

CITY OF NEW HAVEN ENGINEERING DEPARTMENT

Standards & Specifications



Prepared For:

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June 4, 2019



**CITY OF NEW HAVEN
ENGINEERING DEPARTMENT
STANDARD CONSTRUCTION DETAILS**

EFFECTIVE AND ADOPTED JUNE 18, 2019

NEW HAVEN BOARD OF PUBLIC WORKS AND SAFETY

Terry McDonald, Chairman

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Wayne Doenges, Board Member

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Mickey Hill, Board Member

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Section 0.00 General Requirements

0.01 Standards Purpose and Prevailing Specifications

The City of New Haven Engineering Standards are to be used as a detailed guide for the planning, design, permitting, and construction of all utilities and roadway infrastructure completed within the City's rights-of-way, utility easements, and other properties or facilities owned and maintained by the City. The Standards shall also be followed for all developments that are proposed for future inclusion into the City owned infrastructure.

These City of New Haven Standard Specifications along with the City of New Haven Standard Drawings shall be considered the standard requirements for all City of New Haven projects. The current edition of the Indiana Department of Transportation's Standard Drawings, and the current edition of the Indiana Manual on Uniform Traffic Control Devices for Streets and Highways shall also be considered a part of these standards. All other local, County, State, or Federal requirements and regulations shall also be adhered to. In the event of any conflicting requirements, the most restrictive shall prevail.

0.02 Acronyms and Abbreviations

The intent and meaning of the following terms and abbreviations shall be interpreted as follows:

Acronyms	Meaning
AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
ANSI	American National Standards Institute
ASTM	ASTM International (formerly known as the American Society for Testing and Materials)
AWWA	American Water Works Association
CTS	Copper Tube Size
DIP	Ductile Iron Pipe
DIPS	Ductile Iron Pipe Size
FM	FM Approvals
GIS	Geographic Information System
GPS	Global Positioning System
HMA	Hot-Mix Asphalt
HPDE	High Density Polyethylene
IAC	Indiana Administrative Code



Acronyms	Meaning
IC	Indiana Code
IDEM	Indiana Department of Environmental Management
IDNR	Indiana Department of Natural Resources
INDOT	Indiana Department of Transportation
IPS	Iron Pipe Size
LF	Linear Feet
MUTCD	Indiana Manual on Uniform Traffic Control Devices
NEMA	National Electrical Manufacturers Association
NOI	Notice of Intent
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
PCCP	Portland Cement Concrete Pavement
PE	Polyethylene
PPI	Plastics Pipe Institute, Inc.
PROWAG	Public Right-of-Way Accessibility Guidelines
PS	Pipe Stiffness
PSI	Pounds per Square Inch
PSIG	Pounds per Square Inch Gauge
PVC	Polyvinyl Chloride
RCP	Reinforced Concrete Pipe
SDR	Standard Dimension Ratio
SWCD	Soil and Water Conservation District
SWPPP	Stormwater Pollution Prevention Plan
UL	Underwriters Laboratory
USACE	United States Army Corps of Engineers



Terms	Definition
10 States Standards	Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (GLUMRB), Recommended Standards
Board	City of New Haven Board of Public Works and Safety
City	City of New Haven, Indiana
Contract Documents	Project specific drawings and/or specifications for a construction contract
County	Allen County, Indiana
Department	City of New Haven Engineering Department
Easement	A right to occupy, access or otherwise utilize the real property of another for a specifically defined use
Emergency	Any event which may threaten public health or safety, including, but not limited to, damaged or leaking water or gas conduit systems, damaged, plugged, or leaking sewer or storm drain conduit systems, damaged underground electrical and communications facilities, or downed overhead pole structures
Engineer	Director of the City of New Haven Engineering Department
Excavate	Shall mean to dig into or in any way remove or physically disturb or penetrate any part of a Right-of-Way
Facility or Facilities	Any infrastructure component or tangible asset in the Right-of-Way required to provide utility service or means of transportation
Indiana811	Indiana Call Before You Dig; phone: 811 or (800) 382-5544 (formerly known as IUPPS – Indiana Underground Plant Protection Services)
Permittee	A person who has obtained a permit as required by these Standards
Person	Any natural or corporate Person, business association or other business entity including, but not limited to, a partnership, a sole proprietorship, a political subdivision, a public or private agency of any kind, a utility, a successor or assign of any of the foregoing, or any other legal entity
Professional Engineer	An engineer licensed and certified in the State of Indiana by the Indiana Professional Licensing Agency



Terms	Definition
Public Place	Any public street, way, place, alley, sidewalk, park, square, plaza, or any other similar public property owned or controlled by the City and dedicated to public use, and any dedicated-but-unaccepted street or way
Right-of-Way	The area on, below, or above a public roadway, highway, street, bicycle lane, and public sidewalk in which the City has an interest, including other dedicated Rights-of-Way for travel purposes and utility easements of the City
Right-of-Way Occupancy Permit	A Right-of-Way Permit shall be obtained from the Department of Engineering for any work completed within the right-of-way. This shall include but not be limited to the following: any type of excavation work, repair work on utilities both above and below grade, any work that requires any disruption to normal traffic flow, maintenance of traffic or lane closures.
Standards	City of New Haven Engineering Department Standards & Specifications
Utility	A public utility as defined in IC 8-1-2-1 and as it may be hereinafter amended and shall specifically include the non-regulated activities of such a utility
Utility Locates	Field located public and private utilities identified by Indiana811

0.03 Bond, Contract, and Permit Requirements and Fees

Any proposed construction within the right-of-way, shall require approval from the New Haven Engineering Department prior to the start of construction. All required permits shall be obtained, and any contracts, bonds, and fees shall be processed with the City or other permitting authority by the Contractor.

0.03.01 Bonds

A Performance Bond equal to 100% of the estimated improvement value is required for any construction in the public right-of-way, made payable to the City of New Haven and held by the office of the Engineering Department. This Bond shall be for a calendar year and it is the Contractor's responsibility to provide bond continuations from year to year during. This Bond shall remain current in order to obtain any City permits to perform any construction within the public rights-of-way, easements, or other City properties.

A Maintenance Bond shall be provided by the Contractor for the amount of 10% of the construction value or \$25,000, whichever is greater. The Maintenance Bond binds the Contractor to the City for the guarantee of the work, material, and conditions of the work completed for any improvements that are to be accepted by the City. The Maintenance Bond shall be provided for a period of 3 years, from the date of acceptance of such improvements.

All Other Bonds as required by other local, state or Federal agencies or as noted in the specific project specifications shall be obtained.



0.03.02 Contracts

All proposed developments that plan to include and extend City maintained utilities and roadways shall require approval from the City. The developer shall contact and coordinate with the City regarding the required process for approval of the development.

0.03.03 Permits

All permits for construction, that may be required, shall be the complete responsibility of the Engineer/Developer/Contractor. The Contractor will be responsible for complying with all conditions of said permits including the payment of any and all special bonding or inspection charges emanating therefrom. All required permits shall be obtained prior to the start of construction.

The following City permits/plans are required from the City (based on the scope of the project):

- Right-of-Way Permit
- Maintenance of Traffic Plan
- Driveway Construction Permit

The above permits do not reflect the need to apply and comply with other local, State, and Federal regulations and their requirements for a permit. Agencies that may require permit applications or submittals may include, but not be limited to:

- Allen County Drainage Board – Petition for Consent to Allow Permanent Structure
- Allen County SWCD – SWPPP (as required by IDEM)
- IDEM – Rule 5 NOI, Drinking Water, Wastewater, Water Quality
- IDNR – Construction in a Floodway
- INDOT – Right-of-Way Cut, Driveway
- Railroad Company – Right-of-Way Occupancy Agreement
- USACE – Water Quality

0.04 Project Coordination

The preliminary design, final design, and construction of any City or developer projects, that include utility and roadway construction work within public rights-of-way or easements, shall require continued coordination and communication with the City as well as other local, State and Federal agencies. Actions that may assist in the development of the project may include, but not be limited to:

- City providing existing GIS maps, record drawings, studies, ordinances, plats, surveys, etc.
- City review of conceptual plans and preliminary plans.
- City review and approval process.
- Coordination with other City departments.
- Environmental assessment and coordination with local, State and Federal agencies for requirements.
- Coordination with City and private utilities – obtain utility maps and records, survey utility locates, conflict coordination, etc.
- Permit requirements.



0.05 Safety

The Contractor shall follow all OSHA regulations and comply with all local, State, and Federal codes and regulations. If in the interest of a conflict between agencies the most restrictive shall prevail. The Contractor shall be responsible for all protection of persons and property in the construction area.

All City projects shall include the following:

- Contractor shall have notices posted in prominent locations showing emergency contact information, etc.
- Provide temporary fire extinguishers as required by law.
- Provide first-aid kit as required by law.

0.06 Survey and Easement Requirements

0.06.01 Survey

Projects that require any type of surveying for the design, construction, or utility approval within any public rights-of-way, easements, or other City property shall follow these procedures:

- If the survey crews need to have access to private property, then they shall notify the property owners/residents.
- Survey crews shall have full responsibility to repair any damage to public or private property during their field work.
- Project control points (temporary control points) shall be established with horizontal and vertical coordinates.
- All control points shall be set based on documented control points or verified property monuments.
- Trees shall not be used for surveying markers or control points.

0.06.02 Easements

All utilities that are owned and operated by the City shall be located within a roadway right-of-way, easement, or City owned property. Utilities will not be accepted by the City unless it is located within these parameters. If a utility cannot be installed within existing rights-of-way or easements, then the acquisition of an easement for the utility will be required. If the installation of utilities within existing rights-of-way or easements requires access to private properties, then a temporary construction easement will be required.

0.06.03 Permanent Easements

A permanent easement is a recorded easement, that is either platted or in an easement agreement, that will allow the right to construct, operate and maintain a utility within the limits of the defined areas. The permanent recorded easement shall designate the utility or utilities that will be located within the easement. The permanent easement usually will not have an expiration date and is considered as a utility easement indefinitely.

0.06.04 Temporary Construction Easements

A temporary construction easement will allow for a specific area of property to be used and accessed for a limited time for construction related work. A temporary construction easement will usually expire on a specific date or upon the completion of the construction related work.



0.06.05 Easement Requirements

- All easements shall be appropriately sized for the intended utility(s) to be installed.
- Easements that are submitted for approval shall be established based upon a boundary land or location control route survey.
- Easement plats shall be provided for each parcel on which the proposed easement will be located.
- The proposed easement document shall be prepared and signed by a Professional Surveyor registered in the State of Indiana.
- All proposed utility easements shall be approved by the City prior to final recording at the Allen County Recorder's Office.
- All construction plans shall show the location of permanent and temporary easements.

0.07 Clearing of Right-of-Way

The Clearing of Right-of-Way or Easements shall consist of clearing, grubbing, removal, and disposal of all vegetation and debris within the limits of the Right-of-Way or Easement unless otherwise noted. Burning of any kind is not permitted. The Clearing of Right-of-Way shall include, but not be limited to the following:

- All existing trees and vegetation that are noted as "to remain" or "protect" shall be protected.
- Any damage to the natural habitat, vegetation, or objects designated to remain shall be repaired, replaced, or compensated for by the Contractor for no additional payment.
- The Contractor shall obtain approval from the City prior to the cleaning, removal and disposal of any objects within the right-of-way unless noted as such.

0.07.01 Topsoil Stripping and Stockpiling

- Stockpile topsoil in areas that are approved by the City.
- Dispose of unsuitable or excess topsoil per all local, State and Federal regulations.
- Provide erosion-control measures for all stockpile areas to prevent soil erosion and discharge of soil bearing water runoff to adjacent properties and walkways as identified in Indiana Storm Water Quality Manual of the latest edition.

0.08 Record Drawing Requirements

The Contractor shall keep accurate and complete records of all construction projects and improvements that are within the City's right-of-way, easements, and infrastructure. Record Drawings will also be required for all projects and construction that are to be dedicated to and accepted by the City for future inclusion in the public infrastructure. The Record Drawings shall include items that are pertinent to the type of construction or improvements being completed. The Record Drawings shall include, but not be limited to, the following information:

- Horizontal survey information shall be referenced using the North American Datum 1983 (NAD83).
- Vertical survey information shall be referenced using the National Geodetic Vertical Datum 1988 (NGVD88).
- Right-of-Way, easement, and property lines.
- Property owner information (including lot number, address, name, etc.) when gas, electric, telephone, water or sanitary sewer services are installed.



- Casting elevations of all structures, including manholes, catch basins, inlets, outfalls, and cleanouts.
- Inverts of all pipes, overflows, swales, ditches, and stormwater basins.
- Pipe sizes, lengths, materials, and pipe slopes between structures.
- The elevations of the tops of banks, swales, and ditches.
- The elevation of the tops of curbs, headwalls, retaining walls, channel linings, and stormwater basins.
- The horizontal location and elevation of water main and sanitary force main.
- Horizontal locations of all structures, including manholes, catch basins, inlets, outfalls, headwalls, retaining walls, cleanouts, and miscellaneous structures.
- The horizontal location of all pipe fittings, valves, hydrants, restraints, and corporations.
- The horizontal location of all house service lines, bends, fittings, and other appurtenances.
- The horizontal location of all sanitary sewer lateral locations shall be measured from a downstream manhole.
- The elevation of all sanitary sewer laterals at the property/right-of-way line.
- The horizontal location of all water service tap lines shall be measured from the building to be served.
- All water main valves, sewer manhole castings, cleanout casting, etc., shall be referenced to two permanent monuments or GPS coordinates.

The as-built information kept in the field shall be converted onto the original Contract Documents in a digital AutoCAD format or GIS shapefile format. Revisions to the original Contract Documents shall be noted as follows:

- All revisions on horizontal locations of pipes, structures, fittings, service connections, etc. shall be shown.
- All revisions on the vertical locations of pipes, pipe slopes, services, etc. must be shown.
- Any information that has not been confirmed shall show +/- to indicate that the data has not been verified.
- The revisions shall be noted on the plans by striking through the original plan drawing information and inserting the revised information next to it.
- The revisions shall be bubbled, noted, and referenced in a revision table as a "Record Drawing" revision.

