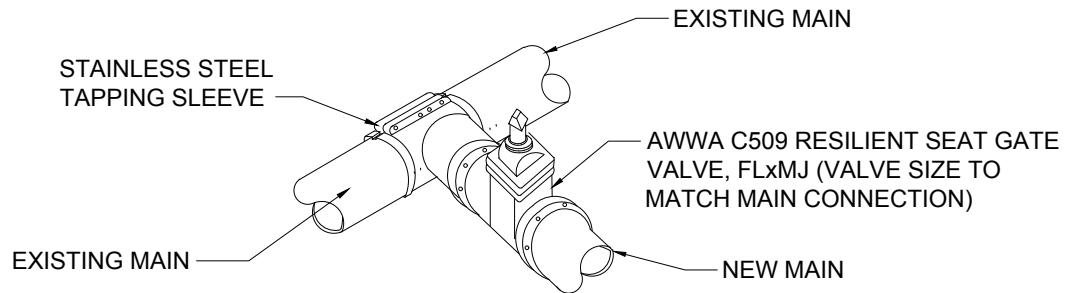


DATE: 07/11/18

SCALE: NTS

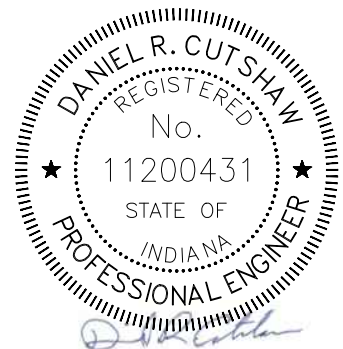
SHEET NO.

14



NOTE:

1. NO MECHANICAL JOINT TAPPING SLEEVES WILL BE ACCEPTED.
2. BOLTS, NUTS, & WASHERS SHALL BE 304 STAINLESS STEEL.

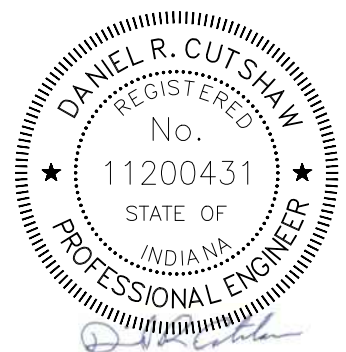
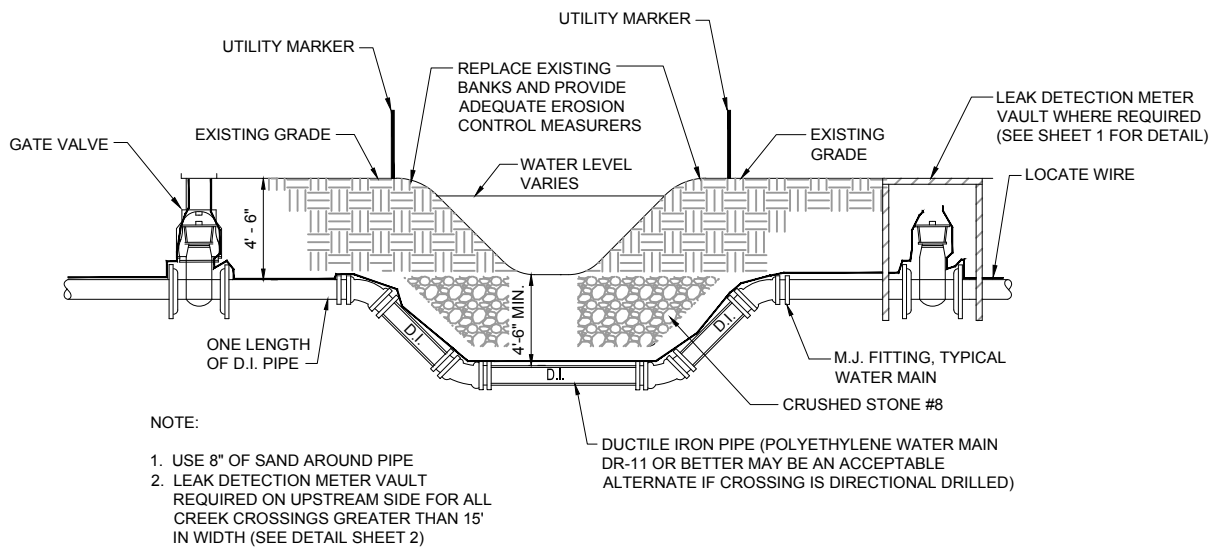


REVISIONS			
NO.	DESCRIPTION	DATE	BY

WET TAP TO EXISTING MAIN
STANDARD DETAILS
TOWN OF WHITESTOWN



DATE:	07/11/18
SCALE:	NTS
SHEET NO.	15

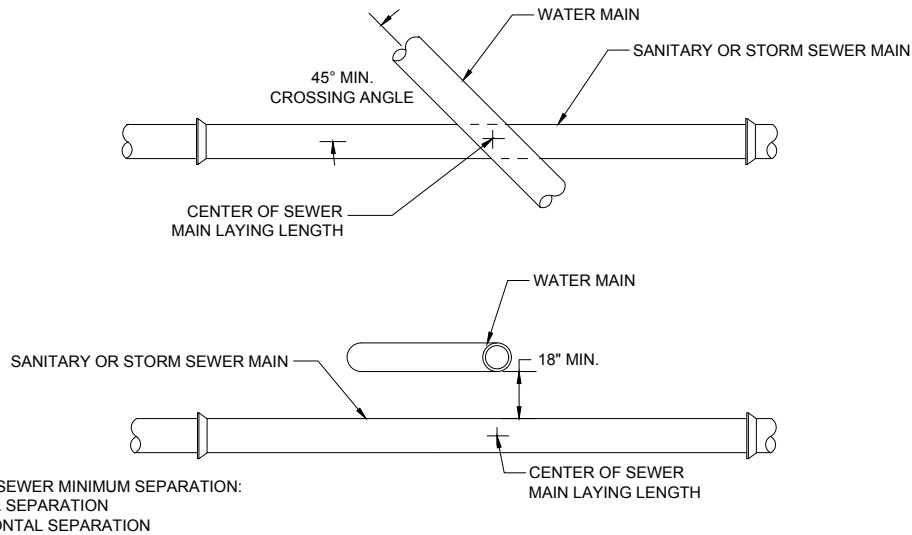


REVISIONS			
NO.	DESCRIPTION	DATE	BY

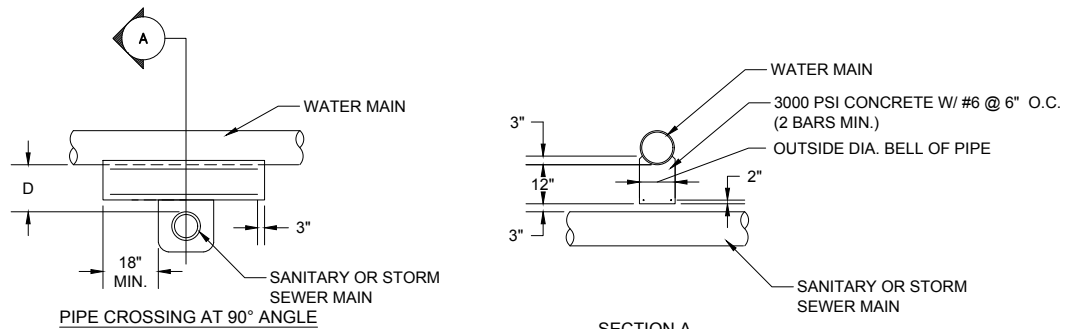
CREEK CROSSING DETAIL
STANDARD DETAILS
TOWN OF WHITESTOWN



DATE:	07/11/18
SCALE:	NTS
SHEET NO.	16



PIPE CROSSING AT 45° ANGLE



NOTE

1. USE OF A CONCRETE CRADLE WILL BE AUTHORIZED BY THE TOWN ON A CASE-BY-CASE BASIS
2. PROVIDE SUPPORT WHEN "D" IS LESS THAN 12 INCHES
3. EXISTING UTILITIES SHALL MEAN: STEEL GAS MAINS, ELECTRIC/TELECOM CONDUITS, FIBER OPTIC BANKS, SANITARY SEWER PIPING, STORM SEWER PIPING, AND WATER PIPING.
4. SDR 26 PIPE SHALL BE USED FOR THE SEWER PIPE IF SPACING REQUIREMENTS CANNOT BE MET
5. WATER GRADE PIPE MAY BE REQUIRED FOR SEWER MAIN PIPE IF SPACING REQUIREMENTS CANNOT BE MET

PIPE CROSSING CONCRETE CRADLE

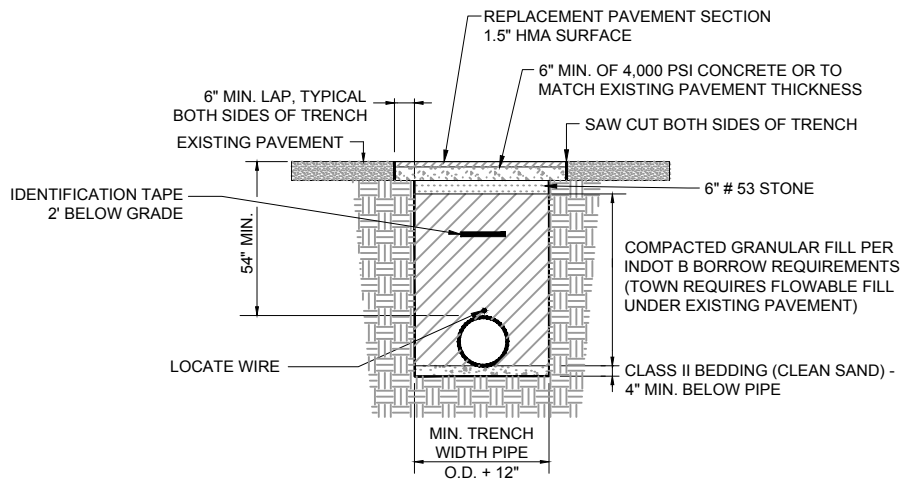


REVISIONS			
NO.	DESCRIPTION	DATE	BY

**MINIMUM PIPE CROSSING &
 SEPARATION REQUIREMENTS
 STANDARD DETAILS
 TOWN OF WHITESTOWN**

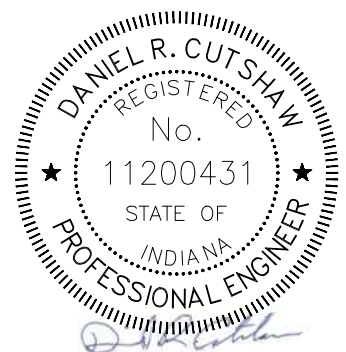


DATE:	07/11/18
SCALE:	NTS
SHEET NO.	17



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

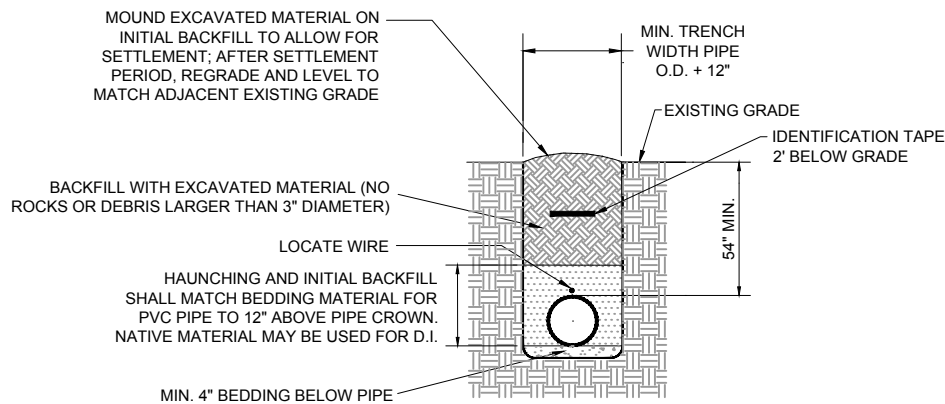


DATE:
07/11/18

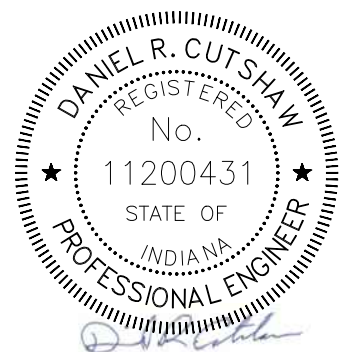
SCALE:
NTS

SHEET NO.

18



BEDDING, HAUNCHING AND INITIAL BACKFILL SHALL BE CLASS II (CLEAN SAND)



REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPICAL TRENCH DETAIL FOR D.I. OR PVC C900
PIPE 12" DIA. OR LESS IN UNPAVED AREAS

STANDARD DETAILS
TOWN OF WHITESTOWN

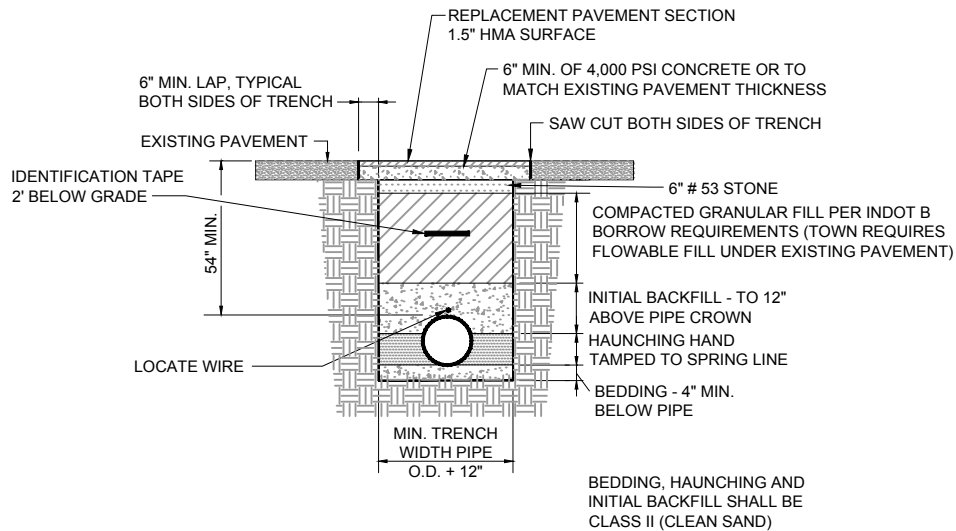


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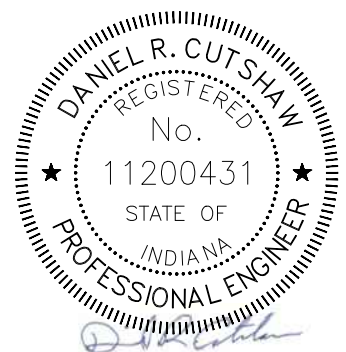
SHEET NO.

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

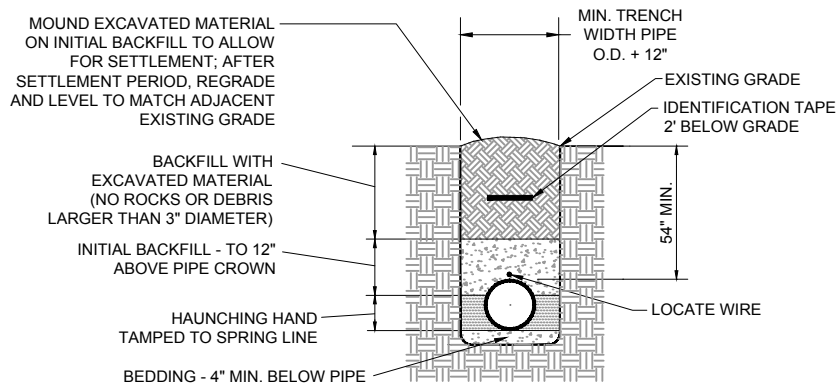


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07/11/18

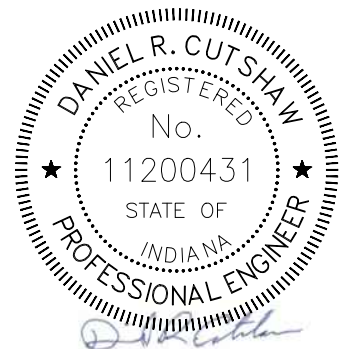
SCALE:
NTS

SHEET NO.

20



BEDDING, HAUNCHING AND
INITIAL BACKFILL SHALL BE
CLASS II (CLEAN SAND)



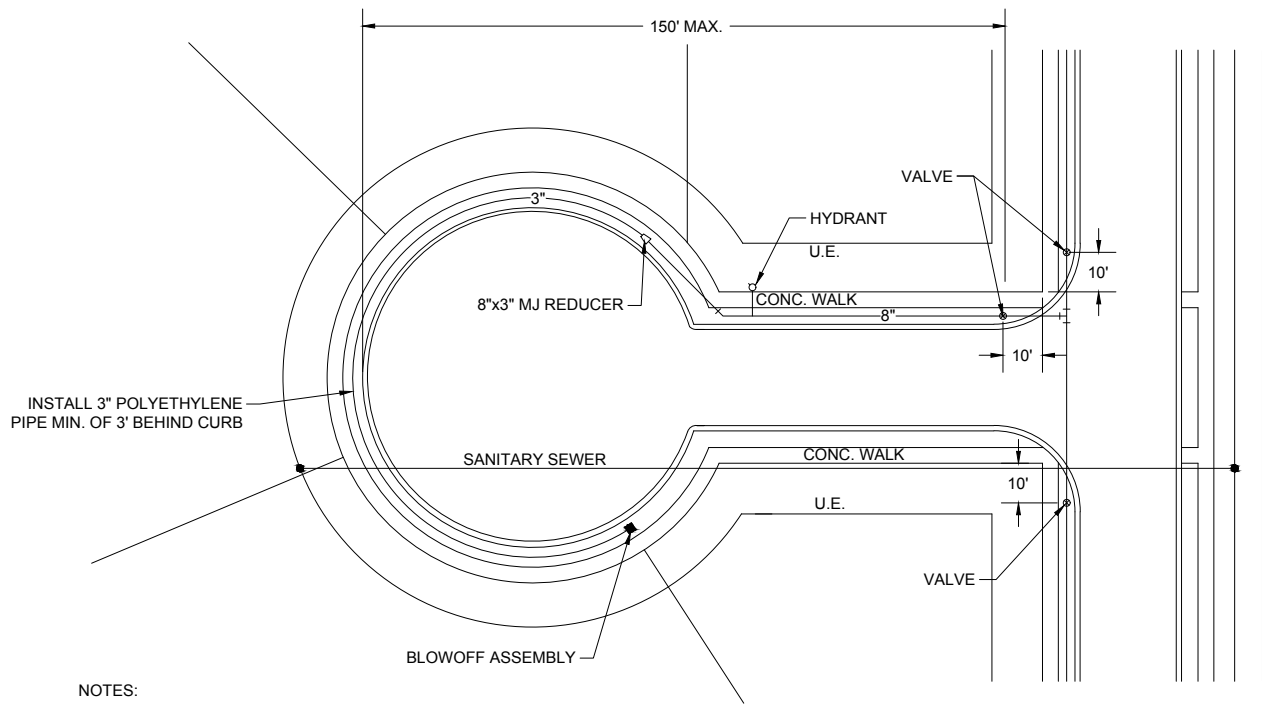
REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPICAL TRENCH DETAIL FOR D.I. OR PVC C905
PIPE LARGER THAN 12" DIA. IN UNPAVED AREAS

STANDARD DETAILS
TOWN OF WHITESTOWN



DATE:	07/11/18
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

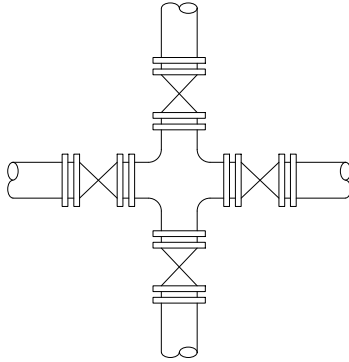


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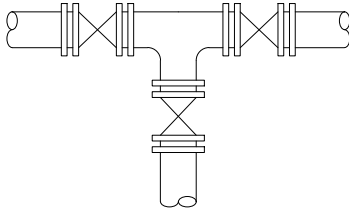
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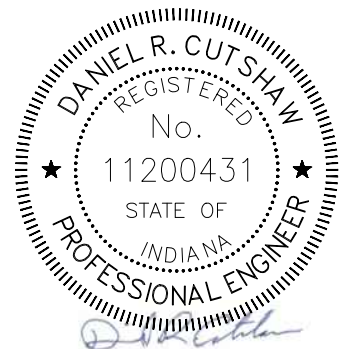
22



4 VALVES REQUIRED AT "CROSS"



3 VALVES REQUIRED AT "TEE"



REVISIONS			
NO.	DESCRIPTION	DATE	BY

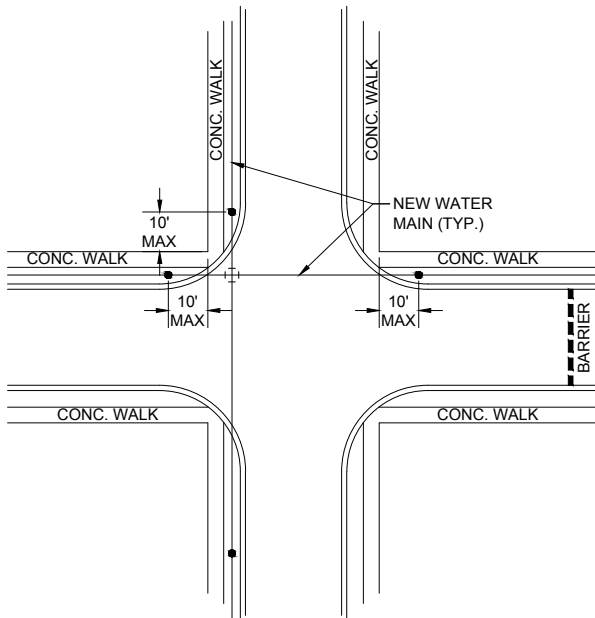
VALVE DETAILS AT INTERSECTIONS

STANDARD DETAILS

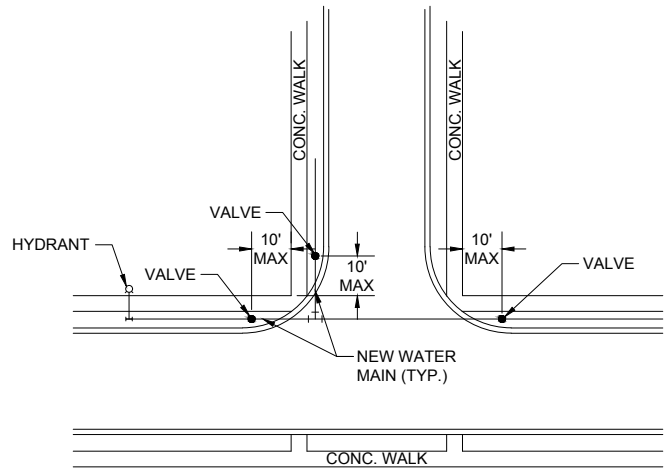
TOWN OF WHITESTOWN



DATE:	07/11/18
SCALE:	NTS
SHEET NO.	23



VALVE DESIGN AT INTERSECTION

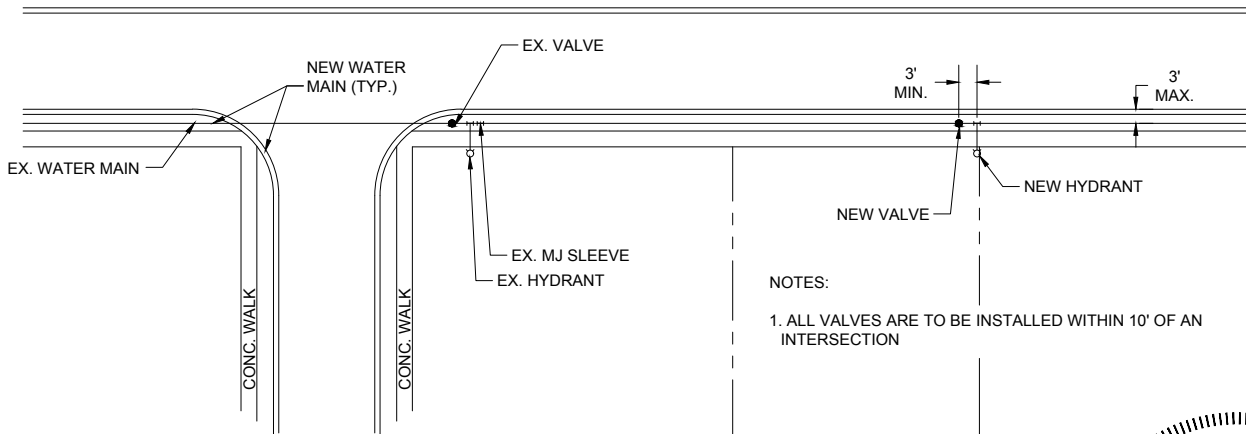


VALVE DESIGN AT TEE INTERSECTION

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'

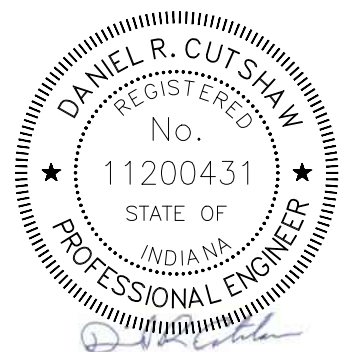
FOR LARGER MAINS, THE VALVE SEPARATION MAY BE REDUCED WITHIN A DEVELOPMENT, AS APPROVED BY THE UTILITY.



