Town of Danville
Standards and Specifications:
Wastewater

49 North Wayne Street
Danville, IN 46122

TOWN OF DANVILLE SANITARY DISTRICT STANDARDS SECTION

TABLE OF CONTENTS

CHAPTER 3 SANITARY MATERIALS

CHAPTER 4 SPECIFICATIONS OF CONSTRUCTION

APPENDICIES – TESTING

APPENDICIES – STANDARD DRAWINGS

SAN-05 – Gravity Sewer Cleanout
SAN-06 – 1000 Gallon Grease Interceptor
SAN-07 – Sanitary Sewer Lateral Plan View
SAN-08 – Sanitary Lateral Shallow Service Connection
SAN-09 – Sanitary Lateral Deep Service Connection
SAN-10 – Cut-In Lateral Connection
SAN-11 – Sanitary Lateral Lowering
SAN-12 – Lift Station Plan
SAN-13 – Lift Station Section
SAN-14 – Lift Station Meter Pit
SAN-15 – 24” Sanitary Casting
SAN-16 – Control Manhole
SAN-17 – Building Adapter and Cleanout
SAN-18 – Air Release Structure
STC-01 – Poured Channel Shapes
STC-02 – Bolted Pipe Connection to Structure
STC-03 – Compression Pipe Connection to Structure
STC-04 – Conflict Structure
STC-05 – Typical Jacked and Bored Casing Pipe
STC-06 – Casing Spacers
STC-07 – Casing End Seals
STC-08 – Marking Post
WAT-01 – Sewer and Water Main Separation

PART 1 – Policies and Procedures

1.1 Introduction

A. Purpose
   a. This section provides the design and construction standards for laterals and sanitary sewer facilities constructed within the Danville Wastewater service territory. Included are submittal requirements and procedures for the issuance of Plan Approvals and the requirements and procedures for inspection, testing, and final acceptance of sanitary sewer facilities.
   b. This section presumes its user will possess a basic understanding in the area of civil engineering design, construction, or land alteration. Readers of this Standard who are not qualified by education or experience should consult with a more qualified person or persons possessing professional expertise in one or more of these fields prior to application of the requirements set forth herein.
   c. This section, together with all future revisions, will be referred to as the "Town of Danville Sanitary Standards"

B. The Town may make revisions or clarifications to any part of this section through policy prior to the next update, if deemed necessary.

C. Whenever in these Standards or in any documents or instruments where the Standards govern, the following terms, abbreviations, or definitions are used, the intent and meaning will be interpreted as follows:
   a. Abbreviations.

1)	ASTM	American Society of Testing and Materials
2)	AASHTO	American Association of State Highway and Transportation Officials
3)	AWWA	American Water Works Association
4)	ANSI	American National Standards Institute
5)	CADD	Computer Aided Design and Drafting
6)	CCTV	Closed Circuit Television
7)	DPW	Department of Public Works
8)	EPA	Environmental Protection Agency
9)	GIS	Geographic Information System
10)	IAC	Indiana Administrative Code
11)	IC	Indiana Code
12)	IDEM	Indiana Department of Environmental Management
13)	I/I	Inflow/Infiltration
14)	IMS	Infrastructure Management System
15)	INDOT	Indiana Department of Transportation
16)	IPC	Indiana Plumbing Code 675 IAC 16
17)	DANVILLE	Danville Sanitary District
18)	NEMA	National Electrical Manufacturers Association
19)	OSHA	Federal Occupational Safety and Health Act
20)	RPR	Resident Project Representative
21)	SCADA	Supervisory Control and Data Acquisition
22)	STEP	Septic Tank Elimination Program
23)	UPC	Uniform Plumbing Code

b. Definitions

1) ACCEPTANCE: The formal written acceptance by the Departments of an entire project which has been completed in all respects in accordance with the approved plans, specifications, including any previously approved modifications thereof.
2) ADMINISTRATOR: Administrator of the Department or their authorized representative.
3) APPLICANT: The property owner and/or their agent who requests to provide any type of Plan or agreement required.
4) APPROVAL: Decision that allows the applicant to proceed to the next step of the process.
5) AUGER BORING: Trenchless construction method for installing sewers.
6) BACKFILL: Material used to replace material removed from trenches during construction which is above the haunching.
7) BEDDING: The material used in the trench to a minimum depth below the bell/barrel of the pipe for the purpose of properly supporting the pipe.
8) BUILDING SEWER: An alternate term for Lateral. See Lateral definition.
9) CLEANOUT: A pipe fitting with a removable plug for inspecting and cleaning a lateral.
10) CODE: Municipal Code of the Town of Danville
11) COMMON LATERAL: A lateral which serves more than one building or residential unit.
12) CONNECTION FEE: Assessment to compensate the Town for all the costs of capitol for the Town's sewer system including the entire sewer system and its treatment facilities.
13) CONTRACTOR: Any Contractor who meets the Department's requirements and is privately insured to perform the work of installing sewers under the Department's jurisdiction.
14) CONSTRUCTION PLANS: Plans which show the dimensions, and details of the work to be done (for submittal to the Town for approval).
15) DEDICATION: The inspection, and if necessary, the rehabilitation of a sanitary sewer facility for public acceptance, ownership, operation, and maintenance.
16) DEPARTMENT: Town of Danville, and any Department therein including Danville Sanitary Wastewater.
17) DIGITAL DATA SUBMISSION STANDARDS: Standards in which the Town of Danville can integrate CADD drawings into the GIS environment thus maintaining the integrity and positional accuracy of the data.
18) DIRECTOR: Director of the Planning Department, Town of Danville, or their authorized representative.
19) EASEMENT: Areas along the line of all public sanitary sewer facilities which are outside the road easements or rights-of-way, and are recorded and dedicated to the Department granting rights along the line of the sanitary sewer facility.
20) ENGINEER: The Engineer for the Town.
21) FINAL BACKFILL: Material used to replace material removed from trenches during construction which is above the initial backfill.
22) FORCE MAIN: A pipe that carries wastewater under pressure from a lift station.
23) FOUNDATION: The supporting material upon which the bedding is placed.
24) FOUNDATION DRAINS: Any network of pipes, pumps or drainage mechanism

located at, near, or under a footing, foundation or floor slab of any building or structure that intentionally or unintentionally conveys groundwater away from a building or structure.

25) HAUNCHING: The area in the trench from the top of the bedding to the springline of the pipe.
26) HORIZONTAL DIRECTIONAL DRILLING (HDD): Trenchless construction method for installing sewer pipe.
27) DANVILLE SANITARY DISTRICT: The area incorporated into the Hendricks County liquid waste district which includes the Town of Danville and the areas for which it is legally responsible.
28) INFILTRATION/INFLOW (I/I): The total quantity of water from both infiltration and inflow without distinguishing the source.
29) INITIAL BACKFILL: Material used in the trench above the haunching.
30) LAND SURVEYOR: A person registered as a land surveyor by the Indiana State Board of Registration as provided by Indiana Code (IC) 25-21.5.
31) LATERAL: A pipe used for transporting waste from the building to the public or private sewer commencing at and including the cleanout, and ending at and excluding the wye or tee fitting at the connection to the sanitary sewer. Same as Building Sewer.
32) LATERAL CONNECTION: Shall mean the point in which a lateral is connected to a sanitary sewer within the Danville Sanitary District.
33) LIFT STATION: Any arrangement of pumps, valves and controls that lift, and/or convey wastewater to a higher elevation. Same as Pump Station.
34) LOW PRESSURE SYSTEM: A wastewater collection system in which multiple users pump wastewater into a common force main.
35) MANHOLE: A structure used in a sewer system to provide access for maintenance.
36) MANUFACTURER: The producer of those materials having direct responsibility and authority for the satisfaction of those minimum material specifications set forth herein.
37) NEW LATERAL CONNECTION PLAN: Plan which shows the location and character of the work to be done (for submittal to the Town for approval).
38) NEW LATERAL CONNECTION PLAN APPROVAL LETTER: Shall mean the approval from the Town of Danville, for a new lateral connection to the DANVILLE sewer system, or a repair, replacement or modification to an existing lateral that increases the capacity to the Town or a lateral to accommodate a proposed increase in the average daily flow.
39) OWNER: Any individual, Partnership, firm, corporation or other entity who, as property owner, is initiating the Work.
40) PIPE JACKING: Trenchless construction method for installing sewer pipe.
41) CONSTRUCTION PERMIT: IMPROVEMENT LOCATION APPLICATION.
42) PRIVATE SEWER: Any sanitary sewer facility that is not dedicated as public.
43) PROFESSIONAL ENGINEER: A person registered as a professional engineer by the Indiana State Board of Registration for Professional Engineers under IC 25-31.
44) PUBLIC SEWER: Any sanitary sewer facility owned, operated, and maintained by the Town of Danville.
45) PUMP STATION: An alternate term for a Lift Station. See Lift Station definition.
46) RECORD DRAWING (AS-BUILTS): Plans certified, signed and dated by a

professional engineer or land surveyor registered in the State of Indiana, indicating the Plans have been reviewed and revised, if necessary, to accurately show all as-built construction and installation details including, but not limited to, key elevations, locations and distances.

47) RESIDENT PROJECT REPRESENTATIVE (RPR): The lead inspector in the field who is responsible for all field inspection operations.
48) RESIDENTIAL UNIT(S): Those units generating domestic wastewater.
49) RIGHT-OF-WAY: All land or interest therein which by deed, conveyance, agreement, easement, dedication or process of law is reserved for or dedicated to the use of the general public, within which the Department shall have the right to install and maintain sanitary sewer facilities.
50) SANITARY SEWER: A sewer that conveys wastewater from residences, commercial buildings, industrial plants, and institutions from lateral connections, and to which storm, surface, and ground waters are not intentionally allowed to enter. Commonly referred to as a "sanitary sewer main."
51) SANITARY SEWER CONSTRUCTION AGREEMENT: An agreement entered into by Owner/Contractor and the Town requiring the construction of those sewer facilities to be in accordance with the technical and procedural standards of this Standard. This Agreement includes inspection services.
52) SANITARY SEWER FACILITY: Any sanitary sewer, lift station or other appurtenance used to transport wastewater from its source to the wastewater treatment plant, excluding the lateral.
53) SERVICE AREA: Any area that contributes, or has the potential to contribute, wastewater to a sanitary sewer facility.
54) SEWER: A pipe for carrying wastewater (sanitary sewer). Wherever in these Standards the word "sewer" is used without distinguishing type, "sewer" shall mean sanitary sewer.
55) SEWER SERVICE AGREEMENT - A legal document that establishes the rights and responsibilities of an Applicant who connects to the Danville Sanitary District's sewer system, in addition to establishing the size, location and time for which that property is serviced by sanitary sewers.
56) STANDARD DRAWINGS (DETAILS): The drawing of structures, sanitary sewer lines or devices commonly used and referred to on the Plans and in this Standard.
57) STANDARDS: The Town of Danville Sanitary District Standards. The requirements for the design and construction of sanitary sewer facilities and laterals within the Danville Sanitary District as contained herein and all subsequent additions, deletions or revisions.
58) STANDARD PROCTOR DENSITY: The maximum dry density of a backfill material as determined by those methods set forth within ASTM D 698.
59) STOP WORK ORDER: An order requiring the suspension of the pertinent construction activity for any construction project within the Danville Sanitary District.
60) STORMWATER: Any flow occurring during or following any form of natural precipitation and resulting there from.
61) TEN STATE STANDARDS: Recommended Standards for Sewage Works, latest edition, developed by the Committee of the Great Lakes - Upper Mississippi River Board of State Sanitary Engineers.
62) UNIFORM PLUMBING CODE (UPC): The Uniform Plumbing Code adopted by the

International Association of the Plumbing and Mechanical Officials, current edition.

63) WASTEWATER: A combination of the liquid and water-carried wastes from residences, commercial businesses, institutions and industrial establishments and other sources, together with such groundwater, surface water and stormwater as may be present.

64) WATERBODY: Any area that in a normal year has water flowing or standing above ground to the extent that evidence of an ordinary high water mark is established.

65) WORK: All the activities to be done under the New Connection Plan, in accordance with the approved plans, specifications, these Standards, and conditions.

D. Failure to comply with requirements set forth by this Standard may necessitate one or more of the following actions to be taken by the Town

a. Posting of a Stop-Work-Order

b. Necessary legal action by the Town to effect the implementation of the approved plan or restoration site

E. Any person violating any provisions of this Standard shall be subject to the penalties in accordance with the Town Code and may be required to correct such violation at their expense.

1.2 General

A. This section provides the procedures and requirements common to both laterals and sanitary sewer facilities.

B. This does not relieve any person from obtaining any and all applicable approvals and Permits from other appropriate regulatory agencies.

C. Exemptions

a. Sewer construction permits for which a fee cannot be charged by the municipality because of federal or state law; or

b. Sanitary sewer construction performed by an employee or contractor on behalf of the Town.

The fee exclusion only applies to the Plan application fees. All other fees associated with the construction, repair, modification, abandonment or connection must be paid. A New Connection (sanitary sewer) Plan is not required for maintenance work performed by or on behalf of the Department.

D. Amendment of Plans

a. After a New Lateral Connection Plan has been approved, any deviation or change in the information contained in the Plan and supporting documentation or the permits shall be considered an amendment subject to further approval by the Administrator. Prior to the time construction activity involving the change occurs; the Owner shall file with the Department a written request for an amendment, including a detailed statement of the requested change and the submission of any amended plans. The Department shall give the Owner written notice that the request for amendment has been approved

or denied, and if approved, copies of the amended plans shall be attached to the original New Lateral Connection Plans.

b. Reinspection fees and other fees which are required as a result of the amendment shall be assessed and paid in the same manner as for original plans.

E. Revocation of Plan or Variance

a. The Town may revoke a Variance when

1) The application permit, plans, or supporting documents contain a false statement or misrepresentation as to a material fact; or

2) The application permit, plans or supporting documents reflect a lack of compliance with the requirements.

3) Additional information becomes available that would necessitate the revocation of the Variance (issued in error).

F. Stop Work Order

a. The Town has the authority to direct the issuance of an order requiring the suspension of the pertinent construction activity ("Stop-Work Order") whenever it is determined that construction activity:

1) Is proceeding in an unsafe manner;

2) Is proceeding in violation of a requirement;

3) Is proceeding in a manner which is materially different from the plans, or supporting documents; or

4) For which a plan is required is proceeding without such a plan being in force. In such an instance, the stop-work order shall indicate the effect of the order terminates when the required plan is issued.

b. The Stop-Work Order shall be in writing by the Sanitary Department and shall state to what construction it is applicable and the reason for its issuance. One (1) copy of the Stop-Work Order shall be conspicuously posted on the property, and one (1) copy shall be delivered via certified mail to the owner of the property or their agent. The Stop-Work Order shall state the conditions under which construction may be resumed.

c. If a Stop-Work Order is issued, the contractor shall restore the site to a safe condition prior to stopping the work pursuant to the Order, at no expense to the Town.

d. These sanctions in no way limit the imposition of penalties provided elsewhere.

G. Variance Procedures

a. The Administrator, after consultation with and concurrence of the Department, has the power to modify or waive any requirement found in this Standard or in any regulations promulgated by the Code. A Variance can only be granted if an Applicant for a plan submits a completed Variance Request and makes a substantial showing that:

1) The design standard or regulation is unfeasible or unreasonably burdensome; and

2) An alternate plan submitted by the Applicant will achieve the same objective and purpose as compliance with the minimum requirements contained in the Standard, and

3) The alternative plan will not increase the direct cost of operation and/or maintenance to the Town.

b. **Cost to the Applicant shall not be the sole factor used to determine whether the design standards or regulations are unfeasible or unreasonably burdensome.**

c. The Department will respond in writing within **fourteen (14) calendar** days from receipt of the Variance Request.

d. If a Variance is requested for any requirement, a review may be required before a decision can be made. The review requirements shall be determined on a case-by-case basis depending on the complexity of the request. All costs associated with a review are the responsibility of the Applicant.

H. Appeals

a. Any person affected by the exercise of any discretionary authority delegated by this Chapter to any official of the Department, including a decision to deny or partially deny a Variance or Plan, and who objects to the decision made or action taken by such official is entitled to appeal the decision. The appeal procedure is as follows:

1) The appeal of such a decision shall be filed with the Administrator in writing within twenty-one (21) calendar days following the date of the decision.

2) If the Administrator denies the appeal, the appellant may file a written request for a hearing, including a statement of their objections, with the Planning Director who will call the same to the attention of the proper Board. Such request shall be filed with the Director within fourteen (14) calendar days from the date of notification by the Administrator.

3) The appeal hearing shall be scheduled before the Board within thirty (30) calendar days after such request is filed. Notice shall be given to the appellant identifying the time, place, and date of the appeal hearing at least seven (7) calendar days prior to the scheduled date. The Board may hear any evidence it deems relevant. After the hearing, the Board may confirm, reverse, or modify the decision or action. The order of the Board is final. Such order shall be made within fourteen (14) calendar days after the hearing and must be in writing and sent to the appellant.

1.3 Laterals

A. This section provides procedures and requirements specific to laterals

B. Responsibility

a. It shall be the responsibility of the Owner whose property is benefited to make all necessary repairs, extensions, relocations, changes, or replacements thereof, and of any accessories thereto for the entire length of lateral, including the portion within public easements and right-of-ways.

b. These requirements may be altered, modified, or waived, at the discretion of the Department when it is shown compliance is not possible due to extenuating circumstances.

C. Applicability

a. A Permit is required to construct, repair, modify, connect, or abandon any lateral within the Danville Sanitary District.

b. Lateral Plan Approval shall not be granted for connections to sanitary sewers not dedicated or accepted. Requirements for Lateral Plans issued for connections to existing private systems shall be determined at the time of application. The Applicant shall supply written permission from the Owner of the private sewer.

c. All work and other construction activity performed on or associated with the lateral and its connection to the sewer shall be in accordance with this Standard and the rules and regulations of the Indiana Plumbing Code.

D. Connection Fee

a. A Connection Fee shall be assessed for all new connections to the sanitary system prior to the issuance of an IMPROVEMENT LOCATION PERMIT APPLICATION, unless the Applicant has been granted a waiver per Board Resolution, or there is Special Agreement in place.

b. New Connections and Connection Fees shall be determined and calculated as follows:

1) New Connections

a) The following are considered New Connections

i. New lateral connections to the DANVILLE sewer system

ii. A repair, replacement, or modification to an existing lateral that increases the capacity of the lateral to accommodate a proposed increase in the average daily flow.

b) The following are NOT considered new connections

i. A repair, replacement, or modification to an existing lateral that does not increase the capacity of the lateral.

ii. A repair, replacement, or modification to an existing lateral that increases the capacity of the lateral without increasing the size of the water meter as a part of the project.

iii. A repair, replacement, or modification to an existing lateral that increases the capacity of the lateral and a water meter is not present, but the Department has determined by appropriate means that there is not a proposed increase in the average daily flow.

c. New Connections

1) A repair, replacement, or modification intended to return the lateral to its original design capacity shall not be interpreted as increasing the capacity. Examples include, but may not be limited to: normal maintenance activities, cleaning the lateral, repairing offset joints, repairing a broken or collapsed lateral, or any other repair, replacement, or modification that does not increase the capacity of the lateral (i.e. Increasing the size or slope) in order to accommodate an increase in average daily flow.

2) The connection fee will only be charged for the proposed increase in average daily flow.

d. If NOT considered a New Connection

1) If a water meter is present, the proposed increase in average daily flow shall be determined by the difference between the size of the water meter before and after the completion of the project.

2) If a water meter is not present, the Department may calculate the proposed increase in average daily flow by any means determined appropriate that results in connection fees assessed comparable to the differences in water meter sizes that correspond to the average daily flow before and after the project. Such means may include, but not be limited to, using the estimated average daily flow based on use as shown in Appendix B, using Table 11-1 of 327-IAC 3-11, or any other appropriate means as approved by the Department.

e. Credits or refunds will not be given for the removal of a water meter, the installation of a smaller water meter, or a reduction in average daily flow.
f. For purposes of the connection fee, a water meter means a Town water supply meter at the point of water withdrawal from the water main owned by the Town of Danville.

E. Submittal Requirements for Laterals
a. Plans shall include the following:
1) Drawing(s) of the building;
2) Plot Plan including parcel boundaries;
3) Connection details including the location of the connection and routing of the lateral;
4) Lateral construction material;
5) Installation method; and
6) Elevation of the lowest floor and building drain, specifically the elevation of the lowest gravity sanitary service. All elevations must be tied to USGS data.
b. A fully completed Sewer Service Agreement and supporting documentation may be required when a new connection is proposed to the sanitary sewer or whenever deemed necessary by the Department.
c. If an easement is required to gain access to the sanitary sewer, proof of such easement is required at the time of application.
d. When requested, the CCTV video and inspection log of the existing lateral, as required, shall be required at the time of the application.
e. Any additional information deemed necessary for ensuring conformance to this Standard.
f. All appropriate fees shall be paid before approval will be issued.

F. Lateral Inspection Requirements
a. Laterals shall be inspected to assure compliance with the Standards.
b. It is the responsibility of the Owner to notify the Department, in the manner described on the Permit; that the lateral is available for inspection.
c. The Department will conduct inspections on lateral connections from 7:30 A.M. to 3:30 P.M. local time, Monday through Friday, except for observed Town holidays.
d. The lateral, in its entirety from the foundation to the connection with the sewer or existing lateral, or at the location of the repair/modification, shall be exposed for inspection and be properly bedded in accordance with this Standard to one-half (1/2) the diameter of the lateral with the tracer wire installed (taped) to the top of the pipe.
e. After the lateral has passed the inspection, the Contractor is responsible for placement of the initial and final backfill.
f. The responsibility for safety measures rests solely with the Permit holder. All excavations shall be adequately protected by barricades, fences, lights, and other such means as necessary to protect the public, and as required by other regulatory agencies, such as, but not limited, to OSHA.
g. The Owner shall reapply for a new Lateral Permit and pay all of the necessary fees, excluding the Connection Fee, if:
1) The lateral does not meet the requirements of this Standard; or
2) The entire length of the lateral is not completely exposed; or
3) Only a portion of the lateral is completed.

h. The Department shall have the right of entry to, upon, or through, any premises for purposes of inspection of work and any other construction activity performed on or associated with the work on the lateral including inspection for clear water discharges into the sewer. Such entry includes the right to enter the building being served by the lateral.

G. Enforcement of Bond

a. Any action may be initiated in a court of competent jurisdiction relative to the bond as follows:

1) The Corporation Counsel of the Town may initiate proceedings to forfeit a bond:

a) As a penalty for repeated Code violations by a contractor, his agents or employees; or

b) To indemnify the Town against any loss, damage, or expense sustained by the Town by reason of the conduct of the contractor, his agents or employees.

2) A person, Partnership or corporation which holds a property interest in the real estate on which work has occurred may bring an action against the bond for expenses necessary to correct code deficiencies therein after written notice of the code deficiency has been given to the contractor and after the contractor has been given a reasonable opportunity to correct performance. If such a person, Partnership or corporation prevails in any action brought under this Standard, they may also be allowed by the court to recover as part of the judgment a sum equal to the aggregate amount of costs and expenses, including attorney's fees based on actual time expended as determined by the court to have been reasonably incurred by the plaintiff for, or in connection with, the commencement and prosecution of such action.

1.4 Sanitary Sewer Facilities

A. This section provides the procedures and requirements specific to sanitary sewer facilities

B. Sanitary Sewer Approval and Construction Plan

a. A sanitary sewer Lateral Plan Approval and Construction Plan is required for the construction of new sanitary sewer facilities and/or modifications of existing sanitary sewer facilities within the Danville Sanitary District.

b. To assist the Applicant in the Planning process, the Department will issue a Plan Approval letter. The Approval letter is intended to inform the Applicant all the requirements related to the design of the sanitary sewer facility have been met. A Plan Approval letter is not a Construction Permit. The Applicant shall submit, either concurrently or consecutively, all the requirements of a Construction Plan prior to the Construction Permit being issued by the Department.

c. The Approval is valid for a period of one (1) year from the date such Approval was granted, or until the Construction Permit is issued. However, prior to the issuance of the Construction Permit, if there are any material changes to approved design plans and specifications, or circumstances which cause the design plans and specifications to be inaccurate or incomplete, then new or corrected design plans and specifications shall be submitted to the Department as a precondition for obtaining a Construction Permit.

d. All proposed sanitary sewer facilities, excluding laterals, shall be dedicated as public facilities. Sanitary facilities shall be transferred over to Danville Wastewater of Sanitary, assets.

e. Construction Permits for sanitary sewer facilities will not be issued for connections to existing private sewers unless pre-existing written agreements or Memorandums of Understanding have been granted.

C. Capacity Certfication/Allocation

a. During the Approval process, the Department may forward a Capacity Certification/ Allocation Letter to IDEM.

b. At the discretion of the Department and after consultation with the Planning Department, the Applicant may be required to evaluate the downstream system if sufficient information and data are not available from the Department. Refer to downstream evaluation requirements.

D. Submittal Requirements for Construction Approval

a. Plans and Specifications shall contain the following

1) Title Sheet;
2) Index Sheet showing the overall sanitary sewer configuration and sheet where the Plan/Profile sheets can be found;
3) Sewer and/or Lift Station Service Area Map;
4) Site Plan;
5) Plan/Profile Sheets which include backfill requirements;
6) Standard Detail Sheets;
7) Structure/Data Table;
8) Lift Station Standard Detail Sheets (when applicable);
9) Specifications shown on plans; and
10) Other sheets as deemed necessary for ensuring conformance to this Standard.

b. Design Calculations

c. A Certificate of Sufficiency of Plan shall be submitted by a Professional Engineer registered in accordance with IC 25-31-1 on a form furnished by the Engineer.

d. When applicable, the lift station submittal requirements set forth in these standards shall be submitted.

e. All recorded Zoning Commitments, or Commitments being negotiated, shall be submitted. Zoning Commitments shall not be justification to violate any provisions of this Standard, or be justification for a Variance. If Zoning Commitments violate any provision of this Standard, contact the Department to determine the necessary steps to amend the Zoning Commitments.

f. The Administrator may require the execution of covenants and/or easements running in form to the Town of Danville, and County of Hendricks by the Owner or Owners of such parcel. At a minimum in such cases, the Administrator shall require that the

following covenant be executed by the Owner or Owners of such parcels, and which shall be included in a recorded plat:

1) It is the responsibility of the Owner of any lot or parcel of land within the area of the plat to comply at all times with the provisions of the permit approved by the Department, and the requirements of all sanitary sewer Construction Plans for the permit issued by the Department.
2) Owner further covenants that no building, structure, tree or other obstruction shall be erected, maintained, or allowed to continue on the portion of the owner's real estate in which the easement and right-of-way are granted without express written permission from the Department. Such permission, when duly recorded, shall run with the real estate. The Department and their agents shall have the right to ingress and egress, for temporary periods only, over the owner's real estate adjoining said easement and right-of-way, when necessary to construct, repair or maintain sanitary sewer facilities.
3) Any person who violates a covenant required under this Standard, and/or the owner of any parcel of land who Plans such a violation, who is notified in writing by the Department that a violation exists, will be given a reasonable period of time, not to exceed thirty (30) calendar days, in which to correct such violation. The notice shall specify the nature of the violation and must stipulate a required correction date.
4) If there has been no activity on the Project during the Approval Process for more than sixty (60) days, the Application has expired and shall be resubmitted.

g. The following shall be submitted to the Town for the Approval of Construction

1) Performance Bond
2) Where applicable and when required, a Sewer Service Agreement shall be executed and submitted.
3) When applicable, the preliminary plat shall be submitted.
4) When required, easements shall be obtained and recorded.
5) The Administrator may require Applicants to send written notification to property owners whose properties abut the route of the proposed sewer.
6) The Applicant shall pay all applicable fees.
7) Applications shall include any additional information deemed necessary by the Department to thoroughly evaluate an application for a Permit and carry out the provisions of this Standard.

E. Who Can Do the Work

a. A general contractor who has met the surety bond and insurance requirements of the Planning Department. Surety bond requirements are met if the general contractor has filed and maintains with the Town a surety bond, as set forth in the Town Code. Insurance requirements are met if the Contractor has secured and maintains a public liability and property damage Insurance Policy as set forth in the Code.

1.5 Sanitary Sewer Construction Inspection and Acceptance Procedures

A. This section provides the procedures and requirements specific to the inspection and acceptance of sanitary sewer facilities.

B. Authority for Investigations and Inspections

a. The Department has the power to inspect and investigate all phases of construction. These inspections and/or investigations may be made at any time by going upon, around, or about the affected property.

b. Such investigation and inspection may be made before, during, and after the construction is completed and shall be made for the purpose of determining whether the construction has been completed in a manner consistent with the approved plans and specifications and the minimum requirements of this Standard.

c. Persons working on, or having control, of the construction shall cooperate fully with the RPR and/or other representatives of the Departments. They shall have a copy of the approved plans and specifications used to obtain the Construction Plan available on-site.

C. Construction Inspection Requirements

a. Full time inspection is required during the installation and testing of all sanitary sewer facilities. Full time inspection will be provided by the Utility (at the Owner's expense).

b. All the construction shall be inspected and tested to assure compliance with the requirements of this Standard.

c. The minimum requirements prior to and during construction are as follows:

1) Sanitary Sewer Construction Agreement

a) The Owner shall execute the applicable Sanitary Sewer Construction Agreement with the Department for construction inspection services

b) The Town shall provide, at the Owners expense, inspection services during the construction of the sanitary sewer facility. The Owner shall reimburse the RPR directly, per the executed Sanitary Sewer Construction Agreement, the cost of the full time inspection services. The Owner shall submit the balance of the cost of the inspection to the RPR prior to acceptance of the sanitary sewer facilities by the Department

c) The inspection services do not include construction engineering or construction stake-out. The Owner or their designated representative is responsible for the construction engineering and stake-out for all construction work.

2) Pre-Construction Meeting. **Construction may not begin until the Pre-Construction Meeting has been held**

3) After construction begins, the contractor shall be responsible for informing and/or notifying the RPR at **least forty-eight (48) hours** in advance of the following:

a) Daily work schedule including any changes in schedule;

b) If work is to be performed on weekends and/or holidays;

c) Dates trenches will be open and sewers will be installed;

d) Dates structures will be installed;

e) Date all applicable tests are to be performed;

f) Date "as-built" verification is to be performed; and

g) Any other information deemed necessary to assure the sanitary sewer facilities are properly constructed.

4) The Department, upon request of the Contractor and/or Owner, will schedule the Final Inspection.

5) All testing required per this Standard, shall be performed under the observation

of the Department's RPR. It is the Contractor's responsibility to schedule the testing with the RPR and/or Department. Test results obtained in the absence of the Department's RPR or Department shall not be accepted.

6) Any portion of the sanitary sewer facility not inspected as prescribed by this Standard may require excavation to the extent required by the Department.
7) Any portion of the sanitary sewer facility not passing the tests prescribed in this Standard shall be repaired or replaced to the extent required by the Department and retested.
8) Failure to comply with these requirements may result in the Department not accepting the sanitary sewer facilities and denying future Plans

D. Requirements for Project Acceptance and Dedication

a. The following shall be submitted and approved prior to a sanitary sewer facility being accepted, lateral Plans being issued, and the performance bond being released:
   1) Three (3) Year Maintenance Bond. The Administrator shall require the posting of a Maintenance Bond by the Contractor, in an amount not to exceed twenty (20%) percent of the contract amount, or subject to the approval by the Administrator, a provision for maintenance for a period of three (3) years from the date of acceptance by the Department. Said bond shall name the Town of Danville and Hendricks County as parties who can enforce the obligations thereunder.
   2) Certificate of Completion and Compliance. A Certificate of Completion and Compliance, as furnished by the Department, shall be filed by a Professional Engineer. The Certificate of Completion and Compliance shall be filed within fourteen (14) calendar days after satisfactory completion of the tests on the sanitary sewer facility for which a Construction Permit was issued.
   3) The completion of a final inspection and all required Forms which confirm all sanitary sewer facilities have been constructed and tested in accordance with this Standard shall be submitted prior to acceptance.
   4) Record ("As built") drawings shall be submitted
   5) GIS Data Submittals as required in this Standard and separate documents provided by the Town.
   6) Final inspection televising report
   7) Payment of all fees shall be made prior to acceptance of any sanitary sewer facility

b. **The original Performance Bond will be released upon acceptance of the sanitary sewer facility.**

E. Record Drawings shall be submitted to the Town. Record Drawings shall be certified by a Professional Engineer or Land Surveyor registered in the State of Indiana. Record Drawings shall be submitted on original mylars and in a digital format. The Record Drawings shall include the following information and all revision dates:

a. Title Sheet;
b. Index Sheet showing the overall sanitary sewer configuration and sheet where the Plan/Profile sheets can be found;
c. Sewer and/or Lift Station Service Area Map;
d. Site Plan;
e. Plan/Profile Sheets;
f. Standard Detail Sheets;

g. Structure/Data Table;
h. Lift Station Sheets (when applicable);
i. Specifications shown on Plans;
j. Structure inverts, pipe inverts and top-of-castings;
k. Horizontal alignment of sanitary sewer and force main pipes, streets, to a minimum accuracy of +/- two (2) feet; and
l. Any other information deemed relevant.

F. As part of the final acceptance process, GIS and IMS data shall be submitted in accordance with these Standards and additional Electronic Data Submission Standards.

G. Dedication of Existing Private Sewers

a. The Owner of a private sanitary sewer facility may apply to the Town for dedication of the facility as public, provided the facility is located within the DANVILLE or Sanitary boundaries. An Application shall be submitted on a Form furnished by the Engineer.
b. Dedication of such sewer facilities are subject to all applicable requirements in this Standard or rehabilitated to an acceptable level as determined by the Department. At the discretion of the Department, the following may be required to determine if the facilities are acceptable or what improvements are necessary to make the facilities acceptable:
    1) Proof of legal ownership;
    2) Recorded easements;
    3) Flow monitoring results;
    4) CCTV video inspection results;
    5) Three (3) year Maintenance Bond;
    6) Record Drawings;
    7) GIS Data Submittal; and/or
    8) Any other requirements deemed necessary by the Department.
c. The Owner of the private sewer facility shall, at their expense, be required to correct any deficiencies or remove any sources of clear water found as a result of any inspection, flow monitoring, CCTV, and/or other related testing.
d. The Department may deny acceptance of private sewer facilities with or without cause even if the private sewer facilities meet the requirements contained in this Standard.

PART 2 - WASTEWATER DESIGN STANDARDS

2.1 Basis of Design

A. Sound engineering judgment shall be utilized when determining locations for sanitary sewers. Existing easements and rights-of-way shall be utilized if at all possible. Service needs of both the present service area and future service areas should be thoroughly evaluated.

2.2 Quality Assurance

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

2.3 Design Flow

A. The design flow for each sewer segment within the system shall be determined as follows:
   a. Prepare a Sanitary Sewer Service Area Map that defines the areas tributary to each element of the sewer. A Sanitary Sewer Service Area Map will be required for ALL projects unless waived by the Town.
   b. Examine each tributary area to determine existing population and future potential land use and equivalent population.
   c. Determine the average daily flow based on existing population and future equivalent population.
   d. Determine the design peak flow based on average daily flow and the appropriate peaking factor.

B. In general, sewers shall be designed to accommodate the peak hourly flow within the sewer system.

2.4 Design Criteria

A. Hydraulic Grade Line: The hydraulic grade line for peak flows shall not rise above the crown of the pipe. If velocity entering a manhole is above critical, the hydraulic grade line must be computed to ensure that service connections will not experience surcharging that causes back-ups. In critical instances or when requested by the Town, the hydraulic grade line shall be computed to show its elevation at manholes, transition structures, and junction points. The calculations shall provide for losses at structures and elevation differences. When necessary, the pipe exiting the manhole must be adjusted in elevation to ensure that the energy gradient remains constant across the manhole.

B. Velocity: The minimum velocity allowed in sanitary sewer pipes under design flow conditions shall be two (2.0) ft/sec. The maximum allowable velocity shall be 10 ft/sec.

C. Slope: Pipes slopes shall meet the requirements of 327 IAC 3-6-12.

D. Pipe Size: The minimum allowable inside diameter for sewer pipe, with the exception of building sewer connections, shall be eight inches (8”). All building sewer connections shall have a minimum inside diameter of six inches (6”), but can be reduced to four inches (4”) if approved in writing by the Town. Commercial and industrial connections shall be discussed on a case-by-case basis.

2.5 General Location Requirements

A. All sanitary sewers shall be constructed with a straight alignment between manholes. Where sewer depth is ten feet (10') or less, sewer lines and manholes shall be located a minimum of ten feet (10') horizontally from any part of a building structure or its foundation. For sewer depths greater than ten feet (10'), this minimum distance shall befifteen feet (15').

B. The sanitary sewer elevation necessary to serve the entire tributary area shall be considered when designing a sanitary sewer line. This design shall include areas beyond the boundary of a design section.

C. Basement elevations shall also be taken into account. In instances where only a limited number of houses on the sanitary sewer have existing basement facilities, the overall impact on the entire system shall be considered prior to providing gravity basement service. In areas where the lowest building level to be served by gravity sanitary sewer service is less than one foot (1’) above the top of the manhole casting elevation of the first upstream manhole on the public sewer to which the connection is made, the Design Engineer shall design for backflow prevention devices to prevent sanitary sewer backups.

D. The top of sanitary manholes shall be a minimum of two feet (2’) above existing, proposed, or projected 100-year flood elevations. In instances in which this minimum elevation causes the manhole to be above natural ground creating an obstruction, the top of the manhole may be lowered to the natural ground elevation and a watertight manhole lid and frame shall be specified. Approval from the Town is required prior to the lowering of any manhole below the 100-year flood elevations.

E. Structures located outside the roadway shall be adjusted to final grade by the Owner / Builder / Developer. Manholes shall be marked to 24” above casting elevation.