All Record Drawings shall be signed and sealed by the Contractor's surveyor or engineer. The Record Drawings shall be submitted to the City at the completion of the project and before acceptance.



Section 1.00 Construction Requirements

1.01 Scope of Work

The Scope of Work shall include all work that is required to complete the construction of the proposed utility and/or roadway infrastructure improvements, within the City's right-of-way, utility easement, and other properties or facilities, as shown in the City approved Contract Documents.

1.01.01 Contractor Requirements

The Contractor shall furnish all labor, materials, necessary tools, equipment and all utility and transportation services and construct, in a workmanlike manner, all sewer mains, water mains, street construction and appurtenances complete and ready for continuous operation, including all clearing, pipe, manholes, cleanouts, valves, hydrants, fittings, water and/or sewer services, curbs, curb and gutters, sidewalks, driveways, pavement, site restoration, and the protection of all existing structures and utilities, and all other items as required by the Contract Documents.

1.02 Material Requirements

The materials used for the construction of any utility and/or roadway infrastructure improvements within the City shall be materials that are approved in these standards. Materials that are not approved in these standards shall be approved by the City prior to installation.

1.02.01 Contractor Furnished Materials

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. 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 it 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. All materials furnished by the Contractor are subject, at the discretion of the City, to inspection and approval at the plant of the manufacturer. The City shall have access to all material delivery tickets to allow for compliance verification with all City Specifications.

1.02.02 City Furnished Materials

The Contractor's responsibility for any material furnished by the City shall begin at the point of delivery thereof to the Contractor. Material already on the site shall become the Contractor's responsibility. The Contractor shall examine all material furnished by the City at the time and place of delivery to him and shall reject all defective material. Material furnished by the City that becomes damaged after acceptance by the Contractor shall be replaced by the Contractor at no expense to the City.

1.02.03 Water and Power

The Contractor shall furnish all water and power for Construction purposes. Construction water connections shall be temporary, to be broken when not in use.

- Connection to infrastructure will require prior approval.
- All water connections to be metered in gallons.



1.02.04 Material Installation

All materials shall be installed per the specifications or the manufacturer's recommendations. All pipe and appurtenances shall be laid, jointed and tested for defects and leakage in the manner specified and in the presence of and as approved by the City.

The Contractor shall make any and all necessary changes in construction and piping to install materials approved for installation. Any material found during the progress of the work to have cracks, flaws or other defects will be rejected by the City. All defective materials shall be promptly removed from the site of the work by the Contractor. Installed material discovered to be defective shall be removed and replaced with acceptable material.

1.02.05 Pressure Rated Pipe Material Specifications

Ductile Iron Pipe and Fittings per AWWA C150 and C151

- DIP pipe and fittings shall conform to AWWA C150 and C151, Pressure Class 350 or Thickness Class 50.
- All ductile iron pipe and fittings shall be cement mortar lined per AWWA C104, unless otherwise specified.
- DIP and fittings shall have an exterior asphaltic coating, minimum thickness of 1 mil, per AWWA C151.
- Pipe and fitting joints shall be either "push on joints" or "mechanical joints" furnished with suitable solid molded rubber gaskets complying with ANSI A21.11 (AWWA C111).
- All joints shall be installed in strict accordance with the recommendations of the pipe manufacturer.
- Joint restraint devices for DIP pipe shall be Uni-flange Series 1390, Megalug Series 1700, or approved equal.
- Joint restraint for mechanical joint DIP fittings shall be Romac Industries "Grip Ring", Megalug Series 1100, Ford Uni-Flange Series 1400 or approved equal.
- Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.
- All bolts, nuts, and threads shall be corrosion resistant. Cor-blue bolts and nuts are required.
- DIP pipe used for potable water shall conform to NSF Standard 61.

PVC Pipe and Fittings per AWWA C900 and C905

- PVC pressure pipe shall conform to AWWA C900 and C905, minimum wall thickness DR 18.
- PVC pressure pipe shall be per AWWA C900 for pipe diameters 4" through 12".
- PVC pressure pipe shall be per AWWA C905 for pipe diameters 14" and larger.
- Pipe and couplings shall be per ASTM D1784, minimum cell classification of 12454.
- PVC pipe shall have bell and spigot joints per ASTM D3139 with gaskets per ASTM F477.
- PVC pressure pipe shall have DIP fittings per AWWA C110 and AWWA C111.
- PVC pipe used for potable water shall conform to NSF Standard 61.
- Joint restraint devices for PVC pipe shall be Uni-Flange Block Buster 1350, Megalug Series 1600, or approval equal.



- Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.
- All bolts, nuts, and threads shall be corrosion resistant. Cor-blue bolts and nuts are required.
- PVC bell restraints shall not incorporate set screws.
- PVC pipe used for potable water shall conform to NSF Standard 61.

PVC Pipe and Fittings per ASTM D2241

- PVC pressure pipe shall be per ASTM D-2241 with a standard dimension ratio (SDR) of SDR 21.
- PVC gravity sewer pipe joints shall be of the bell and spigot type with rubber ring gaskets.
- Gaskets shall be reinforced with a steel ring and meet the requirements of ASTM D3212 and ASTM F477.
- Joint restraint devices for PVC pipe shall be Uni-Flange Block Buster 1350, Megalug Series 1600, or approval equal.
- Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.
- All bolts, nuts, and threads shall be corrosion resistant. Cor-blue bolts and nuts are required.
- PVC bell restraints shall not incorporate set screws.
- PVC pipe used for potable water shall conform to NSF Standard 61.

HDPE Pipe and Fittings per AWWA C906 and ASTM F714

- HDPE pipe shall conform to AWWA C906 and ASTM F714, minimum wall thickness DR 11.
- HDPE shall be ductile iron pipe size (DIPS), unless otherwise specified in the Contract Documents.
- Polyethylene pipe material shall be made from high density, extra high molecular weight compound equaling a PE 4710 designation and shall conform to ASTM D3350 with a cell classification of PE 445574C-CC3.
- The material shall have a minimum Hydrostatic Design Basis (HDB) of 1,000 psi at 73 degrees Fahrenheit when tested in accordance with PPI TR-3 and shall be listed in the name of the pipe and fitting manufacturer in PPI TR-4.
- HDPE Pipe joints shall utilize butt heat fusion per ASTM D3262.
- Permanent identification of piping service shall be provided by co-extruding longitudinal stripes in the pipe's outside surface. The striping material shall be the same material as the pipe material except for color. The stripe shall be blue for water main and green for sanitary sewer.
- No matter how the pipe is turned at least one stripe shall always be visible. Stripes printed or painted on the outside surface shall not be acceptable.
- HDPE pipe shall have fused mechanical joint adaptors for connection to DIP fittings.
- Fittings shall be compact, ductile iron, coated and cement-lined Class 50 manufactured in accordance with ANSI/AWWA specifications.
- Restraining devices shall be Uni-Flange Series 1500, Megalug Series 2000 PV, or approved equal.
- Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.
- Cor-blue bolts and nuts are required.
- Joint restraints shall not incorporate set screws.



- All mechanical joints used on HDPE pipe shall be restrained and shall utilize a stiffener insert constructed of ASTM A240 TP 304 stainless steel.
- Stiffener inserts shall be designed to support the interior wall of HDPE pipe and shall be JCM 230, Romac, or approved equal.
- Joints shall be installed in strict accordance with the recommendations of the pipe manufacturer.
- HDPE pipe used for potable water shall conform to NSF Standard 61.

Copper Tubing per ASTM B88

- Copper tubing up to 2" diameter shall be Type "K" soft temper copper per ASTM B88 and of the flarable type.
- Copper tubing used for potable water shall conform to NSF Standard 61.

HDPE Tubing per ASTM D2737, ASTM D3350, and AWWA C901

- HDPE tubing up to 2" diameter shall be polyethylene pipe material shall be made from high density, extra high molecular weight compound equaling a PE 4710 designation and shall conform to ASTM D3350 with a cell classification of PE 445574C-CC3.
- HDPE tubing shall be copper tube size (CTS) DR 9 and in accordance with ASTM D2737, ASTM D3350, and AWWA C901.
- HDPE tubing shall have a minimum working pressure 250 psi.
- HDPE tubing used for potable water shall conform to NSF Standard 61.

1.02.06 Gravity Pipe Material Specifications

PVC Pipe and Fittings per ASTM D3034 and F679

- PVC pipe and fittings 15-inch diameter and smaller shall be per ASTM D3034 with a minimum standard dimension ratio (SDR) of SDR 35. For bury depths greater than 18 feet, the minimum SDR is 26.
- PVC pipe and fittings larger than 15-inch diameter shall be per ASTM F679 with a minimum pipe stiffness (PS) of PS 46. For bury depths greater than 18 feet, the minimum PS is 115.
- PVC gravity sewer pipe joints shall be of the bell and spigot type with rubber ring gaskets.
- Gaskets shall be reinforced with a steel ring and meet the requirements of ASTM D3212 and ASTM F477.
- All PVC gravity sanitary sewer pipe shall be installed in accordance with the ASTM D2321 and manufacturer's recommendations.
- PVC gravity pipe entering and leaving manholes shall have a manhole water stop gasket firmly clamped around the pipe exterior at the manhole.

RCP per ASTM C76

- Concrete storm sewer pipe shall conform to all aspects of ASTM C76.
- Strength requirements shall be as shown on the Contract Documents and/or a minimum of Class III.
- The use of concrete pipe shall be limited to 12-inch diameter and larger.



- Concrete pipe joints shall be of the bell and spigot type with rubber ring gaskets in accordance with ASTM C443.
- Reinforced concrete elliptical pipe, arch pipe, and concrete box sections for storm sewers shall be used with City approval only and shall be per ASTM C507, ASTM C506, and ASTM C1577.

HDPE Dual Wall Pipe per AASHTO M252, AASHTO M294, and/or ASTM F2306

HDPE non-pressure storm sewer pipe and fittings shall meet the following:

- HDPE pipe may be used in non-paved areas only.
- HDPE pipe may be used in non-pressure storm drainage applications and shall have a smoother interior and annular exterior corrugations.
- HDPE pipe and fittings size 4-inch to 10-inch diameter shall meet AASHTO M252, Type S.
- HDPE pipe and fittings size 12-inch to 60-inch diameter shall meet AASHTO M294, Type S and ASTM F2306.
- HDPE pipe shall have a Manning's "n" value not less than 0.010.
- HDPE pipe joints shall be bell-and-spigot joints meeting AASHTO M252, ASHTO M294, or ASTM F2306.
- 4-inch to 10-inch diameter HDPE pipe joints shall meet the soil tightness requirements of AASHTO.
- 12-inch to 60-inch diameter HDPE pipe joints shall be water-tight joints meeting ASTM D3212.
- Gaskets for 12-inch to 60-inch diameter shall be watertight meet the requirements of ASTM F477.
- Installation shall be in accordance with ASTM D2321.

1.02.07 Pipe Bedding and Backfill

Pipe Bedding – Flexible Pipe (PVC, HDPE, DIP, CMP, PP)

- Embedment materials for flexible pipe shall be INDOT #5, #8 or #9 crushed limestone or per pipe manufacturer's recommendations.
- Special care shall be exercised to work the embedment material completely around the pipe and appurtenances filling all voids.
- Embedment material shall be placed and compacted initially to the spring line of the pipe, thence to a minimum depth of 1'-0" above the pipe.
- All bedding shall be mechanically tamped in 4" to 6" layers.
- All DIP pipe shall be bedded with natural sand only.

Pipe Bedding – Rigid Pipe (RCP)

- The placement of a rigid pipe may be bedded directly on the undisturbed ground.
- Pipe bedded firmly on undisturbed ground shall have small excavations provided for the bell ends so that no weight is supported by the bells.
- The remainder of the bedding material shall be placed around the bottom of the pipe and fittings to fill all voids up to the spring line of the pipe.
- All bedding shall be mechanically tamped in 4" to 6" layers.



Backfill

Backfill shall be either native material or special backfill material used to refill a trench or excavation from construction. Special backfill shall be utilized under all structures, paved surfaces, and for unstable soil replacement. A paved surface is defined as any roadway, driveway, parking area, sidewalk, curb, shoulder, or berm. Native materials, meeting the requirements, may be used in easements or open areas. Compaction of all backfill to 95% of the maximum density at optimum moisture content as determined by ASTM D1557.

Native Materials

Native soil materials removed from the trench may be used for backfill if it is free from debris, waste, vegetation, any rocks or gravel larger than 3", and if no more than 15% passes the No. 200 sieve.

Special Backfill

If the material removed from the trench is not suitable for reuse as backfill, the City on an "As Ordered" basis will require the Contractor to remove the existing material and utilize special backfill for the backfill material. Special backfill shall be compacted INDOT #53 or #73 crushed limestone.

The materials used for backfilling of the trench or excavation to the original surface elevation shall be placed in lifts and mechanically compacted as follows:

Backfill Under Structures and Paved Surfaces

- Lifts in 6" to 8" layers and solidly tamped to subgrade elevation.
- Compaction to 95% of the maximum density at optimum moisture content as determined by ASTM D1557.

Backfill in Easements or Open Areas

- Lifts in 12" layers and solidly tamped to grade
- Compaction to 95% of the maximum density at optimum moisture content as determined by ASTM D1557.

1.03 Construction within Right-of-Way

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

1.03.01 Right-of-Way Permits

A Right-of-Way Permit shall be obtained from all parties having jurisdiction including the City, County and State (INDOT). All permits shall be obtained prior to any type of work within a City, County, or INDOT street or right-of-way. Work within the right-of-way that requires a Right-of-Way Permit shall include but not be limited to the following: any type of excavation work, repair work on utilities both above and below grade, sidewalk or driveway repair or replacement, major landscaping (including, but not limited to, retaining walls, tree plantings, and walkways) within or adjoining the right of way or parkway, any work that requires any disruption to normal traffic flow, maintenance of traffic or lane closures.