NOTES:

1. ALL VALVES ARE TO BE INSTALLED WITHIN 10' OF AN INTERSECTION

PLAN VIEW



REVISIONS

NO.	DESCRIPTION	DATE	BY

TYPICAL VALVE PLACEMENT
STANDARD DETAILS
TOWN OF WHITESTOWN

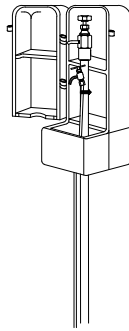


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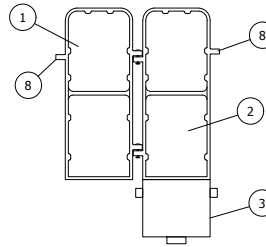
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SHEET NO.

24



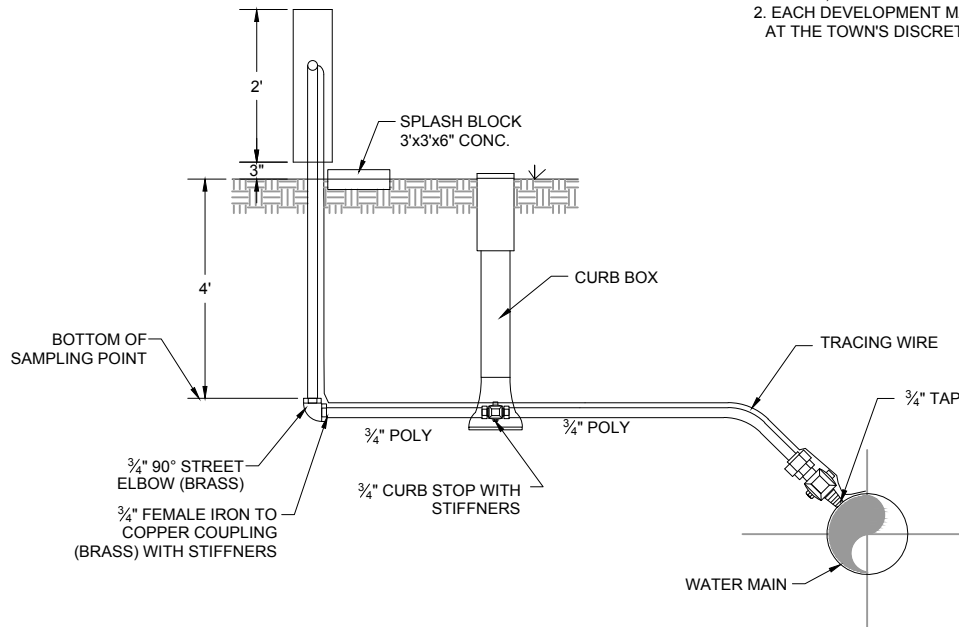
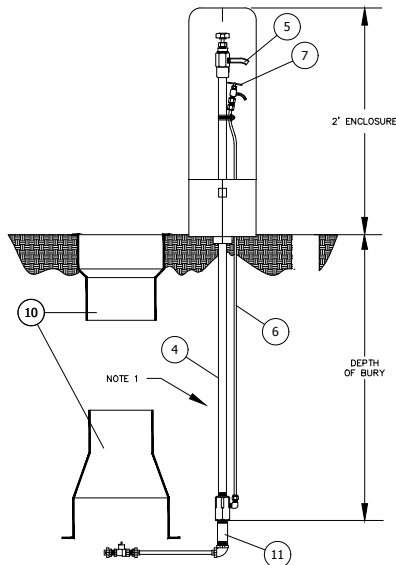
3D VIEW



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 _____' 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.

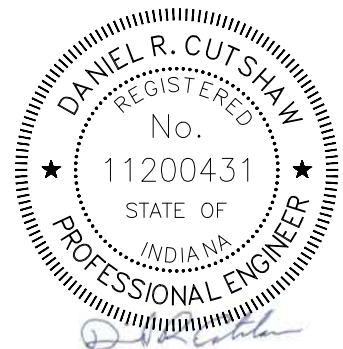
ALL WORKING PARTS SHALL BE OF STAINLESS STEEL AND SERVICABLE FROM ABOVE GROUND WITH NO DIGGING OR REPLACEMENT NEEDED.

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

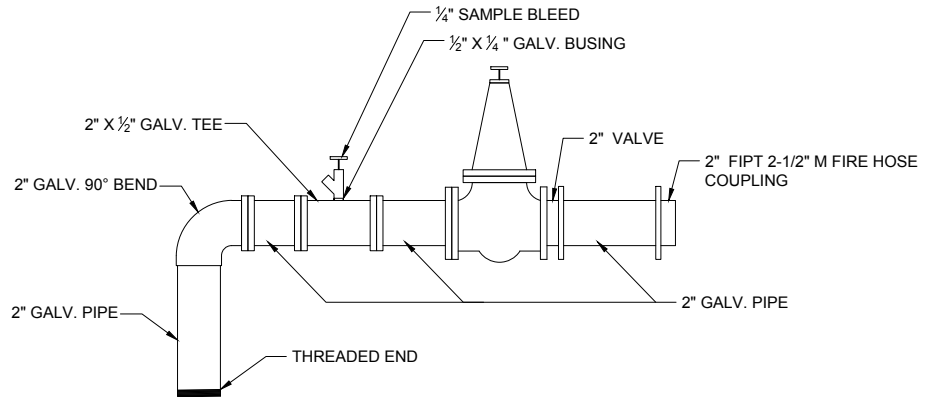
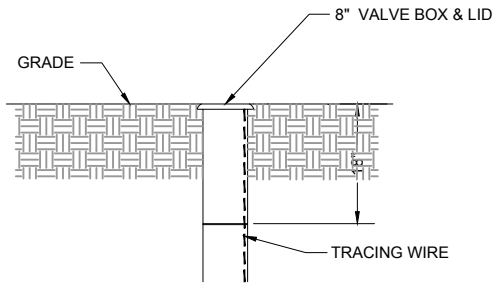


DATE: 07/11/18

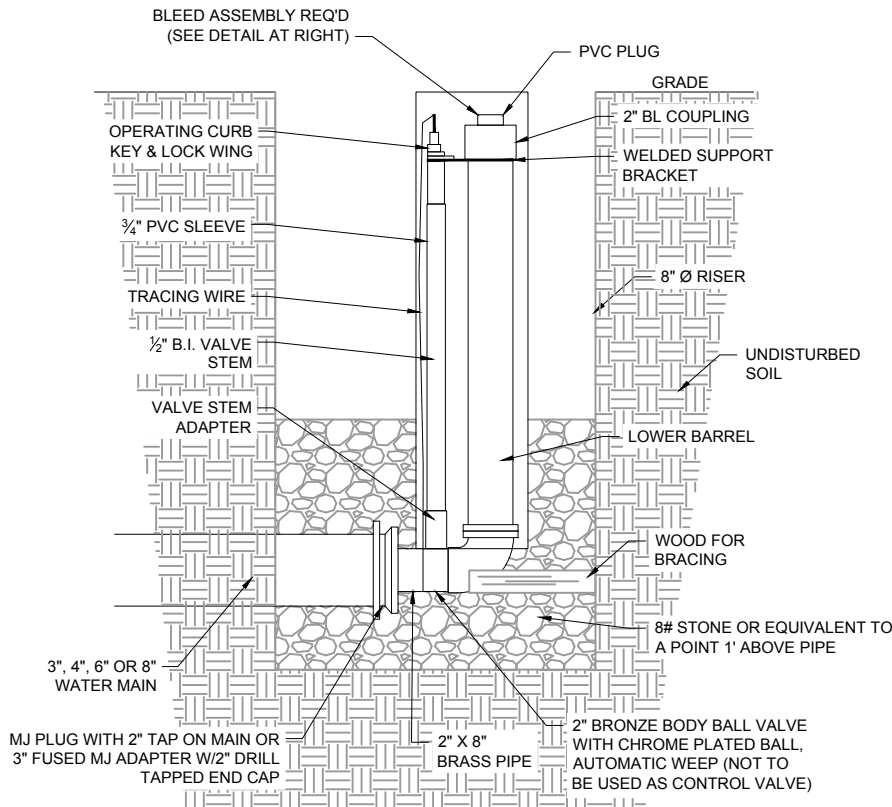
SCALE: NTS

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

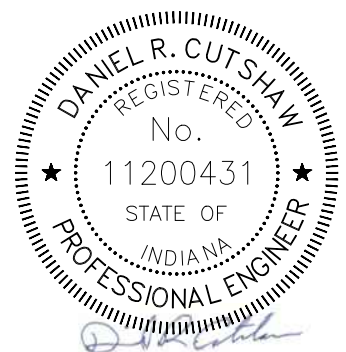
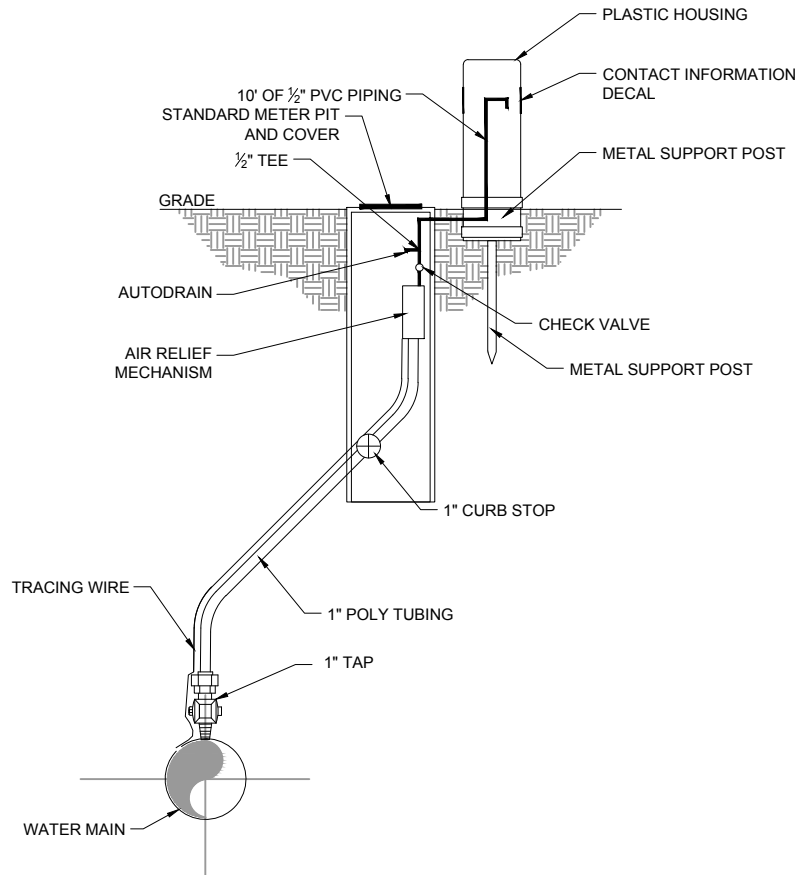


DATE: 07/11/18

SCALE: NTS

SHEET NO.

26



REVISIONS			
NO.	DESCRIPTION	DATE	BY

AIR RELEASE VALVE VAULT DETAIL

STANDARD DETAILS

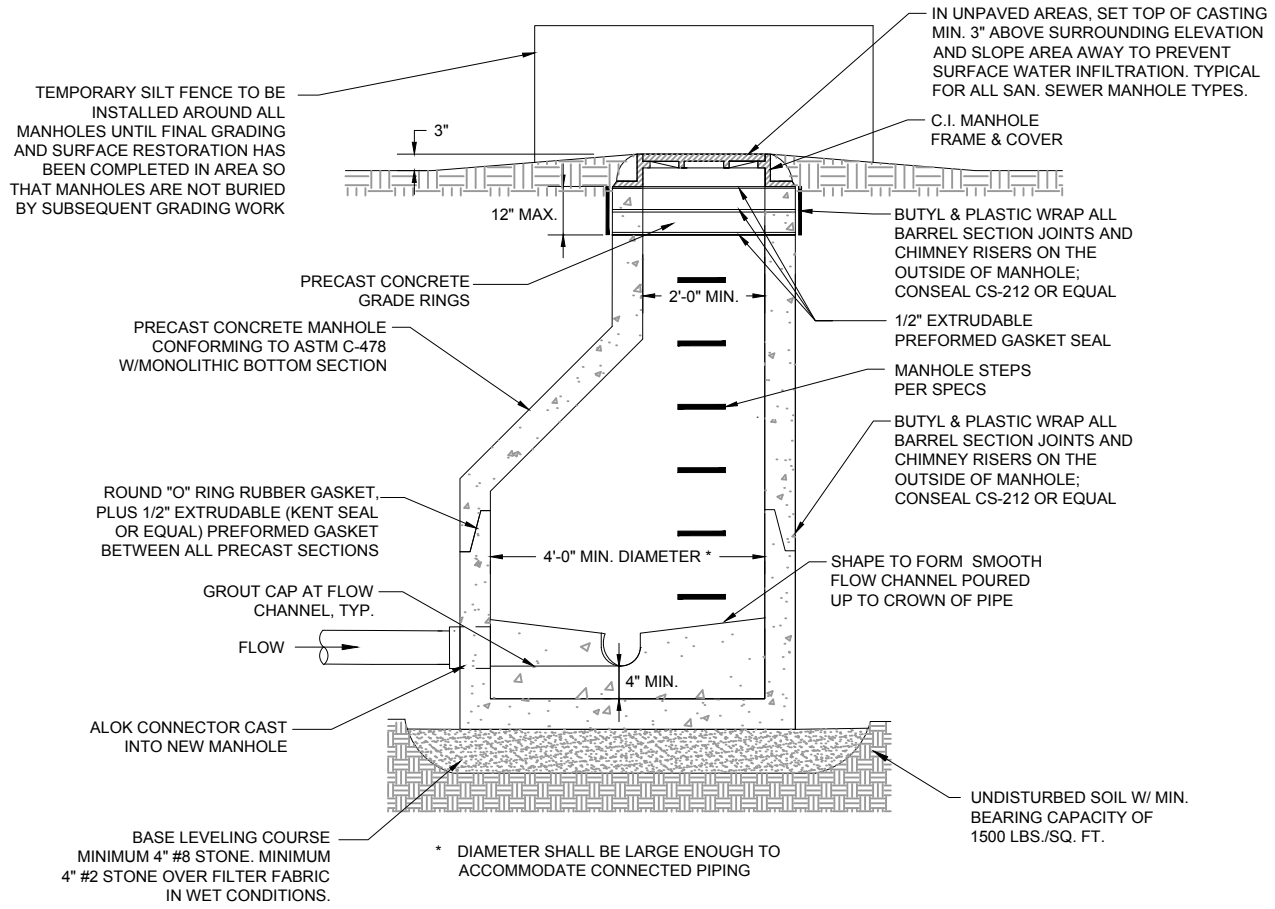
TOWN OF WHITESTOWN



DATE: 07/11/18

SCALE: NTS

SHEET NO. 27

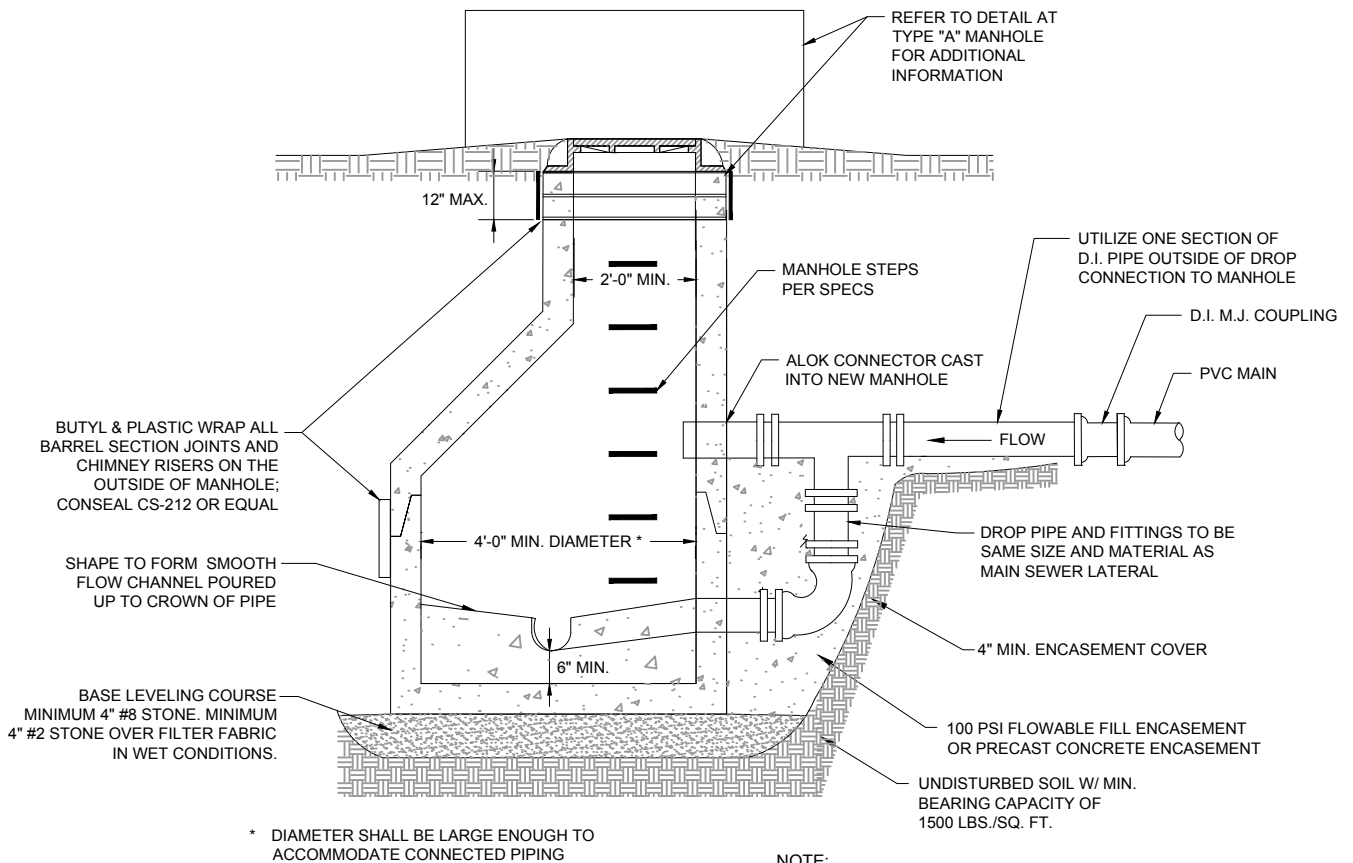


REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "A" MANHOLE
STANDARD PRECAST MANHOLE
STANDARD DETAILS
TOWN OF WHITESTOWN



DATE:	07/11/18
SCALE:	NTS
SHEET NO.	28

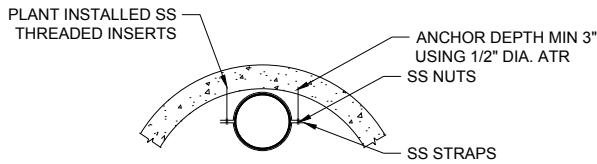


REVISIONS			
NO.	DESCRIPTION	DATE	BY

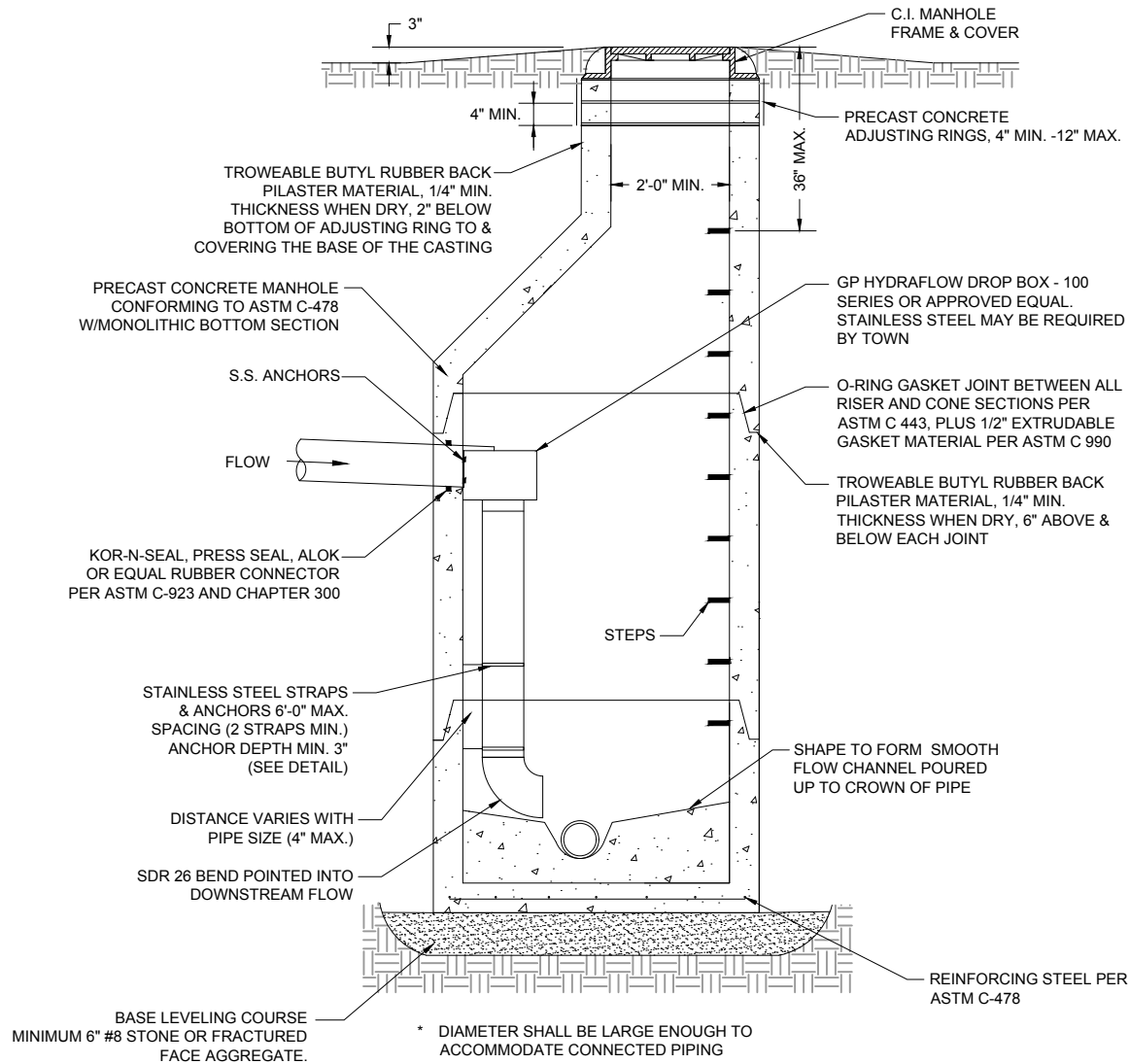
TYPE "B" MANHOLE
OUTSIDE DROP MANHOLE CONNECTION
STANDARD DETAILS
TOWN OF WHITESTOWN