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

G. Under no circumstances will a structure (manhole, cleanout, valve box, etc.) be allowed to be in the driveway or sidewalk.

2.6 Cover Requirements

A. Gravity sanitary sewer mains: 4 feet

B. Gravity sanitary laterals: 3 feet

C. Sanitary force mains: 5 feet

D. Unless otherwise shown or approved by Town / Engineer on a project specific basis.

2.7 Pipe Materials

A. Pipe materials for pipes less than twenty-five inches in diameter shall be SDR-35 PVC per the Materials specification unless approved otherwise in writing by the Town. Pipes greater than or equal to twenty-five inches (25") in diameter shall be SDR-26 PVC.

B. In areas where the required separation distance between water and sewer piping cannot be maintained, the sewer piping may be replaced with Town-approved water main materials in accordance with the Specifications of Construction specification.

2.8 Manholes

A. No sewer laterals or building sewer connections shall be allowed to be connected directly to a manhole structure.

B. Manholes shall be located at the following locations:
   a. Changes in sewer grades or alignment.
   b. Sewer junctions.
   c. Pipe diameter changes.
   d. Material changes.
   e. Where spacing requirements justify placement.

C. Manholes shall be placed at the following maximum intervals:
   a. Diameter 8" to 15": 400'
   2. Diameter 18" to 30": 500'
   3. Under special circumstances, manhole spacing may be increased. The Town will review such instances on a case-by-case basis.

D. Flow Channel:
   a. For all manholes with equal diameter influent and effluent pipes, a minimum 0.10 foot (0.10') drop between the inverts of the influent and effluent pipes shall be maintained to offset losses experienced at manhole structures.
   b. The flow channel through a manhole shall be made to conform in shape, and slope to that of connecting sewers. The channel walls shall be shaped or formed to the full height of the crown of the outlet sewer so that maintenance, inspection, and flow in the manhole are not obstructed.

E. Bench
   a. A bench shall be provided on each side of any manhole channel when the pipe diameter(s) are less than the manhole diameter. The bench shall be sloped no less than one-half (½) inch per foot (four percent).

F. External Drop Inlets: An external vertical drop shall be provided for any pipe invert entering a manhole at an elevation greater than two feet (2') above the pipe invert exiting the manhole.

2.9 Valves

A. Valves used in sanitary sewer collection systems shall be eccentric plug valves.

2.10 Pipe Tracer Wire

A. Tracer wire shall be required on all force mains and sanitary sewer laterals.

2.11 Sanitary Sewer Laterals

A. All gravity sewer service laterals connecting to a main line gravity sanitary sewer line shall be six inch (6") diameter SDR-35 PVC pipe conforming to the same specifications as the main line gravity sewer and shall be installed with a 2% minimum slope to within three feet (3') of the building.

B. Connection to the main line gravity sewer shall be by means of a wye or tee installed with the main line sewer. In the event that a tap is made into an existing sewer, same shall be accomplished utilizing a manufactured wye or tee with rubber hub adapters or, only if approved in writing, a saddle on the pipe.

C. All gravity sanitary lateral stubs shall be installed to the right of way line.

D. Buried Piping Identification Tracing for Service Laterals:
   1. Install #10 tracing wire for all service connections in accordance with the Contract Drawings and these Specifications.
   2. Tracing wire shall be installed from the mainline sewer to the building cleanout, where it is brought up to grade.

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

F. Sewer services shall be located at the property corner unless authorized differently by the Town.

G. A cleanout (4" minimum) shall be installed within 5 feet of the building and every 100 linear feet thereafter and at a changes of direction.

H. All services shall be clearly marked at the termination point for future reference and extend a minimum of 24" above grade.

I. Manholes located outside the roadway shall be adjusted to final grade by the developer and marked to 24" above casting elevation.

J. All industrial sewer laterals shall include an inspection control manhole near the building that will be accessible to the Town employees at all times.

K. All sewer taps and laterals shall be inspected by the Town prior to covering.

L. Under no circumstances shall a manhole or cleanout be allowed to be in the driveway or sidewalk.

2.12 Testing Requirements

A. Provide hydrostatic testing for all force main piping at a test pressure of 100 psi, unless approved otherwise by Town in writing. Unless otherwise specified, required test pressures are at lowest elevation of pipeline segment being tested.

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

C. Provide vacuum test of all sanitary manholes.

D. Provide deflection and leakage testing of all gravity sanitary sewer mains.

2.13 Lift Stations

A. All proposed developments and associated sewage systems shall be connected by gravity sewer to existing Danville sewers if good engineering practices allow. All proposed collection systems, if a gravity sewer connection is not feasible, shall be designed to minimize the need for more than one sewage pump station.

B. The Contractor shall furnish and install one pumping station complete with all equipment installed in a structure as shown on the Contract Drawings. Pump stations shall be as shown on the drawings and shall be complete with all concrete, mechanical, electrical, site and miscellaneous items of work shown, specified, or required for a complete and functional installation.

C. The principal items of equipment shall include two or three submersible, non-clog pumps; valves; piping; control panel with circuit breakers, and automatic pumping level controls, providing all wiring and conduit, and telemetry if specified (to include re-establishing any existing telemetry). General details of construction are shown on the drawings along with pump capacities, speed, minimum motor horsepower, power characteristics, etc. Miscellaneous items necessary for a complete and functional installation are the responsibility of the Contractor.

D. A magnetic flow meter and telemetry system shall be provided with each lift station. Specific magmeter and SCADA system requirements shall be coordinated with the Town on a project-specific basis.

E. Pump station specifics vary greatly on a project-specific basis. The Town reserves the right to allow deviations from this specification upon review by Town.

F. Tsurumi

a. Pumps shall be designed to pump wastewater, sewage, or effluent containing 3” solids without damage during operation. The pumps shall be designed so that the shaft power required (BHP) shall not exceed the motor rated output throughout the entire operating range of the pump performance curve. Pump units shall be designed so that cavitation will not occur at open discharge.

b. All major parts of the pumping units including casing, impeller, discharge elbow, and motor frame shall be manufactured from gray cast iron, ASTM A48 CLASS 35. Units shall have a field adjustable and or replaceable, high chrome iron cutter plate. Internal and external

surfaces coming into contact with the pumpage shall be protected by a fused polymer coating. All exposed fasteners shall be stainless steel. All units shall be furnished with a discharge elbow with 150 lb. flat face flange and NPT companion flange. Impellers shall be of the single or two vane semi-open solids handling design equipped with tungsten carbide vane tips and shall be slip fit to the shaft and key driven. The pump casing shall incorporate an air relief valve.

c. All units shall be furnished with a dual inside mechanical shaft seal located completely out of the pumpage, running in a separate oil filled chamber and further protected by an exclusionary oil seal located between the bottom seal faces and the fluid being pumped. The oil chamber shall be fitted with a device that shall provide positive lubrication of the top mechanical seal, (down to one third of the standard oil level). The device shall not consume any additional electrical power. Mechanical seals shall be rated to preclude the incursion of water up to 42.6 PSI (98.4 Ft.). Units shall have silicon carbide versus silicon carbide upper and lower mechanical seal faces. Mechanical seal hardware shall be stainless steel. Units designed to exceed 42.6 PSI at shutoff head shall incorporate seal pressure relief ports.

d. The pump motors shall be ___ HP, ___ V, 60 HZ, ___ Phase and shall be NEMA MG-1, Design Type B equivalent non explosion-proof. Motors shall have a 1.15 service factor and shall be rated for 20 starts per hour. Motors shall be air-filled, copper wound, class F insulated with built in thermal and over current protection for each winding. Motor shaft shall be 420 stainless steel and shall be supported by two permanently lubricated, high temperature ball bearings, with a B-10 life rating at best efficiency point of 60,000 hours. The bottom bearing on units 7.5 HP and below shall be a single row, double shielded, C3, deep groove type ball bearing. The top bearing on all units shall be a single row, double shielded, C3, deep groove type ball bearing. Motors shall be VFD rated.

e. The pump power cable shall be suitable for submersible pump applications and shall be field replaceable utilizing standard submersible pump cable. The cable entrance shall incorporate built in strain relief and a combination three way mechanical compression sealing with a fatigue reducing/thermal expansion boot. The cable entrance assembly shall contain a anti-wicking block to eliminate water incursion into the motor due to capillary wicking should the power cable be accidentally damaged.

G. Hydromatic

a. The pump shall be non-overloading throughout the entire range of operation without employing a service factor. The pump shall reserve a minimum service factor of 1.30. The performance curve submitted for approval shall state in addition to head and capacity performance, the pump efficiency, solid handling capacity, and reflect motor service factor.

b. Performance:
   i. Chopper Pump
   ii. Quantity:
   iii. Impeller size shall be ___
   iv. Discharge size shall be an __" ANSI flange
   v. Motor shall be __ HP: __ 60Hz; 3 phase; listed; oil filled design
   vi. Each pump power cord shall be a minimum of 75' in length and be epoxy potted
   vii. Each pump shall have a factory performance test with individual pump performance curves. Each pump shall operate at the following conditions:
   _____ GPM at ___' TDH; Design Point
   _____ TDH Shut-off

H. Design Considerations
   a. Pump stations shall be designed to adequately handle the estimated flow from the proposed development without overflow with one pump in service. In addition, the structure, internal piping and valves, electrical service and wet well shall be of sufficient size to permit enlargement of the station, by only exchanging the pumps and motors, to the capacity required to handle contributory flows from areas adjacent to, but outside, the project location.
   b. The Town zoning map and the Danville and Hendricks County Comprehensive Plans shall be used in conjunction with the Town / Engineer in determining the design capacity.
   c. Pump design shall be based on average daily flow with a peaking factor of four times that average flow. Pump starts shall not exceed 5 per hour.
   d. Unless otherwise approved, the wet well shall have a minimum of 6 ft. above the high level alarm.

I. All pump stations shall be designed and constructed as submersible duplex or triplex pump stations, with flanged ductile iron discharge piping braced against the inside walls of the wet well and with separate valve vault. Drain connections between valve vault and wet well shall be provided with a Tide-Flex pinch valve to prevent backflow of wastewater into the valve vault. There shall be a minimum of two pumps with discharge valve size and discharge pipe size being a minimum of 4 inches.

J. All equipment supplied and installed under this item of the specifications shall meet the requirements of the Occupational Safety & Health Act of 1970.

K. Electrical Service
   a. Electrical service size to be submitted to and approved by Town of Danville. Unless approved otherwise by Town, electrical service shall be 240 volt, three-phase (no phase• splitting allowed).

L. Standby Electrical Generator/Connection
   a. The electrical system shall be provided with emergency generator back-up system. Emergency generator shop drawings shall be submitted and approved by the Town Engineer.

M. Transfer Switches
   a. The Contractor shall furnish and install a transfer switch as specified by the Town on a project-specific basis.

N. Telemetry System
   a. Coordinate manufacturer and details with the Town of Danville. The Developer / Contractor is responsible to integrate with the existing Town of Danville SCADA system.

O. Fencing and Fenced Area
   a. The pump station site shall be fenced with a six foot tall chain link fence of aluminum construction and as approved by the Town Engineer.
   b. There shall be three strands of barbed wire turned out around the top.
   c. There shall be a fourteen (14) foot wide entrance consisting of two seven (7) foot wide gates.
   d. The minimum diameters of gate posts shall be four inches (4”), corner posts three inches (3”), and line posts two inches (2”).
   e. Submittal:
      i. Submit shop drawings for all fasteners, fittings, posts, rails, hinges, pickets and all other material to provide complete installation to Town Engineer for approval prior to construction.

   f. Unpaved areas of the pump station shall be graded, compacted and covered with a geotextile fabric barrier per INDOT Specification 918.02 and 6 inches of No. 53/73 crushed stone. The barrier and crushed stone shall extend a minimum 12 inches outside of the fenced area.

P. Access
   a. A driveway 14 feet wide with an approach apron 20 feet wide at the street shall be constructed to the pump station.
   b. The driveway shall consist of at least 6 inches of compacted dense graded crushed limestone base (INDOT #53) placed on compacted subgrade material, 2 inches (2”) of HMA Intermediate, 3/4”, Mainline, Type B, and 1-1/2 (1.5”) inches of HMA Surface, 3/8”, Mainline, Type.

Q. Lift station design shall include the necessary watermain to install a hydrant within a reasonable distance from the lift station. Watermain and hydrant shall comply with Town’s standards.

2.14 Low Pressure Systems

A. Responsibility - The Town will not be responsible for the operation and maintenance of the common force main and the portion of the lateral from the common forcemain to, and including, the shutoff valve. Homeowners shall be responsible for all piping, pumping equipment, and appurtenances between the building and the shutoff valve. The Town is **NOT** responsible for assuring replacement equipment is compatible with the existing equipment in the system.

B. Requirements
   a. Pipe size shall be per pump manufacturer's recommendations with a minimum size of two (2) inches for the common forcemain and one and one-quarter (1-1/4) inches between the grinder pump and the common forcemain. Evidence of adequate cleansing velocities shall be submitted with design.
   b. Layout shall be as follow:
      1) Sufficient to achieve a cleansing velocity of two (2) feet per second in the common forcemain; and
      2) Without any "loops" or parallel pumping segments in the system.
   c. Cleanouts shall be per pump manufacturer's recommendations bat a minimum the following locations
      1) At the terminal end of each common forcemain
      2) When two (2) or more forcemains are connected; and
      3) Every 1,000 feet
   d. Flushing stations shall be incorporated into the system
   e. Air relief valves shall be installed at the following locations:
      1) At all high points in the system
      2) At intervals of 2,000 feet on all horizontal runs lacking a clearly defined high point.
   f. A lateral assembly installation shall be installed on each service line
   g. Other requirements as deemed necessary by the Town

C. No more than one (1) building will be allowed to connect to a Grinder Pump Unit. Industrial facilities, apartment buildings, and condominiums will be handled on a case-by-case basis.

D. To assure all the Grinder Pump Units are compatible, all units shall be the same Make, Model Number, and have the same pump performance characteristics unless approved in writing by the Town. Replacement units shall be the same make and model as was originally approved, unless approved in writing by the Town. Pump replacement requirements shall be contained within the Homeowners Association Covenants and Restrictions if an HOA is planned. The type of pumps allowed are as follows:
   a. Positive Displacement Pumps – May be used in all low pressure system applications
   b. Semi-Positive Displacement Pumps – May be used in all low pressure system applications
   c. Centrifugal Pumps – May only be used if the number of units is then (10) or less and the Total Dynamic Head is less than forty (40) feet

E. Simplex or duplex grinder pumps may be used for single dwelling units. For uses other than single dwelling units, the Town shall determine which is appropriate. General equipment requirements are as follows:
   a. The grinder pump stations shall be a complete package consisting of all equipment and appurtenances required for a fully operable pumping system. Pump level controls, starter,

alarm, piping, fittings, valves, and all accessories shall be of a factory fabricated package so that after burying the wet well the field connection of the gravity lateral, discharge line, and electrical service line to the control box will complete the installation.

b. Each grinder pump station shall be manufactured and assembled by a single manufacturer.
c. The pumps shall be capable of macerating all material in normal domestic and commercial sewage, including reasonable amounts of foreign objects such as wood, plastic, glass, rubber, disposable diapers, and the like to a fine slurry that will pass freely through the pump and one and one-quarter (1-1/4) inch discharge pipe.
d. Electrical and level controls shall be provided by the pump manufacturer. All controls shall be mounted so they can b cleaned or replaced without disturbing the pump or piping.
e. The control panels and all associated components on each standard unit shall be U.L. Approved and installed per manufacturer's recommendations. All equipment associated with each unit shall meet the current requirements of all applicable Federal, State, and Local electrical Codes.

F. **Final approval of Low Pressure Systems is subject to review by the Town of Danville.**

PART 3 – SANITARY MATERIALS

3.1 Excavation & Backfill for Wastewater

A. Backfill and Fill; Suitable & Unsuitable Materials
   1. Materials acceptable for use as backfill against walls, foundations, underground ductbanks, and other structures shall be stockpiled native sandy clay or granular soils which are uniformly mixed, contain no organic matter, nor contain rocks or fragments greater than 3 inches in size, nor have greater than 40 percent passing the 200 sieve.
   2. Standard backfill and fill materials from off-site sources shall consist of silty or clayey sand soils that are uniformly mixed, contain no organic matter and which have a Plasticity Index less than ten. The maximum particle size of imported soils shall be 3- inches or less, if required to satisfy trenching, landscaping, or other requirements. The moisture content of the backfill and fill materials shall be within two percent (2%) of optimum per ASTM D1557.
   3. All materials for use as backfill and fill material shall be tested by the laboratory services, as requested by the Town / Engineer. If on-site material is unsuitable, as determined by the Town / Engineer, Special Backfill or approved off-site fill shall be used.

B. Embedment Material for Flexible Pipes
   1. See Danville Standard Drawings.

C. Embedment Material for Rigid Pipes
   1. See Danville Standard Drawings.

D. Special Backfill
   1. Special Backfill for use beneath structures, concrete slabs and asphalt pavements (and where shown or specified below and around structures) shall be in accordance with the Indiana Department of Transportation (INDOT) Standard Specifications latest edition, Section 904. The material shall be acceptable quality, free from large or frozen lumps, wood, or other extraneous matter. Backfill for public infrastructure shall be in accordance with gradation for No. 53 or No. 73 coarse aggregate in accordance with the gradation requirements of INDOT Standard Specifications latest edition, Section 904.03(e), and shall be limited to No. 73 coarse aggregate for services and laterals.

3.2 Lawns & Grasses

A. Topsoil:
   1. Seeding / Sodding: INDOT Section 914.01
   2. All soil accepted as topsoil, whether obtained from on-site or off-site sources, shall comply with specified topsoil requirements.
   3. Provide fertile, friable, natural topsoil, surface soil, capable of sustaining vigorous plant growth; free of any admixture of subsoil, clods of hard earth, plants or roots, sticks, stones larger than 1-inch in diameter, or other extraneous material harmful to plant growth, in compliance with ASTM D 5268.

4. Topsoil Source: Reuse surface soil stockpiled on-site, where possible. Verify suitability of stockpiled surface soil to produce topsoil, as specified. If not suitable amend topsoil to meet requirements approved by the Town / Engineer. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
    a. Supplement acceptable on-site soil with manufactured topsoil from off-site sources, when quantities available on-site are insufficient to complete the Work.

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

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

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

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

3.3 General Pipe & Utility Appurtenances Materials Requirements

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

2. Component Supply and Compatibility:
    a. All pipe and appurtenances of each material type shall be furnished by the same manufacturer.
    b. Pipe Supplier shall prepare and review all Shop Drawings and other submittals for all materials furnished under this section.
    c. Materials shall be suitable for specified conditions of service and shall be integrated into overall assembly by Pipe Supplier.
3. Quality of materials, process of manufacture and finished pipe shall be subject to inspection by Town / Engineer.

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

C. Marking for Identification
1. Marking:
    a. Each standard and random length of pipe in compliance with this specification shall be clearly marked with the following information that will remain legible during normal handling and storage.
        1) ASTM or AWWA Standard Designation.
        2) Pipe Size.
        3) Pressure/Thickness Class/Profile Number/Standard Dimension Ratio (SDR).
        4) All HDPE for force main piping shall have a green stripe installed by the manufacturer during the pipe forming process. The pipe shall have multiple stripes so as to be viewed from any angle along the pipe.

3.4 Polyvinyl Chloride (PVC) Piping (Gravity, Non-Pressure, Sanitary)

A. Buried PVC Gravity Sewer Pipe.
1. Material (**< 25" - SDR 35** and **25" or > - SDR 26**):
    a. Pipe shall comply with ASTM D3034 or ASTM F679.
    b. Wall Thickness and Pipe Stiffness: Pipe stiffness shall be determined in accordance with test methods in ASTM D3034 or ASTM F679.
2. Fittings:
    a. Gasketed fittings shall comply with ASTM D3034.
    b. Unless otherwise shown or indicated, saddle wyes are unacceptable.

3. Joints:
    a. Provide bell and spigot joints. Bell shall consist of an integral wall section to hold securely in place (and prevent displacement during assembly of joint) elastomeric O-ring gasket.
    b. Jointing lubricant shall be as recommended by pipe manufacturer.
    c. Provide elastomeric gaskets complying with ASTM F477 and ASTM D3212.

3.5 Ductile Iron Pipe, Joints, and Fittings (Pressure & Non-Pressure)

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

B. Flanged Pipe: Fabricate in accordance with AWWA C115.
1. Pressure Rating: As specified in on Contract Drawings. If not otherwise specified, pipe shall be a minimum Pressure Class 350.

C. Non-Flanged Pipe: Conform to AWWA C151 for material, pressure, dimensions, tolerances, tests, markings, and other requirements.
1. Pressure Class:
    a. 3 inch diameter through 12 inch diameter shall be a minimum Pressure Class 350 in accordance with AWWA C150.
    b. Larger than 12 inch diameter shall be a minimum Pressure Class 250 in accordance with AWWA C150.
2. Special Thickness Class: As specified on the Drawings / Piping Schedules.

D. Pipe Joints:
1. Flanged Joints: Conform to AWWA C110 and AWWA C111 capable of meeting the pressure rating or special thickness class, and test pressure noted on Contract Drawings.
    a. Gaskets: Unless otherwise specified, gaskets shall be at least 1/8 inch thick, ring or full-face as required for the pipe, of synthetic rubber compound containing not less than 50 percent by volume nitrile or neoprene, and shall be free from factice, reclaimed rubber, and other deleterious substances. Gaskets shall be suitable for the service conditions specified, specifically designed for use with ductile iron pipe and fittings.
    b. Bolts: Comply with ANSI B18.2.1.
        1) Exposed: ASTM A307, Grade B.
        2) Buried or Submerged: ASTM A193, Grade B8M, Class 2, Heavy hex, Type 316 stainless steel.
    c. Nuts: Comply with ANSI B18.2.2.
        1) Exposed: ASTM A563, Grade A, Heavy hex.
    d. Buried or Submerged: ASTM A194, Grade B8M, Heavy hex, Type 316 stainless steel.
2. Mechanical Joints: Comply with AWWA C111 and AWWA C151, capable of meeting pressure rating or special thickness class, and test pressure specified.
    a. Glands: Ductile iron.
    b. Gaskets: Plain tip.
    c. Bolts and Nuts: High strength, low alloy steel in accordance with AWWA C111. Cor-Blue or approved equal.

3. Push-On Joints: Comply with AWWA C111 and AWWA C151, capable of meeting pressure class or special thickness class, and test pressure specified.
    a. Gaskets: Vulcanized SBR, unless otherwise specified.
    b. Stripes: Each plain end shall be painted with a circular stripe to provide a guide for visual check that joint is properly assembled.
    c. Products and Manufacturers: Provide one of the following:
        1) Tyton or Fastite Joint by Clow Water Systems, Atlantic States Cast Iron Pipe Company, Canada Pipe Company, Ltd., McWane Cast Iron Pipe Company, Pacific States Cast Iron Pipe Company, and Griffin Pipe Products Company.
        2) Fastite Joint by American Cast Iron Pipe Company.
        3) Tyton Joint by U.S. Pipe and Foundry Company.
        4) Or equal.
4. Restrained Joints: Restrained joints shall comply with AWWA C110 or AWWA C153. Restrained push-on joints shall be capable of being deflected after full assembly. Field cuts of restrained pipe are not allowed without approval of Town / Engineer.
    a. Products and Manufacturers: Provide restrained joints for mechanical joint piping by one of the following:
        1) Megalug, Series 1100, by EBBA Iron Sales, Inc.
        2) RomaGrip, by Romac
        3) One-Lok, by Sigma
        4) Star Grip 3000 Series, by Star Pipe
        5) Or approved equal.
    b. Products and Manufacturers: Provide restrained joints for push-on joint piping by one of the following:
        1) Super-Lock Joint Pipe, by Clow Water Systems, a division of McWane, Inc.
        2) Lok-Ring Joint, or Flex-Ring Joint, by American Cast-Iron Pipe Company.
        3) TR Flex Joint, by U.S. Pipe and Foundry Company.
        4) Snap-Lok, by Griffin Pipe Products Company.
        5) Or equal.
5. Flanged and Push-On Joint Fittings: Comply with AWWA C110/AWWA C153 and AWWA C111.
    a. Material: Ductile iron.
    b. Pressure rating, gaskets, bolts, and nuts shall be as specified for flanged joints. Pressure rating of fittings shall meet, but not exceed, specified pressure rating or special thickness class of the connected pipe.
6. Mechanical Joint Fittings: Comply with AWWA C110/AWWA C153 and AWWA C111.
    a. Material: Ductile iron.
    b. Glands: Ductile iron.
    c. Pressure rating, gaskets, bolts, and nuts shall be as specified for mechanical joints. Pressure rating of fittings shall meet, but not exceed, specified pressure rating or special thickness class of connected pipe.

E. Cement-mortar Lining:
1. Unless noted otherwise in the Contract Documents, pipe and fittings shall be lined with bituminous seal coated cement-mortar lining in accordance with AWWA C104.

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

G. Exterior Surface Preparation and Coatings
1. Buried Pipe and Fittings:
a. Asphaltic Coating: Coat pipe and fittings with an asphaltic coating approximately 1 mil thick, in accordance with AWWA C151, AWWA C115, AWWA C110, and AWWA C153, as applicable.
2. Fusion Bonded Epoxy Coating for Fittings
a. When specified, fittings shall be factory coated with 100 percent solids, thermosetting, dry powder epoxy, in conformance with AWWA C116.

3.6 PVC Pressure Pipe for Sanitary Force Main

A. Polyvinyl Chloride (PVC) Piping
1. Buried PVC Pressure Pipe (Diameter ≤ 12 inch):
a. Material:
1) Pipe shall comply with one of the following, as specified on the Plans:
a) AWWA C900; Material per ASTM D1784, Class 12454; (water mains or force mains) or
b) ASTM D2241; Material per ASTM D1784, Class 12454 (water services four inches (4”) in diameter or smaller, or force mains)
2) Wall Thickness: DR 18 for AWWA C900 PVC or SDR 21 for ASTM D2241.
3) Fabricate AWWA C900 pipe with ductile iron pipe equivalent outside diameter.
b. Fittings:
1) Provide ductile iron fittings; see ductile iron pipe specifications.
c. Joints:
1) Provide bell and spigot joints. Bell shall consist of an integral wall section to hold securely in place (and prevent displacement during assembly of joint) elastomeric O-ring gasket.
2) Jointing lubricant shall be as recommended by pipe manufacturer.
3) Provide elastomeric gaskets complying with ASTM F477 and ASTM D3139.
2. Buried PVC Pressure Pipe (Diameter 12 inch to 24 inch):
a. Material:
1) Pipe shall comply with AWWA C905.
2) Material shall comply with ASTM D1784, Class 12454-B.
3) Wall Thickness: SDR 18.
4) Fabricate pipe with ductile iron pipe equivalent outside diameter.
b. Fittings:
1) Provide ductile iron fittings; see ductile iron pipe specifications.

c. Joints:
    1) Provide bell and spigot joints. Bell shall consist of an integral wall section to hold securely in place (and prevent displacement during assembly of joint) elastomeric O-ring gasket.
    2) Jointing lubricant shall be as recommended by pipe manufacturer.
    3) Provide elastomeric gaskets complying with ASTM F477 and ASTM D3139.

3. Restrained Joints: Provide restrained joints where shown or indicated.
    a. PVC push-on joint piping:
        1) Ford Uni-flange Block Buster 1350
        2) EBAA Megalug Series 1600
        3) Or approved equal.
    b. PVC Pipe to Mechanical Joint
        1) EBAA Megalug Series 2000PV
        2) Or approved equal.

3.7 HDPE Pressure Pipe for Sanitary Force Main

A. Quality Assurance
1. Manufacturer's Qualifications:
    a. HDPE pipe and fittings manufacturers and distributors shall be listed as current members of the Plastics Pipe Institute (PPI).
    b. Contractor shall have a minimum of five (5) years of recent experience installing HDPE pressure pipe and fittings for at least the specified pipe and fittings sizes and lengths and shall be able to submit documentation of at least five (5) installations in satisfactory operation for at least five (5) years.
    c. Fusion operators shall have received current training & certification per PPI TN-42.

B. Conditions of Service
1. General:
    a. Pipe shall be capable of withstanding a minimum recurring surge pressure (water hammer) flow velocity of 4 ft/sec, 55 cycles/day, and 100-year estimated fatigue life, or higher if shown in the Drawings.

C. HDPE Mainline Pipe
1. Dimensions:
    a. Pipe Dimensions: The nominal inside diameter of the pipe shall be true to the specified pipe size in accordance with AWWA C901 and/or AWWA C906 and/or ASTM F714.
    b. Wall thickness DR 11.
    c. HDPE pipe shall be DIPS.
2. The pipe shall meet the requirements of the applicable AWWA C901 and/or AWWA C906 and/or ASTM F714.
3. Pipe shall be pressure rated to meet the service pressure requirements specified by Town / Engineer.
4. Pipe material used for the manufacture of HDPE shall be high density polyethylene (HDPE) having a material designation code of PE 4710 or higher, meeting the requirements of ASTM D3350 with a minimum cell classification of PE 445574C. Pipe material shall have an allowable stress (HDS) of 1000 psi at 73°F

5. Only smooth wall HDPE will be permitted.
6. Approved manufacturers are: See list on plasticpipe.org.
7. Physical Properties
    a. Materials used for the manufacture of polyethylene pipe and fittings shall meet the following physical property requirements:

Property	Unit	Test Procedure	Value
1. Material Designation	-	PPI/ASTM	-
2. PPI Material Listing	-	PPI TR-4	PE 4710
3. Material Classification	-	ASTM D 1248	III C 5 P34
4. Cell Classification	-	ASTM D 3350	345434C or 355434C
5. Density	g/cm3	ASTM D 1505	>0.941
6. Melt Index (E)	g/10 min	ASTM D 1238	<0.15
7. Flexural Modulus	psi	ASTM D 790	>110,000
8. Tensile Strength	psi	ASTM D 638	<160,000
9. ESCR (C)	hours	ASTM D 1693	3,000 to 3,500
10. HDB	psi	ASTM D 2837	1,600 @ 23°C
11. UV Stabilizer (C)	%carbon black	ASTM D 1603	2 to 3
12. Elastic Modulus	psi	ASTM D 638	110,000
13. Brittleness	Temp F	ASTM D 746	<-180
14. Vicat Softening	Temp F	ASTM D 1525	255
15. Thermal Expansion	in/in/ F	ASTM D 696	8 x 10E-5
16. Hardness	Shore D	ASTM D 2240	64
17. Molecular Weight Category	-	-	Extra-High

    b. Ring Stiffness Constant (RSC) values for the pipe can be directly related to the pipe's class designation. (Nominal RSC of Class 40 pipe = 40, etc.). The minimum RSC is 90 percent of the nominal.

D. HDPE Joints
1. General:
    a. Joints shall be as specified in the Contract Documents. If not specified, pipe to pipe joints shall be butt heat fusion joints. Provide ductile iron flanged joints for exposed pipe fittings and ductile iron mechanical joints for buried pipe fittings.
2. Butt Heat Fusion Joints:
    a. Shall be allowed for joining lengths of pipe in a straight run only.
    b. Shall conform to ASTM F2620 and PPI TR-33.
    c. Joint strength shall be equal to or greater than the strength of the pipe, as demonstrated by testing requirements.
3. Special Transition Pieces:
    a. Provide suitable transition pieces (adapters) for connecting to existing piping or MJ valves.
    b. Unless otherwise shown or indicated, expose existing piping to determine material, dimensions, and other data required for transition pieces.
    c. All transitions shall be DIPS DR 11 fused MJ adapters by ISCO or approved equal. Follow all manufacturer recommendations.
    d. All connection to existing pipe shall use a thrust collar.

4. Electro-fusion Couplings
    a. When utilized, electro-fusion couplings shall contain heating coils located at the sealing surface. Use ISCO products or approved equal. Follow all manufacturer recommendations.
5. Thrust Collars
    a. Contractor shall account for impacts of temperature expansion and contraction when installing and connecting HDPE pipe to existing systems. All connections to existing pipe shall use a thrust collar to counteract the Poisson effect. Concrete thrust collar shall be attached to the HDPE pipe by the use of electro-fusion flex restraint devices by ISCO or approved equal. Thrust collar detail shall be submitted to and approved by Town / Engineer prior to construction.

E. Fittings
1. Provide ductile iron fittings; refer to ductile iron fitting specifications.

F. Pipe Stiffeners
1. Provide support using pipe stiffeners.
2. Use stiffeners constructed of stainless steel, per ASTM A240 Type 304.
3. The outside diameter of the stiffener must match the inside diameter of the pipe.

G. Electrofusion Saddles
1. When required by the plans in lieu of tapping saddles, provide electrofusion saddles manufactured in accordance with ASTM F-1055 and conform with the following material requirements:
    a. Pre-Blended resin 4710 which complies with ASTM D3350.
    b. Resin must be acceptable for use with potable water and comply with NSF Standard 61.

H. Joint Restraint: Provide restrained joints where shown or indicated.
1. Proposed restraint system shall be submitted to the Town for review and approval.
2. Restraint system shall be per the recommendations of the pipe manufacturer and appropriate for the fitting to pipe connection.
    a. Mechanical Joint Fitting Restraint:
        1) EBAA Megalug Series 2000PV
        2) Or approved equal.
    b. Push On Fitting Restraint
        1) EBAA Series 15PF00
        2) Or approved equal.
    c. Flange Adapter & Restraint
        1) EBAA Megaflange Series 2100
        2) Or approved equal.

3.8 Polyethylene Encasement

A. Supply polyethylene in tubes or sheets.

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

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

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

3.9 Pipe Tracing Wire

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

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

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

3.10 Eccentric Plug Valves

A. Eccentric plug valves shall be non-lubricated type, have fully encapsulated plugs and shall be of eccentric construction. Valves shall be made of cast iron or semi-steel at least equal to ASTM A126, Class B. Body seats of valves 3-inch and larger shall have a welded-in overlay of not less than 90 percent pure nickel on all surfaces contacting the plug face. Stem bearings shall be of corrosion-resistant material. Port areas, except for 1-inch valves, shall be equal to at least 100% of the full pipe area. Valves 4-inch and larger shall have adjustable packing glands and shall be capable of being repacked without the bonnet or plug being removed from the valve. The valve shall be designed to withstand full operating pressure against the face of the plug without leakage. Valves shall be designed for not less than 100 pounds cold water, oil or gas operating pressure, and shall be gear operated, unless otherwise shown or specified. Gear- operated valves with operating wheels 6 feet or more above the floor shall be provided with chains and chain wheels. One wrench shall be furnished for each size valve in each individual room or operating space in which valves are located. Non-full-port valves will not be allowed.

B. Plug valves located underground shall have mechanical joint pipe connections at both ends.

C. Plug valves used for air service shall have EPDM rubber rated to 250 degrees F (CRINRB =180 F).

D. Plug valves located in vaults shall be lever operated.

E. Valves shall be satisfactory for applications involving throttling service as well as frequent or infrequent on-off service. The valve closing member should rotate approximately 90 degrees from the full-open to full-close position and vice-versa.

F. Valves 4 inches thru 6 inches in size shall have a two (2) inch operating nut while eight (8) inch and larger valves shall be provided with a 2 inch operating nut on the worm gear operating mechanism.

G. Valves up to 12-inch shall have 175 psi working pressure, valves larger than 12-inch shall have 150 psi working pressure, unless otherwise noted on the Drawings.

H. All valves shall be supplied with a posi-cap alignment device. Provide valve nut extension if valve is installed deeper than 60" cover.

I. Valves shall be coated with fusion bonded epoxy coating on interior and exterior, 6 mils min.

J. Plug valves shall be by Val-Matic Model 5600 Series, GA Industries ECO-Centric, Dezurik PEF Series, Pratt Ballcentric, Clow F-5400 Series, or equal.

3.11 Valve Boxes & Curb Boxes

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

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

3.12 Wastewater Combination Air Valve

A. Valve shall be capable of venting sufficient quantities of air as determined by the manufacturer's approved sizing methods, while pipelines are being filled and allowing air to re- enter while pipelines are being drained.

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

C. Combination Air Valves shall be automatic float operated valves designed to exhaust large quantities of 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. The valve shall perform the function of both Air Release and Air/Vacuum Valves and be furnished as a single body or dual body type as indicated on the plans.

1. Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited, certifying body.
2. Valve shall be Val-Matic single body 801 or 803 Series, ARI D-020 Series, or approved equal.
3. Valves shall be supplied with flushing attachments to allow periodic flushing of sediment, grease, and solids. Attachments consist of an inlet isolating valve, bronze blow off and flushing valves, and a minimum of five feet of rubber hose with quick disconnects to allow connection to a clean water source.
4. Valves shall be coated with fusion bonded epoxy per AWWA C550.
5. Valves shall be installed in a manhole structure per the Town standard drawings.
6. Valve vaults must be equipped with an exhaust pipe extending to a downward facing elbow with the opening at an elevation of eighteen (18) inches above ground, unless noted otherwise on plans.

3.13 Sanitary Sewer Manholes

A. Precast Concrete Manholes & Structures

1. Precast manholes and structures shall conform to the Town Standards and Specifications. Provide cast-in-place concrete bases where shown.
2. Except where otherwise approved by Town, precast manhole components shall consist of reinforced concrete pipe sections especially designed for manhole construction and manufactured in accordance with ASTM C 478, except as modified herein.
3. Precast, reinforced concrete manhole bases, riser sections, flat slabs and other components shall be manufactured by wet cast methods only, using forms which will provide smooth surfaces free from irregularities, honeycombing or other imperfections.
4. Manholes shall be free from defects and shall be subject to rejection including:
    a. Fractures or cracks
    b. Defects that indicate imperfect proportions, mixing, or molding
    c. Surface defects such as honeycombing
    d. Internal diameter varies more than 1% from the nominal diameter
    e. Deviations more than one-quarter (1/4) inch from the straight edge at any point across the top fo the manhole cone section or riser ring.
    f. Visible steel reinforcing except for stirrups or spaces used for positioning during manufacture and reinforcement bars visible at the manhole structure end, provided these reinforcement bar ends are properly grouted in conformance with applicable ASTM specifications
    g. Illegible or unmarked manhole sections not clearly marked with date of manufacture, Tradename, size designation section number, or ASTM number.
5. Manhole sections shall not be installed until at least five (5) days after having been cast unless granted in writing by the Town.
6. No “see through” lift holes shall be allowed on precast concrete manholes.