1.04 Existing Utilities

The Contractor shall be responsible to locate, protect, and maintain existing utilities during construction. The location of existing utilities shall be verified by the Contractor, prior to initiation of construction. The underground utilities shall be marked by the respective utility company prior to construction upon sufficient notice by the Contractor.

Unless shown or noted otherwise on the Contract Documents, 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.



**Know what's below.
Call before you dig.**

1.05 Protection of the Work

The Contractor shall take all necessary precautionary measures as may be required to prevent damage to the work, storage of material and waste containment bins including the furnishing and maintaining of luminated barricades. Any damage caused by the lack of proper caution on the part of the Contractor shall be made good to the affected party at no cost to the City.

1.06 Site Clean Up

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.

1.07 Project Close-Out

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 with all equipment and appurtenances left in proper working order for use by the City.

1.07.01 Guarantee

In general, 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 the Substantial Completion Certificate and ready for continuous use by the City. Any defects found during this one-year period shall be repaired or replaced at no cost to the City 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.

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.



1.07.02 Operation and Maintenance

The Contractor shall require each manufacturer of equipment supplied on the project to assemble all of their drawings and operational and maintenance instructions into one manual and furnish the City three (3) copies of said manual.



Section 2.00 Stormwater Management and Erosion Control

2.01 Stormwater and Erosion Compliance Requirements

The Contractor shall be responsible for all erosion and sediment control during construction. The Contractor will be required to prevent any sediment, in stormwater runoff, from leaving the construction site. The Contractor shall be responsible to follow and comply with all of the following regarding erosion and sediment control:

- Contractor shall comply with all aspects of 327 IAC 15-5, Rule 5 IDEM Construction/Land Disturbance Storm Water Permitting.
- Contractor shall follow the recommendations provided in the "Indiana Storm Water Quality Manual – Planning and Specification Guide for Effective Erosion and Sediment Control and Post-Construction Water Quality" available from IDEM, published October 2007, and any supplements thereto.
- Contractor shall conduct a self-monitoring evaluation per 327 IAC 15-5. This much include a written evaluation of the project site following each measurable storm event and at least one time per week. The evaluations should discuss the condition of the existing stormwater quality measures, determine if additional erosion control measures are required to remain in compliance, and include any type of corrective actions recommended and completed.
- Contractor shall comply with the requirements of the City of New Haven SWPPP Inspection Form. Inspections shall be conducted once every 7 days and within 24 hours of a 0.5-inch or greater rainfall during construction.



Section 3.00 Excavation, Backfill, and Compaction

3.01 Excavation

Excavation shall be interpreted to mean:

- clearing the site;
- pavement removal (where required);
- excavation of the material encountered in the proposed grade of the utility;
- furnishing and placing all sheeting, trenching, trimming and bracing;
- supporting of structure above and below ground;
- removal and disposal of water using current sediment reduction measures;
- repairing damage to structures, conduits and utilities encountered;
- backfilling, tamping or jetting;
- temporary surfacing of roadways (where required);
- disposal of surplus materials;
- providing barricades and lighting; and
- restoration of the site.

3.01.01 General Excavation Requirements

- During the progress of excavation, care shall be exercised to reserve sufficient material for bedding around the pipe and appurtenances and backfilling for site restoration.
- All earth excavation shall be open cut from the surface, except where otherwise shown or specified.
- Blasting is not permitted. If blasting is required, then the Contractor shall employ such methods and equipment including mats, as to effectively protect life and property. Permission to blast must be secured from the City and all regulations and conditions promulgated by public authorities shall be strictly enforced.
- Open excavations 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.
- The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of the underground structures and utilities, both known and unknown, may be determined.
- The Contractor shall be held responsible for the repair of any broken or otherwise damaged underground structures or utilities during excavation.
- The Contractor shall thoroughly familiarize himself with OSHA Rules and Regulations relating to the Construction Industry, with specific attention being given to the sections devoted to Trenching and Excavation.



3.01.02 Utility Pipe Trench Requirements

- The trench shall be excavated to the depth required and unless otherwise shown on the Contract Documents shaped to provide uniform and continuous bearing on the lower 90 degrees of the pipe, on solid earth at every point between bell holes or shall be excavated to a point four inches (4") below the bottom of the pipe and backfilled with INDOT #5, #8 or #9 limestone.
- Any part of the bottom of the trench excavated below the specified grade shall be backfilled and compacted to design grade with INDOT #5, #8 or #9 limestone.
- Bell holes shall be provided at each joint to permit joints to be made properly.
- 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. The discharge of any trench dewatering pumps shall be filtered and directed to natural drainage channels, drains, or sewers.
- The width of the trench shall be the minimum which will permit the pipe to be laid and jointed properly, and the backfill to be placed and compacted as specified.
- 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.
- The specified minimum clearances are the minimum clearance distances which will be permitted between any part of the pipe or appurtenances being installed, and any part, projection or point of such rock, boulder, or stone.
- 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 utilities are being placed.
- In water bearing strata, well points or underdrain material may be required to affect a dry trench or pit.
- No pipe shall be installed in water or when, in the opinion of the City, trench conditions are unsuitable.

3.01.03 Exploratory Excavation

Various underground utilities and the other structures, shown on the Contract Documents, have been taken from the records of the respective utilities, but other structures not shown on the Contract Documents may be encountered. The Contractor shall complete exploratory excavation per the following requirements:

- The Contractor shall be required to excavate and locate existing underground improvements in advance of proceeding with the excavation for the utility or carry the excavation sufficiently in advance of pipe laying operations so that changes in line and grade may be accommodated to avoid such existing underground improvements.
- The Contractor shall be held responsible for the repair of all improvements broken or otherwise damaged.
- The cost of all exploratory excavation shall be included in the bid price for the conduit complete in place.
- Based on the information obtained from the exploratory excavation, the Engineer may order certain changes in line or grade of the conduit.



- All changes in the new utility, or in existing improvements, shall be made only with approval of the Engineer/City.
- Any changes in the new or existing utilities resulting in an adjustment of the contract price will be made based on the accepted unit prices for the respective items and quantities as set out in the construction proposal.

3.01.04 Unstable Soil

In areas where unstable soil is encountered below the bottom of the pipe, the Contractor shall contemplate removing all such unstable soil. The length and depth to which unstable soil is to be excavated shall be as determined by the City. All unstable soil shall be completely removed from the site of the work. Where unstable soil has been removed, the excavation shall be backfilled with INDOT #2 crushed limestone.

3.01.05 Sheeting, Bracing, and Shoring

Where required to properly protect the construction work, adjacent property, work or workmen, sheeting, bracing and shoring shall be provided. If the City is of the opinion that at any point sufficient or proper supports have not been provided, they may order additional supports, but neither the placing of such additional supports by the order of the City nor the failure of the City to order such additional supports placed, shall release the Contractor from his responsibility for the sufficiency of such supports for protection of the work and adjacent property.

Sheeting, bracing, and shoring shall not be left in place after completion of the work except as required by written order of the City. 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.

3.01.06 Excavated Material

Stockpiling of Material

In general, it is anticipated that 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.

The Contractor shall cooperate with the City of New Haven Engineering Department to maintain traffic at necessary intersections and other areas. The Contractor shall notify and arrange with the City of New Haven Engineering Department 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 City of New Haven Engineering Dept. 48 hrs. in advance of any closures or restrictions on City of New Haven streets.

Disposal of Material

All suitable excavated material shall be used in backfilling over and around the pipe and appurtenances or distributed otherwise by the Contractor. All excavated material more than the quantity required for backfilling and subsequent settlement shall be removed by the Contractor and disposed of in a timely and lawful manner. The Contractor shall be responsible for securing disposal site(s), and any grading or seeding required at same.



3.02 Backfill

Backfill shall be suitable excavated material or approved special backfill material for refilling an excavation.

3.02.01 General Backfill Requirements

- All trenches and excavations shall be backfilled and compacted to at least the original surface of the ground or pavement subgrade with allowances made for subsequent settlement.
- Backfill material shall be deposited and compacted in the trench in layers not exceeding 8" in thickness compacted for its full width simultaneously.
- Mechanical compaction of the backfill shall be provided to the extent that undue settlement of the backfill does not occur.
- For non-pavement areas, the backfill shall be placed in 8" layers and compacted to the original grade level.
- For pavement areas, backfill shall be placed in 8" layers and compacted as per Section 1.16 of the specifications.
- Backfilling shall not be completed in freezing weather except by permission of the City.
- No backfilling shall be made with frozen material, nor shall backfilling be made when the material in the trench is already frozen.

3.02.02 Special Backfill

If the material removed from the trench is not suitable for reuse as backfill, the City on an "As Ordered" basis will require the Contractor to remove the existing material and utilize special backfill as follows for backfill material:

- Compacted sand, INDOT #53/#73 gravel or crushed limestone from 1'-0" above the crown of the pipe to the original surface elevation placed in 8" lifts and mechanically compacted.
- Special backfill shall be utilized within 5 feet of paved surfaces and for unstable soil replacement.
- A paved surface is defined as any roadway, driveway, parking area, sidewalk, curb, shoulder, or berm.

3.03 Compaction

Compaction shall be required for the pipe or utility embedment material and the backfill of all excavations. Compaction requirements shall be as follows:

- Compaction of all pipe or utility conduit embedment material shall be in accordance with the pipe manufacturer's recommendations.
- 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.
- With respect to special backfill material, the Contractor shall place the material in 8" layers and utilize a mechanical compactor to compact each lift to 95% of its maximum density at optimum moisture content all in accordance with ASTM D1557.
- The Contractor will be permitted to submit in writing an alternate detailed plan for achieving adequate compaction prior to commencing construction; however, any alternate plans will be subject to density testing as requested by the city and all costs associated with such testing shall be borne by the Contractor.



Section 4.00 Water

4.01 General

These standards for the water main system provide design and construction requirements that shall be met for all water main installations that are owned or will be owned and operated by the City. These standards were developed to ensure that City's water system can provide sufficient and quality water service and fire protection to the City's residents and businesses.

Water main design and installation shall be in accordance with the following:

- Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers, Recommended Standards for Water Works, latest edition. (Also referred to as the "Ten State Standards for Water Works").
- American Water Works Association (AWWA) Standards
- Indiana Department of Environmental Management (IDEM) Regulations
- Indiana Administrative Code Title 675 Article 16 Plumbing Code
- Indiana Building Code and Indiana Fire Code

4.02 Water Materials

4.02.01 Pipe and Fittings

Water main pipe and appurtenances, that are used for the City's potable water distribution system, shall be as specified on the Contract Documents and/or as specified hereafter. Water main pipe materials shall be one of the following:

- Ductile Iron Pipe (DIP) per AWWA C150 and C151 – Pressure Class 350.
- PVC (Polyvinylchloride) per AWWA C900 and C905 – SDR 21.
- HDPE (High Density Polyethylene) per AWWA C906 – DR 9 (Water Services) or DR 11 (Water Main).

4.02.02 Restraints

Restraints shall be used to prevent joints from separating at all crosses, tees, elbows, hydrants, valves, reducers, and dead-end plugs. The restraint of the pipe shall be with joint restraints and the use of concrete is not acceptable. It is the intent of these specifications to utilize self-restraining joints as specified below. These specifications will not allow thrust blocks, thrust rods, or set screw glands. Products now widely available on the market are more corrosion resistant and do less damage to the pipe than certain earlier products. In addition, self-contained restraint systems allow for excavation immediately adjacent to the pipe itself without fear of accidental removal of thrust blocking which could lead to separation and failure of pipe joints. The restraint requirements for each pipe type and fittings shall be as follows:

Ductile Iron Pipe Joint Restraints

- Ductile Iron Pipe restraints shall be "FIELD LOK" gaskets or equal.
- Restraints shall be manufactured of high strength ductile iron, ASTM A536, grade 65-45-12, and include machined serrations on the inside surface to provide 360° contact and support of the pipe barrel.



- Bell joint restraint devices shall not incorporate set screws that bear against the pipe wall.
- Joint restraint devices for DIP pipe shall be Uni-flange Series 1390, Megalug Series 1700, or approved equal.
- All bolts, nuts, and threads shall be corrosion resistant. Cor-blue bolts and nuts are required.

PVC Pipe Joint Restraints

- Restraint devices for bell and spigot joints of PVC pipe shall consist of a split restraint ring installed on the spigot, connected to a solid back-up ring seated behind the bell.
- Restraints shall be manufactured of high strength ductile iron, ASTM A536, grade 65-45-12, and include machined serrations on the inside surface to provide 360° contact and support of the pipe barrel.
- The solid back-up ring shall have a beveled leading edge to assure exact fit behind the pipe bell.
- Bell restraints shall not incorporate set screws that bear against the pipe wall.
- All restraint devices shall carry a water working pressure rating equivalent to the full rated pressure of the PVC pipe they are installed on.
- Restraints shall meet or exceed the requirements of Uni-B-13-94, Recommended Performance Specification for Joint Restraint Devices for Use with Polyvinyl Chloride (PVC) Pipe.
- Joint restraint devices for PVC pipe shall be Uni-Flange Block Buster 1350, Megalug Series 1600, or approval equal.
- All bolts, nuts, and threads shall be corrosion resistant. Cor-blue bolts and nuts are required.

Joint Restraints for DIP and PVC Fittings

- Restraint devices for MJ fittings for ductile iron pipe and PVC pressure pipe shall incorporate a grip ring made of hardened ductile iron and shall be painted red for IPS, and black for DIP, and blue for PVC C900 pipe.
- Gland shall be ductile iron per ASTM A536, grade 65-45-12.
- Gasket shall be virgin SBR per ASTM D 2000 MBA 710, compounded for water and sewer service.
- Restraints shall be Romac Industries "Grip Ring", Megalug Series 1100, Ford Uni-Flange Series 1400 or approved equal.
- All bolts, nuts, and threads shall be corrosion resistant. Cor-blue bolts and nuts are required.
- Joint restraints shall not incorporate set screws.