DATE: 07/11/18
 SCALE: NTS
 SHEET NO. 29



DROP PIPE ANCHOR DETAIL
TOP VIEW

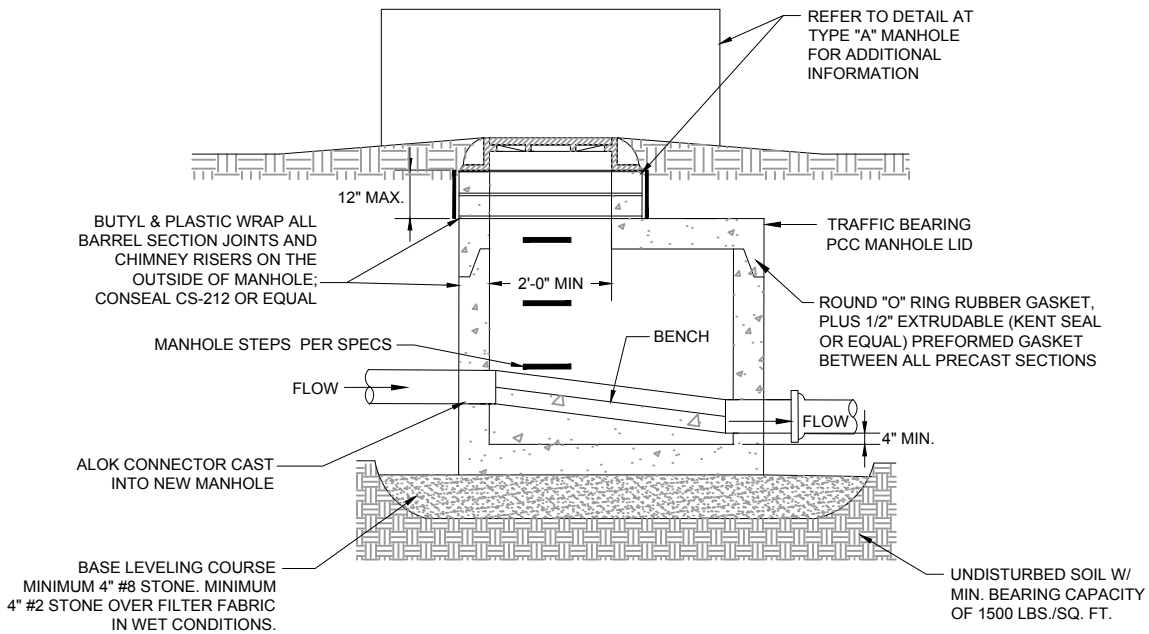


REVISIONS			
NO.	DESCRIPTION	DATE	BY

TYPE "B" MANHOLE
INSIDE DROP MANHOLE CONNECTION
STANDARD DETAILS
TOWN OF WHITESTOWN



DATE: 07/11/18
SCALE: NTS
SHEET NO. 30



REVISIONS

NO.	DESCRIPTION	DATE	BY

TYPE "C" MANHOLE SHALLOW MANHOLE LESS THAN 5' STANDARD DETAILS TOWN OF WHITESTOWN

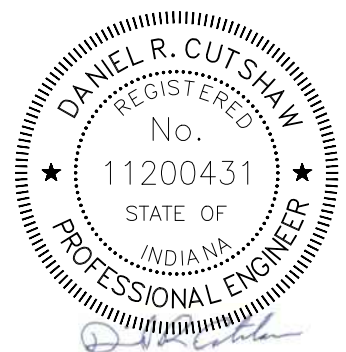
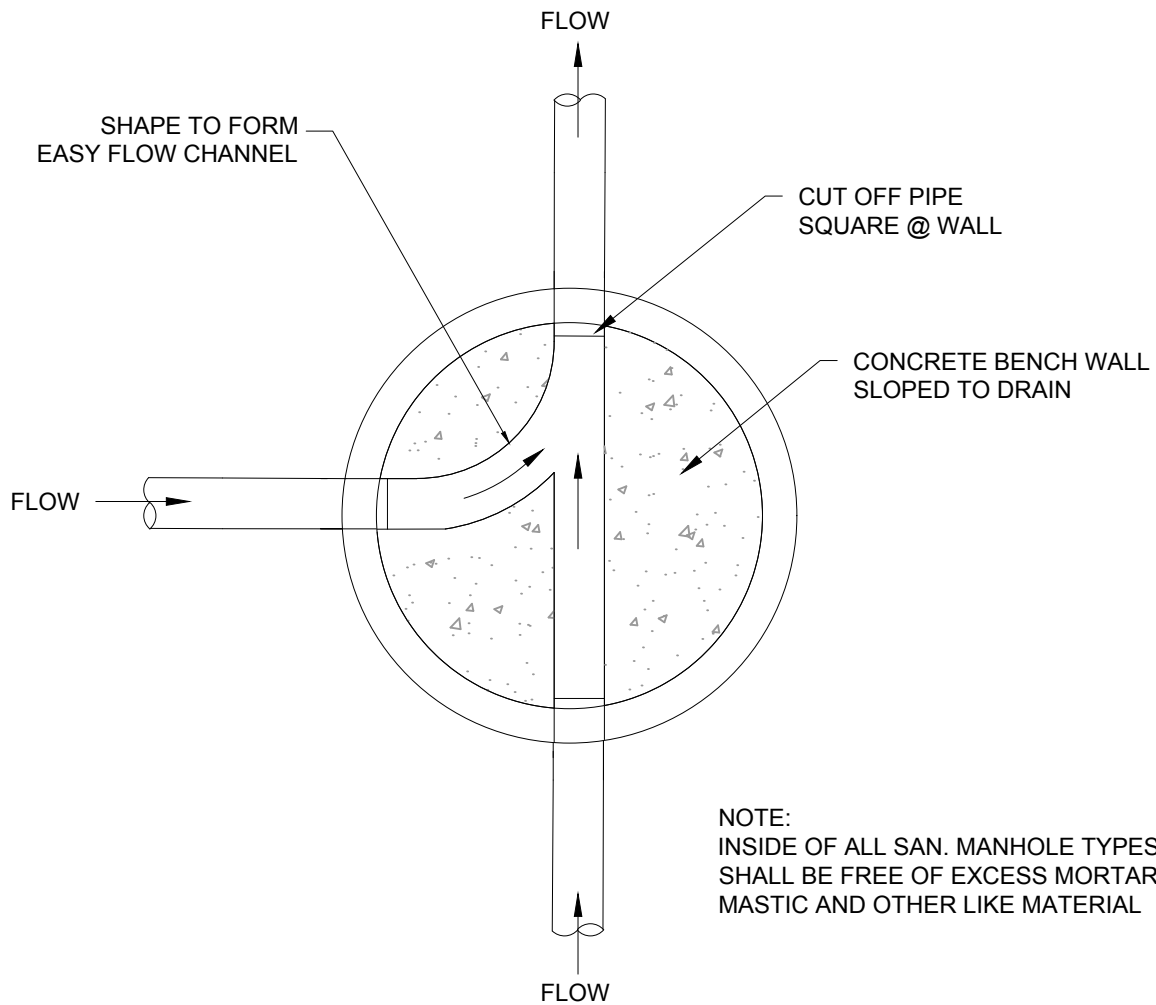


DATE:
07/11/18

SCALE:
NTS

SHEET NO.

31



REVISIONS			
NO.	DESCRIPTION	DATE	BY

STANDARD MANHOLE BENCH WALL

STANDARD DETAILS

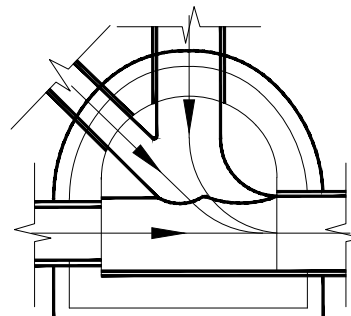
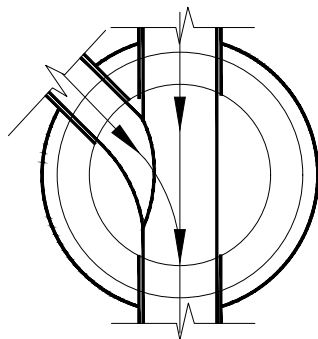
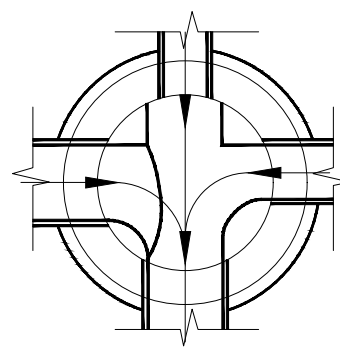
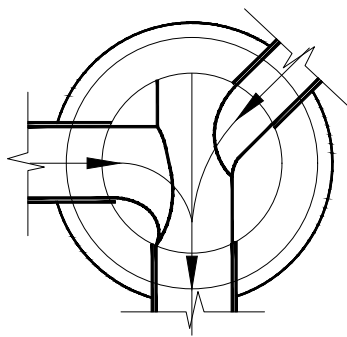
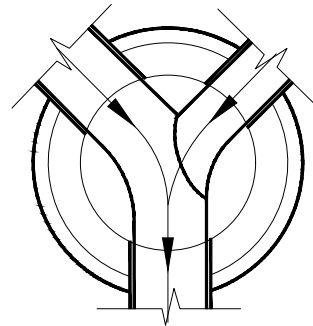
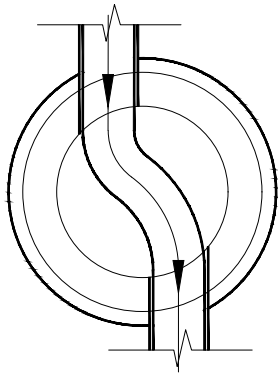
TOWN OF WHITESTOWN



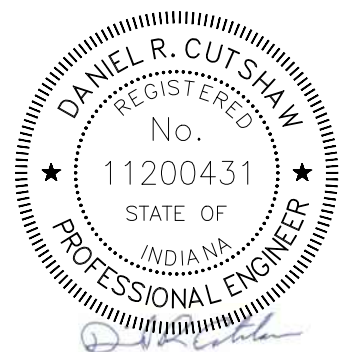
DATE: 07/11/18

SCALE: NTS

SHEET NO. 32



SANITARY SEWER
BENCH SLOPE: 1/2" PER FOOT



REVISIONS			
NO.	DESCRIPTION	DATE	BY

STANDARD MANHOLE BENCHES
STANDARD DETAILS
TOWN OF WHITESTOWN



DATE: 07/11/18
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.

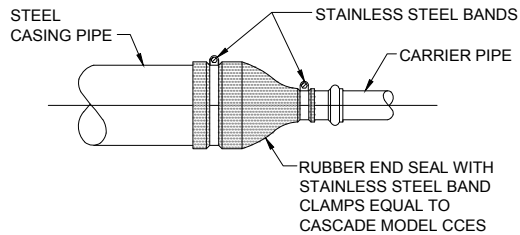
CASTING SCHEDULE

NEENAH FOUNDRY COMPANY EAST JORDAN IRON WORKS
FRAME AND COVER R1772-C FRAME AND COVER 1022-3

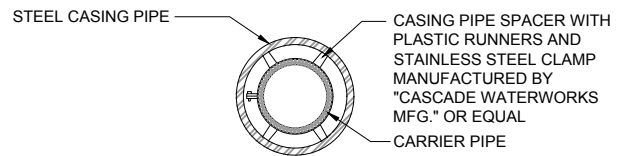
*THE WORDS "SANITARY SEWER" SHALL BE CAST INTO THE COVER WITH 2" LETTER HEIGHT, HEAVY DUTY, SOLID, AND THE COVER SHALL BE SELF SEALING WITH NON-PENETRATING PICK HOLES

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

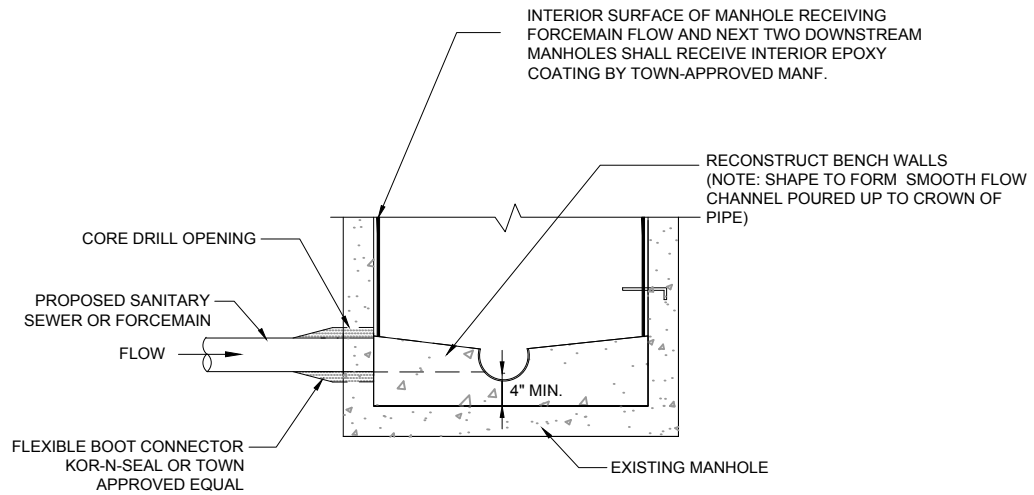


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07/11/18

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NTS

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REVISIONS			
NO.	DESCRIPTION	DATE	BY

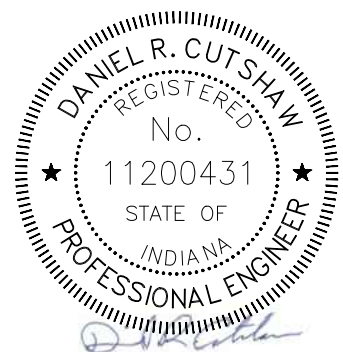
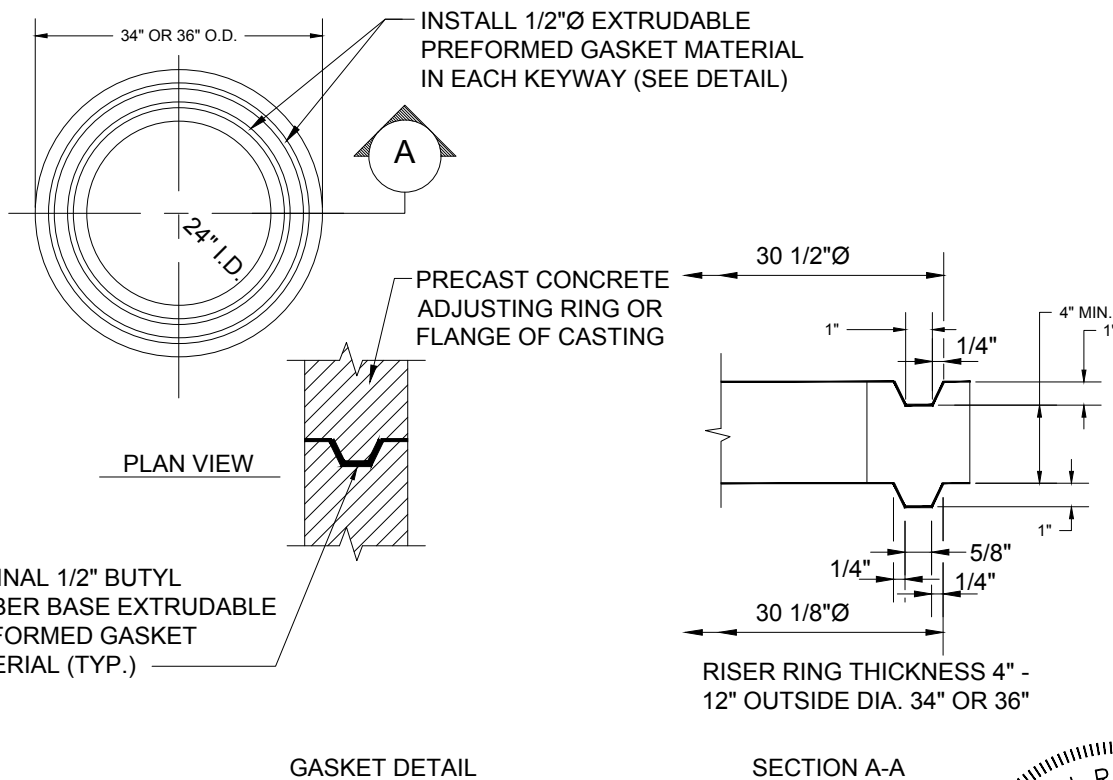
EXISTING MANHOLE CONNECTION DETAIL

STANDARD DETAILS

TOWN OF WHITESTOWN



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REVISIONS

NO.	DESCRIPTION	DATE	BY

PRECAST ADJUSTING RING STANDARD DETAILS TOWN OF WHITESTOWN



DATE: 07/11/18

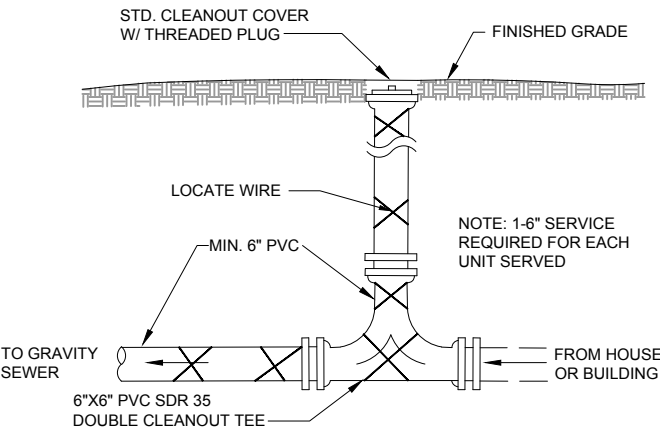
SCALE: NTS

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.



REVISIONS			
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TYPE 1 CLEANOUT DETAIL

STANDARD DETAILS

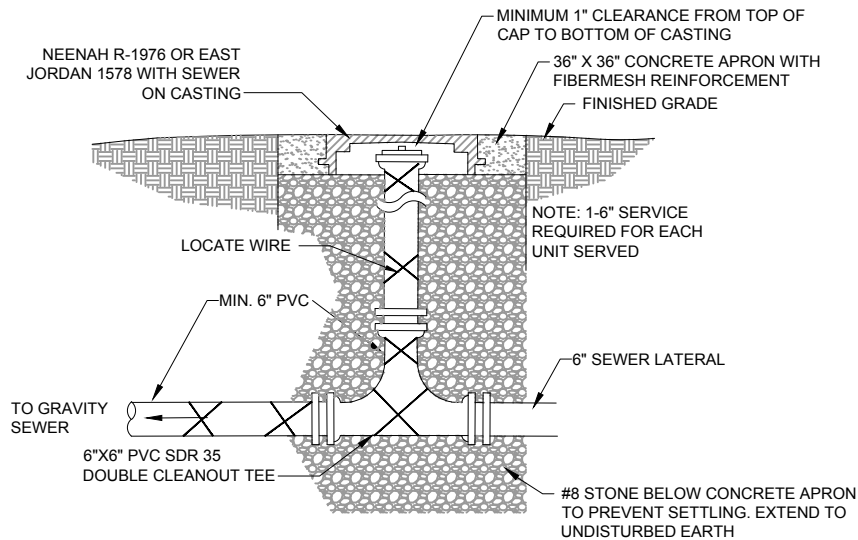
TOWN OF WHITESTOWN



DATE:	07/11/18
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SHEET NO.	37

NOTES:

1. CONCRETE APRON AND CASTING SHALL BE INSTALLED SO THAT THEY DO NOT CONTACT THE LATERAL OR LATERAL CAP



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TYPE 2 CLEANOUT DETAIL

STANDARD DETAILS

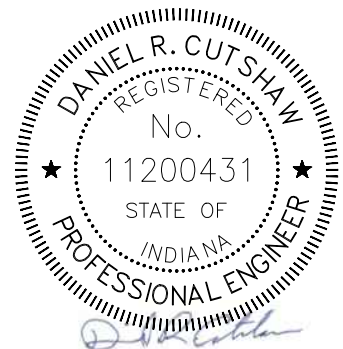
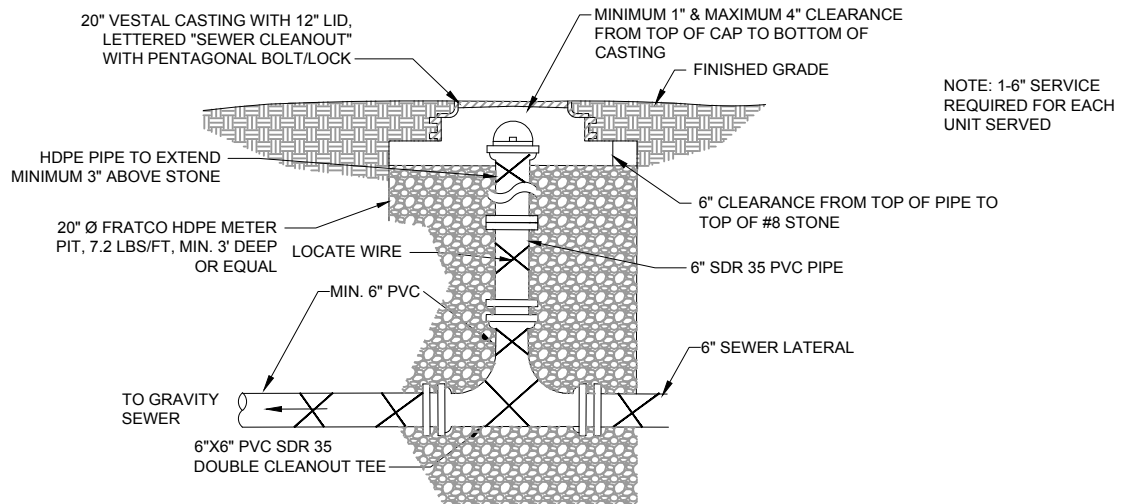
TOWN OF WHITESTOWN



