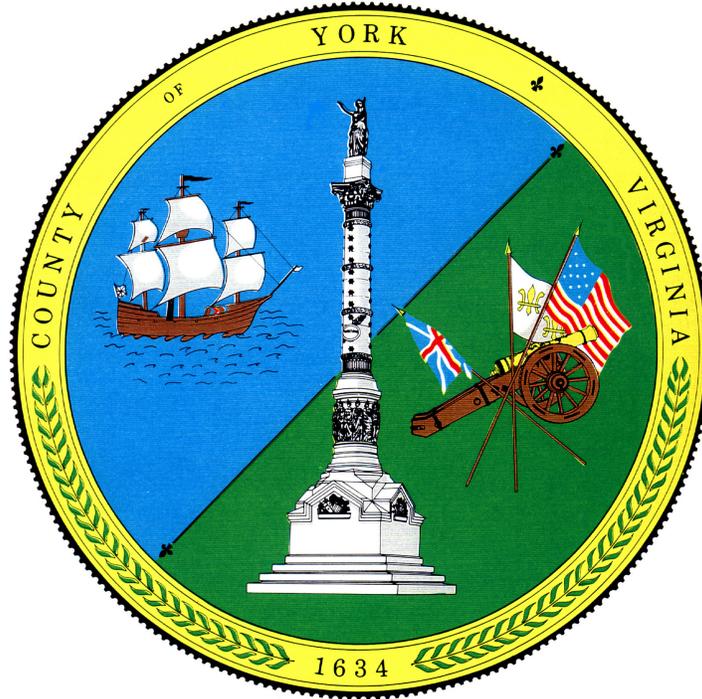


County of York, Virginia



Sanitary Sewer Standards and Specifications

Effective Date: April 1st, 2025

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Section 1. Introduction

The York County Sanitary Sewer Standards and Specifications establish the requirements for the design, construction, inspection, testing, and acceptance of all sanitary sewer facilities within York County. These standards ensure that the wastewater collection system operates safely and efficiently. It also complies with local, state, and federal regulations.

This document outlines essential criteria for pipe materials, installation procedures, sewer alignment, slope requirements, manhole construction, and inspection protocols. The standards provide a uniform framework to guide developers, engineers, and contractors in constructing and maintaining sanitary sewer infrastructure.

In addition to these technical guidelines, the standards integrate the requirements set forth in Section 18 of the County Code, which defines the minimum acceptable criteria for sewer system design and operation. Compliance with these standards is mandatory for all projects to ensure long-term functionality, public health protection, and environmental sustainability.

Lastly, this document was created as a living document, meaning that it will be periodically updated as to stay current with new standards and address problems as they arise.

Section 2. Definitions

The following definitions are meant to coincide and supplement the definitions as detailed in Section 18.1 of the York County Code of Ordinances. Unless the context specifically indicates otherwise, the meaning of terms used herein shall be as follows:

AASHTO: An acronym for the American Association of State Highway and Transportation Officials.

Abut: Touching, adjoining, or bordering on.

Acceptance: Means approval and subsequent ownership including satisfactory completion of all warranty and guarantee periods by the Board of Supervisors or their designated representative.

Aggressiveness: The intensity or force of discharge.

Alignment: The positioning and orientation of a pipe in a system.

ANSI: An acronym for the American National Standards Institute.

Applicant: The owner of the property to be served, or their duly authorized representative who applies to the County for sewer service.

Approved Plans: A site plan, development plan, or utility only plan that has been reviewed and approved by a DPW engineer or their designee. Also referred to as approved set of plans or an approved plan set

Appurtenance: Any accessory object or component connected to a public or private sewer system.

As-built Drawing: Drawings, signed and sealed by a professional land surveyor or a professional engineer, of the constructed sewer system showing actual constructed elevations, dimensions and locations versus the approved plan. Also referred to as record drawings.

ASTM: An acronym for the American Society for Testing and Materials.

Average Daily Flow (A.D.F.): The average volumetric flow rate (typically measured as gallons per minute) of wastewater passing through a sanitary sewer system over a typical 24-hour period, measured as a daily average over a specified timeframe, usually 30 days.

Average Flow: The baseline sewer flow as determined by engineering methodology.

AWWA: An acronym for the American Water Works Association.

Buffer: An area, fencing, landscaping, or a combination thereof used to shield or block noise, lights, glare, pollutants, or other potential or actual nuisances. When located within a Chesapeake Bay Preservation Area or Watershed Protection Area, buffer shall mean an area of natural or established vegetation to protect other components of a resource protection area, reservoirs and state waters from significant degradation due to land or other disturbances.

Building: Any permanent structure having a roof supported by columns or walls, including modular and pre-fabricated buildings, which is used for the shelter, housing, or enclosure of persons, animals, or tangible property and, unless specifically exempted, constructed in accordance with all applicable provisions of the Virginia Uniform Statewide Building Code.

Capital Improvement Plan (CIP): A long-range planning document subject each year to the review and approval of funding by the Board of Supervisors.

Capacity: The maximum amount that a system or its component can effectively contain, convey, or process within a given period. This term is typically used to quantify the limits of infrastructure, such as gravity systems, pressure systems, or vacuum systems in terms of volume, flow rate, or processing ability.

Capacity Report: A document, prepared and sealed by a design professional, that shows that a proposed sewer system is designed within capacity of its respective requirements.

Certificate of Occupancy (CO): A document issued by DPDS allowing the occupancy or use of a building and certifying that the structure and/or site has been constructed to be used in accordance with all applicable plans, codes and ordinances.

Certificate to Construct Sewer: A document issued by the County Administrator that permits a developer, or a representative of a developer, to extend and/or modify the County sanitary sewer system as specified in a utility plan approved by the County.

Cleanout Assembly: A sewer system component that includes the riser pipe, fittings, cleanout cap and cast iron cover, which is located near the property or easement line, for access to the lateral line where connection is made to a plumbing system.

Code: Refers collectively to a set of regulations and standards governing building, safety, and health practices within the jurisdiction of Virginia. This includes, but is not limited to, the Virginia Uniform Statewide Building Code; the National Fire Protection Association standards; the Virginia Safety and Health Codes; and the Code of Ordinances for York County, Virginia, outlining local regulations and ordinances specific to the County.

Collection Point: A centralized point where all of the wastewater in a service area is collected prior to discharging into a larger sewer system.

Combined Sewer System (CSS): A system comprised of connected sanitary and stormwater sewers that is no longer allowed within the County.

Combined Sewer Overflow (CSO): A discharge from a combined sewer system that occurs when the volume of wastewater and stormwater exceeds the capacity of the sewer system.

Component: Refers to an individual part of element of a system that contributes to its overall function.

County Code: Refers to the Code of Ordinances for York County, Virginia.

Connection Fee: An initial charge levied to defray the costs associated with providing public sewer.

Construction: Any placement or installation of sewer infrastructure including the preparation, restoration, and/or incidental work for such placement or installation.

Contractor: Any entity or person performing work (other than the County) on existing County infrastructure, infrastructure to be transferred to the County, or private infrastructure.

County: A regional governmental division within the Commonwealth of Virginia, specifically referring to York County.

County Administrator: Shall mean the County Administrator of York County, as appointed by the York County Board of Supervisors. References to the County Administrator as used in these standards and specifications shall be deemed to include the Administrator or their designated agent.

County Infrastructure: Any sewer system located within or without the boundaries of the County, which have been, are, or are intended to be installed, operated or maintained by the County or in the installation, operation or maintenance of which the County has participated, is participating, or intends to participate financially. Also referred to as Facilities of the County.

Crown: Refers to the topmost point or the highest inner surface of a circular or arched pipe.

Customer: The person who has applied to receive or already receives service of the County sanitary sewer system.

Datum: A coordinate surveying referenced by professional land surveyors that serves as a starting point or base for measurements.

Department of Public Works (DPW): The County of York, Department of Public Works. Includes the Utility Operations, Utility Inspections, and Engineering divisions.

Department of Public Works - Utilities (DPW-U): The division within the Department of Public Works that is tasked with overseeing the planning, inspections, operations, and maintenance of the County's sanitary sewer infrastructure.

Department of Public Works – Engineering (DPW-E): A division within the Department of Public Works that comprises of that is tasked with reviewing and approving utility plans, material submissions, and as-built drawings.

Department of Planning and Development Services (DPDS): The County of York, Department of Planning and Development Services. Includes Planning, Development Services, and Building Safety divisions.

Design Professional: A professional who may design sanitary sewer systems under their professional Virginia seal.

DEQ: An acronym for the Virginia Department of Environmental Quality.

Developer: Any person having a legal interest in real property which may now or in the future be served by County's sanitary sewer system and who is or may be responsible for the design and/or construction of such facilities.

Development: Any building or subdivision activity, with the intent to improve real-estate, which is required to have either site plan or development plan approval of the County before it is commenced. In terms of the standards herein, development also refers to any improvements that will increase the amount of wastewater being discharged into a sanitary sewer system.

Development Plan: A plan that provides detail and specifications on how a subdivision will ensure full compliance with all applicable ordinances, regulations, requirements and policies of the County.

Diameter: A straight line passing through the center of a circle and meeting the surface at each end.

Director: A County employee holding the sole position of department director.

Discharge: A term used to describe the act of releasing fluid into a sewer system. When used in conjunction with sanitary sewer systems, discharge means the intentional release of wastewater into a sanitary sewer system.

Domestic Wastes: The wastes produced from non-commercial or non-industrial activities, and which result from normal human living processes, which are of substantially

similar origin and strength to those typically produced in households, including wastes from sanitary conveniences.

Downstream: Refers to the direction or relative position towards which a fluid is moving while under the forces of gravity. Downstream typically means the portion of a sewer system that is lower in elevation than a reference structure.

Drop Connection: A vertical connection from a sewer at a higher level to or near the invert level of a manhole as not to create more turbulent wastewater flows.

Dual Service Connection: A sewer connection in which two laterals serving individual properties connect prior to entering a larger sub-main or main.

Dwelling Unit: A single unit providing complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking, and sanitation.

Easement: A grant by a property owner recorded with the Clerk of the Circuit Court for the use of their land by another party for a specific purpose.

Easting: The eastward-measured distance from the north-south line which passes through the origin of a grid. Also referred to as the “x” coordinate, an easting is referenced via a horizontal datum.

Engineering Judgement: The ability of a design professional to apply scientifically derived principles to real-world situations in order to solve problems. This judgement is often acquired through experience and is crucial in producing desirable engineering outcomes.

FOG: An acronym for fats, oils and grease.

Force Main: A pressurized pipeline that conveys wastewater from a pump or lift station to a discharge point.

Flow: Refers to the movement of fluid through an area, pathway, or point of analysis within a system.

Flow Rate: A quantitative measure of how much fluid passes through an area, pathway, or point of analysis within a system and over a specified time frame.

Flooding: The overflow of water onto land that is normally dry due to heavy rainfall, hurricanes, tropical storms, et cetera.

Future Use Capacity: Refers to the capacity for the increased flow rates in a sanitary sewer system expected from a development; Capacity not needed at time of design and

construction to accommodate existing needs; or capacity which provides for the future development of property and for community growth.

Governing Body: The Board of Supervisors of York County which serves as the governing body. Also referred to as the Board of Supervisors.

Grease Trap: A structure designed to facilitate the capture of grease from the effluent stream prior to discharging into a sewer system.

Grinder Agreement: An agreement, whether private or public, executed between the County and a person for the installation of a grinder pump system for a single parcel.

Grinder Pump: A compact lift or pump station with pump(s), storage well, appurtenant piping, valves and other mechanical and electrical equipment which grinds or reduces the particle size of wastewater solids to yield a sewage slurry and which conveys the waste from its source to a sewer system.

Ground Surface Elevation: The elevation, as referenced in an established vertical datum, at a point on ground surface.

Hampton Roads Planning District Commission (HRPDC): The regional planning organization representing the area's sixteen local governments, including York County.

Hampton Roads Sanitation District (HRSD): The regional agency that provides regional transmission and treatment facilities for wastewater.

Head: Refers to the difference in elevation between two points in a system, typically in units of feet. Also referred to as static head.

Horizontal Directional Drilling: A trenchless method used for installing underground utilities such as pipes, conduits, or cables.

Incidental: Occurring as a minor or secondary consequence of something more important. In terms of construction, incidental work or material is required for completion of the project but may not be tracked as part of payment or progress.

Incremental Capacity: The additional capacity required in system facilities to accommodate a specific development.

Industrial Wastes: Liquid and liquid carried wastes resulting from industrial, manufacturing, trade or business processes, including industrial cooling water and unpolluted trade or process waste, as distinguished from domestic wastes.

Industry/Industrial User: Any place of business, endeavor, arts, trade, or commerce,

whether public, government, private, commercial or charitable, which uses water in a product, process, or in any manner that generates wastewater.

Infiltration: Unintentional water entering a sewer system from the ground, through such means as defective pipes, pipe joints, connections, or manhole seepage.

Inflow: Unintentional water discharged into a sewer system from such sources as roof leaders, cellar drains, yard drains, area drains, foundation drains, cooling water discharges, drains from springs and swampy areas, manhole covers, cross connections, storm sewers and combined sewers, catch basins, storm waters, surface runoff, or street wash waters.

Infrastructure: Refers to the fundamental sewer systems serving a person or the County.

Interceptor: A sewer that receives sewage flow from a number of gravity mains, trunk sewers, sewage force mains, etc.

Inspector: A person authorized by the County to inspect the construction of sewer systems that are to be dedicated to the County for future maintenance and operation.

Invert: The lowest point inside a pipeline; the point at which the flow of liquid within the pipe is at its deepest.

Lateral: A sewer line that discharges into a sewer main, typically the lateral is downstream from a plumbing system, and has no other common sewers discharging into it.

Local Facilities: A sanitary sewer system serving only one development; any lateral line to which a plumbing system connection is made; all private gravity sewers six inches or less in diameter; and infrastructure, whether on-site or off-site, necessary to make the facilities of the county accessible to the premises.

Lot: Any tract of land described in a recorded deed or on a subdivision plat of record, and which possesses or is in the process of being assigned a number for tax assessment identification purposes. For purposes of development a lot may consist of an individual lot of record, or combinations of adjacent recorded lots and/or portions of lots of the same ownership.

Low Pressure Distribution: The conveyance of effluent through pressure percolation lines at full flow conditions into the absorption area with the prime motive force being a pump. Typically used in septic systems.

Low Pressure Force Main: A sewer force main that discharges into an unpressurized structure such as a manhole.

Main: A sewer pipeline that conveys flow from one point in a system to another by means of the forces created by gravity (gravity main), positive pressure supplied by a pump (force

main), or by negative pressure supplied by a vacuum system (vacuum main). Mains vary in length, diameter, and size; a system may be comprised of multiple varying mains.

Maintenance: The systematic operation, inspection, cleaning, and rehabilitation processes that are essential for optimizing the proper functioning of the wastewater collection system.

Manhole: A structure installed in a sewer system intended to provide a point for inspection, maintenance, and repair.

Meters: An instrument used for measuring and recording flow rate, pressure, or other technical data within a sewer system.

Microtunneling: A pit-launched technique used to install pipe from a remote location.

Minimum Daily Flow (MDF): The minimum flow rate in a sanitary sewer system determined by use of the appropriate factor times the average daily flow (generally $MDF = 0.5ADF$), or as measured directly over a 30 day period for existing developed areas.

Northing: The northward-measured distance from the north-south line which passes through the original of a grid. Also referred to as the “y” coordinate, a northing is referenced via a horizontal datum.

Offset: A spatial distance between two components.

Off-site Extension: An extension of a sewer system from an existing sewer system to the property boundary of the developer or applicant in a manner and location approved by the County.

Ordinance: The municipal regulation authorizing passage of requirements for wastewater disposal in York County.

Owner: Any person having an interest whether legal or equitable, sole or partial, in real property which is, or which may in the future be, served by the facilities of the County.

Parallels: The spatial relationship between two utilities running alongside each other.

Peak Daily Flow (PDF): The maximum flow rate in a sanitary sewer system determined by use of the appropriate peaking factor times the average daily flow or as measured directly over a 30 day period for existing developed areas.

Peaking Factor: The ratio, as determined by engineering judgement or regional standards, of the maximum flow rate to the average flow rate.

Person: Any individual, partnership, firm, association, joint venture, public or private corporation, trust, estate, commission, board, public or private institution, utility, cooperative,

county, city, town or any other political subdivision of the state, any interstate body or any other legal entity. This definition excludes the County.

Pipe: A conduit with a consistent cross section and engineered material used to transport fluids over distances. Also referred to as a line.

Plan: Refers to a detailed and systematic representation, often in the form of drawings and documents that outlines the design, structure, and components of a construction project.

Plan View: Refers to a horizontal plane that shows a top-down view of an object or space.

Plat: A plan or map of a tract or parcel of land, meeting the requirements of the York County Subdivision Ordinance, which is to be or has been subdivided. As a verb, the term is synonymous with subdivide.

Plumbing: A system within a building or property that includes all the pipes, fixtures (sinks, toilets, showers, etc.), and appliances (dishwashers, washing machines, etc.) that are connected to and utilize the water supply and drainage systems. The plumbing system is responsible for the distribution of fresh water to various points within the building and the collection and transportation of wastewater (from sinks, toilets, etc.) to a single exit point, where the plumbing system transitions into a sanitary sewer system, from the property. Plumbing systems are typically the responsibility of the property owner and are confined to the property's boundaries.

Premises: Any building, group of buildings, or land upon which buildings are to be constructed which is or may be served by County Infrastructure.

Premises having access to the facilities of the County: Any improved premises which abut a highway, street, easement, alley, or other public space in which the facilities of the County are located; the improvements to be served on such premises shall be located no more than 300 feet from the County sanitary sewer system and shall be served by gravity flow.

Premises having service available: Any premises, whether improved or unimproved, which abut the Facilities of the County or a right-of-way in which such facilities are located and which could be served by such facilities but is deemed not to be a Premises having access to the County sanitary sewer system because such Premises are unimproved or because of distance between the facilities and the improvements on the property exceed 300 feet or because the installation of an individual grinder pump would be necessary to serve improvements on the property.

Preconstruction Meeting: A meeting held by the contractor and the County prior to the construction of sewer systems.

Pretreatment: An on-site process to reduce, alter and/or change wastewater characteristics prior to discharging the wastewater into a public sanitary sewer system.

Profile: A plot that indicates the alignment of a sewer plotted versus vertical elevation. A profile typically shows existing utilities, proposed utilities, ground surface, etc.

Private Sewer System: A sewer system owned by one or more persons as opposed to the County, HRSD, or any other adjoining city or county.

Professional Engineer: A person who is qualified to practice engineering by reason of their special knowledge and use of mathematical, physical and engineering sciences and the principles and methods of engineering analysis and design acquired by engineering education and experience, and whose competence has been attested by the Virginia Board for Architects, Professional Engineers, Land Surveyors, Certified Interior Designers and Landscape Architects.

Professional Land Surveyor: A person who, by reason of their knowledge of the several sciences and of the principles of land surveying, and of the planning and design of land developments acquired by practical experience and formal education, is qualified to engage in the practice of land surveying, and whose competence has been attested by the Board through licensure as a land surveyor

Public Sewer System: A sewer system owned and operated by the County, HRSD or any adjoining city or county.

Public Sewer Extension Agreement (PSEA): A contract authorized by the governing body between the County and a developer for the extension of the County sanitary sewer system by a developer.

Pumping Station: A facility that houses pumps and equipment to move wastewater from one location to another, often to a higher elevation. It is a critical component in wastewater treatment and pipeline systems, ensuring the efficient and continuous flow of fluids across varying terrains and elevations.

Public Works Engineer: A DPW engineer whose duty is to ensure that work done for the County complies with these Standards. The engineer may be personnel directly designated by the DPW director or a professional engineer appointed to represent the County in such matters.

Regional Consent Order: A legally binding agreement issued by DEQ requiring municipalities in the Hampton Roads area to implement specific measures to reduce and manage sewer overflows and improve wastewater management. It aims to ensure compliance with environmental regulations, protect public health, and preserve water quality in the region.

Regional Construction Standards (RCS): The HRPDC construction reference document addressing typical horizontal construction activities including utility pipelines, roadways, and drainage structures.

Regional Technical Standards (RTS): The design standards established by DEQ as a part of the Regional Consent Order for sanitary sewer systems and pump stations.

Regional Wet Weather Management Plan (RWWMP): Sanitary sewer system rehab plan to decrease and eliminate sanitary overflows within each locality brought on by the DEQ Consent Order.

Reliability: A measure of the ability of a component or system to perform its designed function without failure or interruption of service.

Review: The process in which plans are go through one or multiple stages of examination and evaluation by designated reviewers.

Sanitary Sewer Overflow (SSO): Any discharge of wastewater (including infiltration and/or inflow) out of a sanitary sewer system. Also referred to as sewage spills or spillage.

Sanitary Sewer System: A sewer constructed for collecting, pumping, treating, and disposing of wastewater for the ultimate goal of sanitization. This system, also commonly referred to simply as 'sanitary sewer,' encompasses the infrastructure necessary for effective wastewater management, from residential and commercial buildings to treatment facilities. Also referred to as a wastewater sewer system.

Service Area: A geographical area that represents all of the users that discharge into a sanitary sewer system. A County service area typically represents the areas that discharge into a County collection point. Also referred to as a sanitary sewer basin.

Service Connection: Refers to the point in a sewer system in which the lateral serving a premise connects into a sub-main or main.

Service Charge: A periodic charge levied to defray costs associated with the construction, operation, maintenance, repair, and replacement of public sewer.

Sewage Collection and Treatment Regulations (SCAT): The regulations that govern the design, construction and operation of sewage systems and treatment works serving more than one residence or a non-residential sewage source.

Sewer System: A network of interconnected components, including gravity sewers, pressure sewers, and vacuum sewers, designed to collect and transport fluids. Also referred to as sewer.

Sewer Service: Refers to the availability and accessibility of the County's sanitary sewer system to a property, enabling the effective management and disposal of wastewater.

Site Plan: A required plan, prepared and approved in accordance with the provisions of the York County Zoning Ordinance, which is prepared to scale and depicts and provides design details on the proposed improvements on a site such as the existing and proposed topography, vegetation, drainage, floodplains, marshes, waterways, utilities, open space, walkways, means of ingress and egress, utility services, landscaping, structures and signs, lighting and screening devices, complete dimensioning of the existing and proposed structures and improvements, the boundaries of the site, and any other information that reasonably may be required.

Site Constraints: The limitations imposed on construction that may be due to a limiting factor.

Specify: The act of explicitly naming or stating something in detail which may or may not already be described in other specifications or documentation.

Springline: Refers to the horizontal line at the midpoint of the pipe's vertical axis. It runs perpendicular to the vertical axis and is located at the central point of the pipe's diameter, effectively dividing the pipe into its top and bottom halves. In pipe installation and engineering, the springline is often used as a reference point for measurements and alignments.

Standards: The County Sewer Standards and Specifications.

Storm Sewer System: A sewer system intended to convey stormwater runoff or surface waters to an outfall.

Stream: A channel or watercourse, classified as such by an agency or the County, that regularly has water flowing through it.

Stub-Out: A pipe that is installed in a system intended to be used to connect future sewer into a system.

Subdivision: The division of a lot, tract or parcel of land into two or more lots, tracts or parcels for the purpose, whether immediate or future, of transfer of ownership or development.

Submain: A sewer that receives flow from one or more lateral sewers.

Submittals: The documentation submitted by a contractor to the County for approval before procurement and installation. These documents typically include information on the materials and products to be used in the project, ensuring that they meet specified

standards and requirements.

Supervisory Control and Data Acquisition (SCADA): A computerized system used in industrial organizations to control industrial processes either locally or at remote locations, monitor and process real-time data, and interact with devices such as sensors, valves, pumps, motors, and more.

System: A set of interrelated elements, components, or sub-systems that work together to perform a specific function or achieve a common objective.

Tap: Refers to a connection point in a sewer system where a sewer line is connected to a main.

Temporary Privy: A privy with a tank for collection of human excrement to be used for specified periods and cleaned weekly or more often. Temporary privy's are used for direct treatment of wastewater.

Upstream: Refers to the direction or relative position towards which a fluid is moving while under the forces of gravity. Upstream typically means the portion of a sewer system that is higher in elevation than a reference structure.

User: Any person who discharges into a sanitary sewer system.

Utility: A service that is used by the public, such as electricity or gas.

Utility Crossing: A point at which the alignment of two utilities cross as determined in a plan.

Utility Plan: A plan or combination of plans that are required by a developer to extend and/or modify the County's sanitary sewer system to existing or future parcels. Utility plans are typically a subset of a larger site plan or development plan.

Utility Only Plan: A plan or combination of plans that are required by a developer to extend and/or modify the County's sanitary sewer system. Utility only plans are stand alone and not typically a subset of a larger site plan or development plan.

Vacuum Pot: A component in a vacuum sewer system that acts as a collection sump.

Vacuum Sewer System: A negative pressure system of wastewater transport utilizing differential air pressure to create flow. Vacuum sewer systems are typically used in areas where the head between a user and the collection point is not large enough to allow a normal gravity sewer system.

Virginia Department of Health (VDH): The local office of the Virginia Department of Health, responsible for permitting the construction of soil absorption systems and drinking

water wells. Also referred to as the Health Department.

Warranty: Means the period of time stipulated in a PSEA wherein the developer of a sanitary sewer system is responsible for the correction of any deficiencies in materials and/or workmanship discovered during that specified period of time. Also referred to as a Guarantee Period.

Wastewater: The water carried waste which derives principally from dwellings, businesses, institutions, industry and the like exclusive of any storm, surface and/or ground water. Also referred to as sewage, sanitary sewage, and domestic wastewater.

Section 3. General

3.1 Sewer Systems

A sewer system as defined in these specifications is a series of interconnected infrastructure that conveys wastewater to a wastewater treatment plant ultimately for the goal of sanitation.

3.2 The Necessity for Sanitary Sewer Systems

Effective sanitary sewer systems are essential to protect public health, preserve environmental quality, and ensure compliance with regulations at the federal, state, and local levels. Under the Clean Water Act (CWA), wastewater must be collected, conveyed, and treated to prevent pollutants from reaching natural waterways.

Virginia's SCAT regulations reinforce these requirements by establishing uniform design and operational standards for sewer infrastructure, while HRSD's regional oversight ensures that local systems—like those of York County—meet stringent discharge limits and overflow controls.

Without properly functioning sewer systems, communities face public health risks from untreated wastewater exposure, ecological harm due to nutrient overloading and contamination of water bodies, and potential legal and financial consequences arising from noncompliance with regulatory mandates.

By investing in and maintaining gravity, pressure, and vacuum sewer systems, York County safeguards its drinking water sources, supports responsible land development, and promotes the overall well-being and sustainability of the community.

3.3 Applicable Regulations and Agreements

York County is mandated by multiple agencies to successfully plan, inspect, construct, maintain, and operate its sanitary sewer systems. Below are key regulations and agreements which are the basis of such mandates.

3.3.1 EPA and the Clean Water Act

The Clean Water Act (CWA) was established in 1972 by the Environmental Protection Agency (EPA) to restore and maintain the integrity of the nation's waters by reducing pollution and protecting water quality. It was created in response to widespread water

pollution and aimed to regulate the discharge of pollutants into U.S. waters while setting water quality standards for surface waters.

The CWA regulates sanitary sewage systems by overseeing the collection, conveyance, and treatment of wastewater to prevent contamination of water bodies.

Three key elements as they relate to York County's responsibility are as follows:

1. National Pollutant Discharge Elimination System (NPDES) – Requires permits for discharging treated wastewater into water bodies, ensuring compliance with pollution limits.
2. Secondary Treatment Standards – Mandates a minimum level of wastewater treatment at publicly owned treatment works (POTWs), requiring the removal of biological oxygen demand (BOD), total suspended solids (TSS), and other pollutants.
3. Sewer System Management – Regulates Combined Sewer Overflows (CSOs) and Sanitary Sewer Overflows (SSOs) to prevent untreated sewage from contaminating waterways.

3.3.2 Virginia Sewer Collection and Treatment Regulations

The Virginia Sewer Collection and Treatment (SCAT) Regulations establish statewide standards for the design, construction, operation, and maintenance of sewer systems and wastewater treatment facilities. These regulations, enforced by the Virginia Department of Environmental Quality (DEQ), ensure public health protection, environmental sustainability, and compliance with federal laws, including the Clean Water Act.

The Virginia SCAT regulations set forth the following standards and requirements for sanitary sewer system operators:

1. Virginia Pollutant Discharge Elimination System (VPDES) - A state-administered permit program that regulates the discharge of treated wastewater into surface waters. This program requires treatment facilities to meet effluent limits for nutrients, suspended solids, and biological contaminants.
2. Sewer Collection System Standards - Establishes design and construction requirements for gravity sewers, force mains, pump stations, and vacuum sewers. Mandates minimum slope, depth, material specifications, and capacity requirements to ensure efficient flow and prevent failures.
3. Sanitary Sewer Overflow (SSO) and Combined Sewer Overflow (CSO) Controls - Requires municipalities to monitor, report, and mitigate sewer overflows. Enforces

Corrective Action Plans (CAPs) for reducing infiltration, inflow, and unauthorized discharges.

4. Pretreatment Program (Industrial Waste Control) - Regulates industrial wastewater discharge into municipal sewer systems. - Requires industries to pre-treat wastewater to prevent damage to publicly owned treatment works (POTWs).
5. Operator Certification and Facility Maintenance - Requires licensed wastewater operators to oversee treatment plants and collection systems. Enforces routine inspections, emergency response plans, and asset management programs.
6. Virginia Water Quality Standards - Establishes acceptable nutrient, sediment, and pathogen levels in water bodies. Helps determine Total Maximum Daily Loads (TMDLs) to control pollution from point and nonpoint sources.

3.3.3 Hampton Roads Sanitation District (HRSD)

The Hampton Roads Sanitation District (HRSD) is the regional wastewater authority responsible for collecting, conveying, and treating sewage from York County and the surrounding municipalities. HRSD ensures compliance with state and federal regulations, including the Clean Water Act (CWA) and Virginia Pollutant Discharge Elimination System (VPDES) requirements.

Listed below are key regulatory components as they relate to York County's responsibility for sanitary sewer conveyance.

Regional Consent Order (Issued by Virginia DEQ to Hampton Roads Localities)

In response to concerns over sanitary sewer overflows (SSOs) and inflow/infiltration (I&I) issues, the Virginia Department of Environmental Quality (DEQ) issued a Consent Order in 2007, requiring HRSD and its member localities to:

- Identify and reduce sewer system deficiencies causing SSOs.
- Develop a Regional Wet Weather Management Plan (RWWMP) to handle peak flows.
- Establish corrective action plans (CAPs) for areas with excessive I&I.
- Implement sewer rehabilitation projects to prevent overflows and ensure compliance with water quality standards.
- A modified Consent Order (2014) shifted more responsibility to HRSD for regional infrastructure upgrades, aiming for a cost-effective, long-term solution.

Memorandum of Agreement (MOA) – DEQ & the Hampton Roads Localities

In 2014, DEQ and HRSD, along with the Hampton Roads localities (including York County,) signed a Memorandum of Agreement (MOA) to establish a unified regional approach to wastewater management. Key provisions of the MOA include:

- HRSD taking primary responsibility for major regional sanitary sewer system improvements.
- Localities focusing on maintaining and upgrading local collection systems while coordinating with HRSD.
- Joint compliance efforts to meet Clean Water Act and Virginia Water Quality Standards without duplicating efforts.
- Improved data collection, monitoring, and reporting to ensure system efficiency and prevent overflows.

HRSD's Enhanced Nutrient Reduction Strategy

HRSD is required to meet nutrient discharge limits for Total Nitrogen (TN) and Total Phosphorus (TP) to protect the Chesapeake Bay. Advanced wastewater treatment technologies have been implemented to comply with Chesapeake Bay TMDL (Total Maximum Daily Load) requirements.

Sanitary Sewer Overflow (SSO) Reduction Program HRSD and localities must:

- Identify and repair aging infrastructure contributing to SSOs.
- Monitor sewer flow and reduce stormwater infiltration into the sanitary sewer system.
- Comply with EPA's SSO Control Policy by minimizing unauthorized discharges.

3.3.4 York County Code, Section 18.1

This ordinance establishes comprehensive sanitary sewer standards in York County, recognizing that a reliable system for collecting, treating, and disposing of wastewater is crucial for public health, environmental protection, and orderly community growth.

It sets forth uniform requirements for both private and public sewer systems, details the responsibilities of users and the County, and clarifies procedures for construction, connections, fees, and enforcement.

By regulating everything from permissible discharges to the design and maintenance of sewer facilities, the ordinance ensures wastewater is handled safely and sustainably, pre-

venting contamination of water sources, safeguarding infrastructure, and promoting the overall welfare of County residents.

3.4 Sewer Systems

A sewer system as defined in these specifications is a series of interconnected infrastructure that conveys wastewater to a wastewater treatment plant ultimately for the goal of sanitation.

There are three types of sewer systems in York County:

1. **Gravity Sewer:** A sewer system that utilizes gravity to convey wastewater to a downstream point. Gravity sewer comprises of manholes, gravity mains, submains, laterals, and cleanouts.
2. **Pressure Sewer:** A sewer system that utilizes pressure supplied by a pump to lift wastewater against gravity. Pressure sewer is normally comprised of grinder pumps, lift stations, pump stations, and force mains.
3. **Vacuum Sewer:** A sewer system that utilizes negative pressure supplied by a downstream vacuum pump to pull wastewater toward the station. Vacuum sewer is comprised of vacuum mains, vacuum pots, and vacuum stations.

Section 4. Planning and Development

4.1 Overview and Purpose

This section outlines the County's approach to planning, designing, and implementing public sewer extensions, ensuring that new developments are served by reliable and efficient wastewater infrastructure. By categorizing sewer extensions based on scale and complexity—Minor, Standard, or Major—York County can tailor its processes to meet each development's needs while upholding engineering standards and regulatory requirements. This section also details the overall workflow for obtaining sewer service, from initial inquiries about system availability through construction, inspection, and formal acceptance.

4.2 Sewer Availability

Any interested property owner may reach out to DPW-E staff to inquire on the availability of public sewer. Engineering staff is available to discuss existing utilities and potentials for extension of sewer in order to serve said property. Additionally, staff will inform the property owner on which sewer development criteria they fall under if sewer is not available.

4.3 Sewer Development Categories

Given that a public sewer extension project varies drastically depending on a developer's goals, public sewer extensions are divided into three categories:

- **Minor Sewer Extensions**

These extensions normally involve an individual home owner or a single lot developer who needs to extend the existing public sewer system to serve their property. The maximum number of flows to qualify for a minor sewer extension is equal to or less than two ERUs.

Most normally, capacity to handle the additional wastewater flows is disregarded as one or two ERUs do not overload a sewer system. Even if the additional two ERUs brought the sewer system out of capacity, the onus for upgrading the sewer system should not be on the home owner or developer in this situation.

Additionally, DPW staff works to expedite the process within reason while still abiding by these standards and specifications. I.e. simplified forms, quicker correspondence, etc. is offered to minor sewer extension developers.

- **Standard Sewer Extensions**

These developments involve the extension of public sewer to serve multiple lots. Extensions can range from three to hundreds of lots to be served by public sewer.

Upon review, DPW-E confirms that the existing sewer system has capacity to handle the additional wastewater flows.

- **Major Sewer Extensions**

These developments involve extension of public sewer to serve multiple lots, similarly to standard sewer extensions. The caveat is that DPW-E staff determines that there is not adequate capacity for the additional flows generated by the proposed development unless upgrades to the existing sewer system, such as a new pump station or modification of existing system components, is proposed.

In a situation where a sewer extension is proposed where there is not existing capacity downstream then the developer shall be logistically and financially responsible for developing a plan to upgrade the system and executing such plan.

4.4 General Sewer Development Workflow

The section below describes a typical workflow for sewer development, starting from concept to sewer acceptance.

1. A person or may inquire about sewer availability of a property (referred to as inquirer) directly with DPW-E. After researching the property, DPW-E staff informs the inquirer on how the property is currently served. If there is no sewer service available, DPW-E staff provides a statement that sewer is not available and that a public sewer extension will be required to serve the property.
2. If the inquirer desires to connect to public sewer, it is the inquirer's responsibility to have a utility only plan developed by a design professional (referred to as submitter) to submit to DPW-E for review.
3. Plans are periodically submitted to DPW-E for review either through DPDS or directly from a submitter. The method of routing is dependent on if it is a utility only plan review or apart of a site or development plan. DPW-E staff has 2 weeks from the time of submission or distribution from DPDS to review the utility plans. After review DPW-E either approve the plans or provides a list of comments to DPDS or directly to the submitter depending on how it was routed.
4. If the utility plans cannot be approved by DPW-E staff then it is the submitter's responsibility to have the plans adequately revised per the plan review comments.

Once revised, the submitter resubmits the plans for review and approval. (Plan review is an iterative process, and depends on the design professional's experience designing sewer systems and familiarity with County standards. While County review staff will work within all reason to review plans in a timely manner, this process can repeat any number of times until DPW-E can approve such plans.)

5. Once the plans are approved, DPW-E will stamp and record the utility plans on file. An approval letter will be sent to the submitter or the DPDS planner indicating what is required in order to obtain a certificate to construct sewer.
6. If required, the inquirer has applicable easements or agreements approved and/or recorded with the County Attorney's office. Please refer to the Easements and Agreements subject of this section for further information.
7. At this point it will be the inquirer's responsibility to find a contractor who is approved to construct sewer within York County.
8. The other conditions of the approval letter, such as material submittals, are submitted to DPW-E for review and approval. DPW-E will review all material within 7 business days and return to the inquirer or inquirer's contractor a status of the review.
9. Once all conditions are addressed and/or approved, a statement from DPW-E will be sent to the inquirer's contractor that a sewer preconstruction meeting can be scheduled with the DPW-U. It is then the inquirer or the inquirer's responsibility to reach out to the designated person to schedule a preconstruction meeting.
10. A preconstruction meeting is held with DPW-E, DPW-U, and the inquirer's contractor at a minimum. The meeting is required to share contact information and establish procedures and inspection checkpoints. After the meeting a certificate to construct sewer is issued to the inquirer's contractor.
11. After the preconstruction meeting the contractor may begin construction of the sewer.
12. Over the period of construction or at certain designated inspection checkpoints, the County sends a designated person to inspect the project. The County inspector acts as the liaison between the contractor, sewer installation, and the County.
13. In addition to inspection checkpoints, survey as-builts and testing (dependent on the kind of sewer) are required to be submitted to DPW for review. As-builts are required before testing to confirm that the sewer was constructed in the right location and to the appropriate elevations. Testing is required to confirm that the sewer was constructed to appropriate standards and is sufficient for acceptance. If the as-builts or the testing comes back deficient, then the contractor will be required to make

sufficient repairs to the system to correct the deficiencies.

14. As the sewer is constructed, as-builts are approved, and testing is complete the inquirer can request that the sewer is accepted by the County.
15. A standard one-year warranty is required to be offered by the inquirer or the contractor with acceptance. This one year warranty is to cover any insufficient workmanship due to deficient installation that did not appear during construction or inspections.
16. Once all of the requirements for the public sewer extension has been approved, a letter of acceptance is sent to the inquirer noting that the County has accepted the sewer. As such, sewer is extended to all premises. The inquirer may then pay sewer connection fees for the newly served lot and acquire building permits.

4.5 Public Utility Easements

A public utility easement provides the County the right to install, access, maintain, and repair the sewer located beneath the property. While a property owner retains ownership of the land, they are generally prohibited from building or making improvements that would obstruct or damage the underlying sewer. The easement ensures that essential utility services can be delivered and maintained without undue interference, while still allowing the owner to use the property, subject to the limitations required for sewer system access.

4.5.1 General

The County may require public utility easements depending on where the sewer system is proposed and the ease of future maintenance. The size and location of easement depends on what's proposed on the associated utility plans, the type of sewer system, and the feasible area for maintenance. DPW-E reviews and approves all proposed public utility easements based on sound engineering judgment.