7. Sanitary Sewer Manholes
    a. Provide manhole with tongue and groove joints. Seal joints with all of the following methods:
        1) Rubber Gasket in accordance with ASTM C443
            a) Manufacturers: Provide rubber gasket from the following:
            b) O-Ring Gasket, by Press-Seal Gasket Corporation.
            c) Or approved equal.
        2) Preformed Flexible Joint Sealant in accord with ASTM C990 & AASHTO-M198.
            a) Manufacturers: Provide joint sealant from the following:
            b) EZ Stik, by Press-Seal Gasket Corporation.
            c) Kent Seal #2, by Hamilton-Kent.
            d) RU 106 RUB'RNEK LTM, by Henry Co.
            e) Or approved equal.
        3) Butyl Rubber Backplaster-exterior
            a) Manufacturers: Provide joint sealant from the following:
            b) Trowelable EZ Stik #3, by Press-Seal Gasket Corporation
            c) Or approved equal.
        4) Polyethylene Plastic Sheeting Film
            a) Manufacturers: Provide joint sealant as required to protect the joint from backfill operations:
            b) 6 mm polyethylene plastic sheeting film by Visqueen.
            c) Or approved equal.
8. All precast manhole components shall be of approved design and of sufficient strength to withstand the loads imposed upon them. They shall be designed for a minimum earth cover loading of 130 pounds per cubic foot, an H-20 wheel loading, and an allowance of 30 percent impact.
9. Mark date of manufacture and name or trademark of manufacturer on inside of barrel.
10. The barrel of the manhole shall be constructed of various lengths of riser sections to provide the correct height with the fewest joints.
11. Except as approved by the Town, openings in the barrel of the manholes for pipe connections will not be permitted closer than one foot from the nearest joint. Special manhole base or riser sections shall be furnished as necessary to meet this requirement.
12. A precast or cast-in-place slab or precast eccentric cone, as shown or approved, shall be provided at the top of the manhole barrel to receive the cast iron frame and cover.

B. Riser Rings
1. Riser rings shall be used for all precast and masonry manholes and structures, where required. Stacks of riser rings shall be as specified, and shall be provided between the top of the cone or slab and the underside of the manhole casting for adjustment of the casting to finished grade.
2. Riser rings shall be precast concrete and shall have a minimum thickness of 2 inches and a maximum thickness of 6 inches. No more than two (2) riser rings shall be stacked together to reach the finished grade without the written approval of the Town / Engineer.

3. Riser ring joints shall be sealed with the following method:
    a. Preformed Flexible Joint Sealant in accordance with ASTM C990 and AASHTO-M198.
        1) Manufacturers: Provide joint sealant from the following:
            a) RU 106 RUB'RNEK LTM, by Henry Co.
            b) EZ Stik, by Press-Seal Gasket Corporation.
            c) Kent Seal No 2, by Hamilton Kent.
            d) Or Approved Equal.

C. Sanitary Manhole Chimney Seal
1. Internal manhole chimney seals shall consist of a flexible internal rubber sleeve, interlocking extension, and stainless steel compression bands conforming to ASTM C 923.
2. The seal shall remain flexible throughout a 25-year design lift , allowing repeated vertical movement of the frame of not less than two (2) inches and repeated horizonal movement of the frame of not less than one-half (1/2) inch. The sleeve portion of the seal shall b a minimum double pleated with a minimum unexpanded vertical height of 8, 10, or 13 inches respectively. The sleeve and extension shall have a minimum thickness of three-sixteenths (3/16) inches and shall be made from a high quality rubber compound conforming to the applicable requirements of ASTM C 923, with a minimum 1500 psi tensile strength, a maximum 18% compression set, and a hardness (durometer) of 48 +/- 5.
3. The area of the seal that compresses against the manhole frame/casting and the chimney/cone shall provide a watertight seal.
4. The bands shall be fabricated from 16 gauge stainless steel with no welded attachments and shall have a minimum adjustment range of two (2) diameter inches. Any screws, bolts, or nuts used to lock the band in place shall be stainless steel.
5. The internal seals shall be as manufacture red by
    a. Cretex Specialty Products
    b. NPC Specialty Products
    c. Or equal approved in writing by the Town

D. Castings
1. Catalog Number
    a. The frame and Cover shall be as follows
        1) Neenah R-1713-B-SP, or
        2) East Jordan Iron Works Model 1022-1AGSMD
    b. All castings shall have a machined bearing surface with Type F concealed pickholes
2. Markings
    a. Sanitary sewer manhole covers shall be a solid lid casting. The words "Sanitary Sewer" and "Town of Danville" must be cast in recess letters two (2) inches in height onto solid lid covers.
3. Requirements
    a. Castings shall be manufactured in accordance with ASTM A 48 – Class 35B, and have a minimum tensile strength of 35,000 psi.
    b. Boltdown castings shall be provided in Special Flood Hazard Areas, or as determined by the Town.
    c. Casting shall be of uniform quality, free from blow holes, porosity, hard spots, shrinkage, distortion, or other defects. They shall be smooth and well-cleaned by shot blasting or other approved methods.

E. Concrete Mix
   1. Proportioning and Design of Class “A” Concrete Mix:
      a. Minimum compressive strength at 28 days: 4,000 psi.
      b. Maximum water-cement ratio by weight: 0.50.
      c. Minimum cement content: 564 pounds per cubic yard.
   2. Proportioning and Design of Class “B” Concrete Mix:
      a. Minimum compressive strength at 28 days: 3,000 psi.
      b. Maximum water-cement ratio by weight: 0.50.
      c. Minimum cement content: 517 pounds per cubic yard.

F. Flexible Pipe Joint at Manhole Base for Sanitary Manholes
   1. An approved flexible joint shall be provided between each pipe entering and exiting the manhole. Pipe to structure connections shall conform to the details shown. The joint into the manhole base shall be completely watertight.
   2. Provide products manufactured to meet the requirements of ASTM C923.

G. Manhole Flow Channels and Bench Walls
   1. The channels shall be shaped and formed for a clean transition with proper hydraulics to allow the smooth conveyance of flow through the manhole. The bench wall shall be formed from the invert to a minimum height of 80% of the inside diameter of the inlet and outlet pipes to form a “U” shaped channel. The bench top shall be constructed at a one-half (1/2) inch per foot slope from the manhole wall.
   2. Where a flow channel is constructed as an integral section of the precast base, it shall be shaped and formed as described above, wit the exception that the bottom of the flow channel may be formed from the bottom of inlet and outlet pipes if the pipe wall thickness is not greater than one (1) inch.
   3. For cast-in-place flow channels, the bottom invert of all pipes entering a manhole shall be at least three (3) inches above the top of the base slab to the outlet invert so the finished sewer channel may be installed and shaped.
   4. For connections to existing sanitary sewer structures, flow channels shall be shaped as if it were a new manhole.

H. Manhole Steps
   1. Steps shall conform to the requirements of ASTM C 478 and be manufactured using steel rods encased in polypropylene plastic. Steps shall be factory installed when the manhole is manufactured.

3.14 Lift Station Materials

A. Quality Assurance
   1. The pumps shall be as specified in 2.13 – Lift Stations. The pumps shall be capable of operating in a liquid temperature up to 104 degrees F.
   2. The pump, mechanical seals and motor units provided shall be from the same manufacturer.
   3. The pumping unit manufacturer shall test each pump for mechanical and electrical correctness.
   4. All control panels shall be designed and constructed to UL 508A standards. All control panels shall be UL 508A listed. Control panels shall be made available to the Town / Engineer during factory testing.

B. Submittals

1. Standard submittal data for pump approval must consist of:
    a. Manufacturer's Certificate of compliance certifying compliance with the referenced specifications and standards.
    b. Shop drawings with performance data and physical characteristics.
        1) Certified performance total dynamic head, capacity, brake horse power, efficiency, and required net positive suction head curves for each pump supplied.
    c. Manufacturer's installation instructions.
    d. Manufacturer's operation and maintenance material and manuals.
    e. Coatings
    f. Weights
    g. Anchor Bolts
    h. Bill of Materials
    i. Repair Parts
    j. Certified copies of test reports.
    k. Pump outline drawing.
    l. Station drawing for accessories.
    m. Warranty Information.
    n. Electrical:
        1) Submit all electrical requirements for each piece of equipment including voltage, phase, and load data.
        2) Submit a drawing showing the electrical enclosure placement within the pump station. Placement must be approved by the Town / Engineer prior to installation.
        3) Provide interior and exterior layouts of control panels where applicable. Layouts shall be to scale and a bill of material shall be included.
        4) Submit information on all pilot and control components. This includes but is not limited to: pilot lights, relays, push buttons, and timers.
        5) Provide wiring and interconnection diagrams for each piece of equipment. For example, submitting one diagram for all screening equipment is not acceptable. Differentiate between panel and field wiring.
    o. “Typical” diagrams are not acceptable. Manufacturer’s standard diagrams may be submitted if they are made specific for this project by:
        1) Showing all included options, special items, etcetera.
        2) Unused options or features shall be crossed out or deleted.
        3) Identify the drawing with project name, equipment name, and tag number.
    p. Statement of compliance with AFBMA B-10 bearing lift and shaft deflection requirements of this specification section.
    q. Operator training data and operator training lesson plans shall be submitted with the revised copies of the O&M manuals.
    r. Manufacturer’s representative reports shall be submitted within seven (7) days of each site visit. Product and material certifications and inspection data shall be included with report(s).
    s. Standard submittal data for plug and check valve approval must consist of:
        1) Shop Drawings
        2) Product Data

t. Operation and Maintenance Manuals
   1) The Contractor shall submit operation and maintenance manuals for the pump equipment furnished hereunder.
   2) The Contractor shall submit operation and maintenance manuals for the plug and check valves furnished hereunder.

u. Local Representative and Service Provider.

C. Submersible Sewage Pumps

1. Pump manufacturer shall be subject to review and approval of Town. The motors shall be of a voltage, phase, and speed as approved by the Town. Impeller configuration shall be subject to review and approval of Town.
2. In general, Pump models shall be the following unless otherwise approved in writing by the Town
   a. Pumps less than 7.5 HP shall be Tsurumi C Pumps
   b. Pumps greater than or equal to 7.5 HP shall be Hydromatic Chopper Pump HPE
3. Tsurumi
   a. Pumps shall be designed to pump wastewater, sewage, or effluent containing 3" solids without damage during operation. The pumps shall be designed so that the shaft power required (BHP) shall not exceed the motor rated output throughout the entire operating range of the pump performance curve. Pump units shall be designed so that cavitation will not occur at open discharge.
   b. Materials of Construction - All major parts of the pumping units including casing, impeller, discharge elbow, and motor frame shall be manufactured from gray cast iron, ASTM A48 CLASS 35. Units shall have a field adjustable and or replaceable, high chrome iron cutter plate. Internal and external surfaces coming into contact with the pumpage shall be protected by a fused polymer coating. All exposed fasteners shall be stainless steel. All units shall be furnished with a discharge elbow with 150 lb. flat face flange and NPT companion flange. Impellers shall be of the single or two vane semi-open solids handling design equipped with tungsten carbide vane tips and shall be slip fit to the shaft and key driven. The pump casing shall incorporate an air relief valve.
   c. Mechanical Seal - All units shall be furnished with a dual inside mechanical shaft seal located completely out of the pumpage, running in a separate oil filled chamber and further protected by an exclusionary oil seal located between the bottom seal faces and the fluid being pumped. The oil chamber shall be fitted with a device that shall provide positive lubrication of the top mechanical seal, (down to one third of the standard oil level). The device shall not consume any additional electrical power. Mechanical seals shall be rated to preclude the incursion of water up to 42.6 PSI (98.4 Ft.). Units shall have silicon carbide versus silicon carbide upper and lower mechanical seal faces. Mechanical seal hardware shall be stainless steel. Units designed to exceed 42.6 PSI at shutoff head shall incorporate seal pressure relief ports.
   d. Motor - The pump motors shall be ___ HP, ___ V, 60 HZ, ___ Phase and shall be NEMA MG-1, Design Type B equivalent non explosion-proof. Motors shall have a 1.15 service factor and shall be rated for 20 starts per hour. Motors shall be air-filled, copper wound, class F insulated with built in thermal and over current protection for each winding. Motor shaft shall be 420 stainless steel and shall be

supported by two permanently lubricated, high temperature ball bearings, with a B-10 life rating at best efficiency point of 60,000 hours. The bottom bearing on units 7.5 HP and below shall be a single row, double shielded, C3, deep groove type ball bearing. The top bearing on all units shall be a single row, double shielded, C3, deep groove type ball bearing. Motors shall be VFD rated.

e. Power Cable and Cable Entrance - The pump power cable shall be suitable for submersible pump applications and shall be field replaceable utilizing standard submersible pump cable. The cable entrance shall incorporate built in strain relief and a combination three way mechanical compression sealing with a fatigue reducing/thermal expansion boot. The cable entrance assembly shall contain a anti-wicking block to eliminate water incursion into the motor due to capillary wicking should the power cable be accidentally damaged.

4. Hydromatic
   a. The pump shall be non-overloading throughout the entire range of operation without employing a service factor. The pump shall reserve a minimum service factor of 1.30. The performance curve submitted for approval shall state in addition to head and capacity performance, the pump efficiency, solid handling capacity, and reflect motor service factor.
   b. Performance:
      1) Chopper Pump
      2) Quantity:
      3) Impeller size shall be ___
      4) Discharge size shall be an __" ANSI flange
      5) Motor shall be __ HP: __ 60Hz; 3 phase; listed; oil filled design
      6) Each pump power cord shall be a minimum of 75' in length and be epoxy potted
      7) Each pump shall have a factory performance test with individual pump performance curves. Each pump shall operate at the following conditions:
         a) _____ GPM at ___' TDH; Design Point
         b) _____ TDH Shut-off
   c. Component Design and Materials of Construction
      1) Castings - Cord Cap / Motor Housing / Bearing Housing / Seal Plate shall be ASTM A48 Class 30 Cast Iron
      2) Shaft shall be 416 Stainless Steel
      3) Impeller - ASTM A48 Cast Iron Class 30 or ASTM B584-836 Ductile Iron Class 65
      4) Fasteners / Hardware shall be 302 Stainless Steel with optional 316 Stainless Steel
      5) Elastomers for O-Rings/Mechanical Seals/Cord Grip Grommets shall be Nitrile with optional Fluoropolymer Elastomer
      6) Mechanical Seals shall be Carbon/Silicon Carbide with optional Silicon Carbide/Silicon Carbide, Tungsten Carbide/Silicon Carbide or Cartridge Seal
      7) Power Cable shall be type SOOW or W while Control Cable shall be SOOW
      8) Lifting Ball shall be welded or forged 300 Series Stainless
   d. Electrical Power Cord - The pump shall be double protected with a compression fitting and an epoxy potted area at the power cord entry to the pump. The power cable entry into the cord cap assembly shall first be made with a compression fitting. Each individual lead shall be stripped down to bare wire installed in a socket and enclosed

in an over molding. Mating pins shall be provided and attached to the individual Teflon lead wires and enclosed in another over molding which will be affixed to the cord cap. This area of the cord cap shall then be filled with an epoxy compound potting. This assembly will prevent water contamination from gaining entry even in the event of wicking or capillary action. The cord cap assembly where bolted to the motor housing shall each be sealed with a Nitrile O-ring on a beveled edge to assure proper sealing. Strain relief shall be integral to the power cable and must be clamped over the molding and vulcanized to the outer jacket of the cable. A stator lead sealing gland or terminal board shall not be relied upon to prevent moisture from contaminating the motor. The power cable will be domestic type SOOW, 4-wire rated at 90C below 30 amps or type W, 4-wires rated at 90 C above 30 amps. The control cable type will be SOOW, 5-wires. The cable size will be based on rated horsepower amps and NEC ampacities ratings at the cable's rated temperature for intermittent / continuous duty. Both the power and control cables will contain a grounding wire of the same size as the current carrying wire.

e. Motors

1) The motors shall meet premium efficiency in accordance with IEC 60034-30, level IE3 and NEMA MG1 [NEMA 12.60 Enclosed Motor]. Motor rating tests shall be conducted in accordance with CSA C390-10 requirements and shall be certified accurate and correct by a third party certifying agency. A certificate shall be available upon request. The motors are submerged in non-toxic, oil filled, cool running design providing significantly reduced operating temperatures. Pump designs requiring a secondary cooling apparatus shall be deemed unapproved and not equal. Air filled pump designs shall not be considered equal or approved.
2) Motor will be of the squirrel-cage induction design, NEMA type A or B for 3 phase [Per NEMA MG1 1.19] & NEMA type L for 1 phase [Per NEMA MG1 1.20]
3) The copper stator windings shall be insulated with moisture resistant Class H insulation materials, rated for 180° C (356° F). [Per NEMA MG1 1.66]
4) The service factor shall be 1.3 in wet pit service and 1.0 for VFD operation (as defined by MG1 standard). The motor shall have a voltage tolerance of +/- 10% from nominal, and a phase to phase voltage imbalance tolerance of 1%.
5) The rotor bars and short circuit rings shall be made of cast aluminum.
6) The motor shall be designed for continuous duty. The maximum continuous temperature of the pumped liquid shall be 40° C (104° F), and intermittently up to 50° C (122° F). Each of the three phases will have a UL / FM approved thermostat or thermistor. The winding operating temperature at rated horsepower and service factor will be a maximum of 130° C @ 40° C ambient.
7) The motor shall be capable of handling up to 15 (>=20 kW) and 20 (<20 kW) evenly spaced starts per hour without overheating. [Per NEMA MG1 12.54]
8) The motor shall meet the requirements of NEMA MG1 Part 30 and 31 for operation on PWM type Variable Frequency Drives. The rotors will have high efficiency laminated steel with die cast bars and shorting rings. The stators will have high efficiency laminated steel (if required to meet premium efficiency), with inverter duty rated, Class H magnet wire & insulation materials. Each of the three phases will have a UL / FM approved thermostat or thermistor set for 130° C +/- 5°.

f. Bearings - The upper bearing shall be a heavy-duty radial single row ball bearing while the lower bearing shall be a double row heavy-duty angular contact ball bearing of the thrust limiting design. Minimum of 50,000 hours of B10 bearing life for radial & thrust bearings while operating across the entire hydraulic operating range of the pump. Any pumps having rated B10 life only at the BEP shall not be considered equal or approved. Bearing shall be lubricated for life from the factory and will be accomplished through the non-toxic, low viscous, dielectric oil in the frame. Pump designs requiring periodic scheduled bearing service shall not be considered equal or approved. Single row or sleeve lower bearings shall not be acceptable.

g. Shaft - The pump shall be an integral, one-piece unit adequately designed to meet the maximum torque required at any normal start up condition or operating point in the system. Shafts of carbon steel, chrome plated or spin welded shafts shall not be considered adequate or equal. Material of shaft shall be 416 stainless steel conforming to ASTM 8582. At BEP, the maximum shaft deflection at lower seal shall not exceed .002".

h. Fluid End

1) The impeller shall be ASTM Class 30 Cast Iron or ASTM Class 65 Ductile Iron with optional SST available. The impeller mounting is to be a slip fit onto a tapered shaft and a drive key. The impeller shall be attached to the shaft by an SST fastener and impeller washer. The impeller is to be balanced to ISO1944 standard. Impeller designs that rely on fins or pins protruding into the suction path to assist in the handling of fibrous material shall not be considered equal. Impellers shall be of the radial single or two vane type or a vortex impeller having the ability to pass a wide range of solids. Any impeller design requiring a mechanical bypass mechanism located in the volute in order to handle solids shall not be considered equal or acceptable.

2) The volute shall be ASTM Class 30 also with optional SST. It will consist of a centerline discharge one-piece design. The passages are to be large enough to pass the same solid size as the impeller. The discharge and inlet flanges shall be ANSI Class 125 and be integrated into the volute case.

i. Seals

1) Each pump must be equipped with a switchable seal design allowing for the use of either tandem mechanical seals or a cartridge dual seal design without voiding the agency rating of the pump. Pumps utilizing one seal technology shall not be considered equal or approved. In the standard tandem mechanical seal configuration, the lower seal shall be of the type 2 design and constructed of Carbon / Silicon Carbide and be replaceable without disassembly of the seal chamber and without the use of special tools. The upper seal shall be of the type 2100 design and constructed of Carbon / Silicon Carbide. Each seal will not require routine maintenance or adjustment. For ease of maintenance both the lower and upper seals shall be locally available and of a standard design. For ease of service, the pumps shall be available with drop in cartridge seal constructed of Silicon Carbide / Carbon. The cartridge seal design shall fit into the seal chamber with a switchable seal plate allowing for retrofit in the field. Units equipped with opposing mechanical seals shall not be acceptable. All seals shall be optionally available in Tungsten

Carbide construction.

2) The integrity of the mechanical seal system shall be continuously monitored during pump operation and standby time. Two electrical probes shall be provided in a sensing chamber positioned between the primary and secondary mechanical seal for detecting the presence of water contamination within the chamber. The sending chamber shall be fitted with environmentally safe nontoxic oil. A solid-state relay mounted in the pump control panel or in a separate enclosure shall send a low voltage, low amperage signal to the probe, continuously monitoring the conductivity of the liquid in the sensing chamber. If sufficient water enters the sensing chamber through the primary mechanical seal, the probe shall sense the increase in conductivity and signal the solid-state relay in the control panel. The relay shall then energize a warning light on the control panel, or optionally, cause the pump to shut down. This system shall provide an early warning of mechanical seal leakage, thereby preventing damage to the submersible pump and allowing scheduled rather than emergency maintenance. Systems utilizing float switches or any other monitoring devises located in the stator housing rather than in a sensing chamber between mechanical seals are not considered to be early warning systems and shall not be considered equal.

j. Serviceability - The complete rotating assembly shall be capable of being removed from the volute without disturbing the suction piping, discharge piping, and volute. The motor housing, seal housing with seal plate and impeller still attached to the shaft shall be capable of being lifted out of the volute case from the top as one assembly. For ease of repair, the motor stator shall be securely held in place by an end ring so it can be easily removed without the use of heat or a press. No special tools shall be required for pump and motor disassembly. Stators held in place by heat shrink fit shall not be acceptable.

k. Testing - All pumps shall be built in a dedicated domestic factory with fifty years of continuous operation. All pumps shall be visually inspected to confirm that it is built in accordance with the specification as to HP, voltage, phase, and hertz. The motor seal and housing chambers shall be meagered for infinity to test for moisture content or insulation defects. Each pump shall be allowed to run dry to check for proper rotation. Discharge piping shall be attached, the pump shall be submerged in water, and amp readings shall be taken in each leg on each phase to verify balanced stator windings. The pump shall be removed from the water, meagered again, dried and the motor housing filled with dielectric oil. Volutes can receive hydrostatic testing to ensure high quality castings are being provided. All pumps shall receive standard Hydraulic Institute (HI) non-witnessed testing at a third-party agency-certified test lab. Pump motors can be tested on a factory dynamometer capable of simultaneously measuring torque and rotational speed. Testing conducted off site shall not be considered equal or approved.

l. Paint - The pump shall be painted with waterborne hybrid acrylic / alkyd paint. This custom engineered, quick dry, low VOC paint shall provide superior levels of corrosion and chemical protection. Optional coatings are available through the factory of chlorinated rubber, coal tar epoxy, and polyamide epoxy.

5. Mating Surfaces: All mating surfaces where watertight sealing is required shall be machined and fitted with rubber O-rings.

6. Housing: The stator winding, rotor and bearings shall be mounted in sealed submersible

type housing. The pump and motor are to be specifically designed so that they may be operated partially or completely submerged in the liquid being pumped. The pump shall not require cooling water jackets. Motor shall be provided with heat sensing units attached to the motor windings which shall be connected to the control panel to shut down pump if overheating occurs.

7. Cables: Pump motor cable and heat sensor/seal failure sensor cable shall be suitable for submersible pump applications and this shall be indicated by a code or legend permanently embossed on the cable. Cable sizing shall conform to NEC specifications for pump motors and shall be of adequate size to allow motor voltage conversion without replacing the cable. Cable of the proper length shall be provided to eliminate need for splices or junction boxes between pump and "control center."
8. Mounting Base: The pump mounting base shall include adjustable guide rail supports and a discharge connection with a standard flange. 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.
9. Guide Rails: A rail system shall be provided for easy removal of the pump and motor assembly for inspection and service. The system shall not require a man to enter the wet well to remove the pump and motor assembly. 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 attachment to the access hatch frame. All mounting equipment shall be stainless steel.
10. Rail Guide & Lifting Chain: The pumps shall be equipped with sliding brackets or rail guides. A stainless steel lifting chain of adequate length for the basin depth shall be provided for each pump. Each pump shall be equipped with a permanent, stationary lifting handle with a minimum clearance of twelve (12) inches between the top of the pump and bottom of the handle.
11. The rails and the rail guide 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. Concrete Pump Station Structure and Details

1. Provide the precast pump station structures of the type and size as shown on the drawings.
2. Provide the following items of accessories and equipment, subject to approval by the Town.
    a. Stainless steel lifting yokes and stainless steel chain or cable and clamps for each pump.
    b. Stainless steel pump guide rails.
    c. Positive type quick release discharge flange to allow pump removal without entering the station.
    d. Gravity vent.
    e. Entrance hatch.
    f. Piping, valves and valve vault.
    g. Electrical and control equipment.
3. Each station shall include a control panel enclosure, electrical disconnect, pressure transducer with high and low level float switch for high level alarm and low level shut- off,

alarm horn with a silencer, HOA with rheostat on the control panel, flashing alarm light with a red dome (120 VAC), rotatable stanchion arm for pump removal, spare check valve, set of spare seals for each pump, pressure gauge, three running time meters (one to record the time both pumps are operating), tool kit, cable hoist/puller and 4 inch or 6 inch emergency pump connection. Other than piping and valving, all materials shall be of 304/316 Stainless Steel or non-metallic, with Town approval. Galvanized components are not allowed.

E. Controls

1. The control center shall be built in a NEMA 4X stainless steel enclosure and shall be suitable for the specified horsepower and voltage for the pumping equipment. The control center shall bear the U.L. listed label as an assembly after manufacturing of a U.L. 688A shop without exception. The outer door of the panel shall be hinged dead front with provisions for locking with a padlock. Inside shall be a separate hinged panel to protect all electrical components. H-O-A switches, run lights, circuit breakers, will be mount on stand off's and noting shall be mounted on the hinged panel.
2. B.A circuit breaker and magnetic starter with three (3) leg overload protection and manual reset shall be provided for each pump. Starters shall have auxiliary contacts, on three phase applications, to operate both pumps on over-ride condition. A separate circuit breaker shall be supplied for power to the control circuit. The control center shall include an extra circuit breaker of adequate size to provide 115-volt, single (1) phase power for remote monitor panel. The control center shall include a voltage transformer to reduce supply to 115-volt, single (1) phase to be used for all control functions and associated items required. An alternating relay shall be provided to alternate pumps on each successive cycle of operation. A green light and H-O-A switch shall be provided for each pump. A terminal strip shall be provided to make field connections of pump power leads, transducer, seal sensor leads, and remote monitor panel interconnections.
3. The control center shall incorporate connections for heat sensors which are installed in the pumps. The connection shall disconnect the starter upon high temperature signal, and will automatically reconnect when condition has been corrected.
4. The control center shall incorporate connections for seal failure sensors which are installed in the pumps. The panel will have a seal failure alarm light for each pump. This alarm indicates failure of the lower mechanical seal in the pump. This will be an alarm light only and will not shut down the pump.
5. The control center shall include an hour meter for each pump to register the elapsed operating time of each pump.
6. The control center shall have a high-water alarm built-in the main enclosure. The high-water alarm shall consist of a flashing alarm light with red Lexan plastic cover or red glass globe with metal guard mounted on top of the enclosure such that it is visible from all directions. An alarm horn shall be mounted on the side of the enclosure. A push to test horn and light button as well as a push to silence horn button shall be provided and mounted on the side of the enclosure.
7. The control center shall include a condensate heater to protect against condensation inside the enclosure. The heater shall be placed so as not to damage any other component or wiring in the control center.
8. The control center shall include lightning protection and a phase monitor relay to shut down the control circuit and protect the equipment due to loss of phase or phase reversal. The three phase sequence voltage relay shall be of the eight-pin connector type.

9. The control center shall incorporate an alternator selector switch to allow selection of automatic alternation or manual selection of the lead pumps.
10. The control center shall include a GFI convenience outlet with a 20 AMP breaker and suitable transformer or power supply to provide 110 single (1) phase power to the convenience outlet.
11. K.A minimum four (4) inch PVC schedule 40 wall conduit shall be provided from the wet well basin to the control center which will allow the pump power cables, sensor cables and float switch cables to be pulled through without difficulty and allow the use of one (1) piece cables from the pumps and float switches to the control center. The conduit shall be sealed at the control center to avoid entrance of sewer gases into the control panel.
12. JUNCTION BOXES SHALL NOT BE USED.
13. The control center and associated components shall be mounted on a non-maintenance type pedestal or mounting stand constructed of aluminum. The control center shall be located as to provide safe access to the panel while wet well hatch doors are opened, and shall be positioned so as not to be between the access drive and the wet well.
14. The panel shall have an interlocking main and generator breaker. The generator receptacle shall be mounted on the side of the panel and be model_____. The main disconnect shall be stainless steel NEMA 4X with a correct size circuit breaker.
15. There shall be OmniSite remote monitor mounted in the control panel
16. Level Control will be controlled by a Hydromatic Novus system connected to a Model 6100, Sigma submersible transducer, 0-10PSI range.

F. Submersible Pump Station Piping and Valves
1. Furnish complete station piping, valve pit, check valves and plug valves.
2. The discharge pipe and fittings shall be ductile iron Class 350. Inside pipe and fittings shall be flanged. Bell end pipes or fittings with mechanical joints shall be provided at or near the outside face of the station well. Piping shall be supported independent of the sewage flanges.
3. All plug valves shall be per the Materials specifications.
4. All check valves shall be iron body, bronze mounted, with outside lever and weight, to operate without excessive loss of head. Valves shall be rated for 150 psi differential pressure. Covers shall be bolted and ends flanged. Check valves shall be of the size specified on the plans, shall be swing type check valves as manufactured by Clow, M & H, or approved equal. The valve shall permit flow in only one direction, close tightly when the discharge pressure exceeds the inlet pressure, and shall close without a slam or hammering action. All internal parts, including the disc seat, shall be easily replaced in the field without removing the valve from the pipeline. Valves shall be coated with fusion bonded epoxy coating on interior and exterior, 10 mils min.
5. Guide rails and all interior miscellaneous metals, including bolts, shall be stainless steel.

PART 4 - SPECIFICATIONS OF CONSTRUCTION

4.1 Scope of the Work

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

4.2 Utilities for Construction Purposes

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

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

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

4.3 Material Furnished by the Contractor

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

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

4.4 **Material Furnished by the Town**

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

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

4.5 **Disposition of Defective Material**

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

4.6 **Material Verification**

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

4.7 **Disposal of Waste and Water**

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

4.8 **Erosion Control**

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

4.9 **Excavation & Backfill for Wastewater**

A. Excavation

1. All earth excavation shall be open cut from the surface, except where otherwise shown on the drawings. Excavation shall be interpreted to mean clearing the site; pavement removal where required; excavation of the material encountered in the proposed grade of the conduit; furnishing and placing all sheeting, trenching, trimming and bracing; supporting of structures above and below ground; removal and disposal of water; repairing damage to structures, conduits, and utilities encountered; backfilling; compaction; temporary surfacing of roadways; disposal of surplus materials; providing barricades; temporary lighting; and restoration of the site. During the progress of excavation, care shall be exercised to reserve sufficient material for

filling and backfilling.

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

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

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

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

E. Utility Trench Unstable Soil
   1. In areas where unstable soil is encountered below the bottom of the pipe, the Contractor shall notify the Town / Engineer Representative. The length and depth to which unstable soil is to be excavated shall be as determined by the Town / Engineer Representative and

no such material shall be excavated unless and until so ordered by the Town / Engineer Representative. All unstable soil shall be completely removed from the site of the work.

2. In cases where over-excavation for the replacement of unacceptable soil materials is required, the excavation shall be backfilled to the required subgrade with special backfill material and thoroughly compacted as specified.

F. Width of Trench

1. The minimum width of the trench at and below the top fo the sanitary sewer, lateral, or force main shall be only as wide as necessary for proper installation and backfilling.
2. The minimum trench width for sanitary sewers, laters, and forcemains shall not be less than the greater of the following:
   a. Minimum Width = Pipe O.D. + 16 inches, or
   b. Minimum Width = (Pipe O.D. x 1.25) + 12 inches
3. Under no circumstances shall the distance from the trench wall to the outside edge of the pipe be less than six (6) inches for pipes six (6) inches and less, and eight (8) inches for pipes eight (8) inches and larger.

G. Sheeting, Bracing, and Shoring

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

H. Sheeting Left in Place

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

I. Removal of Water

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

J. Piling of Excavated Material

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

K. Disposal of Excavated Materials

1. All suitable excavated material shall be used in backfilling over the pipe and appurtenances or distributed otherwise in lawn areas to the design grades. All excess/unsuitable excavated material shall be removed by the Contractor and disposed of in a timely, legal, and appropriate manner. The Contractor shall be responsible for securing disposal site(s), as well as all grading or reseeding required at same.

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

L. Blasting
1. Blasting and explosives will not be permitted.

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

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

O. Backfill and Fill; Suitable & Unsuitable Materials
1. See “Materials”.

P. Embedment Material for Flexible Pipes
1. See “Materials”.

Q. Embedment Material for Rigid Pipes
1. See “Materials”.

R. Special Backfill
1. See “Materials”.

S. Compaction
1. Compaction will be required of all embedment material. The Contractor shall maintain on the job site with each crew, a copy of the manufacturer’s recommendations with respect to pipe embedment material and compaction.
2. With respect to special backfill material, the Contractor shall place the material in lifts and compact each lift per the following table.
3. Material shall be within plus or minus two percent (2%) of optimum moisture content. The Contractor shall submit to the Town written documentation of proof of compaction. Provide mechanical compaction for cohesive material and vibratory compaction for granular materials, unless otherwise approved by the Town / Engineer. Jetting, flooding, puddling, or vibroflotation may not be used without written consent of the Town/Engineer. Noncohesive soils shall be compacted with vibrating roller or equivalent; cohesive soils shall be compacted with sheeps-foot roller, pneumatic tamping, or approved equivalent, unless otherwise indicated. Granular bedding for structures shall have each lift thoroughly compacted and seated with the subgrade. Compaction methods

and procedures shall be subject to approval of the Town / Engineer. Unless otherwise indicated or approved by the Town / Engineer, place fills in the loose lift thicknesses indicated hereafter and compact to a dry density not less than the specified percentage of maximum dry density, determined by the Modified Proctor Test, ASTM D1557, unless otherwise noted.

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

T. Compaction Testing During Construction

1. Quality Control Testing During Construction: Contractor's independent testing service shall inspect and approve subgrades and fill layers before construction Work is performed thereon. All associated costs for density testing as specified by the Town shall be at the expense of the Contractor.
2. Testing agency will conduct and interpret tests and state in each report whether tested work complies with or deviates from specified requirements.
3. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
4. Tests of subgrades and fill layers shall be taken as follows:
    a. The frequency of Contractor confirmation tests shall be not less than as follows: Each test location for trenches shall include tests for each layer, type, or class of backfill from bedding to finish grade.
        1) Trenches for Underground Facilities:
            a) In open fields: Two locations every 1,000 linear feet.
            b) Along dirt or gravel roads or off traveled Right-of-Way: Two locations every 500 linear feet.
            c) Crossing paved roads: Two locations along each crossing.
            d) Under pavement cuts or within two feet of pavement edges: One location every 400 linear feet.
        2) For Structural Backfill: On 30-foot intervals on all sides of the structure for every compacted lift, but no less than one per lift on each side of the structure for structures less than 60 feet long on a side.
        3) In Embankment or Fill: One per 1,000 square feet on every compacted lift.

4) Base Material: One per 1,000 square feet on every compacted lift.
5) Footing Subgrade: For each strata of soil on which footings will be placed, conduct at least 1 test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to Town / Engineer.

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

U. Construction in Highway Rights of Way

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

V. Special Highway and Railroad Crossings

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

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

1. General
   a. The pilot hole and reamed hole shall be drilled so as to provide straight sections and uniform transitions from straight to long radius curve sections. The pipeline profile shall contain no high points except as noted on the drawings. The drill path shall be monitored by using a pothole machine and electronic package. The minimum required cover on sewage force mains shall be five (5) feet. At no time shall any bore contain voids. All directional drilling shall be stopped immediately if any surface deformation is detected in the road right-of- way.
2. Equipment Requirements:
   a. The Contractor shall ensure that appropriate equipment is provided to facilitate the installation. Equipment shall be matched to the size of pipe being installed and shall have appropriate torque and thrust/pullback capacity for the diameter and length of the intended drilling sections. The Contractor will ensure that the drill rod can meet the bend radius required for the proposed installation.
3. Drilling Fluids:
   a. In order to minimize friction and prevent collapse of the bore hole, introduce a soil stabilizing agent (drilling fluid) into the annular bore space from the trailing end of the drill bit. The rotation of the bit in the soil wetted by the drilling fluid creates a slurry. The slurry acts to stabilize the surrounding soil and prevent collapse of the bore hole as well as provides lubrication.
   b. Select or design drilling fluids for the site specific soil and ground water conditions.
   c. A mixture of bentonite clay or other approved slurry and potable water with a minimum pH of 6.0 shall be used as the cutting and soil stabilization fluid. The viscosity shall be varied to best fit the soil conditions encountered. Water shall be clean and fresh. No other chemicals or polymer surfactant are to be used in the drilling fluid without the written consent of the Engineer and after a determination is made that the chemicals to be added are not harmful or corrosive to the facility and are environmentally safe.