DATE:	07/11/18
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SHEET NO.	38

NOTES:

1. CONCRETE APRON AND CASTING SHALL BE INSTALLED SO THAT THEY DO NOT CONTACT THE LATERAL OR LATERAL CAP



REVISIONS			
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TYPE 3 CLEANOUT DETAIL

STANDARD DETAILS

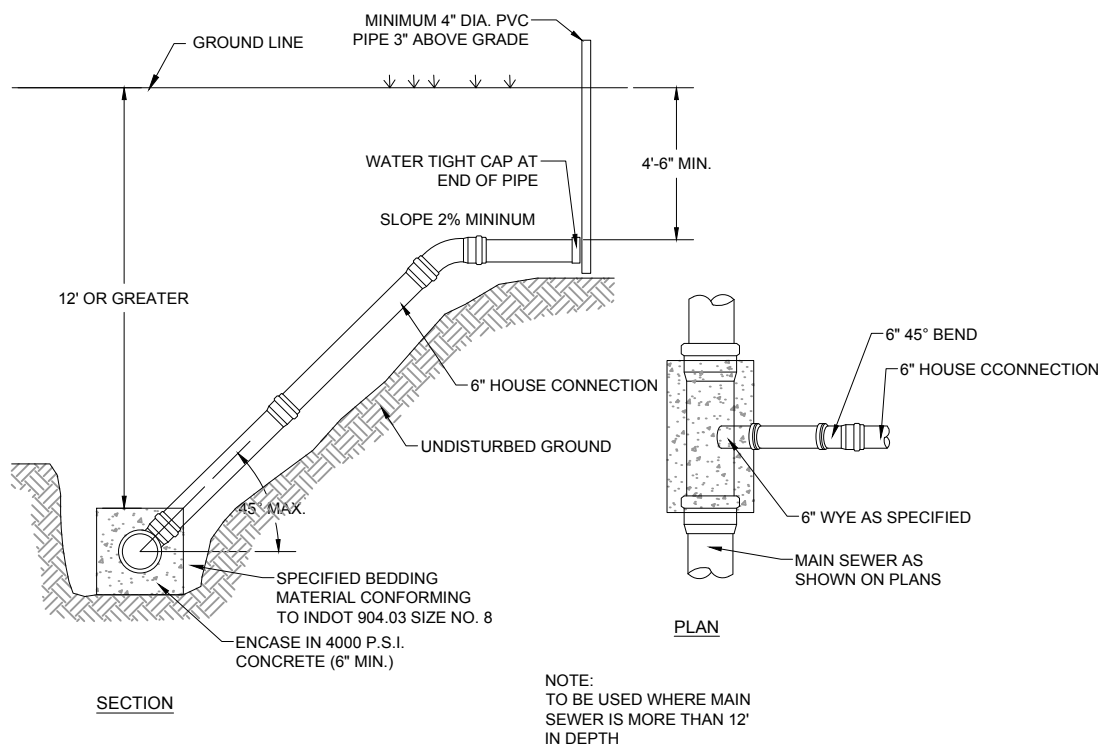
TOWN OF WHITESTOWN



DATE:	07/11/18
SCALE:	NTS
SHEET NO.	39

SERVICE CONNECTION NOTES

- A. CONTRACTOR SHALL NOT BACKFILL SERVICE CONNECTION UNTIL THE CITY HAS INSPECTED AND TAKEN MEASUREMENTS, ELEVATIONS AND OTHER INFORMATION REQUIRED FOR PURPOSED OF RECORD
- B. ALL WYE BRANCHES IN THE MAIN SEWER LINE ROTATED MORE THAN 30° FROM HORIZONTAL SHALL BE ENCASED IN 6" MIN. 4000 P.S.I. CONCRETE.
- C. TEE BRANCHES MAY BE USED IN LIEU OF WYE BRANCHES FOR CONNECTION TO MAIN SEWERS 18" AND LARGER.



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SANITARY SEWER SERVICE CONNECTIONS STANDARD DETAILS **TOWN OF WHITESTOWN**



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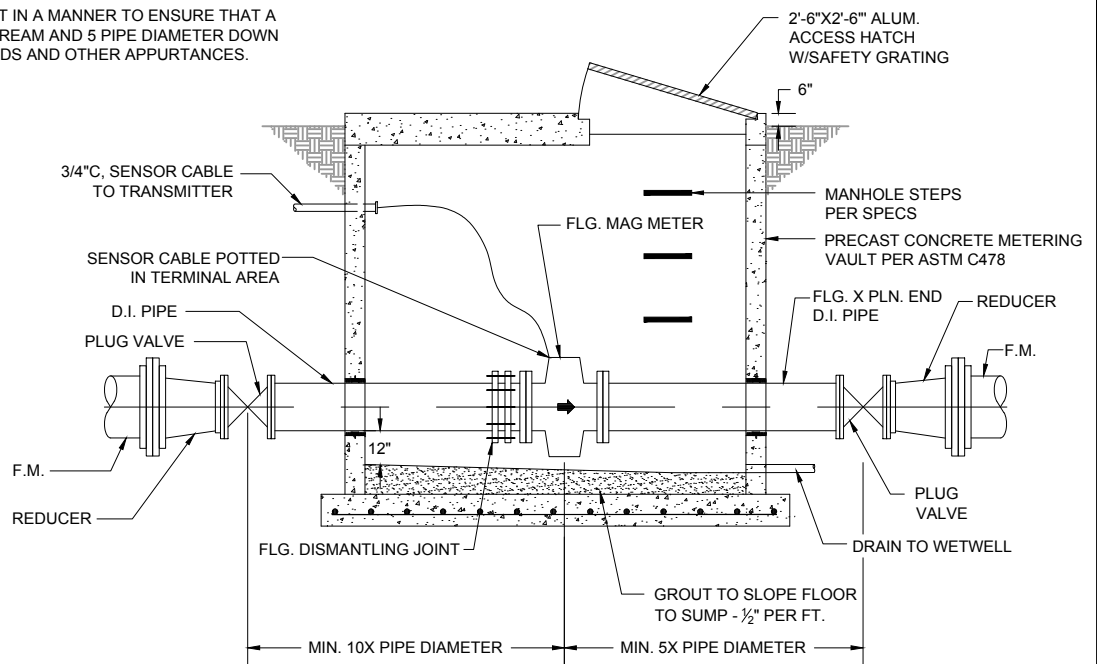
FLOW METER NOTES:

METER REQUIRED ON LIFT STATION DISCHARGES. DETAILS TO BE COORDINATED AND APPROVED WITH TOWN. SEE SHEETS 9 AND 10 FOR LIFT STATION DETAILS.

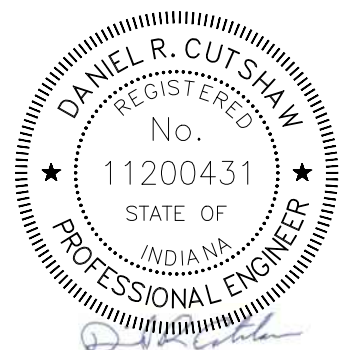
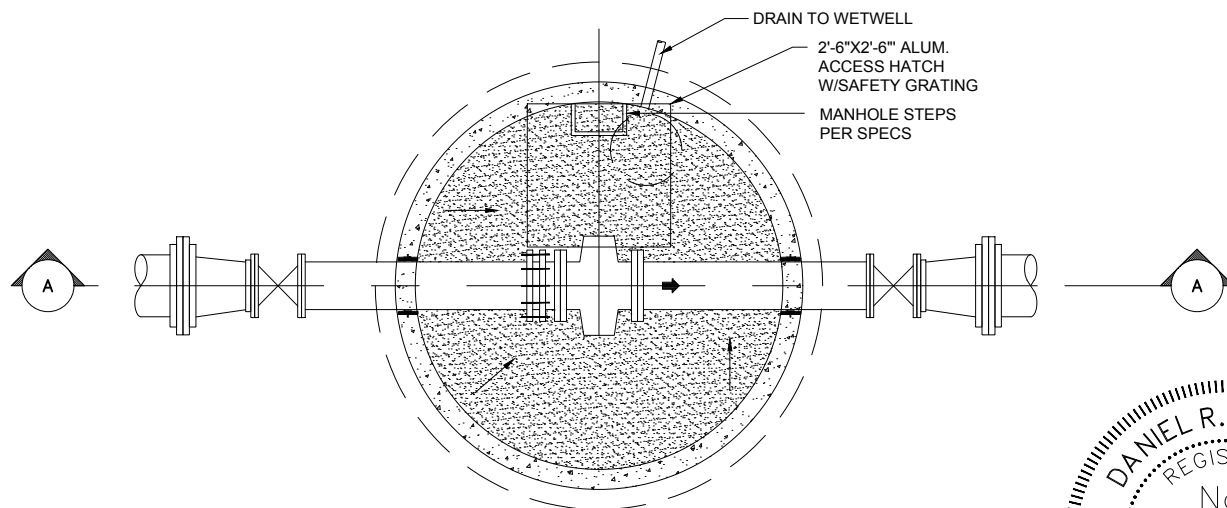
CONTRACTOR SHALL INSTALL MAG METER AND FORCEMAIN IN A MANNER TO ENSURE FULL PIPE FLOW/SUBMERGENCE AT ALL TIMES FOR PROPER MAG METER OPERATION.

PROVIDE A SPOOL PIECE TO REPLACE MAGMETER BODY IF REMOVAL IS REQUIRED FOR REPAIR/REPLACEMENT.

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 APPURTANCES.



SECTION A-A



REVISIONS			
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MAG METER VAULT DETAIL STANDARD DETAILS **TOWN OF WHITESTOWN**

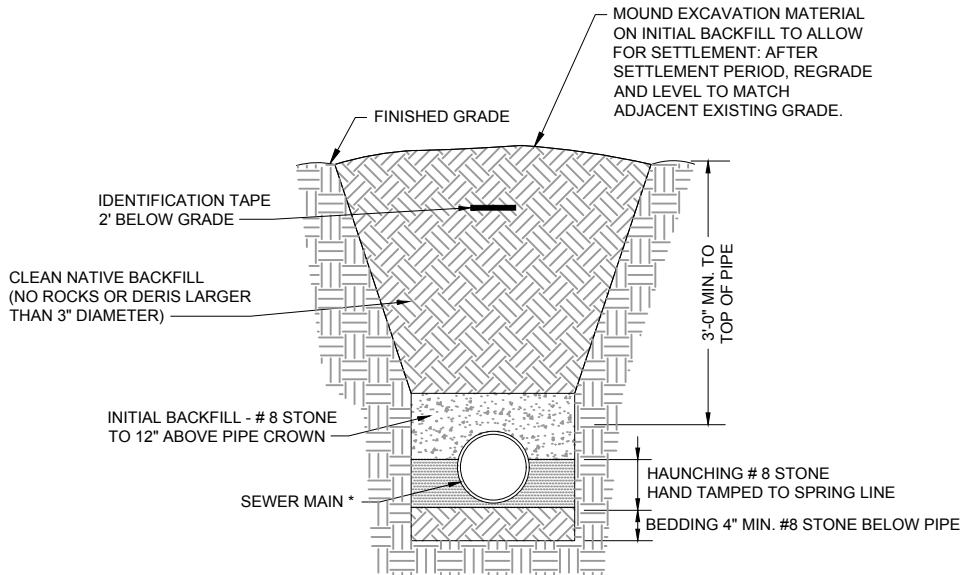


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SCALE: NTS

SHEET NO.

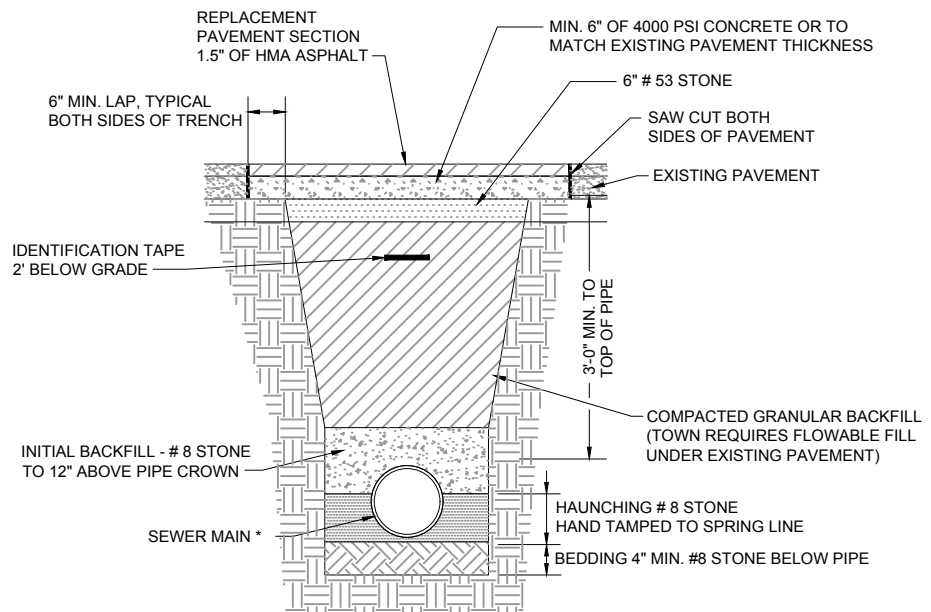
41



NOTE:
FORCEMAINS ARE TO BE INSTALLED PER THE
TYPICAL TRENCH DETAILS FOR WATER MAINS
(SEE SHEET 3)

SEWER TRENCH UNPAVED AREAS

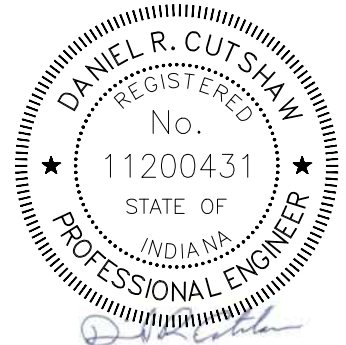
* SDR 26 OR DUCTILE IRON USED FOR
SEWER DEEPER THAN 15'.



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.



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TYPICAL GRAVITY SANITARY SEWER TRENCH DETAILS STANDARD DETAILS TOWN OF WHITESTOWN



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SCALE:
NTS

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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:

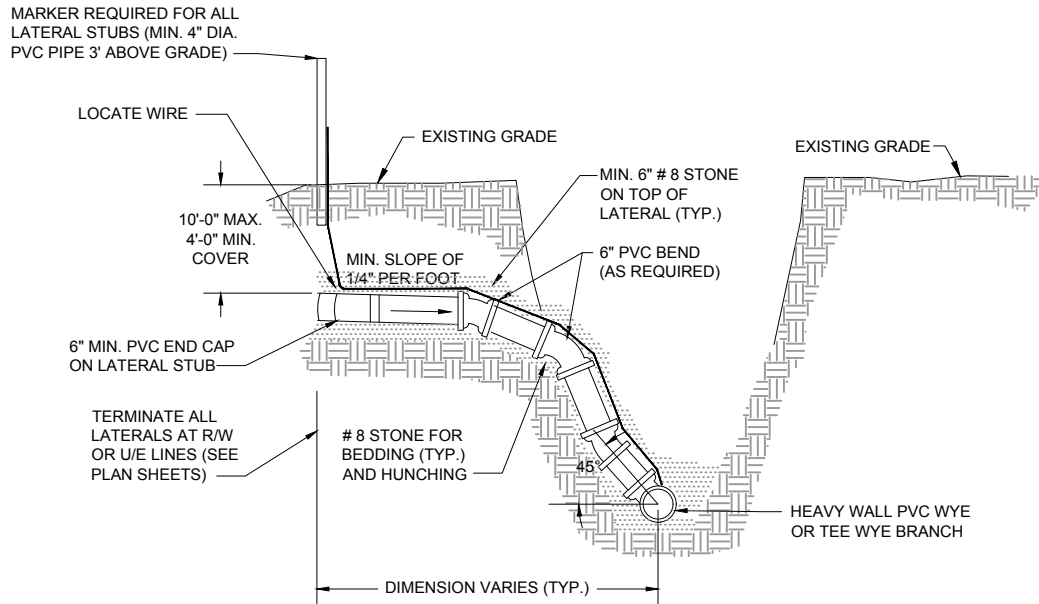
1. ROAD CURB TO BE STAMPED WITH AN "S" TO INDICATE SANITARY SEWER LOCATION.
2. FINISHED FLOOR ELEVATION OF ADJACENT BUILDINGS SHALL BE SET A MINIMUM OF 12" HIGHER THAN THE RIM ELEVATION OF THE UPSTREAM MANHOLE OF THE CONNECTED SEWER MAIN TO PREVENT SANITARY BACKUPS. OTHERWISE, BACKFLOW PREVENTION MUST BE PROVIDED ON THE SERVICE CONNECTIONS.
3. SAMPLE STATION MANHOLES AND GREASE TRAPS SHALL BE INCLUDED ON ALL COMMERCIAL AND INDUSTRIAL SERVICE CONNECTIONS.

FORCE MAIN LOCATION WIRE AND MARKERS:

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.

OPEN CUT PIPE INSTALLATION REQUIRES ONE #12 AWG HIGH-STRENGTH COPPER CLAD, STEEL CONDUCTOR LOCATE WIRE.

DIRECT DRILL / BORE PIPE INSTALLATION REQUIRES TWO #12 AWG EXTRA HIGH-STRENGTH COPPER CLAD, STEEL CONDUCTOR LOCATE WIRES (SEE TOWN SPECIFICATIONS).



REVISIONS

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SANITARY SEWER SERVICE CONNECTIONS **STANDARD DETAILS** **TOWN OF WHITESTOWN**



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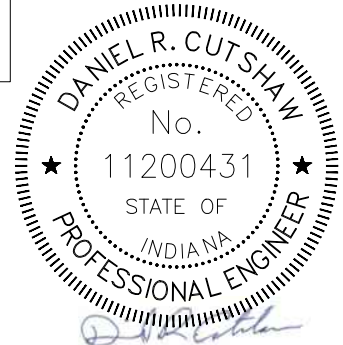
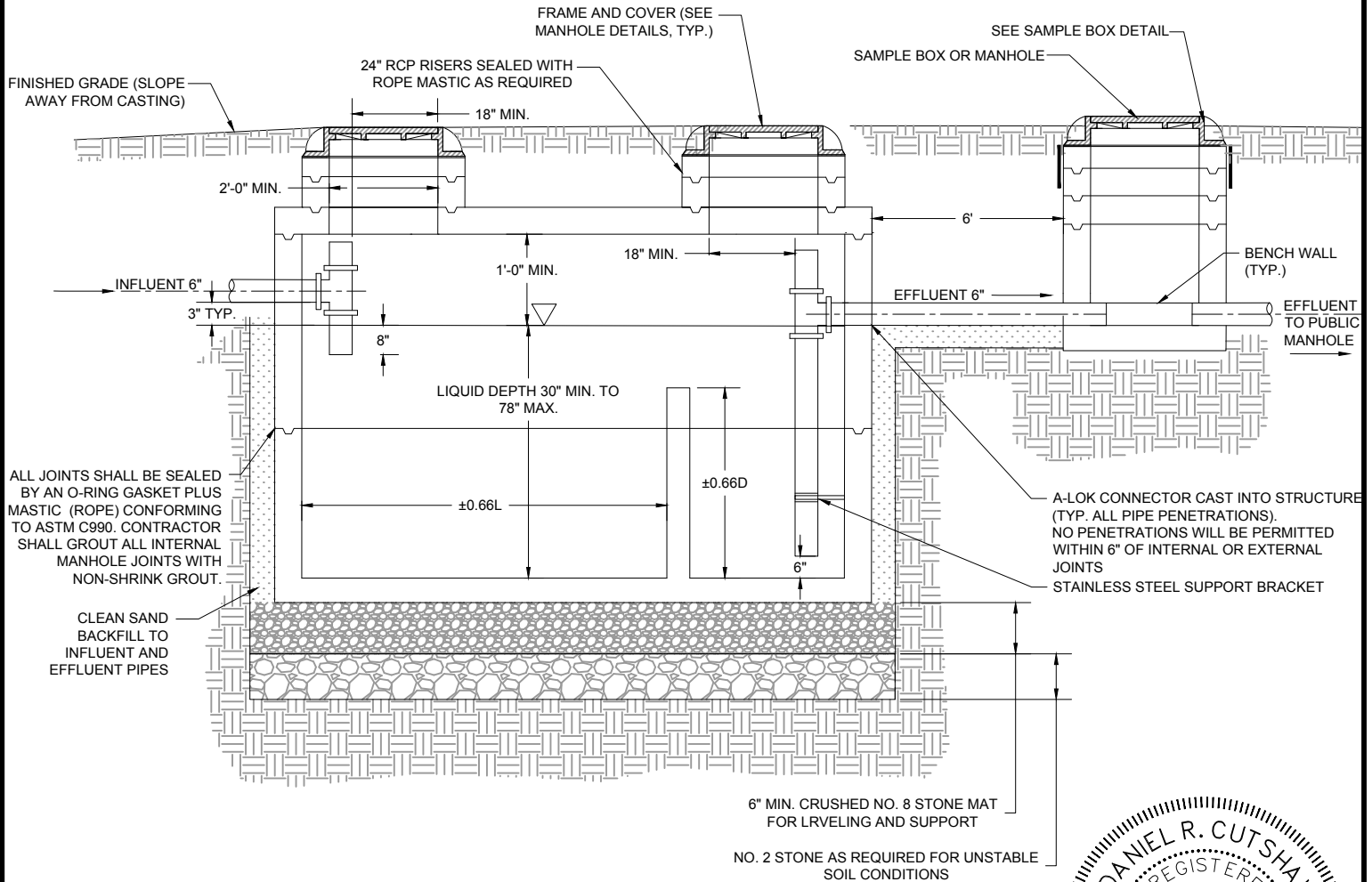
NOTES:

- GREASE TRAP SHALL CONFORM TO ASTM 858 UTILIZING 4000 PSI CONCRETE. STRUCTURE SHALL BE DESIGNED TO SUPPORT LOADING IN PLANNED LOCATION.
- EXTERIOR INSTALLATION MUST BE CONCRETE. STEEL GREASE TRAPS SHALL ONLY BE INSTALLED INSIDE BUILDING.
- CONTRACTOR MAY SUPPLY GREASE TRAP AS MANUFACTURED BY ZURN SERIES Z-1170 OR JAY R. SMITH MANUFACTURING COMPANY SERIES 8000 IF INTERIOR INSTALLATION UTILIZED.
- 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.
- SHOP DRAWINGS MUST BE SUBMITTED TO THE UTILITY ENGINEER FOR REVIEW AND APPROVAL.
- TOP OF CASTING SHALL EXTEND 3" MIN. ABOVE FINISHED GRADE.
- 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

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GREASE TRAP DETAIL
STANDARD DETAILS
TOWN OF WHITESTOWN



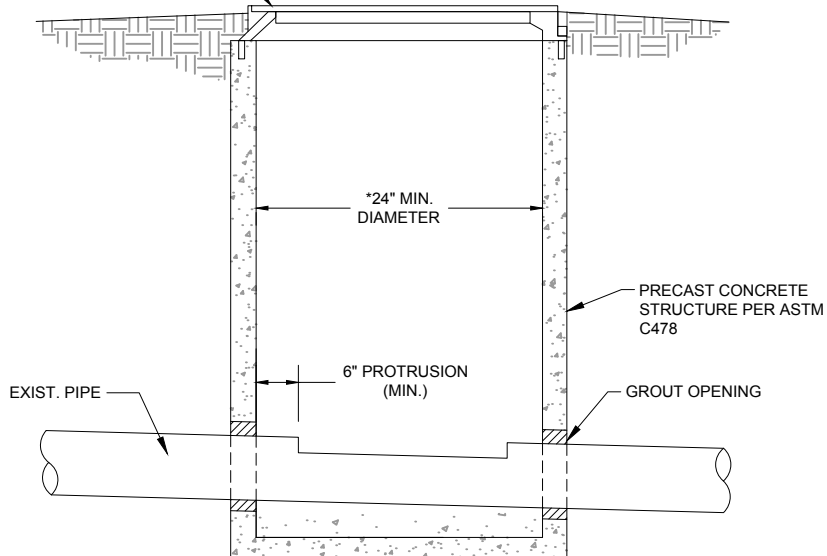
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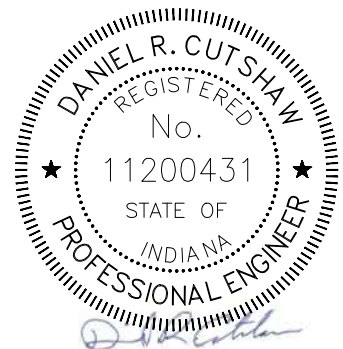
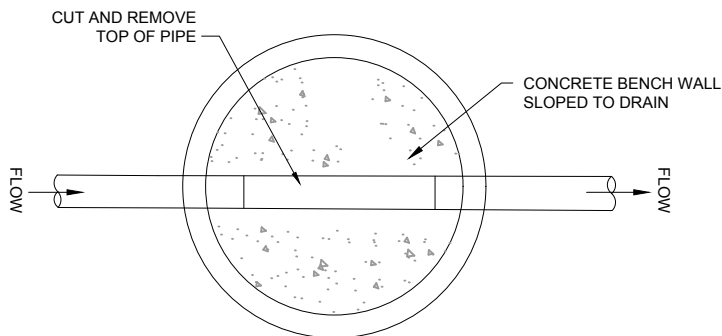
44

STANDARD MANHOLE CASTING
SET RIM 3" ABOVE GRADE AND
SLOPE SURROUNDING AREA
TO DRAIN AWAY FROM CASTING
IN UNPAVED AREAS. SET FLUSH TO
PAVEMENT IN PAVED AREAS.