4.5.2 Deed of Easement

A deed of easement is a legal document that grants an easement and outlines its specific terms. To clearly identify where the easement lies on the property, the deed of easement typically references a recorded plat (or survey) that visually depicts the easement's exact location and dimensions.

Deed of easements are recorded at the Courthouse and are coordinated through the County Attorney's office.

4.5.3 Easement Plat

An easement plat is essentially the visual, surveyed depiction of an easement on a parcel of land. While a deed of easement is the legal document granting and outlining the terms of the easement, the easement plat provides a detailed map that complements and clarifies those terms.

Before a utility easement is conveyed to the County, DPW-E reviews the plat to ensure that it correctly correlates with an approved utility plan and/or that it is located in an ideal way for future maintenance operations. Ultimately, DPW-E approves or disapproves the proposed public utility easements on behalf of the County.

4.6 Private utility easements

In some situations, a private utility easement is required between two or more private parties over a proposed utility easement. These situations arise when DPW-E determines that it would not be in the County's interest to maintain a private easement.

Given that these easements and underlying infrastructure are private, it is the responsibility of the private parties to have the private easements executed. Occasionally, DPW may require that a copy of the executed easements be provided as a condition of a public sewer agreement.

4.7 Public Sewer Extension Agreements

Per the County Code, the developer shall enter into a legal binding agreement with the County in order to extend the public sewer referred to as a PSEA (Public Sewer Extension Agreement). This agreement, written and administered by the County Attorney, sets forth the agreement conditions as part of extending the public sewer and is required to obtain a certificate to construct sewer.

4.8 Certificate to Construct Sewer

A certificate to construct sewer is issued to a developer or the developer's certified contractor after all of the conditions have been met. This certificate allows a contractor to construct public sewer to eventually dedicate to the County.

Section 5. Design Standards

This section sets forth the standards required for the design of utility plans to be reviewed and approved by the County prior to the construction of sanitary sewer systems.

5.1 Variance Requests

Variance requests deviating from these standards herein shall be submitted in writing to DPW – Engineering Division (DPW-E) for review prior to approval of an associated utility plan. Variance requests shall include, at a minimum, the following information:

1. Name of the associated utility plan
2. Date of the variance request
3. Point of contact for the designer
4. A narrative detailing:
 - (a) What variance is being requested along with the respective section reference.
 - (b) Why the variance is being requested and why it is necessary.
 - (c) What additional measures or design features are being proposed to mitigate potentially negative impacts.
5. Documentation referencing the system components for which the variance is being requested.

DPW-E reserves the right to approve or deny each variance request on a case by case basis.

5.2 Information Required for Utility Plans

The following information is generally required on utility plans and are required prior to the begin of review:

1. Existing Conditions: A separate sheet showing the existing features prepared in accordance with section 24.1-502 (e) of the County Code. In addition, the existing conditions shall show how all existing residences are served by sewer which may include septic systems (septic tank, drain field, etc.)
2. Professional Seal: The design professional's Virginia seal is signed, dated, and provided on all sheets.

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3. Date: The date the plans were prepared is provided on the plans.
 4. Title: The title of the plans is shown on all sheets.
 5. North Arrow: A north arrow is provided on all plan views and is correctly oriented.
 6. Scale Bar: A scale bar (or note indicating the scale) is provided on all plan views, profiles, and cross sections. All plans are appropriately scaled per the respective sheet and scale bar.
 7. Design Scales: All utility plans shall be scaled based on one of the proposed design scales:
 - (a) 1" = 50'
 - (b) 1" = 40'
 - (c) 1" = 30'
 - (d) 1" = 20'
 - (e) 1" = 10'
 8. Page Size: The plans shall indicate the standard sheet size, ARCH D 24" x 36".
 9. Alignment: All proposed sewer has an alignment that indicates the stationing in appropriate and legible spacing. The alignment also includes the length of pipe in feet.
 10. Profile: All proposed sewer has a profile that shows the corresponding alignment plotted versus elevation. The profile shall show all proposed and existing utility crossings and parallels. Refer to 5.6.4
 11. Easements: All existing and proposed easements shall be shown on the plans. Proposed easements shall be clearly shown with appropriate width callouts. In instances where variable width easements are proposed, the Easting and Northing shall be called out where the easement lines change direction.
 12. Notes: The York County Sanitary Sewer General Notes shall be included on all utility plans. The notes may be found in Appendix 11.1
 13. Cover Sheet Information: The following information shall be included on the cover sheet of the plans, whether or not the plans are a subset of a larger plan set or are utility only plans:
 - (a) Existing Sanitary Sewer Flows: Average and Peak in gallons per minute and gallons per day.

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- (b) Proposed Sanitary Sewer Flows: Average and Peak in gallons per minute and gallons per day.
 - (c) Name of the pump station service area in which the development discharges into.
14. Details: All applicable County Sanitary Sewer Details shall be included on the plan. The detail may be found in Appendix 11.2
 15. Horizontal Datum: The plans shall be prepared in Virginia Coordinate System of 1983 (VA South Zone) and the 1983 North American Datum.
 16. Vertical Datum: The plans shall be prepared in the North American Vertical Datum 1988. (NAVD88)

5.3 Information Required for Capacity Reports

The designer submitting the utility plans may be requested by DPW-E verify that the proposed sewer system has capacity for the future use of a development. Such verification is typically presented in an engineering report, referred to herein as a capacity report.

The following information, at a minimum, shall be included in the capacity report:

1. Title of the project
2. Name of the design consultant.
3. Preparation date of the report.
4. A summary of the existing sanitary sewer system.
5. A summary of the proposed sanitary sewer system.
6. Conclusions provided by the Consultant.
7. Calculations required to verify capacity for each system component.
8. A service area map showing the analyzed system to the collection point.

5.4 Determination of Existing and/or Proposed Sewer Discharges

As determination of flows are required to verify capacity, the following sections aim to detail how to determine such flows. The following shall be considered when determining discharges for analysis.

5.4.1 Sewer Discharge Calculations

Existing and/or future sewer flows at any point within a sanitary sewer system shall be calculated in accordance with the equations shown below:

$$A.D.F._{(gpd)} = F.F._{(gpd/units)} * Units$$

$$P.D.F._{(gpd)} = F.F._{(gpd/units)} * Units * PK.F.$$

Where:

- A.D.F.: Average daily flow
- F.F.: Flow factor
- Units: Units of flow, dependent on property use
- P.D.F.: Peak daily flow
- PK.F.: Peaking factor

The flow factors, units, and peak factors are provided in Appendix 11.3.

5.4.2 Hydraulic Modeling of Service Areas

When analyzing service areas where there are varying contributing land use and/or pumps, the entire service area shall be modeled using standard hydraulic modeling methods. Refer to Appendix 11.9 for more detail on hydraulic modeling methodology and procedures.

5.4.3 Metered Data Usage

If metered data exists for a property in County records, then such data shall supersede the sewer flow equations above and provided that the A.D.F. is determined using sound engineering judgment.

5.4.4 SCADA Data

If SCADA data exists that represent the A.D.F. and P.D.F., then that information shall be implemented in analysis of the sanitary sewer system capacity.

5.4.5 Pump Discharge Analysis

When an existing service area is analyzed that has an existing pump discharging into gravity, then the flows shall incorporate the peak discharges of the pump versus the flows of the contributing service area.

5.4.6 Accessory Units Flow Analysis

DPW-E may require flows from accessory units be included in the analysis on a case by case basis.

5.5 Approvals from Other Agencies

In such situations, the design professional will need to submit the utility plans to other local, state, or federal agencies for approval. It is expected that the design professional is already familiar with such requirements and coordinates with the other agencies on their own accord. However, DPW-E may require documentation from such agencies be provided showing approval from such agency prior to utility plan approval.

5.6 Gravity Sewer Design

The following sections pertain to the design of gravity sewer:

5.6.1 Determination of Capacity

In many instances, the velocity and flowrates shall be determined to verify capacity. The methodology for showing velocity, flow rate, and depth of flow shall be based on Manning's Equation (1), the Continuity Equation (2), and sound engineering judgment.

$$V = \frac{1.49 * R^{0.67} * S^{0.5}}{n} \quad (1)$$

$$Q = A * V \quad (2)$$

Where:

- V is the instantaneous velocity, in feet per second, of flow in a sewer system at a specific point in time.
- R is the hydraulic radius, in feet, which is the area of flow divided by the wetted perimeter

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- P (not shown) is the wetted perimeter, which is the perimeter of flowing fluid about its channel.
 - A is the Area, in square feet) of flow in a sewer system at any given point.
 - S is the slope, in foot per foot, of the gravity main.
 - n is the manning's coefficient, unitless, based on the material of pipe. Refer to Appendix 11.4 for a list of acceptable manning's coefficients
 - Q is the flow rate, in feet per second OR gallons per minute, that reflects the peak capacity of the pipe.

A pipe which is found to be over capacity is one in which the design flows exceed the pipe capacity. In such instances a proposed or existing pipe will need to be modified so that the design flows are retained within the pipe.

5.6.2 Sub-main Capacity

The pipe capacity for all sub-mains shall be designed to accommodate 400% of the A.D.F.

5.6.3 Main Capacity

The pipe capacity for all mains shall be designed to accommodate 250% of the A.D.F..

5.6.4 Plan and Profile Information

The following information shall be provided on both the plan and profile view for proposed gravity mains:

1. Length in feet as measured between manholes
2. Material of pipe
3. Nominal diameter in inches
4. Slope in percentage (%)

5.6.5 Minimum Size

No proposed sewer main shall be less than eight inches in nominal diameter, except sewer serving six connections or fewer, unless the design professional submits a variance request with their utility plan showing that the average flow rate and average velocity is adequate.

5.6.6 Minimum Slope

All gravity sewers shall be designed with a minimum design slope based on the respective main diameter as specified in Appendix 11.5. Minimum slope may be decreased provided that the depth of flow will be $\geq 30\%$ of the diameter for the design average flow. Whenever such decreased slopes are selected, the design professional shall submit a variance request with their utility plan for review and approval by DPW-E.

5.6.7 Uniform Slope

All sewer mains shall be installed with uniform slope between manholes.

5.6.8 Slopes Exceeding 20%

No sewer mains shall be proposed with a slope exceeding 20%.

5.6.9 Straight Alignment

All sewer shall be straight in alignment between manholes.

5.6.10 Minimum Depth of Cover

The standard minimum depth of cover, measured from the crown of pipe to the top of ground surface elevation as measured on the profile, shall be a minimum of 3'.

5.6.11 Depths in Excess of 12'

Sewer lines proposed to be installed at a depth of 12 feet or greater as measured from the invert of pipe to the top of ground surface elevation, from invert to finish grade shall be specified as ductile iron (DI) or C900 PVC.

5.6.12 Sewer in Fill Sections

Sewer lines installed in fill sections shall be specified as ductile iron pipe with mechanical joints or C900 PVC.

5.6.13 Corrosive Soils

If soil is determined corrosive, an approved polyethylene encasement material shall be provided on proposed ductile iron pipes. DPW-E shall approve DI or C900 PVC based on soil conditions within the project.

5.6.14 Stream Crossings

Any gravity main that is proposed to cross a stream, ravine, or other natural conveyance system shall be specified as ductile iron or C900 PVC pipe with restrained joints.

5.6.15 Maximum Velocities

In general, velocities in a sewer main generated from P.D.F. shall not be greater than 8 feet per second. In such instances of steep terrain, the proposed sewer system should be modified to decrease slopes and reduce excessive velocities. Where it is impractical to limit velocities below 8 feet per second by decreasing slope, reasonable effort shall be made not exceed 10 feet per second. Whenever such excessive slopes are proposed beyond 8 feet per second, the design professional shall submit a variance request with their utility plan for review and approval by DPW-E. The variance request shall specify what pipes exceed 8 feet per second, what restrained joint pipe and fittings are proposed, and what additional measures are proposed to protect the sewer main against increased corrosion and erosion.

5.6.16 Easement Widths

Where easements are required for the proposed gravity main, the width of any gravity sewer main shall be 20' wide, aligned on center over the easement.

5.6.17 Horizontal Separation from other Utilities

The proposed sewer alignment shall be offset at least ten feet from any existing or proposed utilities owned by other entities. Should conditions prevent a 10' offset, the sewer may be aligned closer to such utilities if the following are provided:

1. The design professional submits a variance request with their utility plan for review and approval by DPW-E highlighting the specific areas and distances from the proposed sewer and the other utilities.
2. Acknowledgment of the utility owner is provided to the County that such utilities are to be less than 10' offset from the proposed sewer.
3. The plans clearly indicate at what elevation the utilities will be proposed within the 10' offset.

5.6.18 Utility Crossings

When the proposed sewer is shown to cross over other utilities, a minimum 18" separation shall be provided between the crown of the underlying utility and the invert of the overlying utility. Any proposed utility crossing, involving sanitary sewer that is less than 18", may be approved provided the design professional submits a variance request to DPW-E for review and approval. The variance shall specify what additional protective measures are proposed for the utility crossing.

5.6.19 Material

The proposed sewer system shall be consistent material from manhole to manhole.

5.6.20 Buoyancy

Where high groundwater conditions are anticipated or known to exist, buoyancy of sewers shall be given due consideration and appropriate construction details specified for the utility. DPW-E may request buoyancy calculations as part of a utility plan. Buoyancy calculations shall be based on sewer pipes that are not conveying any flow.

5.6.21 Valves

Generally, the design or installation of valves are not allowed on gravity mains. In rare situations DPW-E may require a valve for systemic reasons.

5.7 Manhole Design

The following sections pertain to the design of manholes

5.7.1 Determination of Capacity

Capacity verification of manholes is typically not required to be shown as part of design. However, there may be instances where the HGL of gravity mains may be compared against the rim elevation of a manhole to verify capacity. DPW-E may require the capacity be shown for proposed or existing sewer manholes on a case by case basis.

5.7.2 Plan & Profile Information

The following information shall be provided on both the plan and profile view for proposed manholes:

1. Manhole name, number or an equivalent unique designator

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2. Diameter in inches
 3. Rim elevation in feet
 4. Invert in elevations (including laterals)
 5. Invert out elevations
 6. Specified drop connections
 7. A description specifying whether a manhole is existing or proposed.
 8. Stationing
 9. Manhole Coating

5.7.3 Maximum Spacing between Manholes

Proposed manholes shall be located at the end of each gravity sewer main line; at all changes in line size, slope or alignment; and at all intersections. Manholes shall not be spaced greater than 300'.

5.7.4 Manhole Types

Manholes shall be specified as standard type, shallow, straddle, deep, or drop (inside only). No flat top manholes shall be specified. Refer to Appendix 11.2 for details on manhole types.

5.7.5 Placement of Manholes

Manholes shall be located in the most optimally located areas. The chosen locations should facilitate the best possible low-maintenance requirements for these structures. This may include outside the wheel path of traffic lanes, outside of pavement entirely, or other locations best determined by sound engineering judgment.

5.7.6 Drop Type

Inside drop pipes shall be provided for all main line sewers and service laterals entering a manhole at an elevation greater than 24 inches above the manhole invert. Wherever the difference in elevation between the incoming sewer and the manhole invert is 24 inches or less, the manhole invert shall be installed with a fillet to prevent solids deposition. Interior drop manholes shall have a minimum interior diameter of 60 inches.

5.7.7 Diameter

The minimum interior diameter of gravity sewer manholes shall be 48 inches for manholes less than 12 feet in depth, and 60 inches for manholes 12 feet and greater in depth.

5.7.8 Head Loss

All changes of direction, size or shape of sewers shall be made by gradual transitions so as to minimize head loss in manholes. The design professional shall take into consideration the head losses occurring at all manhole inlets and outlets.

5.7.9 Inverts

Manholes should be designed with a minimum 0.1 foot drop in elevation from the inverts of the inlets to the invert of the outlet.

5.7.10 Excessive Depths

Manholes shall be structurally designed by a Virginia professional engineer when depths exceed 25 feet.

5.7.11 Areas Subject to Flooding

Proposed manhole rim elevation shall be specified to be higher than surface waters. In areas subject to flooding, the plans shall specify watertight manhole covers or Stainless Steel manhole inserts. Where a series of watertight manhole covers are used on a main line sewer for a distance of 1,000 feet or more, SDR 26 PVC or approved equal vent pipes shall be specified.

5.7.12 Coatings

The interior of all new and modified manholes shall be specified to receive a type A epoxy coating at the minimum. DPW-E may require additional coating requirements to be specified on the utility plans based on the aggressiveness of the discharge. Reference Appendix 11.6 for County approved type A and B epoxy coating products.

5.7.13 Manholes Receiving Force Main Discharge

The interior of any new or existing manholes receiving a new force main discharge shall be coated with a type B epoxy coating. Additionally, DPW-E may require up to three (3) manholes downstream from the manhole receiving discharge shall be specified to be

coated with type B epoxy coating. Reference Appendix 11.6 for Type B Epoxy coatings approved by the County.

5.7.14 Manholes near Streams

The immediate upstream and downstream manhole of a main crossing a stream shall be specified as cross-country style manholes and coated with type B epoxy.

5.7.15 Service Connections

A maximum of four service connections may be installed into one manhole. When the service connection is to be installed into an existing manhole, a boot connector shall be specified. When more than one service connection is installed in a manhole, the connections shall be staggered vertically as shown in the Standard Details.

5.7.16 Connections into Existing Manholes

Existing manholes that are proposed with a new connection shall be specified with a boot connector and to be coated on the utility plans. An existing manhole receiving a gravity tap shall be specified with type A epoxy. An existing manhole receiving a pressure sewer tap shall be specified with a type B epoxy.

5.7.17 Manhole Steps

No manhole shall be specified with steps.

5.7.18 Stub-outs

Stub-outs may be required as part of plan approval by DPW-E in order to serve additional properties. Stub-outs at new manholes planned for future gravity sewer expansion shall not exceed eight (8) feet in length. A plug shall be specified at the end of the stub-out.

5.7.19 Easements

When required by DPW-E, a 20' wide easement shall be shown over any proposed sanitary sewer manholes that are to be dedicated to the County.

5.8 Lateral & Cleanout Design

The following sections pertain to the design of laterals and cleanouts.

5.8.1 Determination of Capacity

The pipe capacity for all laterals shall be designed to accommodate 400% of the A.D.F.. However, laterals that are designed to these standards do not need to be verified for capacity.

5.8.2 Plan & Profile Information

The following information shall be provided on both the plan and profile view for proposed laterals and cleanouts:

1. Laterals are to be shown and provided for each proposed lot
2. Invert elevation of connection
3. Pipe diameter
4. Pipe material
5. Length of laterals extending from manholes at the end of a line.

5.8.3 Diameters

Any six inch diameter sewer lateral that serves more than two lots shall terminate in a manhole or vacuum pot, unless approved otherwise by the County. Six inch diameter laterals are required for dual service connections. The minimum size for a single sewer lateral shall be four inches in diameter.

5.8.4 Width of Easements

When required, easements shall be 10' in width aligned on center of the lateral.

5.8.5 Location of Cleanouts

Cleanouts shall be shown for every existing and future lot. Proposed cleanouts shall be located so that the back of cleanout abuts the property line.

5.9 Force Main Design

The following sections are requirements that shall be shown for the design of force mains.

5.9.1 Determination for Capacity

Verification of capacity for force mains shall be shown by verifying that the head supplied by the corresponding pump exceeds the maximum design HGL at the connection point.

The methodology for verifying capacity shall be based on the following criteria:

- A manufacturer pump curve shall be provided in the capacity report. The pump curve shall show the pump head in feet as a function of flow rate in gallons per minute.
- A system curve shall be developed by the design professional indicating the TDH as a function of flow rate. TDH is determined by the following equations:

$$H_p = Z + H_l$$

$$H_l = H_f + H_m$$

Where:

- H_p is the TDH (total dynamic head) in feet, and varies as a function of head loss.
- Z is the static head (the difference in elevations between the points of analysis) in head
- H_l is the varying head loss, determined by summing the minor losses and the friction losses of the pipe.
- H_f is the friction loss as a function of discharge through the pipe. Friction loss may be determined via the Hazen-Williams equation or sound engineering judgment.
- H_m is the minor losses as a function of discharge, Q , through the pipe. Minor losses typically include the lost in energy about fittings, valves, bends, etc.
- The operating point is determined as the elevation in which the system curve and the pump curve cross.

The maximum design HGL in the system, shall be provided by DPW-E as a basis of design. If the connection point of a force main is an unpressurized system component, such as a manhole, then the minimum and maximum design HGL is the invert of the receiving structure.

5.9.2 Minimum Velocity

The minimum allowable velocity is 2 feet per second based on the dry-weather-minimum HGL.

5.9.3 Maximum Velocity

The maximum velocity is 8 feet per second based on the wet-weather-maximum design HGL. Where velocities within a force main will exceed 8 feet per second, restrained joints shall be specified on the plans. Additionally the pipe shall specify the appropriate ASTM or AWWA specifications providing protection against internal erosion and corrosion.

5.9.4 Plan & Profile Information

The following information shall be provided on both the plan and profile view for proposed force mains:

1. Length of Pipe Section between Appurtenances or Change in Slope (Feet)
2. Pipe Material
3. Pipe Diameter in inches
4. Slope
5. Valves
6. Air Release Valves
7. Horizontal Bends
8. Vertical Offsets
9. Other Appurtenances
10. Valve Table

5.9.5 Standard Slope of Force Mains

Force main slopes shall be specified at +/- 0.20% slopes, unless terrain requires steeper grades.

5.9.6 Manual Air Release Valves

Manual air release valves shall be specified at high points in the force main.

5.9.7 Connections into Gravity Sewer Systems

When a force main connects directly into a gravity sewer system, it shall enter the receiving manhole with an invert elevation that will ensure a smooth flow transition to the gravity sewer system. In no case shall the force main enter the gravity sewer system at a point more than one foot above the flow line of the receiving manhole.

5.9.8 Thrust Protection

The plans shall specify thrust protection on force mains larger than 4”.

5.9.9 Minimum and Maximum Depth of Cover

Force mains shall have a minimum depth of cover, as measured from the top of the pipe to the final grade, of 36 inches and shall not exceed 48 inches.

5.9.10 Minimum

The minimum size force main for residential grinder pumps shall be 1-½”. The minimum force main size for duplex units shall be 2”.

5.9.11 Pipe Material

1. Ductile iron (DI) or C900 PVC pipe with restrained joints are required for force mains larger than two inches in diameter.
2. Schedule 80 PVC meeting ASTM D 1785 standards may be used for force mains two inches or smaller in diameter.
3. When directional drilling, HDPE piping, with approved transitional fittings may be used for force mains less than 6” in diameter provided a design variance is submitted for review and approved by DPW-E.

5.9.12 Tracer Wire

When force mains are proposed as non-metallic, the plans shall specify the installation of tracer wire.

5.9.13 Minimum Distances between Taps

The distance between existing and/or proposed taps into force mains shall be 12’ or greater

5.9.14 Maximum Pressure in Force Main

The maximum pressure in any point in a force main shall not exceed 150 psi.

5.9.15 Valve Boxes

All proposed valve boxes shall be designed to support the load of an AASHTO class H-20 design vehicle.

5.9.16 Maximum Pipe Deflection

When proposed, pipe joint deflection shall be shown on the plans in the nearest percent in both the horizontal and vertical direction. The deflection of force mains, including joints, shall not exceed 50% of the manufacturer's allowable deflection. DPW-E may request the design professional provide the manufacturer's deflection as part of a utility plan review.

5.9.17 Horizontal Separation from Utilities

The force main shall be separated 10' away from other existing and proposed utilities. Force mains can be located closer to utilities provided a variance request is submitted and approved by DPW-E explaining why the minimum 10' separation cannot be provided.

5.9.18 Methods of Installation

The design professional shall indicate what methods of installation are specified for the installation of the force main including micro tunneling, HDD or jack-and-bore. All indicated methods shall conform to the construction specifications.

5.9.19 Easement Widths

Where easements are required for the proposed force main, the width of any force main shall be 20' in width, measured on center over the alignment of the main.

5.10 Private Grinder Pumps

The following sections pertain to the design of grinder pumps to be privately maintained.

5.10.1 Determination for Capacity

In addition to the capacity requirements for force mains, capacity for grinder pumps shall be verified by showing that the peak discharge of the pump operating at the maximum

HGL operating point is equal to or less than the P.D.F. coming into the tank. Additionally the cycle time of the grinder pump shall be provided as shown below:

$$T = V/Q$$

Where:

- T is the minimum cycle time in minutes
- V is the storage volume of the grinder pump in gallons
- Q is the design pump rate at the maximum HGL operating point.

DPW-E may require additional justification based on the values of the provided cycle times.

5.10.2 Required Information

The following information shall be included in the capacity report and profile when a new grinder pump is proposed:

1. Number of Pumps
2. Design TDH
3. Proposed owner name
4. Proposed owner address
5. Ground elevation
6. Lead/Lag On and Off elevations and volumes
7. High water alarm elevation and volumes
8. Overflow Elevation
9. Finished Grade Elevation
10. The grinder pump sump elevation
11. 100-year flood elevation
12. top of force main at air releases (where provided)
13. Bottom or top of force main where the force main passes over or under other underground utilities or obstructions, (in such cases, include required minimum vertical separation distance).

5.10.3 Alarm/control Panels

Appropriate alarm and control panels shall be located and specified on the plans. Controls and/or panels shall be located in easily accessible locations and within visible location of the grinder pump. Alarms and/or panels should be specified 3-5' above ground level.

5.10.4 Location within a floodplain

The grinder pump shall be located outside of the 100-year flood zone. When the grinder pump cannot be located outside due to site constraints the designer shall specify a flood rated grinder pump with a certification from the pump manufacturer. Any alarm/control panel shall be specified with an elevation that is higher than the 100-year flood zone elevation.

5.10.5 Connection into the Public Sewer

The plans shall specify a public valve vault if the connection is made directly into pressure sewer. The plans shall specify a public cleanout if the connection is made into gravity sewer. Any proposed cleanout or valve vault shall be located at the edge of property line or easement to delineate the point of maintenance and responsibility between the developer and the County.

5.11 Design of County Maintained Grinder Pumps

When pre-approved by the director of Public Works, any grinder pump proposed for County ownership shall meet the following in addition to the standard requirements for Grinder Pump Design in addition to requirements for private grinder pumps. For an existing system it shall be the responsibility of the owner to bring the existing facilities the County standards before acceptance.

1. County maintained grinder pumps shall be specified as Environment One (E-One).
2. The depth for each unit is to be determined for each proposed installation but in no case shall a unit with a depth to the gravity lateral influent invert greater than 72-inches be permitted.
3. Residential units shall use a simplex E-One Model DH071 and commercial/industrial units shall use a duplex E-One Model DH152, unless otherwise noted and approved by the County.
4. Should it be determined that additional sump storage is required and approved, then an appropriate E-One Model grinder pump shall be used.

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5. The plans shall specify spare cores in the grinder pump if multiple E-one Model grinder pumps are installed in a development. The number of spare cores will be determined on a case by case basis by the County
 6. A commercial/industrial property served by a grinder pump shall use a duplex grinder pump system approved by the County.
 7. Location of the proposed grinder pump system shall consider the following:
 - (a) It shall be located for ease of maintenance access.
 - (b) It should be located in front of the property adjacent to the main roadway. Location is derived from parameters of the building lateral connection placed at 1% grade and invert depth using the E-One grinder pump as a design basis in placement of the unit. Installation of alternative models
 - (c) may be permitted with prior approval of the County; however, the maximum depth of the lateral connection at the grinder pump shall not exceed 72-inches.
 - (d) The unit should not be more than 75 feet from the alarm panel. If installation of the cable will be under a paved surface, sidewalk or other permanent impervious surface the power and alarm cable shall be installed in a 1-inch minimum schedule 80 conduit. The location of the alarm panel shall be in a location approved by the County and kept accessible to DPW.

5.11.1 Power Requirements

The plans shall specify the power requirements as follows:

1. A dedicated 240-volt, 30 amp supply is required for the grinder pump to operate properly. The grinder pump alarm panel shall be fed with a 240 volt (v), 30 amp, 2-pole, 4-wire circuit from the supply panel of the property owner.
2. Simplex and duplex units require that the supply panel over-current protection shall be a dedicated 30 ampere, 2-pole, plus one insulated neutral and one ground. Use minimum 10/3 wire with ground for all installations.
3. To account for the provision of 208v, three-phase power service to most commercial facilities, a step-up or “buck and boost” transformer shall be used. This requirement shall be noted on the construction plan and the record drawing.
4. In no situation may the conduit from the control box to the pump exceed 100’.
5. The power cable for the grinder pump shall not be spliced.

5.12 Vacuum Sewer Design

The use of vacuum sewerage collection systems is limited to installations by the County to serve existing platted residential areas. The design of vacuum collection systems shall be in accordance with the Department of Environmental Quality (DEQ).

5.12.1 Criteria for Design

The vacuum sewer system shall be designed in accordance with the most recent edition of the AIRVAC Vacuum Sewerage System Design Manual. Additionally the design consultant may be required to provide proof of the successful design of vacuum systems prior to submittal of the utility plans.

5.12.2 Criteria for Vacuum Sewer Extension

Vacuum sewer collection systems may be proposed to extend to undeveloped areas when the County has installed a vacuum sewer system to serve the area or adjacent areas and one of the following provisions are applicable:

1. The undeveloped parcel or parcels have not been, and are not proposed for subdivision.
2. The developer has submitted a request to the County to consider an extension of the vacuum sewer collection system and the County has determined that the existing vacuum system has adequate capacity to serve
3. The undeveloped area, and service by vacuum sewer is in the best interests of existing sewer customers and would, from an engineering standpoint, benefit the development of the sewer facilities of the County.
4. The determination by DPW-E shall also take into consideration the overall impact of the development on the environment and whether allowing the extension of the vacuum sewer will have a detrimental effect which would not otherwise occur.

5.12.3 Plan & Profile Information

The following information shall be provided on both the plan and profile view for proposed vacuum sewer mains and vaults:

1. Vacuum Mains:
 - (a) Length of Pipe Section between Lifts in feet.
 - (b) Lifts and length of lift in feet.

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- (c) Pipe Material
 - (d) Pipe Diameter in inches.
 - (e) Slope in %
2. Valves
 3. Valve Table
 4. Horizontal Bends
 5. Vertical Offsets
 6. Stationing for all bends
 7. Valves
 8. Tracer wire boxes
 9. Vacuum Vaults
 - (a) Vault Number
 - (b) Vault Size (Standard, Deep or Extra Deep)
 - (c) Rim Elevation - Invert Elevations (Influent Laterals and Effluent 3" Vacuum Line)
 - (d) Lateral Diameter Sizes (inches)
 - (e) Vault Table
 - (f) Stationing

5.12.4 Easements

Easement widths shall be specified as follows:

1. For vacuum mains, a minimum 20' wide easement shall be specified when required.
2. For vacuum laterals, a minimum 10' wide easement shall be specified when required.
3. For vacuum pots, a 15' by 15' easement centered over the pot shall be specified. Vacuum pot easements may be required to be up to 20' by 20' in area if the pot is placed directly between two lots.

5.12.5 Rim Elevation of Pots over the Flood Zone

Vacuum pots shall not be located in ditches, low spots, or areas where regular maintenance will be impeded by stormwater runoff.

Section 6. Specifications for Aggregate and Earthwork

6.1 General

6.1.1 Use of New Materials and Standards

1. The Contractor shall provide all material submittals and/or samples to be used in the work.
2. These submissions shall undergo approval by the County before any construction commences and materials are ordered.
3. DPW-E may require the Contractor to furnish a Certificate of Compliance from the manufacturer of materials and equipment used in the work. This certificate should affirm that the material or equipment conforms to the specified requirements outlined in these standards.
4. Ultimately, the County retains the final authority regarding material approval on a case-by-case basis.

6.2 Material & Component Specifications

6.2.1 Bedding Gravel

1. Shall consist of washed or crushed material.
2. shall conform to VDOT specifications for #57 coarse aggregate and ASTM C 33.

6.2.2 Sand (CBR-20 or greater)

1. When specified for backfill, shall be natural sand.
2. The sand grains shall be hard, sound material, free from injurious amounts of clay or other coatings, and deleterious material.

6.2.3 Select Stone Backfill

1. Shall conform to VDOT specifications for either #25 or #26 crusher run aggregate, #21A or #21B dense graded aggregate.

6.2.4 Trench Excavation Material

1. If trench excavation material is deemed suitable by the County, it can be used for backfill. The County approves the suitability of all backfill.
2. Suitability is based on approval from a report prepared by a professional geotechnical engineer, professional geologist, registered soil scientist, or by the County Inspector.
3. Generally, trench material shall be free of all organics.
4. If trench excavation material is unsuitable, the Contractor shall provide select backfill (e.g., clean earth, sand, gravel, or other approved material).

6.2.5 Flowable Fill (CLSM)

1. CLSM shall have a design compressive strength of 30 to 200 psi at 28 days unless otherwise specified in the utility plans.

6.3 Submittal Requirements

6.3.1 Aggregate Material Submittals

1. The contractor shall submit the source of all material that shall be used for aggregate or backfill for review and approval by the County.
2. The submittal shall indicate the required material and component specifications.
3. The County reserves the right to not accept any material that has not been reviewed and/or approved prior to installation.

6.3.2 Select Fill Submittals

1. The contractor shall submit the source of all material being used and imported to the site for review and approval.
2. The submittal shall indicate the required material and component specifications.

6.4 Construction & Installation Specifications

6.4.1 Dewatering

1. Excavations shall remain free from standing water during pipe installation and, as necessary, during backfilling.

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2. The water table should be lowered below the trench bottom using well points and/or pumps with sufficient capacity to dewater the excavations.
 3. Disposal of water shall not compromise public health or cause injury or damage to public or private property, the work of other Contractors, or any completed or ongoing work. It should also not impede the use of highways or streets by the public.
 4. Dewatering flows shall be performed in accordance with the applicable erosion and sediment control and stormwater management regulations.
 5. Effluent from dewatering operations should be filtered or passed through an approved sediment trapping device, ensuring it does not adversely affect flowing streams or offsite property.
 6. Upon completion of dewatering, sediment removal from storm sewers and drainage ditches are mandatory.
 7. Gutters, storm sewers, drains, and ditches shall remain open at all times.
 8. Damming or ponding of water in gutters or other waterways is prohibited.
 9. Projects that last longer than 24 months with normal dewatering require to be permitted under a Virginia Department of Environmental Quality groundwater withdrawal permit.

6.4.2 Restoration

1. The Contractor shall restore all drainage features as specified in the plan.
2. If drainage feature restoration is not specified in the plans, then the contractor shall restore the drainage features back to original condition.

6.4.3 Excavation and Backfill

1. All work shall adhere to the dimensions and depths specified in the approved plans.
2. Suitable material intended for backfill shall be stockpiled in a location as indicated on the E&SC plan or as approved by the York County inspector.
3. Unsuitable materials for backfill shall be legally disposed offsite.

6.4.4 Protection of Existing Utilities and Structures

1. During construction, existing utilities, structures, and fencing shall be protected.

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2. If any damage occurs or removal is necessary during operations, they should be repaired or replaced in as good or better condition.

6.4.5 Deeper Excavations and Proper Elevation

1. If an excavation is deeper than necessary, a layer of consolidated gravel (No. 57 course aggregate or equivalent) shall be placed in sufficient quantity. This ensures that the pipe can be positioned at the proper elevation.

6.4.6 Excavated Material Handling

1. Excavated material should be stockpiled without obstructing public travel.
2. Bridging shall be provided as needed to allow access to public or private property.

6.4.7 Sidewalks, Crossings, and Driveways

1. Sidewalks, crossings, and driveways shall remain open for pedestrians and vehicles during work progress.
2. Permission and authorization are required for partial or complete street, driveway, or crossing closures.
3. All work affecting traffic flow or public rights-of-way shall comply with VDOT standards and requirements.
4. Safety and Public Property Protection
5. The Contractor shall ensure the safety of the excavation and protecting the public and surrounding property.

6.4.8 Trenching for Pipe Installation

1. Pipe installation operations should remain close to the excavation.
2. As a general rule, no more than 200 feet of trench should be opened at any given time.
3. The inspector reserves the right to halt excavation if, in their opinion, the trench is opened too far ahead of pipe installation.

6.4.9 Excavation Depth for Gravity Sewer Lines

1. Unless otherwise indicated on the plans, pipe trenches shall be excavated to a depth that ensures a minimum of 36 inches of cover for gravity sewer lines.
2. When authorized in advance by the County, lines with less than 36 inches of cover may use ductile iron or C900 PVC.

6.4.10 Trench Width and Working Space

1. Trenches should be limited to a width that provides a free working space on each side of the pipe. This allows for proper placement, joining of the pipe, and compaction of bedding and backfill materials.

6.4.11 Consideration for Pipe Bells

1. The excavation depth should account for the pipe bells to allow access for construction and inspection.
2. In no situation shall the bell support the weight of the pipe, bedding shall be formed around the bell as to equally distribute the load from the ground to the pipe.

6.4.12 Sheet piling, Shoring and Trench Boxes

1. All excavations and work requiring sheet piling, shoring, or trench boxes shall adhere to Federal, State, and Local laws, rules, regulations, and requirements.
2. The contractor shall be solely responsible for preventing unnecessary excavation hazards. The County reserves the right to halt construction if it deems that unsafe work is occurring.
3. The Contractor bears sole responsibility for the safety and condition of the work and affected property.
4. The Contractor should not proceed until necessary trench boxes, sheet piling, shoring, and bracing are properly installed.
5. Shoring should not be removed until a minimum of three feet of backfill has been placed over the crown of the pipe and compacted to the required density.
6. The Contractor is responsible for protecting personnel, pipes, tracks, walls, buildings, and other structures in the vicinity of the work (above or below ground) at their own expense.

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7. All sheeting, shoring, and bracing shall be removed by the Contractor during backfilling operations unless otherwise approved by the County.
 8. Compaction of backfill should not occur within the sheeting, shoring, trench boxes, or bracing unless the bracing is intended to remain in place.

6.4.13 Proper Bedding and Joint Preparation

1. All pipes shall have proper bedding and each joint shall be correctly made before backfilling.
2. Trenches should be immediately backfilled with approved material after laying the pipes, unless alternative pipe line protection is approved by the County.

6.4.14 Backfilling Techniques:

1. Backfill material should be carefully tamped around and over the pipes in maximum six-inch layers up to at least one foot above the top of the pipe.
2. The maximum stone size in the first 12 inches of backfill should not exceed one inch in diameter.
3. Simultaneous backfilling on both sides of the pipe is required.
4. The remaining backfill should be deposited and compacted by mechanical equipment in thoroughly tamped layers, not exceeding one-foot lifts.
5. The maximum stone size permitted in this portion of backfill should not exceed two inches in diameter.

6.4.15 Paving Considerations

1. In areas where paving will cover the backfilled trench, the entire depth of backfill should be deposited in maximum six-inch layers and compacted by hand or mechanical tampers.

6.4.16 Compaction Requirements

1. Backfill compaction shall follow AASHTO Method T-99, modified.
2. Each layer of material should be compacted to a minimum of 95 percent of the maximum density at optimum moisture content as described by the specified method.

6.4.17 Mechanical Tamper Usage

1. When using mechanical tampers, the Contractor shall ensure that pipe joints are not broken, damaged, or disturbed, and pipes are not deflected or deformed.

6.4.18 Dewatered Trench and Proper Compaction

1. Flooding with water for compaction is not permitted.
2. The trench shall be maintained in a dewatered state during backfill placement and compaction. However, sufficient water should be added to the fill material as needed to allow proper compaction.

6.4.19 Unstable Subgrade

1. In the event that unsuitable material is encountered at or below the level of the pipe bed, such material shall be removed and replaced, or removed, stabilized and replaced. Material used for replacement shall be No. 57 course aggregate or other material specifically designated in writing by the Contractor's Engineer and approved by the County.