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

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

4. Installation

a. General

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

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

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

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

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

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

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

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

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

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

11) Carry out excavation for entry, exit, recovery pits, slurry sump pits, or any other excavation.

12) Confine free flowing (escaping) slurry or drilling fluids at the ground surface during pull back or drilling. Accomplish this by creating sump areas or vacuum operations to prevent damage or hazardous conditions in surrounding areas. Sump pits are required to contain drilling fluids if vacuum devices are not operated throughout the drilling operation.

13) Ensure adequate removal of soil cuttings and stability of the bore hole by monitoring the drilling fluids such as the pumping rate, pressures, viscosity and density during the pilot bore, back reaming and pipe installation. Relief holes can be used as necessary to relieve excess pressure down hole. To minimize heaving during pull back, the pull back rate is determined in order to maximize the removal of soil cuttings without building excess down hole pressure. Contain excess drilling fluids at entry and exit points until they are recycled or

removed from the site or vacuumed during drilling operations. Ensure that entry and exit pits are of sufficient size to contain the expected return of drilling fluids and soil cuttings.

14) After completing installation of the product the work site shall be restored. The work site shall be cleaned of all excess slurry left on the ground. Removal and final disposition of excess slurry or spoils as the product is introduced shall be the responsibility of the Contractor.
15) Excavated areas shall be restored in accordance with the Contract Documents. The cost of restoring damaged pavement, curb, sidewalk, driveways, lawns, storm drains, landscape, and other facilities is borne by the Contractor.
16) Contractor shall take responsibility for any damage caused by heaving, settlement, separation of pavement, escaping drilling fluid (frac-out), or the directional drilling operation, at no cost to the Owner. All restoration shall be per the Town's standards.
17) If an existing marked (or otherwise known) utility is damaged, stop bore immediately and repair at no cost to the Town.
18) If underground utilities and/or structures not shown on the Drawings are encountered, notify the Town and do not proceed until instructions are obtained.
19) Notify the Town if springs or running water are encountered.
20) Provide maintenance of traffic in accordance with the municipal street department, county highway department, or state department of transportation and these Specifications as applicable. Comply with the Manual of Uniform Traffic Control Devices when the former are silent.

5. Utility Verification (Potholing)
   a. Contractor shall conduct prior to the start of construction the verification of all underground utilities (potholing) that may conflict with construction.
   b. Potholing results shall be presented to the Town on a full set of drawings showing accurate locations of utilities. Information marked on the plans should include horizontal tie downs as well as depths related to USGS elevation.
   c. Alignment of the proposed utility (horizontal and vertical) may be adjusted in the field upon review of potholing results by the Town.
   d. All potholes are to be protected and marked so as to not cause injury.
6. Locating and Protecting Sanitary Sewer Laterals
   a. Sanitary sewer laterals are considered "private" and are not part of the public sewer system and begin at the inside face of the public sewer.
   b. It shall be the Contractor's responsibility to pothole and verify the location of the underground utility (sanitary sewer lateral) that may be in conflict with the water main construction.
   c. It shall be the Contractor's responsibility to protect sanitary sewer laterals during all construction activities.
   d. Any and all costs associated with locating, protecting, and repairing sanitary sewer laterals shall be considered incidental to the project cost and the responsibility of the Contractor.
7. Drilling Operations
   a. Directional drilling/boring shall use techniques of creating or directing a borehole along a predetermined path to a specified target location. This must involve use of mechanical and hydraulic deviation equipment to change the boring course and must use instrumentation to monitor the location and orientation of the boring head

assembly along a predetermined course.

b. Drilling must be accomplished with fluid assisted mechanical cutting. The spoils must be transported from the job site and be properly disposed. Under NO circumstances will the drilling spoils be permitted to be disposed into waterways, sanitary, storm, or any other public or private drainage system.

c. Steering shall be accomplished by the installation of an offset section of drill stem that causes the cutterhead to turn eccentrically about its centerline when it is rotating. When steering adjustments are required, the cutterhead offset section is rotated toward the desired direction of travel and the drill stem is advanced forward without rotation.

8. Locating and Tracking

a. The Contractor shall at all times provide and maintain instrumentation that will accurately locate the pilot bore/hole and measure drilling fluid flow and pressure.

b. The Contractor shall describe the method of locating and tracking the drill head during the pilot bore. The accepted methods of tracking directional bores are walkover, wire line, and wire line with surface grid verification, or any other system as approved by the Engineer. The locating and tracking system shall be capable of ensuring that the proposed installation is installed as intended. The locating and tracking system shall provide information on:

1) Clock and pitch information
2) Depth.
3) Transmitter temperature.
4) Battery status.
5) Position (x,y).
6) Azimuth, where direct overhead readings (walkover) are not possible (i.e. subaqueous or limited access transportation facility.)
7) Alignment readings or plot points shall be taken and recorded such that elevations from the top of and offset dimensions from the center of the product to a permanent fixed feature are provided. Provide elevations and dimensions at all bore alignment corrections (vertical and horizontal) with a minimum distance between points of fifty (50) feet. Provide a sufficient number of elevations and offset distances to accurantely plot the vertical and horizontal alignment of the installed product. Before commencement of a directional drilling operation, proper calibration of the equipment (if required) shall be undertaken.

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

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

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

9. Ream and Pullback

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

b. Reaming operations shall be conducted to enlarge the pilot after acceptance of the pilot bore. The number and size of such reaming operations shall be conducted at the discretion of the Contractor. However, the Contractor shall minimize potential

damage from soil displacement / settlement by limiting the ratio of the bore hole to the product size. The size of the back reamer bit or pilot bit, if no back remaing is required, will be limited relative to the product diameter to be installed as follows:

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

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

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

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

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

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

10. Drilling Failure

a. If conditions warrant removal of any materials installed in a failed bore path, it will be at no cost to the Owner. Promptly fill all voids by injecting all taken out of service products that have any annular space with excavatable flowable fill.

b. No payment will be made for failed bore paths, injection of flowable fill, products taken out of service or incomplete installations.

11. Work Affecting Existing Piping

a. Location of Existing Piping

1) Locations of existing piping shown should be considered approximate.

2) Contractor shall determine the true location of existing piping to which connections are to be made, and location of other facilities which could be disturbed during earthwork operations, or which may be affected by Contractor's Work in any way.

b. Taking Existing Pipelines Out of Service

1) Do not take pipelines out of service unless approved by Engineer.

2) Notify Engineer, in writing, at least 48 hours prior to taking pipeline out of service.

12. Quality Control

a. A representative of the Contractor must be in control of the operation at all times. The representative must have a thorough knowledge of the equipment and the procedures to be performed, and must be present at the job site during the installation.

b. The Town must be notified forty-eight (48) hours in advance of starting work. The installation shall not begin until the Town's representative is present at the job site and agrees that proper preparations have been made.

4.10 Pipe & Fittings for Wastewater

A. General Requirements

1. The Contractor shall furnish and install, complete and ready for continuous operation, all new water, sanitary sewer, and appurtenances as shown on the drawings and/or herein specified. The Contractor shall furnish and follow the manufacturer's recommendations and requirements for the installation and use of the selected pipe, fittings and special appurtenances.
2. A complete installation shall include materials, labor, all special features, appurtenances, supports, transitions between different types of pipe and structural modifications for the type of pipe furnished.
3. Contractor shall be responsible for verification of pipe loading during construction. Pipe design is based on final installation depth and required cover.

B. Replacement of Existing Pipes and Appurtenances

1. Unless shown or noted otherwise on the drawings, all existing sewer lines, water lines, drainage tile, culverts, or other pipe conduits or appurtenances that are disturbed by construction shall be repaired or replaced with the same type and size as encountered. The cost of all such repair or replacement shall be the Contractor's responsibility.
2. The location of all repaired lines shall be furnished to the Town / Engineer Representative as part of the As-Built Record Drawings. The information provided shall indicate the size, depth and material of the line as well as the size and material utilized in making the repair.

4.11 Polyethylene Encasement

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

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

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

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

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

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

G. Provide polyethylene wrap for valves if specified in Contract Documents.

4.12 **Pipe Tracing Wire**

A. Installation

1. Tracing wire shall be laid directly over the pipe and attached to the pipe at regular intervals not to exceed ten (10) feet.
2. Attach the tracer wire to the pipe using plastic "zip" strapping or metal wire.
3. The following technique shall be used to splice wires together:
   a. Use direct bury lug and strip the wire to 5/8".
   b. Place one stripped conductor into the lug.
   c. Tighten the set screw till it comes in contact with the solid conductor.
   d. Note the location of screwdriver and continue tightening the set screw ¾ turn for
      # 10 solid copper wire.
   e. Repeat the steps for the adjacent side.
   f. Remove sealant cover and discard. Close housing, aligning conductors until housing lid is fully latched.
4. For valves, the wire shall be brought up the outside of the valve or curb box riser or cleanout. Construct an opening in the lip of the valve box or curb box to allow the top of the tracer wire to be stored inside the box. Ensure that the opening is sized adequate so the cover will fit snug onto the box, once the tracer wire is installed. The wire should be installed with an excess length of 4-6 inches that is to be folded down in the valve box.
5. For cleanouts, the wire shall be brought up the outside of the cleanout. Wrap a minimum of 12" of wire around the outside of the cleanout within four inches of grade. No tracing wire should be drawn up inside or terminated inside a cleanout.
6. Successful completion of conductivity test to be completed by the Contractor and in the presence of the Town / Engineer. Successful completion of the test will be required prior to acceptance of water main.

4.13 **Pipe Installation for Wastewater**

A. General

1. Install piping as shown, specified, and as recommended by pipe and fittings manufacturer.
2. In event of conflict between manufacturer's recommendations and the Contract Documents, request interpretation from Town / Engineer before proceeding.
3. Town / Engineer will observe excavations and bedding prior to laying pipe by Contractor. Notify Town / Engineer in advance of excavating, bedding, pipe laying, and backfilling operations.

B. Cleaning Pipe and Fittings

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

C. Separation of Sewers from Potable Water Piping or Potable Water Structures

1. Horizontal Separation:
   a. Existing and proposed potable water mains and service lines, and sanitary, combined, and storm sewers shall be separated horizontally by clear distance of at least ten feet.
   b. If local conditions preclude the specified clear horizontal separation, installation will be allowed if potable water main is in separate trench or on undistributed

earth shelf on one side of sewer and with bottom of potable water main at least 18 inches above top of sewer.

c. No water main should be located within 8 feet of a sanitary or storm sewer manhole as measured from the outside edge of the water main to the outside edge of the structure.

d. Exception:

1) Where it is not possible to provide minimum horizontal separation described above, construct sewer pipe of pressure pipe complying with public water supply design standards of authority having jurisdiction. Hydrostatically test newly installed pressure piping to a minimum complying with public water supply design standards of authority having jurisdiction. Hydrostatically test water main and sewer as specified in this Section prior to backfilling. Hydrostatic test pressure at crossing shall be at least 150 psi.

2) Alternatively, the water main or the sewer line may be encased in a watertight carrier pipe which extends 10 feet on both sides of the crossing, measured perpendicular to the water main. The carrier pipe shall be of the materials approved by the Town for water main construction.

2. Vertical Separation:

a. Provide minimum vertical distance of 18 inches between outside of potable water main and outside of sewer when sewer crosses potable water main.

b. Center a section of potable water main pipe at least 17.5 feet long over sewer so that sewer joints are equidistant from potable water main joints.

c. Provide adequate structural support where potable water main crosses under sewer. At minimum, provide compacted select backfill for ten feet on each side of crossing.

d. Exceptions:

1) Where it is not possible to provide minimum vertical separation described above, construct sewer pipe of pressure pipe complying with public water supply design standards of authority having jurisdiction. Hydrostatically test water main and sewer as specified in this Section, prior to backfilling. Hydrostatic test pressure at crossing shall be at least 150 psi.

2) Encase either potable water main or sewer in watertight carrier pipe extending ten feet on each side of crossing, measured perpendicular to potable water main, with a watertight carrier pipe of the materials approved by the Town for water main construction.

3. Separation of Sewer Mains from Potable Water Structures:

a. Maintain sanitary setbacks from water supply wells and other water supply sources and structures per the requirements of 327 IAC 8-3.4-9.

D. Plugs (Bulkheads)

1. Temporarily plug installed pipe as directed by Town at end of each day of work or other interruption of pipe installation to prevent entry of animals, liquids, and persons into pipe, and entrance or insertion of deleterious materials into pipe. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

2. Install standard plugs in bells at dead ends, tees, and crosses. Cap spigot and plain ends.

3. Fully secure and block plugs, caps, and bulkheads installed for testing to withstand specified test pressure.

4. Where plugging is required for phasing of the Work or subsequent connection of piping, install watertight, permanent type plugs, caps, or bulkhead acceptable to Town /Engineer.

E. Bedding Pipe

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

F. Alignment

1. Install pipe accurately to line and grade shown and indicated in the Contract Documents, unless otherwise approved by Town / Engineer.
2. Slope piping uniformly as shown on the Drawings.
3. For gravity pipe installations, maintain reference line and grade with laser equipment daily for adjustment and accuracy. Correct deficiencies in equipment, reference line and reference grade. Take precautions to prevent deflections in reference line and grade.
4. Contractor shall install sewer pipe in compliance with slope requirements shown on the Drawings.
5. Contractor shall test every section of installed gravity sewer pipe for compliance with design slope. All gravity sanitary sewer pipe shall be installed using a laser and target system through the pipe. A ground surface laser and target system will be permitted for use when installing force main pipe that requires alignment and grade. The use of a laser system does not preclude the use of differential leveling instruments for determining the exact elevation of the installed pipe.

G. Laying Pipe

1. Conform to manufacturer's instructions and requirements of standards and manuals listed below, as applicable:
   a. Ductile Iron Pipe: ANSI/AWWA C600, ANSI/AWWA C105, AWWA M41.
   b. Thermoplastic Pipe: ASTM D2321, ASTM D2774, ANSI/AWWA C605, AWWA M23, AWWA M45, AWWA M55, ASTM F645.
   c. Sanitary and Storm Sewers: ASCE 37.
2. Each piece shall be opposite or near the place where it is to be laid in the trench. Proper implements, tools and facilities shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe and fittings shall be carefully lowered into the trench, piece by piece, by means of a crane, rope or other suitable tools or equipment, in such a manner so as to prevent damage to main materials and to protective coatings and lining. Under no circumstances shall main materials be dropped or dumped into the trench.
3. Slope piping uniformly between elevations shown.
4. No pipe lengths shorter than 6 ft are permitted without written approval of the Town/Engineer.
5. Do not lay pipe in water. Maintain dry trench conditions until jointing and backfilling are complete. Keep clean and protect interiors of pipe, fittings, valves, and appurtenances.
6. Place bell and spigot-type pipe so that bells face the direction of laying, unless otherwise

approved by Town / Engineer.

7. Deflections at joints shall not exceed 75 percent of amount allowed by pipe manufacturer, unless otherwise approved by Town / Engineer.
8. Carefully examine pipe, fittings, valves, and specials for cracks, damage, and other defects while suspended above trench before installation. Immediately remove defective materials from the Site and replace with acceptable products.
9. Inspect interior of all pipe, fittings, valves, and specials and completely remove all dirt, gravel, sand, debris, and other foreign material from pipe interior and joint recesses before pipe and appurtenances are moved into excavation. Bell and spigot-type mating surfaces shall be thoroughly cleaned and dried immediately before pipe is laid.
10. Field cut pipe, where required, with machine approved by manufacturer for cutting the type of pipe being installed. Make cuts carefully, without damage to pipe, coating or lining, and with smooth end at right angles to axis of pipe. Cut ends on push-on joint type pipe shall be tapered and sharp edges filed off smooth. Do not flame-cut pipe. Breaking of the pipe with any type of hammer will not be permitted.
11. Do not place blocking under pipe, unless specifically approved by Town / Engineer for special conditions.
12. Touch up protective coatings in manner satisfactory to Town / Engineer prior to backfilling.
13. Notify Town / Engineer in advance of backfilling operations.
14. On steep slopes, take measures acceptable to Town / Engineer to prevent movement of pipe during installation.
15. Thrust Restraint: Where required by specifications or shown on permitted Contract Documents, provide thrust restraint.
16. Exercise care to avoid flotation when installing pipe in cast-in-place concrete, and in locations with high groundwater. The Contractor shall take all precautions necessary to prevent flotation of the pipe due to water coming into the trench. Any damage from flotation or water entering the trench shall be corrected by removing that section which becomes damaged and repairing or replacing it.

H. Joining Pipe

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

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

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

K. Thrust Restraint
   1. Provide thrust restraint on piping systems where shown or indicated in the Contract Documents.
   2. Thrust restraint may be accomplished by using restrained pipe joints. Harnessing buried pipe or use of thrust blocks is permitted only if approved by Town / Engineer in writing. Thrust restraints shall be designed for axial thrust exerted by test pressure specified on Contract Drawings, or 150 psi for water mains or 100 psi for force mains if not listed on Drawings.
   3. Restrained Pipe Joints:
      a. Pipe joints shall be restrained by means suitable for the type of pipe being installed.
         1) Ductile Iron, Push-on Joints and Mechanical Joints: Restrain with proprietary restrained joint system; or other suitable joint restraint system, subject to the approval of Town / Engineer.
         2) Thermoplastic and HDPE Joints: Where bell and spigot-type or other non-restrained joints are utilized, provide proprietary restrained joint system; or other suitable joint restraint system, subject to the approval of Town / Engineer.
   4. Project Engineer shall submit for approval a joint restraint length schedule for each diameter and material of piping utilized on the project and requiring restraint. See standard drawings for further detail.

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

M. Records

1. Record Documentation:

   a. Maintain accurate and up-to-date record documents showing modifications made in the field, in accordance with approved submittals, and other Contractmodifications relative to buried piping Work. Submittal shall show actual location of all piping Work and appurtenances at same scale as the Drawings.

   b. Show piping with elevations referenced to Project datum and dimensions from permanent structures. For each horizontal bend in piping, include dimensions to at least three permanent structures, when possible. For straight runs of piping provide offset dimensions as required to document piping location.

   c. Include profile drawings with buried piping record documents when the Contract Documents include piping profile drawings.

   d. The Contractor shall keep accurate and complete records of the actual location of all fittings, existing pipes, repair of existing utilities or tiles, tap locations into the main and the depths of the service laterals at the point of termination of the laterals.

      1) Said records shall be turned over to the Town at the completion of the project. Each sewer and water fitting, structure, tap location, or valve box shall be referenced to three permanent monuments. All water service tap lines shall be measured from the building corners on the property served.

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

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

N. Electronic Submittal Requirements for GIS

1. Contractor shall meet Town of Danville's Electronic Submittal Requirements for GIS collection. These standards are provided separate from this documentation, but the general requirements are listed below. These requirements are separate from the records requirements in section "M" of this document.

   a. Contractor shall locate via GPS all Sanitary Gravity Mains, Sanitary Forcemains, Sanitary Manholes, Sanitary Cleanouts, and Lift Stations. Location of all features shall be collected with a horizontal accuracy of at least 4 inches.

   b. Photos shall be taken of all features. Photos shall be taken in landscape orientation and facing north. Photo size shall be restricted to 10MB per photo. Photos should be attached to features when submitted. Manholes and lift stations shall have photos taken of interior.

   c. Features should be collected with the required fields, in the required format, listed in the electronic submittal requirement.

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

   e. Camera files of new pipes shall be completed by the contractor and submitted to the Town in a format approved by the Town.

O. Special Installation Instructions

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

4.14 Wastewater Appurtenances Installation

A. General:

1. Install sewer appurtenances as shown, specified, and as recommended by the manufacture.
2. In the event of conflict between manufacturer's recommendations and the Contract Documents, request interpretation from Engineer before proceeding.
3. Location of service connections and insertion valves indicated are approximate. Final location will be established during construction by the Town.
4. Prior to ordering insertion valve and sleeve assembly, expose existing main at point of installation and verify circumference, actual caliper diameter and roundness of existing pipe. In addition, identify the exterior condition of the pipe with respect to pitting, scaling, electrolysis, or other defects which would affect manufacturing dimensions or exact location of the insertion.
5. The Town of Danville shall be the only party allowed to operate Danville's water valves and hydrants.

B. Valves

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

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

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

D. Backflow Prevention Devices

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

E. Cleanouts

1. Install piping so cleanouts open in direction of flow in sewer pipe. Set cleanout frames and covers as shown on the site drawings.

F. Tap Connections
1. Connect to existing sewer main according to the conditions of the sewer tapping permit.

4.15 Painting of Buried Valves and Appurtenances

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

4.16 Sanitary Manholes & Structures

A. General
1. Manholes and structures shall conform in shape, size, dimensions, material, and other respects to the details shown or as directed by Town / Engineer.
2. Cast-iron frames, grates and covers shall be the standard frame and grate or cover unless otherwise approved by Town and shall be as specified.
3. Concrete for cast-in-place manholes and structures and for inverts in precast and masonry manholes and structures shall be Class "A" and shall conform to the requirements specified hereinafter.
4. All manholes and structures shall be precast construction, unless otherwise approved by Town.
5. Inverts shall be as shown and shall conform accurately to the size and elevation of the adjoining pipes.

B. Existing Conditions
1. Avoid damage to the existing system. Existing manholes, catch basins, and sewers damaged by the Contractor shall be repaired to the satisfaction of the Town at no additional cost.

C. Poured-in-Place Manhole Bases
1. Poured-in-place bases shall be utilized only with written permission of the Town.
2. Poured-in-place bases shall be placed on suitable foundations, as shown in details, after the pipes are laid.
3. They shall be cast using class "A" concrete.
4. They shall be cast monolithically to an elevation at least 7 inches above the top of the highest pipe entering the manhole, except where a drop connection is to be installed.
5. Base, walls and bottom shall be at least of the thickness shown and reinforced to withstand the loads to be expected.

D. Manhole Base Installation
1. Precast bases shall be set on a 6" min. crushed stone or crushed gravel foundation as shown and detailed. Precast bases shall be set at the proper grade and carefully leveled and aligned.

E. Precast Manhole Sections Installation

1. Install sections, joints and gaskets in accordance with these specifications and the manufacturer's recommendations.
2. Lifting holes, if used in manhole components, shall be repaired using a conical precast concrete plug, properly sealed into place using non-shrink cement or epoxy grout. The repair shall be clean and neat to ensure water tightness.

F. Drop Connections
1. Drop connections for sanitary sewer manholes and structures shall be constructed where shown or directed by the Town / Engineer and shall conform to the design and details shown.
2. Concrete for pipe encasement shall be Class "A". Concrete shall be bonded to manhole in the manner shown or otherwise approved by Town / Engineer. Drop connection pipe encasement shall begin six (6) inches above the drop connection and continue to the bottom of the manhole.

G. Stubs for Future Connections
1. When installing pipe stubs for future pipeline, installation of all stubs shall be properly restrained to prevent any movement. Where pipe stubs, sleeves or couplings for future connections are shown or directed by the Town / Engineer, Contractor shall provide all materials and labor in order to complete the Work.

H. Grading at Manholes & Structures
1. Backfill shall be carried up evenly on all sides of the structures to prevent overturning forces.
2. All sanitary sewer manholes and structures in unpaved areas shall be built, as shown or directed by the Town / Engineer, to an elevation graded to drain away from the manhole. Fill shall be placed around manholes to the level of the upper rim of the manhole frame, and the surface evenly graded on a 1 to 5 slope to the existing surrounding ground, unless otherwise shown or directed by the Town / Engineer. The slope shall be seeded and maintained until a satisfactory growth of grass is obtained.
3. Manholes and structures in paved areas shall be constructed to meet the final surface grade. Manholes and structures shall not project above finished roadway pavements to prevent damage from snowplows.

I. Manhole Watertightness
1. All manholes and structures shall be free of visible leakage. Each manhole shall be tested for leaks and inspected, and all leaks shall be repaired in a manner subject to Town / Engineer approval. Note that sanitary sewer manholes shall be vacuum tested per these Specifications.

J. Casting Installation
1. Comply with casting manufacturer's printed instructions and the Contract Documents. Install casting in accordance with requirements of manufacturer of product on which casting will be installed.
2. Set castings accurately to required location, alignment, and elevation, plumb, level, true and free of rack, measured from established lines and levels. Where applicable, brace temporarily or anchor temporarily in formwork.

3. In Paved and Unpaved Streets and Alleys:

a. Where work is in paved streets or areas which have been brought to grade, not less than six inches (6”) and not more than twelve inches (12”) of riser rings shall be provided between the top of the cone or slab and the underside of the manhole casting for adjustment of the casting to finished street grade. The top of the manhole casting shall be flush with the finished grade, unless otherwise directed by the Town / Engineer.

4. Within Cultivated and Non-Cultivated Areas:
   a. Where work is in cultivated areas, the top of the manhole casting shall be exposed one foot (1’) and in non-cultivated areas the casting shall be flush with the finished grade, unless otherwise directed by the Town / Engineer. Marking post shall be provided per Standard Drawings for all manholes within cultivated areas.

K. Connections to Existing Manholes & Sewers
   1. Connections at existing manholes shall be made in a manner to prevent damaging the structure and shall be made watertight where the connection is made. Openings shall be core drilled and rubber boots shall be installed.

L. Cleaning
   1. All new manholes and pipes shall be thoroughly cleaned of all silt, debris, and foreign matter of any kind, prior to final inspection. Clean, jet, and camera all pipes.

4.17 **Lift Stations**

A. Installation

1. All equipment shall be installed in accordance with these specifications, construction drawings and the manufacturer's printed instructions.
2. Inspect all equipment and appurtenances prior to installation of the Work. Promptly remove damaged or unsuitable products from the job site. Replace damaged or unsuitable products with new, undamaged and suitable products.
3. All electrical work shall be done by a qualified licensed electrician and shall conform to the National Electric Code.

B. Testing

1. Each pump shall be fully tested in accordance with manufacturer's written instructions. Certified copies of the test results shall be furnished with each pumping unit. Record the test voltage and amperage measurements.

C. Manufacturer's Supervision

1. The Contractor shall include in his bid price the services of a factory trained representative, of the pump manufacturing company, for two separate days at the lift station to perform initial start-up of the pumping station and demonstrate satisfactory performance of each piece of equipment and instruct operating personnel in the operation and maintenance of the equipment.

D. Electrical Service

1. The Contractor shall be responsible for all construction and operational costs imposed by the electric utility to provide electric service to the pump station, from the initiation of construction until substantial completion (acceptance) by the Town of Danville.

E. Warranty

1. Unless approved otherwise by the Town in writing, the pump manufacturer shall warrant the pumps being supplied to the Town against defects in workmanship and materials for a period of two years under normal use, operation, and service. The warranty shall be in published form and apply to all units. Warranty costs shall include all shipping costs.

F. Low Pressure Systems

1. Requirements for Low Pressure Systems are contained in 2.14 – Low Pressure Systems

4.18 **Testing for Wastewater**

A. General

1. General Testing Requirements

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

b. Notify Town / Engineer and authorities having jurisdiction in writing at least 48 hours in advance of testing. All testing to be witnessed by a Town Employee or representative. Results obtained in their absence will not be accepted.

c. Contractor shall be responsible for providing all testing equipment at no cost to the Town.

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

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

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

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

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

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

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

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

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

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

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

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

n. Test to confirm connectivity of tracer wire.

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

B. Gravity Pipe Deflection & Leakage Testing

1. Deflection Test:
    a. A deflection test shall be performed on each flexible pipe following the elapse of thirty (30) days after the placement of the final backfill.
    b. No pipe shall exceed a deflection of five percent (5%) or greater.
    c. The diameter of the rigid ball or mandrel used for a deflection test shall be no less than ninety-five percent (95%) of the base inside diameter of the pipe to be tested dependent on what is specified in the corresponding ASTM standard. The test shall not be performed with the aid of a mechanical pulling device.
2. Leakage Test: All gravity sanitary sewers shall be tested per one of the following tests:
    a. A hydrostatic test shall be performed with a minimum of two (2) feet of positive head. The rate of exfiltration or infiltration shall not exceed two hundered (200) gallons per inch of pipe diameter per linear mile per day.
    b. Air test plastic pipe according to ASTM F1417: "Standard Test Method for Installation Acceptance of plastic gravity sewer lines using Low-Pressure Air".
3. Any piping that is damaged shall be removed and re-installed before approval.
4. An infiltration test is required only when specified by the Contract Documents.
    a. The Contractor shall furnish all weirs, bulkheads, catchments, and other appurtenances as required for performing the test.
    b. Procedure for Infiltration Testing: After the new main line pipe has been installed and the new house service laterals connected in a reach of conduit between two manholes, this reach of sanitary sewer may be tested for infiltration. This testing shall be performed through the use of a bulkhead in the upstream manhole and a calibrated sharp-edged weir installed at the downstream manhole. The infiltration flow from the reach undergoing testing shall be measured over a sufficiently long period of time to establish the rate of infiltration but in no case shall the test duration be less than two (2) hours. Where the reach being tested was installed through ground that required dewatering, the infiltration test shall not be performed until a sufficient period of time has elapsed after the dewatering equipment has been removed to permit the ground water table to return to its natural level, as agreed by the Town.
    c. Allowable Infiltration: The total quality of infiltration into the system from ground water during wet weather or from water from creeks, rivers, springs or other sources shall not exceed two hundred gallons per inch diameter of sewer, per mile, per twenty-four (24) hours (0.00263 gallon per inch diameter, per 100 feet, per minute).

C. Vacuum Testing

1. Manholes
    a. Perform vacuum test on all manholes according to ASTM C1244 prior to backfill.
    b. All pipes entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.
    c. Following set-up of test apparatus per manufacturer's recommendations, draw vacuum of ten inches of mercury on manhole being tested. The time shall be measured for the vacuum to drop to nine inches mercury.
    d. Start test upon reaching specified test vacuum. Test duration shall be in accordance with ASTM C1244.
        1) Minimum test times for various manhole diameters shall conform to the following table per ASTM C1244 or be 1 minute; whichever is longer:

Depth (ft)	Diameter, in.												
	48	54	60	66	72	78	84	90	96	102	108	114	120
Time, in seconds													
<4													
6													
8													
10											63	67	71
12								62	67	71	76	81	85
14						62	67	72	78	83	89	94	100
16					69	70	76	83	89	95	101	108	114
18				65	73	79	86	93	100	107	114	121	128
20			65	72	81	88	95	103	111	119	126	135	142
22		64	72	79	89	97	105	114	122	131	139	148	156
24		64	78	87	97	106	114	124	133	143	152	161	170
26	64	75	85	94	105	114	124	134	144	155	164	175	185
28	69	81	91	101	113	123	133	145	155	167	177	188	199
30	74	87	98	108	121	132	143	155	166	178	189	202	213

e. Record vacuum drop at end of test. If vacuum drop is greater than one inch of mercury, manhole fails the test and shall be repaired and retested. If vacuum drop is less than 1 inch of mercury, manhole passes the test.

D. Hydrostatic Testing

1. General:
   a. All newly installed sanitary force mains must be pressure and leak tested prior to final acceptance.
2. Preparation
   a. Pipeline shall be laid and backfilled.
   b. Valves shall be properly located, operable, and plumb and at correct elevation.
   c. Lines shall be properly vented to eliminate entrapped air.
   d. Prior to testing, ensure adequate thrust protection is in place and joints are properly installed.
   e. Prior to testing ensure that the line is clean and free of dirt and debris.
   f. For PVC and thermoplastic pipe, follow preparation and procedures described in Section 7 of ANSI/AWWA Standard C605. Test pressure & duration shall be 100 psi for 2 hours for force mains, unless noted otherwise.
   g. For ductile iron piping, follow preparation & procedures described in AWWA C600. Test pressure shall be as specified and duration shall be for 2 hours.
   h. For HDPE pipe, follow preparation and procedures described in ASTM F2164. Test duration, including time to pressurize, time for initial expansion, time at test pressure, and time to depressurize shall not exceed 8 hours. If re-testing of a test section or pipeline is required, at least 8 hours shall elapse between tests. HDPE pipe test pressure and duration shall be 150 psi for 4-hour expansion period and 140 psi for the 1-hour test.
3. Test Procedure:
   a. Fill pipeline slowly to minimize air entrapment and surge pressures. Fill rate shall not exceed one foot of pipe length per second in pipe being tested.
   b. Expel air from pipe as required by venting through air release valves, blow-offs, or special taps at high points in line. Obtain approval of Town / Engineer prior to tapping pipe for expelling air.

c. During the test, examine all exposed pipe, fittings, valves and appurtenances for leakage. Make repairs to eliminate visible leakage.

d. For DIP and PVC Pressure Pipe
   1) Add fluid as required to pressurize line to required test pressure. Maintain test pressure for a stabilization period of ten minutes before beginning test.
   2) Timed test period shall not begin until after pipe has been filled, exposed to required wetting period, air has been expelled, and pressure stabilized.
   3) Timed Test Period: After stabilization period, maintain test pressure for at least two hours. During timed testing period, add fluid as required to maintain pressure within five psig of required test pressure.
   4) Pump from test container to maintain test pressure. Measure volume of water pumped from test container and record on test report. Record pressure at test pump at 15 minute intervals for duration of test.

e. For HDPE Pressure Pipe
   1) After filling pipeline, gradually pressurize pipe to test pressure and maintain required test pressure for four hours for pipe to expand. During expansion, add fluid to maintain required test pressure. Begin timed test period after expansion period and other requirements are met.
   2) Timed test period shall not begin until after pipe has been filled, exposed to required wetting period, air has been expelled, and pressure stabilized.
   3) Timed Test Period: After four hour expansion phase, reduce test pressure by ten psig and do not add liquid. Test pressure shall then remain steady for three hours, indicating no leakage.
   4) If no visible leakage is observed and pressure remains within 5% of the original test pressure for one hour, a passing test is indicated.

4. Makeup Water Allowances:
   a. The allowable makeup water allowance is the maximum amount of water that is added into a pipeline undergoing hydrostatic pressure testing. The allowable leakage rates for the various pipe materials and joints are listed below.
   b. No Makeup Water: Pipe with flanged, welded, fused, threaded, soldered, or brazed joints.
   c. Makeup Water shall be less than the allowable amounts specified in AWWA C600 for ductile iron pipe or AWWA C605 for PVC pipe, and less than that determined by the following formula:

$$L = \frac{S*D*(\text{Square Root of } P)}{148{,}000}$$

L = allowable leakage, gallons per hour
S = length of pipe tested, feet
D = nominal diameter of pipe, inches
P = average test pressure during leakage test, psi

   d. Observed leaks shall be repaired regardless of leakage measurements.
   e. Any damaged or defective pipes, fittings, valves, or joints should be repaired and the pressure test repeated until satisfactory results are obtained, at no additional cost to the Town.

4.19 **Electrical**

A. Scope

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

B. General Requirements

1. Perform all work in accordance with the latest edition of the National Electric Code. Nothing contained in these specifications should be interpreted as conflicting with the Code.
2. All materials and equipment installed shall be new and undeteriorated and of a quality not less than the minimum specified. Materials for which examination service is provided shall bear the Underwriters label.
3. All workmanship shall be in accordance with the best practices of the trade. Electrical work shall be installed by journeymen electricians under the direct supervision of a competent foreman. At no time shall electrical work be installed by apprentice electricians or laborers without the immediate on-the-job supervision of a journeyman electrician.
4. Wiring layouts when shown on Drawings are schematic and the exact locations shall be determined by structural and other conditions. This shall not be construed to mean that the design of the system may be changed. It refers only to the exact locations of conduits and equipment to fit into the work and the coordination of conduits and other equipment with piping and equipment included under other divisions of the specifications.
5. Furnish and install all necessary hangers, supports, straps, pull boxes and fittings not indicated on the drawings but which are required for a complete and properly installed system.
6. Consult all contract drawings which may affect the location of any equipment, conduit or wiring and make minor adjustments in location to secure coordination.
7. Other than minor adjustments all modifications shall be submitted to the Town / Engineer for approval before proceeding with the work.
8. The Contractor shall at all times be fully informed of the progress of the general construction, and shall install all work that is concealed and built into the work in place in sufficient time to insure proper location without delays to the work of the other trades. Properly attend the electrical work during the progress of construction to prevent misalignments of and damages to the electrical work.

C. Grounding

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

D. Shop Drawings

1. Prior to the commencement of work the Contractor shall submit to the Town, for approval, drawings relating to the arrangement of work and shop drawings of all equipment and apparatus.