HDPE Pipe and Fittings Restraints

- Restraints for HDPE pipe joined with standardized mechanical joint fittings shall be incorporated in the design of the follower gland and shall provide full circle contact and support of the pipe wall.
- Restraint shall be accomplished by a series of ring segments mechanically retained inside the gland housing and designed to grip the pipe wall in an even and uniform manner.
- Restraining ring segments shall be actuated by bolts featuring "Auto-Tork" twist off heads to ensure proper installation torque is applied.
- All components of the restrainer, including the gland, bolts, and restraint segments shall be of high strength ductile iron, ASTM A536, Grade 65-45-12.
- Restraining devices shall be Uni-Flange Series 1500, Megalug Series 2000 PV, or approved equal.



- Cor-blue bolts and nuts are required.
- Joint restraints shall not incorporate set screws.
- All mechanical joints used on HDPE pipe shall be restrained and shall utilize a stiffener insert constructed of ASTM A240 TP 304 stainless steel.
- Stiffener inserts shall be designed to support the interior wall of HDPE pipe and shall be JCM 230, Romac, or approved equal.

4.02.03 Water Appurtenances

All water main appurtenances shall be constructed of the materials as specified in the Contract Documents, Standard Drawings, and/or as may be specified as follows:

Hydrants

Hydrants are to be located at the approximate locations as shown on the Contract Documents. Minor deviations will be permitted to locate the hydrant tee so as to minimize the cutting of the pipe. All hydrants shall meet the following requirements:

- Hydrants shall be UL listed and FM approved and conform to AWWA C502.
- Hydrants shall be of the compression type, closing with line pressure.
- Hydrants shall be of the traffic model breakaway type.
- Hydrant cap and stuffing box shall be of a unitized, one-piece design creating a water tight cavity without the use of gaskets.
- The combination of three (3) O-rings to a crimped brass ferrule around the stem shall seal the cavity from contact with water.
- Operating nut shall be of one-piece bronze construction with a dirt shield provided to protect the operating mechanism from grit buildup and corrosion due to moisture.
- A thrust washer shall be supplied between the operating nut and stem lock nut to facilitate operation.
- Nozzles shall be of the tamper resistant, with O-ring seals and stainless steel retaining screws.
- An O-ring shall be provided to seal between the upper and lower barrels and the main valve shall be of synthetic rubber reinforced with steel.
- The seat shall be of a bronze ring threaded to a bronze insert in the hydrant shoe, with O-rings to seal the drainway and barrel from leakage of water in the shoe.
- The hydrant drain valve shall momentarily force flush with each operation.
- Drain valve facing shall be of synthetic rubber with a stainless steel retaining pin.
- Hydrants shall be model K-81 Guardian as manufactured by Kennedy Valve, color: yellow.

Gate Valves

Gate valves shall be used for all water mains 16" and smaller and shall meet the following requirements:

- Manufactured in accordance to AWWA C509.
- Valves shall be made of Ductile Iron, ASTM A536, minimum 65,000 psi tensile with bonnet and body metal thickness shall exceed minimum thickness permitted by ANSI/AWWA C153/A2153-88.



- Wedge shall be Ductile Iron, one piece, fully encapsulated in synthetic rubber except of guide and wedge nut areas.
- Synthetic rubber shall be molded in place and bonded to the wedge. Mechanical fasteners are not allowed.
- Valves shall be provided with two (2) O-rings above and one (1) O-ring below the thrust collar.
- All stem seals shall be replaceable with the valve wide open and while subjected to full rated pressure.
- Stem shall be removable.
- Valve body and bonnet shall be coated, inside and out, with fusion-boned epoxy.
- Bonnet body and stuffing box bolts and nuts shall be type 18-8 stainless steel, shall be installed and tested by the manufacturer, and shall have a full ten (10) year published money back warranty.
- All valves shall be left-hand open.

Valve Boxes

- All underground gate valves shall be fitted with an approved cast iron roadway box.
- Valve boxes shall be cast iron with a two piece 5 ¼-inch diameter shaft with either a round or oval base and shall be of the screw type.
- The cover shall be cast with the word "water" on the top.
- Posi-Cap alignment device must be used.
- All valve boxes in paved areas require 1" riser ring.

Tapping Sleeves

Tapping sleeves shall meet the following requirements:

- Tapping sleeves shall be made of 18-8 stainless steel fabricated per AWWA C223.
- Outlets shall be 18-8 stainless steel schedule 10 for 4" and schedule 5 for all outlets larger than 4".
- Flanges shall be 18-8 stainless steel and conform to AWWA C207 Class D.
- Gaskets shall be gridded virgin SBR compounded for water service meeting ASTM D2000 and provide 360° pipe coverage.
- All bolts, nuts, and washers shall be 18-8 stainless steel and shall be fluorocarbon coated to prevent galling.
- A testing plug shall be provided and shall include be a Water Works Brass 3/4" with standard square head.
- Tapping sleeves shall be Ford style FAST or approved Equal.
- Tapping sleeves shall be tested at 150 psi for 2 hours.

Tracer Wire

Tracer wire shall be installed on all water main, including service lines. Tracer wire shall meet the following requirements:

- The tracer wire shall be Copperhead High Strength Tracer Wire and connected to each fitting and appurtenance.



- The tracer wire shall be blue in color, #10 AWG fully annealed, high carbon 1055 grade steel, high strength solid copper clad steel conductor (HS-CCS), insulated with a 30 mil, high-density, high molecular weight HDPE insulation, and rated for direct burial use at 30 volts.
- The tracer wire shall be brought to grade at each valve riser.
- Tracer wire shall be installed on each water service line and fire hydrant line.
- All tracer wire splices shall be accomplished using DryConn direct bury lug connectors.
- After successful hydrostatic pressure test, Contractor will be required to conduct a continuity test of the entire system with a City of New Haven representative present.

4.03 Building Water Services

Building water services includes any service that taps off the water main pipe within the City's distribution system. A separate building water service line shall be required for each water service. The building water service includes the corporation stop, curb stop, and the piping between the corporation stop and the curb stop. The installation and maintenance of the building water service is the responsibility of the City. The remainder of the water service line from the curb stop to the building shall be the responsibility of the property owner.

4.03.01 Pipe Materials

The building water service materials shall meet the following requirements:

- The service corporation stop on a ductile iron water main shall be an all brass ball type valve with inlet threads meeting the standard AWWA tapered threads.
- Service corporation stops shall have a 300-psi pressure rating.
- Curb stops shall be an all brass ball type valve and include a cast iron curb box.
- Curb stops shall have Teflon coated ball valve and a hard or synthetic rubber seat-ring and shall have a 300-psi pressure rating.
- Cast iron curb boxes shall be 3" screw type and shall have a lid marked with "water".
- Service line pipe material up to 2" shall be Type "K" soft temper copper ASTM B88 of the flarable type or HDPE CTS tubing DR 9.
- All joints and fittings on service lines shall be brass of the compression type design.
- The service corporation stop on HDPE and PVC shall be completed with the use of a tapping saddle.
- New services shall be continuous with no joints.

4.03.02 Tapping Saddles

Tapping saddles for building water services shall meet the following requirements:

- Tapping saddle body shall be made of high strength ductile iron per ASTM A536 with double wide bands and 5/8" NC threaded bolts of 18-8 stainless steel.
- 1/2" bolts shall be furnished on saddles 3" and smaller.
- Gaskets shall be Buna-N rubber per ASTM D2000.
- The finish on the saddle body shall be a fusion bonded epoxy coat approximately 12 mils thick.
- The saddles shall be Ford style FC202, FRS202, FS303, or approved equal.
- When tapping saddles are used in conjunction with HDPE pipe, spring washers shall be utilized.



4.03.03 Water Meters

All building water service lines shall require the installation of a water meter. Water meters shall be supplied and installed by the City of New Haven.

4.04 Water Main Installation Requirements

The Contractor shall furnish and install, complete and ready for continuous operations, all new water main pipe and appurtenances as shown on the Contract Documents and/or herein specified. 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.

4.04.01 Pipe Inspection

- While suspended above grade, all pipe and fittings shall be inspected for defects.

4.04.02 Cleaning Pipe and Fittings

- All lumps, blisters, and excess coatings shall be removed from the bell and spigot end of each pipe.
- Prior to making connections at pipe joints, remove all mud, sand or other foreign material.
- Clean and dry all surfaces of pipe joints and joining material. The outside of the spigot and the inside of the bell shall be wiped clean and dry and free from oil and grease before the pipe is laid.
- Use pipe manufacturer's recommendations for pipe cleaning and joint assembly.

4.04.03 Laying of Pipe

- Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. During laying operations, no debris, tools, clothing or other material shall be placed in the pipe.
- 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 put into the trench piece by piece by means of a crane, rope or other suitable tools or equipment, in such a manner as to prevent damage to main materials and to protective coatings and lining.
- Under no circumstances shall pipe materials be dropped or dumped into the trench.
- After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade.
- Pipe and fittings which do not allow a sufficient and uniform space for joints shall be removed and replaced with pipe and fittings of proper dimensions to insure such uniform space.
- Precautions shall be taken to prevent dirt from entering the joint space.
- At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the City.
- If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.
- If protective coating or lining is damaged, pipe is to be removed from site.



4.04.04 Cutting of Pipe

- The cutting of pipe for inserting fittings or closure pieces shall be done in a neat workmanlike manner without damage to the pipe, coating or lining, and so as to leave a smooth end at right angles to the axis of the pipe.
- All cutting of pipe shall be performed utilizing a saw; breaking of the pipe with any type of hammer will not be permitted. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

4.04.05 Jointing Pipe

- All pipe joints shall be made installed 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 over stressing 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 Engineer 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 redone.
- "Slip Joints" and other rubber gasket type pipe joints shall be installed in strict accordance with the manufacturer's recommendations. Lubricants, unless recommended by pipe manufacturer, shall not be used.
- Joints found to be not tight, or with the plain end not sufficiently inserted in the socket shall be disassembled, thoroughly cleaned and properly remade

4.04.06 Allowable Deflection

- Wherever it is necessary to deflect the water main, either in the vertical or horizontal plane, or where long radius curves are permitted, the amount of deflection allowed shall not exceed the manufacturer's recommendations.
- Where water main is installed with a deflection greater than the maximum allowable deflection, per the manufacturer's recommendation, the pipe shall be removed and reinstalled.
- Water main pipe that requires deflection greater than what the allowable manufacturer's recommendation is shall be deflected with the use of elbows or other fittings to redirect the alignment of the water main.

4.04.07 Separation Requirements

- Follow the IDEM standards for separation of sanitary sewer and water distribution systems.
- Water main shall be deflected to maintain the minimum separation.
- Water main shall have a minimum vertical separation from sewers of 18" and a minimum horizontal separation of 10' from sewers.



- If the water main cannot be deflected to maintain the minimum separation from sewers then one of the following shall occur:
 - The sewer shall be constructed with water main grade pipe that meets the requirements of water main pipe and is pressure and leak tested per the water main pipe requirements.
- The water main pipe or the sewer pipe shall be encased in a watertight casing pipe.

4.04.08 Unsuitable Conditions for Laying Pipe

- No pipe shall be laid in water, or when trench conditions are unsuitable.
- The Contractor shall take all precautions necessary to prevent floatation of the pipe due to water coming into the trench.
- Any damage from floatation or water entering the trench shall be corrected by removing that section which becomes damaged and repairing or replacing it at no additional cost to the Owner.

4.04.09 Pipe Bedding and Backfill

Pipe bedding and backfill materials shall be as recommended by the pipe manufacturer and in accordance with these standards.

- Pipe bedding for PVC or HDPE shall be INDOT #5, #8 or #9 crushed limestone.
- Pipe bedding for DIP shall be natural sand.

4.05 Water Main Testing and Disinfection

All new water main shall be tested and disinfected after all water main pipe has been laid and joints completed, fire hydrants have been installed, and the trench has been partially backfilled. The Contractor shall be responsible for the coordination and completion of all testing and disinfection required. All testing shall be witnessed by an employee of the City or their designated representatives and certified by a qualified independent firm or testing laboratory. The City shall be notified 48 hours prior to any testing.

4.05.01 Testing

All pressure tests and leakage tests shall comply with AWWA Standards and the following requirements:

Testing of Ductile Iron Pipe and PVC Pipe (Hydrostatic Pressure Test)

All ductile iron water distribution main pipe shall be subjected to a hydrostatic pressure test. The test procedure and requirements shall be per AWWA C600 and C605 and as follows:

- After the pipe is laid and the joints completed, the newly laid pipe or any section thereof shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the City.
- The trench shall be partially backfilled so that the joints and fittings area exposed for examination during testing.
- The pump, pipe connection, and all necessary apparatus shall be furnished by the Contractor.
- The Contractor shall furnish all gauges for the test and shall make all taps into the pipe.
- Before applying the specified test pressure, all air shall be expelled from the pipe.
- While the test section is filling, venting at high points may be necessary to purge air pockets.



- If hydrants or blow offs are not available at high places, the Contractor shall make the necessary taps at points of highest elevation before the test is made and insert plugs after the air has been released and before the pressure test.
- The hydrostatic test pressure shall be 150 psi, based on the elevation of the lowest point on the line under test and corrected to the elevation of the test gauge.
- The duration of each pressure test shall be at least two hours.
- All exposed pipe, fittings, valves, hydrants and joints will be carefully examined during the test.
- Any cracked or defective pipes, fittings, or valves discovered as a result of this pressure test, shall be removed and replaced by the Contractor at his expense, and the test shall be repeated.

Water Pipe Leakage Test

A leakage test shall be conducted after the pressure test has been satisfactorily completed. The leakage test procedure and requirements shall be as follows:

- The Contractor shall furnish the pump, pipe, connections and all other necessary apparatus including the gage and measuring device and shall furnish all necessary assistance to conduct the test.
- The duration of each leakage test shall be a minimum of two hours.
- The test main shall be subjected to a pressure of 150 psi.
- Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof: necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.
- No pipe installation will be accepted until the leakage is less than the number of gallons per hour as determined by the formula:

$$L = \frac{S \times D \times \text{square root of } P}{133,200}$$

L = the allowable leakage in gallons per hour

S = the length in feet of the pipe line tested

D = the nominal diameter of the pipe in inches

P = the Average test pressure during the leakage test in psig

- Should any test of pipe laid disclose leakage greater than that specified, the Contractor shall, at his sole expense, locate and repair all defective joints until the leakage is within the specified allowance.