6.5 Testing Requirements

6.5.1 Backfill Compaction Testing Locations

1. Compaction tests shall be performed in an area approved by the County Inspector.

6.5.2 Testing Procedures

1. Determine compaction results using the testing procedure outlined in ASTM D1556.

6.5.3 In-Place Trench Material Testing

1. Compaction tests of in-place trench material are essential to ensure the required density.
2. These tests shall utilize a County-approved Soils Laboratory.
3. One test should be conducted per segment of pipe from manhole to manhole or every 200 linear feet of pipeline whichever is least. A test shall be performed every 24 inches of lift starting from one foot above the pipe.

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4. The Contractor shall provide copies of all test results in a report format to the County Inspector to demonstrate compliance with compaction requirements. Refer to VI. Reporting I. for information required on the testing report.

6.5.4 Reporting

A report shall be provided indicating the name of the professional preparing the compaction reports that indicate the following at a minimum:

1. Reporter name
2. Date of testing
3. Locations of testing
4. Description of the soils encountered
5. Proctor method
6. Maximum density and 95
7. Optimum moisture content
8. Lift elevations
9. Reporting narrative

6.6 Repair Warranty

6.6.1 Backfill and Compaction

1. The Contractor is responsible for repairing any settlement occurring within the one-year warranty period (Note: Warranty period shall start at date of formal acceptance).
2. This shall include repairs to roadway, sidewalk, driveways or other damages resulting from settlement or its repair.
3. Necessary repairs and replacements shall be completed within 30 days after notice from the County.

Section 7. Specifications for Gravity Mains

7.1 General

7.1.1 Use of New Materials and Standards

1. The Contractor shall provide all material submittals and/or samples to be used in the work.
2. These submissions shall undergo approval by the County before any construction commences and materials are ordered.
3. DPW-E may require the Contractor to furnish a Certificate of Compliance from the manufacturer of materials and equipment used in the work. This certificate should affirm that the material or equipment conforms to the specified requirements outlined in these standards.
4. Ultimately, the County retains the final authority regarding material approval on a case-by-case basis.

7.2 Material and Component Specifications

7.2.1 PVC Solid Wall Pipe and Fittings

1. Pipe and fittings must be permanently marked with the manufacturer's trademark, size, and ASTM conformance designation.
2. Pipe and fittings for C900 must conform to ASTM F477, ASTM D1784, and ASTM D3139.
3. For pipe and fitting sizes from four to six inches, use SDR 26 and conform to ASTM D 3034.
4. For pipe and fitting sizes from eight through 15 inches, use SDR 26 and conform to ASTM D 3034.
5. For pipe and fittings sizes 18 inches through 27 inches shall conform to ASTM F 679.
6. All fittings for laterals must be glued.
7. Joints should meet the requirements of the ASTM specification referenced above for the given pipe size.

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8. Gasket materials must be tested and rated as suitable for continuous contact with domestic sewage.

7.2.2 Joint Restraint for PVC Pipe and Fittings

1. Retainer glands should be one of the following:
 - (a) EBAA Iron Series 2000PV; or
 - (b) Uni-Flange Series 1300 or 1500
2. Retainer glands for PVC pipe greater than 12 inches in diameter shall be approved reviewed and approved by the County.
3. Glands must be manufactured from ductile iron conforming to ASTM A 536.
4. The restraining glands must have a pressure rating equal to or greater than the pipe on which they are used.
5. The gland design should allow replacement of the standardized mechanical joint gland and compatibility with the standardized mechanical joint bell, conforming to ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53.

7.2.3 Ductile Iron Pipe (DIP)

1. Ductile iron pipe shall conform to ANSI/AWWA C151/A21.51.
2. Flanged ductile iron pipe shall comply with the requirements of ANSI/AWWA C115/A21.15.
3. The pipe and fittings shall be a minimum pressure class of 350.

7.2.4 Cement-Mortar Lining for Ductile Iron Pipes

1. The pipe and fittings shall have a cement-mortar lining in accordance with ANSI/AWWA C104/A21.4.

7.2.5 Restrained Ductile Iron Pipe and Fittings

1. Joint restraint shall be provided where required by the designer and/or the County.
2. For pipelines inside casing pipes (including the first joint outside either end of the casing pipe unless that pipe section terminates in a manhole), all fittings shall have restrained joints.

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3. The restrained joint systems for piping and fittings shall be one of the following approved systems:
 - (a) Snap-Loc/Bolt-Loc (Griffin)
 - (b) Super Lock (CLOW)
 - (c) TR Flex (U.S. Pipe)
 - (d) Or similar systems as approved by the County.
 4. Retainer glands shall be EBAA Iron Series 1100 ductile iron glands with thrust restraint wedges, as manufactured by EBAA Iron, Inc. Alternatively, the following approved equals can be used:
 - (a) "M. J. Gripper" by U. S. Pipe and Foundry
 - (b) Uni-Flange Series 1300, 1390, or 1400
 5. Retainer glands shall be installed in accordance with the manufacturer's recommendations and shall conform to the requirements of ANSI/AWWA C111/A21.11.

7.3 Submittal Requirements

7.3.1 General

1. The contractor shall submit the source of all main and incidental material that shall be used for gravity main installation for review and approval by the County.
2. The submittal shall indicate the required material and component specifications. The County reserves the right to not accept any material that has not been reviewed and/or approved prior to installation.

7.3.2 Calibrated Laser Certification

1. A copy of the laser calibration certification used for laying the gravity main shall be provided when requested for each separate job before pipe installation begins.

7.4 Construction & Installation Specifications

7.4.1 Inspection and Preparation of Gravity Mains

1. Each joint of pipe must be inspected for defects before being lowered into the trench.

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2. The pipe shall be swabbed or brushed out to prevent dirt or foreign materials from entering the joint or finished line.
 3. Trench water must be kept out of the pipe, and the pipe should remain closed by a plug when work is not in progress.

7.4.2 Procedures for Laying Gravity Main

1. Bell and spigot pipe laying should proceed upgrade, with spigot ends pointing in the direction of flow.
2. Pipe installation should immediately follow excavation, and efforts should be made to keep pipe laying close behind trenching.
3. Holes should be scooped out for the bells, and the entire barrel of the pipe should rest on the pipe bed.

7.4.3 Grade and Alignment

1. The pipe must be accurately laid to line and grade.
2. Pipe shall lie on a straight sight line between manholes without dips or bends.
3. No joints in the pipe are allowed within 8 feet of a manhole unless pre-approved by DPW-E.
4. Any section of pipe found to be laid at the wrong grade or settled must be re-laid at the Contractor's expense.
5. Surveying benchmarks shall be provided every 300 feet at a minimum throughout the project.

7.4.4 Calibrated Laser

1. A calibrated laser must be used to maintain line and grade.
2. A ventilating fan should be used in conjunction with the laser beam to prevent refraction due to fumes or air conditions.

7.4.5 Safe Handling

1. Pipes should be carefully handled during lowering into the trench.
2. Proper and suitable equipment and tools should be used for the safe and convenient handling of pipes during installation.

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3. Special care shall be taken to ensure that each length abuts against the next.
 4. A pipe joint shall not be brought into position until the preceding length has been secured in place with sufficient backfill material to prevent movement of the pipeline.

7.4.6 Cleanout Assemblies

1. Unless otherwise approved by the County, all joints from the first 45-degree elbow (where the lateral begins to turn to the vertical) to the termination of the vertical section shall be solvent weld glue joints.
2. The vertical riser shall be terminated with a glue cap.
3. For existing homes:
 - (a) The pipe cap shall be within four inches of the top of the cleanout casting.
 - (b) The casting shall be set to finished grade.
4. In areas under development or where the cleanout assembly may be damaged by continuing construction:
 - (a) The vertical section shall be terminated three feet above grade with the glue cap.
 - (b) The cleanout casting shall be placed a few inches above the cap and the entire assembly buried for protection.
 - (c) A marker post (metal fence post or treated four-by-four post) shall be set to identify the cleanout. Marker post shall be marked as Sewer by use of green marking paint.

7.5 Testing Requirements

7.5.1 Prerequisites

1. Prior to scheduling tests for the new sanitary sewer, the following conditions must be addressed:
2. A minimum of 30 days must have elapsed since the installation of the sanitary sewer lines.
3. Preliminary certified "as-builts" must be submitted to and approved by DPW-E. Any errors by the Engineer or Contractor must be corrected prior to testing.

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4. All essential underground utilities (water, electric, telephone, gas, and cable) must be installed, or a plan shall be submitted for review and approval to mitigate conflicts from future utility installations.
 5. Proposed Roadways shall have at a minimum compacted base and sub-base installed prior to testing of sanitary sewer.

7.5.2 Testing Sequence

New gravity sanitary sewer systems shall undergo the following tests in the specified order:

1. Low Pressure Air Test
2. Deflection Test (where directed by County Inspector)
3. Closed Circuit Television Camera (TV) Inspection
4. The gravity section must pass each test before proceeding to the next one.
5. County Inspector reserves the right to require additional deflection testing after CCTV inspection.

7.5.3 Notification and Attendance

1. The County inspector must be notified 2 full business days prior to all tests.
2. Representatives of the developer or developer's engineer may be present during testing.

7.5.4 Safety Considerations

1. All testing activities must comply with the Occupational Safety and Health Agency (OSHA) guidelines.

7.5.5 Low Pressure Air Test - Overview

1. For plastic pipes, a low pressure air test conforming to ASTM Specification F1417 or an equivalent standard as approved by the County, will be performed.
2. The Contractor shall supply the required air-testing rig and pressure gauge, calibrated to the tenth of a pound, for this test.

7.5.6 Lower Pressure Air Test - Equipment Requirements

1. Plugs must resist internal testing pressures without external bracing or blocking.
2. If pneumatic plugs are used, a separate hose is required to inflate them from the above-ground control panel.
3. The above-ground control equipment should include:
 - (a) Shut-off valve
 - (b) Pressure regulating valve
 - (c) Pressure relief valve
 - (d) Input pressure gauge
 - (e) Continuous monitoring pressure gauge (with a range from zero to at least ten psig, accurate to plus or minus 0.04 psi)

7.5.7 Low Pressure Air Test - Line Cleaning

1. All service laterals, cleanouts, stubs, and fittings within the sewer test section must be properly capped or plugged during construction to prevent air loss.

7.5.8 Low Pressure Air Test – Procedure

(Refer to ASTM F 1417 for complete procedure)

1. Place plugs in the line at each manhole and secure them. - Inflate the plugs after connecting the air hoses.
2. Pressurize the sewer line to the test pressure.
3. Slowly supply air to the sewer section until the internal pressure reaches 4.0 psig greater than the average back pressure of groundwater above the pipe (but not exceeding 9.0 psig). - Calculate the groundwater adjustment based on the average vertical height of groundwater above the invert of the sewer pipe.
4. Allow at least two minutes for air temperature to stabilize.
5. Shut off and disconnect the air hose from the control panel.
6. Observe the continuous monitoring pressure gauge while the pressure decreases by no more than 0.5 psig.
7. Record the elapsed time when the pressure drops 1.0 psig.

7.5.9 Low Pressure Air Test - Acceptance Criteria

1. If the time elapses before the air pressure drops 1.0 psig (as calculated from ASTM F 1417), the section passes and is presumed defect-free.
2. If the section fails, the Contractor must identify the source of leakage and repair or replace defective materials to the County Inspector's satisfaction.

7.5.10 Low Pressure Air Test - Reports

1. Upon successful completion and approval of pressure testing, the contractor shall provide the County a testing report indicating the following:
 2. Project name
 3. Name of test
 4. Date
 5. Sections of gravity main that was tested with legible stationing and labeling.
 6. The dates of each test performed along with each location.
 7. Results of the tests with recorded pressures versus time.
 8. Name of the County inspector

7.5.11 Deflection Test – Equipment

1. A rigid mandrel will be used for testing.
2. The mandrel, one for each pipe size, shall be a nine-arm mandrel with a proving ring sized at 95 percent of the base inside diameter of the pipe.

7.5.12 Deflection Test - Procedure

1. The mandrel will be pulled through the sewer line in the presence of a County Inspector.
2. The sewer line must be free of debris during the test.
3. The deflection test shall not be performed until at least 30 days after installation of the line to be tested.
4. Any sections that do not pass (exceeding the five percent deflection limit) shall be corrected or replaced by the Contractor.

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5. Ductile iron pipe is exempt from the deflection test.

7.5.13 Deflection Test - Reference Standards

1. Base inside diameter definitions are as per ASTM D 3034 and ASTM F 679.
2. Refer to the Appendix 11.7 for acceptable mandrel sizes.

7.5.14 Deflection Test - Reports

Upon successful completion and approval of deflection testing, the contractor shall provide the County a testing report indicating the following:

1. Project name
2. Name of test
3. Sections of gravity main that was tested with legible stationing and labeling
4. The dates of each test performed along with each location.
5. Results of the tests
6. Name of the County inspector
7. Name and signature of testing agent and contractor

7.5.15 Closed Circuit Television Camera (CCTV) - General

1. Upon successful completion of other test procedures (such as deflection testing), a CCTV inspection shall be performed by a qualified contractor with current NASSCO certification.
2. The County Inspector may request to be present during the inspection.

7.5.16 CCTV - Standards

1. The CCTV shall be prepared in accordance with the latest edition of the National Association of Sewer Service Companies (NASSCO) Pipe Assessment and Certification Program (PACP) and Lateral Assessment and Certification Program (LACP).
2. The video footage shall be recorded in such a manner that the County may make an assessment in accordance with NASSCO PACP and LACP.

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3. In no situation may appurtenances such as nozzles, jets, or other tools be recorded in the video. Any submitted CCTV with such recorded appurtenances shall be immediately denied by the County for review.

7.5.17 CCTV - Process

1. Prior to the commencement of the CCTV inspection, the contractor shall flood the sewer system with water. The amount of water and maximum time between the flooding and the CCTV inspection shall be specified by the County inspector.
2. The contractor shall use CCTV equipment to visually inspect the entire length of the sewer lines.
3. The TV inspection shall be conducted in a manner that provides an unobstructed view of the entire pipe.
4. The pipe shall be free of debris and obstructions that significantly impede visibility.
5. All reasonable efforts shall be made to fully inspect the entire pipe segment including removal of obstructions, location and exposure of access point and use of more versatile equipment.
6. The inspection shall capture video footage or other electronic records.
7. The Contractor shall provide an electronic copy of the inspection to the County for review.

7.5.18 CCTV - Pipeline Assessment Report

1. While not normally required, it is highly encouraged that the contractor submit a pipeline assessment report in accordance with the NASSCO PACP.
2. However, the County may require a PACP report be provided on a case-by-case basis.
3. The County may require a copy of contractor's NASSCO certification for verification.

7.5.19 CCTV - Repeat Inspections

1. The Contractor shall repeat the TV inspections as necessary as required by the County.
2. Any identified issues or deficiencies shall be addressed promptly by the Contractor.

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3. Any sewers repaired, replaced, relayed, or otherwise uncovered shall be retested 30 days after covering.
 4. The County may require main lines, laterals or other sewer connected to manholes be retested after repairs or adjustments to manholes on a case by case basis.

Section 8. Specifications for Manholes

8.1 General

8.1.1 Use of New Materials and Standards

1. The Contractor shall provide all material submittals and/or samples to be used in the work.
2. These submissions shall undergo approval by the County before any construction commences and materials are ordered.
3. DPW-E may require the Contractor to furnish a Certificate of Compliance from the manufacturer of materials and equipment used in the work. This certificate should affirm that the material or equipment conforms to the specified requirements outlined in these standards.
4. Ultimately, the County retains the final authority regarding material approval on a case-by-case basis.

8.1.2 Precasting

1. Manholes shall be pre-cast concrete unless otherwise approved by the Owner.
2. Pre-cast concrete manholes shall be manufactured in accordance with ASTM C 478 and the Standard Details for Manholes
3. Cast-in-place base sections are only permitted for straddle manholes.

8.1.3 Joints & Grout

1. Joints shall be sealed with "O"-ring rubber gaskets, "Profile" gaskets or butyl resin sealant in accordance with ASTM C 443, ASTM C 361, or ASTM C 381.
2. Grout shall be in accordance with VDOT Section 218.

8.1.4 Frames and Covers

1. Manhole frames and covers shall conform to ASTM A 48, Class No. 30 and shall be of high quality gray cast iron that is even-grained and free from unsightly defects.
2. Frames and covers shall be designed for AASHTO Highway Loading Class H-20.

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3. Frames and covers shall conform to the design and pattern shown on the Standard Details located in Appendix 11.1.
 4. Frames and covers shall be machined to insure a uniform bearing in all positions.

8.1.5 Tops

1. Flat top sections are not permitted.
2. Top sections shall be precast eccentric cones designed to receive the cast iron frame and cover.

8.1.6 Chimneys

1. The exterior of the manhole frame and adjustment rings shall be set by embedding in butyl joint material and covered with "Wrapid Seal" or approved equal.
2. If an existing manhole frame and cover need to be adjusted to match proposed grade, new "Wrapid Seal" and butyl joint sealant shall be reapplied to create a watertight connection.

8.1.7 Base Sections

1. Base sections shall be the extended base type.

8.1.8 Steps

1. Manhole steps are not permitted.

8.1.9 Epoxy Coatings

1. All manholes shall be coated according to the table in the Appendix 11.6.
2. Manhole coatings shall be in accordance with the plan.
3. The County reserves the right, within reason, to specify any manhole to be coated in type B epoxy prior to acceptance.
4. All manholes shall receive type A epoxy coating at a minimum.
5. The applicator of the epoxy coating shall be approved by the epoxy coating manufacturer

8.1.10 Watertight Frame and Covers

1. In undeveloped (cross country) areas the rim elevation shall be set 18 inches above the existing ground elevation regardless whether it was included on the utility plan or not.
2. In areas subject to flooding, watertight manhole covers or Stainless Steel manhole inserts are required.
3. Where a series of watertight manhole covers are used on a main line sewer for a distance of 1,000 feet or more, SDR 26 PVC or approved equal vent pipes are required. Alternative materials may be required by the county on a case by case basis.

8.1.11 Pipe Connections

1. Pipe connections shall be made via a flexible rubber boot type connection.
2. Flexible rubber boot pipe-to-manhole connections shall be of the locked-in factory assembled rubber ring type utilizing a stainless steel band as manufactured by Kor-N-Seal, EPCO Seal System or an approved equal.

8.1.12 Manhole Inverts

1. Manhole Inverts shall be built up of brickwork and grout.
2. Invert channels and manhole bottoms shall be shaped and smoothed with 2:1 sand-cement grout or other appropriate consistency.
3. Precast inverts are not permitted.

8.1.13 Stone Bedding

1. Bedding for manholes are required.
2. Refer to Section 6 for material specifications on bedding stone.

8.1.14 Miscellaneous

1. Lifting holes are not permitted.
2. Dust covers, locking covers, and watertight frames and covers shall be coated with a bituminous material and placed in accordance with approved plans.

8.2 Submittal Requirements

8.2.1 General

1. The contractor shall submit the source of all material that shall be used for manholes for review and approval by the County.

8.2.2 Submittal Schedule

1. The following, at a minimum, shall be included for County review and approval prior to installation:
 2. Manhole Frames and Covers
 3. Precast Concrete Manholes
 4. Rubber Boots
 5. Type A and Type B Epoxy Coating

8.2.3 Epoxy Coating Applicator's Certification

1. Epoxy Coating Applicator's certification shall be provided to the County prior for review and approval to commencement of the work.

8.3 Construction & Installation Specifications

8.3.1 General

1. Manholes shall be constructed promptly as the sections of the sewer between them are completed.

8.3.2 Manhole Frame Rim

1. The manhole frame rim shall be free of all dirt and debris prior to the installation of the manhole insert.
2. The insert shall be fully seated around the manhole frame rim to insure against water seepage between the insert and the manhole frame rim.
3. Gasket lubricant, such as used in water and sewer main installation, shall be applied generously on the gasket prior to installing the insert.

8.3.3 Combined Total Height

1. The combined height of the manhole, which includes the base, barrel, cone, and casting, shall be constructed to provide the fewest number of joints.

8.3.4 Grouting of Joints

1. Apply a non-shrink grout both inside and outside of all manhole joints.

8.3.5 Coring for Boot Connectors

1. Coring for boot connectors shall not be within six inches of a manhole barrel section joint or any other cores.
2. When more than one service connection is installed in a manhole, the connections shall be staggered vertically, refer to the corresponding detail for more information.

8.3.6 Adjustment of Manhole Rim Elevations

1. A maximum of up to 12 inches of adjustment rings may be used for the adjustment of the manhole rim elevations.
2. If adjustments of 12 inches or greater are needed, a one-foot barrel riser section must be used.
3. Concrete adjustment rings shall be used.
4. Other materials may be considered by submitting a variance request to DPW-E for review and approval.
5. The use of brick and mortar for making height adjustments is not permitted.

8.3.7 Manhole Inverts

1. Manhole inverts shall be constructed so that a minimum 0.1' drop is provided between any inlet invert and outlet invert.
2. Wherever the difference in elevation between the incoming sewer and the manhole invert is 24 inches or less, the manhole invert shall be installed with a fillet to prevent solids deposition.

8.3.8 Stubouts

1. Pipe stubs shall extend beyond the manhole as indicated in the Approved Plan and shall be sealed with a watertight plug or cap.

8.3.9 Chimneys

1. The exterior of the manhole frame and adjustment rings shall be set by embedding in butyl joint material and covered with “Wrapid Seal” or approved equal.
2. If an existing manhole frame and cover need to be adjusted to match proposed grade, new “Wrapid Seal” and butyl joint sealant shall be reapplied to create a watertight connection.

8.3.10 Manhole Coatings – Surface Preparation

1. Surface preparation is the process by which sound, clean, and suitably roughened surfaces are produced on concrete substrates.
2. This process includes the removal of unsound concrete and bond-inhibiting films, strength verification, opening the pore structure, verification of moisture content, and establishing profiles suitable for the application of the specified protective system.
3. Installation of the epoxy coating shall not commence until the concrete substrate has properly cured and prepared in accordance with coatings manufacturer’s recommendations.
4. All contaminants including: oils, grease, unsound or incompatible existing coatings, waxes, form release agents, curing compounds, efflorescence, sealers, salts, concrete dust, or other contaminants shall be removed.
5. All concrete that is not sound or has been damaged shall be removed to a sound concrete surface or replaced.

8.3.11 Manhole Coatings – Temperature

1. Temperature of the surface to be coated should be maintained between 40° F and 120° F during application.
2. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the structure being coated.
3. Where varying surface temperatures do exist, care should be taken to apply the coating when the surface temperature is falling versus rising.

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4. Ambient conditions shall be controlled and maintained during curing as required by the Manufacturer.

8.3.12 Manhole Coatings – Applicator Inspection

1. Applicator shall inspect all specified surfaces prior to surface preparation.
2. The applicator shall notify the Contractor and the County Inspector within 24 hours of all manholes/structures:
 - (a) Whose concrete is not sound or has been damaged; or
 - (b) are not otherwise suitable for surface preparation.
3. Should any surface be found to be inadequate for acceptance of coating, or should the structure fail to meet the structural requirements of the referenced specifications, such structures shall be either repaired to the complete satisfaction of the County or removed from the project site and replaced with a new structure, all at no expense to the County. Replacement structures shall be subject to the same requirements for structural integrity and surface preparation.

8.3.13 Manhole Coatings - Application Requirements

1. Application procedures shall conform to the recommendations of the coating Manufacturer, including material handling, mixing, environmental controls during application, safety, and application equipment.
2. Unless specified elsewhere herein, the Applicator shall comply with the Manufacturer's most recent written instructions.
3. The County reserves the right to review the manufacturer's instructions and require proof of the contractor that the coating was applied correctly.
4. The Applicator must follow the minimum and maximum recoat limitation times and related temperature range restrictions between successive lifts, per Manufacturer's stated requirements.
5. The applied coating system shall be protected from damage during curing and shall be cured as recommended by the Manufacturer.
6. The Applicator shall be responsible for coating all openings, including the top of manhole cone and pipe penetrations; and, joints (following field application of grouting).
7. Any deficiencies in the finished coating shall be repaired by the Applicator according to the procedures provided by the coating Manufacturer.

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8. For the Type of Coating specified, surfaces shall be coated to a minimum dry film thickness as recommended by the manufacturer and approved by the County.

8.4 Testing Requirements

8.4.1 Vacuum Testing

1. Vacuum testing shall be in accordance with ASTM C1244
2. All pipe entries into the manhole shall be plugged.
3. The compression band of the manhole vacuum testing equipment shall be inflated to create a seal between the vacuum equipment base and the top of the manhole.
4. If the manhole is backfilled prior to testing, then (10) inches of mercury shall be applied to the manhole and the time measured for the vacuum to drop from 10-inches to 9-inches shall be recorded.
5. The test duration for a 48-inch diameter manhole is 60 seconds; the test duration for a 60-inch diameter manhole is 75 seconds.
6. If the vacuum drop is greater than 1-inch of mercury during the test period, necessary repairs shall be made and the vacuum test and repairs shall be repeated until the manhole passes the test.

8.4.2 Manhole Coatings Systems Testing

1. Coating systems shall be tested during coating applications and after manholes have been installed.
2. During coating the Applicator shall regularly perform and record coating thickness using a wet film thickness gauge meeting ASTM D4414 – Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gauges, to ensure a monolithic coating and uniform thickness during application.
3. A minimum of three (3) readings per 200 square feet of surface area shall be recorded.
4. Applicator shall submit documentation on thickness readings to the Owner on a daily basis when coating application is underway.

8.4.3 Manhole Coatings Systems Testing – Type B Coatings

1. For Type B coatings, the applicator shall perform holiday testing on all coated surfaces in the presence of the Owner.

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2. After the coating has dried and set hard to the touch, an induced holiday shall then be introduced on the coated concrete surface and shall serve to determine the minimum/maximum voltage to be used to test the coating for holidays at the particular area.
 3. The spark tester shall be initially set at 100 volts per 1 mil of film thickness applied but may be adjusted as necessary to detect the induced holiday (refer to NACE RPO188-99).
 4. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method.
 5. After abrading and cleaning, additional coating material can be hand applied to the repair area.
 6. All touch-up and repair procedures shall follow the coating manufacturers recommendations.

8.4.4 Owner Visual Inspection

1. After manholes have been installed and all required testing of coatings and assembly have been performed, the Owner will perform a visual test to verify that no damage to the coating system occurred during installation.
2. Any deficiencies in the finished coating shall be marked and repaired by the Applicator according to the procedures provided by the coating Manufacturer.

8.5 Special Warranties

8.5.1 Type B Epoxy Coating

1. Following the successful application and acceptance of Type B coatings by the County, the coatings manufacturer shall warrant all Work against defects in materials and workmanship for a period of five (5) years, unless otherwise noted. Warranty shall begin at the date of substantial completion of the project.
2. Coatings Manufacturer shall, within a reasonable time after receipt of written notice thereof, repair defects in materials or workmanship that may develop during the warranty period.
3. The coatings Manufacturer shall be responsible for all costs necessary and associated with the repair of defects or the repairing of same, including traffic and environmental controls, at their sole expense.

Section 9. Specifications for Force Mains

9.1 General

9.1.1 Use of New Materials and Standards

1. The Contractor shall provide all material submittals and/or samples to be used in the work.
2. These submissions shall undergo approval by the County before any construction commences and materials are ordered.
3. DPW-E may require the Contractor to furnish a Certificate of Compliance from the manufacturer of materials and equipment used in the work. This certificate should affirm that the material or equipment conforms to the specified requirements outlined in these standards.
4. Ultimately, the County retains the final authority regarding material approval on a case-by-case basis.

9.1.2 Specifications for Force Mains Larger than 8”

1. Specifications for the material, testing, and construction of all force mains larger than 8” in nominal diameter shall be prepared and sealed by a Professional Engineer licensed by the Commonwealth of Virginia.

9.2 Material and Component Specifications

9.2.1 Schedule 80 - PVC Pipe

1. Schedule 80 PVC shall meet ASTM D 1785 standards.
2. All fittings shall be Schedule 80 and meet ASTM D 2467 standards.
3. PVC pipe and fittings shall be manufacture red from PVC resin having cell class of 12454B or 12454C as defined in ASTM 1784.
4. Solvent cements used for joining PVC pipe and fittings must meet requirements of ASTM D 2564.

9.2.2 C900 PVC - Pipe

1. C900 pipe shall be integral wall bell and spigot joints and shall be in accordance with AWWA - C900 Class 150 DR-18.
2. PVC pipe shall be furnished in 20-foot laying lengths, with push-on joints. Pipe shall be restrained joint where shown in the approved utility plans.
3. Joints shall be locked-in factory assembled rubber ring type.
4. O-ring gaskets shall conform to ASTM F 477.
5. Gasket materials shall have been tested and rated as suitable for continuous contact with domestic sewage.
6. C900 PVC - Fittings
7. Fittings for C900 PVC pipe shall be ductile iron ANSI/AWWA C153/A21.53, compact fittings with a minimum pressure class of 350 psi.
8. Manufacturer's standard asphaltic coating (one mil thickness) shall be provided on the exterior of all fittings.
9. Fittings shall have a cement-mortar lining in accordance with ANSI A21.4 (AWWA C104).
10. Joint restraint shall be used where specified on the plans.

9.2.3 C900 PVC - Joint Restraint

1. Retainer glands shall be EBAA Iron Series 2000PV; Uni-Flange Series 1300 or 1500; or approved equal for PVC pipe up to 12 inches in diameter.
2. Glands shall be manufactured of ductile iron conforming to ASTM A 536.
3. The restraining glands shall have a pressure rating equal to or greater than the pipe on which it is used.
4. The gland shall be such that it can replace the standardized mechanical joint gland and can be used with the standardized mechanical joint bell conforming to ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.

9.2.4 Ductile-Iron Pipe (DIP)

1. DIP shall be furnished in 18- or 20-foot laying lengths, with push-on joints, except where mechanical or restrained joint, or flanged pipe is shown unless otherwise

approved by DPW-E.

2. DIP pipe shall conform to the requirements of ANSI/AWWA C150/A21.50 and C151/A21.51.
3. DIP shall be Class 52 for all pipe diameters; or Class 350 minimum pressure classification for diameters 24-inches and smaller and, 250 psi for diameters larger than 24-inches; or the thickness classification indicated in the Utility plans.
4. The manufacturer's mark, country where cast, year the pipe was produced, pipe class, and the letters "DI" or "Ductile Iron" shall be cast or stamped on the pipe.
5. DIP with diameters 12-inches or smaller shall be gaged and delivered round and true throughout its entire length.

9.2.5 Ductile Iron Pipe (DIP) – Joints, Gaskets and Fittings

1. Joints and gaskets shall conform to AWWA/ANSI C111/A21.11 or AWWA/ANSI C115/A21.15, as applicable.
2. The minimum acceptable pressure rating for all joints is 250 psi.
3. All flanges and glands for pipes shall be made of ductile iron.
4. Fittings shall be manufactured in accordance with ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53, as applicable, and shall be ductile iron.
5. Compact fittings are required and shall have a minimum acceptable pressure rating of 350 psi for pipe diameters less than 16-inch and 250 psi for diameters larger than 16-inch.
6. Fittings shall have the same pressure rating, as a minimum, as the connecting pipe.

9.2.6 Ductile Iron Pipe (DIP) - Nuts and Bolts

1. Mechanical and buried flanged joints – provide per AWWA C111, shall be manufactured in accordance with ASTM 588 – High strength low-alloy structural steel, up to 50 ksi minimum yield point, with atmospheric corrosion resistance (Corten steel)
2. Heads and dimensions shall conform to ASME B1.1.
3. Threads shall conform to ASME B1.1.
4. Bolts shall terminate ¼" (0.25)" – 1/2" (0.50") beyond the end of final torqued nut.

9.2.7 Ductile Iron Pipe (DIP) – Polyethylene Encasement

1. DIP Encasement shall conform to AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
2. Polyethylene shall be at least 4 mils thick, cross laminated, and shall conform to the requirements of ANSI/AWWA C105/A21.5.

9.2.8 Ductile Iron Pipe (DIP) - Coatings

1. Coatings shall be provided on the exterior of all pipe, joints and fittings as required by AWWA/ANSI C110/A21.10, C111/A21.11, C115/A21.15, C116/A21.16, C151/A21.51, or C153/A21.53 as applicable.
2. Pipe diameters over 12-inches shall have one piece of gaged pipe delivered for each fitting and at connections to existing pipelines.
3. Gaged pieces shall be marked on the pipe with markings indicated in the shop drawings.

9.2.9 Ductile Iron Pipe (DIP) – Linings

1. Ductile iron pipe and fittings shall be lined with ceramic epoxy coating.
2. The lining shall be shop applied to bare metal in strict accordance with the manufacturer's recommendations to cover the inner surface of the pipe and fittings.
3. The lining shall be a nominal thickness of 40 mils and a minimum thickness of 35 mils.
4. The gasket area and spigot end up to 6-inches back from the end of the spigot on the outside of the pipe shall be coated with 6 mils nominal, and 10 mils maximum.
5. The lining in each joint of pipe and fitting shall pass a 2,500 volt pin hole/holiday test.
6. The pin hole/holiday detection testing shall be conducted over 100% of all lined surfaces for the ductile iron pipe and fittings.
7. All holidays shall be repaired in accordance with the manufacturer's instructions and tested again to ensure a pinhole free lining.
8. Short lengths of pipe required to accommodate the pipeline geometry shall be furnished factory-lined.
9. All outlets shall be tapped by the pipe manufacturer at the factory prior to applying the pipe lining.

9.2.10 Ductile Iron Pipe (DIP) - Corrosion Resistant Linings

1. All ductile iron pipe and fittings shall be seal coated in accordance with ANSI/AWWA C104/A21.4.
2. Each length of ductile iron pipe shall be hydrostatically tested at the point of manufacture to 500 psi for a duration of 10 seconds per AWWA C151. Testing may be performed prior to machining bell and spigot.
3. Failure of ductile iron pipe shall be defined as any leak or rupture of the pipe wall.

9.2.11 High Density Polyethylene Pipe (HDPEP)

1. HDPEP shall be in accordance with AWWA C906-15 and shall have a nominal DIPS (Ductile Iron Pipe Size) outside diameter unless otherwise specified.
2. The nominal size, pressure classification rating, and SDR of the pipe shall match as specified in the approved utility plans.
3. ODs and tolerances for IPS outside diameter pipe shall be in accordance with ANSI B36.10 as illustrated in AWWA C906-15 Table 3.
4. HDPEP shall be homogeneous and uniform throughout; shall be free of injurious defects such as visible cracks, holes, foreign inclusions, voids, and blisters; and shall have uniform color and physical properties according to the provisions of AWWA C906-15.
5. Commercial virgin PE Compounds shall meet ASTM D3350 physical property requirements and shall be classified per ASTM D3350 as shown in Table 1 of AWWA C906-15. The compound shall have HDB (Hydrostatic Design Basis) ratings at 73°F (23°C) and at 140°F (60°C) and HDS (Hydrostatic Design Stress) ratings at 73°F (23°C) determined in accordance with ASTM D2837 and PPI TR-3.
6. The PE Compound in the pipe shall contain color and ultraviolet (UV) stabilizer meeting the requirements of ASTM D3350 Codes C or E.
7. Code C compounds shall contain 2 to 3 percent carbon black when material from the pipe is tested in accordance with Section 4.3.11 of AWWA C906-15.
8. Code E compounds used for solid color pipe, color stripes, or color layer (shell) shall contain sufficient UV stabilizer to protect the pipe against UV degradation for at least 24 months of unprotected outdoor exposure.
9. Color PE compounds used for stripes or color layers shall be of the same materials designation codes as the pipe material, varying only by color and UV stabilizer.

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10. Clean rework materials derived from pipe production by the same manufacturer are acceptable as part of a blend with virgin PE compound meeting section 4.2.1 of AWWA C906-15 for the production of new pipe, including sections 4.2.3.1, 4.2.3.2, 4.2.3.3 and 4.2.4.
 11. PE fittings or components may be molded, thermoformed from pipe sections or fabricated. Molded fittings shall meet the requirements of AWWA C906-15 and the requirements of ASTM D2683 for socket-type fittings, or ASTM D3261 for butt-type fittings, or ASTM F1055 for electrofusion-type fittings. Thermoformed and fabricated fittings shall meet the requirements of AWWA C906-15 and ASTM F2206.

9.2.12 Air Release Assemblies

1. Cleanout and air release valves shall be provided with valve boxes and shall be extended to within 18" of the finished grade.
2. The valve box cover shall have the words "SEWER" on it.

9.2.13 Gate Valves – Larger than Three Inches in Diameter

1. Gate valve three inches or larger shall be resilient seat type, shall have a minimum working pressure of 150 psig conforming to AWWA Standard C509 and shall have an interior epoxy coating in accordance with AWWA C550.
2. Valves shall be of the non-rising bronze or stainless steel stem type with an iron body, mechanical joint or flanged ends, "O" ring stem seals, bronze mountings, and, suitable for buried service.
3. The valves shall open left (counter-clockwise) by a two inch square operating nut.
4. Gate valves shall be as manufactured by A.O. Smith, J & S, Mueller, Kennedy, Apollo, Clow or approved equal.
5. One valve wrench shall be provided for every three valves installed in a project.
6. All gate valve hardware shall be 316 stainless steel.
7. Valves shall conform to Standard SP80, Type 2, Class 150, Manufacturers Standardization Society of the Valve and Fitting Industry, Inc.
8. Valves shall conform to AWWA C509-94 and be suitable for buried service and for use with domestic sewage.
9. Valves shall be manufactured by Waterous Company, Mueller, J & S, American Flow Control or a County approved equal.

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10. Waterway shall be smooth and shall have no depressions or cavities in seat area where foreign material can lodge and prevent closure or sealing.

9.2.14 Gate Valves – Smaller than Three Inches in Diameter

1. Gate Valves smaller than 3” in diameter shall be cast bronze, solid wedge disc, screwed bonnet, stainless steel full port, inside screw, and have non-rising stem valves with threaded connections.

9.2.15 Gate Valve - Wedges

1. Wedges shall be constructed of ductile iron, fully encapsulated in synthetic rubber except for guide and wedge nut areas.
2. Wedge rubber shall be molded in place and bonded to the ductile iron portion, and shall not be mechanically attached with screws, rivets, or similar fasteners.
3. Wedge shall seat against seating surfaces arranged symmetrically about the center-line of the operating stem, so that seating is equally effective regardless of direction of pressure unbalance across the wedge.
4. All seating surfaces in body shall be inclined to the vertical at a minimum angle of 32-degrees (when stem is in a vertical position) to eliminate abrasive wear of rubber sealing surfaces.
5. Stem shall be non-rising and sealed by at least two (2) O-Rings; all stem seals shall be replaceable with valve wide open and while subjected to full rated pressure.

9.2.16 Gate Valve – Operating Nuts

1. Operating nuts shall be 2” square.
2. Extensions shall be required to bring the nut to within 3 feet of the ground surface.

9.2.17 Gate Valve - Bonnetts

1. Bonnett shall be embossed with direction of open; shall open counter-clockwise.

9.2.18 Gate Valve - Coatings

1. Valve body and bonnet shall be coated, inside and out, with fusion-bonded epoxy.
2. Coating shall conform to AWWA C550-90.

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3. All interior ferrous surfaces of all valves shall be coated in accordance with ANSI/AWWA C550 and shall not contain lead, coal tar resins, lampblack, carbon black or bituminous materials.
 4. The exterior surfaces shall receive a factory applied fusion bonded epoxy coating.

9.2.19 Polyethylene Encasement

1. Polyethylene encasement shall be at least 4 mils thick, cross laminated, and shall conform to the requirements of ANSI/AWWA C105/A21.5.