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

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

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

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

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

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

4.20 **Site Restoration**

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

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

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

5. Project Conditions
    a. Environmental Requirements:
        1) Proceed with and complete lawn and grass planting as rapidly as portions of the Site become available, working within the seasonal limitations for each type of lawn and grass planting required.
        2) Proceed with planting only when current and forecasted weather conditions are favorable to successful planting and establishment of lawns and grasses.
            a) Do not spread seed when wind velocity exceeds five miles per hour.
            b) Do not plant when drought, or excessive moisture, or other unsatisfactory conditions prevail.
        3) Begin maintenance immediately after each area is planted and continue until acceptable growth is established.
        4) Herbicides, chemicals and insecticides shall not be used on areas bordering wetlands.
    b. Scheduling:
        1) Plant during one of the following periods:
            a) Spring Planting: April 1 to June 15.
            b) Fall Planting: September 1 to October 30.
            c) During other periods, the time of planting shall be determined by the Town / Engineer.
    c. Water & irrigate lawn and grass plantings as required to obtain adequate establishment of lawns and grasses.
6. Examination
    a. Contractor shall examine the areas and conditions under which lawn and grass Work is to be performed, and notify Town / Engineer, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to Town / Engineer.
7. Preparation
    a. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
    b. Provide erosion-control measures to prevent erosion or displacement of seeded soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
    c. Confirm that subgrade is at proper elevations and that no further earthwork is required to bring the subgrade to proper elevations. Provide subgrade elevations that slope parallel to finished grade and towards subsurface drains shown.
    d. Remove all construction debris, trash, rubble, and all extraneous materials from subgrade. In the event that fuels, oils, concrete washout, or other material harmful to plant growth or germination have been spilled into the subgrade, excavate the subgrade sufficiently to remove all such harmful materials and fill with approved fill, compacted to the required subgrade compaction level. Removed materials to be disposed of in a legal manner.
8. Fine Grading
    a. Reset and realign curb boxes and meter boxes to ensure proper alignment and plumbness upon fine grading.
    b. Immediately prior to dumping and spreading topsoil, clean subgrade of all stones greater than 1 inch and all other extraneous matter. Remove all such material from Site.
    c. Notify Town / Engineer that subgrade has been cleaned, and obtain approval prior to

spreading topsoil.

d. Do not attempt to spread excessively wet, muddy or frozen topsoil. Do not spread topsoil more than five days before seeding or planting.

e. Spread topsoil to a minimum depth of three (3) inches but not less than required to meet finish grades after light rolling and natural settlement.

f. The area to be seeded shall be made smooth and uniform and shall conform to the finished grade and cross section shown on the Drawings or as directed by the Town / Engineer.

g. Incorporate fertilizers, after spreading Topsoil, as specified, and at a rate of:

1) Fertilizer: 18 pounds per 1,000 square feet.

9. Conventional Seeding

a. General: Maintain grade stakes until removal is mutually agreed upon by all parties concerned.

b. Rake or harrow all seedbeds immediately prior to seeding to produce a rough, grooved surface, no deeper than 1 inch. Seed only when seedbed is in a friable condition and not muddy or hard.

c. Sow seed using a spreader or seeding machine.

d. Distribute seed evenly over entire area by sowing equal quantity in two directions at right angles to each other.

e. Sow lawn grass seed mixture at the rate of not less than 5 pounds for every 1,000 square feet.

f. All seeded areas shall be thoroughly mulched by a method approved by the Town / Engineer. Mulching material shall be applied uniformly in a continuous blanket at a rate of 92 pounds per 1,000 square feet. Mulch shall be punched into the soil so that it is partially covered. The punching operation shall be performed longitudinally with a mulch tiller. Care shall be exercised to obtain a reasonably even distribution of mulch incorporated into the soil.

g. Using a uniform fine spray, irrigate lawn and grass plantings as required to obtain adequate establishment of lawns and grasses.

h. Reseed areas that remain without mulch for longer than 3 days.

i. Take precautions to prevent damage or staining of construction or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.

j. Prevent foot or vehicular traffic, or the movement of equipment, over the mulched areas. Reseed areas damaged as a result of such activity.

10. Reconditioning Existing Lawns and Grass Areas

a. Recondition existing lawn damaged by Contractor's operations, including areas used for storage of materials or equipment and areas damaged by movement of vehicles. Recondition existing lawn and grass areas where minor regrading is required.

b. Provide fertilizer, seed or sod and soil amendments, as specified for new lawns and grass areas, and as required to provide satisfactorily reconditioned lawns and grass areas. Provide new topsoil as required to fill low spots and meet new finish grades.

c. Till stripped, bare, and compacted areas thoroughly to a depth of 12 inches.

d. Remove diseased or unsatisfactory lawn and grass areas; do not bury into soil. Remove topsoil containing extraneous materials resulting from Contractor's operations including oil drippings, stone, gravel and other construction materials.

e. In areas approved by Town / Engineer, where substantial lawns and grass areas remain (but are thin), mow, dethatch, core aerate and rake. Fill low spots, remove humps, cultivate soil, fertilize, and seed. Remove weeds before seeding or if extensive, apply selective chemical weed killers, as required. Apply seedbed mulch, if required, to maintain moist condition.

f. Water newly planted areas and keep moist until new lawns are established, as specified.

11. Acceptance Criteria for Lawns and Grass Areas
    a. Lawn and grass Work will be considered acceptable when:
        1) Areas Seeded with "Lawn Grass Seed" Mixture: When a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 square feet and bare spots not exceeding 5 inches by 5 inches.
        2) Areas Seeded with "General Purpose" Mixture: When a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 20 square feet and bare spots not exceeding 12 inches by 12 inches.
        3) Areas Sodded with "Turf Grass Sod": When a healthy, well-rooted, even-colored, viable lawn has been established, free of weeds, open joints, bare areas, and surface irregularities.
12. Cleanup and Protection
    a. Promptly remove soil and debris, created by lawn and grass Work, from paved areas. Clean wheels of vehicles before leaving Site to avoid tracking soil and topsoil onto roads, walks, or other paved areas.
    b. Erect barricades and warning signs as required protecting newly planted areas from traffic. Maintain barricades throughout extended service period and remove when service period ends. Treat, repair or replace damaged lawns and meadows.
13. Inspection & Acceptance
    a. The Contractor shall replace or repair any areas damaged by erosion or which fail to grow or take root within one (1) year of the date of final acceptance of the work.
    b. Where lawns and grass areas do not comply with specified acceptance criteria, reestablish lawns and grasses and continue extended service period until lawns and grasses comply with criteria for acceptance.

4.21 **Maintenance of Traffic**

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

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

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

D. Full Lane Closures
    1. No full lane closures will be allowed on State Roads.

2. The Contractor may, with the approval of the authority having jurisdiction, close local roads for minimum periods of time with proper notice to the Town or County Highway Department as applicable, local occupants of all premises, police and fire protection authorities, and other public authorities as applicable. The Contractor shall schedule this work so that this time is at a minimum and shall, whenever possible, make suitable provisions for access by local residents, businesses, school buses, police and fire emergency vehicles and mail delivery vehicles. The Contractor shall keep fire hydrants and other public utility valves accessible at all times.
3. The Contractor shall submit traffic control plans to the Town or the County Highway Department if required.
4. The Contractor shall furnish, erect, and maintain barricades, suitable and sufficient red lights and other lights or reflecting material as may be required for the protection of any local traffic permitted on the roadway.
5. The Contractor shall furnish, erect, and maintain advanced warning signs to direct traffic away from closed sections and detour marking signs on temporary routes, except where same may be furnished by the State or County Highway Departments.
6. All road crossings where the Contractor is permitted to open cut the trench, the crossing shall be completed, cleaned up, temporary pavement in place, and open to traffic within twenty-four (24) hours from the time the road is closed to through traffic, unless specific approval is received from the authority having jurisdiction, for a longer period.

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

4.22 **Manufacturer's Service Representative**

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

4.23 **Adjustment and Operation of Systems**

A. Prior to time of final inspection, the Contractor shall carefully adjust and place in operation all parts of the equipment, systems and electrical facilities, installed by him when any work included in this contract is completed. The Contractor shall also assist in the adjustment of equipment and systems furnished by the Owner and installed by the Contractor. All automatic

controls and safety devices shall be adjusted, all air and water flow shall be balanced and adjusted, and all valves shall be properly set. The Contractor shall perform all other necessary operations to make the equipment, systems and electrical facilities fully operable. Where required, all equipment shall be oiled and greased and all oilers and grease cups shall be left filled.

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

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

4.24 **Cleanup**

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

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

4.25 **Guarantee**

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

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

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

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

AIR PRESSURE TEST DATA SHEET

Danville Sanitary District Test No. _____

Job name, Location, Project number or SubDepartment Name _____

Field Test Data (To be filled in by Inspector)

Date	Specified Maximum Pressure Drop: _____ psig
Identification of Pipe Material Installed	
Pipe Under Test	Field Test Operations Data

Upstream MH No.	Downstream MH No.	Dia. D (in)	Length, L (ft)	Time from Table (min:sec)	Air Pressure Adjustment (psig)	Initial Pressure (psig)	Time Allowed for Pressure to Stabilize (min)	Start Pressure (psig)	Stop Pressure (psig)	Elapsed Time (min:sec)	Pass or Fail (P or F)

Inspectors name and Title	
Signature of Inspector:	
If a section fails, the following items must be completed:	
Identify section(s) that failed:	
Leak (was) (was not) identified. Method used:	
Description of leak:	Corrective Action Taken:
Results after repair refer to Test No.:	Inspector:

Sewer Manhole Test Report

Date: _____

Weather: _____

Project/SubDepartment Name:	**Project No.**
Contractor:	**Reference Plan:**
Testing Conducted by:	**RPR:**

Testing procedure shall be as specified in ASTM C 1244 (latest revision) – Standard Test Method For Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test, further as modified by the allowable vacuum loss shall not exceed 1" Hg (mercury) within the minimum times as contained in the following Table.

Manhole Depth (ft)	Manhole Diameter		
	48-in	60-in	72-in
	Minimum Test Time, seconds		
8	*20*	*26*	*33*
10	*25*	*33*	*41*
12	*30*	*39*	*49*
14	*35*	*46*	*57*
16	*40*	*52*	*67*
18	*45*	*59*	*73*
20	*50*	*65*	*81*
22	*55*	*72*	*89*
24	*59*	*78*	*97*
26	*64*	*85*	*105*
28	*69*	*91*	*113*
30	74	98	121

Manhole			Time			Vacuum,(Inch Hg)			
No.	**Diameter, in**	**Depth, ft**	**Time Req'd**	**Start**	**End**	**Start**	**End**	**Loss**	**Pass/ Fail**

Sewer manhole Test Report

Manhole			Time			Vacuum,(Inch Hg)			
No.	Diameter, in	Depth, ft	Time Req'd	Start	End	Start	End	Loss	Pass/ Fail

Comments:_____.

_____.

_____.

_____

Sewer Force Main Test Report
Hydrostatic Leak Test

Date: _____

Weather: _____

Right-of-Way:	**Project/SubDepartment Name:**
Contractor:	**Reference Plan:**
Testing Conducted by:	**RPR:**

Testing procedure shall be as specified in AWWA C600 and/or C900 (latest revisions) – Standard Hydrostatic Test Method Of (DIP and PVCP) Sewer Force Mains and ASTM 1003.

The required test time shall be two (2) hours, the required pressure shall be 1.5 times the working pressure of the pipe or 100 psi whichever is greater.

Pipe Diameter (inches)	Pipe Type	Pipe Length Tested, ft	Starting Pressure (psi)	Ending Pressure (psi)	Pressure Loss (psi)	Pass Or Fail

Comments:

_____

_____

_____

_____

Sewer Force Main Test Report Alternate Test Method

Date: _____ Weather:

Right-of-Way:	**Project/SubDepartment Name:**
Contractor:	**Reference Plan:**
Testing Conducted by:	**RPR:**

Testing procedure shall be as specified in AWWA C600 and/or C900 (latest revisions) – Standard Hydrostatic Test Method Of (DIP and PVCP) Sewer Force Mains, further as modified by the required test time shall be two (2) hours, the required pressure shall be 1.5 times the working pressure of the pipe or 100 psi and the allowable leakage shall not exceed "L" in the following formulas:

For PVC Pipe

$$L = (ND(P)^{1/2})/7400$$

For Ductile Iron Pipe

$$L = (SD(P)^{1/2})/133,200$$

Where:
L = allowable leakage (gph)
N = number of joints in the pipeline tested S = length of pipe tested (feet)
D = nominal diameter of the pipe (in) P = average test pressure (psi)

Pipe Diameter & Type	Pipe Length Tested, ft.	Starting Pressure (psi)	Amount of Water Added (gal)	Allowable Leakage (gph)	Actual Leakage (gph)	Pass Or Fail

Comments: _____

STANDARD DRAWINGS

TOWN OF DANVILLE
HENDRICKS COUNTY, INDIANA
SANITARY SEWER

BEDDING SPECIFICATIONS

1. FOR ROCK OR OTHER NON-COMPRESSIBLE MATERIAL, THE TRENCH SHALL BE OVER EXCAVATED TO PROVIDE A MINIMUM OF 6" MINIMUM CLEARANCE TO THE PIPE AND REFILLED WITH BEDDING MATERIAL.

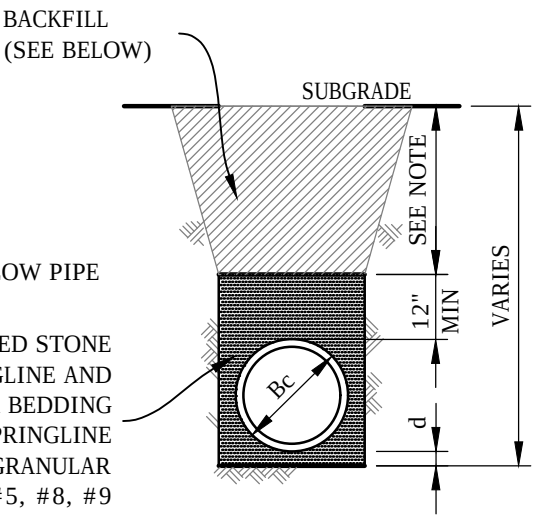
2.

DEPTH OF BEDDING MATERIAL BELOW PIPE	
D	d(Min.)
LESS THAN 36"	4"
36" & LARGER	Bc / 8

LEGEND

Bc = OUTSIDE DIA. OF PIPE
D = INSIDE DIA. OF PIPE
d = BEDDING MATERIAL BELOW PIPE BELL

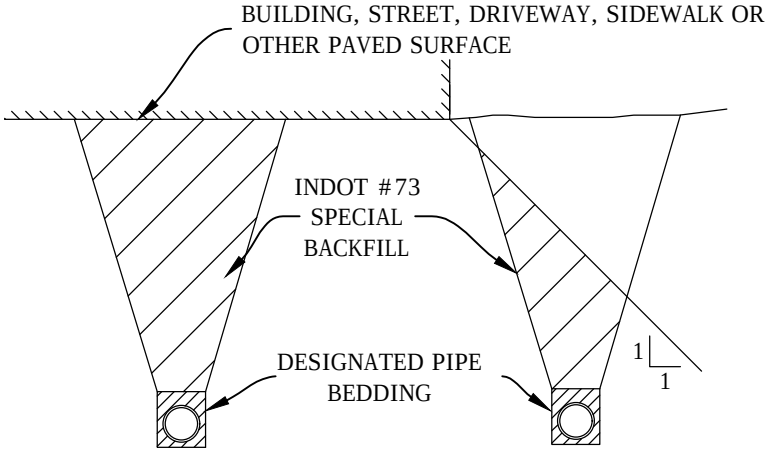
FLEXIBLE PIPE: COMPACTED CRUSHED STONE INDOT #5, #8 BELOW SPRINGLINE AND COMPACTED GRANULAR BEDDING INDOT #5, #8, #9 ABOVE SPRINGLINE
RIGID PIPE: COMPACTED GRANULAR MATERIAL INDOT #5, #8, #9



BACKFILL SPECIFICATIONS

1. BACKFILL UNDER PAVED AREAS SHALL BE INDOT #53/#73. INFLUENCE ZONE SHALL EXTEND AT A 1:1 SLOPE FROM ABOVE ITEM. COMPACTION SHALL MEET OR EXCEED 95% OF MAXIMUM DRY UNIT WEIGHT ACCORDING TO ASTM D 1557.

2. BACKFILL WITHIN LAWN AREAS AND OUT OF THE INFLUENCE OF: BUILDING STRUCTURES, AND PAVED AREAS, SHALL BE STANDARD BACKFILL. STANDARD BACKFILL SHALL BE FREE OF: ROCK AND GRAVEL LARGER THAN 3" IN ANY DIMENSION, DEBRIS, WASTE, FROZEN MATERIALS, VEGETATION, AND OTHER DELETERIOUS MATERIAL ACCORDING TO ASTM D 2487. COMPACTION SHALL MEET OR EXCEED 90% OF MAXIMUM DRY UNIT WEIGHT ACCORDING TO ASTM D 1557.



INFLUENCE LINE

SCALE : N.T.S.

NOTES:

1. DETAIL APPLIES TO WATER AND WASTEWATER INSTALLATIONS. SEE HENDRICKS COUNTY STANDARDS FOR STORMWATER.
2. MINIMUM COVER - GRAVITY SANITARY MAINS 4'; WATER & FORCE MAINS 5'.
3. FLEXIBLE PIPE - PVC, HDPE, DIP, & CMP ARE CONSIDERED FLEXIBLE PIPES.
4. RIGID PIPE - RCP IS CONSIDERED RIGID PIPE.

	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	BF-01	PIPE TRENCH DETAIL (PUBLIC INFRASTRUCTURE)	
	STANDARD DRAWINGS	APPROVED:	REVISED:	SCALE: NONE

BEDDING SPECIFICATIONS

1. FOR ROCK OR OTHER NON-COMPRESSIBLE MATERIAL, THE TRENCH SHALL BE OVER EXCAVATED TO PROVIDE A MINIMUM OF 6" MINIMUM CLEARANCE TO THE PIPE AND REFILLED WITH BEDDING MATERIAL.

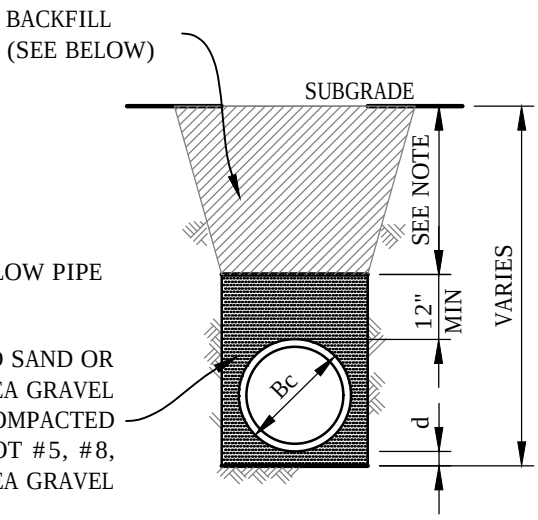
2.

DEPTH OF BEDDING MATERIAL BELOW PIPE	
D	d(Min.)
LESS THAN 36"	4"
36" & LARGER	Bc / 8

LEGEND

Bc = OUTSIDE DIA. OF PIPE
D = INSIDE DIA. OF PIPE
d = BEDDING MATERIAL BELOW PIPE BELL

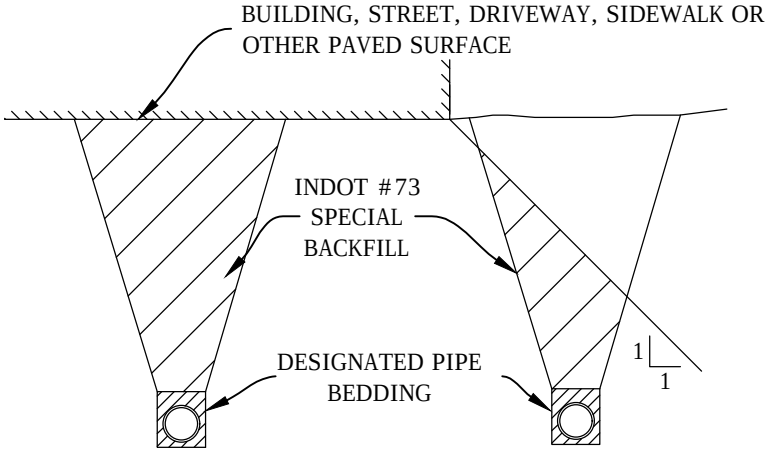
WATER SERVICE: COMPACTED SAND OR PEA GRAVEL
SEWER LATERAL: COMPACTED GRANULAR MATERIAL INDOT #5, #8, #9, OR PEA GRAVEL



BACKFILL SPECIFICATIONS

1. BACKFILL UNDER PAVED AREAS SHALL BE INDOT #73. INFLUENCE ZONE SHALL EXTEND AT A 1:1 SLOPE FROM ABOVE ITEM. COMPACTION SHALL MEET OR EXCEED 95% OF MAXIMUM DRY UNIT WEIGHT ACCORDING TO ASTM D 1557.

2. BACKFILL WITHIN LAWN AREAS AND OUT OF THE INFLUENCE OF: BUILDING STRUCTURES, AND PAVED AREAS, SHALL BE STANDARD BACKFILL. STANDARD BACKFILL SHALL BE FREE OF: ROCK AND GRAVEL LARGER THAN 3" IN ANY DIMENSION, DEBRIS, WASTE, FROZEN MATERIALS, VEGETATION, AND OTHER DELETERIOUS MATERIAL ACCORDING TO ASTM D 2487. COMPACTION SHALL MEET OR EXCEED 90% OF MAXIMUM DRY UNIT WEIGHT ACCORDING TO ASTM D 1557.



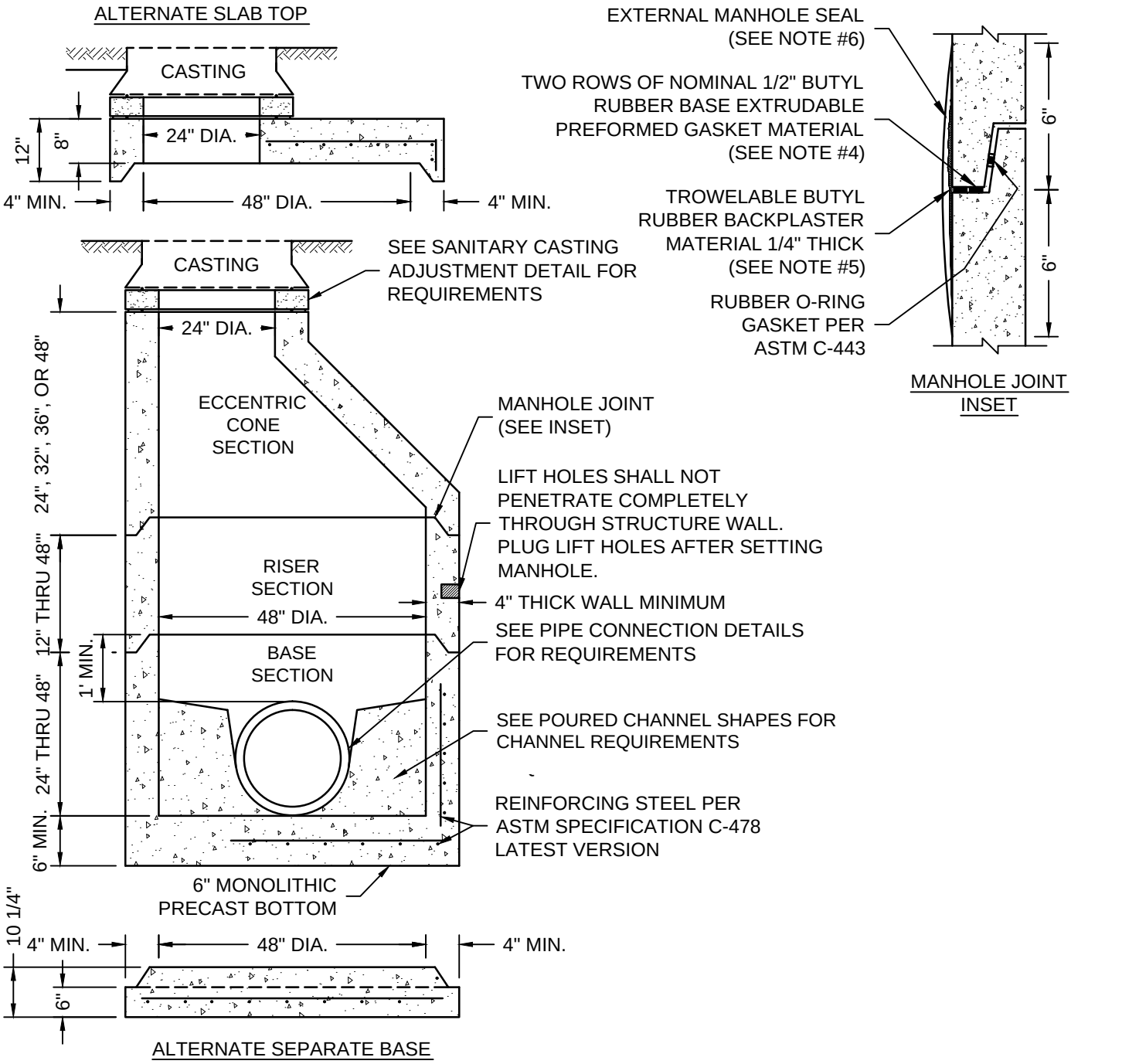
INFLUENCE LINE

SCALE : N.T.S.

NOTES:

1. MINIMUM COVER - SANITARY LATERALS 3'; FORCE MAINS 5'; WATER SERVICES SMALLER THAN 2" DIAMETER 4'-6", WATER SERVICES 2" AND LARGER DIAMETER 5'-0".

	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	BF-02	PIPE TRENCH DETAIL (SERVICES & LATERALS)	
	STANDARD DRAWINGS	APPROVED:	REVISED:	SCALE: NONE

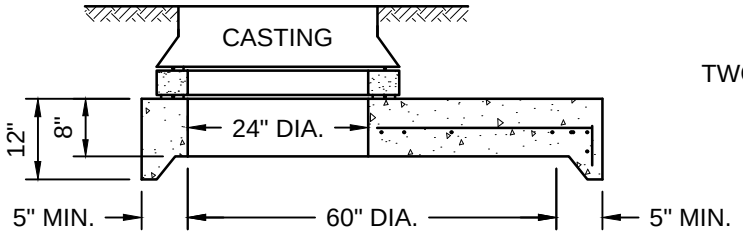


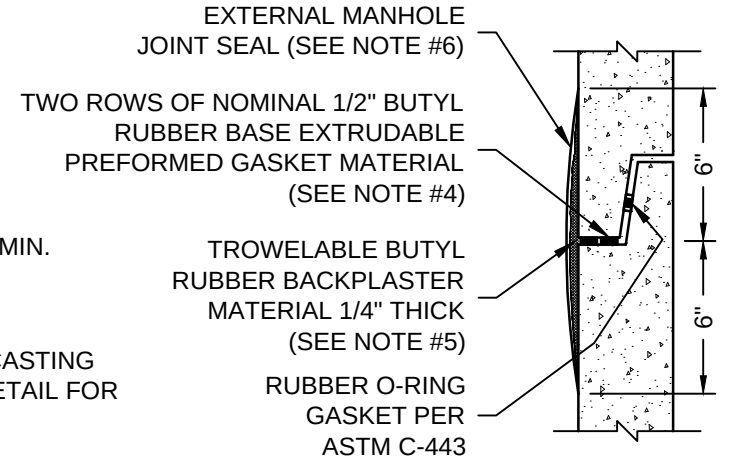
NOTES:

1. CAST IN PLACE BASE ONLY PERMITTED WITH WRITTEN APPROVAL OF TOWN.
2. THE BASE SHALL BE PLACED ON COMPACTED FRACTURED FACE STONE, 6" MINIMUM.
3. THE INSIDE WALL DISTANCE BETWEEN OPENINGS SHALL BE A MINIMUM OF 6".
4. USE RU 106 RUB'RNEK LTM AS MANUFACTURED BY HENRY CO., KENT-SEAL NO. 2 AS MANUFACTURED BY HAMILTON-KENT OR EZ-STICK BUTYL-RUBBER-BASED PREFORMED FLEXIBLE SEALANT AS MANUFACTURED BY PRESS-SEAL.
5. APPLY TROWELABLE BUTYL RUBBER BACK PLASTER MATERIAL 1/4" THICK (WHEN DRY) FROM 6" ABOVE TO 6" BELOW JOINTS. USE TROWELABLE EZ-STICK #3, AS MANUFACUTRED BY PRESS-SEAL GASKET CORP.
6. EXTERNAL MANHOLE JOINT SEAL SHALL CONSIST OF A SHEET OF PLASTIC VISQUEEN.

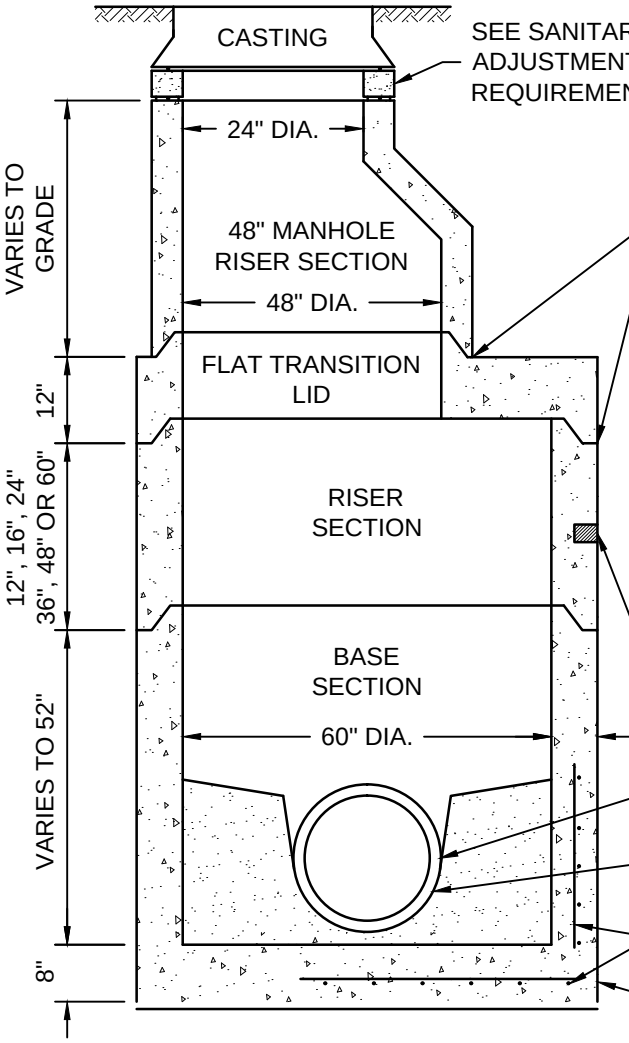
	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	SAN-01	48" SANITARY MANHOLE
	STANDARD DRAWINGS	APPROVED:	REVISED: / SCALE: NONE

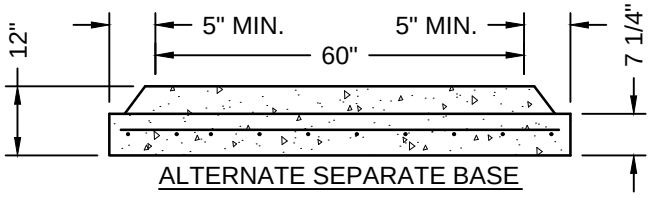
ALTERNATE SLAB TOP





MANHOLE JOINT INSET



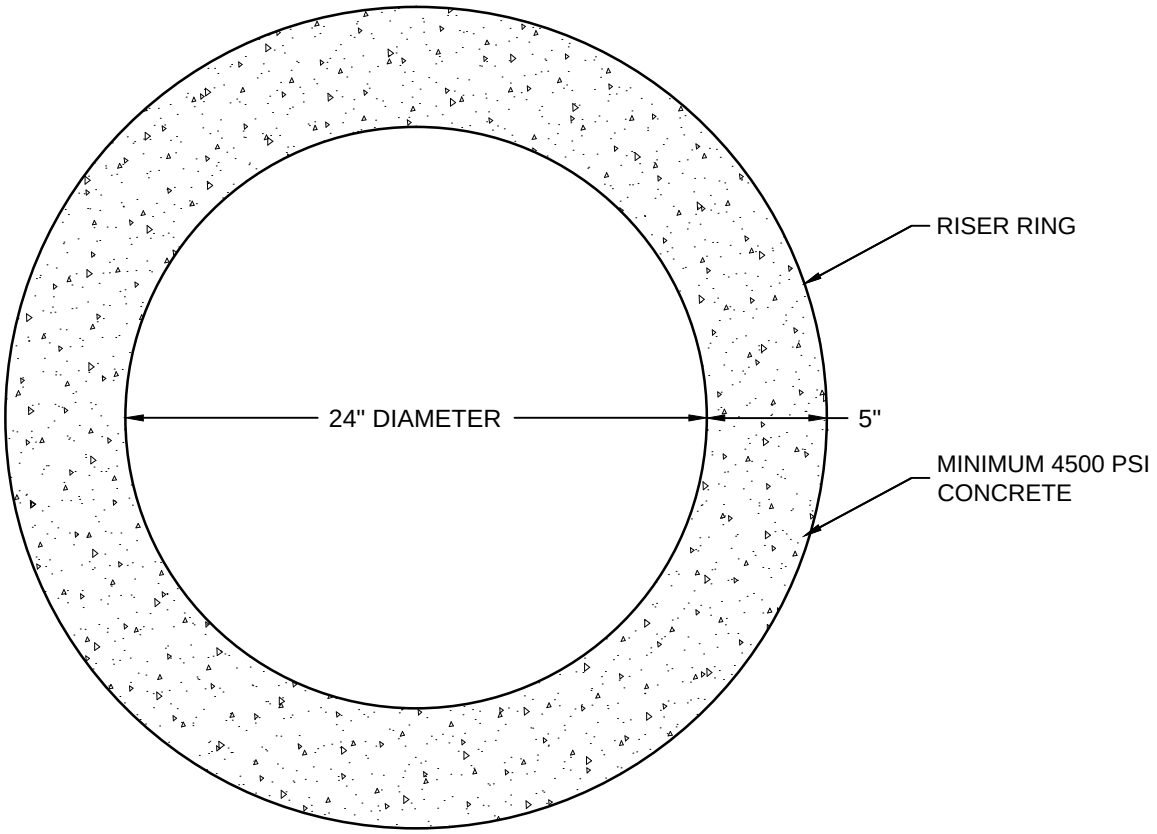


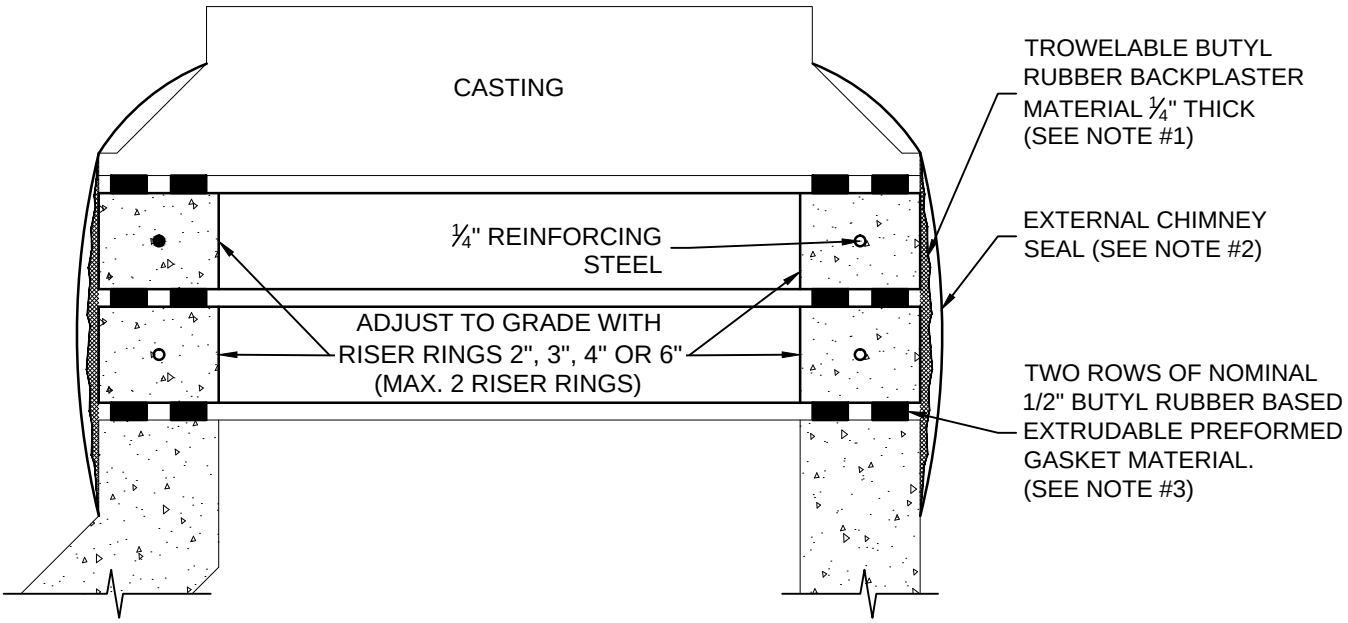
ALTERNATE SEPARATE BASE

NOTES:

1. CAST IN PLACE BASE ONLY PERMITTED WITH WRITTEN APPROVAL OF TOWN.
2. THE BASE SHALL BE PLACED ON COMPACTED FRACTURED FACE STONE, 6" MINIMUM.
3. THE INSIDE WALL DISTANCE BETWEEN OPENINGS SHALL BE A MINIMUM OF 6".
4. USE RU 106 RUB'RNEK LTM AS MANUFACTURED BY HENRY CO., KENT-SEAL NO. 2 AS MANUFACTURED BY HAMILTON-KENT OR EZ-STICK BUTYL-RUBBER-BASED PREFORMED FLEXIBLE SEALANT AS MANUFACTURED BY PRESS-SEAL.
5. APPLY TROWELABLE BUTYL RUBBER BACK PLASTER MATERIAL 1/4" THICK (WHEN DRY) FROM 6" ABOVE TO 6" BELOW JOINTS. USE TROWELABLE EZ-STICK #3, AS MANUFACUTRED BY PRESS-SEAL GASKET CORP.
6. EXTERNAL MANHOLE JOINT SEAL SHALL CONSIST OF A SHEET OF PLASTIC VISQUEEN.