Testing of HDPE Pipe (Hydrostatic Pressure Test)

All HDPE water distribution pipe shall be subjected to a hydrostatic pressure test. The test procedure and requirements shall be per AWWA Manual of Practice M55, ASTM F2164, and as follows:

- Testing shall commence once the installation of the pipe, joints and fittings are complete.
- The trench shall be partially backfilled so that the joints and fittings area exposed for examination during testing.
- Heating fusion joints must be completely cooled before pressure testing.



- Expansion joints and expansion compensators should be temporarily isolated or removed during the pressure test.
- The test section of pipe shall be slowly filled with water and all trapped air bled off.
- While the test section is filling, venting at high points may be necessary to purge air pockets.
- The specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the City.
- The pump, pipe connection, and all necessary apparatus shall be furnished by the Contractor.
- The Contractor shall furnish all gauges for the test and shall make all necessary taps into the pipe.
- The temperature of the test medium and the pipe test section should be the same. Before applying test pressure, allow time for the test medium and the pipe test section to equalize.
- The hydrostatic test pressure shall be 150 psi, based on the elevation of the lowest point on the line under test and corrected to the elevation of the test gauge.
- The loss of pressure and leakage within the pipe can be measured with two different methods. Either one of the following methods shall be used:

Monitored Make-Up Water Test

- The test procedure consists of initial expansion, and test phases. During the initial expansion phase, the test section is pressurized to the test pressure, and enough make-up water is added each hour for three (3) hours to return to test pressure.
- The test phase follows immediately, and may be one (1), two (2), or three (3) hours. At the end of the test time, the test section is returned to test pressure by adding a measured amount of liquid. If the amount of make-up liquid added does not exceed the Table values below, leakage is not indicated.

Test Phase Make-Up Liquid Amount

Nominal Pipe Size (Inches)	Gallons/100 LF of Pipe		
	1 Hour Test	2 Hour Test	3 Hour Test
3	0.10	0.15	0.25
4	0.13	0.25	0.40
6	0.30	0.60	0.90
8	0.50	1.0	1.5
10	0.75	1.3	2.1
12	1.1	2.3	3.4
14	1.4	2.8	4.2
16	1.7	3.3	5.0
18	2.2	4.3	6.5



Nominal Pipe Size (Inches)	Gallons/100 LF of Pipe		
	1 Hour Test	2 Hour Test	3 Hour Test
20	2.8	5.5	8.0
22	3.5	7.0	10.5
24	4.5	8.9	13.5
26	5.0	10.0	15.0
28	5.5	11.1	16.8
30	6.3	12.7	19.2
32	7.0	14.3	21.5
34	8.0	16.2	24.3
36	9.0	18.0	27.0

Non-Monitored Make-Up Water Test

- The test procedure consists of initial expansion, and test phases. For the initial phase, make-up water is added as required to maintain the test pressure for three (3) hours.
- The test phase, the test pressure is reduced by 10 psi. If the pressure remains steady (within 5% of the target value) for an hour, no leakage is indicated.
- For any test, the total test time including initial pressurization, initial expansion, and time at test pressure, must not exceed eight (8) hours.
- If the test is not completed due to leakage, equipment failure, etc., depressurize the test section, then allow it to "relax" for at least eight (8) hours before bringing the pipe section up to test pressure again.
- HDPE fused water piping systems shall have zero leakage present.
- All exposed pipe, fittings, valves, hydrants and joints will be carefully examined during the test.
- If any leakage is observed at any of the joints, then it is assumed complete rupture is imminent.
- If the pressure cannot be maintained and/or leakage is discovered, the pipe shall be considered failed and shall be repaired or replaced by the Contractor at the Contractor's expense.
- Any cracked or defective pipes, fittings, or valves discovered during the pressure test, shall be removed and replaced by the Contractor at his expense, and the test shall be repeated.
- Pneumatic testing for HDPE pressure pipe shall not be allowed.



4.05.02 Disinfection

The Contractor shall disinfect each of the water lines once they have been installed and have passed all testing requirements and before they are placed into service. All disinfection shall be in accordance with AWWA C651 and the following procedures and requirements:

- Disinfect all potable and finished water piping.
- All equipment, tools, and mixing machines used in the disinfection process shall be clean and free from debris and substances not acceptable for contact with potable water.
- Procedure for accomplishing complete and satisfactory disinfection is specified below.
- Other procedures may be considered for acceptance by Engineer or City of New Haven. Any deviations or changes must be confirmed in writing by the City of New Haven.
 - Prior to disinfection, clean piping as specified and flush thoroughly.
 - Conform to procedures described in AWWA C651. Use the slug method of disinfecting, unless alternative method is acceptable to the City.
 - No chlorine tabs are to be glued to the inside of the pipe of fittings.
 - Do not place any other material or substance inside the pipe, including dye, without prior approval from the City.
- Work and all necessary equipment, tools, and machines shall be furnished by the Contractor. Contractor shall be responsible for damage caused by water from hydrants.
- Use a clean and free from debris rotary mixer for chlorine preparation. Any other equipment shall be approved by the City.
- Chlorine shall be provided by the Contractor.
- Dechlorinating chemical, injector pump, and hoses shall be provided by the Contractor.
- Test Risers shall be installed within 10 feet of tie-on point and every 1,200 feet of new water main plus one at the end of branches. Contractor shall be responsible for maintaining all test risers in operable condition, erosion protection, and that test risers are ready for sampling when the City arrives. Test riser maintenance includes but is not limited to protection from freezing, and protection from dust and dirt.
- Bacteriologic samples will be performed by the City. This includes procuring the sample, transporting sample to the testing facility, and receiving and communicating the results of the test. Certified test laboratory report will be provided to Contractor, if requested.
- Chlorine concentration in water entering the piping shall not have less than 100 mg/L free chlorine. The chlorine shall be applied continuously and for a sufficient period to develop a column or "slug" of chlorinated water that will, as it moves through the main, expose all interior surfaces to a concentration of approximately 100 mg/L for at least 3 hours. Disinfect piping and all related components. Repeat as necessary to provide complete disinfection.
- A minimum of two (2) successive sets of satisfactory bacteriological results must be reported from samples collected at a 24-hour interval.



- After 24-hour required retention period:
 - Contractor shall flush water to the sanitary sewer, unless otherwise acceptable to the Engineer or City.
- Contractor shall be responsible for maintaining all test risers in clean, operable condition including protection from freezing. Test risers shall be removed by the Contractor following the City of New Haven's acceptance of the water main.



Section 5.00 Sanitary Sewer

5.01 General

These standards for sanitary sewer provide design and construction requirements that shall be met for all sanitary sewers that are owned or will be owned and operated by the City. These standards have been developed to ensure that the operation and maintenance of the City’s sewer system will provide adequate sanitary sewer service.

All sanitary sewers shall be designed and installed in accordance with the following:

- Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers, Recommended Standards for Wastewater Facilities, latest edition. (Also referred to as “Ten State Standards for Wastewater Facilities”).
- Indiana Department of Environmental Management (IDEM) Regulations
- Title 327 of the Indiana Administrative Code (327 IAC)

5.02 Gravity Sanitary Sewer Materials

5.02.01 Pipe

All gravity sanitary sewer pipe and appurtenances shall be constructed of the materials as specified in the Contract Documents and/or as specified hereafter. Sanitary Sewer (Non-Pressure Gravity Sewer) pipe material shall be one the following:

- PVC (Polyvinyl Chloride) pipe per ASTM D3034 or ASTM F679.
- PVC (Polyvinyl Chloride) pipe per ASTM D2241 (4” through 12”) or AWWA C905 (14” through 36”), SDR 21, for use at greater depths or if required due to lack of separation from water main.

The sanitary sewer pipe allowable depth of bury for each type of pipe is as follows:

Sanitary Sewer Gravity Pipe Bury Depth

Depth (Feet)	PVC (4” through 36”)		PVC (4” through 15”)		PVC (18” through 36”)	
	SDR 21	SDR 35	SDR 26	PS 46	PS 115	
5-10	X	X	X	X	X	X
10-15	X	X	X	X	X	X
15-19	X		X			X
20-24	X					

5.02.02 Sanitary Sewer Structures

Sanitary sewer structures shall be of the type, size, weight and dimensions as specified on the Contract Documents, described below, or as approved by the City.



Manholes

- Sanitary manholes shall be constructed per ASTM C478 with joints meeting requirements of ASTM C443.
- All concrete shall be 4,500 psi at 28 days and contain a minimum of 6 sacks of cement per cubic yard.
- All sanitary sewer manholes shall be circular with circular reinforcement.
- The unit for the top of the structure shall be constructed to provide for the use of standard covers as shown on the Contract Documents.
- The groove of the receiving section shall be carefully cleaned, and a butyl rubber flexible joint sealant material shall be applied around the perimeter. The tongue of the next section shall be cleaned and placed in the groove end of the first section.
- The flexible joint sealant material shall be per ASTM C990 and shall not be less than ½" diameter material.
- In the event that the Contractor is of the opinion that flexible butyl sealant material may not provide a suitable joint to meet the infiltration limits, the use of O-ring rubber gaskets will be permitted.
- Riser rings shall be installed where manholes require adjustment of the casting to get the proper rim elevation. A maximum of 12" of riser rings shall be allowed.
- Manhole adjusting riser rings shall be set in 2 rows of 3/4" flexible joint sealant for proper sealing
- Each manhole shall be provided with steps spaced at 12" center to center with the first step a maximum of 24" below the top of the manhole casting.
- Manhole steps shall be constructed of coated cast iron or steel reinforced fiberglass.

Pipe Connections

- To protect against infiltration and create a watertight seal, provide a resilient connector at each pipe inlet and outlet of the manhole.
- Openings for pipe inlets and outlets shall be provided with rubber boot connections in the precast units at the locations shown on the Contract Documents.
- Openings shall be made true to form and shall be approximately 1" larger in diameter than the outside diameter of the inlet or outlet.
- If it becomes necessary to cut a manhole on the job site, same shall be accomplished utilizing a core drill.
- No changes in the openings in a manhole utilizing a hammer will be permitted.
- All patching of openings in a manhole, made on the job site, shall be accomplished using non-shrink grout or hydraulic cement.

Castings

- Sanitary sewer castings (frames and covers) shall meet ASTM A48.
- Sanitary sewer castings shall be as specified on the Contract Documents, in these standards, or as approved by the City.
- Casting frames and covers located in pedestrian areas shall comply with all current ADA requirements.



Protective Lining

The coating of existing and new manholes shall include the barrel sections and the cone or flat cap sections. This Work shall be generally accomplished as follows:

- Repair hydrostatic leaks.
- Utilize a high pressure washer to clean the walls.
- Apply hydraulic cement mortar on the interior of the manhole at the joints, seams, and/or lifting holes.
- Apply a chemically modified epoxy/urethane hybrid material as a chimney/manhole frame seal.
- Apply ultra high build epoxy coating to the barrel section(s).
- The application of the linings system shall be per the manufacturer's recommendation. **Roll on applications will not be permitted.**

Hydrostatic Leak Correction

Where a hydrostatic leak into a manhole is occurring, it shall be stopped prior to any work on the interior of the manhole. This may be accomplished through one or more of the following:

- a chemical grout on the exterior of the manhole; and/or
- another system deemed appropriate by the Contractor and approved by the City.

The hydraulic cement mortar shall be a fast setting blend of cements and fillers with adhesion to existing concrete in water immersion service environment. Where hydraulic cement mortar is utilized, it shall be installed by trowel with a very rough finish in the area of the leakage. This material shall be from Mainstay, Parsons, Permacast, or equal as approved by the City. The color shall be dark gray or white and installed in accordance with manufacturer's recommendations.

Surface Preparation

All surfaces shall be prepared in accordance with manufacturer's instructions. At a minimum:

- All surfaces shall be cleaned with a water blast having a minimum pressure of 3,500 psi to remove all loose concrete, contaminants, dirt, debris, etc.
- All surfaces shall be prepared to have a minimum profile of 1/16" with aggregate exposed.
- All surfaces shall be saturated thoroughly with clean water prior to the placement of any coating material.
- Restoration mortar shall be applied only after the water sheen is no longer visible.
- The surface to be coated shall be disinfected with bleach or other disinfectant approved by the City.

Cementitious Material

All cementitious material shall be:

- A blend of cement, microsilica, thermoplastic fiber, densifiers, and polymer admixtures that produce a high strength, low shrinkage, low permeability sprayable mortar for rehabilitation of the joints and seams of manhole barrels, lifting holes, and chimney area.



- This mortar shall not contain calcium aluminate cement or aggregates.
- The color of the material shall be gray or white.
- The material shall attain in 7 days a compressive strength of 4,500 psi, a flexural strength of 800 psi, a tensile strength of 275 psi, and a shrinkage at 0.04% or less at 28 days.
- The cementitious material, restoration mortar, shall be applied by trowel or other appropriate tool in a uniform manner to the specified thickness in accordance with manufacturer's instructions.
- The mortar thickness at joint, seams, etc. shall be a minimum of ½" above the walls of the existing profile of the manhole barrel sections.
- The finish shall be a smooth surface.
- This material shall be Parson Proxy SEL-80 or SEL-80 HB, Mainstay ML-72, Permaform MS-10,000 with Con-Shield, or equal as approved by the City and shall be installed in accordance with manufacturer's recommendations.

Chimney/Manhole Frame Seal

All chimney/manhole frame seal shall be:

- A chemically modified epoxy/urethane hybrid material specifically designed to accommodate expansion, contraction, and movement.
- The materials shall contain 100% solids and be a flexible epoxy, trowel grade mastic in a light gray or white color.
- The material shall only be applied to a clean, dry surface with a trowel to a minimum thickness of ½" in accordance with the manufacturer's instructions.
- Material shall be applied from the top of the manhole cone, to and including the precast concrete adjustment rings, and manhole frames.
- The finish shall be semi-gloss.
- This material shall be Parsonpoxy FP, Madewell 806 M or equal as approved by the City and shall be installed in accordance with the manufacturer's recommendations.