9.2.20 Tapping Sleeves and Valves

1. Tapping valves shall meet the same specifications as gate valves, except they shall have a full, unobstructed opening to receive a full size shell cutter.
2. Tapping valves shall be a standard mechanical joint type on one end and a flanged joint on the other end.
3. Tapping valves shall be Mueller H-667 or a County approved equal.
4. All hardware on buried valves must be Series 316 Stainless Steel.
5. Tapping sleeves shall be mechanical joint, cast iron, or stainless steel furnished complete with plain rubber gaskets, mechanical joint accessories, and duckback gaskets.
6. The connecting flange between the sleeve and valve shall conform to Manufacturer's Standardization Society of the Valve and Fitting Industry Standard SP60.
7. Stainless steel tapping sleeves, when approved, shall be JCM No. 432, or a County approved equal.
8. Tapping valves and sleeves shall be compatible for use with the pipe being tapped and as approved by the County.
9. Tapping valves for DIP shall meet the same specifications as gate valves, except they shall have a full, unobstructed opening to receive a full size shell cutter.
10. Tapping valves shall contain a standard mechanical joint and flanged joints on the appropriate ends of the pipe.
11. The valves shall be subjected to a factory test pressure of 400 psi.
12. Tapping sleeves shall be split sleeve with mechanical joint type end seals.

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13. Cast sleeves for tapping cast iron pipe, shall be ductile iron meeting ASTM A536 Grade 65-42-12.
 14. Gaskets shall conform to the applicable requirements of ANSI/AWWA C111/A21.11, and shall be clearly marked to identify the diameter range for which intended.
 15. Tapping sleeves for Ductile Iron and PVC C-900 Pipe
 16. As appropriate, tapping sleeves shall be mechanical joint, furnished complete with plain rubber gaskets, mechanical joint accessories, and approved interior and exterior coatings.
 17. The outlet flange shall be 125 pound, drilling per ANSI B16.1, with standard tapping flange counterbore per MSS SP-60.
 18. Tapping sleeves shall be in accordance with ANSI/AWWA C110/A21.10. and approved by the manufacturer for use on the type and class of pipe being tapped.

9.2.21 Tapping Sleeves for PVC Pipe (Other than C-900)

1. Tapping sleeves for PVC Pipe other than C-900 shall be complete, furnished with plain rubber gaskets, have a full circumference band made of 18-8 type 304 stainless steel.
2. The flange and all bolts and nuts shall conform to AWWA C207 Class D 150 lb. drilling, made of 18-8 type 304 stainless steel.

9.2.22 Stainless Steel Tapping Sleeves

1. Stainless steel tapping sleeves may be used when specified in the approved plans.
2. The body shall be 18-8, type 304 stainless steel.
3. All welds shall be fully restored to stainless steel characteristics.
4. Gaskets shall be virgin SBR compounded for water service.
5. Gaskets shall conform to ASTM D2000 8M 4AA607.
6. The gasket shall be a full 360 degree pipe coverage.
7. The outlet gasket shall be Buna-N.
8. A waterworks brass 3/4-inch test plug with standard square head shall be provided.
9. Bolts and nuts shall be 18-8, type 304 stainless steel UNC threads.

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10. Stainless steel tapping sleeves shall be manufactured by Ford Meter Box Co., Inc., Model FTSS, Smith-Blair Style 665, Romac Industries Inc., SST or JCM Industries, Inc., Model 432, or a County approved equal.

9.2.23 Valve Boxes

1. Castings shall be of cast iron construction in accordance with ASTM A 48 Class 30.
2. Valve box frame and cover shall be in accordance with the approved utility plans.

9.2.24 Underground Warning Tape

1. Tape shall be printed polyethylene tape, magnetic, six (6) inches minimum width, color coded, one inch minimum lettering, printed with name of utility buried below, and suitable for installation in all soil types.
2. Color coding shall be green for all sanitary sewers including force mains.

9.2.25 Tracer Wire

1. Wire shall be plastic coated ten (10) gauge, solid, copper (or stainless steel, especially for bored pipe) wire.
2. Wire coating shall be suitable for direct burial.

9.2.26 Anchor Bolts

1. All concrete anchor bolts not cast in place shall be 316 stainless steel.
2. Anchor bolts that are pre-set and cast in place may be either galvanized or 316 stainless steel.

9.2.27 Ball Valves

1. County-approved ball valves smaller than 3-inches in diameter shall be:
2. Brass with threaded connections, O-ring seals, and a coated ball conforming to AWWA C800 and Standard SP-80, Type 2, Class 150 Manufacturer's Standard Society of the Valve and Fittings Industry, Inc.
3. Valves shall be manufactured by the Ford Meter Box Company B11, Mueller Company 300 Ball Curb Valve, B-20283, or approved equal.

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4. PVC True Union Standards ball valve with steel reinforced threaded-end connectors, with a minimum pressure rating of 230 psi at 70°F, conforming to ASTM D1784, Cell Classification 12454, as manufactured by Asahi, Spears, or approved equal.
 5. Valves shall be NSF approved.

9.2.28 Plug Valves 16-inch and larger

1. Refer to the most recent edition of the Hamton Road Regional Construction Standards (HRRCS) for material specifications.

9.2.29 Appurtenances

1. Appurtenances with Brass Pipe shall be red brass pipe meeting the requirements of ASTM B 43.
2. Pipe sizes, wall thickness and dimensions shall meet the requirements of ASTM B 251 Table I for regular pipe.
3. Brass pipe fittings shall be screwed end malleable iron pattern meeting the requirements of ANSI B16.15. They shall be finished rough, unless otherwise specified.
4. Unions shall be of all brass or bronze with ground joints and shall be left semi-finished.
5. Fittings shall be rated for steam working pressures up to 125 psi.
6. Joints shall be screwed type with threads clean cut, tapered and smooth, meeting the requirements of ANSI B2.1.

9.2.30 Service Saddles

1. Service Saddles shall be sized for the force main on which the saddle is to be installed.
2. Stainless steel saddle bodies shall be 18-8, Type 304, stainless steel with all welds fully passivated to restore stainless steel characteristics.
3. Ductile iron saddle bodies shall conform to ASTM A-536 and have a fusion applied epoxy coating 12-mils dry thickness (D.T.).
4. Straps shall be stainless steel, 18-8, Type 304 fully passivated for corrosion resistance.
5. Threads shall be AWWA C-800 CC/Taper.

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6. The saddle band shall be a minimum of 2-inches in width.
 7. The saddle shall be provided with a Buna-N rubber gasket meeting ASTM D2000 to seal the saddle and the main pipe.
 8. Service Saddle nuts, washers, bands, and bolts shall be 18-8 stainless steel.
 9. Acceptable manufacturers are The Ford Meter Box Co., Inc., Model FS202/FS303/FRS202, JCM Model 406, Romac Industries Inc., Style 202N, Cascade Products Style CNS2, or a County approved equal.

9.2.31 Sleeves and Couplings

1. Mechanical joint sleeves shall be solid type, long body pattern as approved by the County, manufactured in accordance with ANSI/AWWA C110/A21.10.
2. Sleeves shall have a minimum pressure rating of 350 psi. Glands, gaskets, bolts, and nuts shall be in accordance with ANSI/AWWA C111/A21.11.
3. Sleeves shall not be machined in order to facilitate use with pipe of a class or type other than that for which the sleeve was manufactured.
4. The use of bolted steel couplings shall be restricted to joining pipes of different outside diameters, joining pipes of dissimilar materials, and joining sections of steel pipe.
5. Ferrous surfaces shall be coated with a fusion bonded epoxy lining and coating with stainless steel nuts and bolts. Enamel coatings are not acceptable.
6. Bolted steel transition couplings shall be Rockwell 413, Dresser style 162, or a County approved equal.
7. Bolted steel reducing couplings shall be Rockwell 415, Dresser style 62, or a County approved equal.
8. Bolted steel couplings for joining pipes of the same outside diameter shall be Rockwell 411, Dresser style 38, or a County approved equal.

9.3 Submittal Requirements

9.3.1 General

The contractor shall submit the source of all material and all technical data such as Manufacturer's catalog cuts, technical data, operation and maintenance data, and/or shop

drawing that shall be used for force mains for review and approval by the County. The following shall be included for County review and approval prior to installation:

1. Force Main Pipe
2. Joint Restraints
3. Gate Valves
4. Tapping Valves
5. Tapping Sleeves
6. Valve Boxes
7. Flowable Fill
8. Air Vent Assemblies, Vaults, and Boxes

9.3.2 Shop Drawings

When the plans do not specify exact parts or material needed to install portions of the sewer system, then the contractor shall submit a shop drawing to DPW-E for review with the material submittals. Shop drawings may include, but are not limited to, the following:

1. Non-standard cleanouts
2. Manhole drop connections
3. Saxophone connections

9.3.3 Confirmation of Existing Material and Pipe

The Contractor shall verify the material and diameter of the pipe being tapped prior to ordering tapping valves and sleeves.

9.3.4 Work Plan for Force Mains

Prior to the commencement of any proposed force main that will tie into existing systems, the contractor shall submit a work plan to the County for review and approval. The work plan shall include the following:

1. Schedule that includes the following:
 - (a) Starting Date
 - (b) Sequential listing of specific tasks required to complete the tie-in.

(c) Anticipated duration for each task of the tie-in operation.

2. Testing Schedule
3. Identification of businesses and residences that may be impacted and will require notification
4. Installation method of the force main.
5. Location of road closures, approved Traffic Control Plan, and VDOT Land Use Permit (if applicable.)
6. York County Land Disturbing Activity Permit and VSMP Permit (if applicable)
7. Number of pump trucks, to include total capacity, to be supplied to handle flow at the existing stations (if applicable.)
8. Mobile phone contacts and email addresses for Contractor and Developer personnel.
9. Location of where equipment and material will be staged.

9.3.5 Proposed Force Mains Larger than 8" in Diameter

The contractor shall hold a special meeting with DPW-E and Utility Operations to determine a more detailed work plan.

9.4 Construction & Installation Specifications

9.4.1 Cleaning

1. All lumps, blisters and excess coatings shall be removed from the bell and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be cleaned and dry, and be free from dirt, grease, oil, sand, grit, or any foreign materials before the pipe is installed.

9.4.2 Trenching, Bedding, Backfilling, and Compaction

1. Refer to the Aggregate and Earthwork Specifications.

9.4.3 Pipe Laying

1. Pipe shall be laid to a true, uniform line and grade.

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2. High points, other than those indicated in the approved utility plans or where an air vent assembly is to be placed, shall be avoided.
 3. Pipe laying shall be in accordance with the manufacturer's recommendations.
 4. Pipe laying shall proceed upgrade, bells ahead.
 5. Each section of pipe shall be laid to form a close concentric joint with the adjoining section and to prevent sudden offsets in the flow line.
 6. Each section of pipe, as it is laid, shall be backfilled at least up to the springline, before the next joint is made.
 7. As the work progresses, the interior of the pipe shall be cleared of dirt and superfluous material.
 8. When work is not in progress, open ends of pipe and fittings shall be closed, so that trench water, earth, and other substances will not enter the pipe or fittings.
 9. Laying of the pipe shall commence immediately after the excavation is started, and every means must be used to keep pipe laying closely behind the trenching.
 10. All pipes, joints, and fittings shall be examined after laying to determine if the coating was damaged during installation. Any damaged pipe sections shall be replaced to the County's Satisfaction.
 11. No more than 100 feet of trench may be open ahead of the pipe laying operation, unless otherwise approved by the County.
 12. Holes shall be scooped out where the bells occur leaving the entire barrel of the pipe bearing on the pipe bed.

9.4.4 Pipe Cutting & Jointing

1. Whenever a pipe requires cutting for the insertion of valves, fittings, closure pieces, or to bring it to the required location, the work shall be performed in a satisfactory manner so as to leave a beveled end in accordance with the manufacturer's instructions or recommendations.
2. Cuts shall be made at 90° with the centerline of the pipe so that a framing square placed against the side of the pipe will reveal not more than 1/4-inch variation across the diameter of the pipe in any direction.
3. The pipe shall be cut with an abrasive wheel, rotary wheel cutter, guillotine pipe saw, milling wheel saw or other equipment specifically designed for that purpose.

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4. The Contractor shall grind smooth cut ends and rough edges and for push-on connections; the cut ends should be beveled slightly.
 5. Pipe damaged by the Contractor in cutting shall be replaced at the Contractor's expense.
 6. Pipe joint assembly practices and joint assembly material such as lubricants, primers and adhesives shall be installed in accordance with the manufacturer's recommendations and specifications, and in accordance with ANSI/AWWA C111

9.4.5 Alignment and Grade

1. The Contractor shall not deviate from the line and grade indicated in the approved utility plans.
2. Any significant deviation, as determined by the County Inspector, shall require review and approval by the County.
3. Where it is necessary to deflect pipelines to avoid obstructions, the amount of deflection shall not exceed $\frac{1}{2}$ of that recommended by the manufacturer of the pipe.
4. Where necessary to maintain the required line, short sections of pipe and fittings shall be provided.
5. The Contractor shall investigate the proposed location of the main far enough in advance of the work to determine where conflicts will occur and to determine joint deflections necessary to clear any obstructions.

9.4.6 Polyethylene Encasement

1. Polyethylene encasement shall be used where specified in the approved utility plans.
2. In the event that corrosive soils (as defined by Appendix "A" of ANSI/AWWA C105/A21.5) are encountered during excavation (and have not been identified as such in approved utility plans), the County may direct that all, or a portion, of the pipeline be encased.
3. Materials and methods of installation shall be in accordance with AWWA C105; Method A, B, or C may be used upon approval by the County.
4. A fabric type or padded sling shall be used when handling polyethylene encased pipe to prevent damage to the polyethylene encasement.
5. All seams in the polyethylene encasement shall be sealed completely with approved 2-inch wide plastic adhesive tape.

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6. The tube shall be pulled snugly long the pipe barrel and fastened in-place with adhesive tape at 3 foot intervals.
 7. The fittings shall be covered with film, held snugly in place with point tape or strapping.
 8. Extreme care shall be taken when backfilling to avoid damaging the polyethylene encasement.

9.4.7 Tracer Wire Installation

1. All open trench force mains shall be installed with a continuous tracer wire attached every 10 feet to the piping system with plastic strapping.
2. The wire shall terminate above ground at every valve box, tracer wire box, and air release valve.
3. The wire shall be of sufficient length to allow the wire to be uncoiled and extended one (1) foot above the finished grade.
4. The tracer wire installation will be considered complete and acceptable for service when the County can trace the wire using the locating equipment.
5. Any breaks shall be repaired by the Contractor prior to project acceptance

9.4.8 Subsurface Utility Tape Installation

1. When required, tape shall be placed approximately 18" below grade, overtop of the installed force main.
2. Subsurface utility tape is required for all open trench force mains.

9.4.9 Valve Installation

1. Prior to installation, the County shall inspect valves for direction of openings, interior and exterior coating systems, freedom of operation, tightness of pressure containing bolting, cleanliness of valve ports and especially seating surfaces, handling damage and cracks.
2. Valves determined to be defective by the County shall be replaced by and at the sole expense of the Contractor.
3. The Contractor shall operate all valves greater than 3-inches once prior to installation to determine the number of rotations of the operating nut; this number of rotations

shall be recorded on the record drawings.

4. The Contractor shall set and join valves to pipe in accordance with the manufacturer's requirements for the type and class of valve and pipe.
5. The valve box shall be centered and set plumb with the top of the box neatly to grade of the surface of the existing ground, unless otherwise directed by the County.
6. Shock and stress shall not be transferred from the box to the valve.
7. The top of the operating nut shall be less than 36-inches below the rim of the valve box (as measured from final grade).
8. When the distance from the operating nut to the top of the valve box is greater than 36-inches, the Contractor shall install an approved valve stem extension device to result in a distance of 12- to 24-inches from the top of the operating nut to the rim of the valve box.
9. Valves shall be set vertical and bedded in accordance with the approved utility plans.

9.4.10 Installation of Appurtenances

1. All appurtenances (fittings, air vent assemblies) shall be installed in accordance with the manufacturer's recommendations and as indicated in the approved utility plans.

9.4.11 Restraint Installation

1. Fittings, valves, and pipe joints shall be restrained as indicated in the approved utility plans and County details.
2. Alternate methods of thrust restraint other than specified herein may be used only while approved by DPW-E.
3. Blocking shall be placed between undisturbed earth and the fitting to be restrained.
4. The blocking shall be in accordance with County Details, oriented to contain the resultant thrust force and to leave the fitting joints accessible.

9.4.12 Exposed Piping and Appurtenances

1. All exposed piping, flanges, couplings, nuts and bolts shall receive a minimum of two coats of an approved protective coating.

9.4.13 Connections to Existing Force Mains

1. For pipe diameters larger than 10-inches, connections shall be installed in accordance with specifications prepared and sealed by a Virginia licensed professional engineer.
2. All existing system valves shall be operated by the County's personnel unless otherwise indicated. The County shall make every effort to have a complete shutdown. Failure by the County to achieve a complete shutdown shall not entitle the Contractor to any additional compensation.
3. The operation of all existing privately-owned mainline valves, air vents, and pump stations will be performed only by forces of the private utility.
4. The Contractor shall provide adequate support and restraint, against system pressure of the exposed piping prior to and during startup and final backfill.
5. If specified on the utility plans, utility warning tape shall be installed above the connection.
6. Any joints not inspected by the County will not be approved and shall be excavated for inspection.
7. The Contractor shall assist the County during the reestablishment of flows as follows:
 - (a) Provide riser pipe, fittings, and sewage containment drums for each control air vent location, and temporary valve at the air release point to vent air.
 - (b) Provide means of electronic communication to coordinate this operation.
8. Connection shall be made to the existing main through the installation of a tee in the existing main or by tapping sleeve and valve, as indicated in the Utility plans. Taps shall be sized based on manufacturer's recommendations, but in no case shall the taps be of equal or larger size than the main.
9. Careful attention shall be given to the depth of new pipelines at points where tie-ins to existing mains are to be made. The existing main shall be uncovered in the presence of the County and the new pipeline set to proper elevation to provide for a perpendicular and level tie-in.
10. The Contractor shall be responsible for ascertaining the exact location, depth, and joint pattern of existing mains prior to making connections. Prior to cutting into any force mains the Contractor shall have on site all required fittings, pipe, tools, personnel and equipment, and shall satisfy the County through field measurements, that his fittings will properly join the existing line.

9.4.14 Tapping Existing Mains Under Pressure

1. Tapping sleeves and valves shall be utilized for connecting to existing mains where indicated in the Utility plans.
2. It shall be the Contractor's responsibility to verify the actual outside diameter of the existing main at the location of the proposed tap in order that the tapping sleeve or couplings to be provided can be properly installed.
3. The centerline of the tapping sleeve and valve assembly shall be located the following minimum distances from existing pipe joints:
 - (a) For 4, 6, and 8 inch diameter tapping sleeves: 3.5 feet
 - (b) For 10, 12 and 16 inch diameter tapping sleeves: 5.5 feet
4. For sleeves larger than 16 inches: Consult with DPW-E
5. In cases where the horizontal alignment as indicated in the Utility plans would result in a "sleeve to joint" distance less than the minimum stated above, the County may direct the Contractor to substitute a MJ x MJ x Flange tee connection using acceptable sleeves and pipe sections.
6. All installed tapping sleeves shall be restrained in accordance with the utility plans.
7. Only taps of size equal to the diameter of the branch are acceptable.
8. Upon completion of the tap the Contractor shall save the pipe coupon to show the County.

9.4.15 Sleeve-In of Straight Pipe

1. Sleeve-in connections shall be installed where indicated in the utility plans.

9.4.16 Ductile Iron Pipe (DIP) Installation

1. Installation of DIP shall conform to ASTM A674 – Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids.
2. Where field touch up is required to seal cut ends and repair damaged areas, a manufacturer or County approved Joint Compound shall be applied by brush to ensure complete coverage in accordance with the manufacturer's recommendations.
3. Joint Compound may be used over lined pipe and fittings, or on bare substrate.

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4. Care must be taken that the joint compound is applied smooth, without excessive buildup in the gasket seat or on the spigot ends and allowed to cure for 24 hours in accordance with the manufacturer's recommendations.
 5. At least 1-inch of overlap shall be applied to the area being repaired. Protecto 401 shall not be applied over Protecto 401 Joint Compound.
 6. Joint Compound shall not be applied over wet or frozen surfaces.
 7. If DIP is to be used, a corrosion resistant lining material shall be used on each side of the air release assembly for a minimum distance of 20 feet or until the crown of the pipeline is at an equal elevation to the invert of the pipeline at the air release assembly, whichever is greater.

9.4.17 High Density Polyethylene Pipe (HDPEP) Installation

1. HDPEP sections shall be joined on the job site above ground into continuous lengths by the thermal butt-fusion or electrofusion method, which shall be performed in strict accordance with the manufacturer's recommendations.
2. The butt-fusion equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400 ° F, alignment, and 75 psi interfacial fusion pressure.
3. Butt-fusion joining shall be 100% efficient and shall provide a joint weld strength equal to or greater than the tensile strength of the pipe.
4. Socket-fusion, extrusion welding or hot gas welding of HDPE shall not be used for pressure pipe applications.
5. Flanges, unions, grooved couplers, transition fittings, and some mechanical couplers may be used to mechanically connect HDPE pipe without butt-fusion, upon preapproval by the County.
6. The manufacturer's representative shall be made available a minimum of 2 working days (time on site) during the project when requested by the County, including the first 2 Days of pipeline installation.
7. The cost for the services of the manufacturer's representative, including expenses, shall be at the contractor's expense.
8. Transition couplings from HDPE to other pipe materials shall be as indicated in the approved utility plans.

9.4.18 Connections to Manholes

1. The force main shall enter the receiving manhole with its centerline horizontal and with an invert elevation that will ensure a smooth flow transition to the gravity flow section.
2. In no case shall flow from the force main enter the manhole at a point more than one foot above the flow line.
3. Force main to manhole connections shall be in accordance with the utility plans.
4. Force Mains 2 inches or less in diameter may connect to a Gravity Cleanout in accordance with the approved utility plans.

9.4.19 Offsets to Existing Force Main

1. These specifications do not cover general procedures for offsets to existing force mains.
2. Refer to the most recent version of the Hampton Roads Regional Construction Standards (HRRCS) Division 8 for reference to the applicable specifications.

9.4.20 Air Release Valve Installation

1. Air release valves shall be installed at the high points in the force main.
2. All air release valves shall be installed within a respective and properly sized valve vault.

9.4.21 Minimum Cover

1. All force mains shall have a minimum depth of cover of 36 inches.
2. The maximum depth of force mains shall be indicated on the approved utility plans.

9.5 Testing Requirements

9.5.1 Prerequisites

1. The Contractor shall provide the County notice of at least 2 business days to schedule testing and inspection.
2. Prior to pressure testing, all joint restraint shall be installed.

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3. The Contractor shall be responsible for providing proper safety measures during pressure testing operations. The County shall have the right to halt the test or cancel tests the County determines safety measures to be inadequate.
 4. The Contractor shall present documentation that the testing pressure gauges being used for the test have been calibrated within six months prior to the test by an authorized testing facility.
 5. The Contractor shall test the line prior to contacting the County for a formal pressure test.

9.5.2 General

1. All flushing and pressure testing shall conform to this section and the applicable sections of the Virginia Sewerage Regulations.
2. Only properly functioning, calibrated, clean, and approved equipment shall be used for flushing and pressure testing force mains.
3. Pressure gauges shall display readings to 1.0 psi.
4. All valves in the existing sewer system shall be operated only by or in the presence of the Owner or HRSD or private utility, as applicable.

9.5.3 Pressure Test

1. New force mains shall be pressure tested in accordance with ANSI/AWWA C600-Section 5.2, except as herein provided.
2. The newly laid pipe, or any valved section thereof, shall be slowly filled with water from an approved source and all air expelled from the pipe at air release assemblies before applying the specified test pressure.
3. Force mains shall be filled with water and subjected to a pressure of 1.5 times the expected working pressure or 150 psig, whichever is greater, measured at the highest point along the test section.
4. The pressure test shall be of at least a two hour duration.
5. Testing shall be performed on each section of pipe between main line valves.
6. Before applying the specified test pressure, air shall be slowly expelled completely from the pipe and valves.

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7. Water for the pressure test shall be obtained through a fully valved manifold, with an approved backflow preventer, as indicated in the utility plans, or other source and procedure approved by the County.
 8. The Contractor shall furnish all pumps, fittings, and gauges as necessary to fill the line with water, expel air from the system, and pressurize the pipeline for the tests.
 9. The County reserves the right to test gauges to determine their accuracy.
 10. The Contractor shall coordinate arrangements for water to be used for the pressure testing with the County.
 11. The Contractor shall provide all necessary temporary restraint and support during testing.
 12. The test pressure shall not vary by more than +/- 5 psi for the duration of the test. Any variance outside of this shall invalidate the test.

9.5.4 Testing Allowance

1. Testing allowance shall be defined as the quantity of makeup water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled.
2. Testing allowance shall not be measured by a drop in pressure.
3. No pipe installation will be accepted if the amount of makeup water is greater than that determined by the allowable leakage formula, EQ. 3. In section V.E.4.

9.5.5 Testing for Heat-Fusion HDPE

1. Before testing, heat fusion joints are to be completely cooled.
2. All parts of the test section shall be restrained against movement. Temporarily remove, restrain, or isolate expansion joints and expansion compensators before starting.
3. All safety precautions identified in ASTM F2164 shall be observed.
4. To compensate for expansion, add make-up water during the initial expansion phase. The quantity of water needed to fill the pipe test section and accommodate expansion (and possible leakage at non-fusion joints and seals) is estimated using the following equation:

$$V = 1.015 * 0.04 * ID^2 * L$$

Where:

- V = pipe section volume, in gallons
- ID = pipe inside diameter, in inches
- L = test section length, in feet

5. Testing allowance for make-up water shall be determined using the following equation:

$$L = \frac{(S * D * P)^{0.5}}{148,000}$$

Where:

- L = Allowable leakage, in gallons/hr.
- S = Length of pipe tested, in feet
- D = Nominal Diameter of the pipe, in inches
- P = Average test pressure during test, in psig

6. Allow the test section and the test liquid to equalize to a common temperature.

7. Initial Expansion Phase

- (a) When the test section is completely filled and purged of air, gradually increase the pressure to the required test pressure identified in Appendix 11.8.
- (b) Add make up water as necessary to maintain the maximum test pressure for 4 hours.

8. Test Phase

- (a) Reduce the test pressure by 10 psi and monitor pressure for 1 hour.
- (b) No visible leakage shall be observed and the pressure shall remain steady (within 5% of the test phase pressure) for the 1 hour test phase period for a passing test.
- (c) If retesting is necessary, depressurize the test section per ASTM F2164 and correct any faults/leaks. Allow the test section to “relax” for at least 8 hours before repressurizing and repeat the Initial expansion and test phases as indicated above.

9. Leakage Test

- (a) Leakage shall be in accordance with VDH requirements.

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- (b) No leakage shall be allowed for heat-fusion joined HDPE pipe or fPVC pipe.
 - (c) The leakage test shall be conducted concurrently with the pressure test.
 - (d) No pipe installations will be accepted if the leakage is greater than the values determined as following equation or table:

$$L = \frac{(S * D * P)^{0.5}}{148,000}$$

Where:

- L = Allowable leakage, in gallons/hr.
- S = Length of pipe tested, in feet
- D = Nominal diameter of the pipe, in inches
- $P^{0.5}$ = Square root of the average test pressure during leakage, in psig

10. Failed Tests and Retesting

- (a) The Contractor shall locate and repair any defective material until the leakage is eliminated.
- (b) If a force main or section fails to meet the specified test requirements or has to be repaired, it shall be retested.
- (c) All joints, not subjected to pressure testing, shall be visually inspected under pressure for not less than 30 minutes for leakage.

9.5.6 Tapping Sleeves and Valves

1. The Contractor shall test each tapping sleeve and valve assembly prior to making a tap under pressure.
2. Water shall be injected into the body of the sleeve, to a pressure of 150 psig, through the test plugs.
3. If test plugs are not provided in the sleeve, a tapped mechanical joint plug shall be assembled to the valve for testing purposes.
4. Pressure shall be maintained for a one (1) hour period without evidence of leakage.
5. Upon obtaining a satisfactory test (which shall be witnessed by the County), the tapping operation may commence.

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6. Tapping valves shall be subjected to a test pressure of 300 psi upon installation.

9.5.7 Encountered Damaged Sewer

1. Any cracked or defective pipe, fitting, valve or other component discovered in consequence of testing shall be removed and replaced by the Contractor with sound material in the manner specified at the Contractor's expense.
2. After repairs and/or replacements have been completed the test shall be repeated on the entire system.

9.6 Special Warranties

9.6.1 Valves

1. Valves shall come with a full ten (10) year warranty.

Section 10. Specifications for Vacuum Sewer

10.1 General

10.1.1 Use of New Materials and Standards

1. The Contractor shall provide all material submittals and/or samples to be used in the work.
2. These submissions shall undergo approval by the County before any construction commences and materials are ordered.
3. DPW-E may require the Contractor to furnish a Certificate of Compliance from the manufacturer of materials and equipment used in the work. This certificate should affirm that the material or equipment conforms to the specified requirements outlined in these standards.
4. Ultimately, the County retains the final authority regarding material approval on a case-by-case basis.

10.1.2 The Distinctness of Vacuum Sewer and References

1. Given that vacuum sewer is distinctly different from regular sewer conveyance systems, majority of the specifications come from experience from staff.
2. All specifications listed below shall be in addition to those specified by the most recent version of the Airvac Municipal Design Manual.

10.1.3 Specifications for Vacuum Stations

1. Specifications for Vacuum Stations shall be prepared and sealed by a professional engineer who can demonstrate to DPW-E staff that they have past successful experience of designing vacuum sewer stations.
2. These specifications do not cover specifications for vacuum stations.

10.1.4 Vacuum Pots

1. The term "Vacuum Pot" is used synonymously with the manufacturer's term "Valve Pit".

10.2 Material and Component Specifications

10.2.1 Vacuum Mains

1. SDR 21 PVC pipe is recommended over all other force main material.
2. SDR21 PVC pipe conforming to ASTM D-2241 produced from a PVC compound having a cell classification of 12454 conforming to ASTM D- 1784.
3. All other material shall be reviewed and approved by the County on a case-by-case basis.

10.2.2 Elastomeric Joints

1. Elastomeric sealed joints shall be made in accordance with ASTM D- 3139.
2. All elastomeric joints shall be double lipped Rieber style

10.2.3 Solvent Welded Joints

1. Solvent cement and primer shall be as specified by the pipe manufacturer.

10.2.4 Tee Fittings & 90° Bends

1. Tee fittings and 90° bends are prohibited from use in vacuum sewer systems.

10.2.5 Molded Solvent-Welded Joint Fittings

1. Solvent weld fittings for wyes are PVC Schedule 40 per ASTM D2466 from a PVC compound having a cell classification of 12454 conforming to ASTM D- 1784.

10.2.6 Assembled Gasketed Joint Fittings

1. Assembled joint fittings are made from molded Schedule 40 fittings per ASTM D- 2466 and Spigot x Gasket Adapters fabricated from SDR21, 200 psi pressure rated pipe per ASTM D2241.
2. Gasketed joints are “Rieber Style” 200 psi rated complying with ASTM D3139.

10.2.7 Fabricated Solvent Weld Joint Fittings

1. Fabricated gasket joint fittings are IPS diameter fabricated from SDR 21, 200 psi pressure rated PVC pipe per ASTM D2241 and Spigot Adapters fabricated from SDR 21, 200 psi pressure rated pipe per ASTM D241.

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2. Gasket joints are “Rieber Style” 200 psi rated complying with ASTM D3139.

10.2.8 Fabricated Miter-Cut, Butt Fused Gasket Joint Fittings

1. Wyes that are fabricated using a miter cut, butt fused joints are not permitted.

10.2.9 Vacuum Pots

1. Vacuum pot packages shall be as manufactured and supplied by AIRVAC of Rochester, Indiana.
2. The fiberglass pits shall be 3'-0” inside diameter at the bottoms and be conical shaped to allow fitting of a 23-1/2” diameter clear opening cast iron frame and cover.
3. Standard valve pit depth shall be 3'6” and Pits shall be suitable for AASHTO Highway Loading Class H-20.

10.2.10 Vacuum Pot Anti-Flotation Collars

1. Each valve pit shall be supplied with an anti-flotation collar.
2. Anti-flotation collars shall be supplied by the valve pip manufacturer.
3. Frame and Cover shall be designed for H-20 traffic loading.
4. Frame shall weigh no less than 90 pounds and the cover no less than 100 pounds.
5. Lids shall be 5900F by Neenah Foundry or a County approved equal.
6. Lids shall not be painted and shall be non-locking.

10.2.11 Vacuum Pot Collection Sumps

1. Collection sumps shall be as manufactured and supplied by AIRVAC of Rochester, Indiana.
2. The sumps shall be designed for H-20 loading at two feet depth of cover.
3. Elastomer connections shall be provided for connecting the gravity line(s) and for the pit/sump connection.
4. Sumps shall be either “Standard” or “Deep” or “Extra Deep” AIRVAC models.

10.3 Submittal Requirements

10.3.1 General

1. The contractor shall submit the source of all material and all technical data such as Manufacturer's catalog cuts, technical data, operation and maintenance data, and/or shop drawing that shall be used for review and approval by the County.

10.3.2 Connections and Tie-Ins

1. The contractor shall specify what the plan is for connections and tie-ins of the vacuum mains.

10.3.3 Elevation Benchmark & Vertical Control

1. The contractor shall inform the County of what elevation benchmark(s) is being used for the project.
2. The contractor shall provide the County its plan for establishing and maintaining vertical control throughout the project.

10.4 Construction & Installation Specifications

10.4.1 AirVAC Design Manual

1. All construction and installation shall conform to the AirVAC Design Manual. Refer to the manual for further information.

10.4.2 Connections and Tie-Ins

1. Connections and tie-ins shall be verified in field and confirmed by the inspector prior to the installation of any vacuum sewer system.
2. The connection elevation shall be verified against the utility plans prior to the installation of pipe. Any deviation of elevations greater than 0.2' or that will cause a reverse slope shall be rectified immediately via a utility plan revision prior to the continuation of work

10.5 Testing Requirements

10.5.1 Prerequisites

1. The Contractor shall provide the County notice of at least 2 business days to schedule testing and inspection.
2. Prior to pressure testing, all joints and lifts restraint shall be installed.
3. The Contractor shall be responsible for providing proper safety measures during pressure testing operations. The County shall have the right to halt the test or cancel tests the County determines safety measures to be inadequate.
4. The Contractor shall present documentation that the testing pressure gauges being used for the test have been calibrated within six months prior to the test by an authorized testing facility.
5. The Contractor shall test the line prior to contacting the County for a formal pressure test.

10.5.2 Daily Vacuum Main Test

1. All vacuum sewer mains and laterals shall undergo a 2-hour vacuum test at the end of each work day.
2. The County will provide the vacuum testing rig and testing equipment.
3. The contractor shall be responsible for connecting the testing equipment at the vacuum main side and the County will be responsible for connecting the testing equipment at the testing side.
4. All pipe previously installed shall be tested along with the newly installed pipe.
5. A 22-in. Hg vacuum is applied to the pipes.
6. A maximum loss of vacuum of 1% per hour for a 2-hour test is permissible.
7. The contractor shall be responsible for uncovering all connection points prior to testing.

10.5.3 Vacuum Lift Elevation Test

1. Prior to backfilling of any lift, the contractor shall provide proof that the lift elevations are in accordance with the approved utility plans.
2. Proof may be one of the following:

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3. A written or verbal statement to the inspector from a registered land surveyor that the lift elevation(s) is/are within acceptable ranges.
 4. The County may, at its own discretion and time, confirm lift elevations via a County performed survey.

10.5.4 Final Vacuum Main Test

1. At the end of the construction period, and prior to the installation of any vacuum valves, the complete vacuum sewer is to be vacuum tested.
2. The County normally provides the vacuum testing rig and testing equipment within 2 business days of notice.
3. The contractor shall be responsible for connecting the testing equipment at the vacuum main side and the County will be responsible for connecting the testing equipment at the testing side
4. The testing procedure is the same as the daily test, except the final test is 4-hours in duration.
5. The contractor shall be responsible for uncovering all connection points prior to testing.
6. The maximum permissible loss is 1% per hour over the test duration (approximately 1-in. Hg loss.)

Section 11. Appendices

11.1 York County Sanitary Sewer General Notes

The following notes shall be included on all utility plans.

1. All sanitary sewers shall be designed and installed in accordance with the most current version of York County's Sanitary Sewer Standards and Specifications.
2. The contractor shall submit sanitary material submittals prior to construction to be approved by the Department of Public Works. Digital copy of material submittals shall be submitted to DPW-E for review and approval prior to the pre-construction meeting. No construction of the sanitary sewer system shall commence until a Certificate to Construct Sewer has been issued by the County.
3. This project requires a Public Sewer Extension Agreement (PSEA). Please contact the York County Attorney's Office at (757) 890-3340 for details and procedures upon plan approval.
4. The Developer/Contractor is responsible for applying and obtaining Land Use Permit from the Commonwealth of Virginia Department of Transportation for any work within VDOT right of way.
5. The Developer/Contractor is responsible for apply and obtaining any Wetland Permits as required by the Commonwealth of Virginia Department of Environmental Quality or the US Army Corps of Engineers.
6. A County Certificate to Construct Sewer will be required for any connections into the existing sanitary sewer facilities. A pre-construction meeting is required prior to the issuance of the permit after the following conditions are satisfied (if applicable):
 - (a) The site plan, development, or utility-only plan has been approved by DPW-E.
 - (b) If applicable, a land disturbing activity permit has been issued; and all perimeter E&SC measures are installed.
 - (c) If applicable, a VDOT Land Use Permit has been approved and issued.
 - (d) The PSEA has been executed and approved as to form by the County Attorney and the County Administrator's designated agent.
 - (e) The Certificate to Construct Fee has been paid
 - (f) Product materials have been reviewed and approved by DPW-E.
7. After the items above have been satisfied, you may call the Chief of Utilities at (757) 890-3765, to schedule the sewer pre-construction meeting.

8. The following items will need to be completed before sewer is accepted:

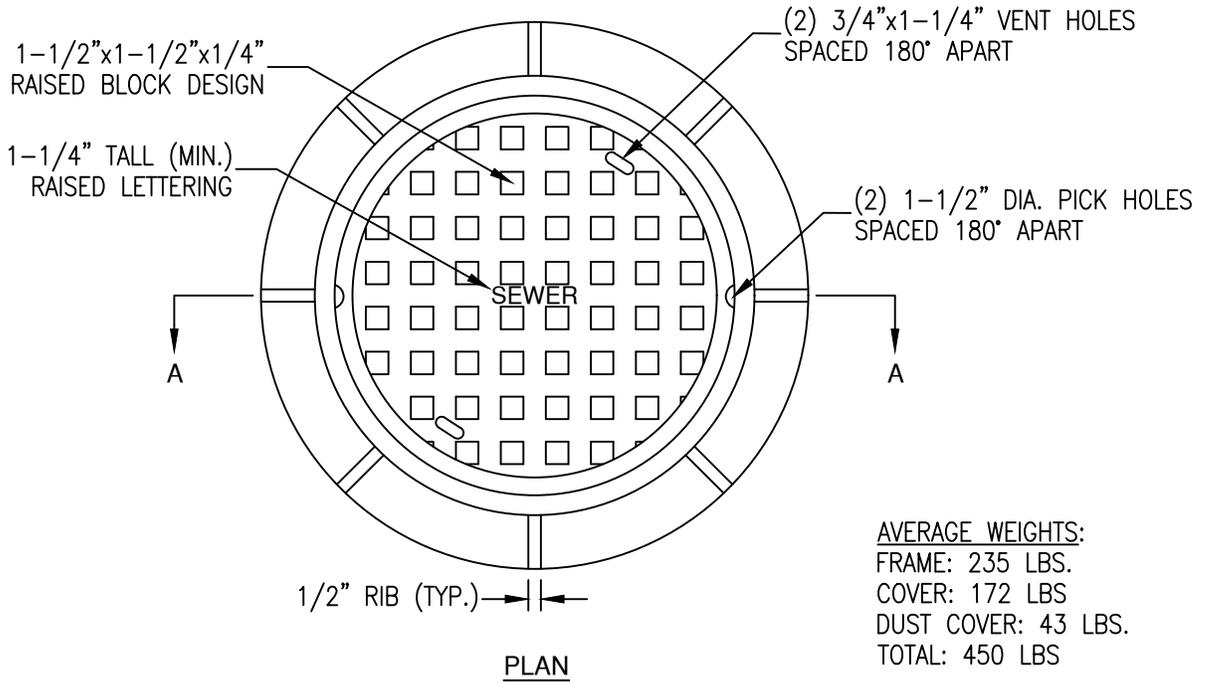
- (a) A County utility inspector is required to be present during the connection of the proposed sanitary sewer service to an existing County Sanitary Sewer. Contact York County at (757) 890-3750, 2 business days in advance prior to installation to arrange for this representative to be present.
- (b) A sanitary Sewer As-built drawing, certified by a Licensed Land Surveyor, shall be submitted to York County's Department of Public Works upon completing the installation of the sanitary sewer prior to any testing is permitted. This requirement may be waived by Public Works for small projects on a case by case basis.
- (c) The developer or contractor will be required to submit a 1 year warranty for all sewer components to be publicly maintained covering all material, equipment, and workmanship associated with the project.
- (d) Any proposed utility easements shall be recorded prior to the acceptance of the sanitary sewer.