	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	SAN-02	60" SANITARY MANHOLE
	STANDARD DRAWINGS	APPROVED:	REVISED: / SCALE: NONE

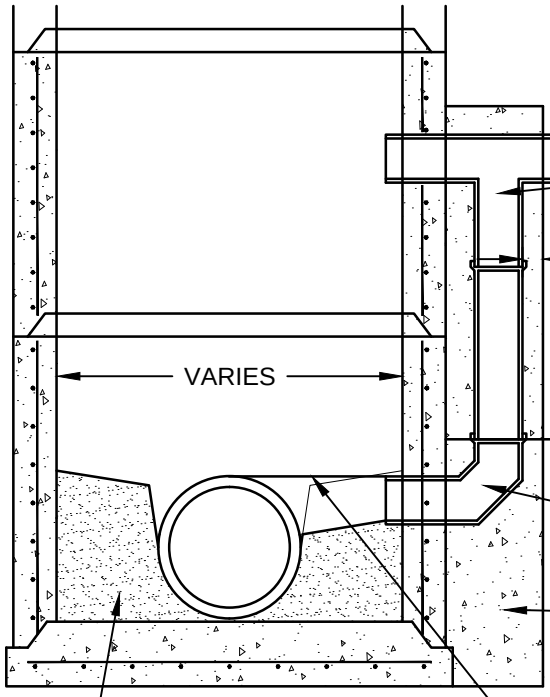




NOTES:

1. APPLY TROWELABLE BUTYL RUBBER BACKPLASTER MATERIAL 1/4" THICK (WHEN DRY) OVER RISER RINGS FROM 6" ABOVE TO 6" BELOW RISER RING JOINTS. USE TROWELABLE EZ-STICK #3, AS MANUFACTURED BY PRESS-SEAL GASKET CORP.
2. EXTERNAL CHIMNEY SEAL SHALL CONSIST OF A HEAT- SHRINKING WRAP- AROUND SLEEVE (WRAPIDSEAL AS MANUFACTURERD BY CANUSA) OR EXTERNAL CHIMNEY SEAL (AS MANUFACTURED BY CRETEX).
3. USE RU 106 RUB'RNEK LTM AS MANUFACTURED BY HENRY CO., KENT-SEAL NO. 2 AS MANUFACTURED BY HAMILTON-KENT OR EZ-STICK BUTYL-RUBBER-BASED PREFORMED FLEXIBLE SEALANT AS MANUFACTURED BY PRESS-SEAL.

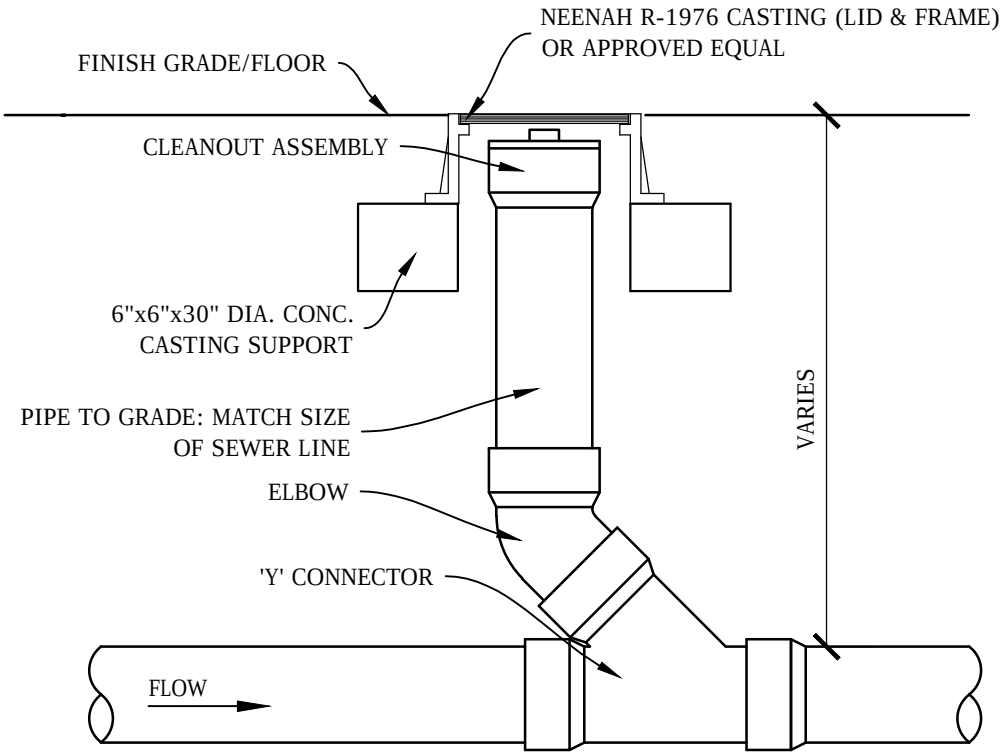
	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	SAN-03	SANITARY CASTING ADJUSTMENT	
	STANDARD DRAWINGS	APPROVED:	REVISED:	SCALE: NONE



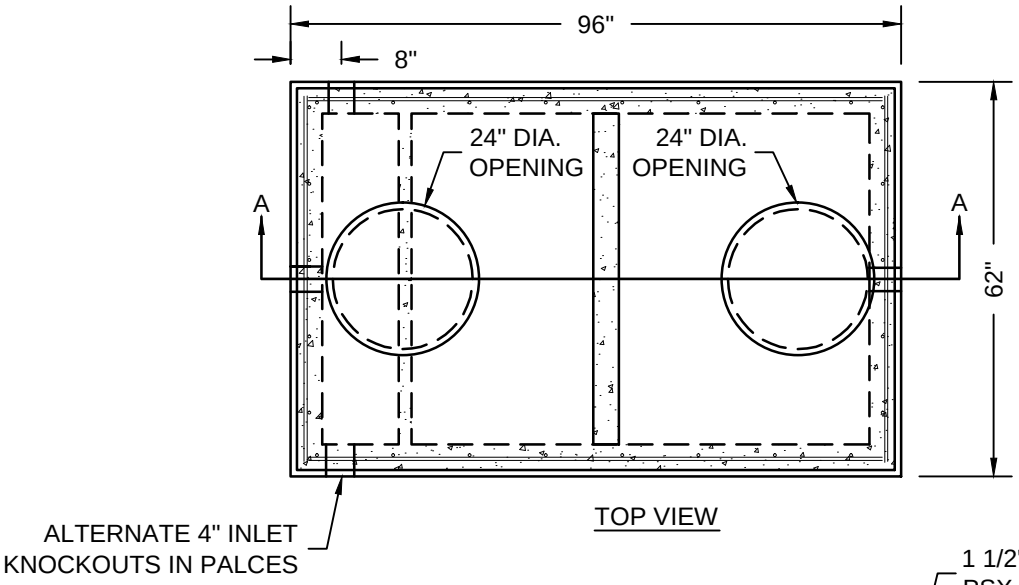
NOTES:

1. DROP PIPE SHALL BE A MINIMUM OF 8" FOR 8" TO 12" DIAMETER MAINLINE PIPE AND 12" DROP PIPE FOR ALL LARGER MAINLINE PIPES UNLESS OTHERWISE SPECIFIED.
2. GENERAL CONSTRUCTION REQUIREMENTS SAME AS STANDARD 48" MANHOLE.

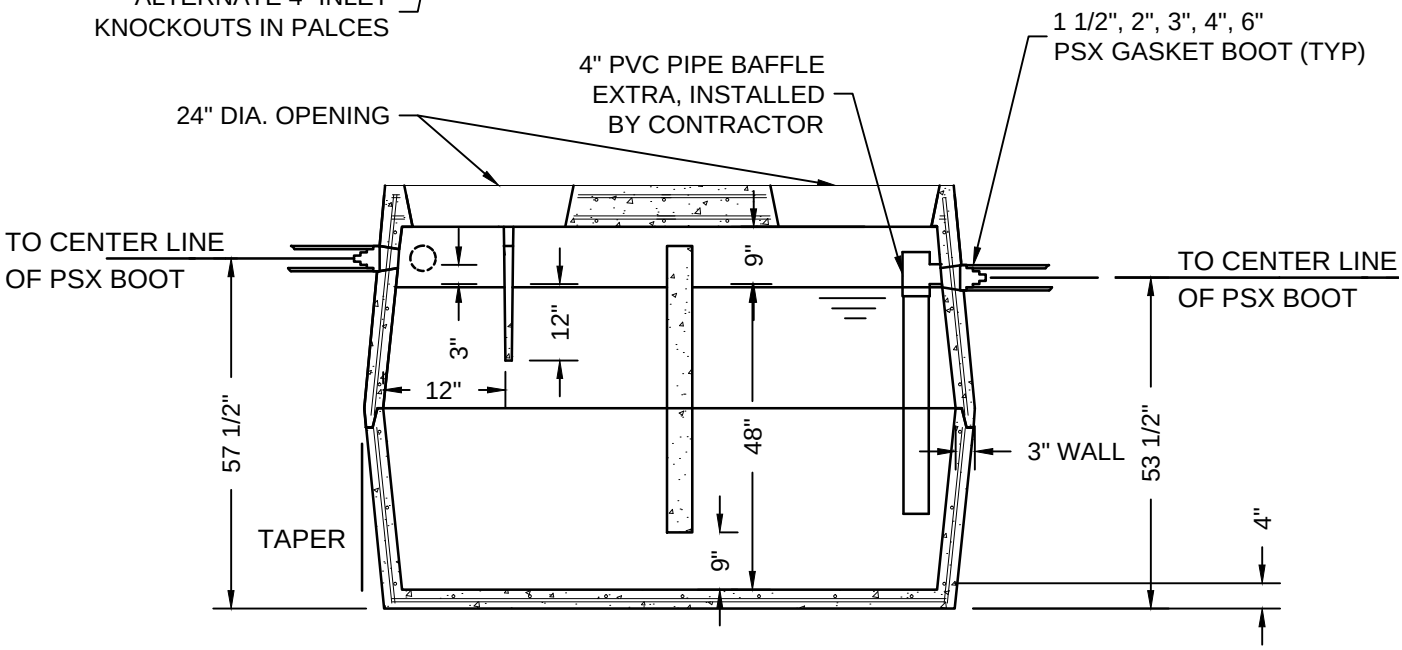
	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	SAN-04	OUTSIDE DROP CONNECTION FOR MANHOLES	
	STANDARD DRAWINGS	APPROVED:	REVISED:	SCALE: NONE



	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	SAN-05	GRAVITY SEWER CLEANOUT	
	STANDARD DRAWINGS	APPROVED:	REVISED:	SCALE: NONE



TOP VIEW

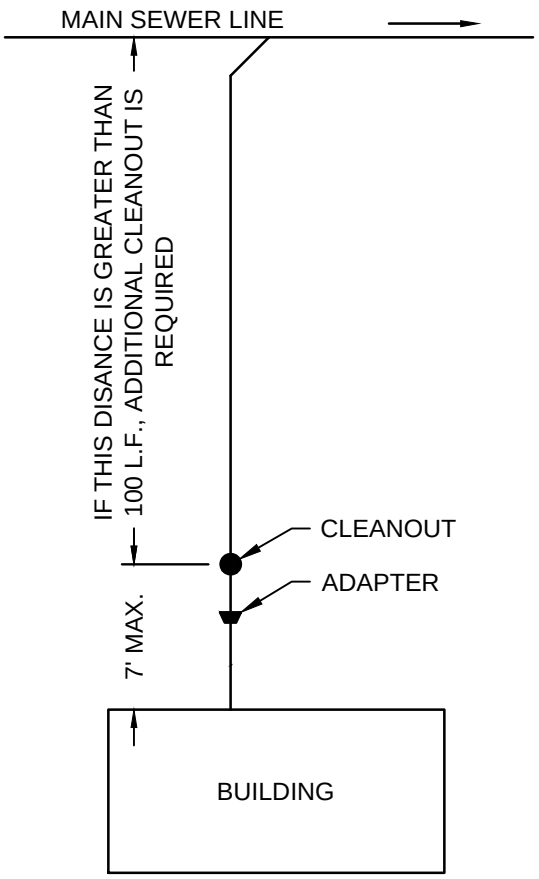


SECTION A-A

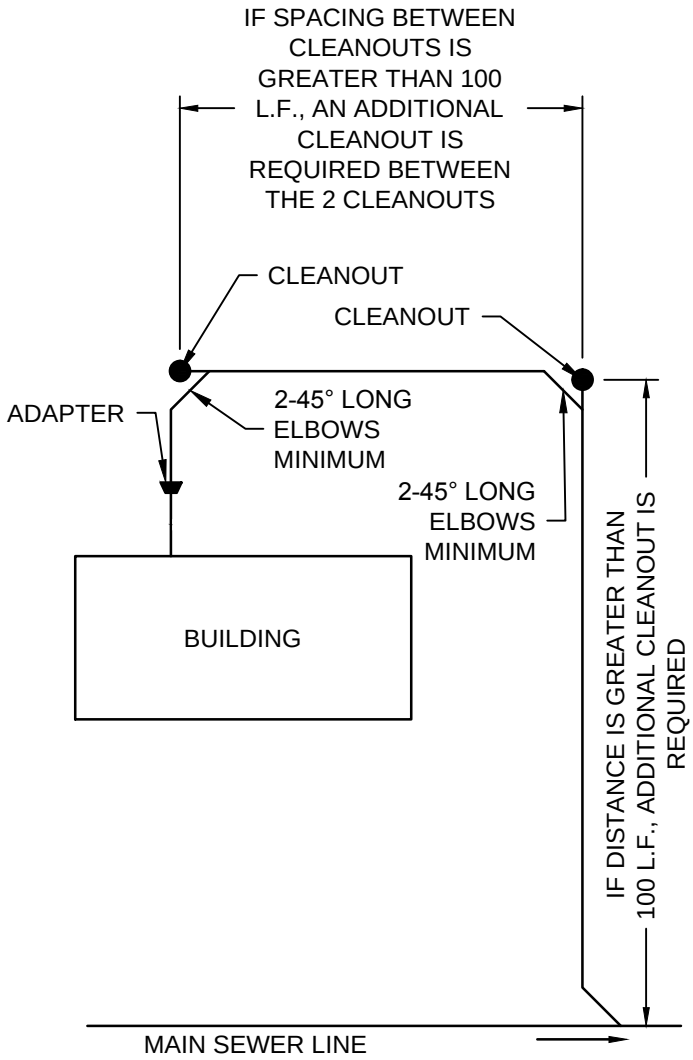
NOTES:

1. OPTIONAL TANK RISERS SHOULD BE ORDERED TO GRADE.
2. MINIMUM 4500 PSI AT 28 DAYS CONCRETE.
3. REINFORCING BARS SHALL CONFORM TO ASTM A-615 GRADE 60 STEEL.
4. ALL REINFORCING BARS SHALL BE CUT AND FORMED TO THE DIMENSIONAL TOLERANCES SPECIFIED IN ACI-315 OR ACI-318 EXCEPT WHERE NOTED ON DRAWINGS.
5. ALL BARS SHALL BE BENT COLD. BARS WITH KINKS AND BENDS NOT INDICATED SHALL NOT BE USED. HEATING AND REBENDING OF BARS IS NOT PERMITTED.
6. REINFORCING STEEL SHALL BE #4 REBAR AT 12" O.C. BOTH WAYS TIED TO 6X6 10/10 WELDED WIRE MESH. TOP OF GREASE TRAP TO HAVE DOUBLE LAYER OF STEEL.
7. EARTH COVER: 2'-0" MINIMUM UP TO 5'-0" MAXIMUM. SIZE PAD ACCORDING TO AMOUNT OF EARTH COVER.
8. DESIGN FOR TRAFFIC LOADING.

	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	SAN-06	1000 GALLON GREASE INTERCEPTOR	
	STANDARD DRAWINGS	APPROVED: TBD	REVISED:	SCALE: NONE



STRAIGHT CONNECTION



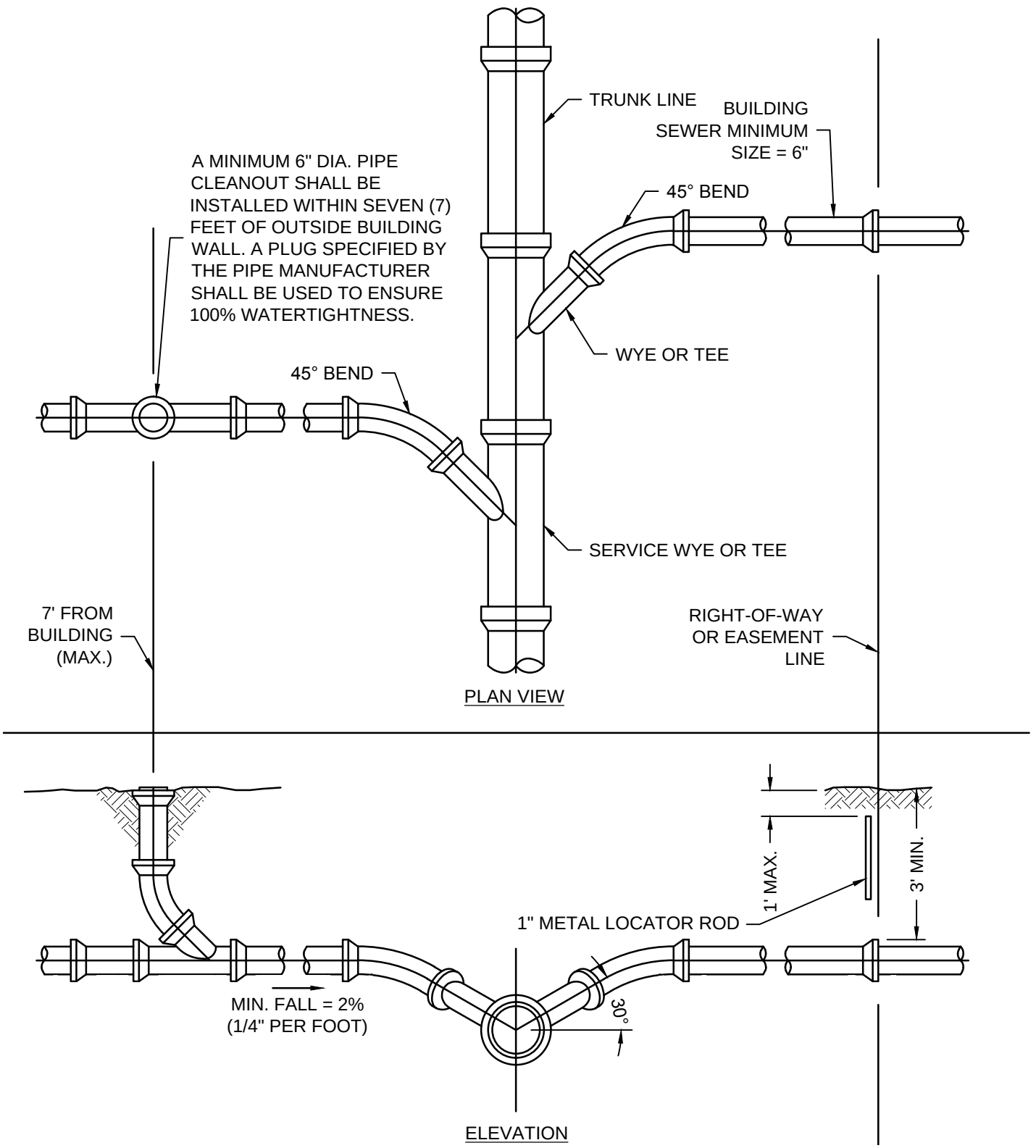
AROUND THE BUILDING CONNECTION

NOTES:

1. MAXIMUM DISTANCE BETWEEN THE EXTERIOR WALL AND THE CLEANOUT WYE SHALL BE 7'.
2. NO 90° ELBOW IS PERMITTED IN BUILDING SEWER. TWO 45° LONG ELBOWS MUST BE USED.
3. MINIMUM SLOPE OF BUILDING SEWER SHALL BE 2% (1/4" PER FOOT).
4. MINIMUM SIZE FOR BUILDING SEWER SHALL BE 6" IN DIAMETER.
5. BUILDING SEWER LINE SHALL BE INSPECTED AND APPROVED BEFORE EXCAVATION IS BACKFILLED.
6. NO CLEANOUT CAN BE INSTALLED IN A ROAD OR ALLEY RIGHT-OF-WAY OR IN A DEDICATED EASEMENT UNLESS OTHERWISE APPROVED BY THE GOVERNING AGENCY OR DEPARTMENT.

	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	SAN-07	SANITARY SEWER LATERAL PLAN VIEW	
	STANDARD DRAWINGS	APPROVED: TBD	REVISED:	SCALE: NONE

LESS THAN 15' DEEP

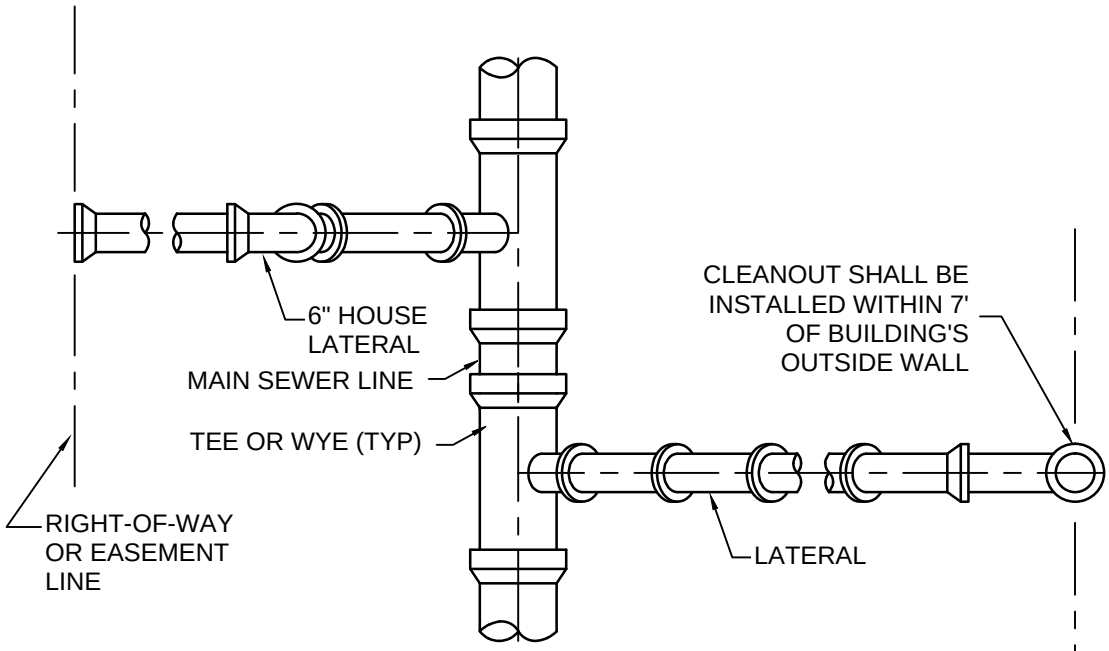


NOTES:

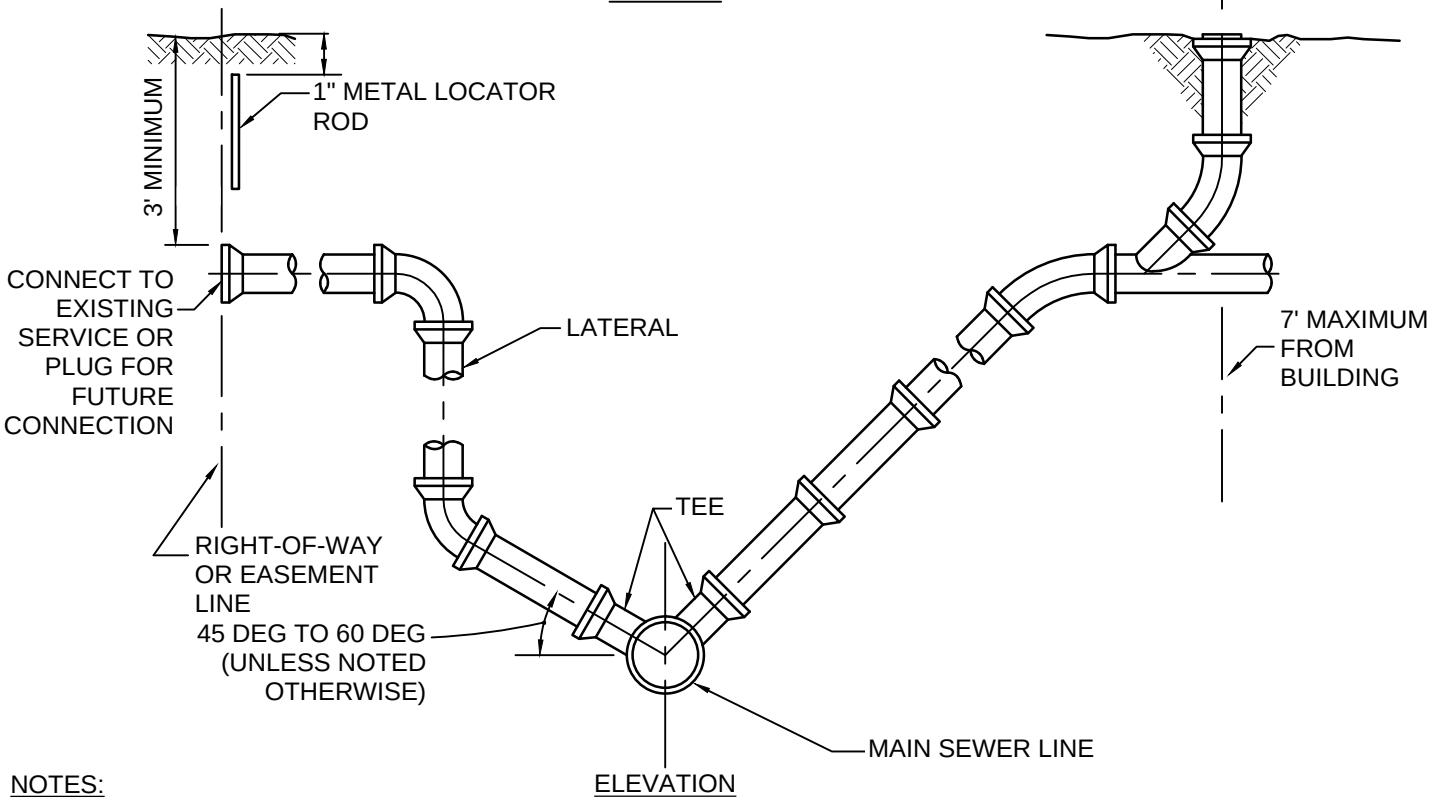
1. COMPACTION OF GRANULAR BACKFILL IS CRITICAL UNDER WYE AND BEND.
2. PROVIDE TRACER WIRE ON LATERALS PER SPECIFICATIONS.
3. PROVIDE WOOD STAKE EXTENDING 24" ABOVE GRADE AT SAME LOCATION AS METAL LOCATOR ROD.

	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	SAN-08	SANITARY LATERAL SHALLOW SERVICE CONNECTION	
	STANDARD DRAWINGS	APPROVED: TBD	REVISED:	SCALE: NONE

15' DEEP AND OVER



Plan View



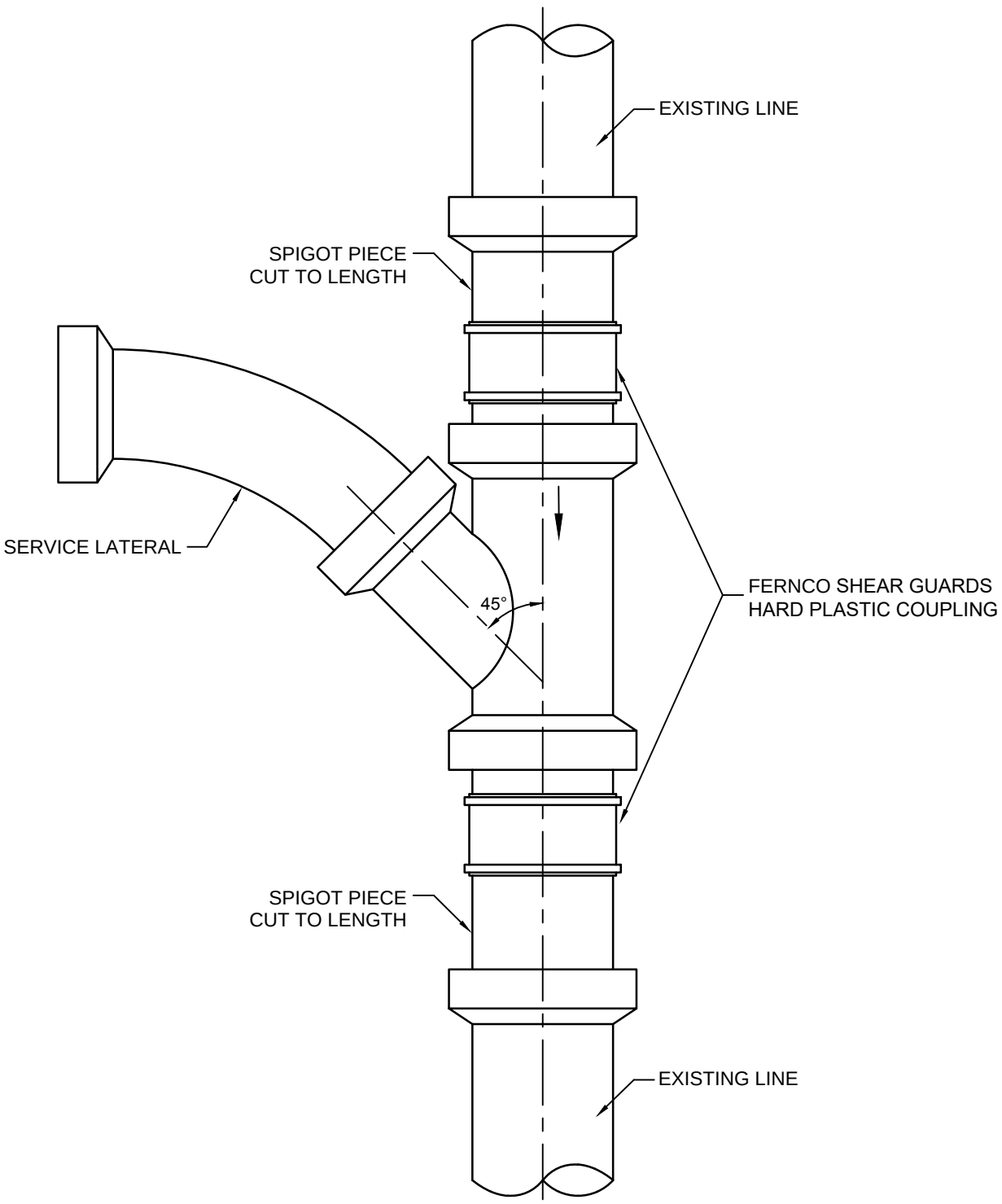
ELEVATION

NOTES:

1. MINIMUM LATERAL SLOPE: 1/4" PER FOOT.
2. PROVIDE TRACER WIRE ON LATERAL PER SPECIFICATIONS.
3. PROVIDE WOOD STAKE EXTENDING 24" ABOVE GRADE AT SAME LOCATION AS METAL LOCATOR ROD.

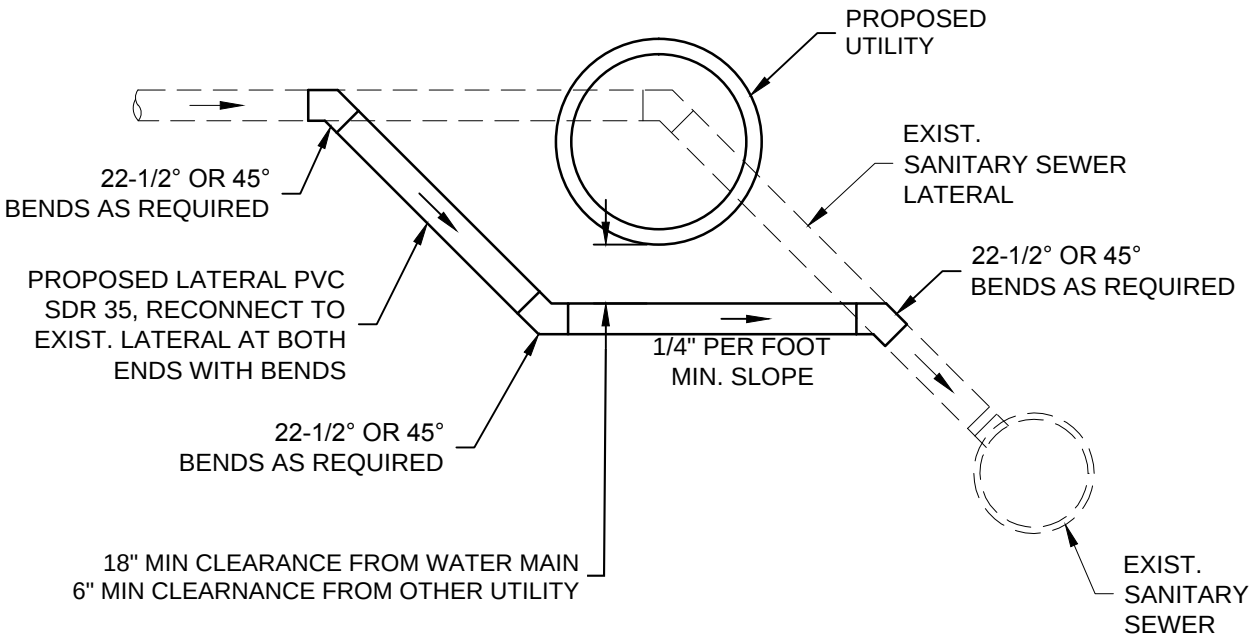
	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	SAN-09	SANITARY LATERAL DEEP SERVICE CONNECTION	
	STANDARD DRAWINGS	APPROVED: TBD	REVISED:	SCALE: NONE

PIPES LESS THAN 15"



NOTES:
1. MANUFACTURED WYES OR TEES SHALL BE USED FOR ALL MAINLINE PIPE LESS THAN 15" IN DIAMETER.
2. BYPASS PUMPING BY CONTRACTOR AS REQUIRED WITH TOWN APPROVAL.