Application

All surfaces shall be prepared in accordance with the manufacturer's instructions. At a minimum, all surfaces shall be cleaned to remove all contaminants, dirt, debris, etc.

Manhole Barrel Coating

The existing and new manholes and wet wells shall be coated with an ultra-high build epoxy coating. This sprayed on coating shall be Madewell Mainstay DS-5, Parsonpoxy SEL-80, or equal applied in accordance with the manufacturer's recommendations.

5.03 Building Sewer Laterals

Building sanitary sewer laterals shall run from the main sanitary sewer line, to the approximate right-of-way or property line of the user. Building sewer laterals shall meet the following requirements:

- Building sanitary sewer lateral connections to main line sewers requires a permit and tapping fees per the City requirements.



- Sanitary sewer lateral piping and fittings shall be PVC pipe, per ASTM D3034, with gasketed joints, per ASTM D3212, unless otherwise indicated.
- Installation of all PVC sanitary sewer lateral pipes shall conform to ASTM D2321 and per the Standard Drawings.
- All sanitary sewer lateral connections to the main sanitary sewer line shall be installed with a tee/wye fitting.
- Sanitary sewer lateral connections to existing VCP sanitary sewers may use a saddle tap on the existing pipe with City approval only.
- Sanitary sewer lateral connections to existing PVC sanitary sewers shall be accomplished by the use of tee/wye fittings only and the use of solid sleeves meeting ASTM D3034 with gasketed joints per ASTM D3212.
- Only one building sewer lateral per property shall be allowed unless otherwise approved by the City.
- All building sewer laterals shall be a minimum 6-inches in diameter with a slope no less than 1/8 inch per foot.
- Any building sewer lateral servicing more than one building or property shall be a minimum of 8-inch in diameter and shall have manholes at the main line connection and any changes in direction.
- Any building sewer lateral longer than 100 linear feet will require a clean-out, every 100 linear feet of piping and at the property line.
- A clean-out will be required for any horizontal changes in direction greater than 45 degrees.

5.04 Grease Interceptors

Grease Interceptors shall be required for the following types of new building developments, existing buildings with new kitchen additions, existing buildings undergoing a change in ownership/occupancy.

- All non-residential developments involved in food preparation, processing, and service of food or food products.
- A Multi-family residential development that will, or has the potential to, discharge grease, oil, or similar substances, having a quantity and characteristics above that of a normal family residential waste, to the sanitary sewer.
- Any development or building that will, or has the potential to, discharge grease, oil, or similar substances, having a quantity and characteristics above that of a normal family residence waste, to the sanitary sewer.

5.04.01 Construction and Installation

The construction and installation of all grease interceptors shall meet the following requirements:

- Installation of all grease interceptor shall be downstream of all kitchen drains or grease-laden equipment drains and dishwashers, and in a location readily and easily accessible for cleaning, maintenance and inspection purposes.
- Grease interceptors shall be constructed with a minimum of one baffle pipe on both the inlet and outlet sides.



- Grease interceptors are to be installed at a minimum distance of 10 feet from sinks and 20 feet from dishwashers to allow for adequate cooling of the wastewater. Water temperatures must be less than 120 degrees Fahrenheit prior to entering the grease interceptor.
- Each building or facility shall have a separate individual exterior grease interceptor.
- If directed to by the City, a sample port or manhole shall be installed downstream of the grease interceptor. The opening shall be a minimum of 24 inches to allow for sampling access.
- All grease interceptors shall have the following:
 - A sample port or manhole, if directed.
 - Clean-outs on either side of every grease interceptor.
 - Manhole(s) at each internal baffle pipe (no more than 10 feet between manholes), no hidden internal baffles.
 - A minimum of 9 inches shall be maintained from the liquid level to the grease interceptor top.
 - Interior baffle pipe tees shall extend a minimum of 0.15 of the liquid depth above the liquid level.
 - Inlet baffle pipe tee shall extend 0.25 of the liquid depth below the liquid level.
 - Outlet baffle pipe tee shall extend 0.5 of the liquid depth below the liquid level.
 - Manhole access covers over each baffle pipe shall be a minimum 24 inches in diameter. Castings shall be cast iron or equivalent traffic bearing material. All adjustment rings shall be sealed watertight. Manholes/covers should extend to the finished grade and shall be water and gas tight.
 - Concrete grease interceptors shall have a minimum concrete compressive strength of 3,500 psi. Grease interceptor and castings shall be structurally designed for vehicular traffic with an H-20 Highway load.
- All connections to grease interceptors shall be inspected and approved by the City prior to backfill. The City will require 72-hour notice prior to inspection.

5.04.02 Grease Interceptor Size Requirements

Grease interceptors shall be sized based on the following calculations:

Grease Interceptor Sizing Calculations								
Tanks Size (in gallons)	=	Meals Served During Peak Hour	X	Waste Flow Rater Factor	X	Retention Time Factor	X	Storage Factor
Meals Served During Peak Hour								
Meals Served During Peak Hour = Seating Capacity x Peak Factor								
a. Peak Factor for Fast Food Restaurants								1.33
b. Peak Factor for all other Food Service Types								1
Waste Flow Rate Factor								
a. Commercial kitchen with dishwashing machine								6
b. Commercial kitchen without dishwashing machine								5



c. Single service kitchen	2
d. Sink waste only	1
Retention Time	
a. Commercial kitchen waste	2.4
b. Single service kitchen	1.5
Storage Factor	
a. Fully equipped commercial kitchen having	
8-hour operation	1
12-hour operation	1.5
16-hour operation	2
24-hour operation	3
b. Single service kitchen	1.5

- The sizing method above shall be used as a guide to determine the size of the grease interceptor. The property owner and/or Contractor shall take full responsibility to determine that the interceptor is sized appropriately to meet the level of treatment required.
- Refer to the Grease Interceptor Detail in the Standard Drawings.
- Regardless of the above sizing formula, the minimum size grease interceptor shall be no less than 750 gallons total capacity unless otherwise approved by the City.
- The maximum size of grease interceptors allowed shall be a 3000-gallon capacity tank. If a larger capacity grease interceptor is required, then multiple grease interceptors shall be installed in a series. Grease interceptors that are installed in series shall be of similar size.
- Polyethylene or fiberglass grease interceptors will only be allowed based on City approval.

5.04.03 Alternative Methods

The use of an alternative method will only be approved by the City based on the following conditions:

- In the circumstance of a “single service kitchen” with no food preparation (heat/serve only) and the meals are served on disposable plates and utensils (e.g., concessions stand).
- For cases in which exterior type grease interceptors are infeasible to install due to physical property restrictions, including zero-lot line (i.e., downtown areas with existing building structures located at sidewalk or roadway). The alternative, due to physical property restrictions, cannot be used with the construction of a new building where the owner or Contractor did not provide a stub and the necessary room for the installation of the appropriate sized exterior grease interceptor.
- A mechanical grease trap alternative that has already gained approval in the cases noted above may be submitted for approval.



5.04.04 Maintenance and Inspection

- All property owners or utility users with grease interceptors or grease traps shall have sole responsibility for the maintenance of the grease interceptor or grease trap. They shall be responsible for the proper removal and lawful disposal, by appropriate means, of the captured material in the interceptors.
- All property owners or utility users with grease interceptors or grease traps shall maintain a written record on site of grease interceptor or grease trap maintenance.
- Maintenance shall include the complete removal of all contents, including floatable materials, wastewater, sludge and solids.
- No grease waste shall be discharged directly to the City's wastewater collection system.
- The City has the right to inspect all grease interceptors and grease traps that are upstream from the City's wastewater collection system at any time. Any person, business or owner that are found to be responsible for the discharging of fats, oils and grease shall be charged for the cost of rectifying any and all issues created by the discharge.

5.05 Sanitary Lift Stations

The installation of a sanitary lift station may be required if the elevation of the service area cannot be served by a gravity sewer or is not addressed in the City's Engineering Report and Recommendation of latest revision. The design for all sanitary lift stations shall be approved by the City. Sanitary lift stations shall meet, but not be limited to, the following criteria:

- Lift Stations shall be duplex with submersible type of pumps within a wet well.
- There shall be a minimum of two (2) submersible pumps that are made to handle raw, unscreened sewage.
- The pump quantity and size shall be based on the design flows.
- All valves and bypass connections shall be located in a separate valve vault.
- The wet well and valve vaults shall be properly ventilated.
- Lift Stations shall have a power and control panel on a concrete pad.
- Lift stations shall be designed with an electrical system and telemetry system that corresponds with the City's existing system.
- Lift Stations shall be located where it can be access by vehicle.
- Lift Stations shall have a back-up power option, either by an on-site generator or the option to hook-up a mobile generator.

5.06 Sanitary Sewer Force Main

5.06.01 Pipe

All sanitary sewer force main pipe and appurtenances shall be constructed of the materials as specified on the Contract Documents and/or as specified hereafter. Sanitary Sewer Force Main (Pressure Sewer) pipe material shall be one the following:

- PVC (Polyvinyl Chloride) pipe per AWWA C900 and C905.
- HDPE (High Density Polyethylene) pipe per AWWA C906 and ASTM F714.
- DIP (Ductile Iron Pipe) per AWWA C150 and C151, Pressure Class 350 (Lift Station application only).



5.06.02 Fittings

All force main fittings shall be compact ductile iron and conform to the following:

- Fittings shall be manufactured in accordance with ANSI/AWWA Specifications.
- Fittings shall have an asphaltic coating and cement mortar lining per AWWA C104.
- Fitting joints shall be "mechanical joints" with suitable restraints and shall be furnished with suitable molded rubber gaskets.
- All bolts and nuts for restraints shall be Cor-Blue.
- Joints shall be installed in strict accordance with the recommendations of the pipe manufacturer.

5.07 Installation Requirements

The Contractor shall furnish and install, complete and ready for continuous operations, all new sanitary sewer pipe and appurtenances as shown on the Contract Documents and/or herein specified. The installation of sanitary sewer shall include all materials, labor, all special features, appurtenances, supports, transitions between different types of pipe and structural modifications for the type of pipe furnished. Installation of all PVC sanitary sewer pipe shall conform to ASTM D2321. The sanitary sewer pipe shall be inspected and installed in accordance with all regulating agencies and these standards, including the following:

5.07.01 Pipe Inspection

- While suspended above grade, all pipe and fittings shall be inspected for defects.
- New pipe must match the pipe to which it is being connected.

5.07.02 Cleaning Pipe and Fittings

- All lumps, blisters, and excess coatings shall be removed from the bell and spigot end of each pipe.
- Prior to making connections at pipe joints and manholes, remove all mud, sand or other foreign material.
- Clean and dry all surfaces of pipe joints and joining material. The outside of the spigot and the inside of the bell shall be wiped clean and dry and free from oil and grease before the pipe is laid.
- Use materials as recommended by the manufacturer for pipe cleaning.

5.07.03 Laying of Pipe

- Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. During laying operations, no debris, tools, clothing or other material shall be placed in the pipe.
- 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 put into the trench piece by piece by means of a crane, rope or other suitable tools or equipment, in such a manner as to prevent damage to main materials and to protective coatings and lining.
- Under no circumstances shall pipe materials be dropped or dumped into the trench.
- All sewer pipes shall be laid using an in-pipe target laser beam method to control alignment. All sewer pipes shall be laid true to both horizontal and vertical alignment and will be subject to review by the City. Pipes that do not "Lamp" shall be removed and reinstalled to true line and grade.



- Commence laying gravity sewer pipe at the lowest point on a section of line and lay pipe with the bell ends uphill.
- After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade.
- Pipe and fittings which do not allow a sufficient and uniform space for joints shall be removed and replaced with pipe and fittings of proper dimensions to insure such uniform space.
- At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the City.
- If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.
- All of the pipes herein permitted shall be connected to a concrete manhole.

5.07.04 Cutting of Pipe

- The cutting of pipe for inserting fittings or closure pieces shall be done in a neat workmanlike manner without damage to the pipe, coating or lining, and so as to leave a smooth end at right angles to the axis of the pipe.
- All cutting of pipe shall be performed utilizing a saw; breaking of the pipe with any type of hammer will not be permitted.

5.07.05 Jointing Pipe

- All pipe joints shall be made installed 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 over stressing 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 Engineer 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 redone.
- "Slip Joints" and other rubber gasket type pipe joints shall be installed in strict accordance with the manufacturer's recommendations. Lubricants, unless recommended by pipe manufacturer, shall not be used.
- Joints found to be not tight, or with the plain end not sufficiently inserted in the socket shall be disassembled, thoroughly cleaned and properly remade.

5.07.06 Allowable Deflection

- The maximum allowable deflection for gravity sanitary sewers shall not exceed 5% of the manufacturer's recommendation and any deflection in which the result is pipes that do not "Lamp", the pipe shall be removed and reinstalled.
- Gravity sanitary sewer pipe that requires deflection greater than what the allowable manufacturer's recommendation is shall be realigned or change in direction with the use of manholes.
- Wherever it is necessary to deflect sanitary sewer force main from a straight line, either in the vertical or horizontal plane, or where long radius curves are permitted, the amount of deflection allowed shall not exceed the manufacturer's recommendations.



5.07.07 Separation Requirements

- Follow the IDEM standards for separation of sanitary sewer and water distribution systems.
- If the minimum separation cannot be met, then the sanitary sewer pipe material shall be an AWWA approved pressure grade water pipe of ductile iron with mechanical joints or PVC-C900 or PVC-C905 with compression seals.
- The pressure grade pipe shall then be pressure tested in place at 150 psi without leakage.

5.07.08 Tracer Wire

- The Contractor shall furnish and install tracer wire along all force main pressure pipe trenches.
- The tracer wire shall be Copperhead High Strength Tracer Wire and connected to each fitting and appurtenance.
- The tracer wire shall be green in color, #10 AWG fully annealed, high carbon 1055 grade steel, high strength solid copper clad steel conductor (HS-CCS), insulated with a 30 mil, high-density, high molecular weight HDPE insulation, and rated for direct burial use at 30 volts.
- The tracer wire shall be brought to grade at each valve riser.
- All tracer wire splices shall be accomplished using DryConn direct bury lug connectors.
- After successful hydrostatic pressure test, Contractor will be required to conduct a continuity test of the entire system with a City of New Haven representative present.
- Tracer wire may be placed with gravity sanitary sewers at the City's discretion.