The County reserves the right to not accept sewer until these items, at a minimum, have been satisfied.

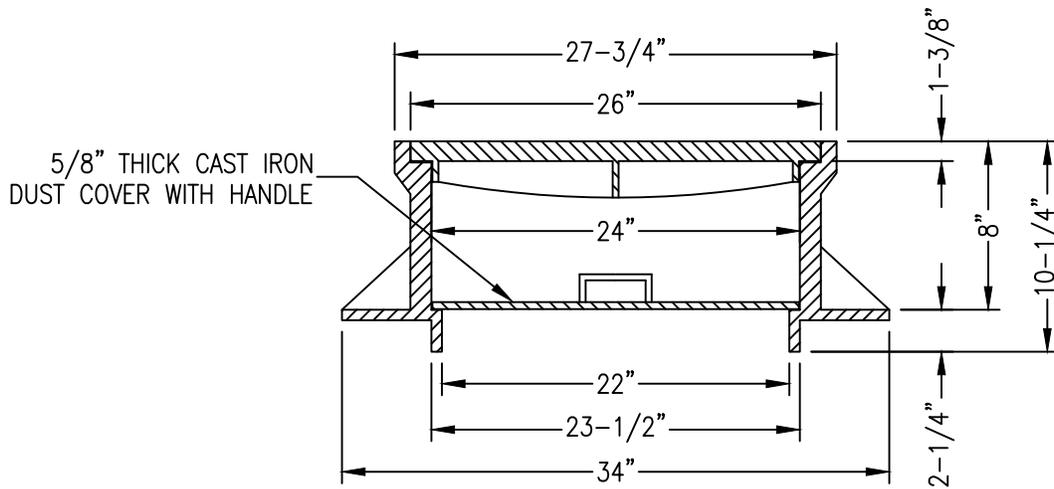
11.2 Standard Detail Drawings

SANITARY SEWER DETAILS

Detail No.	DESCRIPTION
S1001	STANDARD MANHOLE FRAME AND COVER
S1002	WATERTIGHT MANHOLE FRAME AND COVER
S1003	STANDARD PRECAST CONCRETE MANHOLE WITH EXTENDED MONOLITHIC BASE
S1005	INTERIOR DROP MANHOLE
S1006	PRECAST CONCRETE SHALLOW MANHOLE
S1007	SANITARY SEWER STRADDLE MANHOLE
S1008	MANHOLE INVERT SHAPING DETAIL
S1010	TYPICAL SEWER SERVICE CONNECTION
S1011	DUAL SEWER SERVICE CONNECTION
S1012	SANITARY CLEANOUT FRAME AND COVER
S1013	HEAVY DUTY CLEANOUT FRAME AND COVER
S1014	STEEL CASING DETAIL
S1015	PILE BENT SUPPORT DETAIL
S1016	WATER-SEWER CROSSING SEPARATION DETAIL
S1017	WATER-SEWER MAIN SEPARATION DETAIL
S1018	TYPICAL GREASE TRAP/OIL-WATER SEPARATOR
S1019	TYPICAL ACCESS ROAD GATE
S1020	TYPICAL STREAM CROSSING
S1021	STANDARD FLEXIBLE BOOT CONNECTION
S1022	LOW PRESSURE GRINDER PUMP FORCE MAIN CONNECTION TO GRAVITY SEWER
S2001	TYPICAL MANUAL AIR RELIEF VALVE
S2002	LOW PRESSURE FORCE MAIN VALVE
S2003	GRINDER FORCE MAIN CLEANOUT AND VALVE VAULT
S2004	TYPICAL VALVE SETTING DETAIL
S2005	STANDARD VALVE BOX FRAME AND COVER
S2006	EMERGENCY PUMP CONNECTION
S2007	TYPICAL TRACER WIRE BOX INSTALLATION
S2008	FORCE MAIN TO MANHOLE CONNECTION
S2009	TYPICAL GATE/CHECK VALVE VAULT
S2010	ALARM/DISCONNECT PANEL MOUNTING
S2026	GRINDER PUMP CLEANOUT DETAIL
S2027	GRINDER PUMP ELECTRICAL CONNECTION DIAGRAM
S2028	LOW PRESSURE FORCE MAIN ROAD CROSSING DETAIL
S2030	ENVIRONMENT ONE MODEL DH071 GRINDER PUMP DETAIL
S2031	TYPICAL TRENCH DETAIL
S2032	TYPICAL GRAVEL DRIVEWAY RESTORATION
S2033	LOW PRESSURE GRINDER PUMP CONNECTION TO LOW PRESSURE FORCE MAIN
S2034	ENVIRONMENT ONE MODEL DH152 GRINDER PUMP DETAIL
S3001	PIPE BEDDING DETAIL
S3002	TYPICAL ASPHALT DRIVEWAY RESTORATION
S3003	TYPICAL CONCRETE DRIVEWAY RESTORATION
SV2011	TYPICAL VACUUM SERVICE CONNECTION - VALVE POT BELOW VACUUM MAIN
SV2012	TYPICAL VACUUM SERVICE CONNECTION - VACUUM MAIN ABOVE DITCH BOTTOM
SV2013	FIBERGLASS ANTI-FLOATATION COLLAR AND BEDDING DETAIL FOR VACUUM VALVE POTS
SV2014_STD	VACUUM VALVE POT AND SUMP DETAIL - STANDARD (6FT)
SV2014_DEEP	VACUUM VALVE POT AND SUMP DETAIL - DEEP (8FT)
SV2014_XDP	VACUUM VALVE POT AND SUMP DETAIL - EXTRA DEEP (9FT)
SV2015	DIVISION VALVE AND GAUGE TAP ASSEMBLY FOR VACUUM SEWER USING STANDARD MANHOLE FRAME AND COVER
SV2016	VACUUM LINE RESTRAINED JOINT DETAIL
SV2017	DITCH CROSSING DETAIL
SV2018	DUAL SERVICE GRAVITY LATERAL FOR VACUUM SEWER
SV2019	END-OF-LINE IDENTIFICATION MARKER
SV2020	TYPICAL VERTICAL LIFT DETAIL FOR VACUUM SEWER
SV2021	TYPICAL CROSSOVER CONNECTION TO VACUUM MAIN
SV2023	3" SERVICE CONNECTION DETAIL FOR VACUUM SEWER
SV2024	TYPICAL VACUUM SEWER LATERAL AND CLEANOUT DETAIL
SV2025	STANDARD VACUUM SEWER MANHOLE FRAME AND COVER
SV2026	MINIMUM LIFT HEIGHTS - GASKET X GLUED JOINTS
SV2027	LIFT DETAIL AND SLOPE SCHEDULE
SV2028	VALVE PIT CONNECTION LOCATIONS



PLAN



SECTION A-A

STANDARD MANHOLE FRAME AND COVER

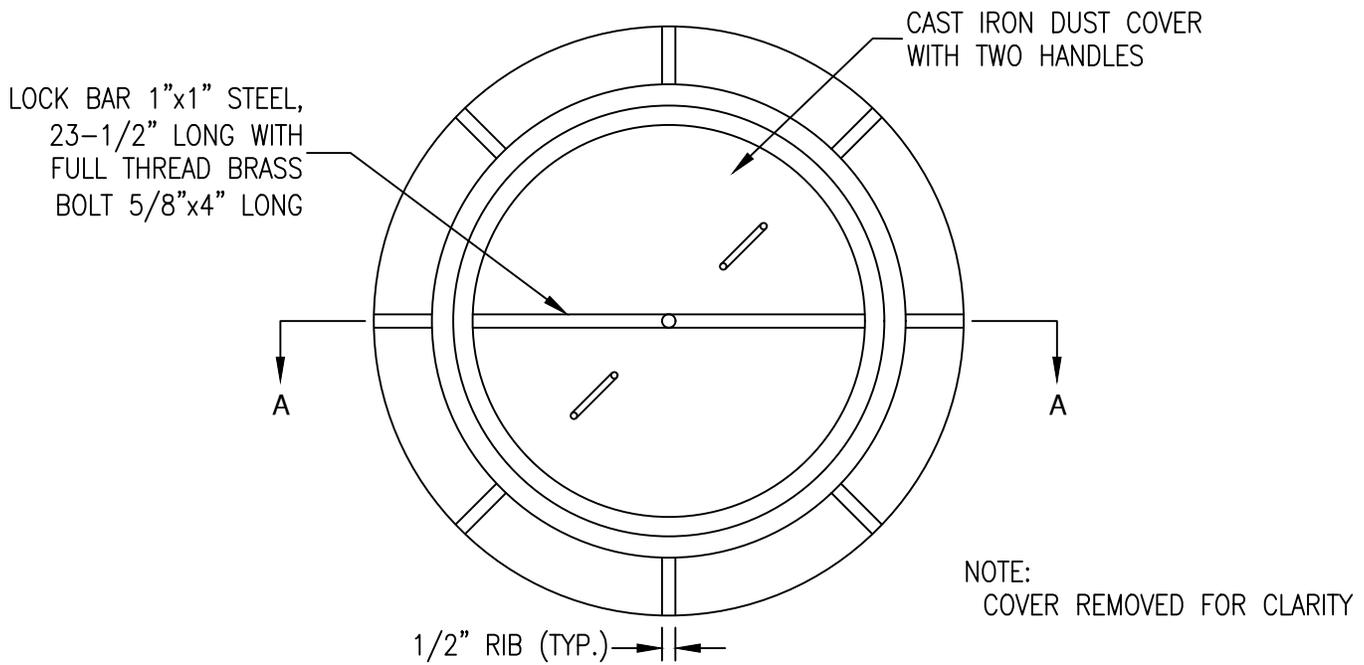
NOTES:

1. ALL GRAY IRON CASTINGS SHALL CONFORM TO ASTM A-48, CLASS 30 AND SHALL BE OF UNIFORM QUALITY.
2. ALL CASTING DIMENSIONS SHALL HAVE A TOLERANCE OF 1/8"±.
3. ALL CASTINGS SHALL BE CLEANED BY SHOT BLASTING AND HAND CHIPPING USING STANDARD INDUSTRY PRACTICES PRIOR TO SHOP APPLICATION OF ASPHALTIC COATING, BY DIPPING.

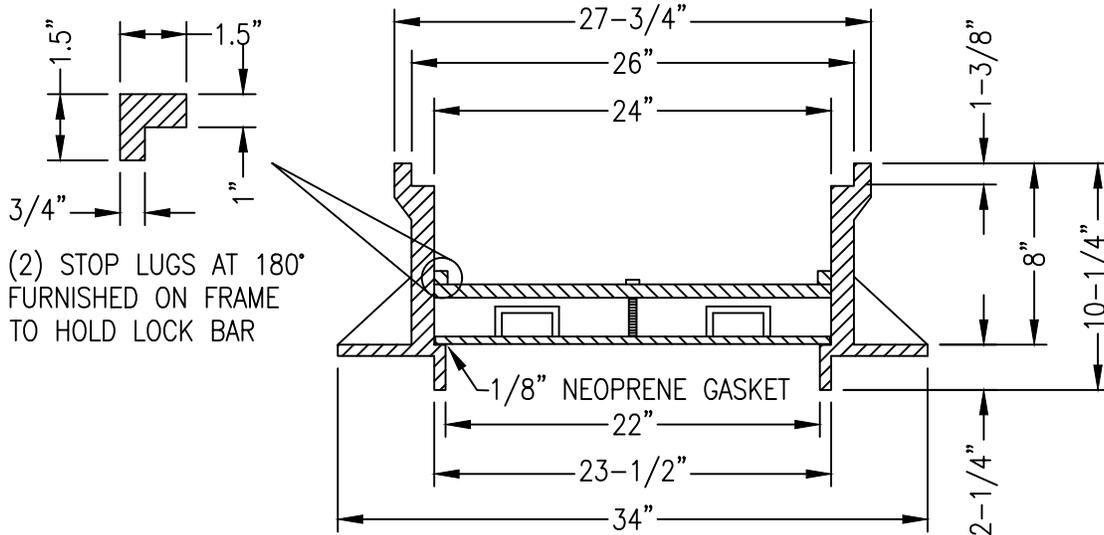


**SANITARY SEWER
STANDARDS AND SPECIFICATIONS
COUNTY OF YORK UTILITIES DIVISION**

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S1001



PLAN: CASTING



SECTION A-A

WATERTIGHT MANHOLE FRAME AND COVER

NOTES:

1. ALL GRAY IRON CASTINGS SHALL CONFORM TO ASTM A-48, CLASS 30 AND SHALL BE OF UNIFORM QUALITY.
2. ALL CASTING DIMENSIONS SHALL HAVE A TOLERANCE OF 1/8"±.
3. ALL CASTINGS SHALL BE CLEANED BY SHOT BLASTING AND HAND CHIPPING USING STANDARD INDUSTRY PRACTICES PRIOR TO SHOP APPLICATION OF ASPHALTIC COATING, BY DIPPING.



SANITARY SEWER STANDARDS AND SPECIFICATIONS

COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S1002

SEE MANHOLE FRAME
AND COVER DETAIL (S1001)

PRECAST CONCRETE ADJUSTMENT RINGS TO BE
SEALED ON ALL INSIDE SURFACES WITH 3/8"
THICK (MIN.) HYDRAULIC CEMENT HIGH STRENGTH
GROUT, TROWELED TO A SMOOTH FINISH. A MAX
OF 3 ADJUSTMENT RINGS ARE ALLOWED.

MANHOLE FRAME AND ADJUSTMENT RINGS TO BE
SET BY EMBEDDING IN BUTYL JOINT MATERIAL AND
COVERED WITH WRAPID SEAL OR APPROVED EQUAL.

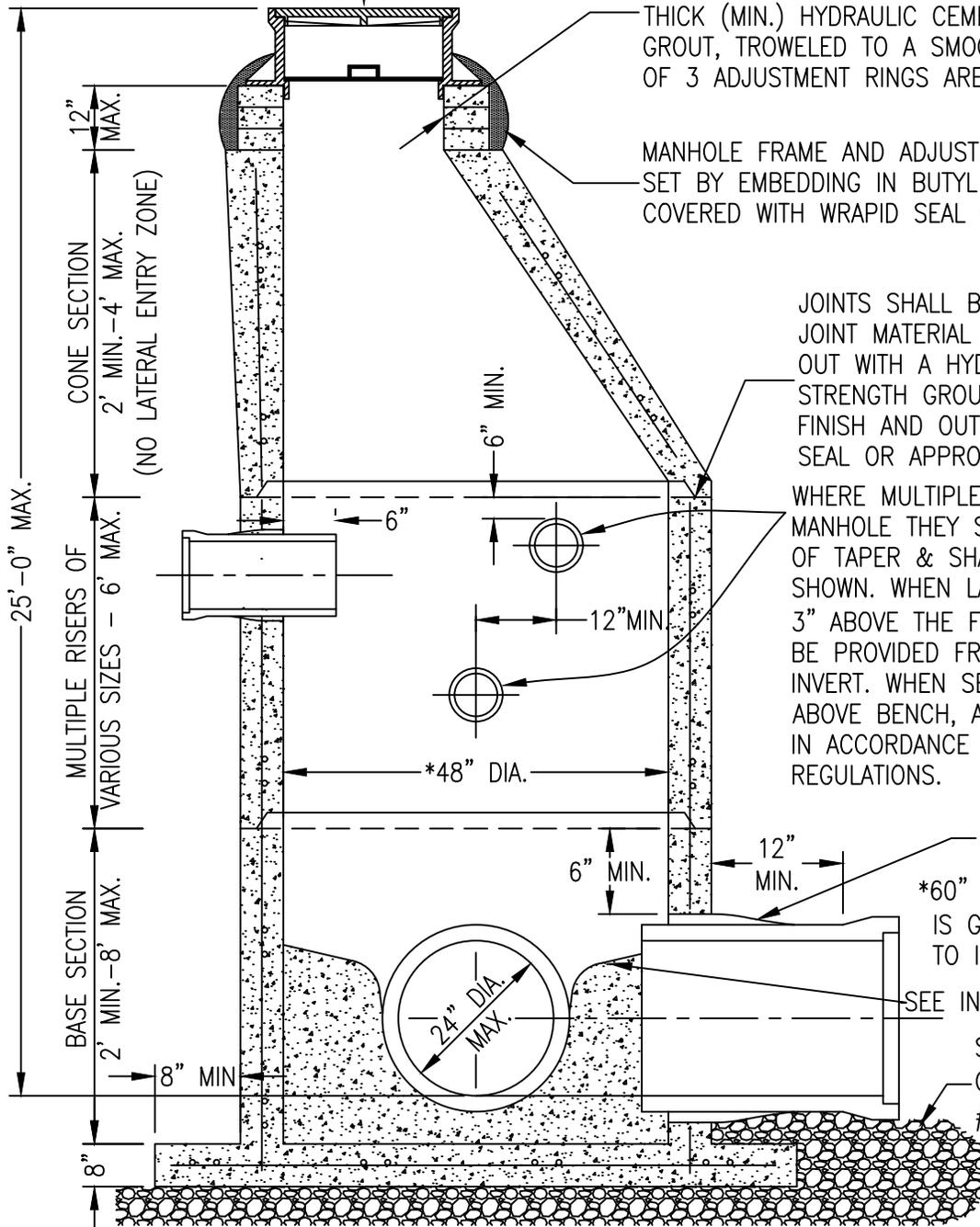
JOINTS SHALL BE SET WITH A BUTYL
JOINT MATERIAL AND GROUTED INSIDE AND
OUT WITH A HYDRAULIC CEMENT HIGH
STRENGTH GROUT, TROWELED TO A SMOOTH
FINISH AND OUTSIDE COVERED WITH WRAPID
SEAL OR APPROVED EQUAL.

WHERE MULTIPLE HOUSE LATERALS ENTER A
MANHOLE THEY SHALL ENTER BELOW POINT
OF TAPER & SHALL BE STAGGERED AS
SHOWN. WHEN LATERALS ENTER LESS THAN
3" ABOVE THE FILLET, A CHANNEL SHALL
BE PROVIDED FROM PIPE INVERT TO MANHOLE
INVERT. WHEN SEWER MAIN ENTERS MANHOLE
ABOVE BENCH, A FILLET SHALL BE PROVIDED
IN ACCORDANCE WITH STATE SEWERAGE
REGULATIONS.

FLEXIBLE BOOT CONNECTION
*60" DIA. WHEN MANHOLE DEPTH
IS GREATER THAN 12' FROM RIM
TO INVERT.

SEE INVERT SHAPING DETAIL (S1008)

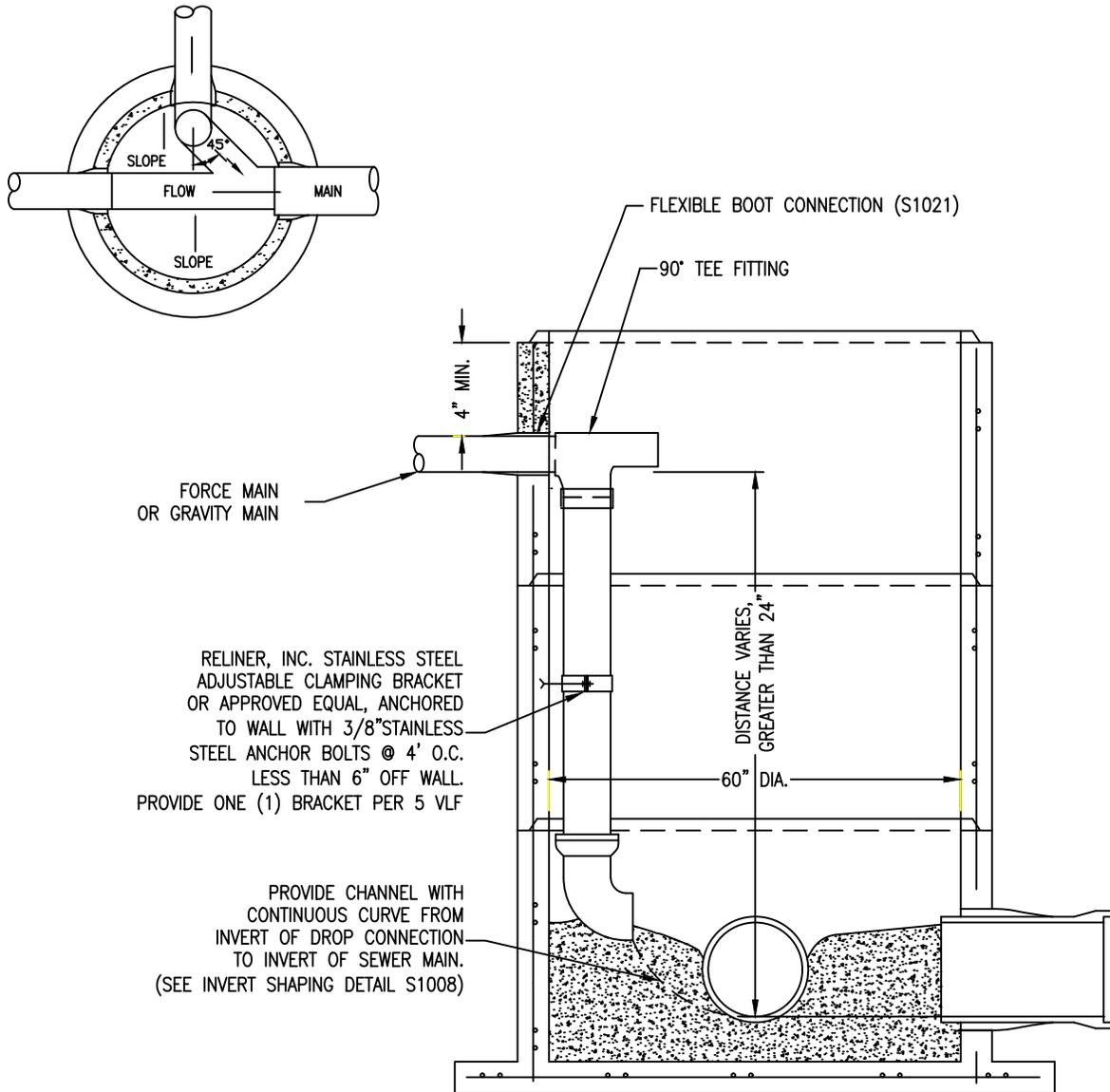
SUPPORT PIPE AND MANHOLE
ON 6" MIN. OF COMPACTED
#57 STONE.



STANDARD PRECAST CONCRETE MANHOLE WITH EXTENDED MONOLITHIC BASE

NOTES:

1. PRECAST CONCRETE MANHOLE SHALL BE IN COMPLIANCE WITH ASTM C-478, NO FLAT TOPS PERMITTED.
2. MANHOLE WALLS SHALL BE 5" THICK MINIMUM FOR 48" INSIDE DIAMETER MANHOLES AND 6" MINIMUM FOR 60" DIAMETER MANHOLES.
3. MANHOLE INTERIOR WALLS SHALL RECEIVE A 40 MIL MINIMUM DRY FILM THICKNESS TYPE "A" EPOXY RESIN COATING AS APPROVED BY THE COUNTY ENGINEER. PLEASE REFER TO THE COUNTY STANDARDS AND SPECIFICATION FOR APPROVED COATINGS.
4. PROVIDE A MAXIMUM OF TWO LIFTING PINS PER SECTION. FULL PENETRATION LIFTING HOLES ARE NOT PERMITTED.
5. MAXIMUM OF FOUR LATERALS ALLOWED PER MANHOLE.
6. LATERALS SHALL PROTRUDE 6" INTO MANHOLE, MEASURED FROM THE INTERIOR WALL.



INTERIOR DROP MANHOLE

NOTES:

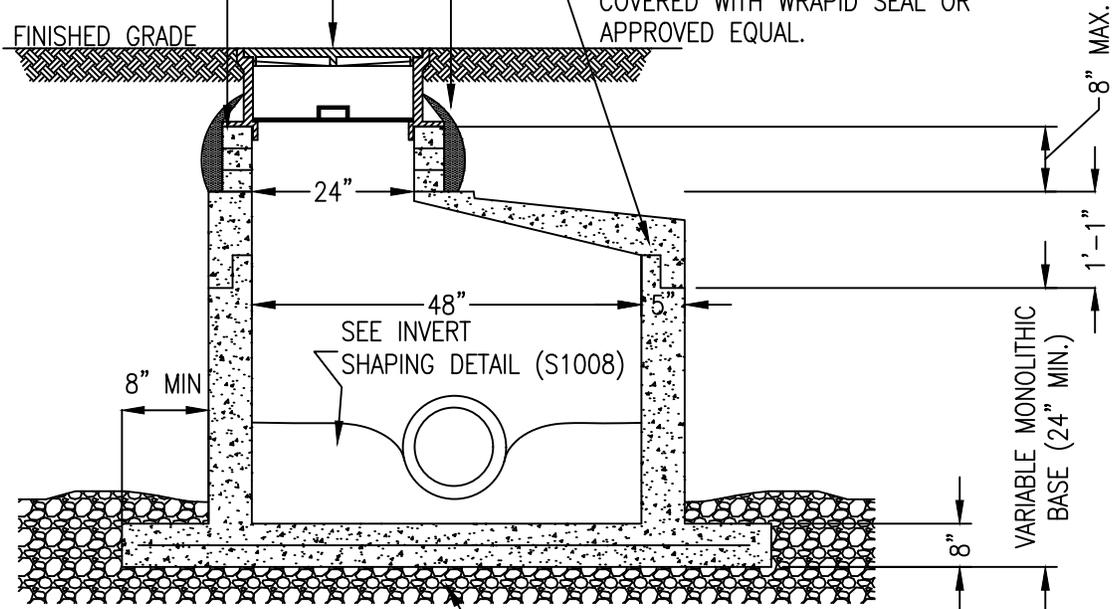
1. BOTTOM 90° BEND OF DROP CONNECTION SHALL BE ORIENTED AT 45° TO THE FLOWLINE OF THE MAIN CHANNEL.
2. ALL PIPING AND FITTINGS INSIDE MANHOLE SHALL BE PVC SDR 26 WITH SOLVENT WELD JOINTS.
3. SEE DETAIL S1003, STANDARD PRECAST CONCRETE MANHOLE, FOR ADDITIONAL DETAIL AND REQUIREMENTS.
4. TRIM INCOMING PIPE SO THAT ONLY 2" MAXIMUM PROTRUDES INTO MANHOLE.
5. FORCE MAIN INTERIOR DROPS WILL REQUIRE TYPE B EPOXY MANHOLE COATING AS REFERENCED IN THE SPECS.
6. THE VERTICAL DROP PIPE IN THE MANHOLE SHALL HAVE THE SAME DIAMETER AS THE PIPE ENTERING THE MANHOLE. CHANGES IN PIPE DIAMETER WHEN ENTERING THE MANHOLE WILL NOT BE ACCEPTED.

PRECAST CONCRETE ADJUSTMENT RINGS TO BE SEALED ON ALL INSIDE SURFACES WITH 3/8" THICK (MIN.) HYDRAULIC CEMENT HIGH STRENGTH GROUT, TROWELED TO A SMOOTH FINISH.

SEE MANHOLE FRAME AND COVER DETAIL (S1001)

MANHOLE FRAME AND ADJUSTMENT RINGS TO BE SET BY EMBEDDING IN BUTYL JOINT MATERIAL AND COVERED WITH WRAPID SEAL OR APPROVED EQUAL.

JOINTS SHALL BE SET WITH A BUTYL JOINT MATERIAL AND GROUTED INSIDE AND OUT WITH A HYDRAULIC CEMENT HIGH STRENGTH GROUT, TROWELED TO A SMOOTH FINISH AND OUTSIDE COVERED WITH WRAPID SEAL OR APPROVED EQUAL.



SUPPORT PIPE AND MANHOLE ON 6" MIN. OF COMPACTED #57 STONE

PRECAST CONCRETE SHALLOW MANHOLE WITH EXTENDED MONOLITHIC BASE

NOTES:

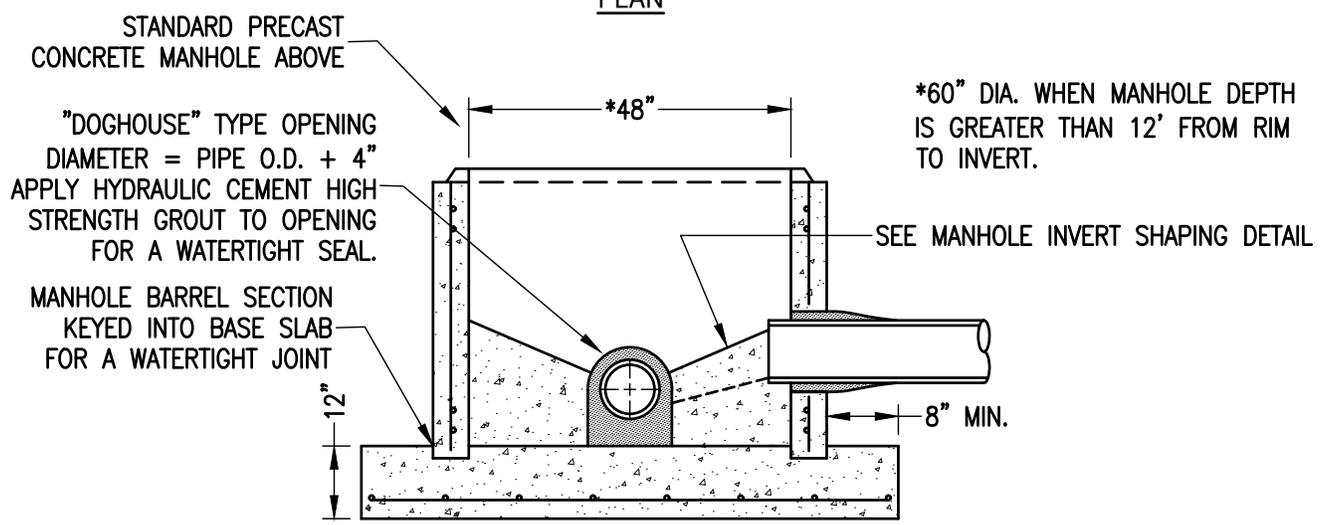
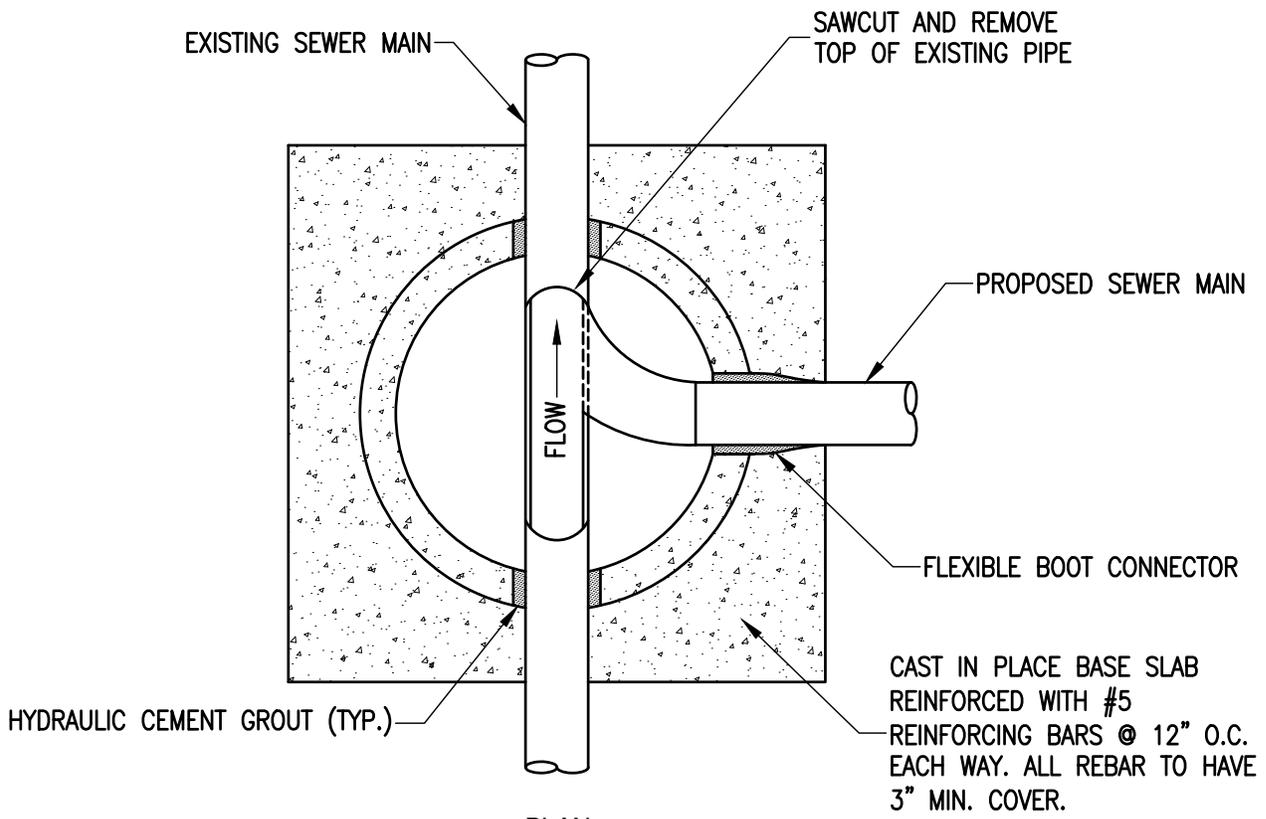
1. A 1'-1" ECCENTRIC SHALLOW CONE (AMERICAST) MUST BE USED, NO FLAT TOPS ALLOWED.
2. PRECAST CONCRETE MANHOLE SHALL BE IN COMPLIANCE WITH ASTM C-478.
3. MANHOLE WALLS SHALL BE 5" THICK MINIMUM FOR 48" INSIDE DIAMETER MANHOLES.
4. MANHOLE INTERIOR WALLS SHALL RECEIVE A 40 MIL MINIMUM DRY FILM THICKNESS TYPE "A" EPOXY RESIN COATING AS APPROVED BY THE ENGINEER. PLEASE SEE THE COUNTY STANDARDS AND SPECIFICATIONS FOR APPROVED COATINGS.
5. PROVIDE A MAXIMUM OF TWO LIFTING PINS PER SECTION. FULL PENETRATION LIFTING HOLES ARE NOT PERMITTED.
6. MAXIMUM OF TWO LATERALS ALLOWED PER MANHOLE.



SANITARY SEWER STANDARDS AND SPECIFICATIONS

COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S1006



SANITARY SEWER STRADDLE MANHOLE

NOTES:

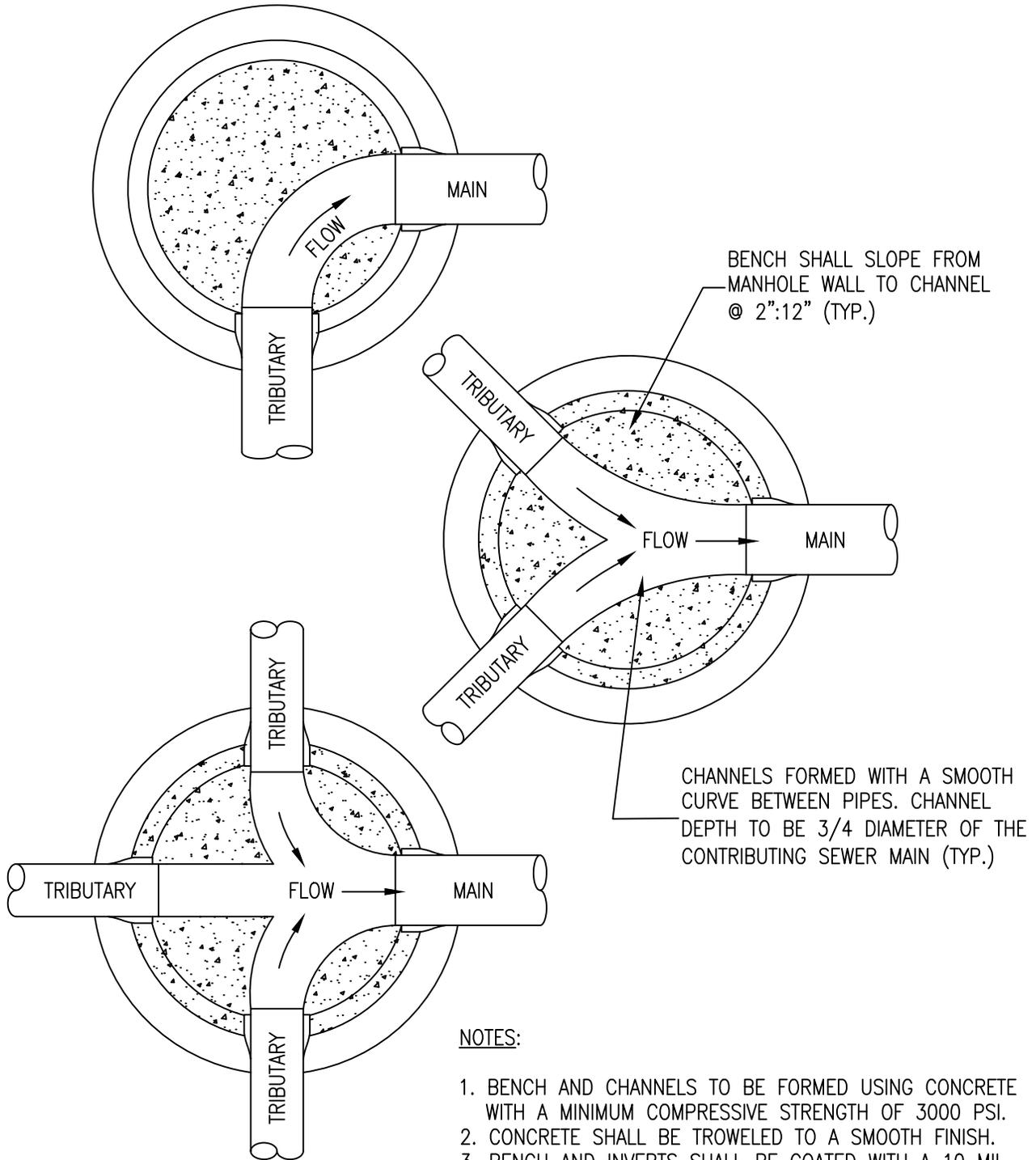
1. SEE DETAIL OF STANDARD PRECAST CONCRETE MANHOLE FOR ADDITIONAL DETAIL AND REQUIREMENTS.