	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	SAN-10	CUT-IN LATERAL CONNECTION	
	STANDARD DRAWINGS	APPROVED: TBD	REVISED:	SCALE: NONE



NOTES:

1. PROVIDE TRACER WIRE ON LATERAL PER SPECIFICATIONS.

	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	SAN-11	SANITARY LATERAL LOWERING	
	STANDARD DRAWINGS	APPROVED: TBD	REVISED:	SCALE: NONE

STANDARD DRAWINGS

TOWN OF DANVILLE
DANVILLE, IN 46122
49 NORTH WAYNE STREET

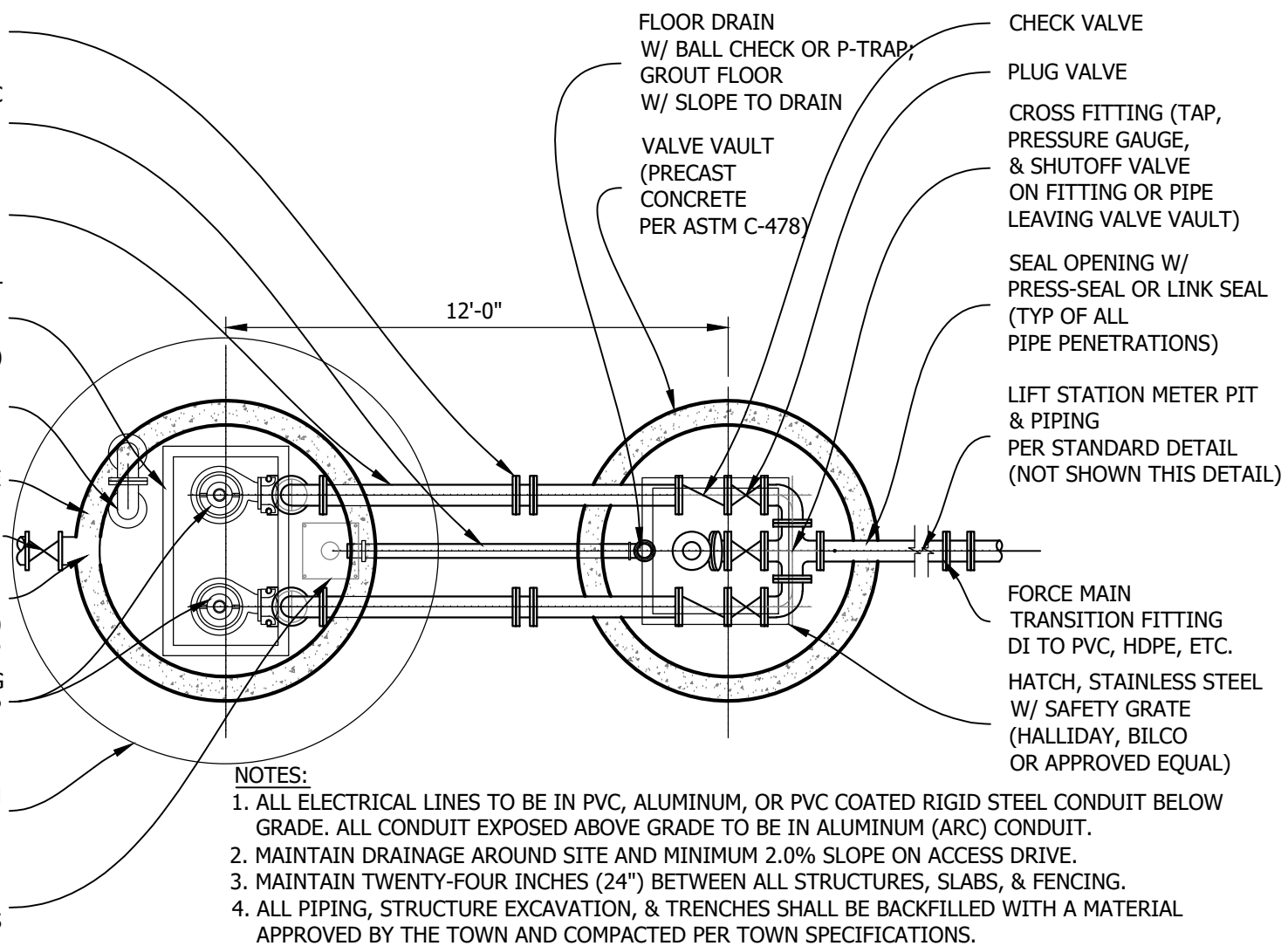
APPROVED:

SAN-12

REVISED:

LIFT STATION PLAN

SCALE: NONE



OTHER REQUIRED ITEMS:

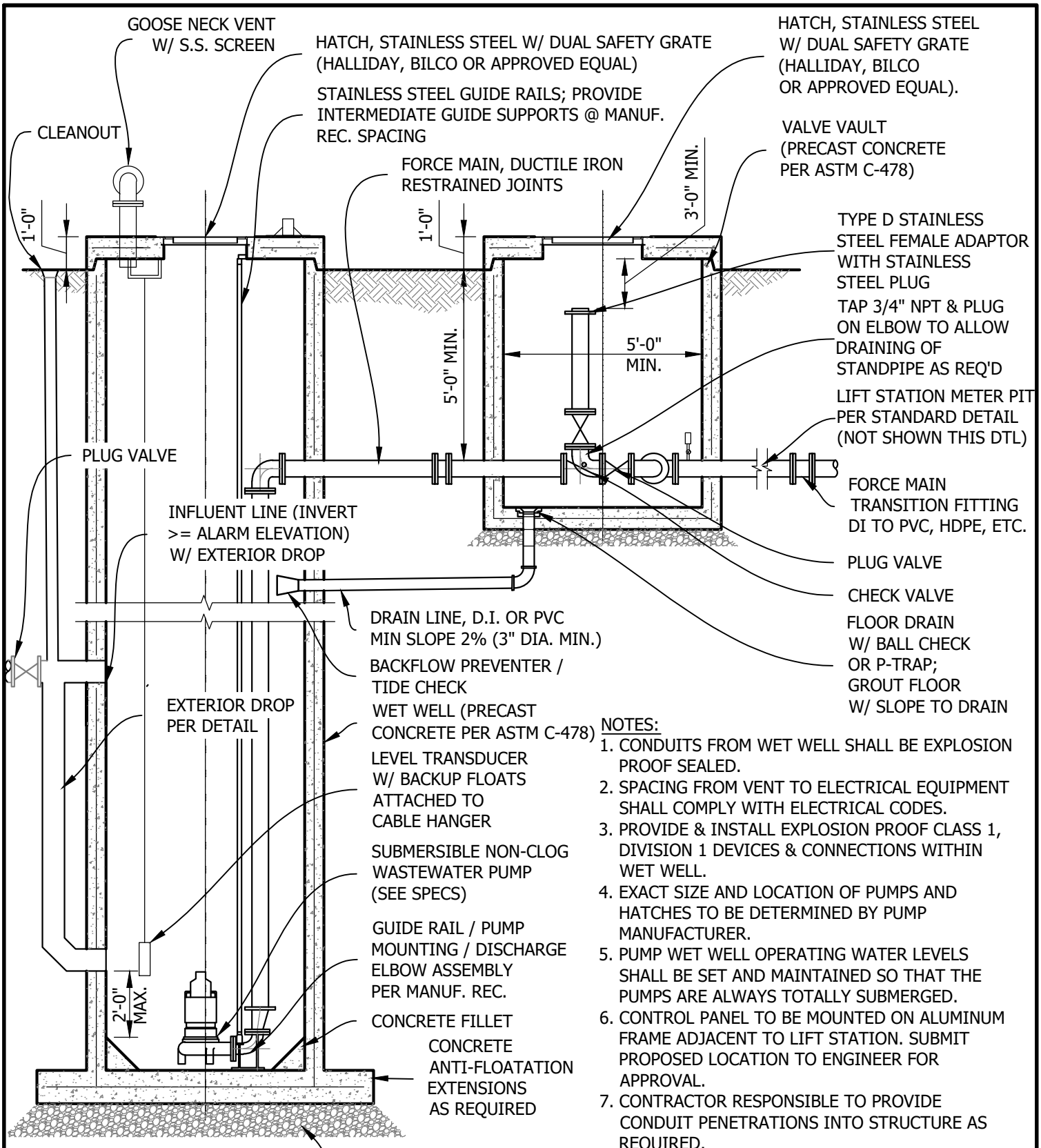
1. FENCING & GATES
2. ACCESS DRIVEWAY
3. ON SITE GENERATOR & PAD
4. FLOW METER, PIT, & PIPING
5. TELEMETRY
6. PUMP HOIST

OPTIONAL ITEMS WHICH TOWN MAY REQUIRE:

1. CHEMICAL TANK
2. CORROSION PROTECTION COATING

NOTES:

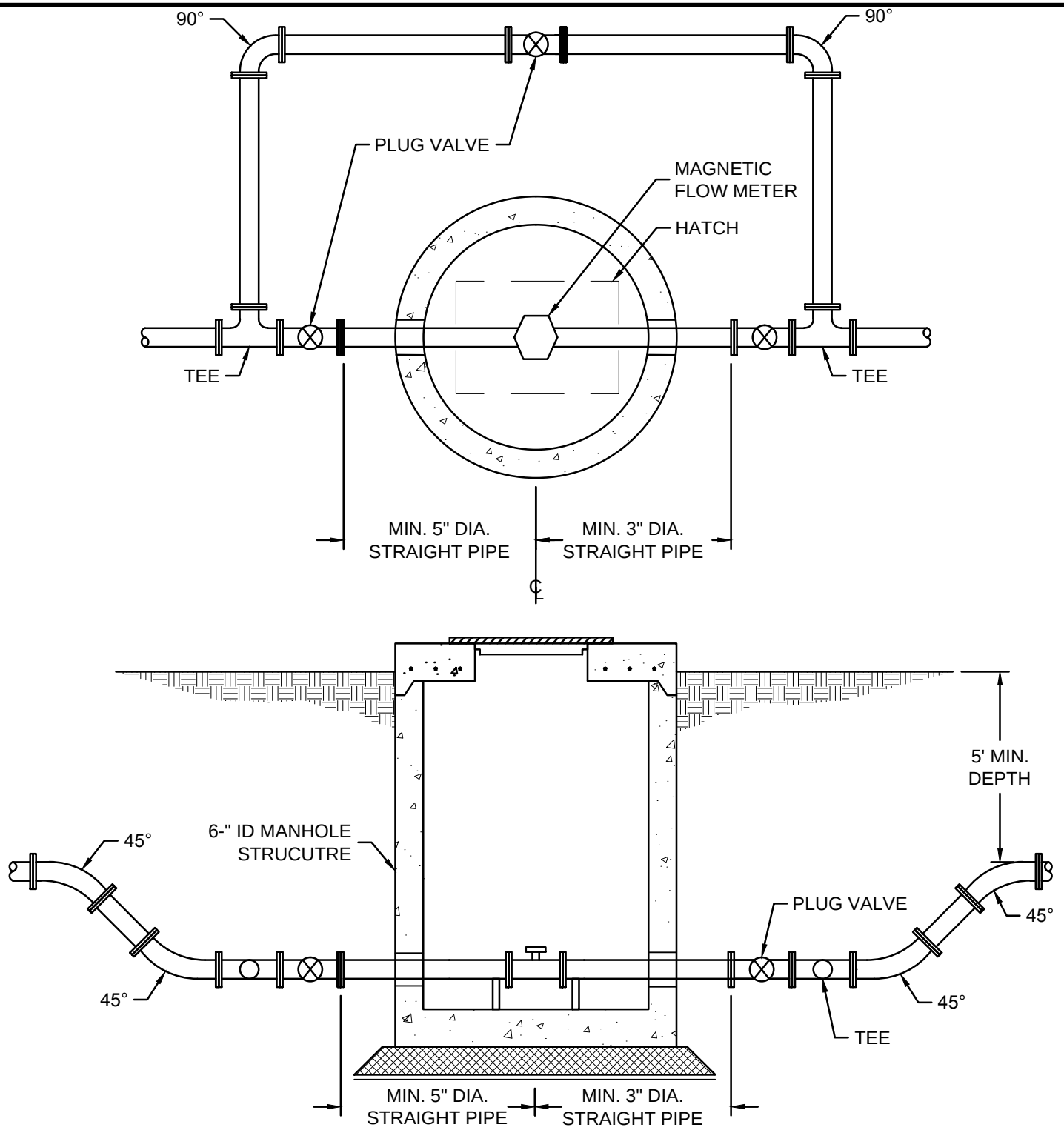
1. ALL ELECTRICAL LINES TO BE IN PVC, ALUMINUM, OR PVC COATED RIGID STEEL CONDUIT BELOW GRADE. ALL CONDUIT EXPOSED ABOVE GRADE TO BE IN ALUMINUM (ARC) CONDUIT.
2. MAINTAIN DRAINAGE AROUND SITE AND MINIMUM 2.0% SLOPE ON ACCESS DRIVE.
3. MAINTAIN TWENTY-FOUR INCHES (24") BETWEEN ALL STRUCTURES, SLABS, & FENCING.
4. ALL PIPING, STRUCTURE EXCAVATION, & TRENCHES SHALL BE BACKFILLED WITH A MATERIAL APPROVED BY THE TOWN AND COMPACTED PER TOWN SPECIFICATIONS.
5. INSTALL LIFT OUT RAIL SYSTEMS, VALVES, CONTROLS, ACCESS COVER(S) AND ALL OTHER APPURTENANCES TO MAKE A COMPLETE SYSTEM. LIFT OUT RAIL SYSTEM COMPONENTS AND UPPER GUIDE BRACKETS TO BE STAINLESS STEEL.
6. INSTALL CHECK VALVES AND ISOLATION VALVES.
7. DUCTILE IRON SHALL BE PRESSURE CLASS 350 AND CONFORM TO AWWA C151.
8. INSTALL ALL TRANSDUCERS/FLOATS, POWER CONNECTIONS, AND MISCELLANEOUS FITTINGS WITHIN THE PUMP CHAMBER. FLOAT SWITCHES TO BE NON-MERCURY TYPE.
9. PROVIDE STAINLESS STEEL LIFTING CHAINS & GUIDE RAILS FOR EACH PUMP.
10. CONTROL PANEL TO INCLUDE: SEAL FAILURE DETECTION, PHASE DETECTION, VISUAL ALARM, AUDIO ALARM, ALTERNATE PUMPS & TIME CLOCK. INSTALL ON METER MOUNTING PEDESTAL OR PROVIDE SEPARATE MOUNTING PANEL. PROVIDE GENERATOR HOOKUP AND TRANSFER SWITCH PER MUNICIPAL REQUIREMENTS. THE PANEL MUST INCLUDE HEATER WITH THERMOSTAT CONTROL.
11. CONTRACTOR TO SUBMIT WIRING DIAGRAM FOR APPROVAL PRIOR TO CONSTRUCTION.



NOTES:

1. CONDUITS FROM WET WELL SHALL BE EXPLOSION PROOF SEALED.
2. SPACING FROM VENT TO ELECTRICAL EQUIPMENT SHALL COMPLY WITH ELECTRICAL CODES.
3. PROVIDE & INSTALL EXPLOSION PROOF CLASS 1, DIVISION 1 DEVICES & CONNECTIONS WITHIN WET WELL.
4. EXACT SIZE AND LOCATION OF PUMPS AND HATCHES TO BE DETERMINED BY PUMP MANUFACTURER.
5. PUMP WET WELL OPERATING WATER LEVELS SHALL BE SET AND MAINTAINED SO THAT THE PUMPS ARE ALWAYS TOTALLY SUBMERGED.
6. CONTROL PANEL TO BE MOUNTED ON ALUMINUM FRAME ADJACENT TO LIFT STATION. SUBMIT PROPOSED LOCATION TO ENGINEER FOR APPROVAL.
7. CONTRACTOR RESPONSIBLE TO PROVIDE CONDUIT PENETRATIONS INTO STRUCTURE AS REQUIRED.
8. ROUTE DRAINAGE PIPING TO FLOOR DRAIN FROM DRAINAGE COUPLING IN VALVE VAULT HATCH.
9. PROVIDE ADEQUATE SUPPORT FOR ALL VALVES & FITTINGS TO STRUCTURE WALLS / FLOOR.

	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	SAN-13	LIFT STATION SECTION
	STANDARD DRAWINGS	APPROVED:	REVISED: / SCALE: NONE

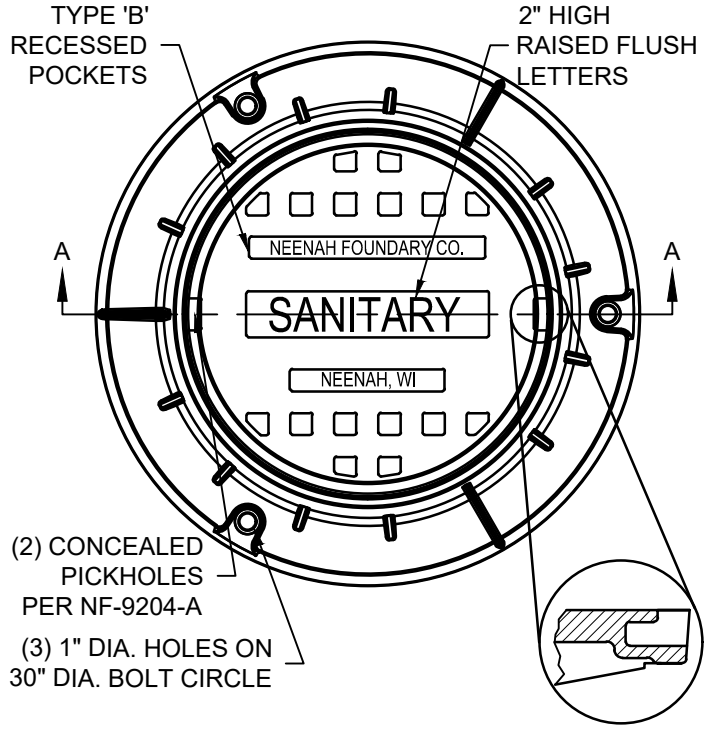


METER PIT ELEVATION VIEW

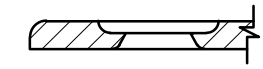
NOTES:

1. ALL VALVES, PIPE, AND FITTINGS TO BE DUCTILE IRON.
2. TOWN MAY WAIVE REQUIREMENT FOR 45 DEGREE ELBOWS UPSTREAM & DOWNSTREAM OF METER.
3. PROVIDE ADEQUATE SUPPORT FOR ALL VALVES / FITTINGS TO STRUCTURE WALLS / FLOOR.
4. PROVIDE FLOOR DRAIN WITH BALL CHECK AND 3" DIAMETER MIN. DRAIN LINE TO CONNECT WITH VALVE VAULT DRAIN LINE.

	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	SAN-14	LIFT STATION METER PIT	
	STANDARD DRAWINGS	APPROVED: TBD	REVISED:	SCALE: NONE



PICKHOLE DETAIL

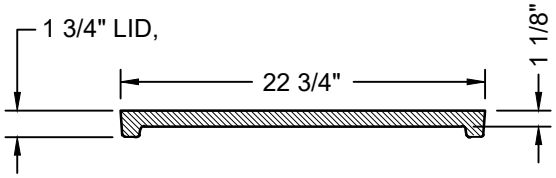


ANCHOR HOLE DETAIL

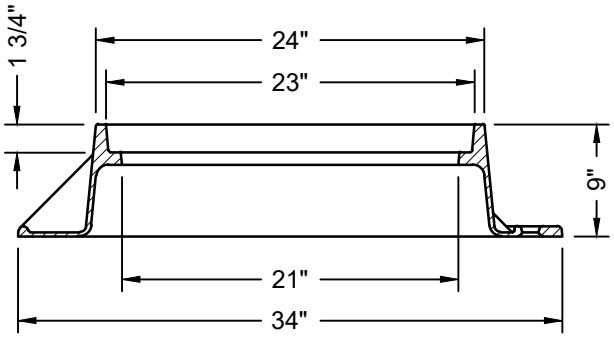
NOTES:

1. ASTM A48-83 CLASS NO. 35
2. ALL BEARING SURFACES TO BE MACHINED

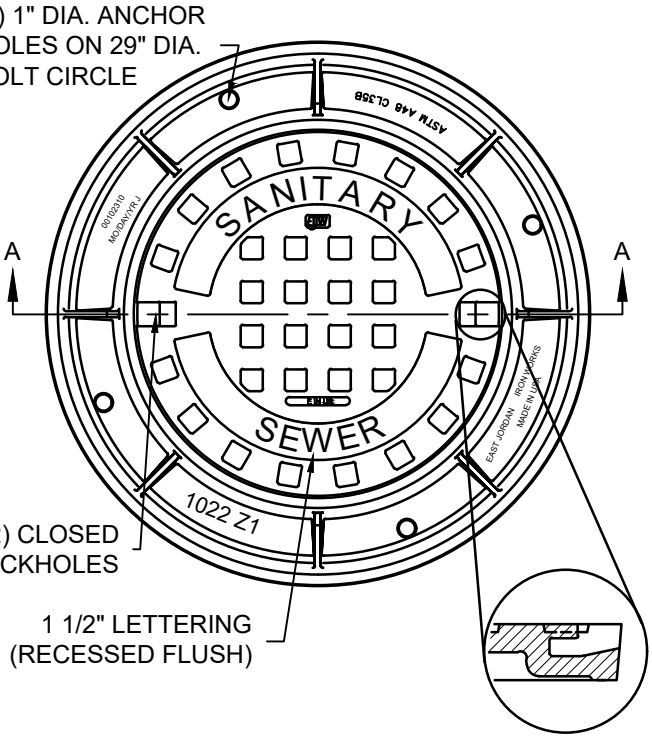
FRAME AND SOLID LID
NEENAH R-1772 W/"SANITARY" LETTERED, SOLID LID (SANITARY APPLICATION ONLY)



LID SECTION A-A



FRAME SECTION A-A

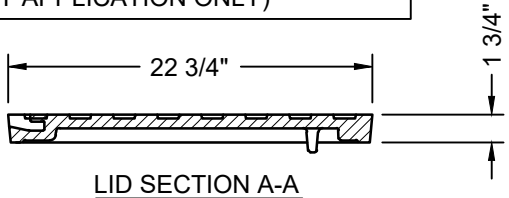


PICKHOLE DETAIL

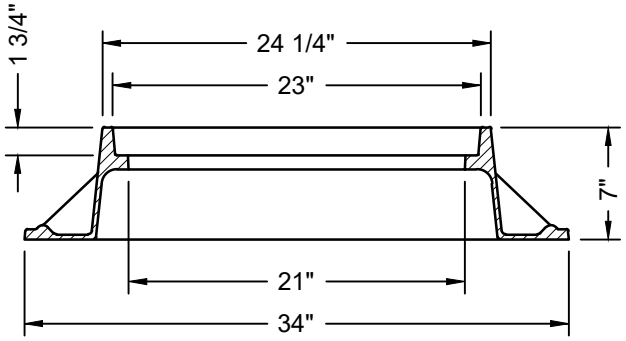
NOTES:

1. ASTM A48-83 CLASS NO. 35
2. ALL BEARING SURFACES TO BE MACHINED

FRAME AND SOLID LID
EAST JORDAN 1022Z1 W/1020AHDGS "SANITARY SEWER" LETTERED, SOLID LID (SANITARY APPLICATION ONLY)

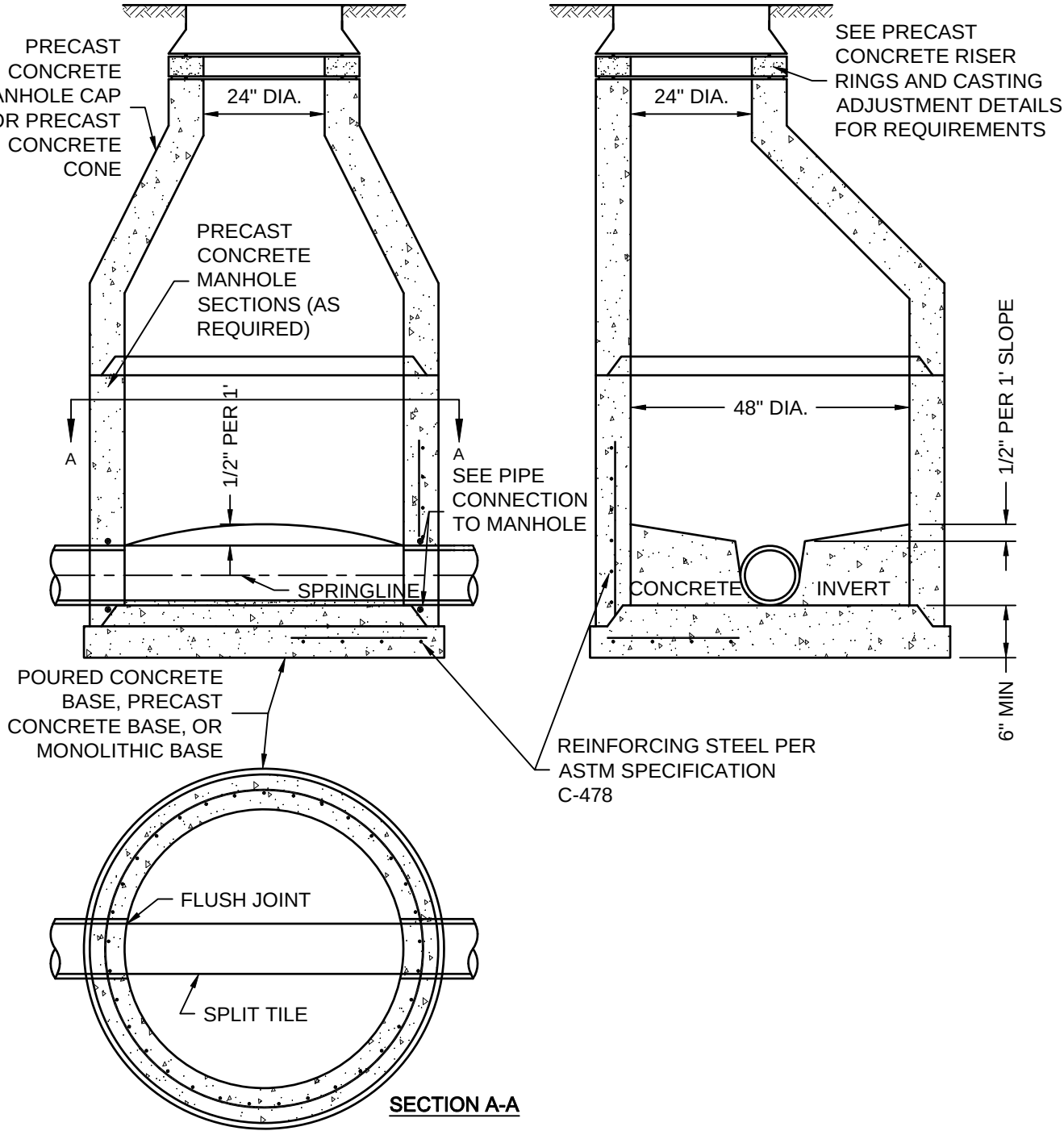


LID SECTION A-A



FRAME SECTION A-A

	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	SAN-15	24" SANITARY CASTING
	STANDARD DRAWINGS	APPROVED: TBD	REVISED: / SCALE: NONE



SECTION A-A

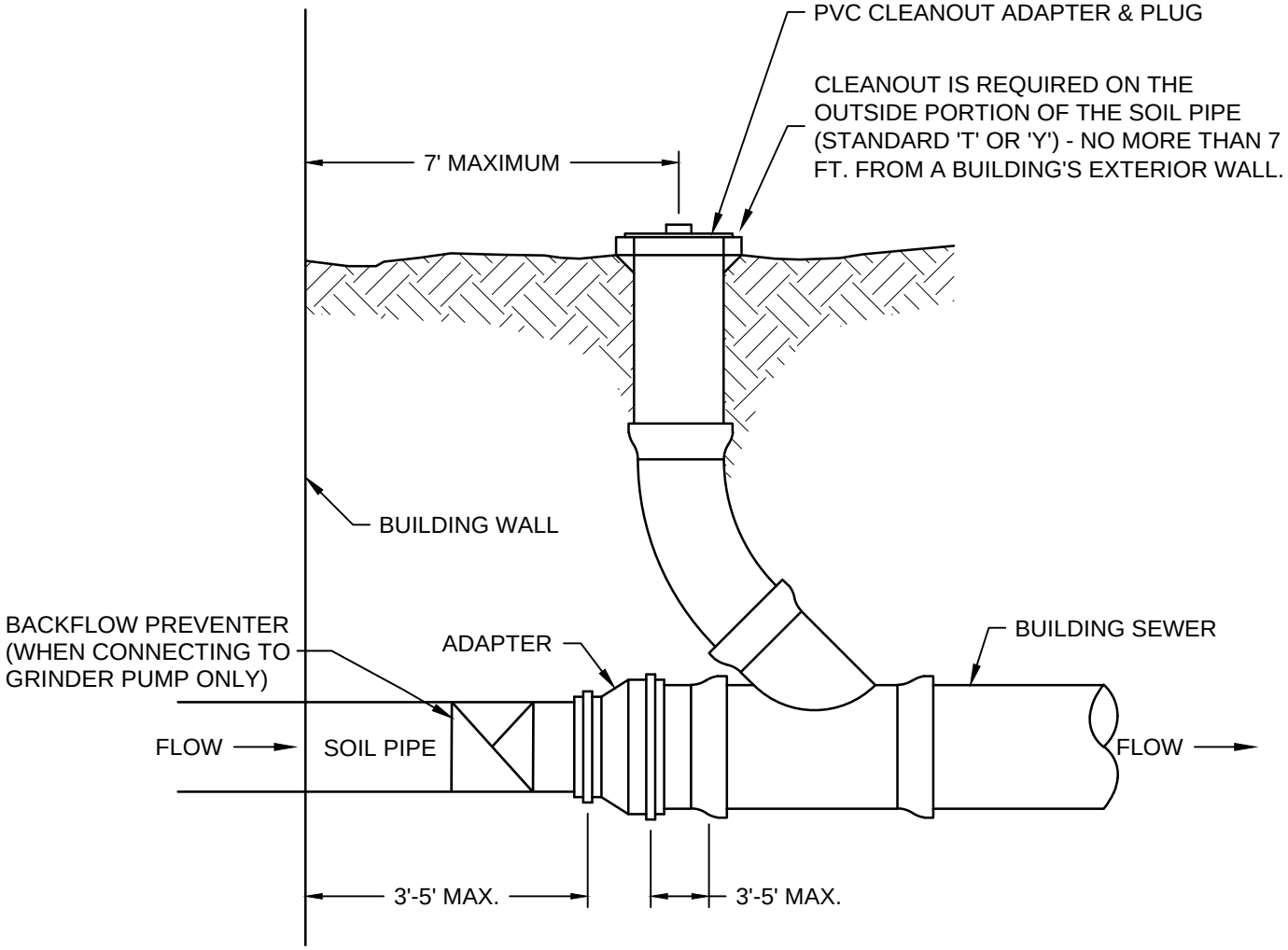
NOTES:

1. MAXIMUM FLOW LIMIT FOR A NON- METERED CONTROL MANHOLE IS 50,000 G.P.D.

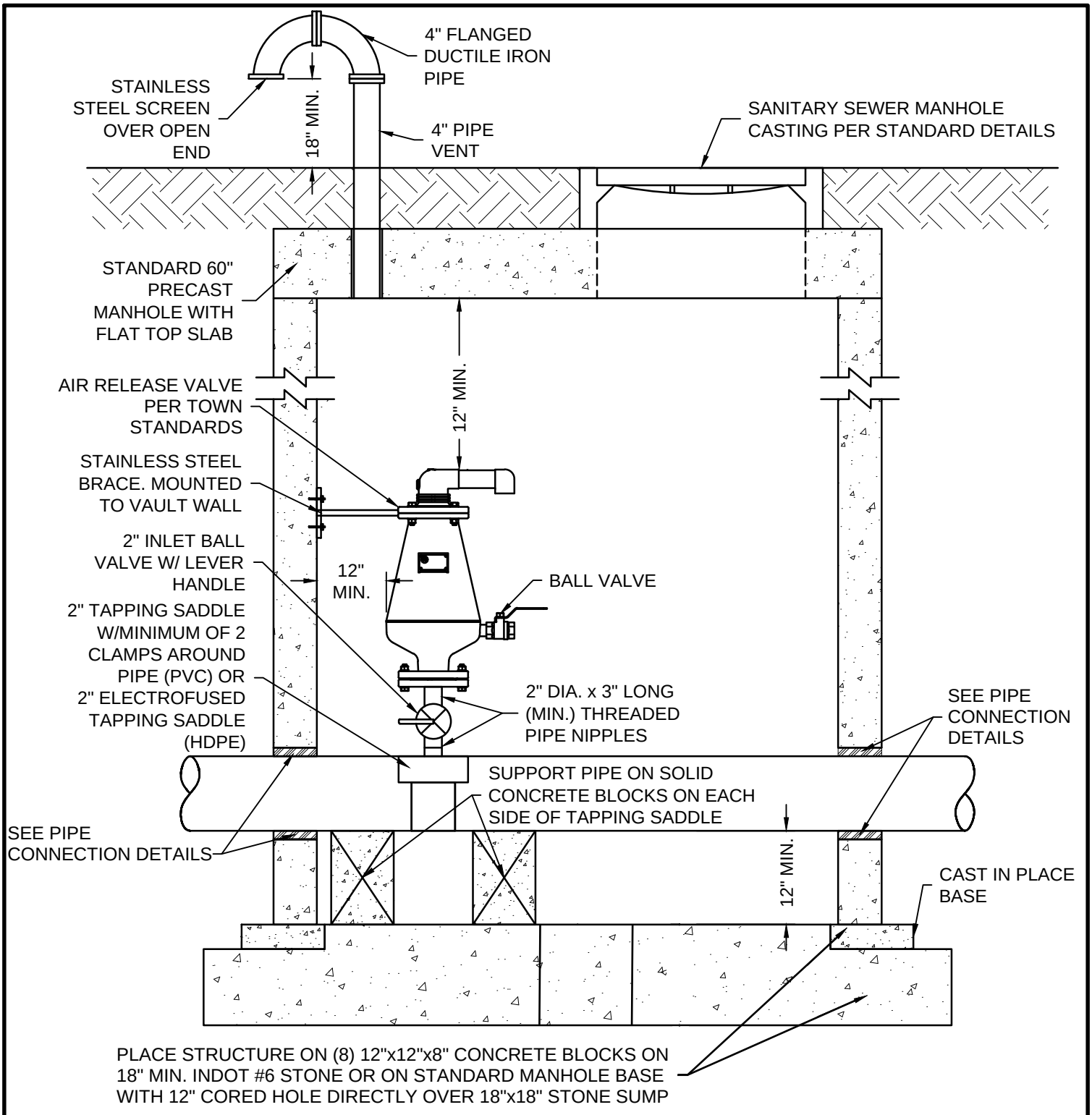
GENERAL CONSTRUCTION REQUIREMENTS:

1. ALL PRECAST MANHOLES TO BE CONSTRUCTED PER ASTM C- 478.
2. PIPE SHALL BE LAID STRAIGHT THROUGH WITH SPLIT TILE OR BROKEN OUT INSIDE TO SMOOTH FINISH.
3. SHOP DRAWINGS SHALL BE APPROVED PRIOR TO CONSTRUCTION.
4. ALL INSIDE JOINTS OF MANHOLE COMPONENTS SHALL BE SMOOTHED WITH MORTAR.
5. MINIMUM DIAMETER OF THROUGH PIPE SHALL BE 6".
6. MANHOLE CONSTRUCTION SHALL COMPLY WITH 48" SANITARY MANHOLE DETAIL.

	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	SAN-16	CONTROL MANHOLE	
	STANDARD DRAWINGS	APPROVED: TBD	REVISED:	SCALE: NONE



	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	SAN-17	BUILDING ADAPTER & CLEANOUT	
	STANDARD DRAWINGS	APPROVED: TBD	REVISED:	SCALE: NONE

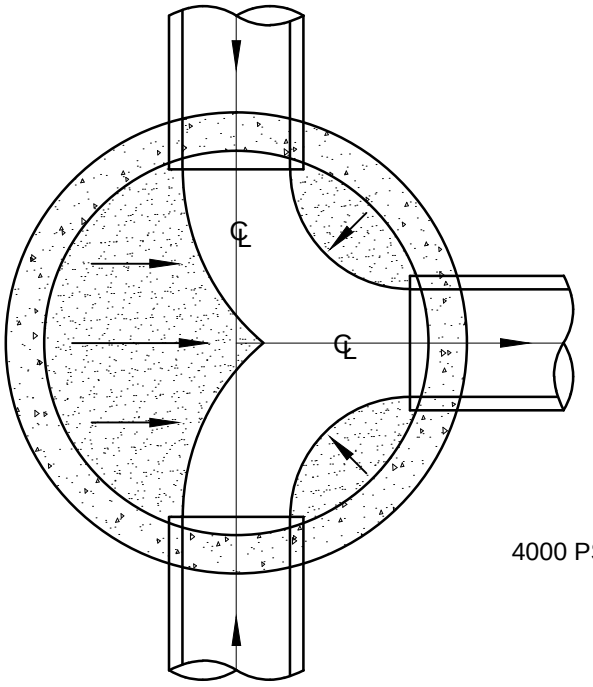


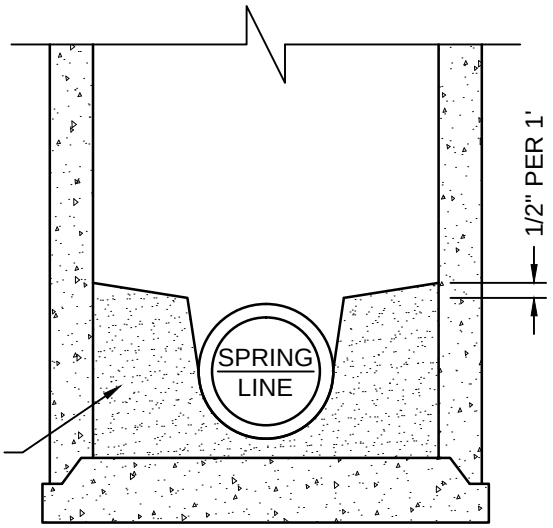
NOTES:

1. CONTRACTOR SHALL BE RESPONSIBLE FOR BRACING VALVE TO PREVENT ANY TYPE OF MOVEMENT.
2. CONTRACTOR SHALL INSTALL COMBINATION VALVE OFFSET FROM CENTER OF STRUCTURE AND ON OPPOSITE SIDE OF MANHOLE ACCESS TO PROVIDE UNIMPEDED ACCESS TO STRUCTURE.
3. WEIGHT OF COMBINATION VALVE SHALL NOT BE SUPPORTED BY THE FORCE MAIN PIPE.
4. PROJECT ENGINEER SHALL PROVIDE VALVE MODEL AND SIZE.
5. MINIMUM CLEARANCE OF STRUCTURE SHALL BE 6 FT. FROM TOP OF STONE BASE TO STRUCTURE CEILING.
6. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR CONTROLLING MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES FOR CONSTRUCTION AND IS THEREFORE RESPONSIBLE FOR CONTROLLING THE QUALITY OF WORK.