***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.



REVISIONS

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**SAMPLE STATION DOGHOUSE MANHOLE
INSTALLATION DETAIL
STANDARD DETAILS
TOWN OF WHITESTOWN**

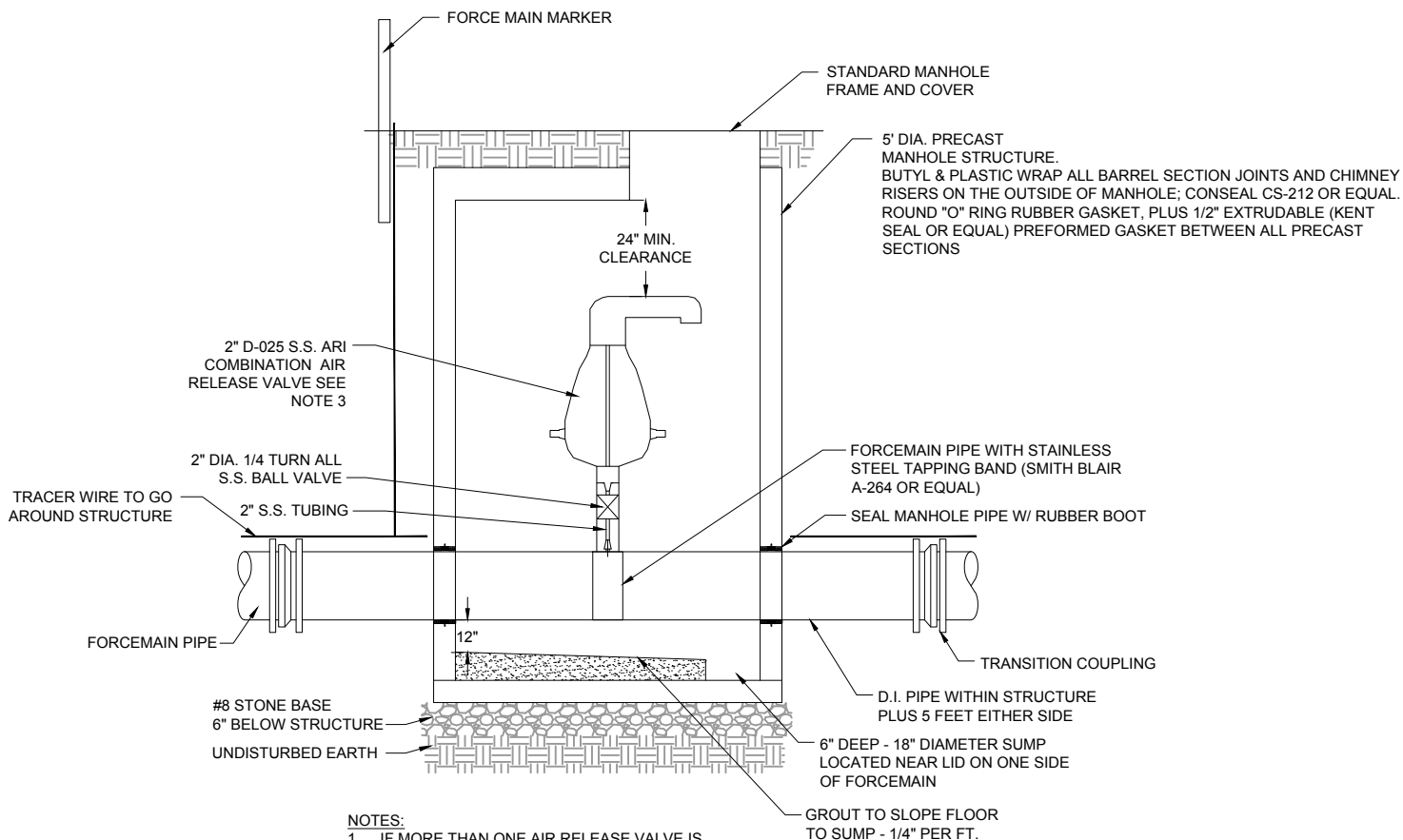


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NTS

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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

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FORCE MAIN AIR RELEASE VALVE

STANDARD DETAILS

TOWN OF WHITESTOWN

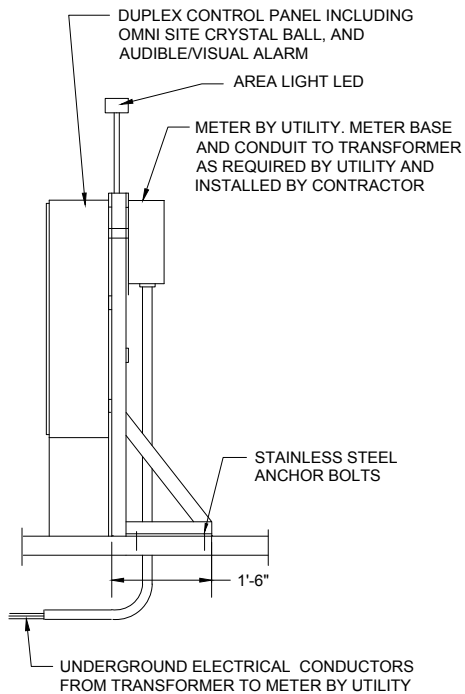


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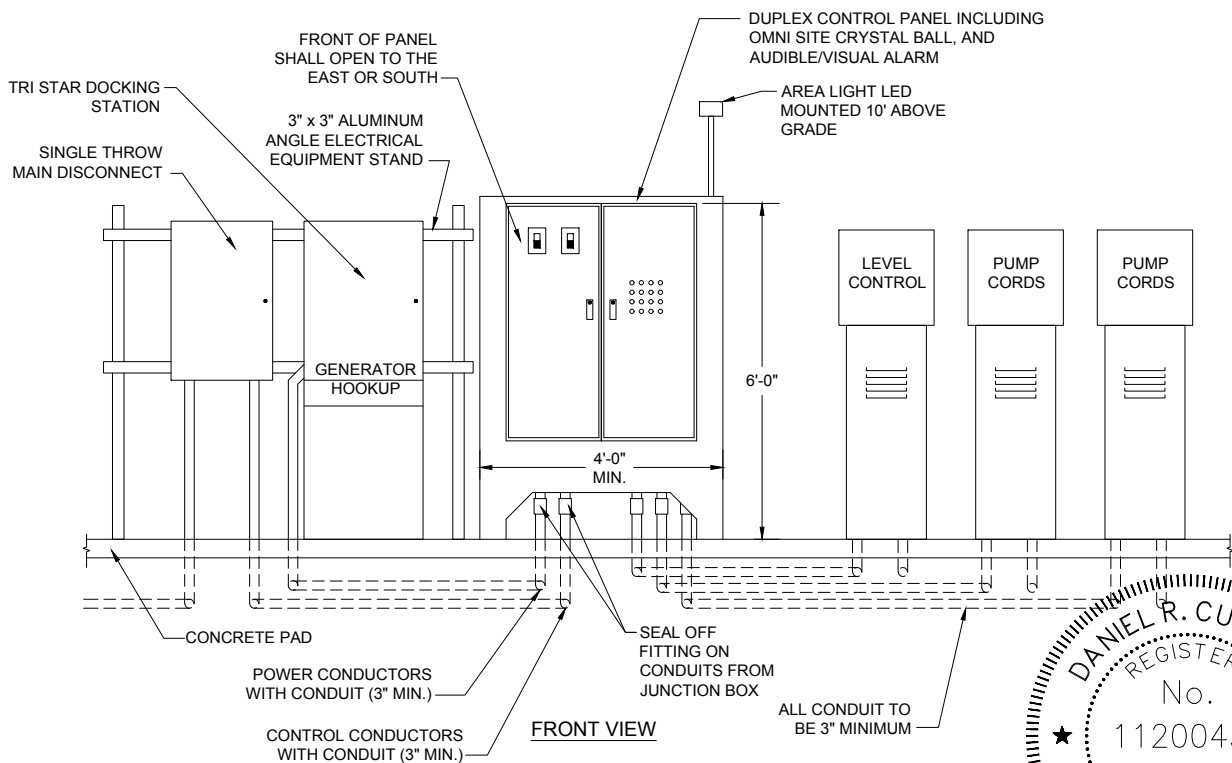
46



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.



REVISIONS			
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ELECTRICAL DIAGRAM

STANDARD DETAILS

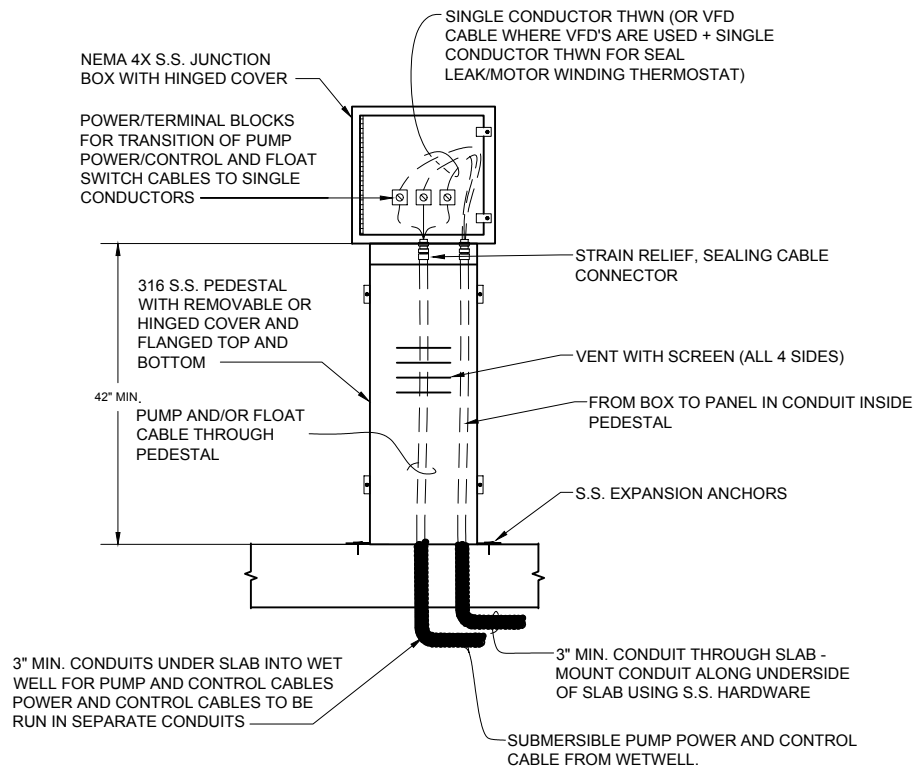
TOWN OF WHITESTOWN



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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

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PUMP/FLOAT CABLE WETWELL JUNCTION BOX STANDARD DETAILS TOWN OF WHITESTOWN

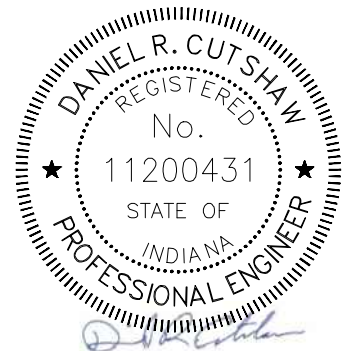
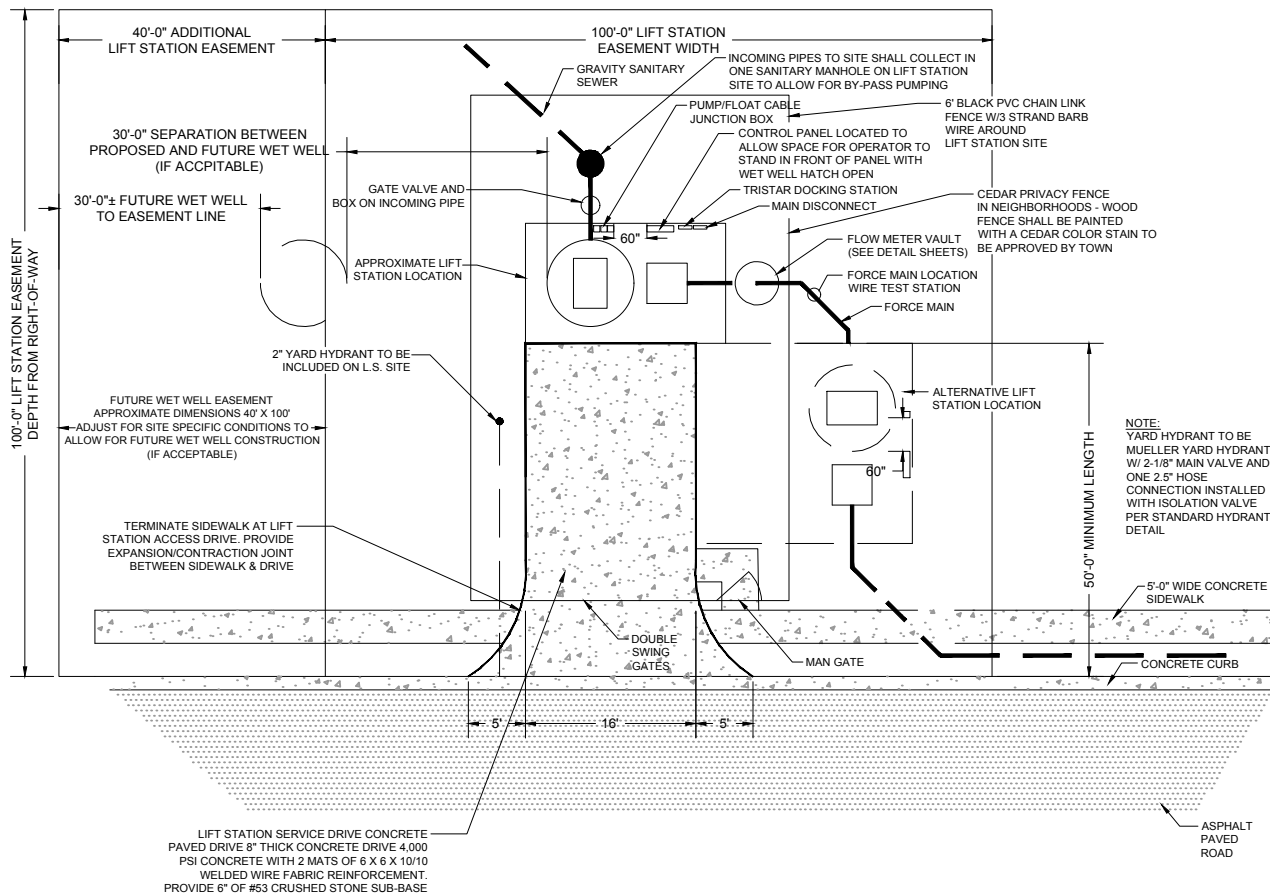


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REVISIONS			
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LIFT STATION SITE LAYOUT

STANDARD DETAILS

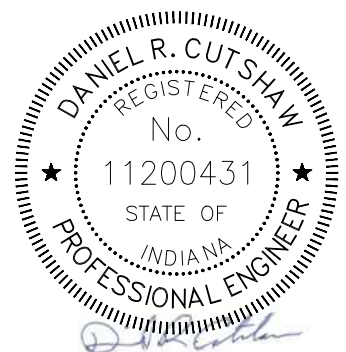
TOWN OF WHITESTOWN



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LIFT STATION DESIGN DATA			
DESCRIPTION	LIFT STATION ID NO. LS1	DESCRIPTION	LIFT STATION ID NO. LS1
	INITIAL DESIGN		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:
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NTS

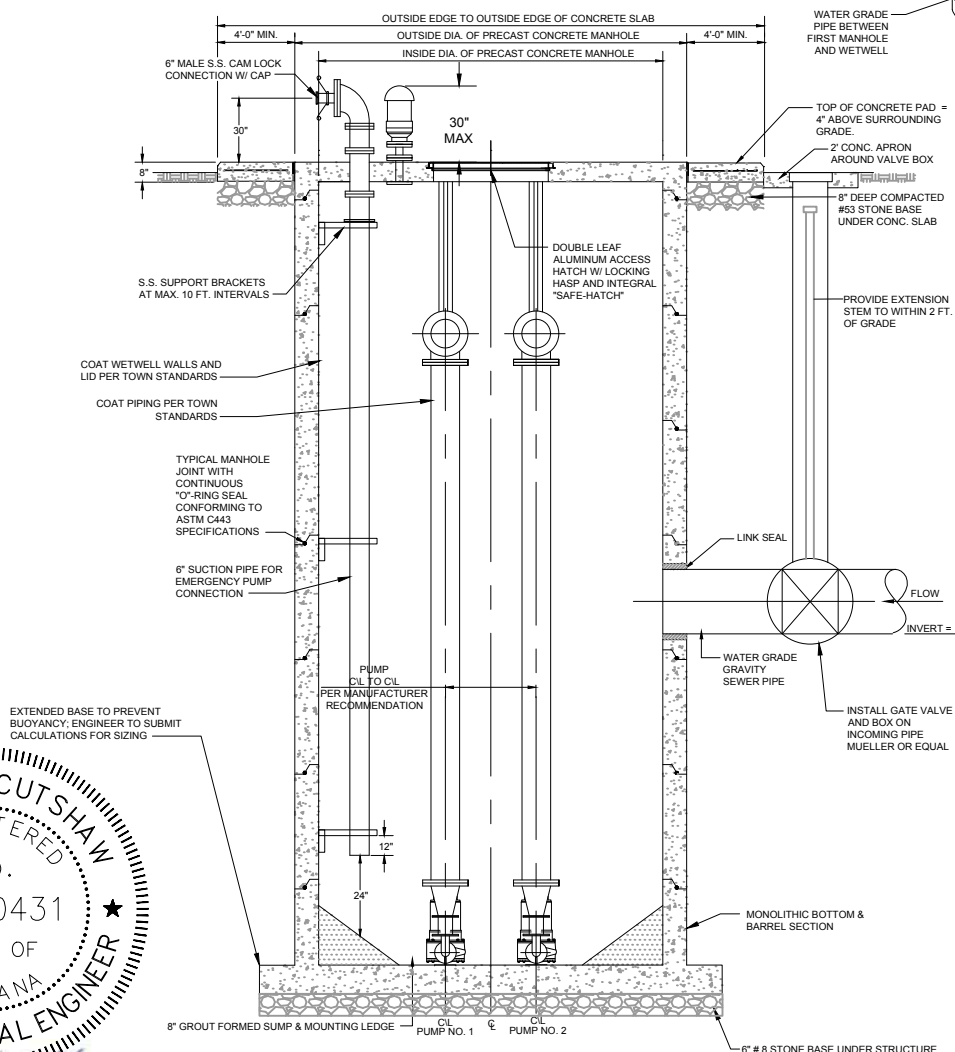
SHEET NO.
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PLAN

Diagram illustrating the plan view of a force main structure, showing various components and their connections:

- FORCE MAIN ROUTE:** Indicated by a dashed line with arrows showing flow direction.
- STRUCTURAL COMPONENTS:**
 - ALUMINUM LADDER W/ TELESCOPING EXTENSION
 - LINK SEALS
 - SWING CHECK VALVE W/ OUTSIDE LEVER & WEIGHT AND TOP ACCESS FLANGE MINIMUM 12" CLEARANCE FROM SWING MECHANISM TO VALVE VAULT WALL (TYP. OF 3)
 - LINK SEALS
- VALVES AND ACCESSORIES:**
 - PRESSURE GAUGE MOUNTED ISOLATING RING RED VALVE OR EQUAL
 - PLUG VALVE AND BOX
 - FORCEMAIN
 - D.I.M.J. REDUCER AS REQUIRED
 - LINK SEAL
 - D.I.F.J. CROSS
 - D.I.F.J. 90 DEGREE BEND
 - ECCENTRIC PLUG VALVE WITH HAND/WHEEL OPERATOR (TYP. OF 3)
 - 2" PVC DRAIN W/ FLAPPER CHECK VALVE
 - D.I.F.J. 90° BEND
- ANCHORING AND CONNECTIONS:**
 - S.S. ANCHOR BOLTS W/ RUBBER GASKETS
 - INSTALL 14X14 GATE VALVE AND BOX ON INCOMING PIPE MUELLER A-2360 W/ ALL S.S. BOLTS OR EQUAL
 - SANITARY SEWER
 - BY-PASS PUMP PIPING

PLAN



SECTION A-A

TYPE I - LIFT STATION
GENERAL CONFIGURATION
STANDARD DETAILS
TOWN OF WHITESTOWN

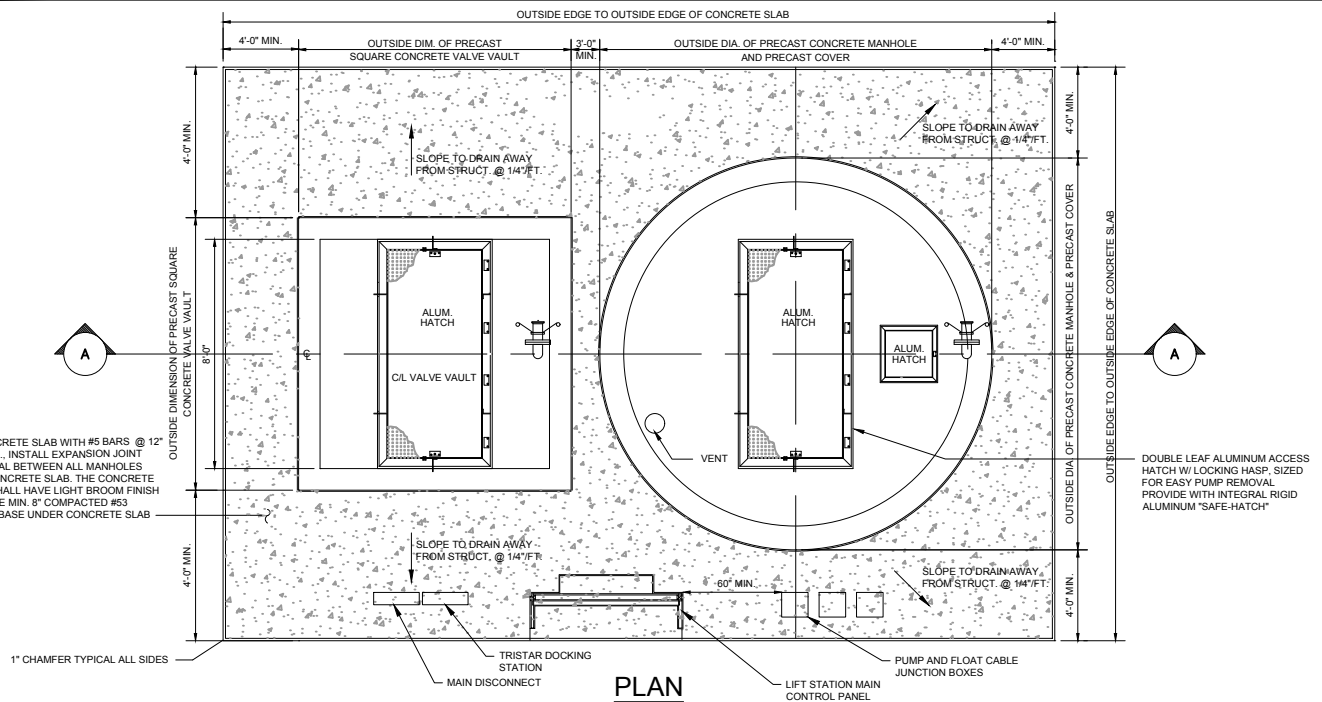
SHEET NO.