SANITARY SEWER STANDARDS AND SPECIFICATIONS

COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S1007



MANHOLE INVERT SHAPING DETAIL

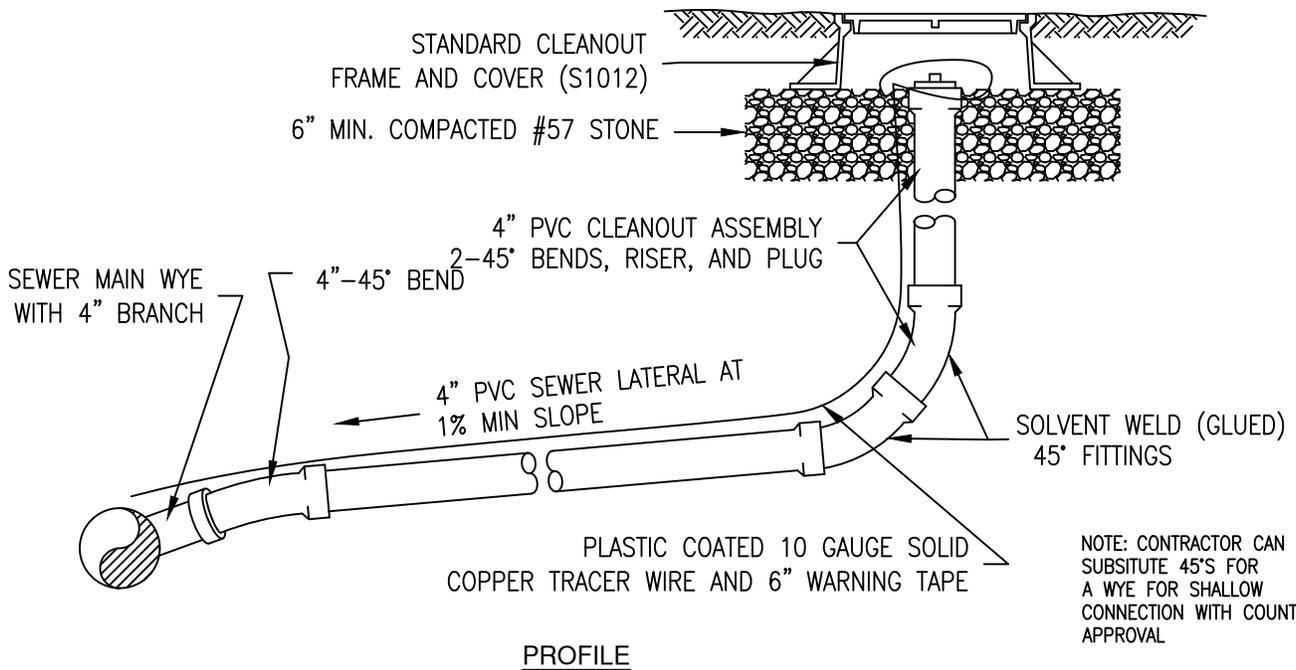
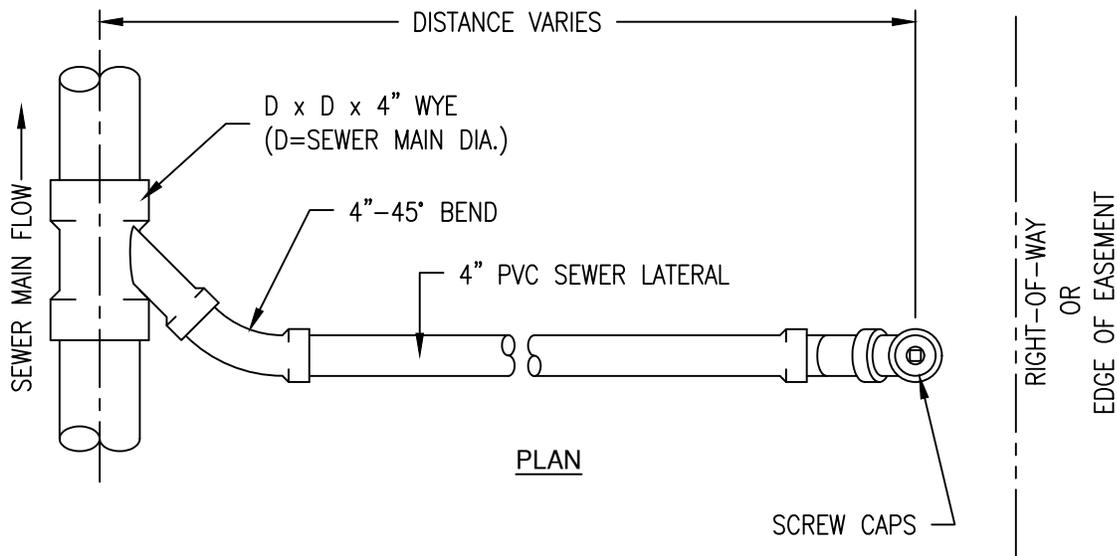


America's Future Since 1781

SANITARY SEWER STANDARDS AND SPECIFICATIONS

COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S1008



NOTE: CONTRACTOR CAN
SUBSTITUTE 45'S FOR
A WYE FOR SHALLOW
CONNECTION WITH COUNTY
APPROVAL

TYPICAL SEWER SERVICE CONNECTION

NOTES:

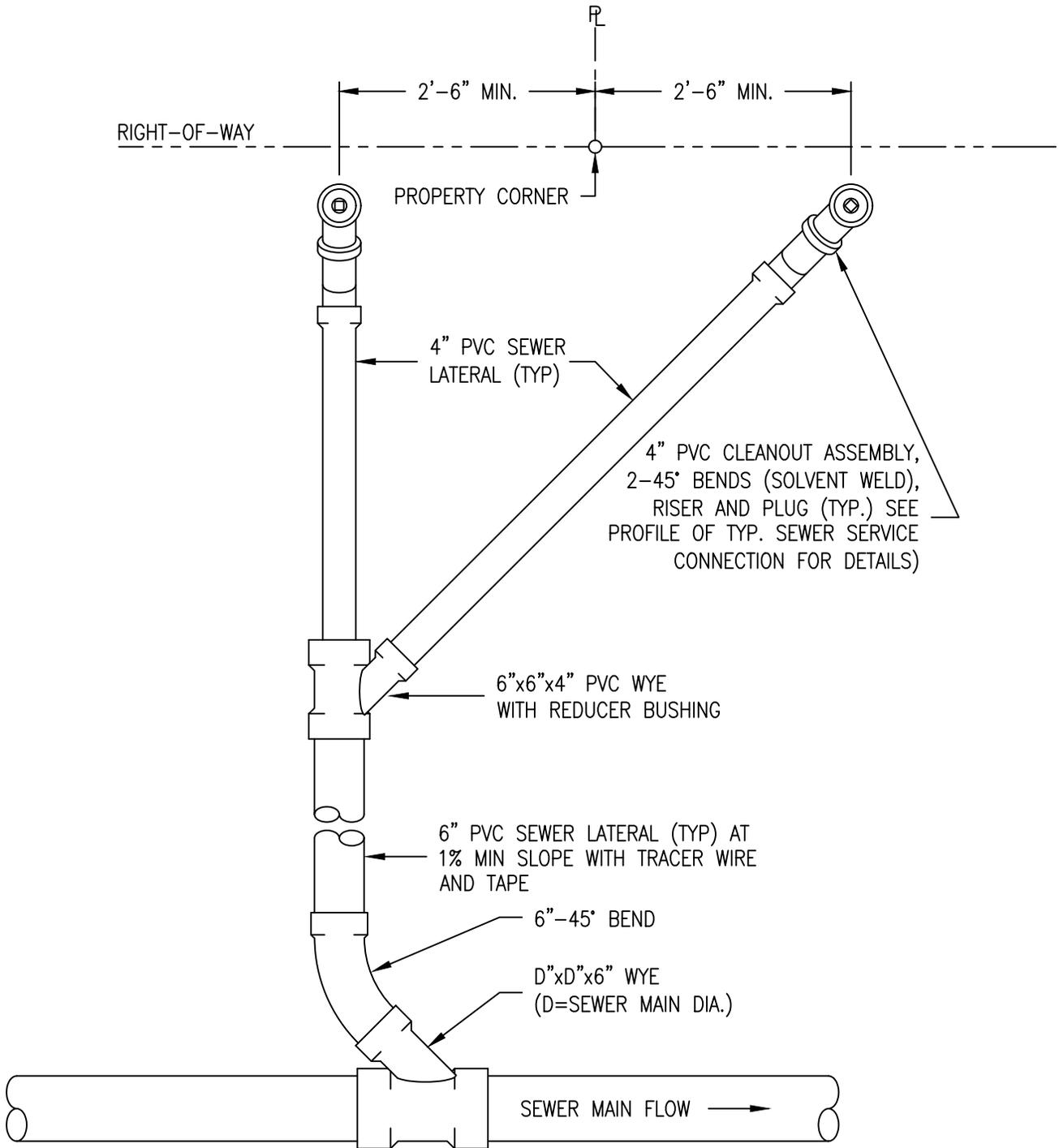
1. SEWER SERVICE LATERAL PIPING AND FITTINGS SHALL BE SDR 26 OR SCH40 PVC WHICH CONFORMS TO ASTM D-3034, UNLESS DEPTH DICTATES OTHERWISE.
2. VACUUM SYSTEM LATERALS SHALL BE SCH.40 OR SDR 21 PRESSURE RATED PIPE AND FITTINGS CONFORMING TO ASTM D-2241.
3. EACH CLEANOUT SHALL BE FITTED WITH STANDARD CLEANOUT FRAME AND COVER.
4. NO BENDS GREATER THAN 45° SHALL BE USED IN SERVICE LATERAL CONSTRUCTION.
5. ALL LATERALS SHALL HAVE TRACER WIRE AND WARNING TAPE FROM MAIN LINE TO CLEANOUT.
6. ALL OF LATERAL PIPE SHALL BE BEDDED WITH #57 STONE.



SANITARY SEWER STANDARDS AND SPECIFICATIONS

COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S1010



DUAL SEWER SERVICE CONNECTION

NOTES:

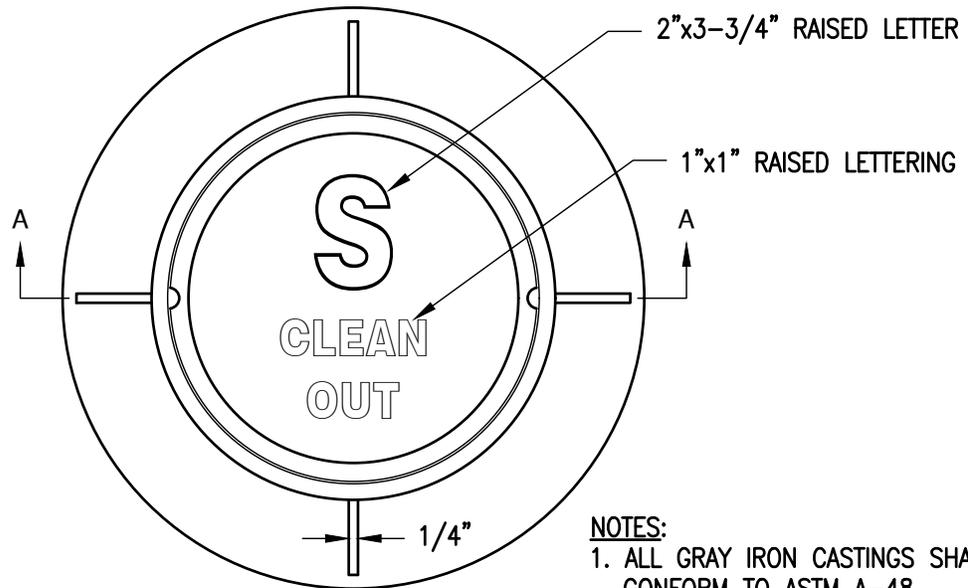
1. DUAL SEWER SERVICE CONNECTION TO BE USED ONLY WHEN APPROVED BY DIRECTOR.
2. SEWER SERVICE LATERAL PIPING AND FITTINGS SHALL BE ASTM C-3034 PVC SDR 26 OR SCH40.
3. EACH CLEANOUT SHALL BE FITTED WITH STANDARD CLEANOUT FRAME AND COVER.
4. SEE TYPICAL SEWER SERVICE CONNECTION FOR ADDITIONAL DETAILS AND REQUIREMENTS (S1010).



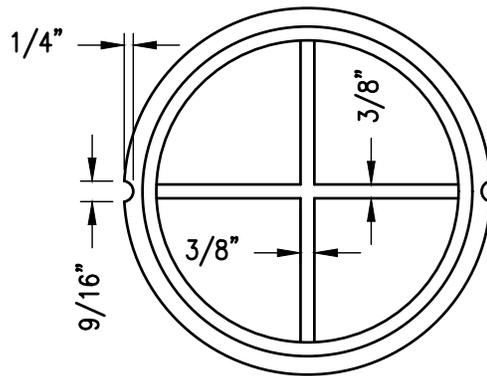
SANITARY SEWER STANDARDS AND SPECIFICATIONS

COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S1011



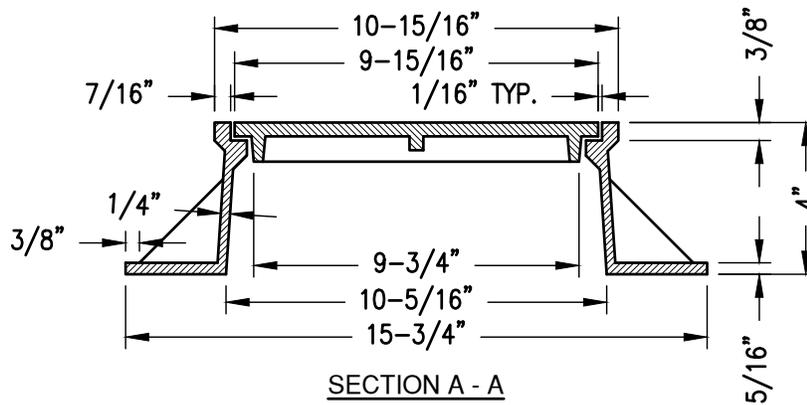
TOP VIEW



BOTTOM VIEW OF COVER

NOTES:

1. ALL GRAY IRON CASTINGS SHALL CONFORM TO ASTM A-48, CLASS 30 AND SHALL BE OF UNIFORM QUALITY.
2. ALL CASTING DIMENSIONS SHALL HAVE A TOLERANCE OF 1/8"±.
3. ALL CASTINGS SHALL BE CLEANED BY SHOT BLASTING AND HAND CHIPPING USING STANDARD INDUSTRY PRACTICES PRIOR TO SHOP APPLICATION OF ASPHALTIC COATING, BY DIPPING.
4. AVERAGE WEIGHTS:
 FRAME: 23 LBS.
 COVER: 8 LBS.
 TOTAL: 31 LBS



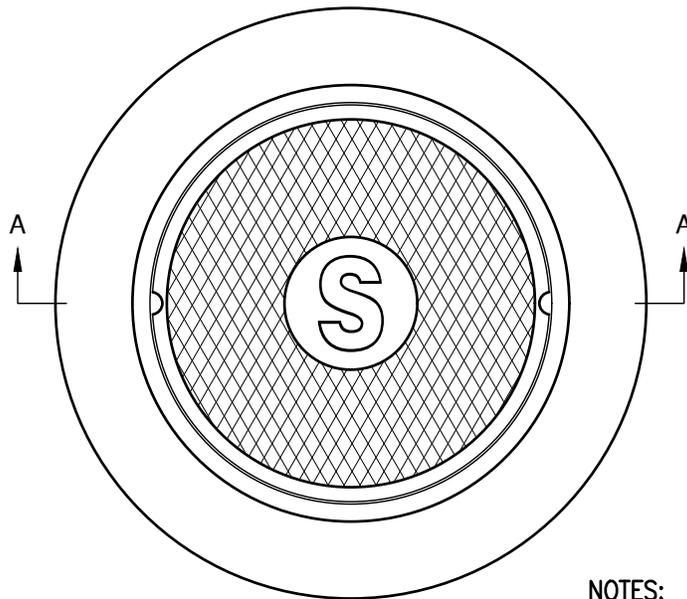
SECTION A - A

SANITARY CLEANOUT FRAME AND COVER

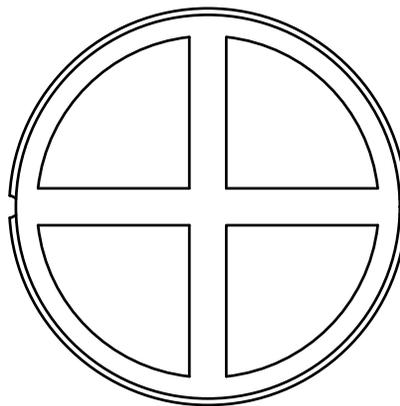


**SANITARY SEWER
STANDARDS AND SPECIFICATIONS**
COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S1012



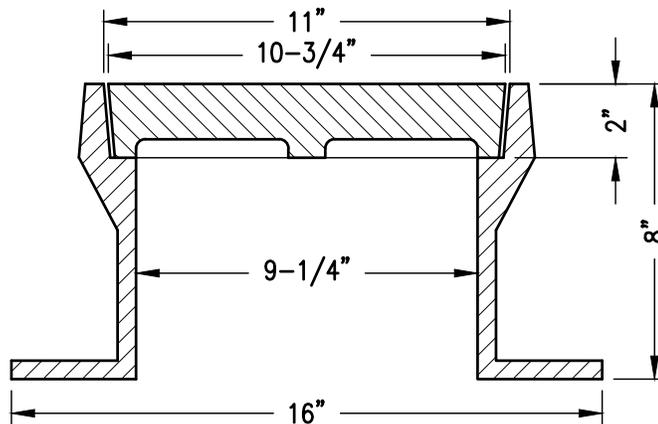
TOP VIEW



BOTTOM VIEW OF COVER

NOTES:

1. ALL GRAY IRON CASTINGS SHALL CONFORM TO ASTM A-48, CLASS 30 AND SHALL BE OF UNIFORM QUALITY.
2. ALL CASTING DIMENSIONS SHALL HAVE A TOLERANCE OF $1/8'' \pm$.
3. ALL CASTINGS SHALL BE CLEANED BY SHOT BLASTING AND HAND CHIPPING USING STANDARD INDUSTRY PRACTICES PRIOR TO SHOP APPLICATION OF ASPHALTIC COATING, BY DIPPING.
4. FRAME AND COVER SHALL BE H-20 HIGHWAY LOAD RATED FOR PARKING LOTS, SHOPPING CENTERS ETC.



SECTION A - A

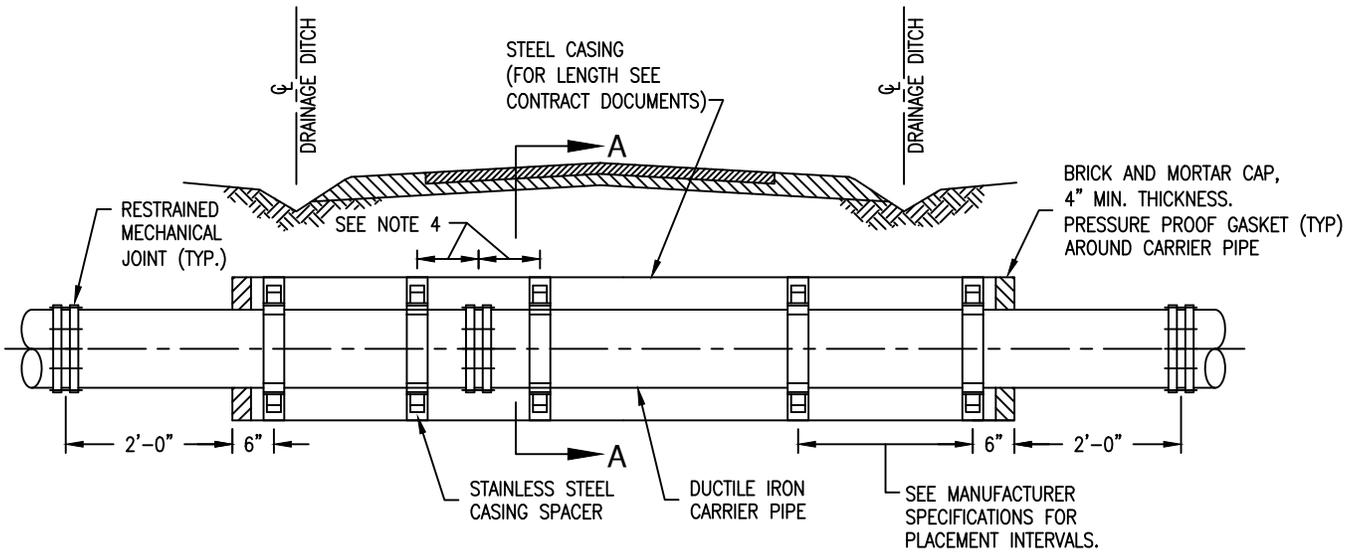
HEAVY DUTY CLEANOUT FRAME AND COVER



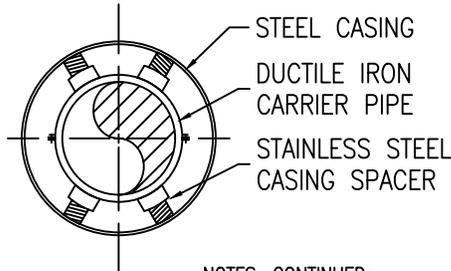
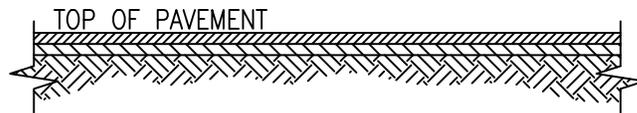
America's Future Since 1781

**SANITARY SEWER
STANDARDS AND SPECIFICATIONS
COUNTY OF YORK UTILITIES DIVISION**

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S1013



SECTION A - A



NOTES:

1. ANY VARIATION FROM TYPICAL CASING SIZE MUST BE APPROVED BY THE DIRECTOR.
2. STEEL CASING PIPE SHALL BE IN ACCORDANCE WITH ASTM A139, GRADE B, 35,000 psi MINIMUM YIELD STRENGTH, SEAMLESS, WITH BEVELED JOINTS SUITABLE FOR WELDING.
3. ALL CARRIER PIPE JOINTS INSIDE OF CASING AND ONE JOINT BEYOND SHALL BE RESTRAINED MECHANICAL JOINTS.
4. IN ALL INSTANCES SPACER SHOULD BE PLACED TO SUPPORT THE CARRIER PIPE WITHIN TWO FEET OF THE END OF EACH PIPE JOINT.
5. THE CASING DIAMETER SHALL BE AS INDICATED ON THE DRAWING AND WALL THICKNESS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF VDOT SECTION 232. IF CASING IS TO BE INSTALLED UNDER RAILROAD TRACKS, THE RAILROAD OWNER'S REQUIREMENTS OR AREA STANDARDS SHALL GOVERN.

NOTES, CONTINUED:

6. CASING SHALL EXTEND 5- FEET BEYOND EDGES OF PAVEMENT, UNLESS SHOWN OTHERWISE ON THE DRAWINGS.
7. FORCE MAIN CASING REQUIRES LEAK DETECTION PIPING.

STEEL CASING PIPE SELECTION CHART					
DUCTILE IRON PIPE SIZE	4"	6"	8"	12"	16"
STEEL CASING PIPE SIZE (O.D.)	12"	18"	18"	24"	30"

STEEL CASING DETAIL

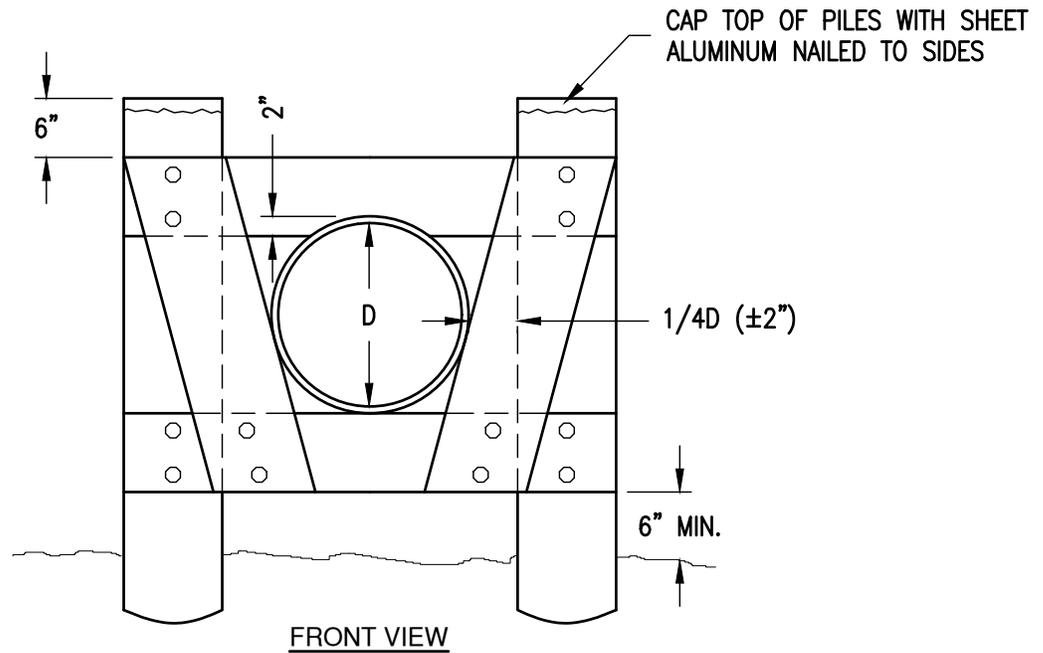
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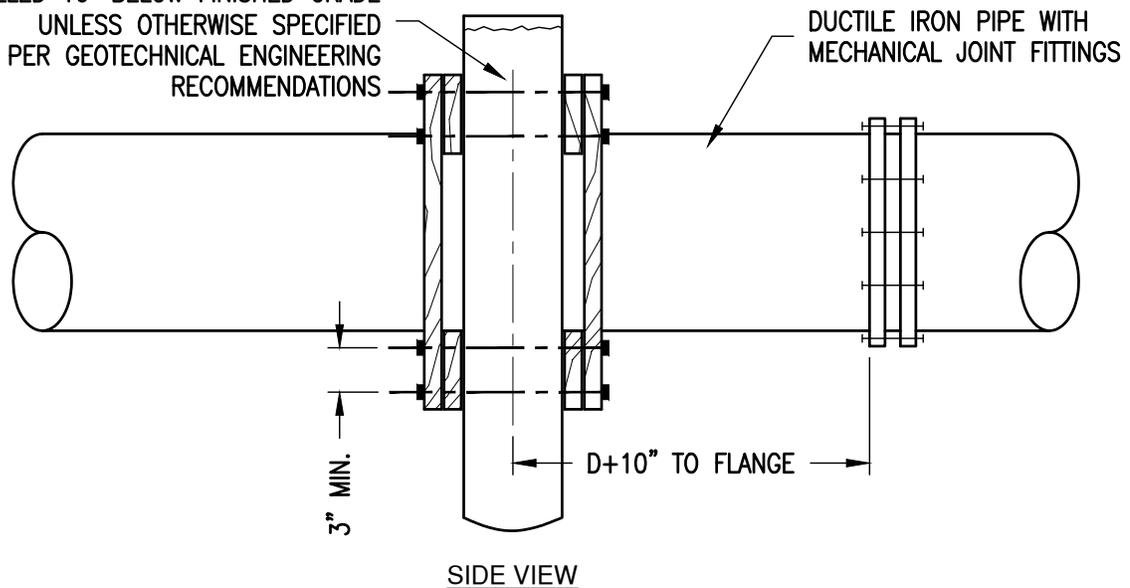
SANITARY SEWER STANDARDS AND SPECIFICATIONS

COUNTY OF YORK UTILITIES DIVISION

SCALE:
NOT TO SCALE
DATE APPROVED:
2016
DETAIL NO.
S1014



MINIMUM 8" DIAMETER SALT TREATED TIMBER
PILES INSTALLED 10' BELOW FINISHED GRADE
UNLESS OTHERWISE SPECIFIED
PER GEOTECHNICAL ENGINEERING
RECOMMENDATIONS



PILE BENT SUPPORT DETAIL

NOTES:

1. SUPPORTING MEMBERS AND BRACING SHALL BE PRESSURE TREATED 2" x 10" LUMBER CONFORMING TO ASTM D-1760.
2. BOLTS SHALL BE 3/4" GALVANIZED WITH O.G. GALVANIZED WASHERS.
3. PILE SPACING SHALL BE AS SPECIFIED BY THE DESIGNER AND APPROVED BY THE COUNTY OF YORK.
4. FORCE MAIN PIPING SHALL BE INSULATED W/MIN. 3" INSULATION AND WRAPPED IN 20 GAUGE METALLIC CASING.



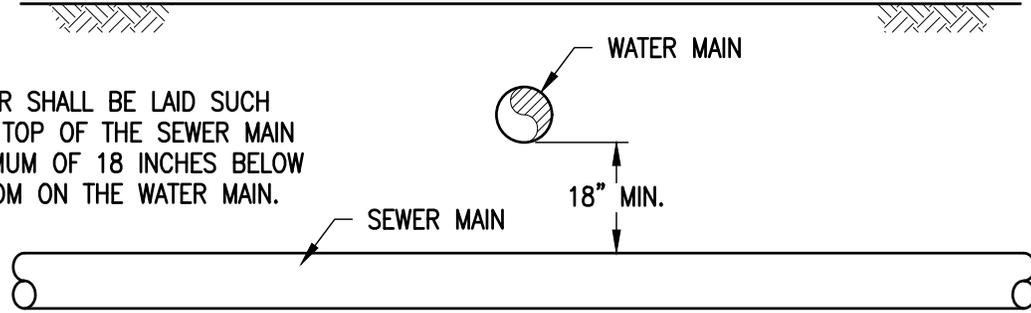
SANITARY SEWER STANDARDS AND SPECIFICATIONS

COUNTY OF YORK UTILITIES DIVISION

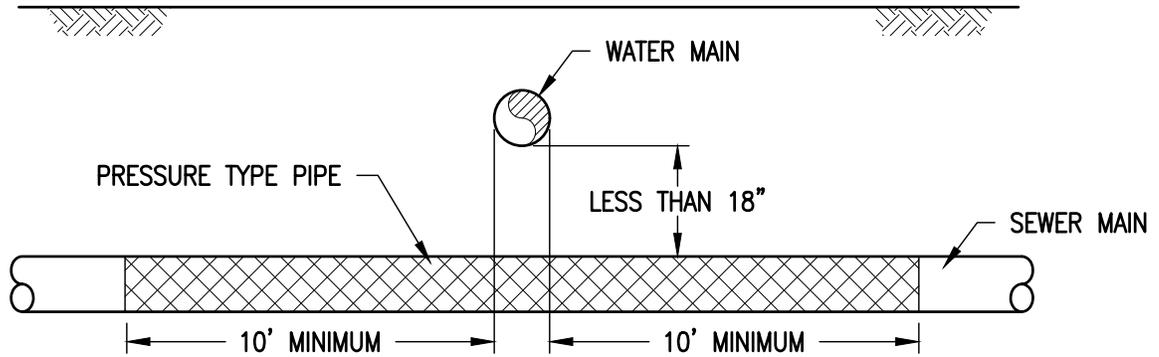
SCALE:
NOT TO SCALE
DATE APPROVED:
2016
DETAIL NO.
S1015

NOTES:

1. THE SEWER SHALL BE LAID SUCH THAT THE TOP OF THE SEWER MAIN IS A MINIMUM OF 18 INCHES BELOW THE BOTTOM ON THE WATER MAIN.



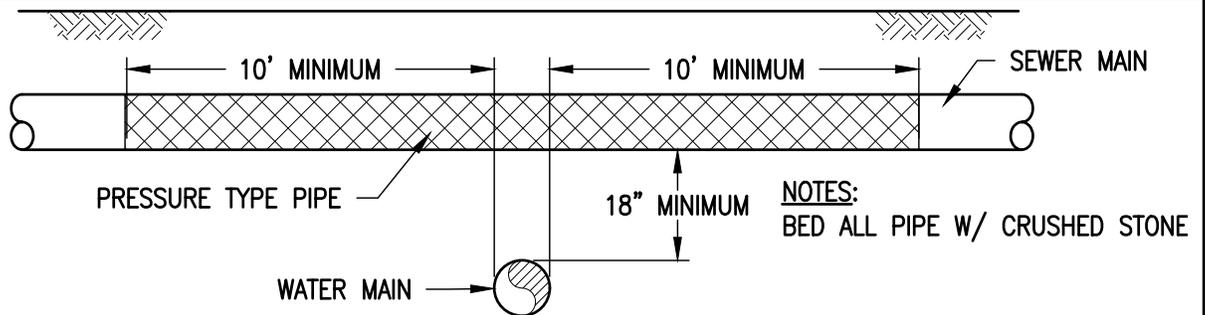
TYPICAL INSTALLATION
(SEWER MAIN CROSSING UNDER WATER MAIN)



INSTALLATION WHERE VERTICAL SEPARATION IS LESS THAN 18"
(USED ONLY WHEN LOCAL CONDITIONS PREVENT TYPICAL INSTALLATION)

NOTES:

1. THE SEWER MAIN SHALL BE CONSTRUCTED FROM A FULL LENGTH SECTION OF AWWA SPECIFIED PRESSURE TYPE PIPE HAVING MECHANICAL OR APPROVED SLIP TYPE JOINTS FOR A MINIMUM OF 10 FEET ON EACH SIDE OF THE WATER MAIN.
2. THE PRESSURE TYPE PIPE SECTION OF SEWER MAIN MUST BE PRESSURE TESTED IN PLACE TO 50 PSI PRIOR TO BACKFILLING.
3. ONE FULL LENGTH OF WATER MAIN SHOULD BE CENTERED AT THE SEWER MAIN SO THAT THE JOINTS IN THE WATER MAIN WILL BE AS FAR AS POSSIBLE FROM THE SEWER MAIN.



SEWER MAIN CROSSING ABOVE WATER MAIN

(USED ONLY WHEN LOCAL CONDITIONS PREVENT TYPICAL INSTALLATION)

NOTES:

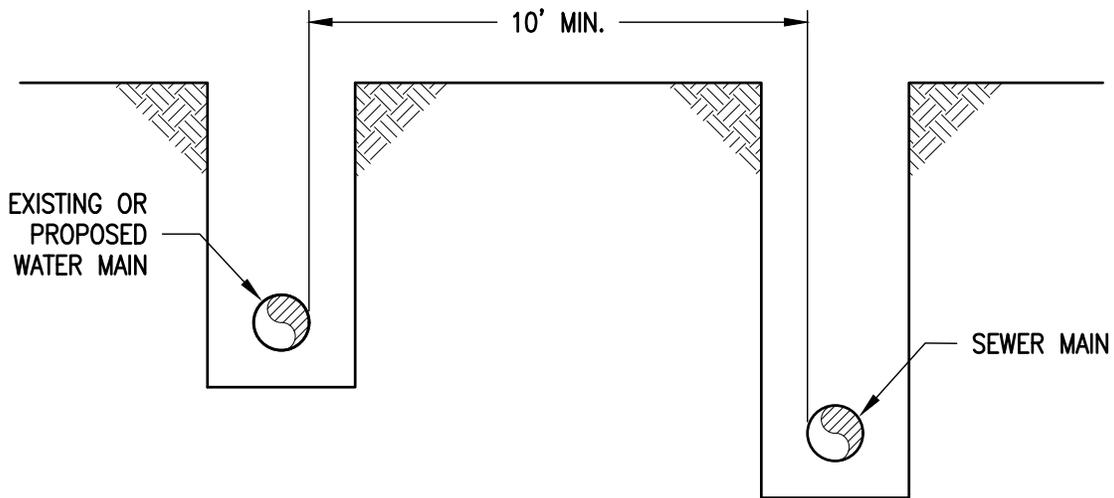
- 1-3. SAME AS ABOVE.
4. THE CROSSING SHALL HAVE ADEQUATE STRUCTURAL SUPPORT TO PREVENT DAMAGE TO WATER MAIN.

WATER-SEWER CROSSING SEPARATION DETAIL



**SANITARY SEWER
STANDARDS AND SPECIFICATIONS**
COUNTY OF YORK UTILITIES DIVISION

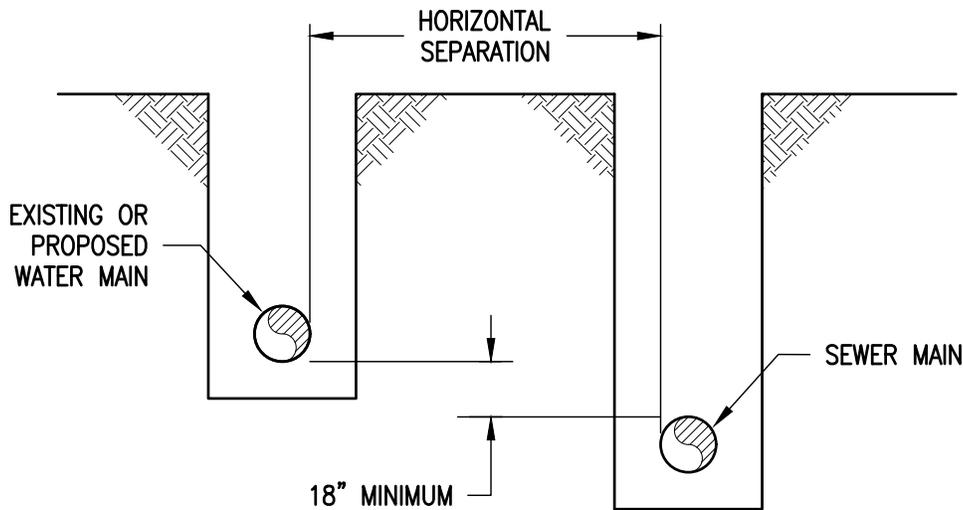
SCALE: NOT TO SCALE
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DETAIL NO. S1016



TYPICAL INSTALLATION
(MINIMUM 10' HORIZONTAL SEPARATION)

NOTES:

1. THERE ARE NO VERTICAL SEPARATION REQUIREMENTS WHEN HORIZONTAL SEPARATION IS 10' OR GREATER.



INSTALLATION WHERE HORIZONTAL SEPARATION IS LESS THAN 10'
(USED ONLY WHEN LOCAL CONDITIONS PREVENT TYPICAL INSTALLATION)

NOTES:

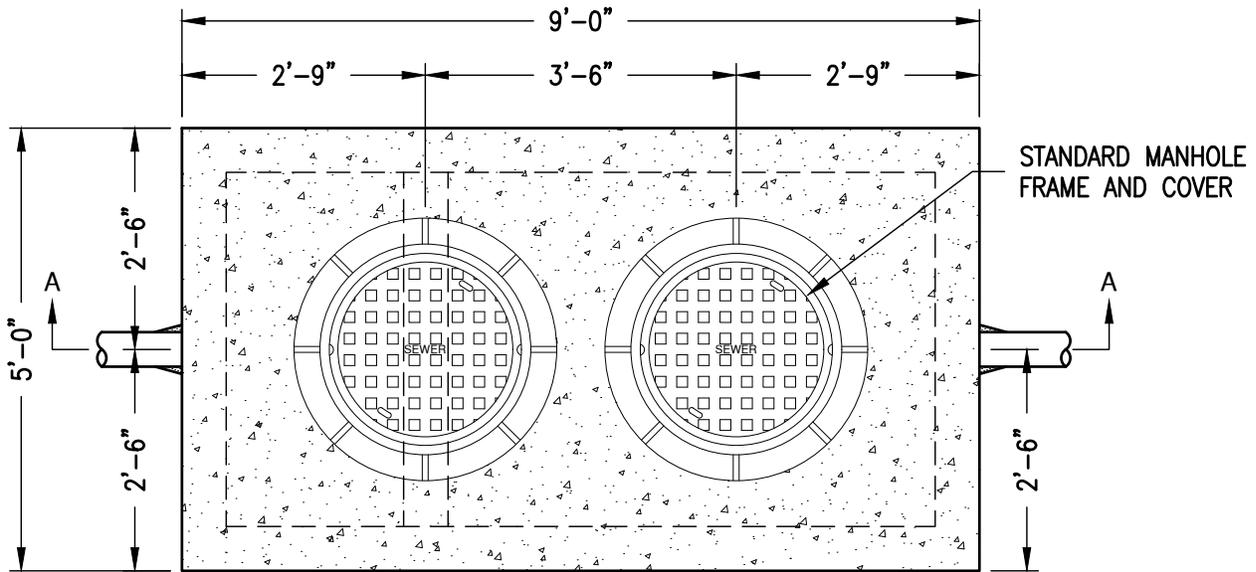
1. THE SEWER MUST BE LAID IN A SEPARATE TRENCH FROM THE WATER.
2. THE TOP OF THE SEWER MAIN MUST BE A MINIMUM OF 18" BELOW THE BOTTOM OF THE WATER MAIN.
3. WHERE THE MINIMUM 18" SEPARATION CANNOT BE OBTAINED, THE SEWER SHALL BE CONSTRUCTED OF PRESSURE TYPE PIPE AND SHALL BE PRESSURE TESTED IN PLACE TO 50 PSI PRIOR TO BACKFILLING.