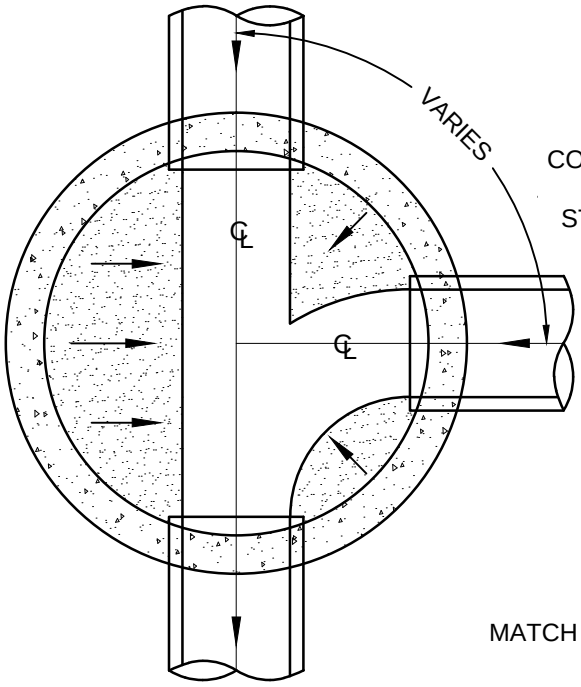
	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	SAN-18	AIR RELEASE STRUCTURE	
	STANDARD DRAWINGS	APPROVED: TBD	REVISED:	SCALE: NONE

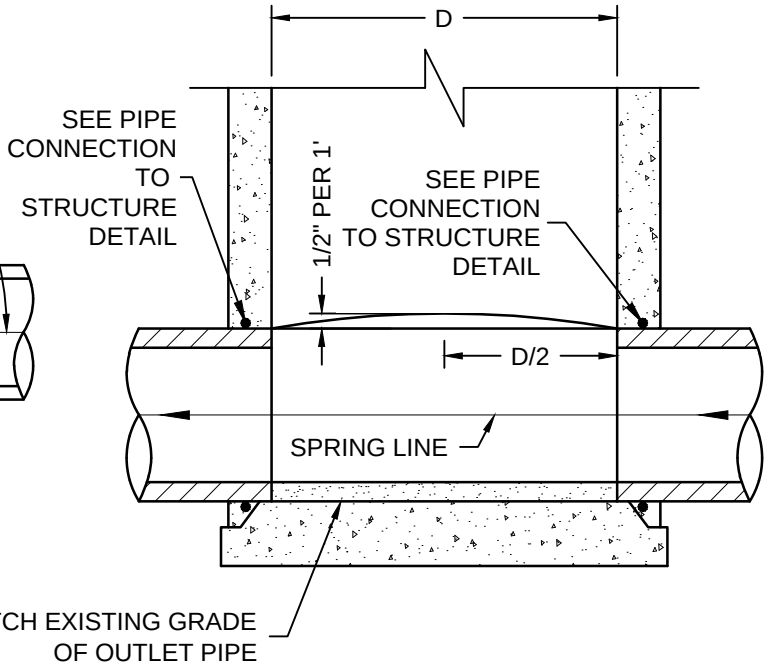
	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122			
	STANDARD DRAWINGS	APPROVED:	REVISED:	SCALE: NONE



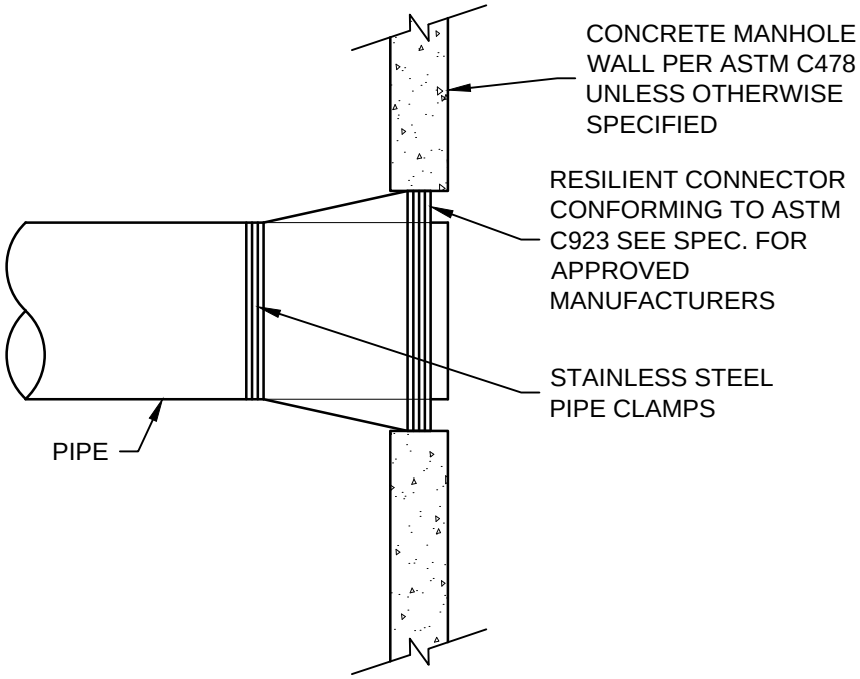


DROP, END, OR STEP-UP MANHOLE





	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	STC-01	POURED CHANNEL SHAPES
	STANDARD DRAWINGS	APPROVED: TBD	REVISED:
			SCALE: NONE

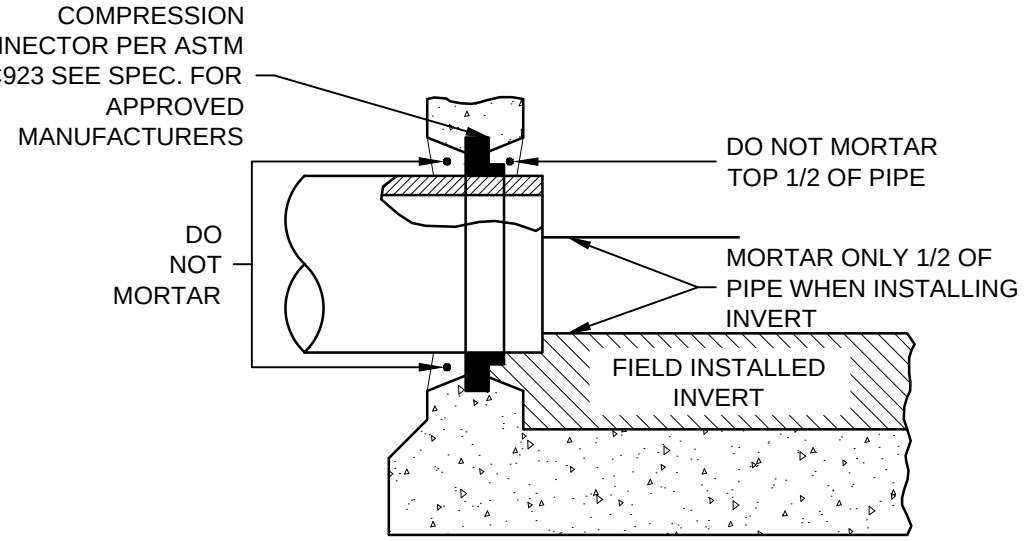


BOOT TYPE

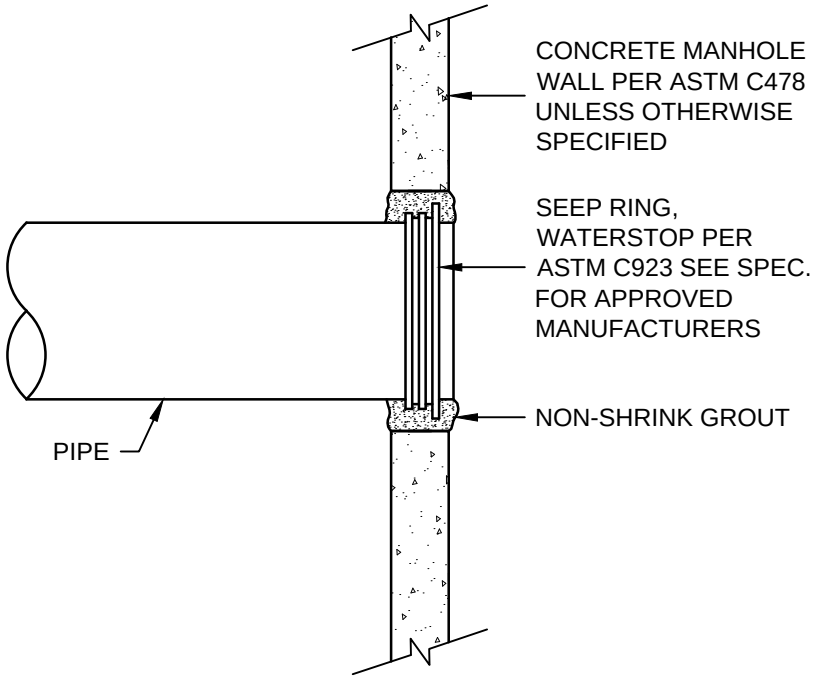
CAUTION:

1. WHEN INSTALLING PIPE STUBS FOR FUTURE PIPELINE, INSTALLATION OF ALL STUBS SHOULD BE PROPERLY RESTRAINED TO PREVENT ANY MOVEMENT.
2. TYPICAL APPLICATION IS FOR PIPES 36" IN DIAMETER OR SMALLER.

	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	STC-02	BOOTED PIPE CONNECTION TO STRUCTURE	
	STANDARD DRAWINGS	APPROVED: TBD	REVISED:	SCALE: NONE



COMPRESSION TYPE CAST IN PLACE

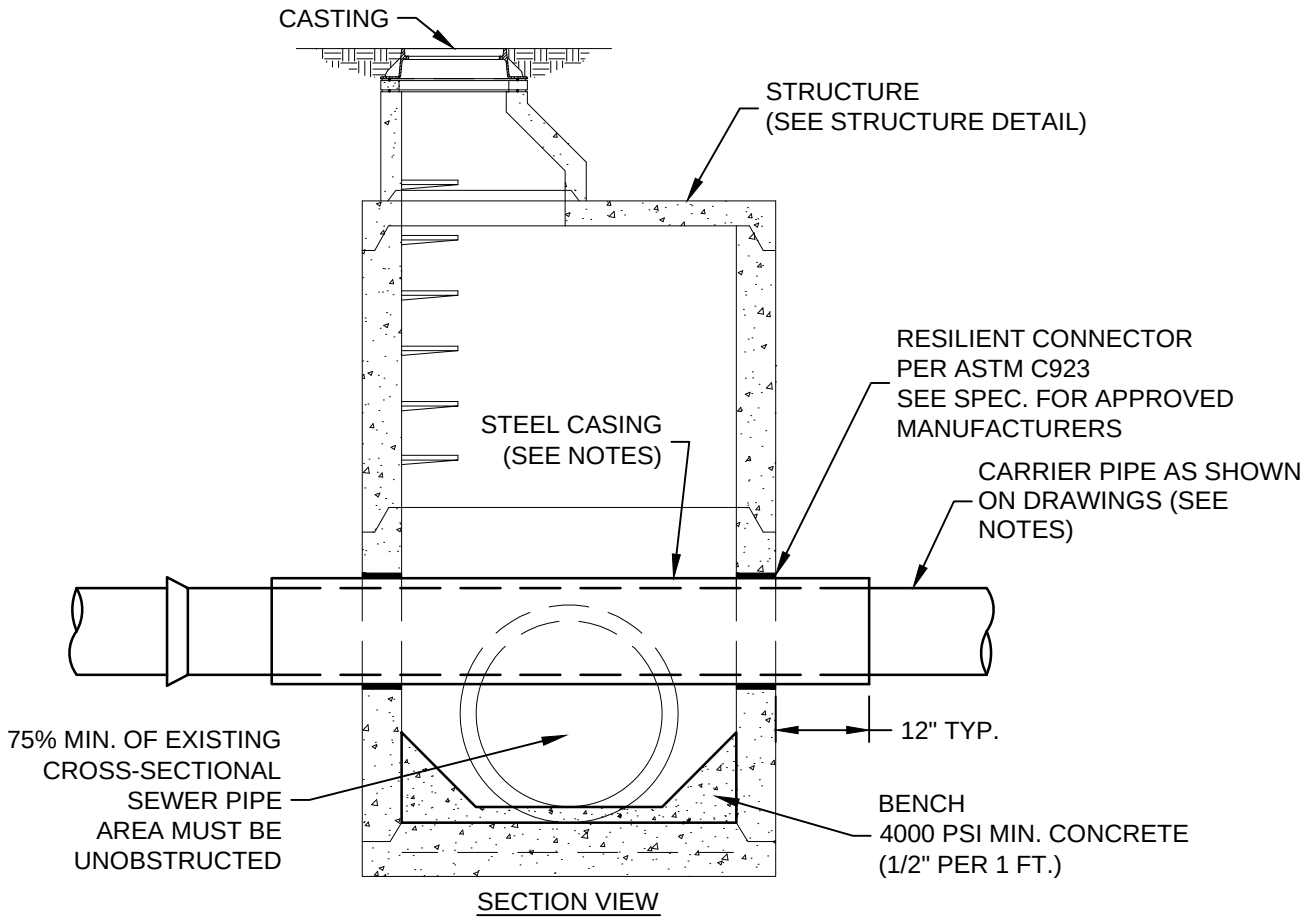


COMPRESSION TYPE GROUT IN PLACE

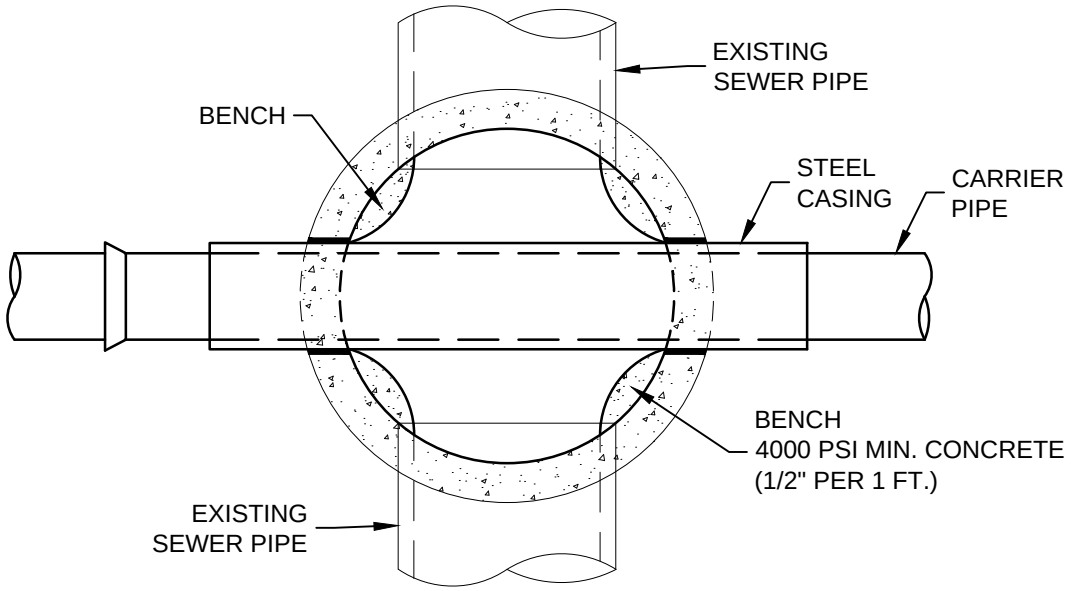
NOTES:

1. WHEN INSTALLING PIPE STUBS FOR FUTURE PIPELINE, INSTALLATION OF ALL STUBS SHOULD BE PROPERLY RETRAINED TO PREVENT ANY MOVEMENT.
2. TYPICAL APPLICATION IS FOR PIPES LARGER THAN 36".

	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	STC-03	COMPRESSION PIPE CONNECTION TO STRUCTURE	
	STANDARD DRAWINGS	APPROVED: TBD	REVISED:	SCALE: NONE



SECTION VIEW

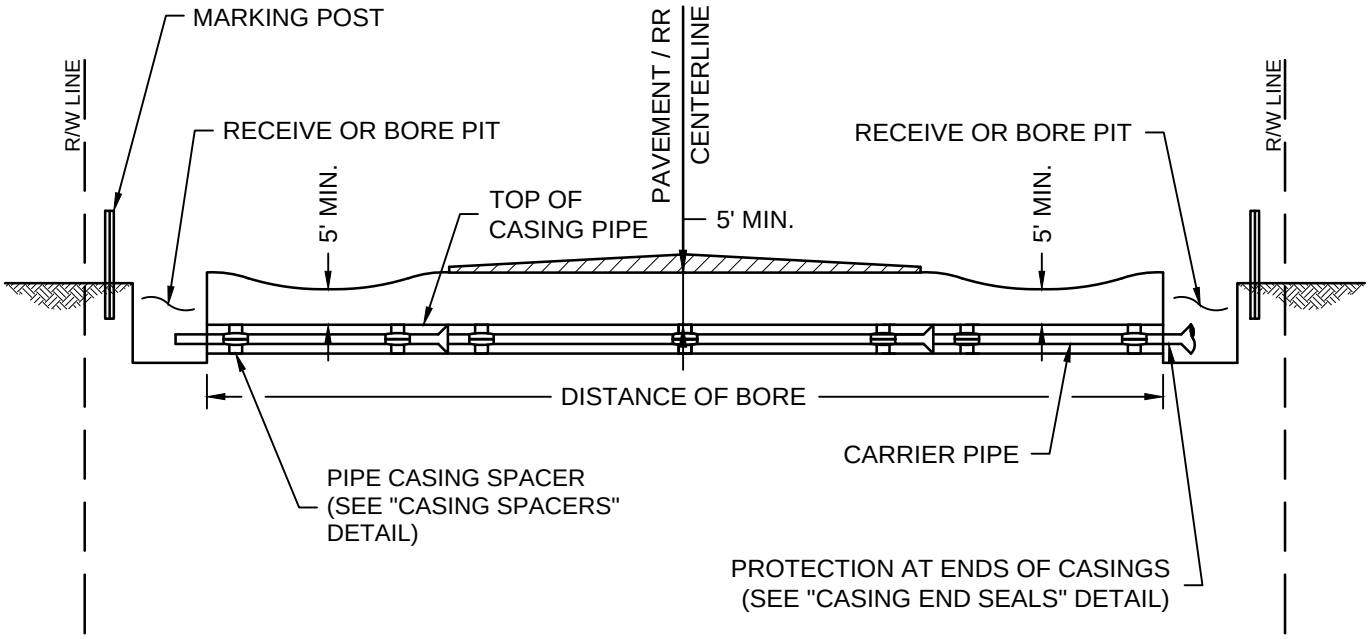


PLAN VIEW

NOTES:

1. STEEL CASING REQUIRED ON A CASE BY CASE BASIS PER OWNER / ENGINEER.
2. DUCTILE IRON PIPE SHALL BE USED FOR CROSSING PIPE IF CASING IS NOT USED.
3. CASING SPACERS SHALL BE USED WITH STEEL CASING. REFER TO CASING SPACERS DETAIL.
4. IT IS PREFERRED TO HAVE THE SANITARY SEWER PIPE RUN THROUGH THE MANHOLE (AS CARRIER PIPE) WHEN POSSIBLE.

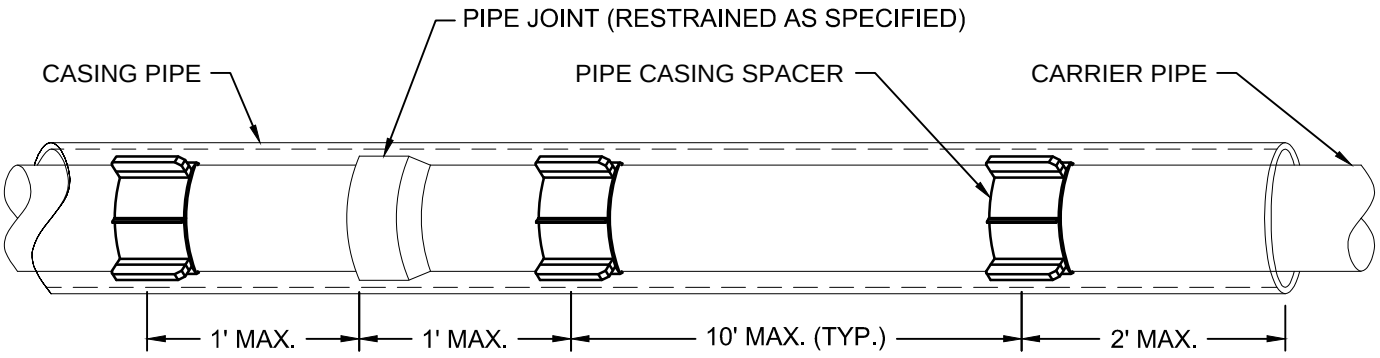
	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	STC-04	CONFLICT STRUCTURE	
	STANDARD DRAWINGS	APPROVED: TBD	REVISED:	SCALE: NONE



NOTES:

1. JOINTS MAY REQUIRE RESTRAINT WITHIN CASING IF SPECIFIED.
2. TRACING WIRE TO BE INSTALLED THROUGH ALL CASED BORINGS.
3. STEEL PIPE CASING SHALL CONFORM TO THE REQUIREMENTS OF ASTM A283, GRADE B, C, OR D. ALL JOINTS SHALL BE WELDED INTERIOR JOINTS SHALL BE GROUND TO A SMOOTH FINISH. ALL WELDING SHALL BE PERFORMED IN ACCORDANCE WITH AWWA C206, "AWWA STANDARD FOR FIELD WELDING OF STEEL WATER PIPE." COATING FOR STEEL CASING NOT REQUIRED.
4. STEEL PIPE CASING SHALL BE INSTALLED SYMMETRICAL ABOUT PIPE CENTERLINE (TYP). PIPE CASING SHALL BE LAID TRUE TO LINE AND GRADE WITH NO BENDS OR CHANGES IN GRADE FOR THE FULL LENGTH OF THE CASING.
5. CASING ONLY TO BE FILLED WITH SAND OR GROUT WITH APPROVAL BY OWNER / ENGINEER.

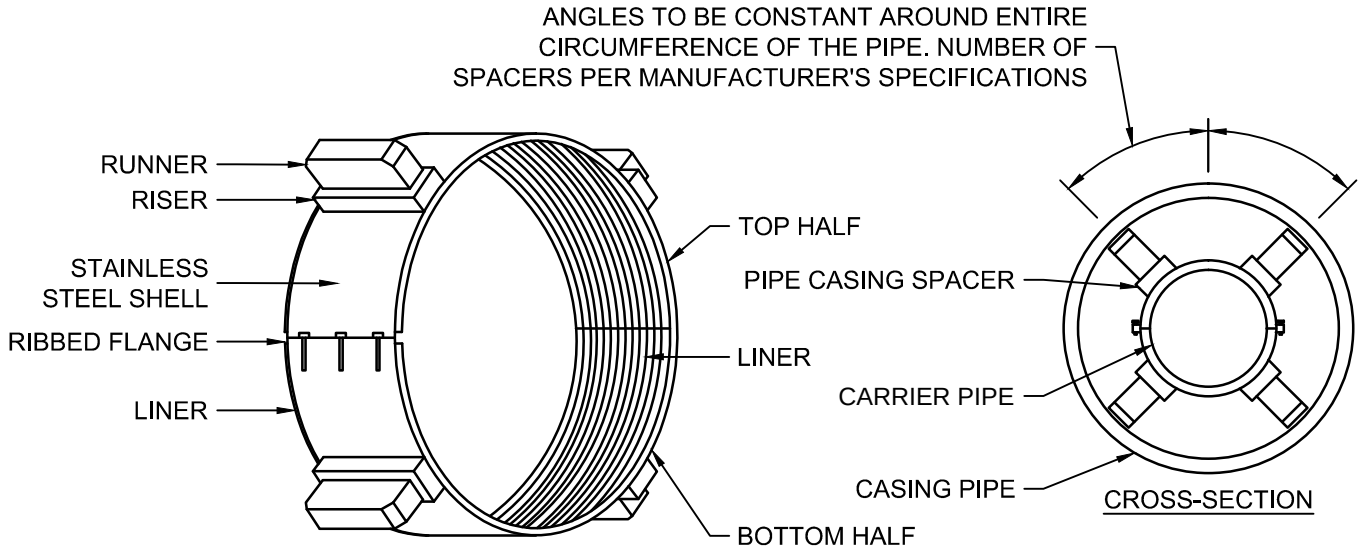
	TOWN OF HUNTERTOWN 15617 LIMA ROAD - P.O. BOX 95 HUNTERTOWN, IN 46748	STC-05	TYPICAL JACKED & BORED CASING PIPE	
	STANDARD DRAWINGS	APPROVED: TBD	REVISED:	SCALE: NONE



CARRIER PIPE		
PIPE SIZE	CASING O.D.*	THICKNESS **
6"	16"	1/4"
8"	18"	1/4"
10"	20"	5/16"
12"	24"	3/8"
16"	30"	1/2"
18"	30"	1/2"
20"	36"	1/2"
24"	42"	1/2"

* PROJECT ENGINEER RESPONSIBLE TO CONFIRM APPROPRIATE CLEARANCES FOR FLANGES / BELLS; SUBJECT TO TOWN REVIEW.

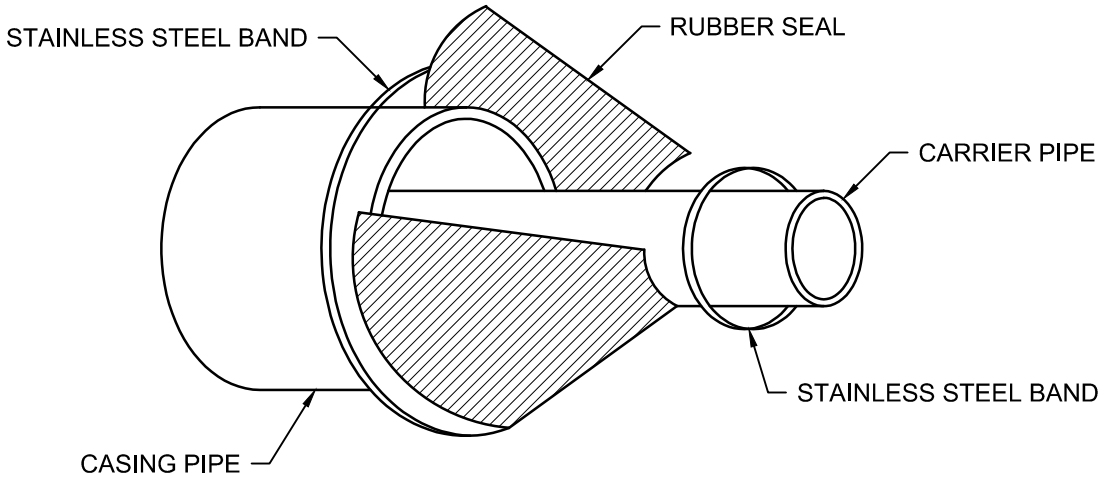
** PROJECT ENGINEER RESPONSIBLE TO COORDINATE WITH INDOT / RAILROAD / AUTHORITY HAVING JURISDICTION; SUBJECT TO TOWN REVIEW.



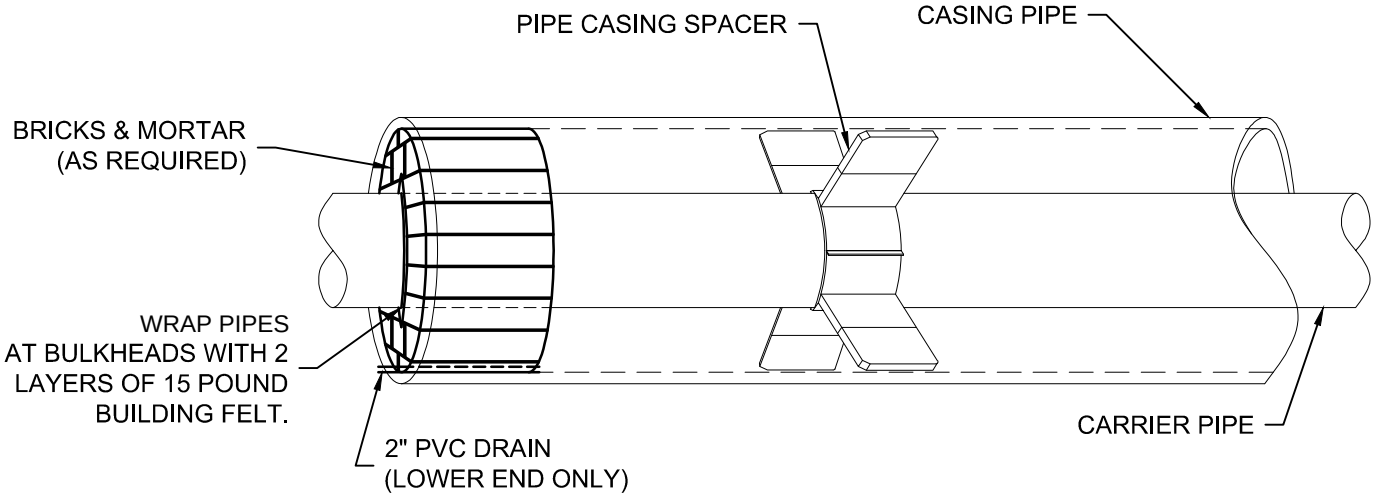
NOTES:

1. CASING SPACERS SHALL BE CCS SERIES BY CASCADE WATERWORKS MFG. ALTERNATE CASING SPACERS MAY BE USED WITH PRIOR APPROVAL FROM OWNER / ENGINEER.
2. TOWN APPROVED CASING SPACERS AND END SEALS SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS. USE A "CENTERED" CONFIGURATION AND PROVIDE THE MANUFACTURER WITH THE FOLLOWING INFORMATION: CARRIER PIPE O.D., CASING PIPE I.D., AND CASING LENGTH.

	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	STC-06	CASING SPACERS	
	STANDARD DRAWINGS	APPROVED: TBD	REVISED:	SCALE: NONE

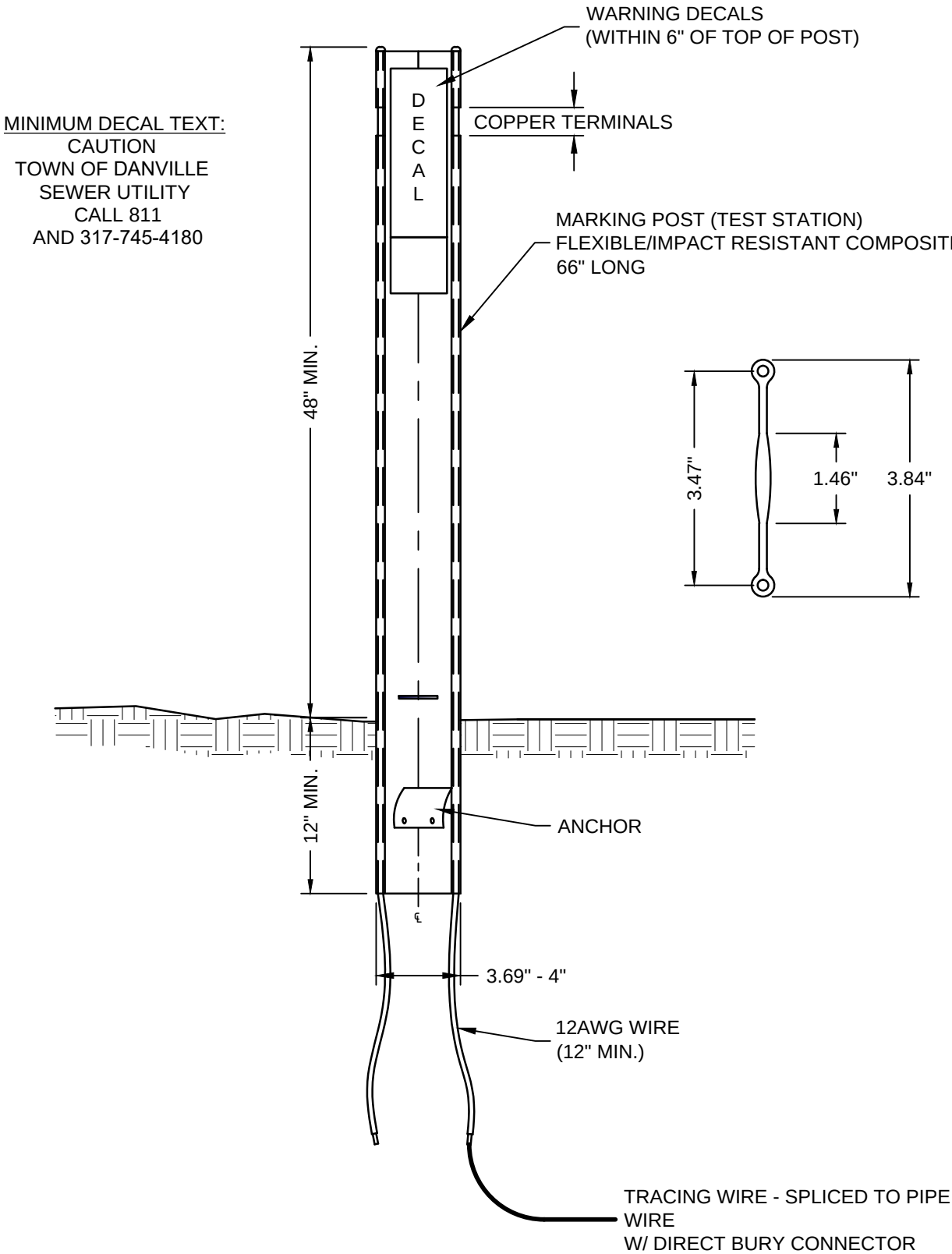


RUBBER END SEAL (3" DIAMETER AND SMALLER CARRIER PIPE)



BRICK AND MORTAR END SEAL (4" DIAMETER AND LARGER CARRIER PIPE)

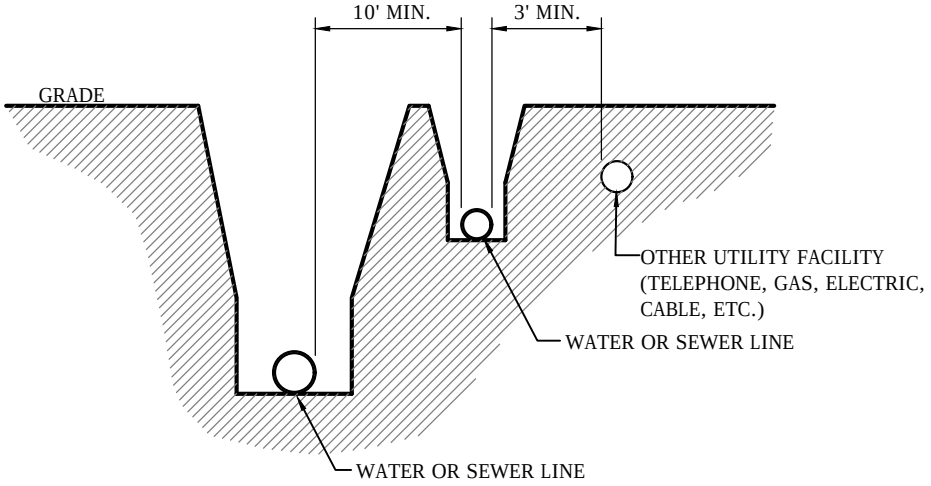
	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	STC-07	CASING END SEALS	
	STANDARD DRAWINGS	APPROVED: TBD	REVISED:	SCALE: NONE



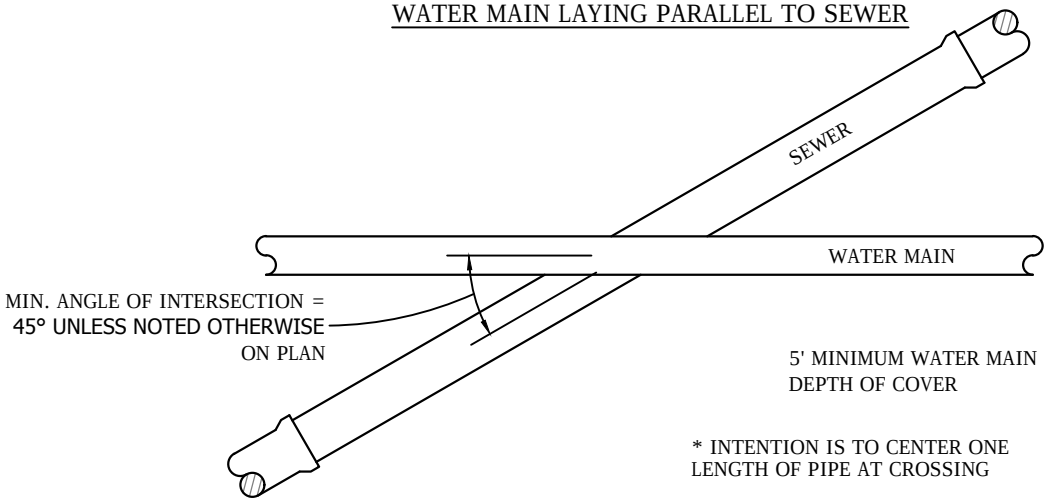
NOTES:

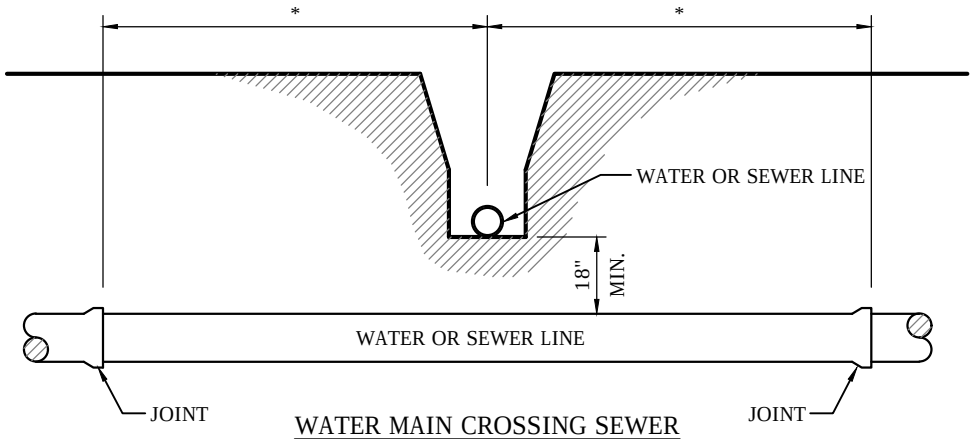
1. MARKING POST REQUIRED AT THE ENDS OF ALL CASING BORES.
2. MARKING POST REQUIRED AT ALL AIR RELEASE STRUCTURES, SYSTEM ISOLATION VALVES, FLUSHING CONNECTIONS, AND EVERY 1000' IN UNDEVELOPED AREAS.
3. MARKING POSTS MAY BE REQUIRED ELSEWHERE AT THE DISCRETION OF THE TOWN.

	TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	STC-08	MARKING POST	
	STANDARD DRAWINGS	APPROVED: TBD	REVISED:	SCALE: NONE



WATER MAIN LAYING PARALLEL TO SEWER





WATER MAIN CROSSING SEWER

NOTES:

1. WATER MAIN SHALL NOT BE LOCATED IN THE SAME TRENCH AS SANITARY SEWERS.
2. SEPARATION OF 3FT. HORIZONTAL WITH ANY UTILITY REQUIRED.
3. 5' MINIMUM DEPTH OF COVER ON WATER MAIN.
4. PREFERENCE IS FOR THE WATER MAIN TO BE LOCATED ABOVE ALL SEWERS.

TOWN OF DANVILLE 49 NORTH WAYNE STREET DANVILLE, IN 46122	WAT-01	SEWER & WATER MAIN SEPARATION	
STANDARD DRAWINGS	APPROVED:	REVISED:	SCALE: NONE