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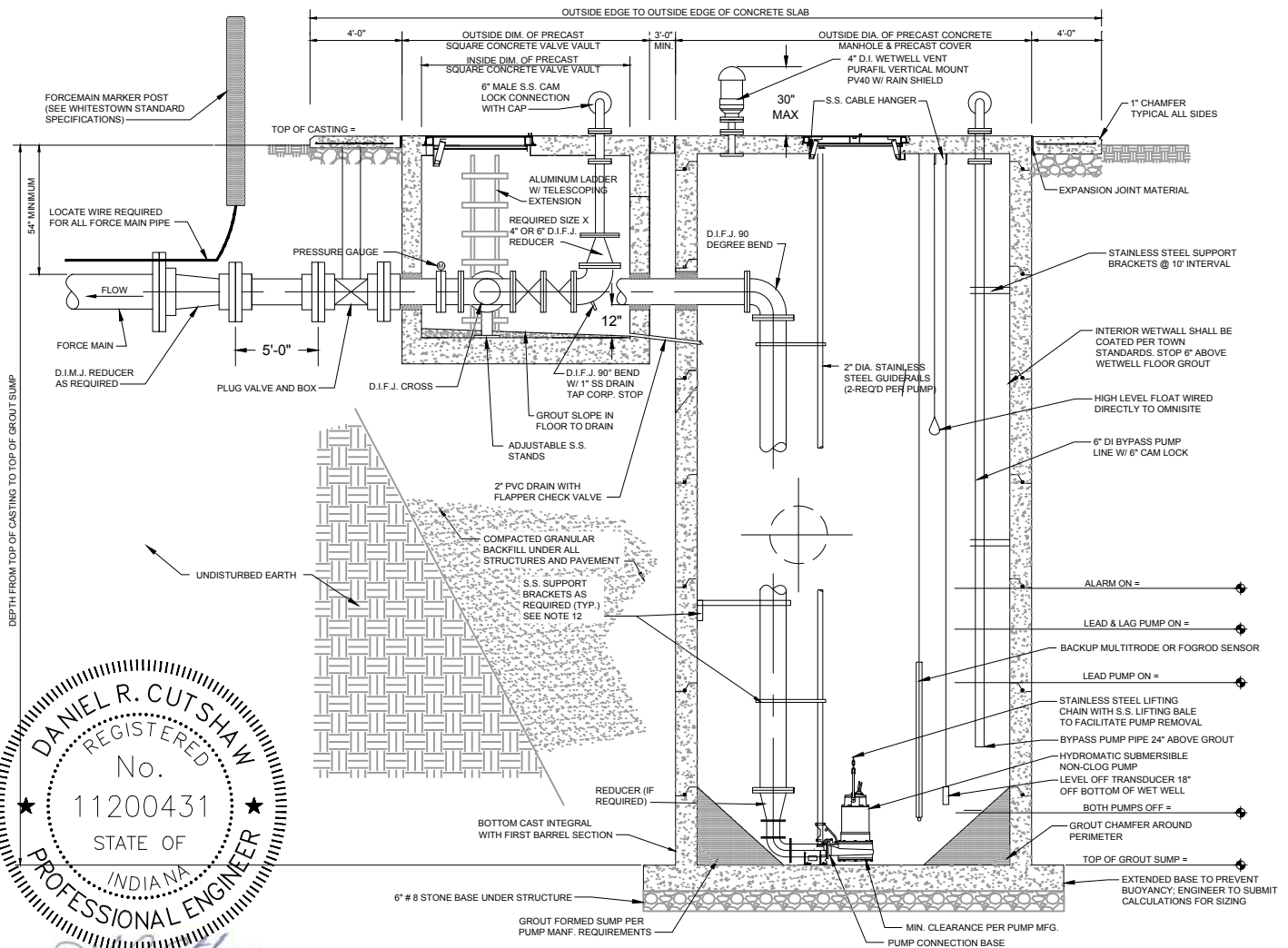


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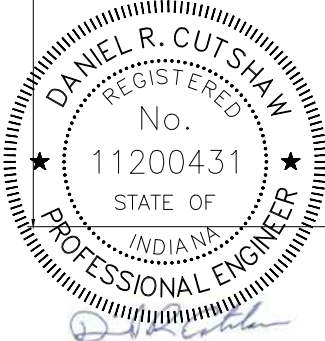




PLAN



SECTION A-A



TYPE II - LIFT STATION
GENERAL CONFIGURATION
STANDARD DETAILS
TOWN OF WHITESTOWN



DATE: 07/11/18
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SHEET NO. 53

REVISIONS

NO.	DESCRIPTION	DATE	BY

ION. FORCE MAIN MARKERS WITH TERMINAL
LLED ALONG FORCE MAIN ROUTE WITH MAXIMUM
INJIOUS BETWEEN LOCATION MARKERS (NO
THE TOWN OF WHITESTOWN. STATION SHALL BE
7CE WITH LID C2. THE FOLLOWING INFORMATION
PSTER POST: "TOWN OF WHITESTOWN", "SANITARY
CT 317-733-8584" AND "CAUTION SEWER PIPELINE".
CE OF TOWN OF WHITESTOWN REPRESENTATIVE

ALUMINUM LADDER
W/ TELESCOPING
EXTENSION

PRESSURE GAUGE
MOUNTED ISOLATING RING
RED VALVE OR EQUAL

PLUG VALVE AND BOX

FORCEMAIN

FLOW

D.I.M.J. REDUCER
AS REQUIRED

LINK SEAL

D.I.F.J. CROSS

D.I.F.J. 90 DEGREE BEND

ECCENTRIC PLUG VALVE
WITH HANDWHEEL
OPERATOR (TYP. OF 3)

SWING CHECK VALVE W/
OUTSIDE LEVER & WEIGHT
AND TOP ACCESS FLANGE
MINIMUM 12" CLEARANCE
FROM SWING MECHANISM
TO VALVE VAULT WALL
(TYP. OF 3)

LINK SEALS

D.I.F.J. 90° BEND

2" P.V.C DRAIN W/
FLAPPER CHECK VALVE

LINK SEALS

BYPASS PUMP PIPING

S.S. ANCHOR BOLTS W/
RUBBER GASKETS

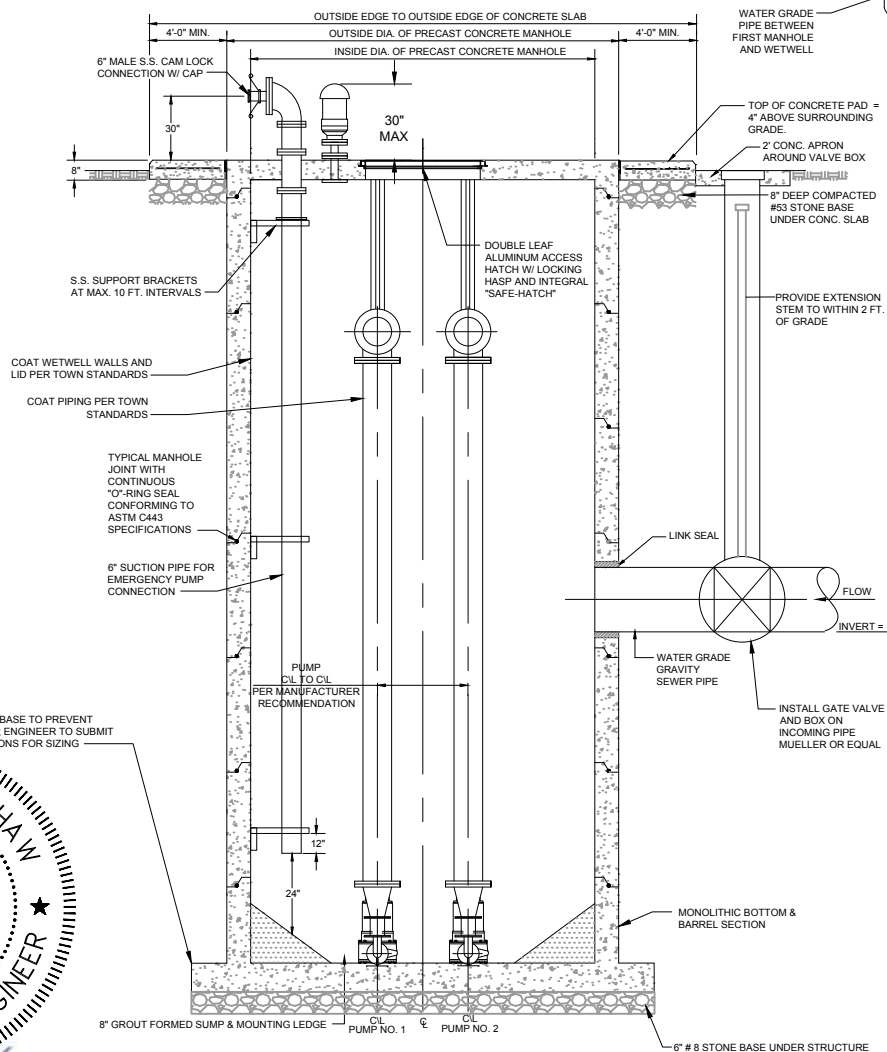
FLOW

SANITARY SEWER

INSTALL MAX/MJ GATE VALVE AND BOX
ON INCOMING PIPE MUELLER A-2360
W/ ALL S.S. BOLTS OR EQUAL

PLAN

PLAN



SECTION A-A

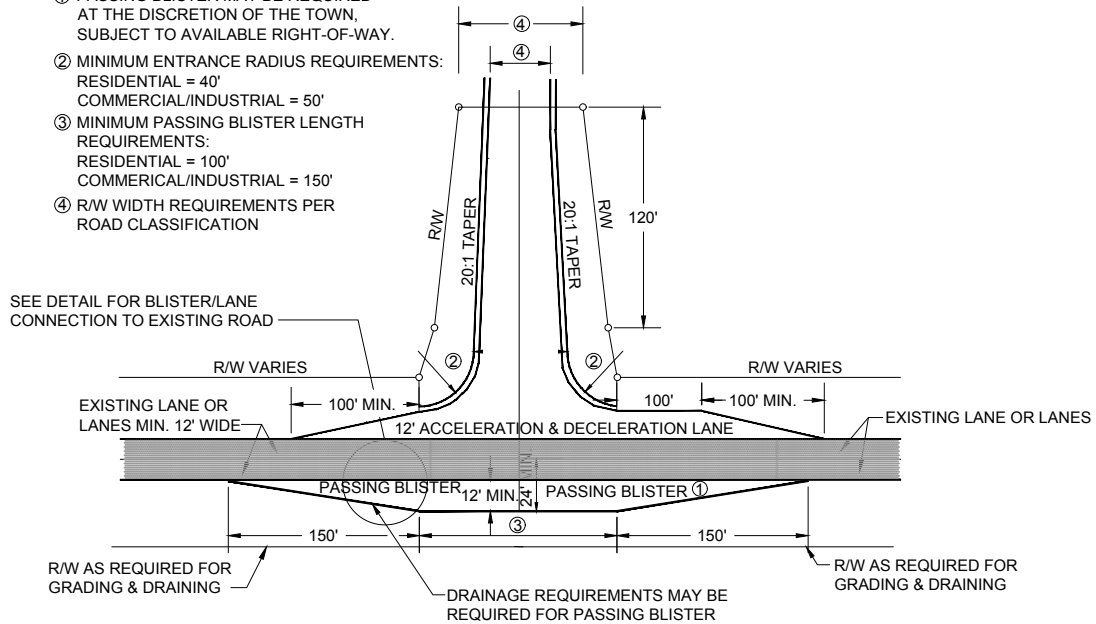
TYPE II - LIFT STATION
GENERAL CONFIGURATION
STANDARD DETAILS
TOWN OF WHITESTOWN

SHEET NO.

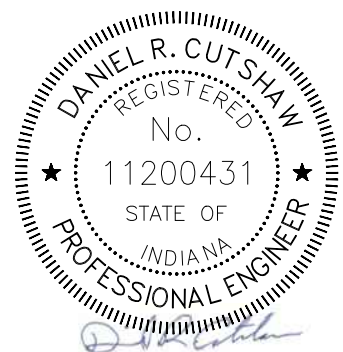
54

[illegible]

- ① PASSING BLISTER MAY BE REQUIRED AT THE DISCRETION OF THE TOWN, SUBJECT TO AVAILABLE RIGHT-OF-WAY.
- ② MINIMUM ENTRANCE RADIUS REQUIREMENTS:
RESIDENTIAL = 40'
COMMERCIAL/INDUSTRIAL = 50'
- ③ MINIMUM PASSING BLISTER LENGTH REQUIREMENTS:
RESIDENTIAL = 100'
COMMERCIAL/INDUSTRIAL = 150'
- ④ R/W WIDTH REQUIREMENTS PER ROAD CLASSIFICATION



NOTE:
THIS DRAWING REPRESENTS THE MINIMUM REQUIREMENTS FOR A PUBLIC ROAD ENTRANCE.
LARGER AND/OR LONGER ACCELERATION AND DECELERATION LANES MAY BE REQUIRED WHEN
DEEMED NECESSARY BY THE TOWN OF WHITESTOWN TO ADEQUATELY SERVE THE ANTICIPATED
TYPES AND VOLUMES OF TRAFFIC. LENGTH OF ACCELERATION AND DECELERATION LANES MAY BE
MODIFIED WHEN WARRANTED AT THE DISCRETION OF THE PLANNING COMMISSION.



REVISIONS			
NO.	DESCRIPTION	DATE	BY

MINIMUM PUBLIC ROAD TO PUBLIC ROAD
ENTRANCE REQUIREMENTS
STANDARD DETAILS
TOWN OF WHITESTOWN

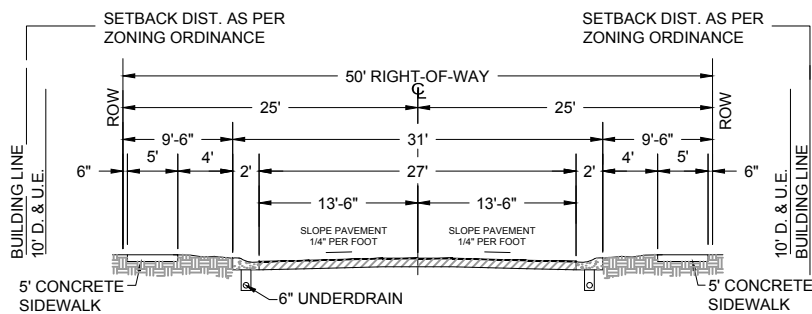


DATE:	07/11/18
-------	----------

SCALE: NTS

SHEET NO.

55



NOTE:
 TWO 13'-6" TRAVEL LANES WITH NO PARKING LANE AS SHOWN ABOVE.
 ALTERNATIVE, TWO 11'-0" MOVING LANES WITH ONE 8'-0" PARKING LANE.

PEDESTRIAN RAMPS AT INTERSECTIONS SHALL MEET PROWAG (PUBLIC RIGHT-OF-WAY) GUIDELINES



REVISIONS			
NO.	DESCRIPTION	DATE	BY

LOCAL STREET OR CUL-DE-SAC

STANDARD DETAILS

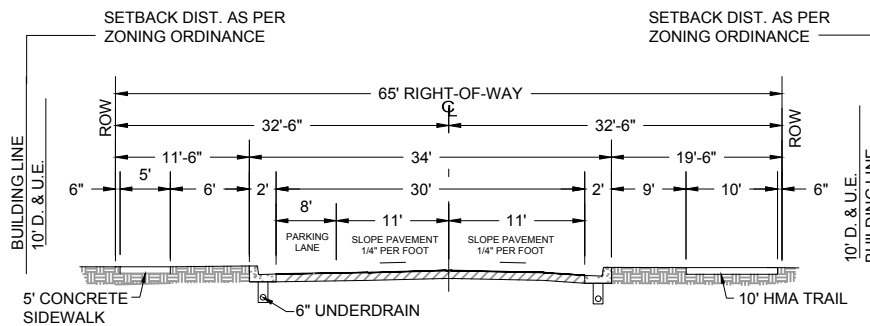
TOWN OF WHITESTOWN



DATE: 07/11/18

SCALE: NTS

SHEET NO. 56



NOTE:
TWO 11'-0" TRAVEL LANES AND ONE 8'-0" PARKING LANE AS SHOWN ABOVE.

PEDESTRIAN RAMPS AT INTERSECTIONS SHALL MEET PROWAG (PUBLIC RIGHT-OF-WAY) GUIDELINES



REVISIONS			
NO.	DESCRIPTION	DATE	BY

MINOR COLLECTOR STREET

STANDARD DETAILS

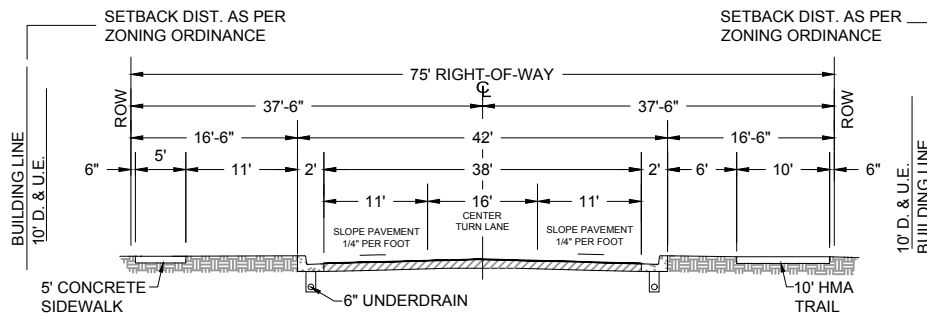
TOWN OF WHITESTOWN



DATE: 07/11/18

SCALE: NTS

SHEET NO. 57



NOTE:
 THREE TRAVEL LANES WITH NO PARKING LANES AS SHOWN ABOVE.
 TWO OUTSIDE LANES OF 11'-0" EACH, CENTER LANE 16'-0" TOTAL, 12'-0" TURN LANE WITH
 4'-0" DIVING CURB (INTERMITTENT AS NEEDED).
 OPTIONAL: ADD 8'-0" OF PAVEMENT FOR EACH PARKING LANE.

PEDESTRIAN RAMPS AT INTERSECTIONS SHALL MEET PROWAG (PUBLIC RIGHT-OF-WAY)
 GUIDELINES

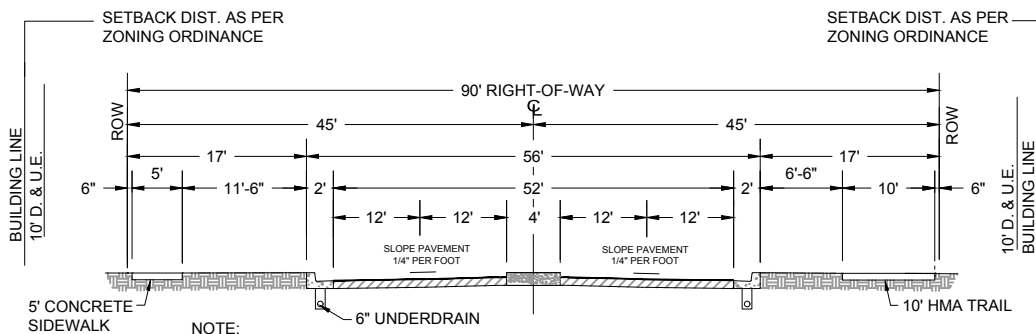


REVISIONS			
NO.	DESCRIPTION	DATE	BY

MAJOR COLLECTOR STREET
 STANDARD DETAILS
 TOWN OF WHITESTOWN

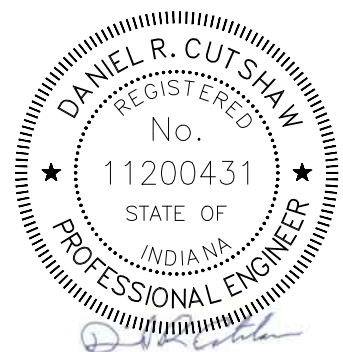


DATE:	07/11/18
SCALE:	NTS
SHEET NO.	58



NOTE:
FOUR 12'-0" TRAVEL LANES, 4'-0" CENTER CURBS, NO PARKING LANES AS SHOWN ABOVE
OPTIONAL: ADD 8'-0" OF PAVEMENT FOR EACH PARKING LANE.