5.07.09 Pipe Bedding and Backfill

Pipe bedding and backfill materials shall be as recommended by the pipe manufacturer and in accordance with these standards.

- Pipe bedding for PVC or HDPE shall be INDOT #5, #8 or #9 crushed limestone to a minimum of 1-foot above the crown of the pipe.

5.08 Sanitary Sewer Testing

Tests required for gravity sanitary sewers shall include a deflection test, a low-pressure air test and an infiltration test. Hydrostatic pressure testing and leakage testing shall be completed for all sanitary sewer force main pressure pipe. All sanitary sewer manholes shall be vacuum tested. The Contractor shall arrange all testing and complete all required testing, at his own expense.

All testing shall be witnessed by an employee of the City or their designated representatives and certified by a qualified independent firm in accordance with IDEM, INDOT or other recognized standards and regulations. The City shall be notified 48 hours prior to any testing.

5.08.01 Deflection Test

Following the installation, bedding, backfilling and compaction of flexible (non-rigid) material gravity sanitary sewer pipes, the City will require all flexible sanitary sewer pipe sections be tested for deflection. The Contractor shall arrange and complete the tests to measure the internal deflection of these pipes. This testing shall be accomplished using a deflectometer, a rigid go/no-go (mandrel) device, or equal in accordance with ASTM D2412. The City shall supply the mandrel for deflection tests. The mandrel shall be pulled manually, and no force pull on the mandrel will be permitted. This test shall not be performed until



after the pipe has been in place for a minimum of 30 days and prior to the placement of any permanent pavement. The maximum ring deflection of the pipe under load shall be limited to five percent (5%) of the nominal internal pipe diameter. If the pipe fails the deflection test, the City may require the pipe to be excavated, removed and discarded and new pipe shall be installed and retested.

5.08.02 Low Pressure Air Test

Each new gravity sanitary sewer, or any isolated section thereof, is to be subjected to a low-pressure air test. The Contractor shall furnish the gages, relief valves, and other equipment, as required, to isolate and air test each section of the sewer. The Contractor shall be responsible to schedule and complete the low pressure air test.

The procedure for the Low-Pressure Air Testing shall be as follows:

- After the pipe is laid, the joints completed, and the trench backfilled, the section of sewer to be tested is to be cleaned and suitably isolated with test plugs securely braced in place.
- Add air slowly to the sewer under test through a suitable connection to one of the test plugs.
- Add air until the internal air pressure is raised to 4.0 psig plus any additional pressure as may be required to offset any back pressure due to ground water submergence of the sewer.
- Contractor's test equipment shall include a pressure relief valve designed and located in such manner as to prevent the test pressure from exceeding 10.0 psig.
- After the internal pressure of 4.0 psig is obtained, allow a minimum of two minutes for air temperature to stabilize, adding only the amount of air to maintain a pressure near 4.0 psig.
- When the stabilization period is over, the test pressure shall be allowed to drop from the 4.0 psig level.
- When the pressure decreases to 3.5 psig, the time shall be checked by means of a stop watch to determine the time in seconds it takes for the test pressure to drop from 3.5 psig to 2.5 psig.
- It is intended that the sewer pipe and joints be of tight construction. The minimum time for the test pressure to drop from 3.5 psig to 2.5 psig per 100 feet of sewer shall be not less than the following:

Pipe Diameter	Time (Seconds)	Pipe Diameter	Time (Seconds)
4"	18	10"	110
6"	40	12"	158
8"	70	15"	248

5.08.03 Gravity Sewer Infiltration Test

Each new gravity sewer, or any isolated section thereof, may be subjected to an infiltration test. The Contractor shall furnish all weirs, bulkheads, catchments, and other appurtenances as required for them to complete the test.

The procedure for the Infiltration Test shall be as follows:

- 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.
- Practically water tight work is required, and the sewer shall be tested carefully to determine the amount of leakage.
- The total infiltration into the system, from the 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).

5.08.04 Hydrostatic Pressure Test and Leakage Test (Force Main)

A hydrostatic pressure test and leakage test shall be completed for each section of sanitary sewer force main pipe. The Contractor shall furnish all equipment and tools necessary to perform the required pressure tests and leakage tests. All sanitary force mains shall be pressure tested per one of the following:

- DIP per AWWA Manual M41
- PVC pipe per AWWA C605
- HDPE pipe per ASTM D2164

The procedure for the testing shall be per the manual referenced for each type of pipe and as follows:

- The pipe shall be filled with water after installation at 150 psi and held for a minimum of 2 hours.
- Leakage shall be defined as the quantity of water to be supplied into the newly laid pipe or any valved section thereof: necessary to maintain the specified leakage test pressure, within 5 psi, after the pipe has been filled with water and the air in the pipe has been expelled.
- No pipe installation will be accepted until the leakage is less than the number of gallons per hour as determined by the formula:

$$L = \frac{S \times D \times \text{square root of } P}{133,200}$$

L = the allowable leakage in gallons per hour

S = the length in feet of the pipe line tested

D = the nominal diameter of the pipe in inches

P = the Average test pressure during the leakage test in psig

- Should any test of pipe laid disclose leakage greater than that specified, the Contractor shall, at his sole expense, locate and repair all defective joints until the leakage test is within the specified allowance.



5.09 Sanitary Sewer Video Inspection

5.09.01 Televising Gravity Sewers

Upon the installation and testing of any new gravity sanitary sewer, the Contractor shall have the new sewer televised so as to provide a permanent record for the City of New Haven.

The procedure for televising shall be as follows:

- After the new main line pipe has been installed, Contractor shall utilize a closed-circuit color television (CCTV) camera to televise the entire length of the main line pipe.
- This testing/video inspection shall be performed in the presence of a City of New Haven Engineering Department representative and shall also have pan and tilt features to inspect each lateral connection.
- Each tape shall be fully narrated, and the recording shall be properly labeled as to the particular section of main being tested from manhole number to manhole number as supplied to the Contractor by the City of New Haven.
- On screen display shall include direction of camera, direction of flow and pipe, manhole beginning number, manhole end number and the lineal footage of pipe. Any and all deformities and any sewer connections shall be noted and referenced from the beginning manhole.
- Unsuitable Conditions: If televising of the main line pipe reveals excess construction debris, dirt, etc., the City may, at their discretion, require the Contractor to clean the sewer line via means determined by the City of New Haven Engineering Department.
- Records: After completion of televising of the main line pipe, a permanent record of the work performed shall be submitted to the City of New Haven Engineering Department for approval. This shall consist of one colored digital thumb drive or approved method and one (1) written report containing all information as is contained on the recording including photos of any defective areas or large deposits of construction debris that will require cleaning.



Section 6.00 Storm Sewer

6.01 General

These standards provide general design and construction requirements that shall be met for all storm sewers that are or will be owned and maintained by the City. These standards were developed to guarantee that the design and installation of new storm sewers allows for acceptable capacity and quality operation and maintenance of the City's storm sewer collection system.

6.02 Storm Sewer Material

6.02.01 Pipe

All gravity storm sewer pipe and appurtenances shall be constructed of the materials as specified in the Contract Documents and/or as specified hereafter. Gravity storm sewer pipe material shall be one of the following:

- PVC (Polyvinyl Chloride) pipe per ASTM D3034 or ASTM F679
- RCP (Reinforced Concrete Pipe) per ASTM C76
- HDPE (High Density Polyethylene) pipe per AASHTO M252 or AASHTO M294
- All street crossings shall be constructed of rigid pipe only.

6.02.02 Storm Sewer Structures

Storm sewer structures shall be of the type, size, weight and dimensions as specified on the Contract Documents, described below, or as approved by the City.

Manholes and Inlets

- Manholes and inlets shall conform to the requirements of the current specifications for precast reinforced concrete manholes and inlets, ASTM C478.
- Circular manholes and inlets shall have circular reinforcement.
- The unit for the top of the structure shall be constructed to provide for the use of standard covers as shown on the Contract Documents.
- The groove of the receiving section shall be carefully cleaned and a butyl rubber flexible joint sealant material shall be applied around the perimeter. The tongue of the next section shall be cleaned and placed in the groove end of the first section.
- The flexible joint sealant material shall be per ASTM C990 and shall not be less than ½" diameter material.
- In the event that the Contractor is of the opinion that flexible butyl sealant material will not provide a suitable joint to meet the infiltration limits, the use of O-ring rubber gaskets will be permitted.
- Riser rings shall be installed where manholes or inlets require adjustment of the casting to get the proper rim elevation. A maximum of 12" of riser rings shall be allowed.
- Manhole adjusting riser rings shall be set in 2 rows of ¾" flexible joint sealant for proper sealing
- Each manhole shall be provided with steps spaced at 12" center to center with the first step a maximum of 24" below the top of the manhole casting.
- Manhole steps shall be constructed of coated cast iron or steel reinforced fiberglass.



Pipe Connections

- A soil tight seal shall be provided between the storm sewer pipe and the structure unless otherwise indicated.
- The connection of the storm sewer pipe inlets and outlets shall be non-shrink grout fill within the annular space.
- If indicated in the Contract Documents, a rubber boot connection may be required in the precast structures per ASTM C923, for a water tight seal.
- Openings shall be made true to form and shall be approximately one inch larger in diameter than the outside diameter of the inlet or outlet.
- If it becomes necessary to cut a manhole on the job site, same shall be accomplished utilizing a core drill.
- No changes in the openings in a manhole utilizing a hammer will be permitted.
- All patching of openings in a manhole, made on the job site, shall be accomplished using non-shrink grout.

Castings

- Storm sewer castings (frames and covers) shall meet ASTM A48.
- Storm sewer castings shall be as specified on the Contract Documents, in these standards, or as approved by the City.
- Casting frames and covers located in pedestrian areas shall comply with all current ADA requirements.

Culverts

A culvert structure is required under a road, driveway, railroad, or similar where there is an existing drainage ditch, swale, or other drainage. The culvert shall be designed and installed to allow the stormwater to flow from one side to the other in the natural direction of flow. All culverts shall be designed and installed as follows:

- Culverts shall be sized to provide the drainage runoff capacity from a 100-year storm event.
- A minimum of a 15-inch diameter culvert shall be used for roadway crossings.
- Private driveway culverts shall be a minimum of 12-inch diameter.
- All culverts under a roadway or driveway shall be designed with a minimum H-20 loading rate.
- All culverts within the County, INDOT, or railroad Right-of-Ways shall be designed and installed per the requirements of the agency with jurisdiction.
- Installation of a culvert may require approval and permits from local, state and federal agencies. Early coordination with all local and state agencies shall be complete prior to design or installation.
- The following type of pipe material may be used for roadway or driveway culverts within the City:
 - RCP (Reinforced Concrete Pipe) per ASTM C76.
 - CMP (Corrugated Metal Pipe) per ASTM A760, A762, or B745.
 - DIP (Ductile Iron Pipe) per AWWA C150 and C151, Pressure Class 350.



6.03 Installation Requirements

The Contractor shall furnish and install, complete and ready for continuous operations, all new storm sewer pipe and appurtenances as shown on the Contract Documents and/or herein specified. 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. 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 shall furnish manufacturer recommendations or requirements for installation and use of pipe and fittings. The storm sewer pipe shall be inspected and installed in accordance with all regulating agencies and these standards, including the following:

6.03.01 Pipe Inspection

- While suspended above grade, all pipe and fittings shall be inspected for defects.
- New pipe must match the pipe to which it is being connected.

6.03.02 Cleaning Pipe and Fittings

- All lumps, blisters, and excess coatings shall be removed from the bell and spigot end of each pipe.
- Prior to making connections at pipe joints and manholes, remove all mud, sand or other foreign material.
- Clean and dry all surfaces of pipe joints and joining material. The outside of the spigot and the inside of the bell shall be wiped clean and dry and free from oil and grease before the pipe is laid.
- Use materials as recommended by the manufacturer for pipe cleaning.

6.03.03 Laying of Pipe

- Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. During laying operations, no debris, tools, clothing or other material shall be placed in the pipe.
- Proper implements, tools and facilities shall be provided and used by the Contractor for the safe and convenient prosecution of the work.
- Pipe and fittings shall be distributed along the line of the trench with "Bells" in the direction of laying. Each piece shall be opposite or near the place where it is to be laid in the trench.
- All pipe and fittings shall be carefully put into the trench piece by piece by means of a crane, rope or other suitable tools or equipment, in such a manner as to prevent damage to main materials and to protective coatings and lining.
- Under no circumstances shall pipe materials be dropped or dumped into the trench.
- All sewer pipes shall be laid using an in-pipe target laser beam method to control alignment. All sewer pipes shall be laid true to both horizontal and vertical alignment and will be subject to review by the City. Pipes that do not "Lamp" shall be removed and reinstalled to true line and grade.
- Commence laying gravity sewer pipe at the lowest point on a section of line and lay pipe with the bell ends uphill.
- After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade.



- Pipe and fittings which do not allow a sufficient and uniform space for joints shall be removed and replaced with pipe and fittings of proper dimensions to insure such uniform space.
- At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the City.
- If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.
- All of the pipes herein permitted shall be connected to a concrete structure.

6.03.04 Cutting of Pipe

- The cutting of pipe for inserting fittings or closure pieces shall be done in a neat workmanlike manner without damage to the pipe, coating or lining, and so as to leave a smooth end at right angles to the axis of the pipe.
- All cutting of pipe shall be performed utilizing a saw; breaking of the pipe with any type of hammer will not be permitted.

6.03.05 Jointing Pipe

- All pipe joints shall be made installed in strict accordance with the pipe manufacturer's recommendations.
- Joints not tight shall be disassembled, thoroughly cleaned, and remade.
- "Slip Joints" and other rubber gasket type pipe joints shall be installed in strict accordance with the manufacturer's recommendations. Lubricants, unless recommended by pipe manufacturer, shall not be used.
- Joints found to be not tight, or with the plain end not sufficiently inserted in the socket shall be disassembled, thoroughly cleaned and properly remade.