WATER-SEWER MAIN SEPARATION DETAIL

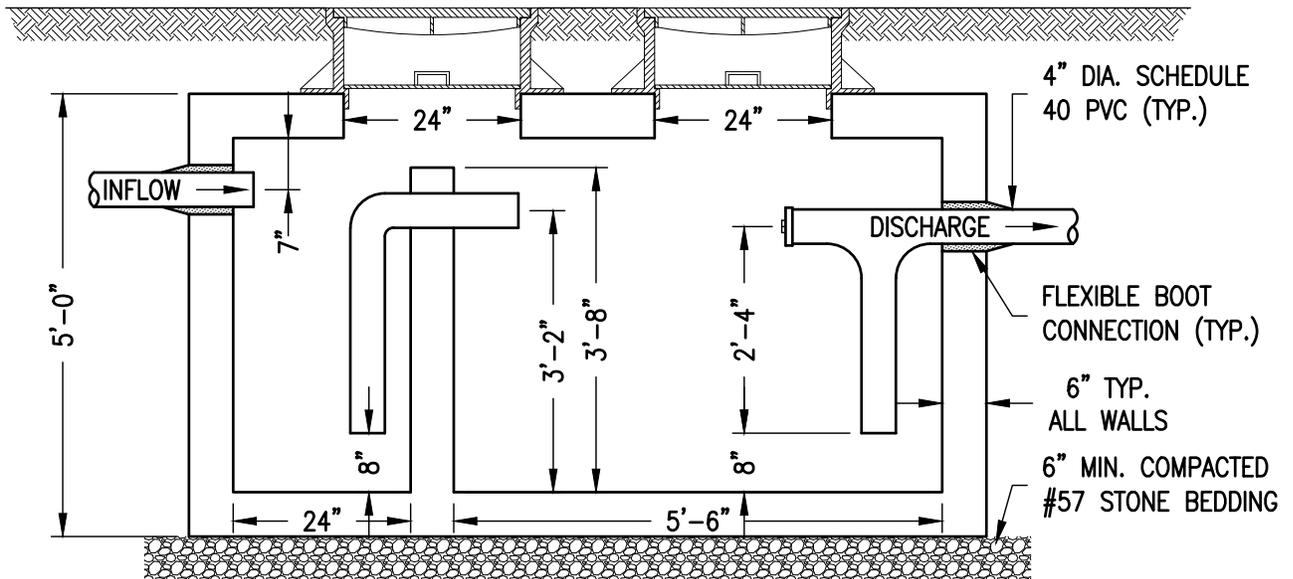


**SANITARY SEWER
STANDARDS AND SPECIFICATIONS**
COUNTY OF YORK UTILITIES DIVISION

SCALE:
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DETAIL NO.
S1017



TOP VIEW



SECTION A - A

TYPICAL GREASE TRAP/OIL-WATER SEPARATOR

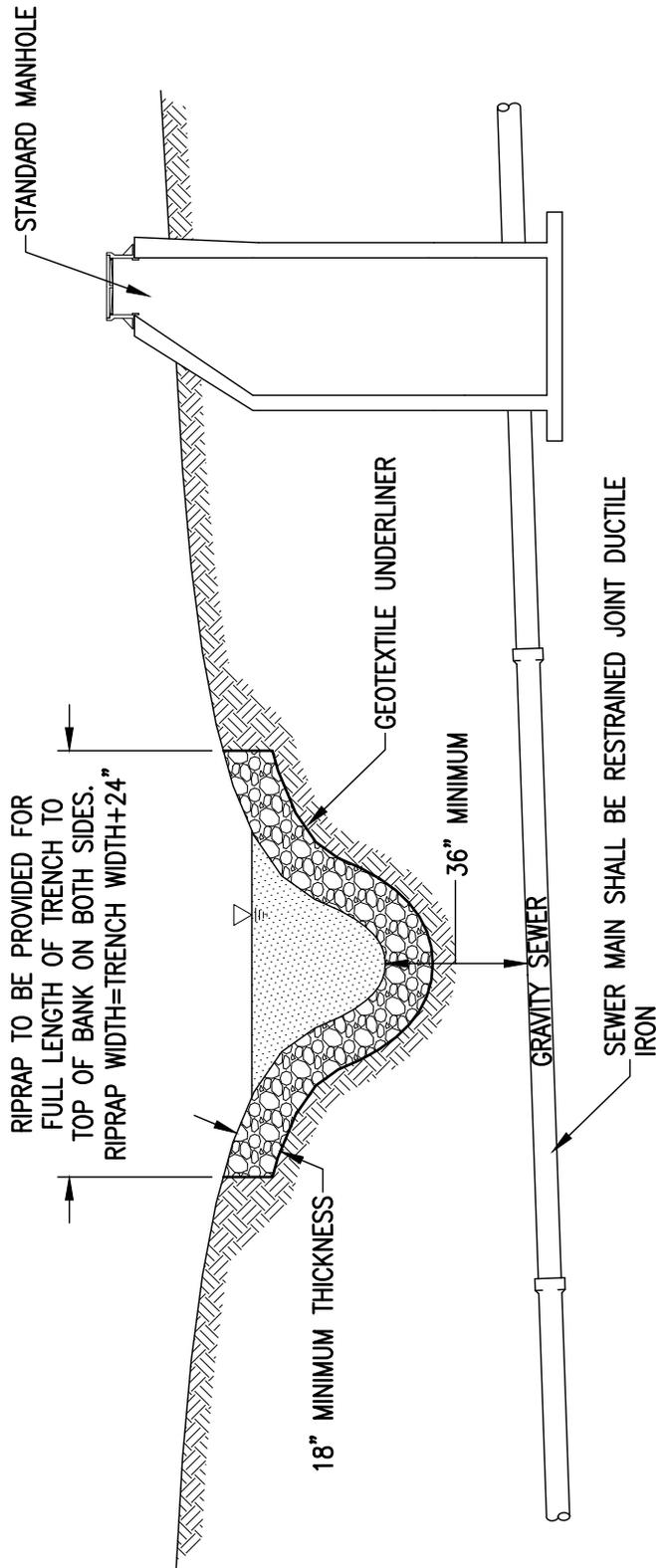
NOTES:

1. THE PRECAST CONCRETE TANK SHALL CONFORM TO ASTM C-858.
2. THE TANK SHALL MEET H2O LOAD REQUIREMENTS IF LOCATED IN TRAFFIC AREAS.
3. DIMENSIONS WILL VARY BETWEEN MANUFACTURERS. SIZE WILL VARY DEPENDING ON HEALTH DEPARTMENT REQUIREMENTS.



**SANITARY SEWER
STANDARDS AND SPECIFICATIONS**
COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
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TYPICAL STREAM CROSSING

NOTES:

1. RIPRAP SHALL BE CLASS A-1 FOR STREAM SLOPES UP TO 1.00% AND CLASS I FOR STREAM SLOPES GREATER THAN 1.00%. REFER TO THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK FOR RIPRAP STONE REQUIREMENTS.
2. A MINIMUM OF 3FT OF CASING NEEDED AROUND SEWER MAIN BEYOND THE TOP OF BANK OF EACH SIDE OF THE STREAM.



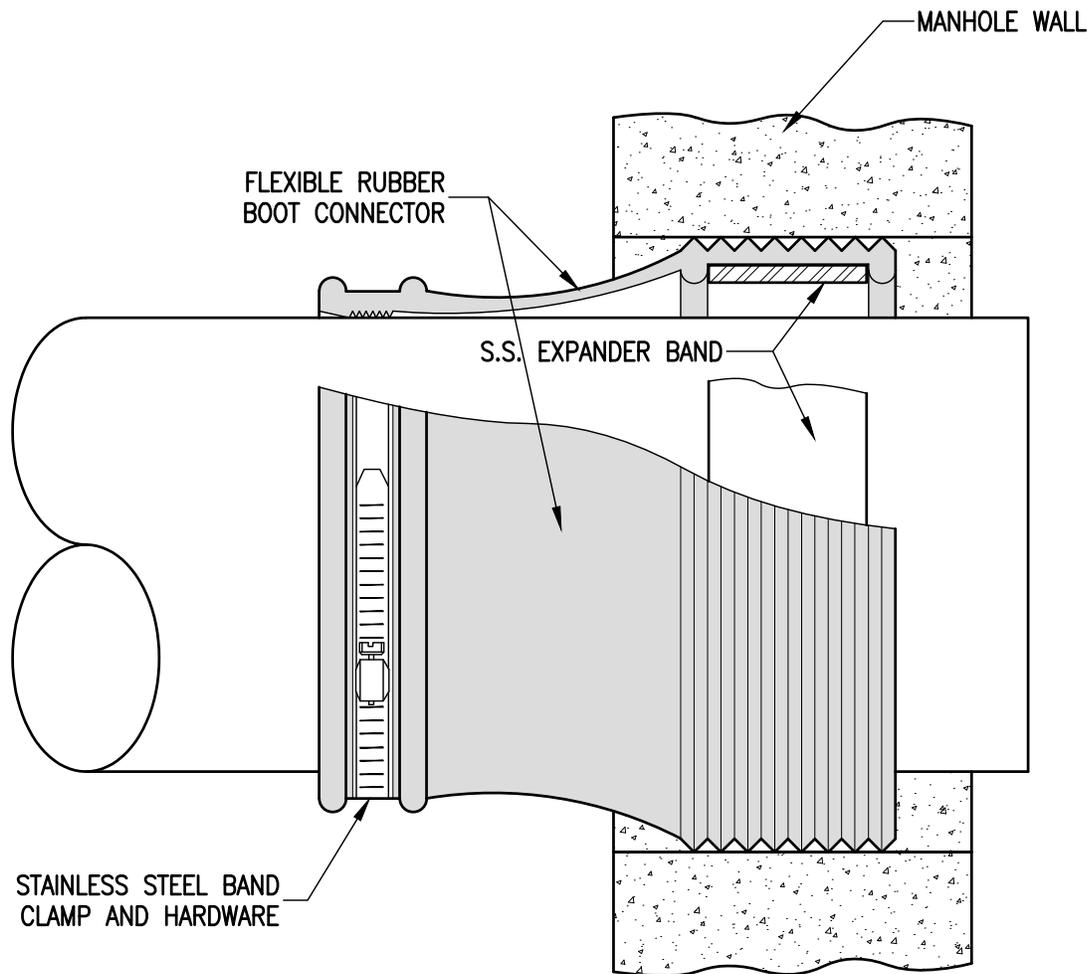
SANITARY SEWER STANDARDS AND SPECIFICATIONS

COUNTY OF YORK UTILITIES DIVISION

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2016

DETAIL NO.
S1020



STANDARD FLEXIBLE BOOT CONNECTION

NOTES:

1. BOOT SHALL BE INSTALLED FOLLOWING MANUFACTURERS RECOMMENDATIONS.
2. PIPE CONNECTION SHALL BE FLEXIBLE RUBBER PIPE TO MANHOLE CONNECTIONS OF THE LOCKED-IN FACTORY ASSEMBLED RUBBER RING TYPE UTILIZING A S.S. BAND AS MANUFACTURED NPC, INC. (KOR-N-SEAL) OR PRESS-SEAL GASKET CORP. (PSX OR PRESS BOOT) GASKET ADJUSTABLE RING. THE RESILIENT FLEXIBLE MANHOLE CONNECTOR SHALL CONFORM TO ASTM C443 AND ASTM C923 AND THE STAINLESS STEEL BAND SHALL BE TOTALLY NON-MAGNETIC SERIES 304 S.S.. OTHER FLEXIBLE CONNECTORS MUST BE APPROVED BY THE OWNER.

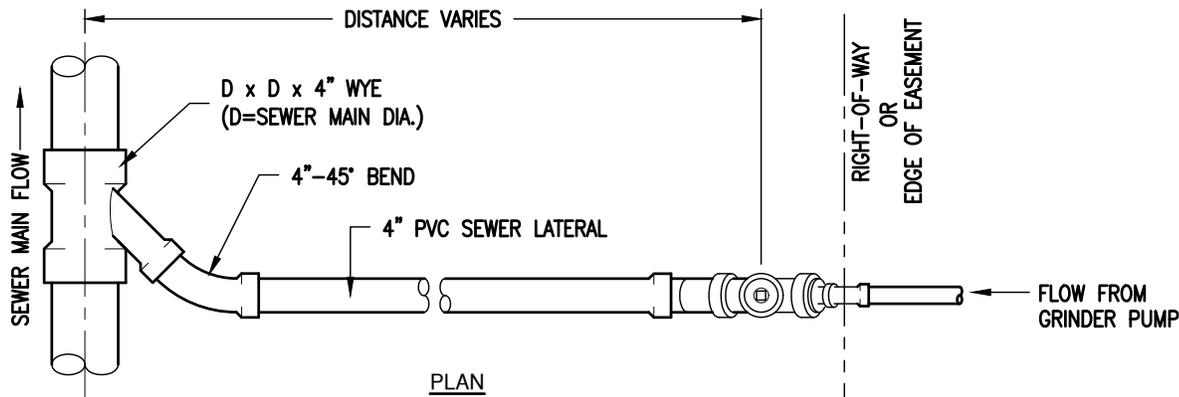


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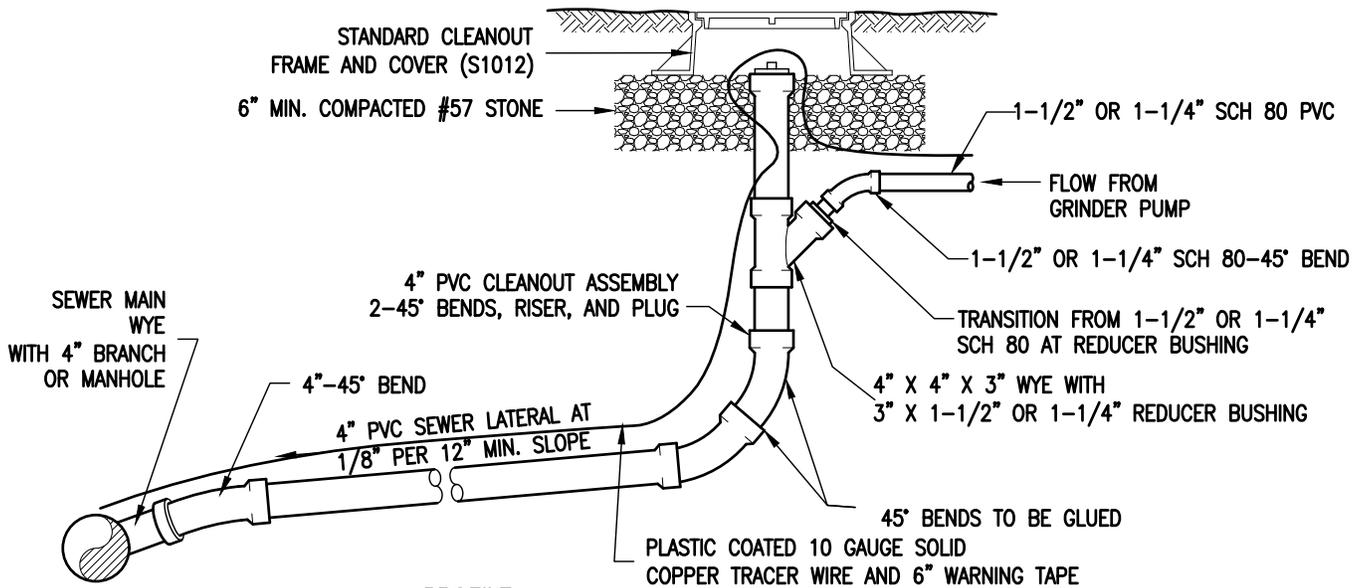
SANITARY SEWER STANDARDS AND SPECIFICATIONS

COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S1021



PLAN



PROFILE

LOW PRESSURE GRINDER PUMP FORCE MAIN CONNECTION TO GRAVITY SEWER

NOTES:

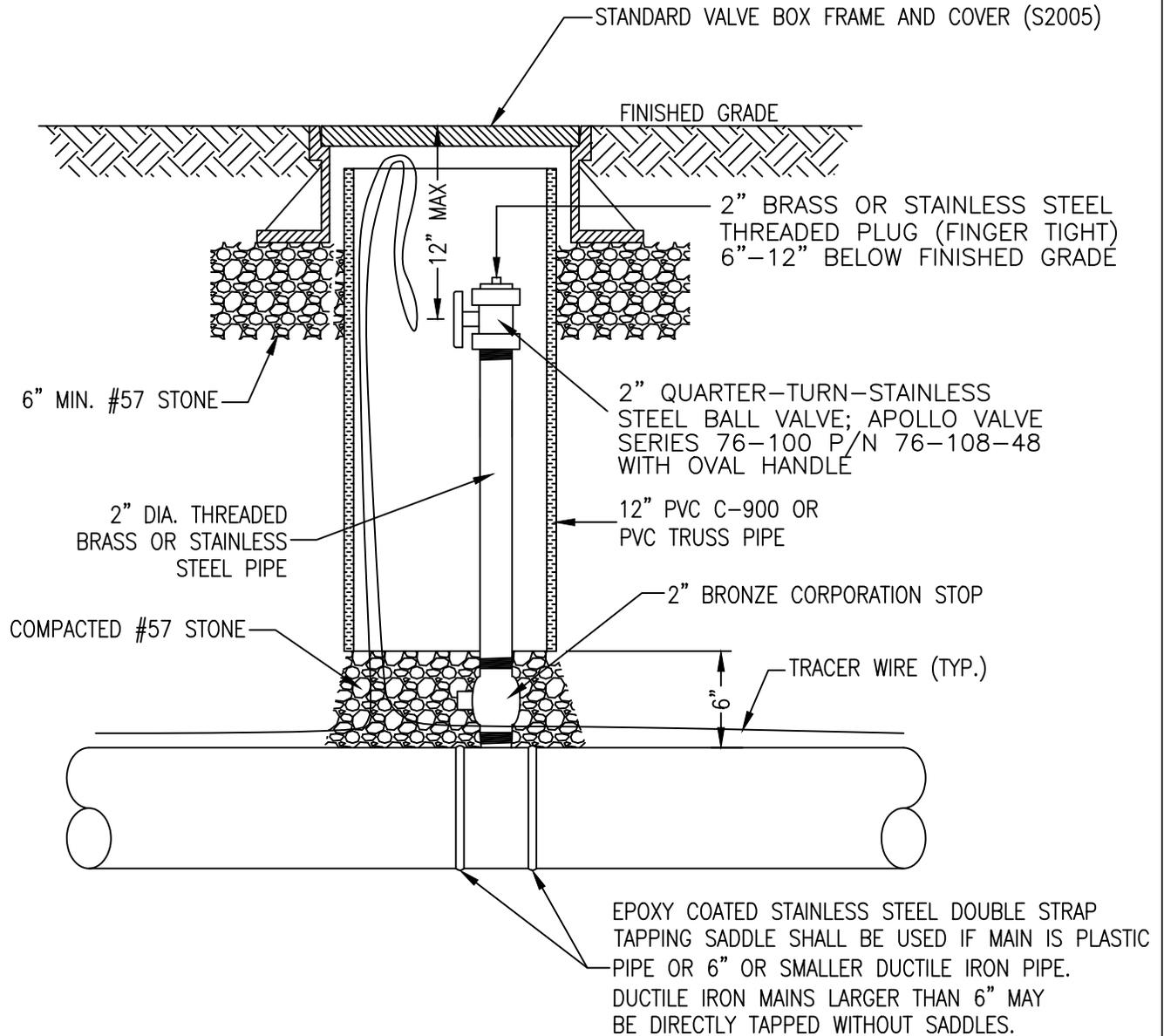
1. SEWER SERVICE LATERAL PIPING AND FITTINGS SHALL BE SDR 26 OR SCH40 PVC WHICH CONFORMS TO ASTM D-3034, UNLESS DEPTH DICTATES OTHERWISE.
2. EACH CLEANOUT SHALL BE FITTED WITH STANDARD CLEANOUT FRAME AND COVER.
3. NO BENDS GREATER THAN 45° SHALL BE USED IN SERVICE LATERAL CONSTRUCTION.
4. PLASTIC COATED 10 GAUGE SOLID COPPER TRACER WIRE AND 6" WARNING TAPE SHALL BE INSTALLED ON LATERAL AND FORCE MAIN.
5. ALL PIPE SHALL BE BEDDED WITH #57 STONE.



SANITARY SEWER STANDARDS AND SPECIFICATIONS

COUNTY OF YORK UTILITIES DIVISION

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TYPICAL MANUAL AIR RELIEF VALVE

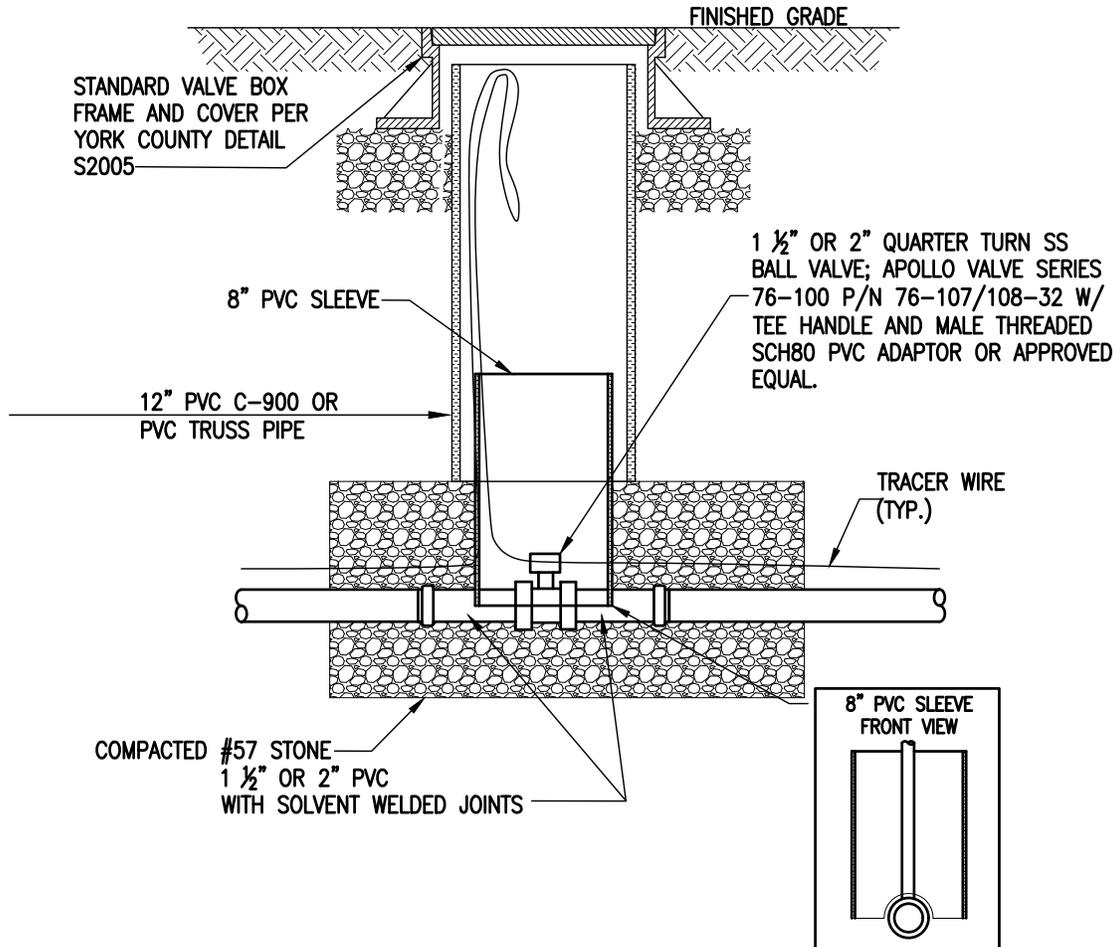
NOTES:

1. PLASTIC COATED 10 GAUGE SOLID COPPER TRACER WIRE SHALL BE ATTACHED TO PLASTIC PIPE WITH PLASTIC STRAPPING EVERY 10 FEET OF LENGTH. WIRE SHALL EXTEND 24" ABOVE FINISHED GRADE AND BE COILED INTO THE VALVE BOX.



**SANITARY SEWER
STANDARDS AND SPECIFICATIONS
COUNTY OF YORK UTILITIES DIVISION**

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S2001



NOTES:

1. PIPE AND FITTING SHALL BE SCHEDULE 80 PVC CONFORMING TO ASTM D-1785 & D-2467 UNLESS OTHERWISE NOTED.
2. PLASTIC COATED 10 GAUGE SOLID COPPER TRACER WIRE SHALL BE ATTACHED TO PLASTIC PIPE WITH PLASTIC STRAPPING EVERY 10 FEET OF LENGTH. WIRE SHALL EXTEND 24" ABOVE FINISHED GRADE AND BE COILED INTO THE VALVE BOX.

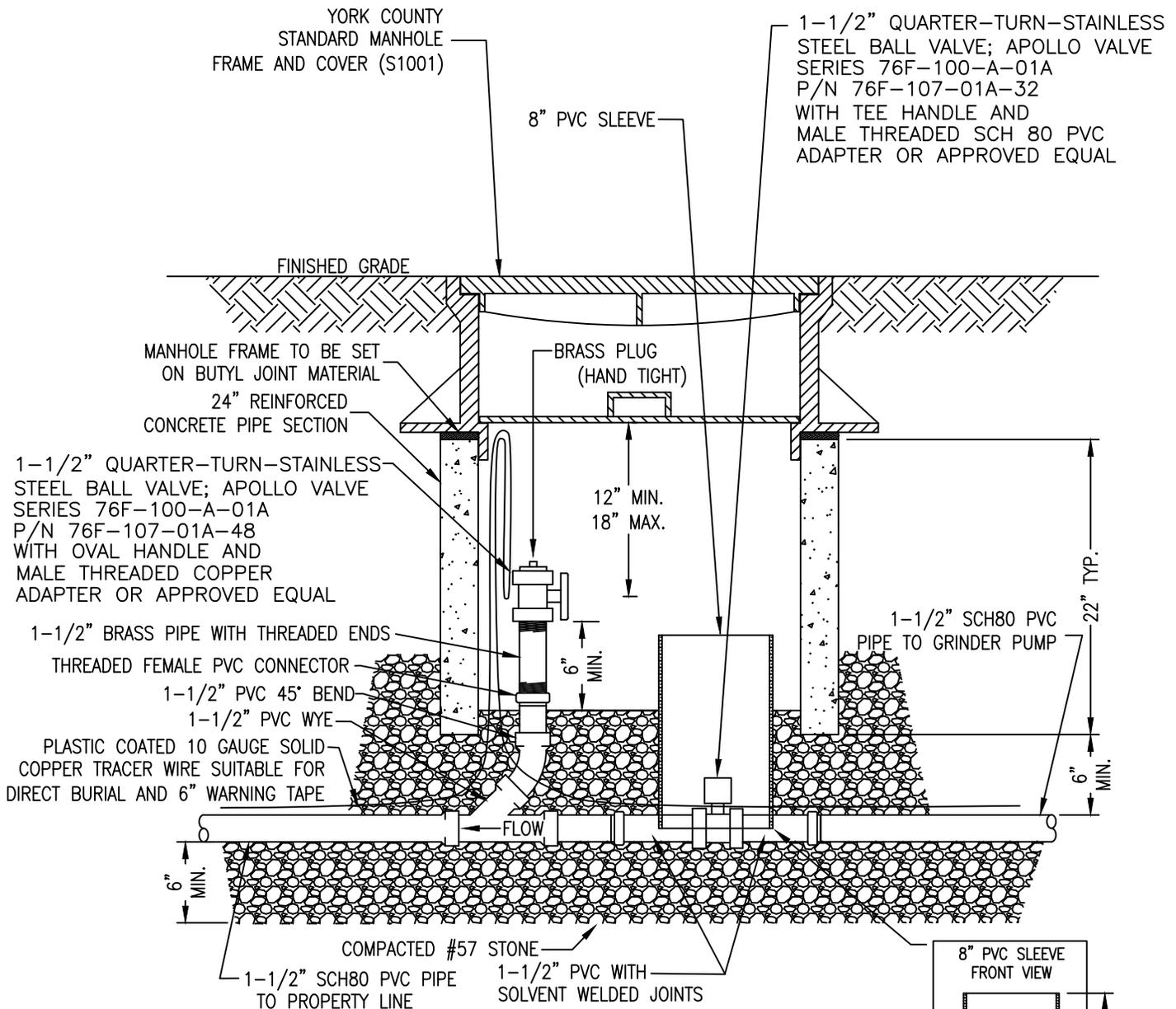
LOW PRESSURE FORCE MAIN VALVE

NOT TO SCALE



**SANITARY SEWER
STANDARDS AND SPECIFICATIONS
COUNTY OF YORK UTILITIES DIVISION**

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S2002

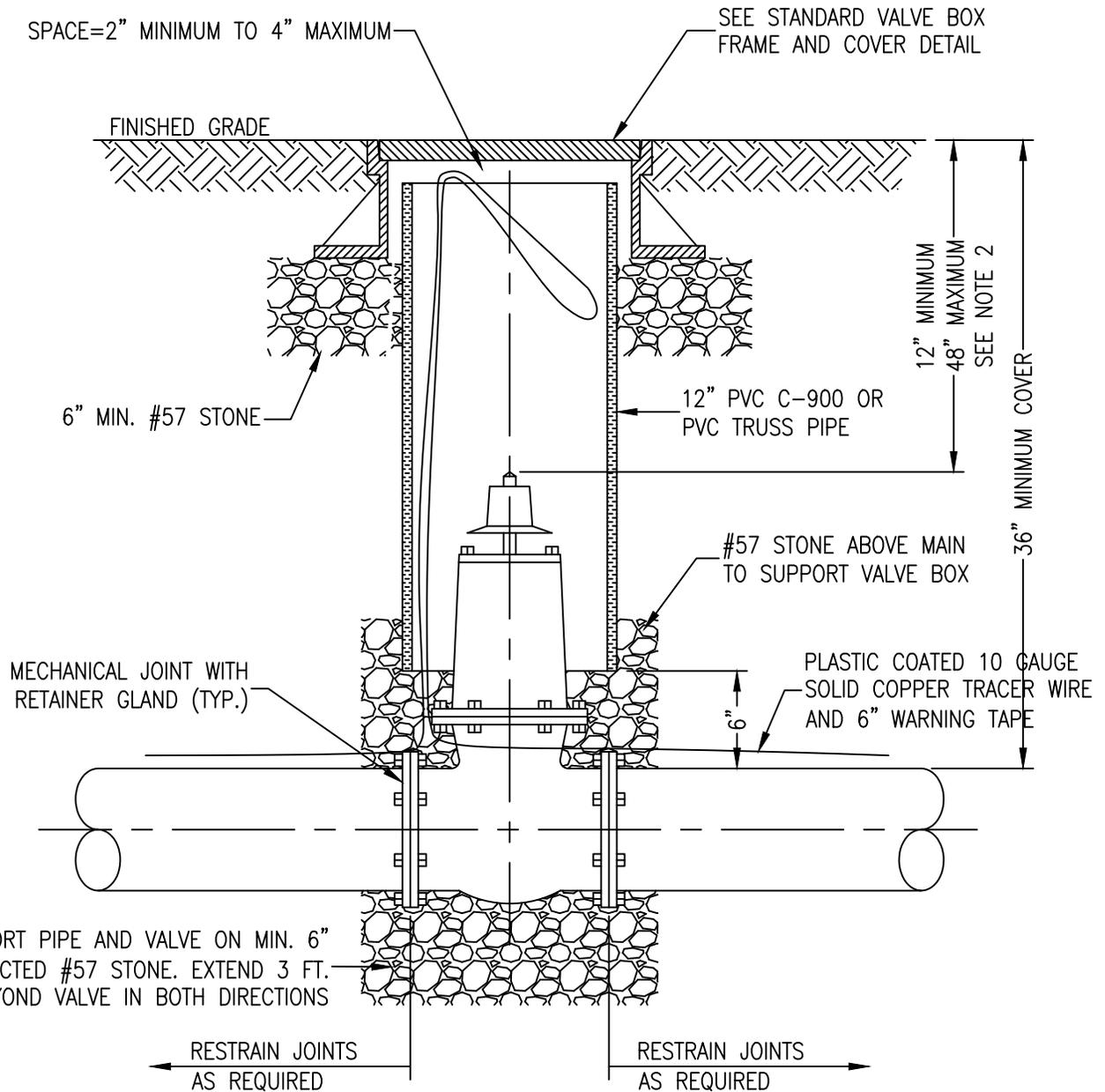


*SR- STEEL RE-INFORCED

GRINDER FORCE MAIN CLEANOUT AND VALVE VAULT

NOTES:

1. PIPE AND FITTINGS SHALL BE SCHEDULE 80 PVC CONFORMING TO ASTM D-1785 & D-2467 UNLESS OTHERWISE NOTED.
2. PLASTIC COATED 10 GAUGE SOLID COPPER TRACER WIRE SHALL BE ATTACHED TO PLASTIC PIPE WITH PLASTIC STRAPPING EVERY 10 FEET OF LENGTH. WIRE SHALL BE LOOPED THROUGH THE VALVE VAULT, EXTEND 24" ABOVE FINISHED GRADE AND BE COILED BACK INTO VALVE VAULT.
3. ALL FITTINGS, VALVES, AND PIPES ARE NOT LIMITED TO 1.5", THEY SHOULD BE A MIN. OF 1.5"



TYPICAL VALVE SETTING DETAIL

NOTES:

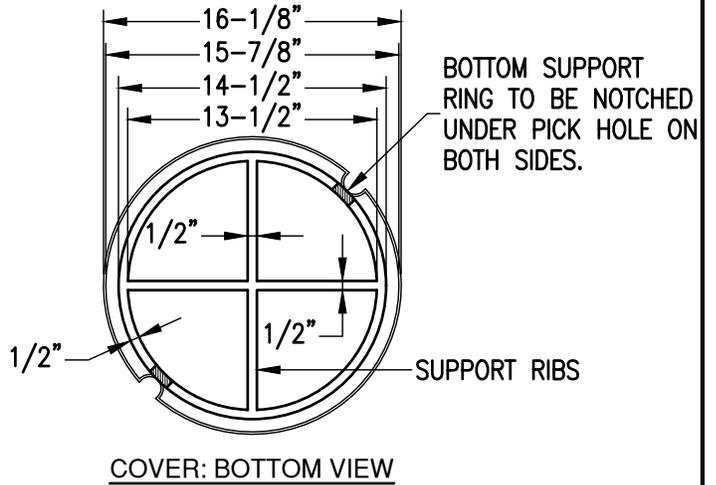
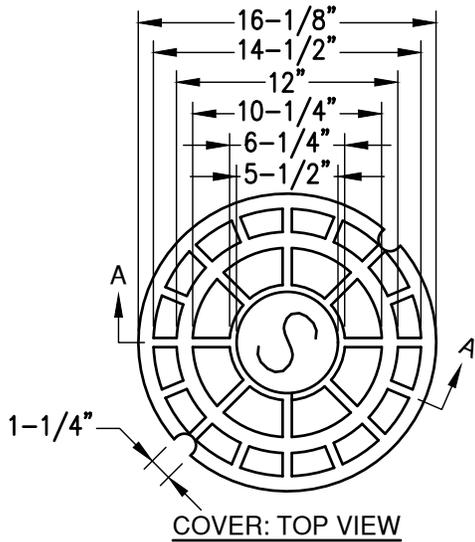
1. PLASTIC COATED 10 GAUGE SOLID COPPER TRACER WIRE SHALL BE ATTACHED TO PLASTIC PIPE WITH PLASTIC STRAPPING EVERY 10 FEET OF LENGTH. WIRE SHALL EXTEND 24" ABOVE FINISHED GRADE AND BE COILED INTO THE VALVE BOX.
2. OPERATING NUT SHALL BE 12"-24" BELOW THE TOP RIM OF THE VALVE BOX. IF OPERATING NUT IS GREATER THAN 36" BELOW TOP OF THE VALVE BOX FRAME, A VALVE STEM EXTENSION MAY BE INSTALLED.



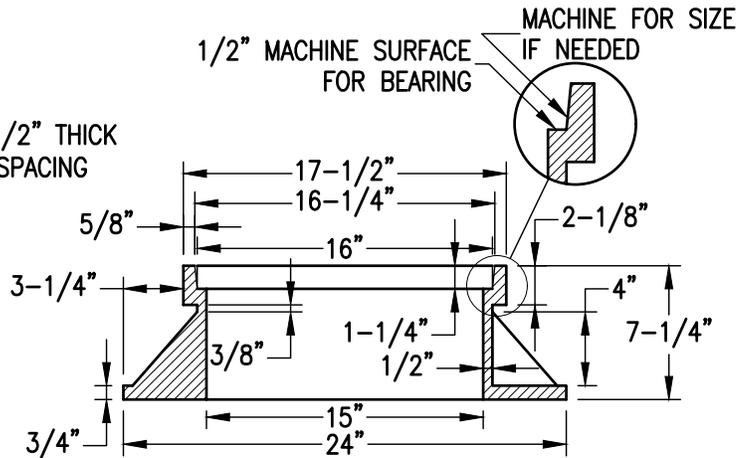
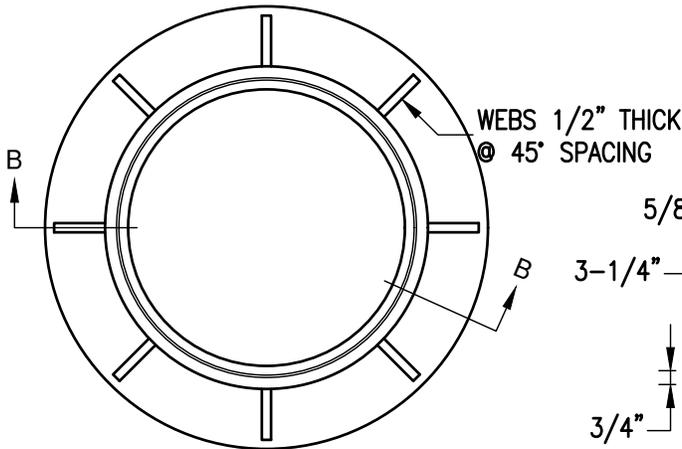
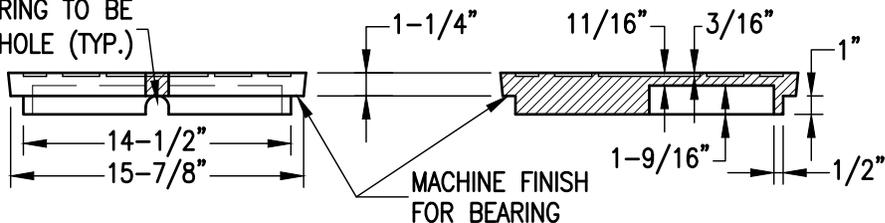
SANITARY SEWER STANDARDS AND SPECIFICATIONS

COUNTY OF YORK UTILITIES DIVISION

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DATE APPROVED: 2016
DETAIL NO. S2004



BOTTOM SUPPORT RING TO BE NOTCHED UNDER PICK HOLE (TYP.)