PEDESTRIAN RAMPS AT INTERSECTIONS SHALL MEET PROWAG (PUBLIC RIGHT-OF-WAY) GUIDELINES



REVISIONS			
NO.	DESCRIPTION	DATE	BY

MINOR ARTERIAL STREET

STANDARD DETAILS

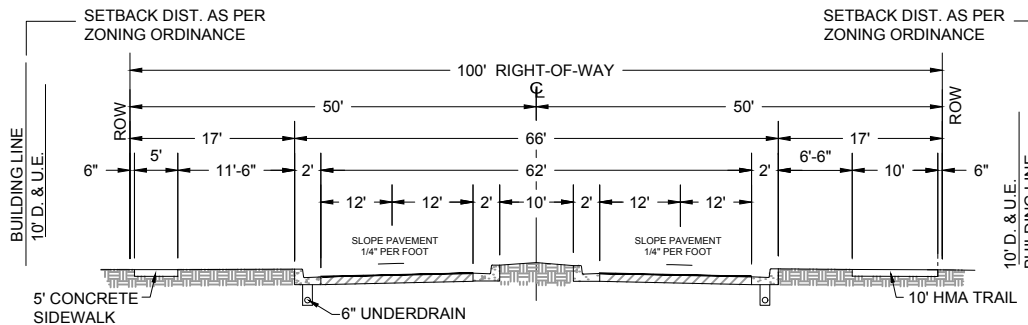
TOWN OF WHITESTOWN



DATE: 07/11/18

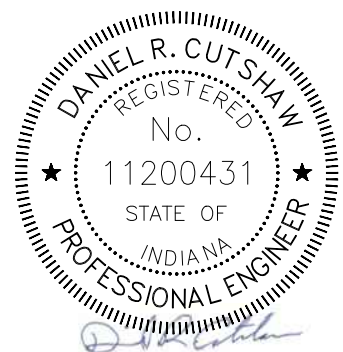
SCALE: NTS

SHEET NO. 59



NOTE:
 INSTALL 12'-0" TRAVEL LANES, 10'-0" GRASS MEDIAN WITH OCCASIONAL CENTER TURN LANES
 AND/OR CROSS-OVERS, NO PARKING LANES AS SHOWN ABOVE.
 BOULEVARD HAS POTENTIAL TO BECOME FIVE-LANE ARTERIAL IF WARRANTED.
 OPTIONAL: ADD 8'-0" OF PAVEMENT FOR EACH PARKING LANE.

PEDESTRIAN RAMPS AT INTERSECTIONS SHALL MEET PROWAG (PUBLIC RIGHT-OF-WAY)
 GUIDELINES



REVISIONS			
NO.	DESCRIPTION	DATE	BY

MAJOR ARTERIAL STREET

STANDARD DETAILS

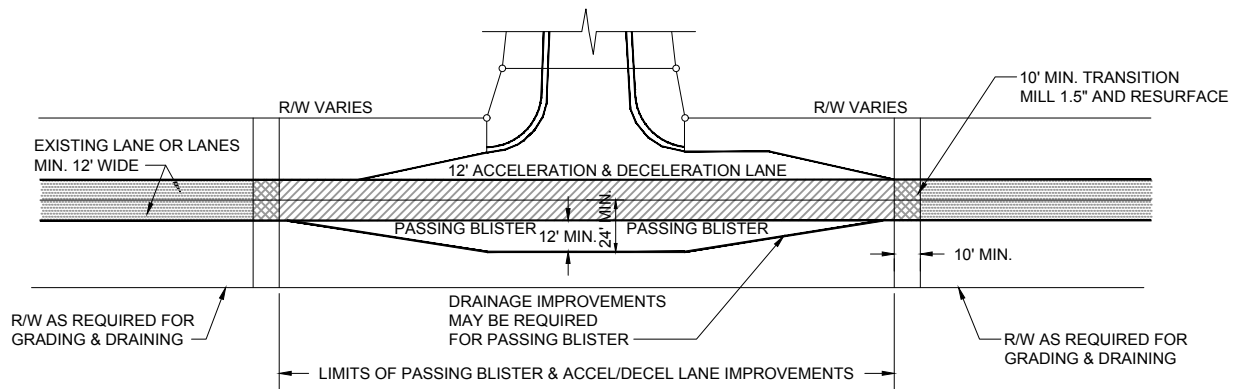
TOWN OF WHITESTOWN



DATE:
07/11/18

SCALE:
NTS

SHEET NO.
60



ROADWAY IMPROVEMENT REQUIREMENTS AT PRIVATE ENTRANCE:

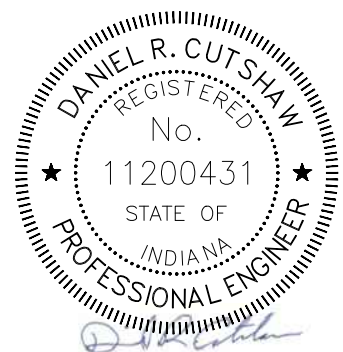
THE MAIN ROAD SHALL BE RECONSTRUCTED FOR THE ENTIRE LENGTH OF THE PASSING BLISTER AND ACCEL/DECEL LANE IMPROVEMENTS. SAW CUT EXISTING ASPHALT PAVEMENT AT THE LIMITS OF CONSTRUCTION OF THE ACCEL/DECEL LANES AND PASSING BLISTER. ALL EXISTING ASPHALT PAVEMENT SHALL BE REMOVED THROUGH THE LENGTH OF WIDENING. PREPARE SUBGRADE FOR NEW PASSING BLISTER, ACCELERATION & DECELERATION LANES, AND MAIN ROADWAY ACCORDING TO THE REQUIREMENTS OF THE TOWN OF WHITESTOWN STANDARD DETAILS.

ASPHALT PAVING OF THE PASSING BLISTER AND ACCELERATION AND DECELERATION LANES SHALL MEET THE MINIMUM REQUIREMENTS OF THE TOWN OF WHITESTOWN. ASPHALT PAVING OF THE MAIN ROAD LANES SHALL MEET THE MINIMUM REQUIREMENTS OF THE TOWN OF WHITESTOWN FOR ROADWAY PAVING, OR MATCH THE DEPTH OF EXISTING ASPHALT, WHICHEVER IS GREATER.

MILL EXISTING ROAD 1.5" DEEP A MINIMUM OF 10' BEYOND THE ROADWAY REPLACEMENT LIMITS AT EACH END. CONTINUE 1.5" HMA SURFACE PAVING OVER THE MILLED AREA TO PROVIDE A SMOOTH TRANSITION BETWEEN NEW AND EXISTING ASPHALT PAVEMENT. CURBING SHALL BE EXTENDED THE ENTIRE LENGTH OF THE ACCELERATION AND DECELERATION LANES. IMPROVEMENTS SHALL BE MADE AS NECESSARY TO PROVIDE APPROPRIATE DRAINAGE WHERE THE PASSING BLISTER IS CONSTRUCTED. ADDITIONAL RIGHT OF WAY SHALL BE ACQUIRED AS NECESSARY TO CONSTRUCT PROPER DRAINAGE IMPROVEMENTS AT PASSING BLISTER.

REQUIRED ON ALL ARTERIAL AND COLLECTOR STREETS AT THE TOWN'S DISCRETION.

PEDESTRIAN RAMPS AT INTERSECTIONS SHALL MEET PROWAG (PUBLIC RIGHT-OF-WAY) GUIDELINES



REVISIONS			
NO.	DESCRIPTION	DATE	BY

**ROADWAY IMPROVEMENTS AT NEW
DEVELOPMENT ENTRANCES
STANDARD DETAILS
TOWN OF WHITESTOWN**

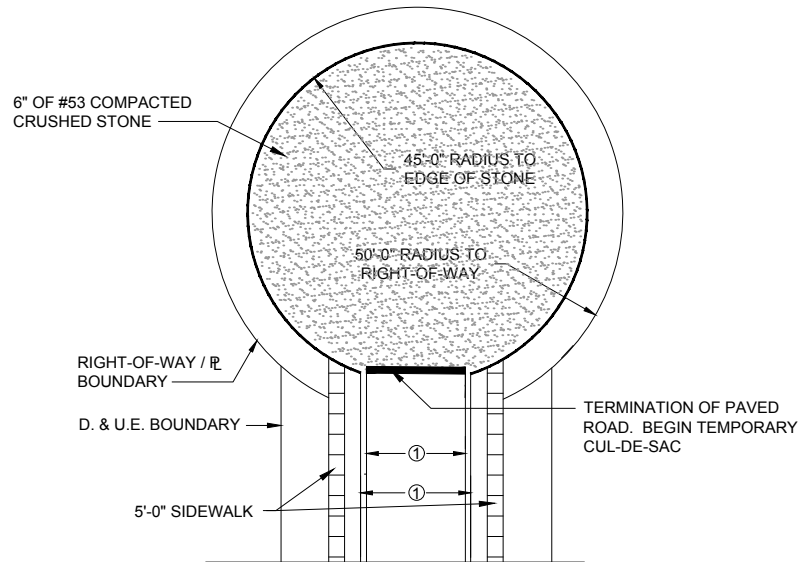


DATE: 07/11/18

SCALE: NTS

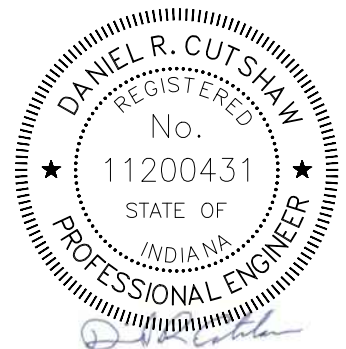
SHEET NO.

61



NOTE:
DESIGN AND CONSTRUCTION OF TEMPORARY
CUL-DE-SACS MUST PROVIDE APPROPRIATE
DRAINAGE TO PREVENT PONDING.

① R/W AND ROAD WIDTH REQUIREMENTS
PER ROAD CLASSIFICATION



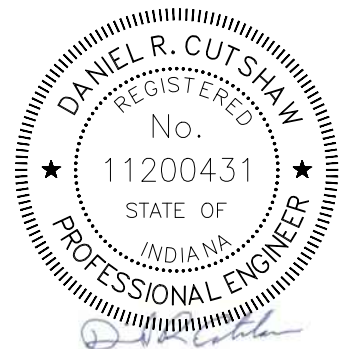
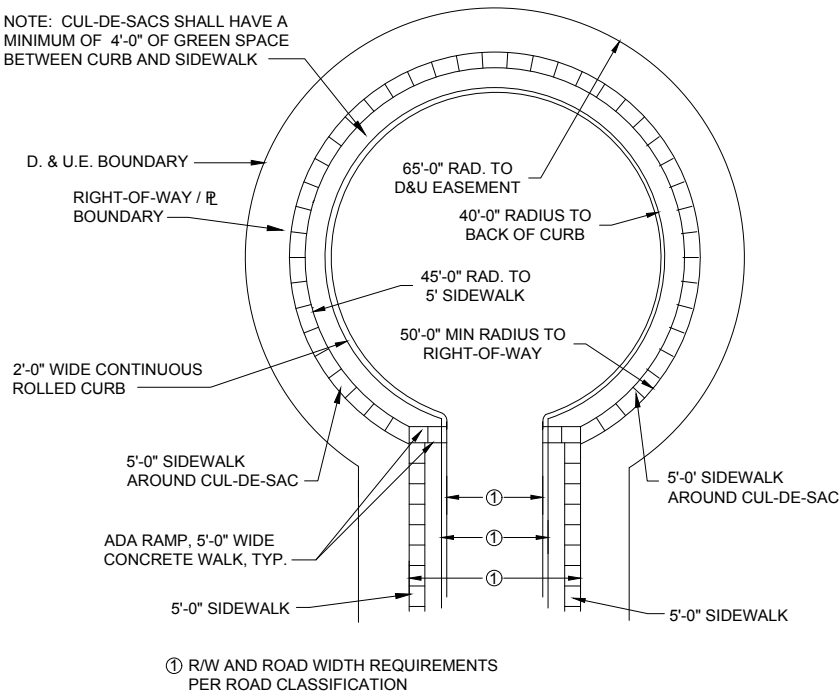
REVISIONS			
NO.	DESCRIPTION	DATE	BY

TEMPORARY CUL-DE-SAC
STANDARD DETAILS
TOWN OF WHITESTOWN



DATE:
07/11/18
SCALE:
NTS
SHEET NO.
62

NOTE: CUL-DE-SACS SHALL HAVE A MINIMUM OF 4'-0" OF GREEN SPACE BETWEEN CURB AND SIDEWALK

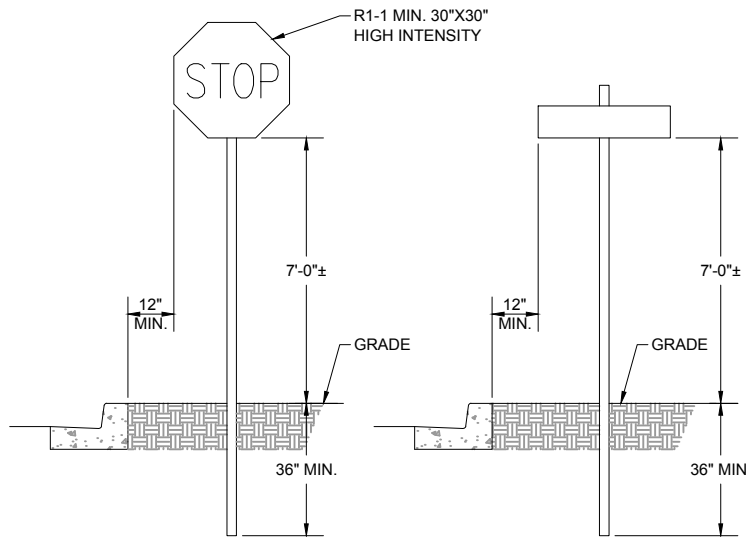


REVISIONS			
NO.	DESCRIPTION	DATE	BY

**RESIDENTIAL CUL-DE-SAC
TURNAROUNDS
STANDARD DETAILS
TOWN OF WHITESTOWN**



DATE: 07/11/18
SCALE: NTS
SHEET NO. 63



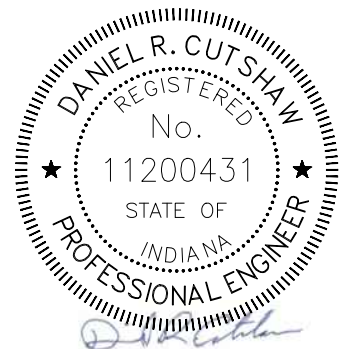
STOP SIGN

STREET NAME SIGN

NOTE: STREET NAME SIGNS TO BE LOCATED AT ALL STREETS.

TRAFFIC CONTROL AND SIGNAGE NOTES:

1. THE CONTRACTOR/DEVELOPER SHALL PROVIDE AND INSTALL ALL STREET NAME AND ROAD SIGNS PER CURRENT INDOT STANDARDS AND TOWN OF WHITESTOWN DETAILS. ALL TRAFFIC CONTROL DEVICES SHALL COMPLY WITH THE CURRENT INDIANA MUTCD.
2. MATERIALS SHALL BE FREE OF BURRS, PITS AND BLEMISHES, AND SHALL PRESENT A SMOOTH CLEAN SURFACE.
3. SIGN BLANKS SHALL MEET INDOT SPECIFICATIONS UNLESS OTHERWISE SPECIFIED.
4. ALL STREET SIGNS SHALL HAVE GREEN BACKGROUND WITH WHITE LETTERS, NUMBERS AND BORDERS ON EXTRUDED ALUMINUM BLADES.
5. THE STREET NAME LETTERS TO BE ENGINEER GRADE: 9" BLADES WITH 6" NUMBERS, 6" CAPITAL LETTERS AND 4.5" LOWER-CASE LETTERS ON ALL STREETS.
6. STOP SIGNS SHALL BE MIN. 30" HIGH INTENSITY.
7. SPEED LIMIT SIGNS SHALL BE 24"X30" HIGH INTENSITY.
8. SIGN POST SHALL BE GALVANIZED U-CHANNEL (3LBS/FT), DRIVEN INTO THE GROUND. NO EXCAVATION SHALL BE DONE TO PLACE SIGNS.
9. LARGER SIGNS MAY BE NEEDED FOR ROAD CLASSIFICATIONS GREATER THAN LOCAL PER INDIANA MUTCD REQUIREMENTS.



REVISIONS			
NO.	DESCRIPTION	DATE	BY

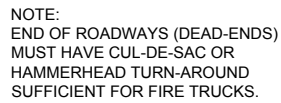
STREET SIGNAGE DETAILS
STANDARD DETAILS
TOWN OF WHITESTOWN



DATE: 07/11/18

SCALE: NTS

SHEET NO. 64



— GALVANIZED 10-GAUGE U-CHANNEL
POST OR 2 1/4" GALVANIZED SQUARE
POST WITH ANCHORS



REVISIONS			
NO.	DESCRIPTION	DATE	BY

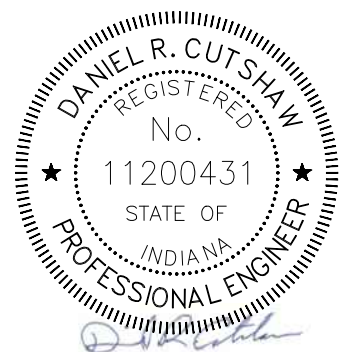
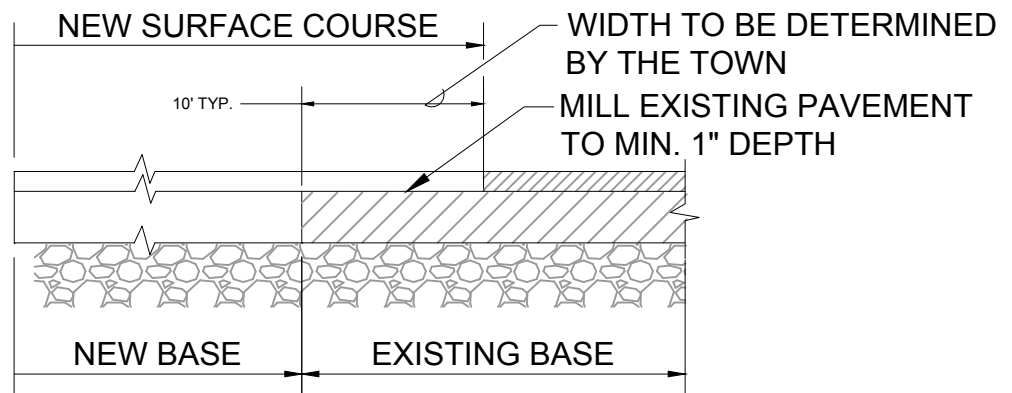
END OF ROADWAY DETAIL

STANDARD DETAILS

TOWN OF WHITESTOWN



DATE:	07/11/18
SCALE:	NTS
SHEET NO.	65



REVISIONS			
NO.	DESCRIPTION	DATE	BY

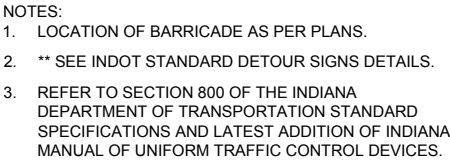
CONNECTION TO EXISTING STREETS

STANDARD DETAILS

TOWN OF WHITESTOWN



DATE:	07/11/18
SCALE:	NTS
SHEET NO.	66

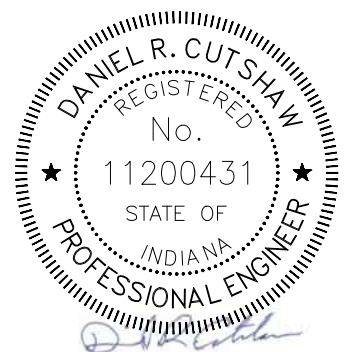
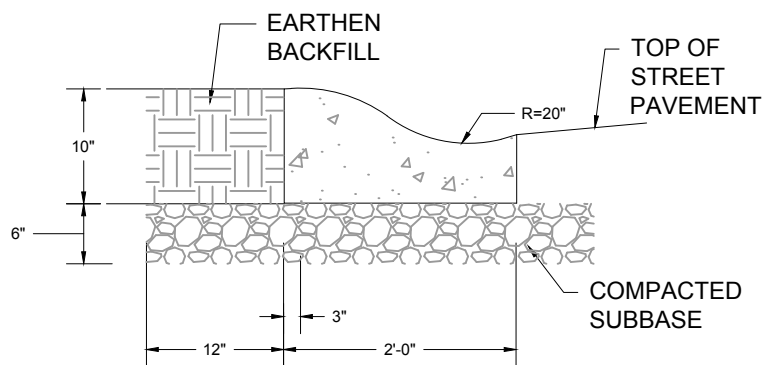


REVISIONS			
NO.	DESCRIPTION	DATE	BY

STANDARD BARRICADE
STANDARD DETAILS
TOWN OF WHITESTOWN



DATE:	07/11/18
SCALE:	NTS
SHEET NO.	67

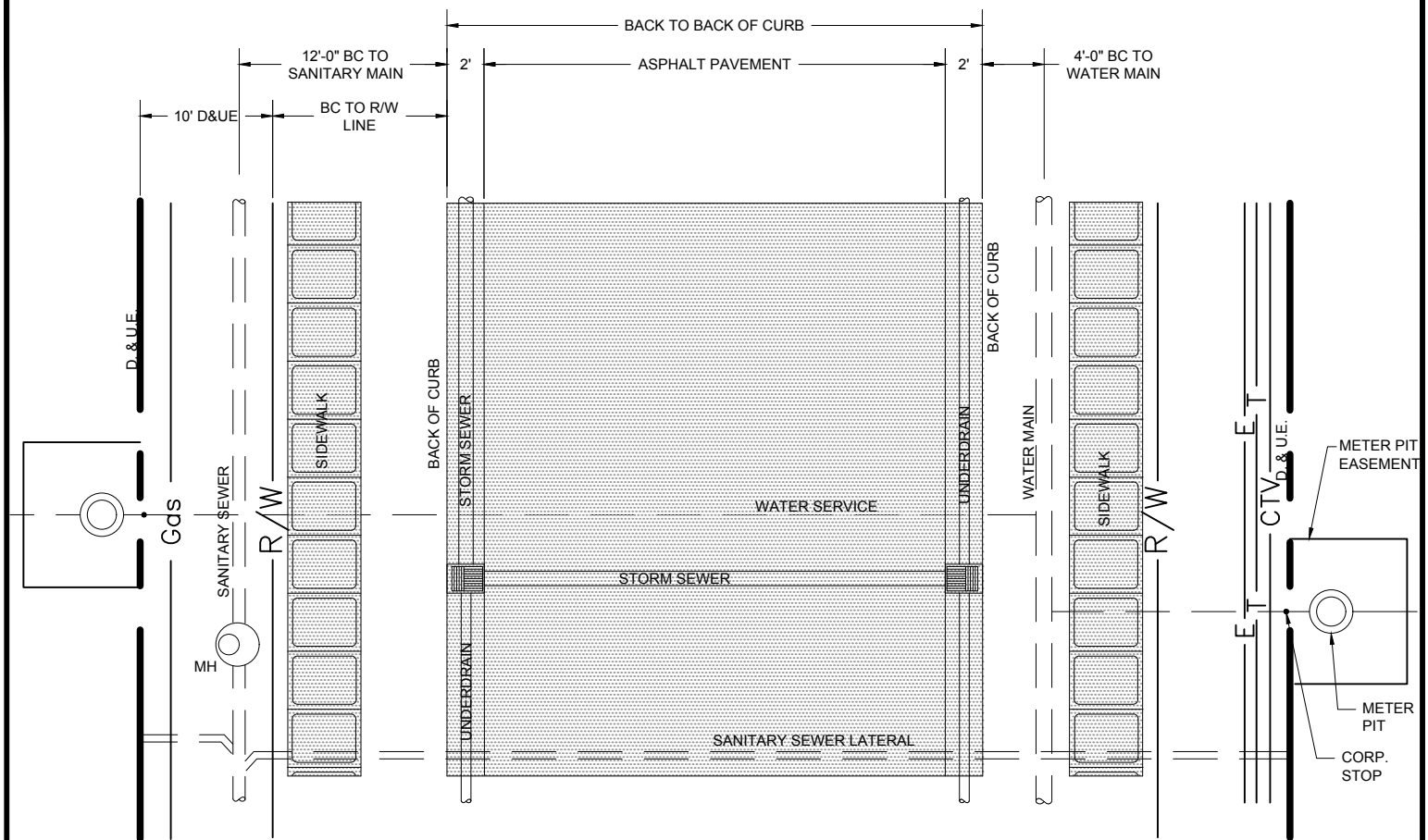


REVISIONS			
NO.	DESCRIPTION	DATE	BY

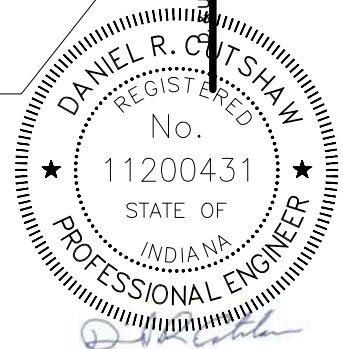
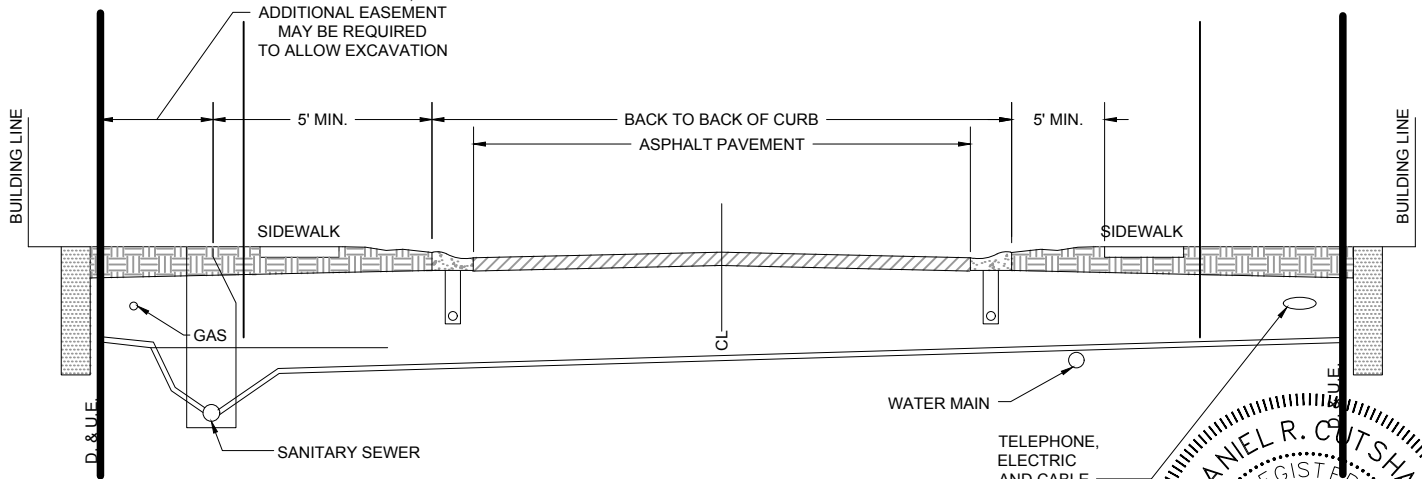
CONCRETE ROLL CURB AND
GUTTER DETAIL
STANDARD DETAILS
TOWN OF WHITESTOWN