6.03.06 Allowable Deflection

- The maximum allowable deflection for gravity storm sewers shall not exceed the manufacturer's recommendation and any deflection in which the result is pipes that do not "Lamp", the pipe shall be removed and reinstalled.
- Gravity storm sewer pipe that requires deflection greater than what the allowable manufacturer's recommendation is shall be realigned or change in direction with the use of structures.

6.03.07 Separation Requirements

- Follow the IDEM standards for separation of storm sewer and water distribution systems.
- If the minimum separation cannot be met then the storm sewer pipe material shall be an AWWA approved pressure grade water pipe of ductile iron with mechanical joints or PVC-C900 or PVC-C905 with compression seals.
- The pressure grade pipe shall then be pressure tested in place at 150 psi without leakage.

6.03.08 Pipe Bedding and Backfill

Pipe bedding and backfill materials shall be as recommended by the pipe manufacturer and in accordance with these standards.



6.04 Storm Sewer Video Inspection

6.04.01 Televising Gravity Storm Sewers (If Required)

Upon the installation and testing of any new gravity storm sewer and as requested by the City, the Contractor shall have the new sewer televised so as to provide a permanent record for the City of New Haven.

The procedure for televising shall be as follows:

- After the new main line pipe has been installed, Contractor shall utilize a closed-circuit color television (CCTV) camera to televise the entire length of the main line pipe.
- This testing/video inspection shall be performed in the presence of a City of New Haven Engineering Department representative and shall also have pan and tilt features to inspect each lateral connection.
- Each tape shall be fully narrated, and the recording shall be properly labeled as to the particular section of main being tested from manhole number to manhole number as supplied to the Contractor by the City of New Haven.
- On screen display shall include direction of camera, direction of flow and pipe, manhole beginning number, manhole end number and the lineal footage of pipe. Any and all deformities and any sewer connections shall be noted and referenced from the beginning manhole.
- Unsuitable Conditions: If televising of the main line pipe reveals excess construction debris, dirt, etc., the City may, at their discretion, require the Contractor to clean the sewer line via means determined by the City of New Haven Engineering Department.
- Records: After completion of televising of the main line pipe, a permanent record of the work performed shall be submitted to the City of New Haven Engineering Department for approval. This shall consist of one colored digital thumb drive or approved method and one (1) written report containing all information as is contained on the recording including photos of any defective areas or large deposits of construction debris that will require cleaning.



Section 7.00 Roadways

7.01 General

These standards provide general design and construction requirements that shall be met for all roadways that are or will be owned and maintained by the City. These standards were developed to guarantee that the installation of all roadways, both temporary and permanent, are designed and installed per the City's requirements.

Current version of Indiana Department of Transportation Standard Specifications and Standard Drawings to be used for Roadway work unless specified differently.

7.02 Subgrade Treatment Types

If required by the Engineer or City, the Contractor shall provide subgrade treatment prior to construction of roadways. Subgrade treatments are as follows:

- Type I per INDOT Specification Section 207.04
- Type II per INDOT Specification Section 207.04
- Type III per INDOT Specification Section 207.04
- Installation of Mirafi RS380i or RS580i geosynthetic fabric and 8" of INDOT #2 aggregate choked off with 6" of INDOT #53 limestone.

7.03 Temporary Pavement

The Contractor shall provide all temporary roadway surfacing and maintenance of the temporary surfacing until the backfill has properly settled to permit permanent pavement replacement.

Temporary roadway surfacing shall be per the following:

- Minimum of 12" depth of INDOT #53 gravel or crushed limestone
- Shall cover the entire area of surface where pavement has been removed
- A minimum 2" depth of cold mix asphalt may be used if determined by the City.
- Contractor shall provide emergency contact numbers in case of settlement or failure.

7.04 Permanent Pavement

7.04.01 Hot-Mix Asphalt (HMA)

- **Base:** The Contractor shall place, at the rate of 110#/SY per inch at the thickness specified, a base course of 25mm HMA material in accordance with the INDOT Specifications.
- **Binder:** The Contractor shall place, at the rate of 110#/SY per inch at the thickness specified, a binder course of 19mm HMA material in accordance with the INDOT Specifications.
- **Wedge:** The Contractor shall place, as required to properly shape the existing pavement, a wedge course of 9.5mm HMA binder material in accordance with INDOT Specifications.
- **Surface:** The Contractor shall place, at the rate of 110#/SY per inch at the thickness specified, a surface course 9.5mm HMA Surface material in accordance with INDOT Specifications.



7.05 Concrete Curb, Curb Ramp, Driveway, Sidewalk

All work and materials related to the replacement or new construction of concrete curbs, curb ramps, driveways, and sidewalks shall be in accordance with the current City Specifications. Existing walks, driveways, or curbs, when disturbed or damaged by construction, shall be replaced to their original condition with construction as per new sidewalks or curbs, and Americans with Disability Act (ADA) compliant.

7.05.01 Curbs

- Contractor shall install new curbs and curb and gutters as per the Standard Details.
- Curb and Gutters shall be poured through all approaches to maintain the gutter pan and positive drainage.
- Curb that has been damaged or proposed to be replaced shall be sawcut and removed to the nearest joint.
- Replacement curb shall match the existing curb unless otherwise noted.
- Backfilling of the curb shall not be until after the concrete has cured for 72 hours.
- Backfilling grade shall be as per the plans or shall match the surrounding grade and be reseeded or sodded.

7.05.02 Curb Ramps

- Concrete Curb ramps shall be as per detailed drawings.
- Curb ramps located at intersections shall be constructed in compliance with the most current requirements of the ADA and PROWAG.
- Detectable warning panels shall be installed for all new construction or reconstruction of curb ramps where the curb ramp, landing, or blended transition connects to a street.
- Drainage inlets shall be located outside of curb ramps and sloped to prevent water ponding at the curb ramp and the path of travel.
- The bottom edge of the curb ramp shall be flush with the edge of the adjacent pavement.
- Gratings, access covers, or other appurtenances shall not be located on curb ramps, landings, or blended transitions.

7.05.03 Driveways and Approaches

- All driveways shall have a 6" minimum depth of concrete. Commercial driveways, if designated, shall have an 8" minimum depth of concrete.
- The construction of new roadways with a vertical curb shall have a depressed curb (1 ½") installed at all driveway locations.
- When a new drive is constructed on an existing street with a vertical curb, the existing curb may be removed and replaced with a depressed curb.
- When a new drive is constructed on an existing street with a rolled curb, the existing curb shall remain or be replaced with a 1 ½" depressed curb.
- A new driveway permit shall be obtained from the City for any new driveway construction or reconstruction.
- The grade of all approaches shall be installed such that positive drainage by gravity flow will be obtained but not greater than 8.33% between sidewalk and back of curb.
- Drives shall be constructed with 4" min. of #73 or #53 compacted limestone.



7.05.04 Sidewalks

- All walks shall have a 4" minimum depth of concrete.
- All walks constructed through a driveway approach shall have a 6" minimum depth of concrete.
- For sidewalk replacement, sawcut at the nearest joint.
- If existing sidewalk not scheduled for replacement is damaged the Contractor shall replace the concrete to the next joint at no additional cost to the City.
- Cross slope of the sidewalk shall not exceed 2%.

7.05.05 Materials

- All new and replaced curbs, curb and gutters, curb ramps, driveways, and sidewalks shall be replaced with "Ready-Mixed" concrete conforming to ASTM C94.
- The cement shall conform to ASTM C175 for air entrained cement with the entrained air within the limits of 4% to 7%.
- All aggregate shall conform to ASTM C33.
- Forms shall be of metal or approved wood, straight and free from warp and of sufficient strength when braced to resist springing while placing concrete.
- The forms shall be to the full depth of the walk or curb and shall be securely staked, braced and held firmly to the required line and grade.
- All concrete shall be of such design and mix as to conform to the following:
 - minimum cement content of 6 sacks per cubic yard;
 - minimum compressive strength, 4500 psi @ 28 days;
 - maximum water-cement ratio, 5.5 gallon per sack; and
 - maximum slump, 3".

7.05.06 Expansion Joints

- Place expansion joints in curb, gutter, and curb & gutter constructed next to HMA pavement or surfacing.
- Locate joints:
 - everywhere that tangent and radial curb or curb & gutter meet;
 - on each side of every inlet, 5 feet from the inlet, but no closer than 6 feet from another joint; and,
 - on tangent sections every 100 feet.
- If constructing curb, gutter, or curb & gutter adjacent to or on concrete pavement constructed with expansion joints, place expansion joints to match locations of pavement expansion joints.
- Set joints at right angles to the face and top of the curb, and at right angles to the flow line and surface of gutters.
- The preformed asphaltic impregnated expansion joint shall be composed of a durable elastic compound of mineral or vegetable matter of not less than ½" and shall be placed the entire width and depth of the walk or curb.
- Install ½" by ½" silicone joint sealant over expansion joints.
- Expansion joint material of ½" thickness shall also be placed where any sidewalk abuts valves, poles, manholes, handholes, etc., which may fall within the walk.



7.05.07 Reinforcement

- Where a new replacement sidewalk or curb abuts an existing walk or curb, the Contractor shall provide a minimum of two (2) ½" rebar into the existing curb or walk.
- Reinforcement for 6" Driveways: ½" rebars shall be placed into the curb at 3 feet on center.

7.05.08 Installation

- The subgrade shall be wetted before the concrete is placed thereon.
- The concrete shall be deposited within the forms upon the wetted subgrade to such depth that after being vibrated, it shall be to the full thickness required.
- Concrete shall be leveled off and tamped sufficiently to bring mortar to the surface after which it shall be finished smooth and even by means of a wood float or trowel.
- Transverse joints shall be cut at intervals not greater than the width of the sidewalk being constructed or at not greater than ten (10) feet on all curbs to a depth of 1/3 of depth of the pour.
- When completed the sidewalk and/or curb shall be covered and kept wet or sprayed with an approved curing agent.
- Concrete shall not be allowed to freeze.

7.05.09 Finishing

All curbs, driveways, and sidewalks shall be troweled and edged to a neat appearance so as not to allow any exposed aggregate and shall have a broom finish at right angles to the direction of travel.

7.06 Pavement Preparation – Milling, Tack, Cleaning

All work and materials related to the preparation of surfaces to be overlaid with HMA shall be in accordance with INDOT Specifications Section 402.11.

7.07 Stone Driveways

7.07.01 Stone and Gravel Drive Replacement

Stone and gravel replacement shall consist of 12" of compacted INDOT #53 crushed limestone upon a compacted approved subbase.

7.08 Testing

7.08.01 Pavement Testing

The following tests may be required to verify the conformance with these specifications:

- Asphalt extraction from job mix
- Percent asphalt
- Asphalt mix gradation (sieve analysis)
- Concrete compression tests
- Compaction test on subgrade
- Pavement coring to verify pavement thickness

Should any test indicate that materials are not in conformance with the Specifications, the City may, upon agreement with the Contractor, have additional tests performed by an independent testing lab to establish the full extent of such non-conformance.



As a result of such testing, the Contractor shall be directed to remove such material or materials as found to be deficient or non-conforming and replace same with acceptable material at the expense of the Contractor.

All associated costs for testing required and/or performed during projects shall be at the Owner's expense unless otherwise stated or agreed to. Owner shall be defined as that entity, person, or persons causing the work to be performed. Additional testing that may be required as a result of unsatisfactory work performed by the Contractor shall be at the expense of the Contractor.



Section 8.00 Traffic

8.01 Maintenance of Traffic

All Contractors, Developers, and Utilities that plan to have any type of maintenance of traffic, including roadway restrictions, closures, shoulder work, etc., shall meet the following requirements:

- A Maintenance of Traffic plan must be submitted for City approval at least five (5) working days prior to restriction or closure of any street. The plan shall include anticipated dates and times of restriction or closure, as well as emergency contact numbers.
- Additional traffic control may be needed for high volume streets.
- Any Maintenance of Traffic plan components that will be located within roadways of other governing bodies (i.e., Allen County, INDOT, etc.) shall have the required approval and permits from the corresponding agency.
- The Contractor is responsible for proper traffic control and warning signing and devices as required by the MUTCD, for the duration of construction on any public street. Failure to do so will result in the City providing the necessary equipment and charging the Contractor with all related costs.
- All Temporary Traffic Control Devices shall be in accordance with the current edition of the MUTCD and shall be delivered to the jobsite in good condition meeting the minimum retroreflectivity levels indicated in MUTCD Section 2A.08.
- The Department of Engineering reserves the right to reject any sign, barricade, or temporary concrete barrier section that is visually deficient.

8.02 Traffic Signals

The Contractor shall furnish and install all necessary miscellaneous equipment required to make a completed and operating installation of traffic signals in accordance with the plans, specifications, Sections 805 and 922 of the INDOT Standard Specifications, and the INDOT Standard Drawings, except as revised herein.

Traffic Signals shall only be installed by a Contractor pre-qualified by INDOT to perform traffic signal installation work.

Any proposed work involving modifications to any traffic signals that are not per plans or specifications shall be approved and permitted by the governing agency including but not limited to the City of New Haven, Allen County, and INDOT.

All new signal installations or modifications shall be reviewed by City of Fort Wayne Traffic Engineering as per provisions in City of New Haven/Fort Wayne Traffic Signal Maintenance Agreement.



Section 9.00 Site Restoration

The Contractor shall restore all ground covers and miscellaneous items removed or disturbed as a part of the work to a condition equal to or better than before the work began.

Final acceptance will not be made until after all the following items have been completed to a condition equal to or better than before construction began, and to the satisfaction of the City and/or any other public body that may have jurisdiction:

- site cleanup;
- site work including restoration of all fences, lawns, drives, poles, signs, sidewalks, curbs, gutters, property monumentation replacement, etc.;
- pavement replacement; and
- repair work and all other miscellaneous items disturbed during construction.