DATE:	07/11/18
SCALE:	NTS
SHEET NO.	68



IF SEWER IS MORE
THAN 15' DEEP,
ADDITIONAL EASEMENT
MAY BE REQUIRED
TO ALLOW EXCAVATION

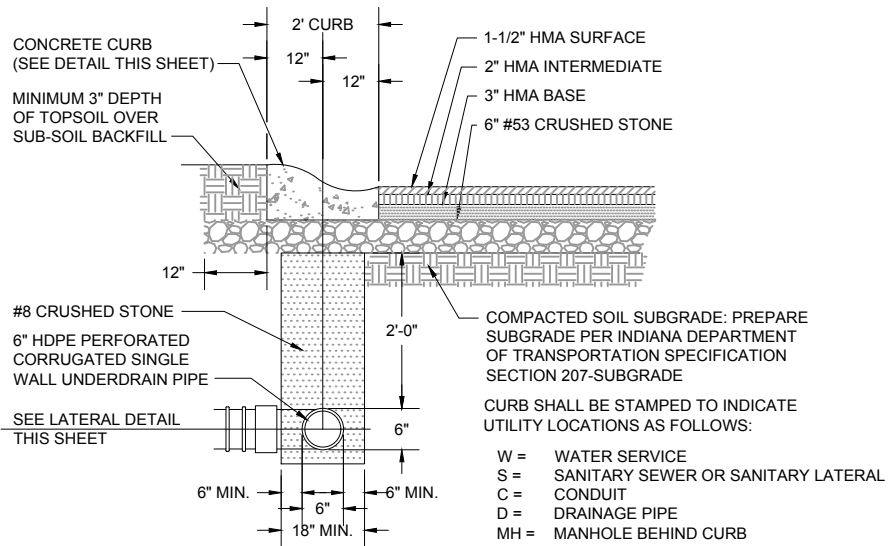


REVISIONS			
NO.	DESCRIPTION	DATE	BY

GENERAL UTILITY LOCATION -
PLAN AND SECTION
STANDARD DETAILS
TOWN OF WHITESTOWN



DATE:	07/11/18
SCALE:	NTS
SHEET NO.	69



REVISIONS

NO.	DESCRIPTION	DATE	BY

LOCAL STREET - MINIMUM PAVEMENT AND UNDERDRAIN: RESIDENTIAL DEVELOPMENTS STANDARD DETAILS **TOWN OF WHITESTOWN**

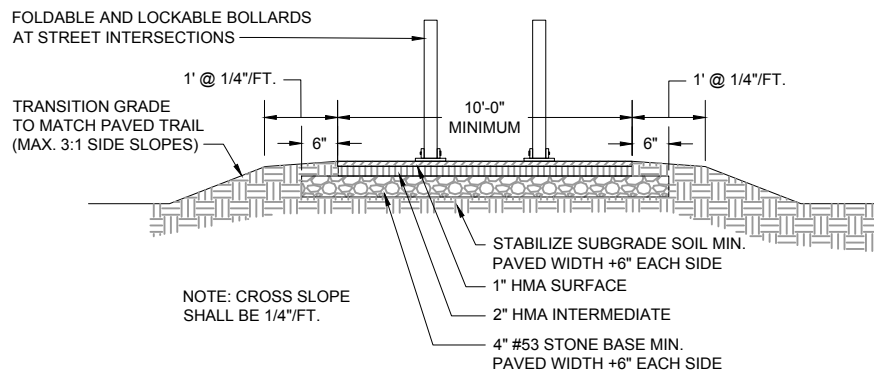


DATE:
07/11/18

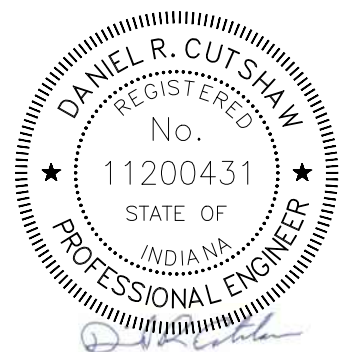
SCALE:
NTS

SHEET NO.

70



* BOLLARDS SHALL HAVE BREAKAWAY FEATURE THAT ALLOWS THEM TO BE
COLLAPSED WITH THE BUMPER OF AN EMERGENCY VEHICLE.



REVISIONS			
NO.	DESCRIPTION	DATE	BY

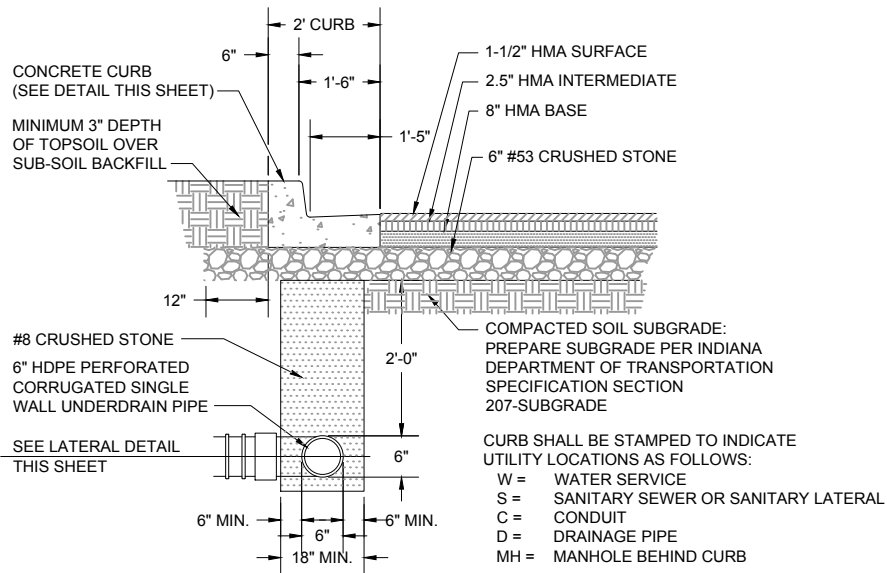
TYPICAL TRAIL CROSS SECTION

STANDARD DETAILS

TOWN OF WHITESTOWN

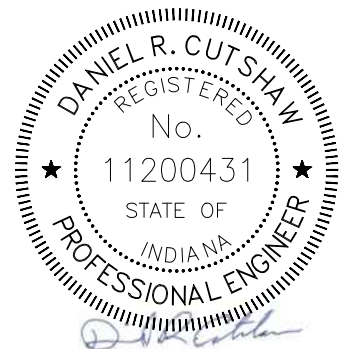


DATE:	07/11/18
SCALE:	NTS
SHEET NO.	71



NOTES:

1. DEVELOPER'S ENGINEER SHALL VERIFY PAVEMENT DESIGN BASED ON SOILS INVESTIGATION IN THE AREA OF CONSTRUCTION.
2. FOR STREETS WITH HIGHER CLASSIFICATIONS THAN LOCAL, DEVELOPER'S ENGINEER SHALL SUBMIT PROPOSED PAVEMENT DESIGN FOR TOWNS APPROVAL.
3. COMMERCIAL DRIVE ENTRANCES SHALL BE DESIGNED PER APPROPRIATE INDOT REQUIREMENTS.



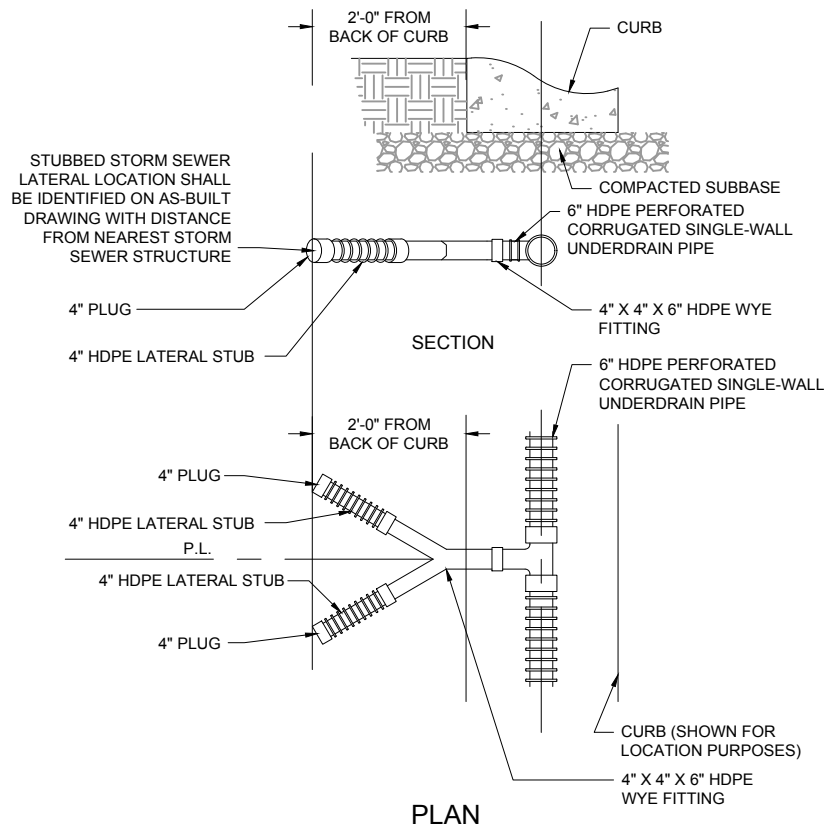
REVISIONS			
NO.	DESCRIPTION	DATE	BY

LOCAL STREET - MINIMUM PAVEMENT AND UNDERDRAIN:
COMMERCIAL AND INDUSTRIAL DEVELOPMENTS

STANDARD DETAILS
TOWN OF WHITESTOWN



DATE: 07/11/18
SCALE: NTS
SHEET NO. 72



NOTE: ONLY ALLOWED WHERE REAR YARD DRAIN CONNECTION IS NOT POSSIBLE

STORM SEWER LATERAL REQUIREMENTS:

1. ROUTE ALL PROPERTY LATERALS TO REAR YARD STORM SEWERS WHEN POSSIBLE.
2. ALL SUMP PUMP DISCHARGE PIPES SHALL BE CONNECTED TO STORM SEWER SYSTEM. "DAY-LIGHTING" OF SUMP PUMP DISCHARGE PIPES ALLOWED WITH TOWN PERMISSION.
3. SUMP PUMP DISCHARGE PIPE MUST BE CONNECTED TO LATERAL WITH AN APPROPRIATE FITTING.



REVISIONS			
NO.	DESCRIPTION	DATE	BY

**STORM SEWER LATERAL CONNECTION AT
ROAD UNDERDRAIN
STANDARD DETAILS
TOWN OF WHITESTOWN**

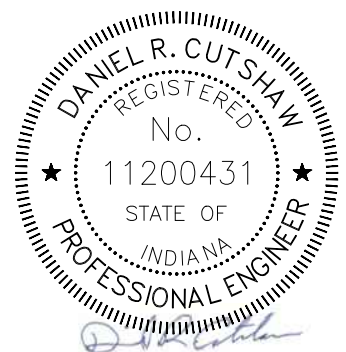
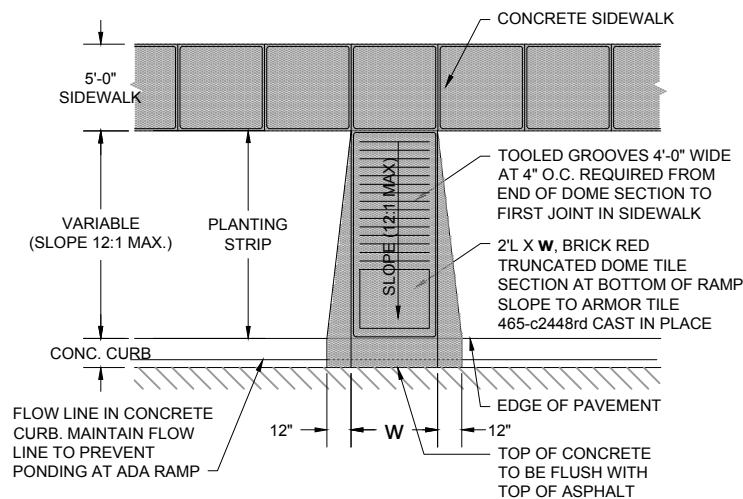


DATE: 07/11/18

SCALE: NTS

SHEET NO.

73



REVISIONS

NO.	DESCRIPTION	DATE	BY

SIDEWALK ADA RAMP DETAIL STANDARD DETAILS TOWN OF WHITESTOWN

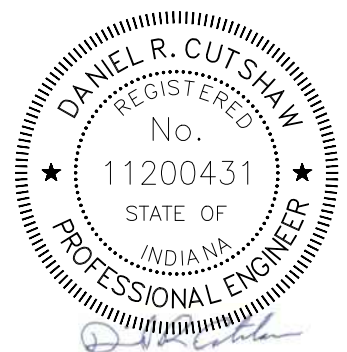
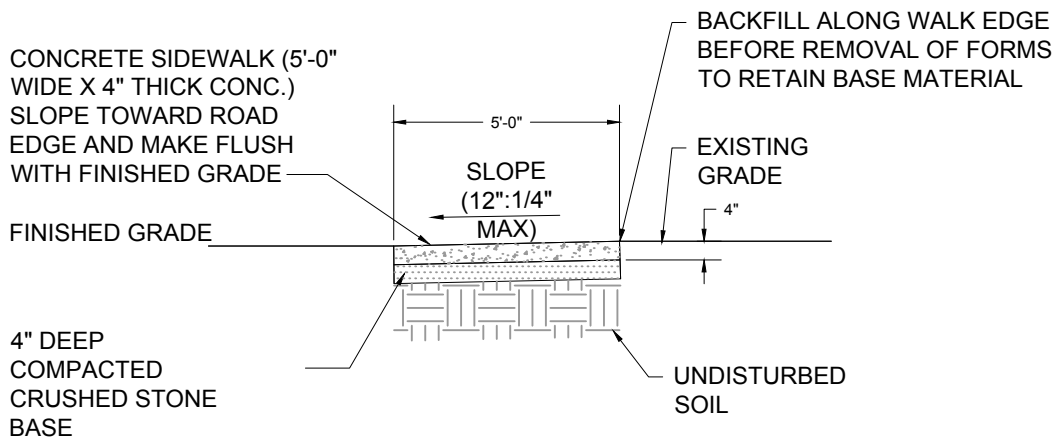


DATE: 07/11/18

SCALE: NTS

SHEET NO.

74



REVISIONS			
NO.	DESCRIPTION	DATE	BY

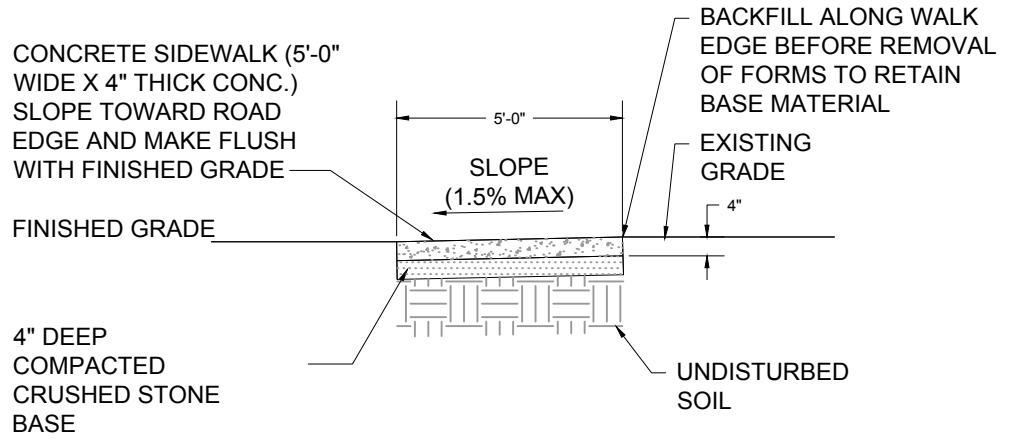
TYPICAL SIDE WALK SECTION

STANDARD DETAILS

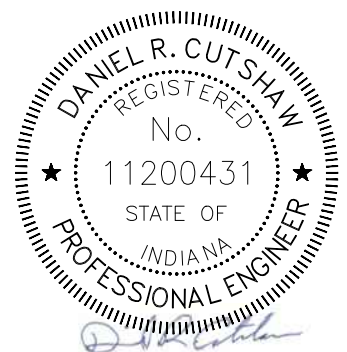
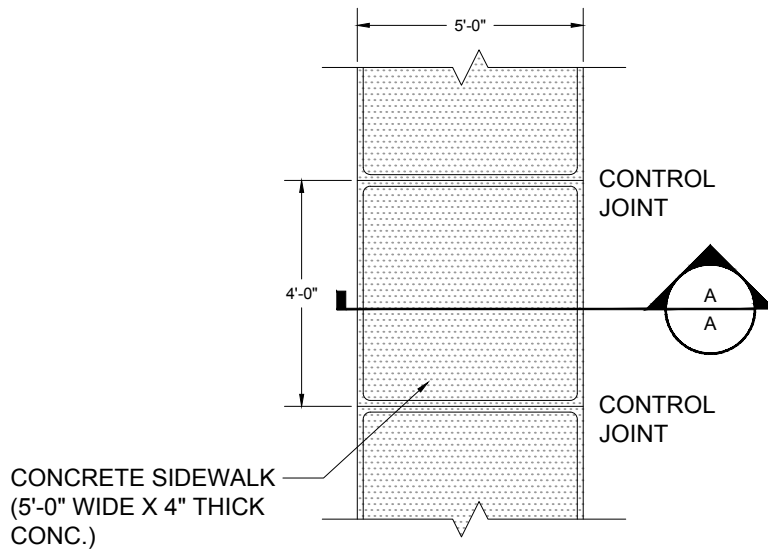
TOWN OF WHITESTOWN



DATE:	07/11/18
SCALE:	NTS
SHEET NO.	75



SIDEWALK SECTION A-A
(FROM SHEET 62)

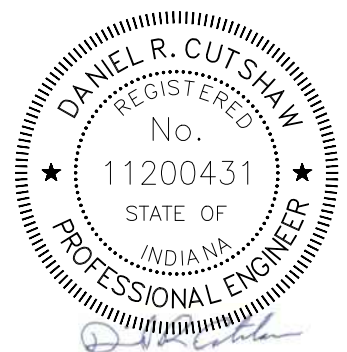
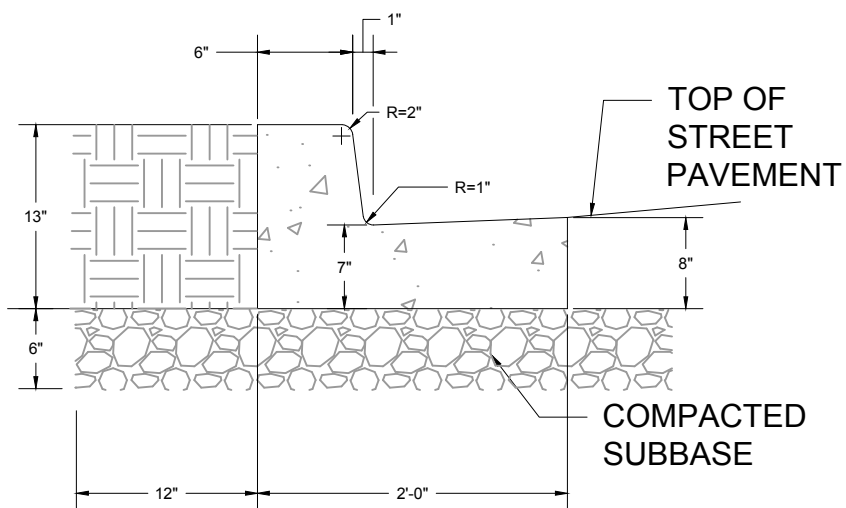


REVISIONS			
NO.	DESCRIPTION	DATE	BY

**TYPICAL SIDEWALK
DETAIL AND SECTION
STANDARD DETAILS
TOWN OF WHITESTOWN**



DATE:	07/11/18
SCALE:	NTS
SHEET NO.	76



REVISIONS			
NO.	DESCRIPTION	DATE	BY

CONCRETE CHAIR BACK CURB
AND GUTTER DETAIL
STANDARD DETAILS
TOWN OF WHITESTOWN



DATE:	07/11/18
SCALE:	NTS
SHEET NO.	77