STANDARD VALVE BOX FRAME AND COVER

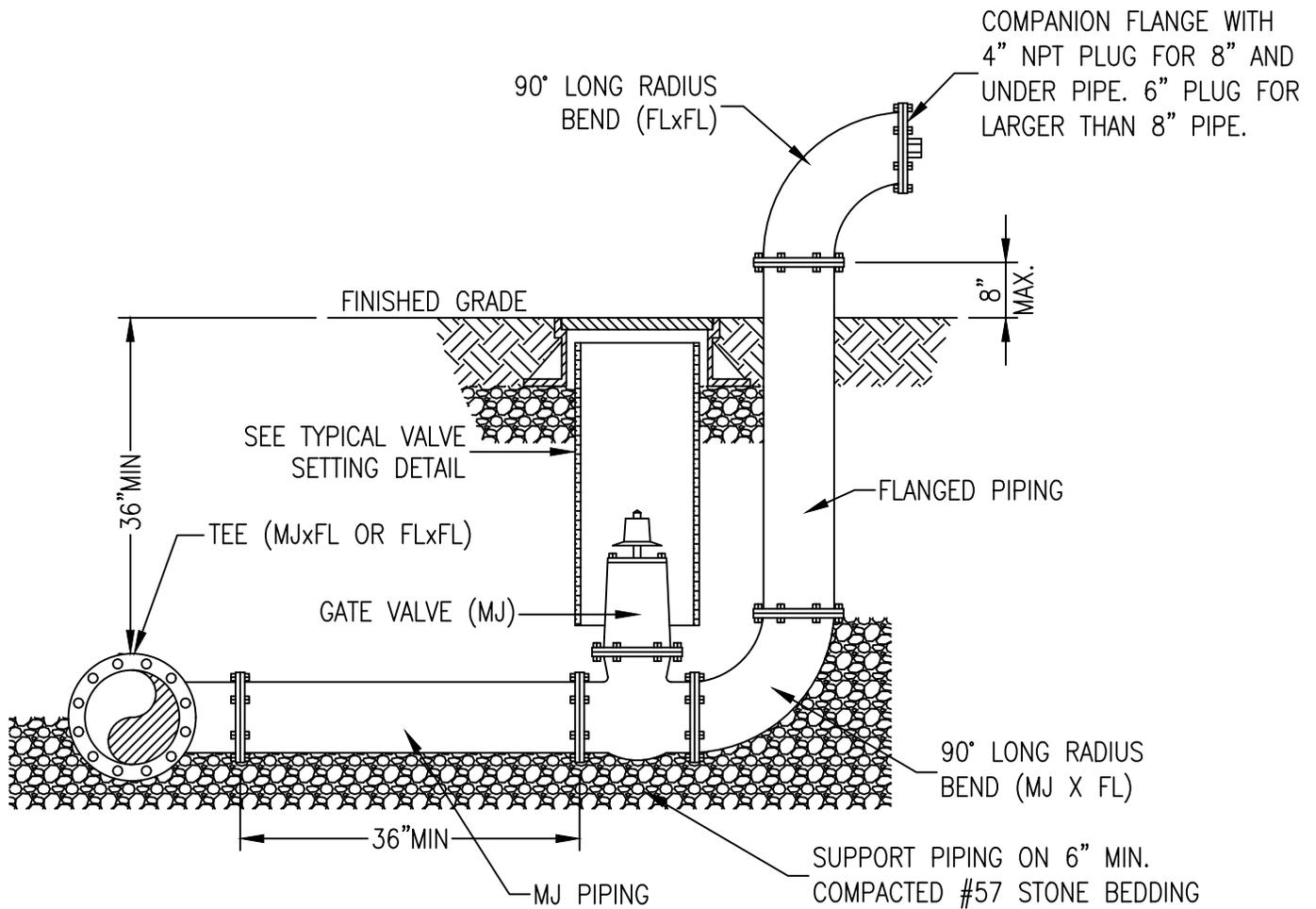
NOTES:

1. ALL GRAY IRON CASTINGS SHALL CONFORM TO ASTM A-48, CLASS 30 AND SHALL BE OF UNIFORM QUALITY.
2. ALL CASTING DIMENSIONS SHALL HAVE A TOLERANCE OF 1/8"±.
3. ALL CASTINGS SHALL BE CLEANED BY SHOT BLASTING AND HAND CHIPPING USING STANDARD INDUSTRY PRACTICES PRIOR TO SHOP APPLICATION OF ASPHALTIC COATING, BY DIPPING.



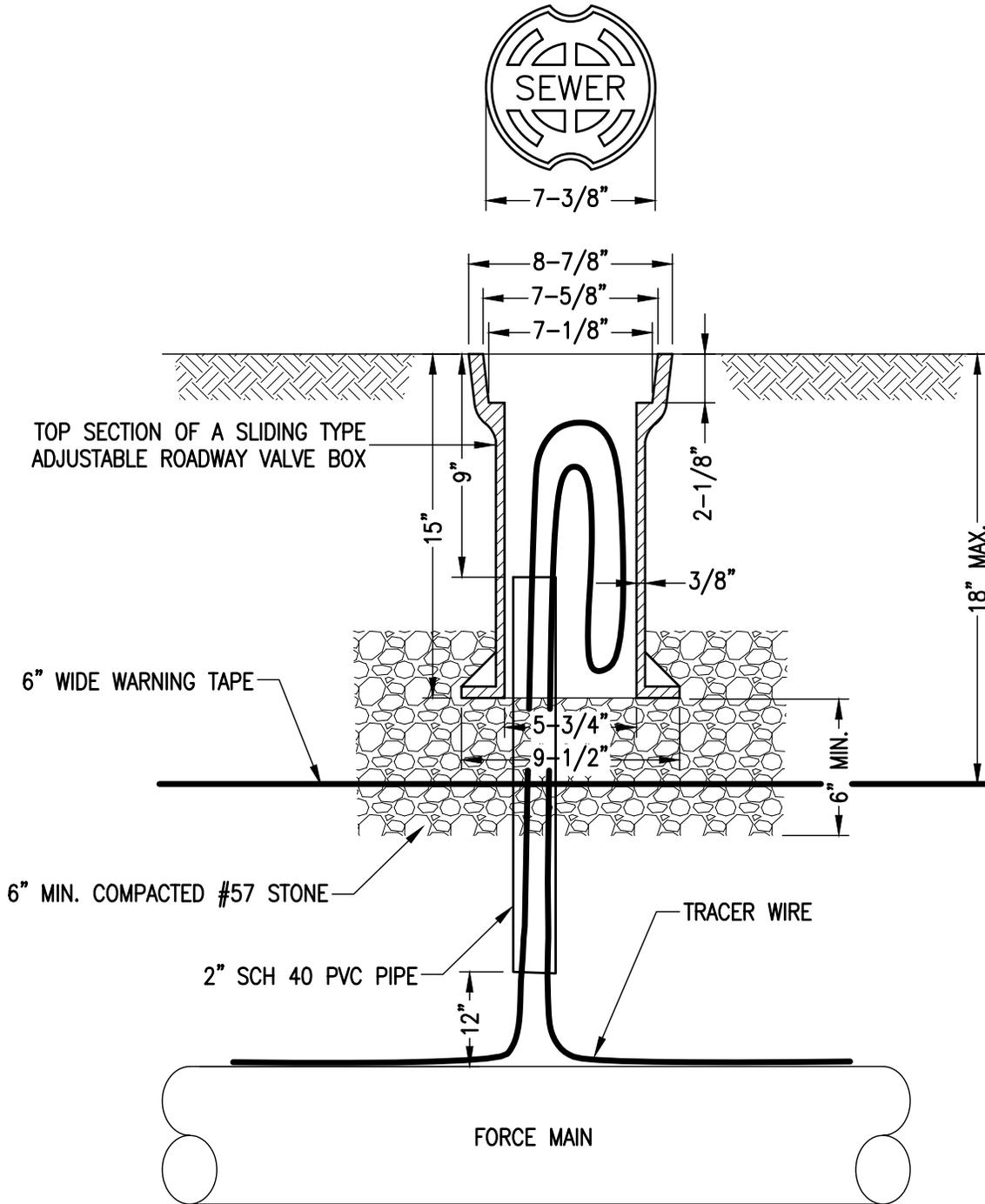
**SANITARY SEWER
STANDARDS AND SPECIFICATIONS**
COUNTY OF YORK UTILITIES DIVISION

SCALE:
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DATE APPROVED:
2016
DETAIL NO.
S2005



ALL PIPE HARDWARE FROM THE TEE TO THE END TO BE SERIES 316 STAINLESS STEEL

EMERGENCY PUMP CONNECTION



TYPICAL TRACER WIRE BOX INSTALLATION

NOTES:

1. UNDERGROUND WARNING TAPE SHALL BE PRINTED POLYETHYLENE TAPE, MAGNETIC, SIX INCHES WIDE, COLOR CODED, ONE INCH MINIMUM LETTERING, PRINTED WITH THE NAME OF THE UTILITY BURIED BELOW, AND SUITABLE FOR INSTALLATION IN ALL SOIL TYPES.
2. TRACER WIRE SHALL BE PLASTIC COATED 10 GAUGE SOLID COPPER ATTACHED TO PLASTIC PIPE WITH PLASTIC STRAPPING EVERY 10 FEET OF LENGTH. WIRE SHALL BE LOOPED THROUGH THE VALVE VAULT AND EXTEND 24 INCHES ABOVE FINISHED GRADE AND COILED BACK INTO THE VALVE VAULT.



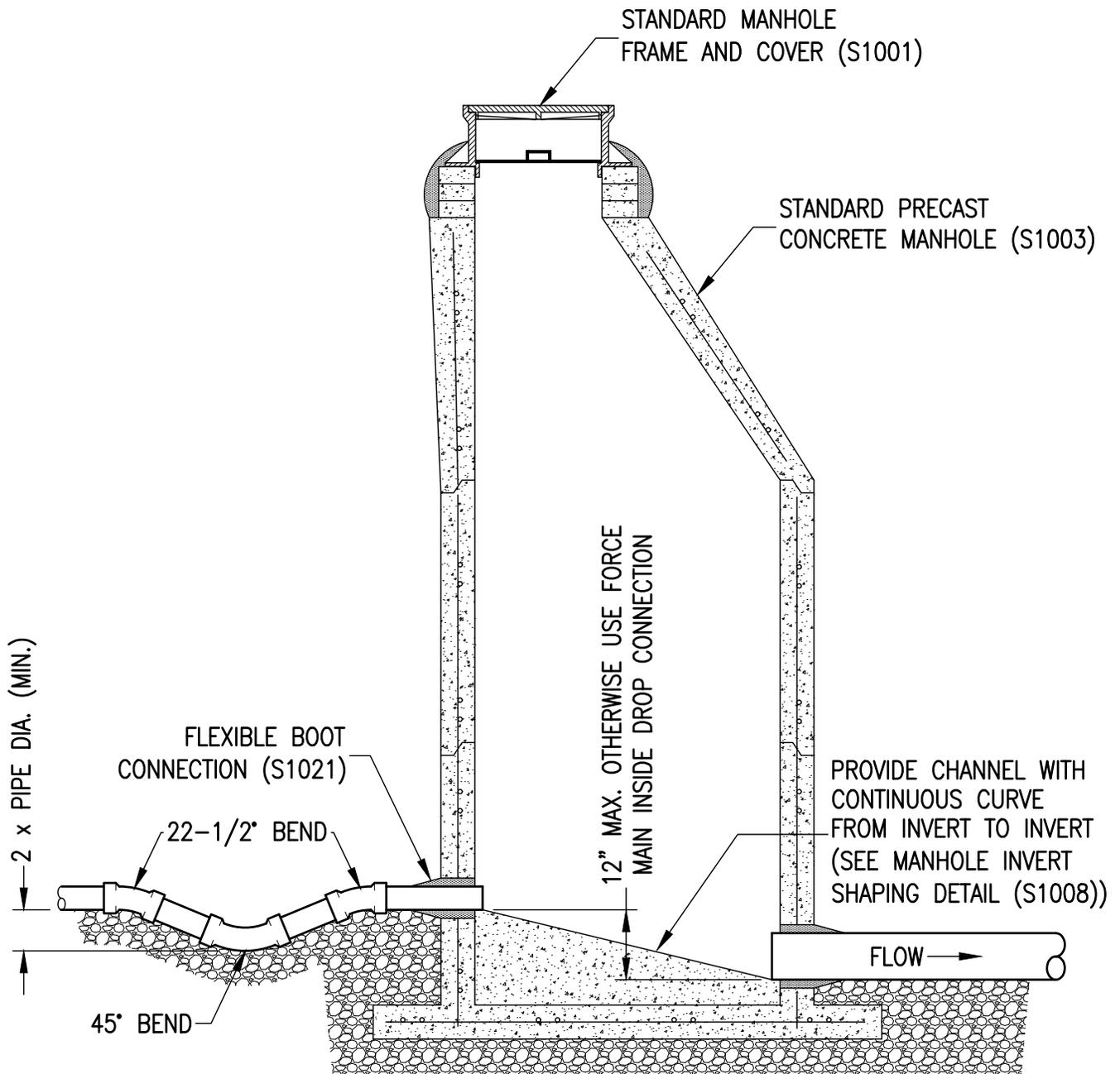
SANITARY SEWER STANDARDS AND SPECIFICATIONS

COUNTY OF YORK UTILITIES DIVISION

SCALE:
NOT TO SCALE

DATE APPROVED:
2016

DETAIL NO.
S2007



FORCE MAIN TO MANHOLE CONNECTION

NOTES:

1. THE RECEIVING MANHOLE AND ALL DOWNSTREAM MANHOLES WITHIN 1000 FEET SHALL BE COATED WITH A TYPE "B" 80 MIL THICKNESS OF AN ACID RESISTANT COATING.
2. ALL PIPING AND FITTINGS INSIDE THE MANHOLE SHALL BE SCHEDULE 80 PVC WITH SOLVENT WELD JOINTS WHICH CONFORMS TO ASTM D-1784 AND D-1785.



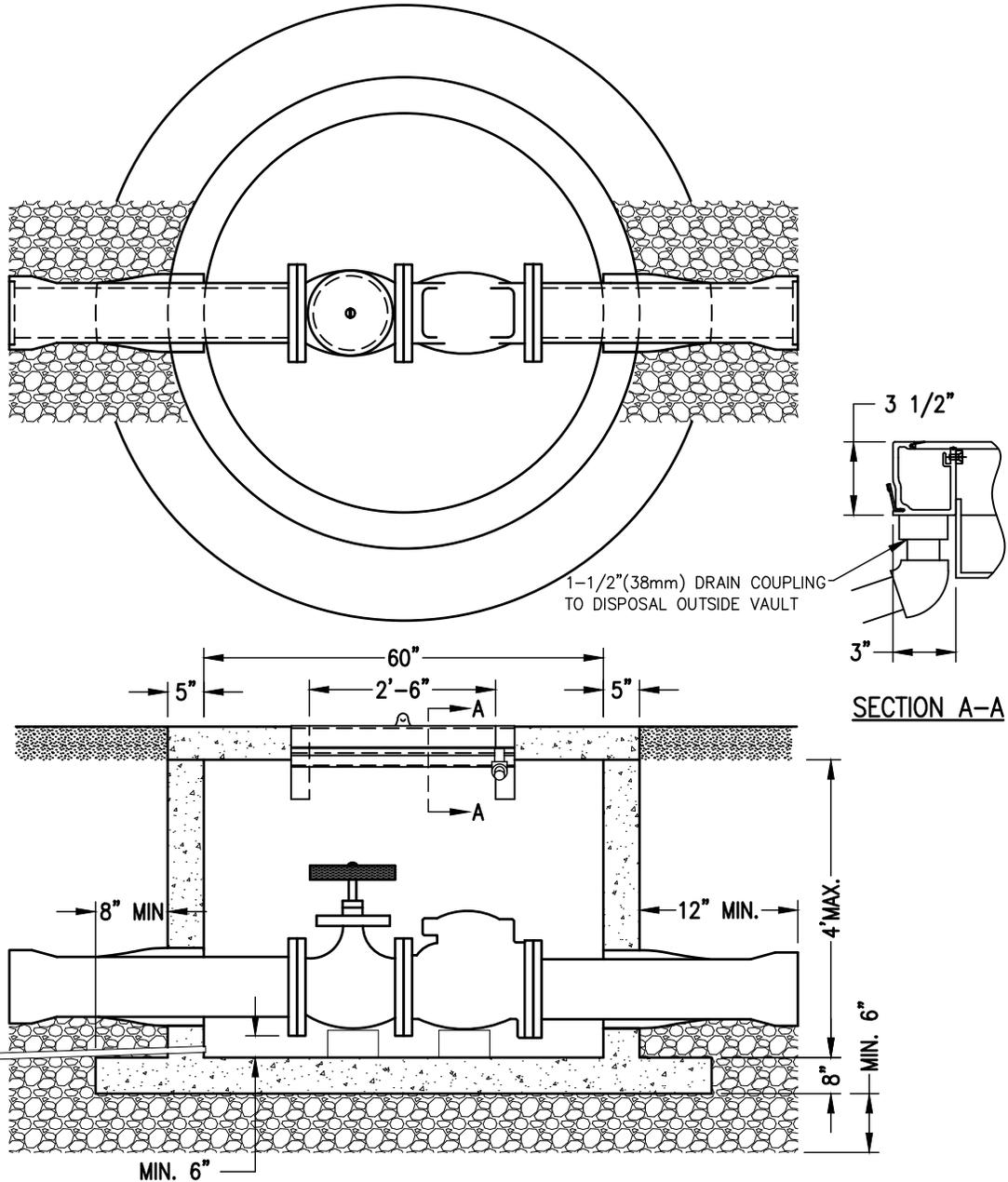
SANITARY SEWER STANDARDS AND SPECIFICATIONS

COUNTY OF YORK UTILITIES DIVISION

SCALE:
NOT TO SCALE

DATE APPROVED:
2016

DETAIL NO.
S2008



TYPICAL GATE/CHECK VALVE VAULT (PUMP STATIONS)

NOTES:

1. VAULT HATCH SHALL BE SINGLE LEAF, H2O LOADED, TYPE J-2ALH20 EXTERIOR DOOR AS MANUFACTURED BY THE BILCO COMPANY OR EQUAL.
2. HATCH UNIT SHALL BE SET WITH SLIGHT PITCH TOWARD DRAIN.
3. DRAIN CHECK VALVE SHALL BE TRUE UNION BALL TYPE CONSTRUCTED FROM PVC TYPE I CELL CLASSIFICATION 12454 AS MANUFACTURED BY SPEARS MANUFACTURING COMPANY OR EQUAL.



SANITARY SEWER STANDARDS AND SPECIFICATIONS

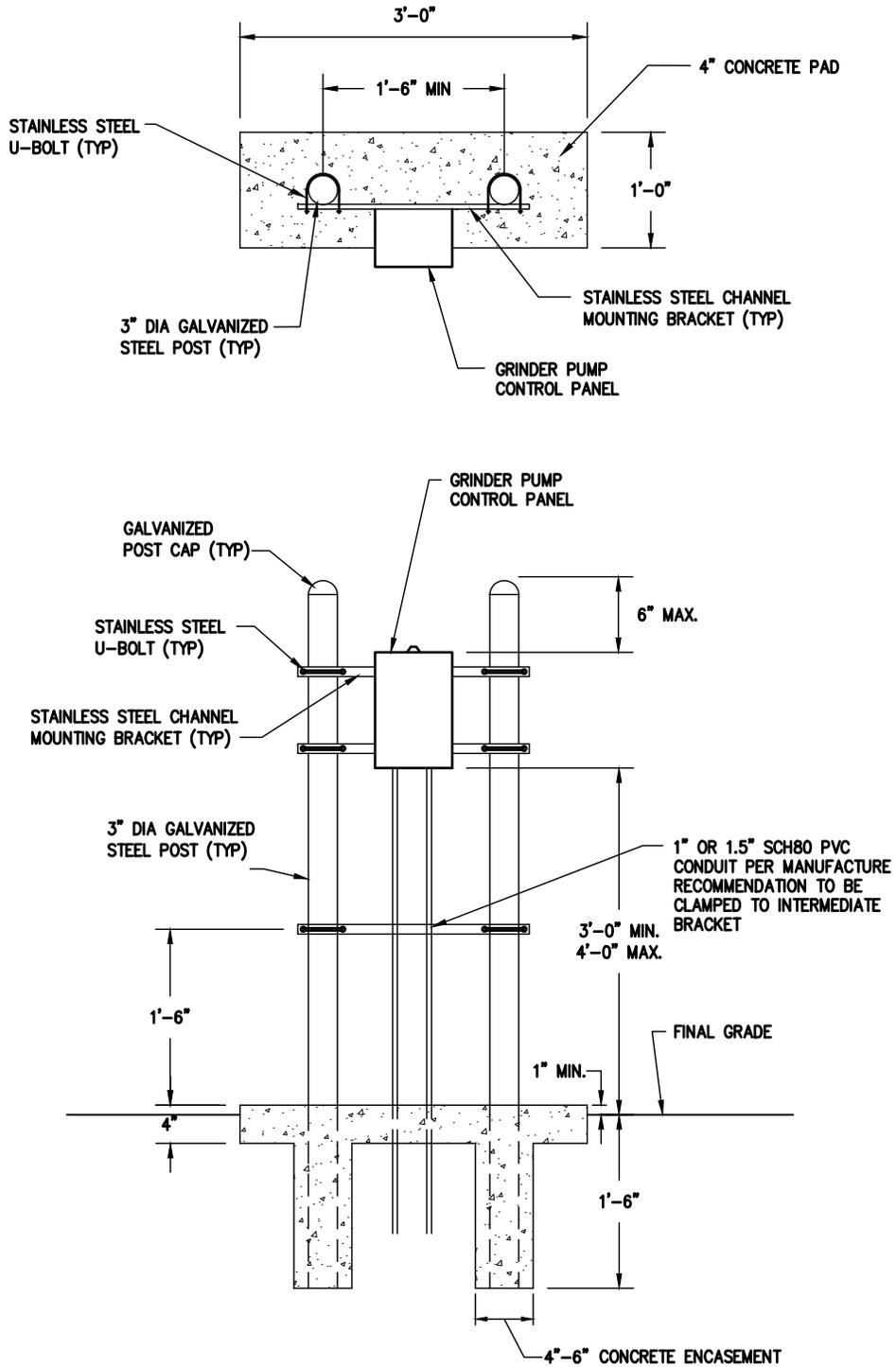
COUNTY OF YORK UTILITIES DIVISION

SCALE:
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DATE APPROVED:
2016

DETAIL NO.
S2009

NOTE:
ALL HARDWARE TO BE
STAINLESS STEEL



ALARM / DISCONNECT PANEL MOUNTING



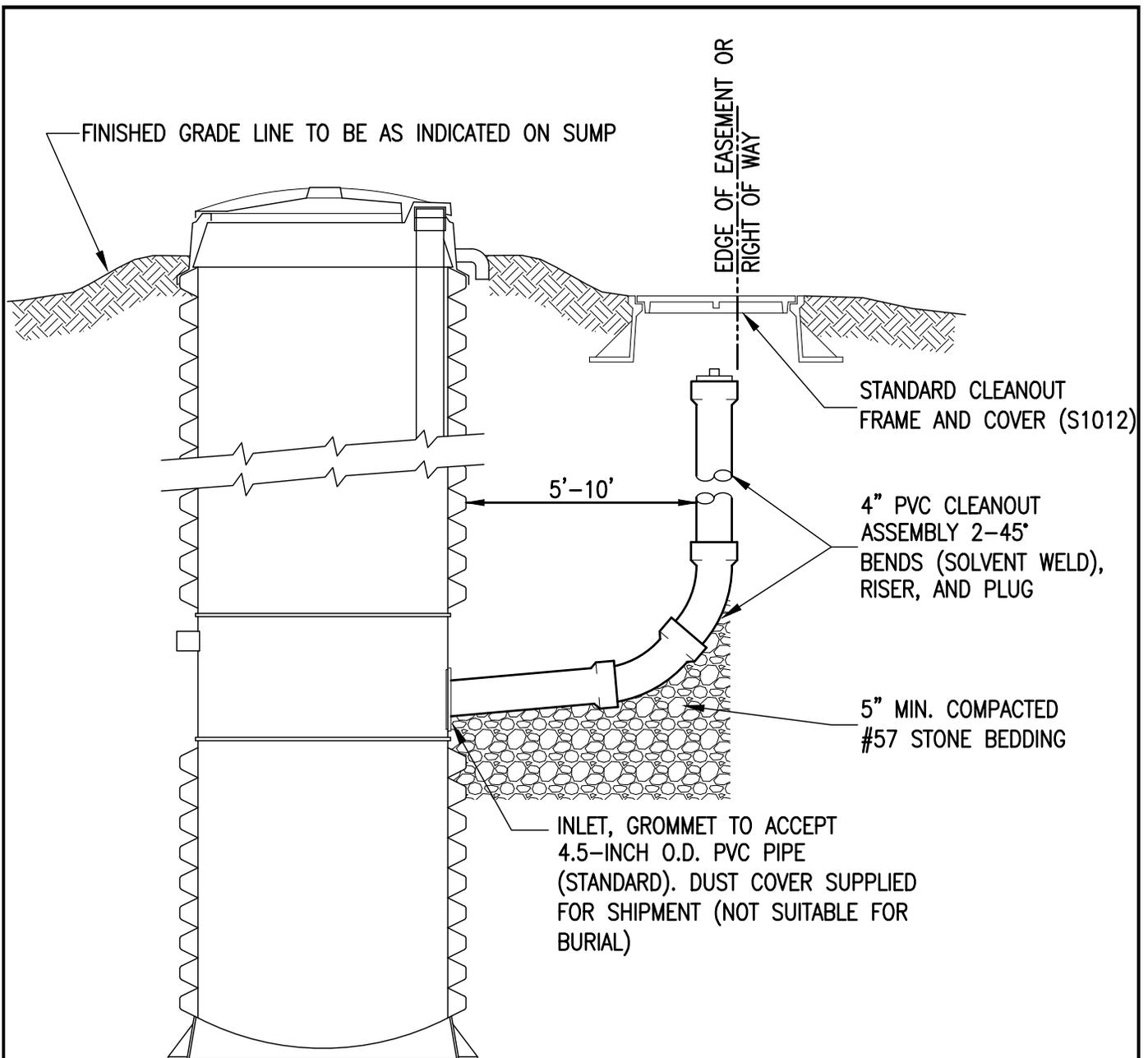
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COUNTY OF YORK UTILITIES DIVISION

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DATE APPROVED:
2016

DETAIL NO.
S2010



NOTES:

1. SEWER SERVICE LATERAL PIPING AND FITTINGS SHALL BE SCH 40 PVC CONFORMING TO ASTM D-1785.
2. EACH CLEANOUT SHALL BE FITTED WITH A YORK COUNTY STANDARD CLEANOUT FRAME AND COVER. SEE YORK COUNTY SANITARY SEWER DETAIL S1012/S1013.
3. NO BENDS GREATER THAN 45° SHALL BE USED IN SERVICE LATERAL CONSTRUCTION.

GRINDER PUMP CLEANOUT DETAIL

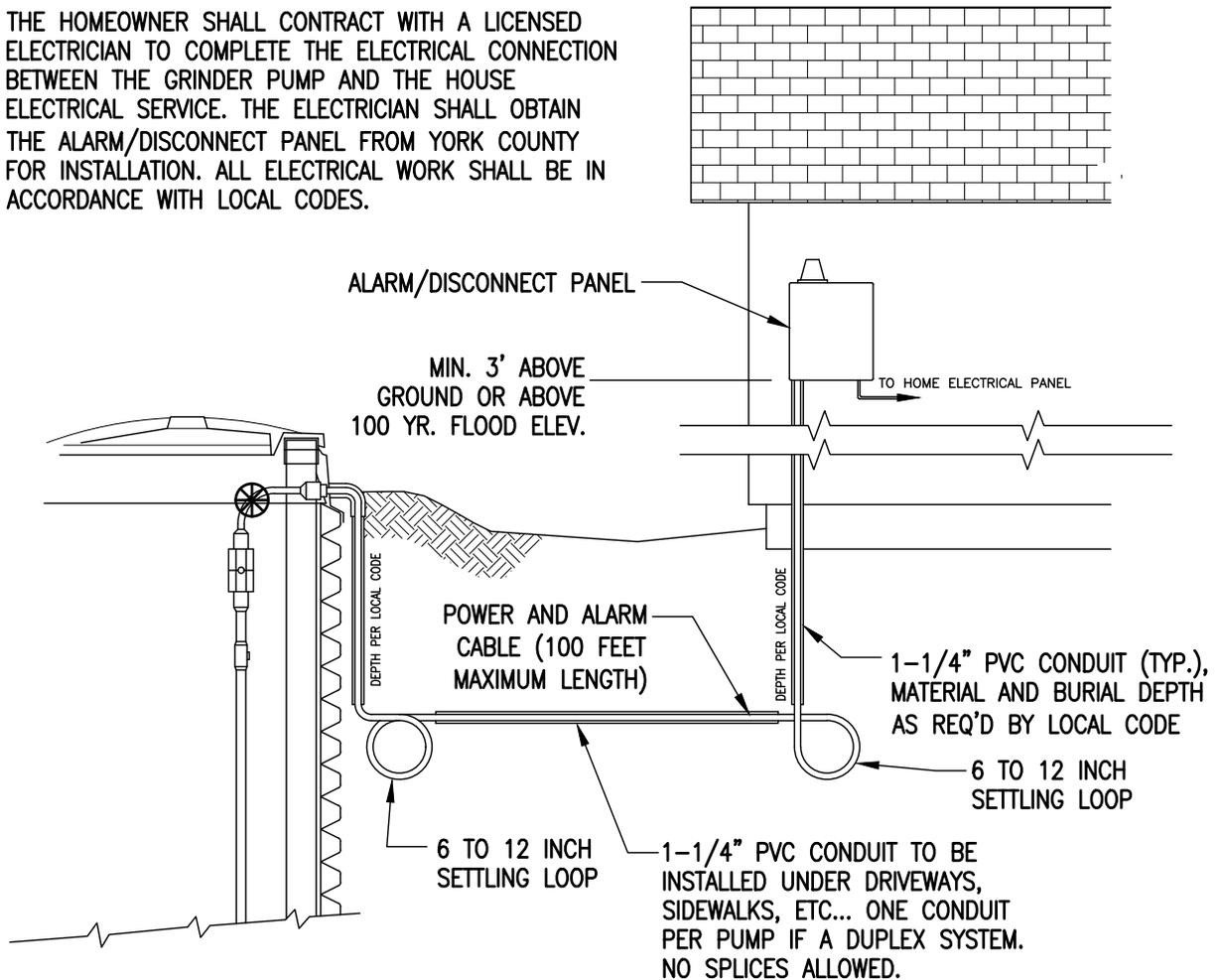
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**SANITARY SEWER
STANDARDS AND SPECIFICATIONS**
COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S2026

THE HOMEOWNER SHALL CONTRACT WITH A LICENSED ELECTRICIAN TO COMPLETE THE ELECTRICAL CONNECTION BETWEEN THE GRINDER PUMP AND THE HOUSE ELECTRICAL SERVICE. THE ELECTRICIAN SHALL OBTAIN THE ALARM/DISCONNECT PANEL FROM YORK COUNTY FOR INSTALLATION. ALL ELECTRICAL WORK SHALL BE IN ACCORDANCE WITH LOCAL CODES.



GRINDER PUMP ELECTRICAL CONNECTION DIAGRAM

NOT TO SCALE



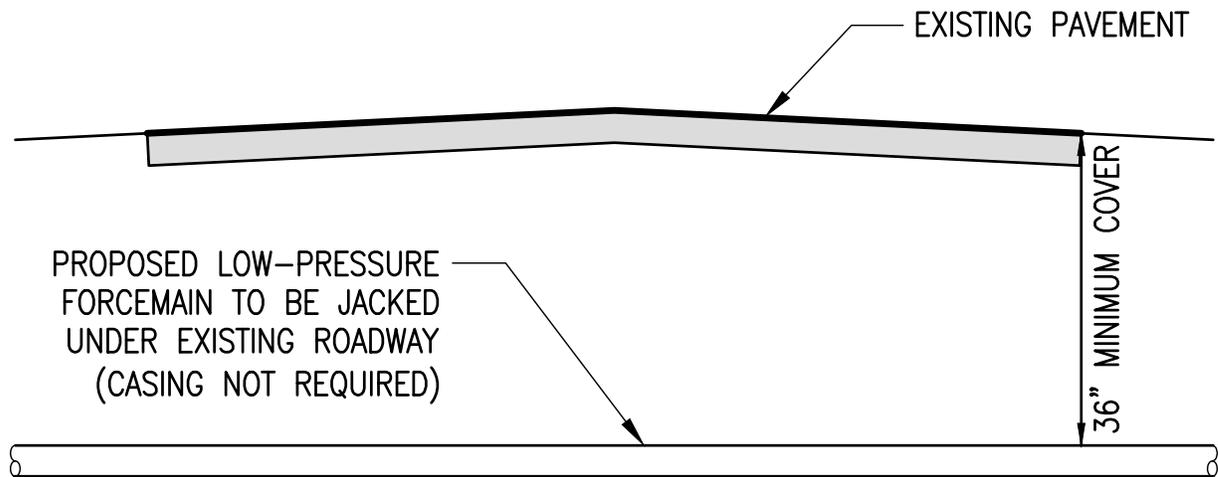
SANITARY SEWER STANDARDS AND SPECIFICATIONS

COUNTY OF YORK UTILITIES DIVISION

SCALE:
NOT TO SCALE

DATE APPROVED:
2016

DETAIL NO.
S2027



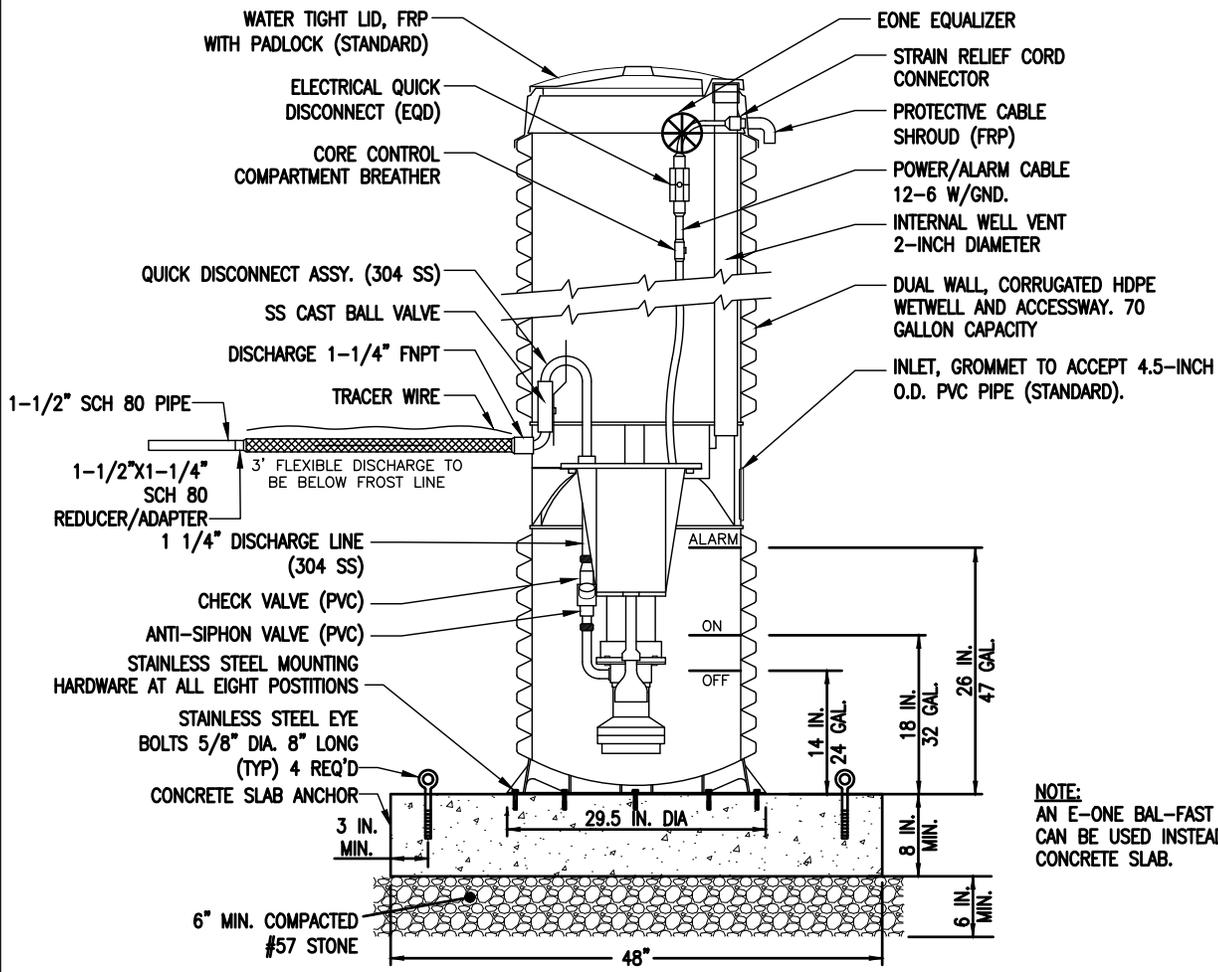
LOW PRESSURE FORCE MAIN ROAD CROSSING DETAIL

NOT TO SCALE



**SANITARY SEWER
STANDARDS AND SPECIFICATIONS**
COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S2028



NOTE:
AN E-ONE BAL-FAST BALLAST CAN BE USED INSTEAD OF A CONCRETE SLAB.

SEMI-POSITIVE DISPLACEMENT TYPE PUMP DIRECTLY DRIVEN BY A 1 HP MOTOR CAPABLE OF DELIVERING 9 GPM AT 138' T.D.H. AND 12.0 GPM @ 70 T.D.H.

NOTES:

1. CONCRETE SLAB ANCHOR OF 370 LBS (2.5 CU. FT.) PER FOOT OF TOTAL STATION HEIGHT, BASED ON STATION HEIGHT IN 6 INCH INCREMENTS, IS REQUIRED TO PREVENT TANK FROM FLOATING. MINIMUM DIMENSIONS SHOWN ABOVE ARE BASED ON STATION HEIGHT OF 4'-0". ONE INCH OF ADDITIONAL THICKNESS SHALL BE REQUIRED FOR EACH ADDITIONAL 6 INCHES OF TOTAL STATION HEIGHT. SEE CHART 1 BELOW. FOR STATIONS EXCEEDING 10 FEET IN TOTAL HEIGHT, SLAB THICKNESS SHALL BE INCREASED BY ONE INCH OF THICKNESS FOR EACH ADDITIONAL 6 INCHES OF STATION HEIGHT, OR FRACTION THEREOF.
2. 5/8" DIA STAINLESS STEEL EYE BOLT ARE TO BE SET IN EXPANSION ANCHORS IMBEDDED IN CONCRETE SLAB AT FOUR POINTS OF EQUAL SPACING.
3. STATION SHALL BE FASTENED TO SLAB WITH 3/8" DIA, STAINLESS STEEL HARDWARE AT ALL (8) MOUNTING POSITIONS.
4. ONCE STATION IS FASTENED TO SLAB, UNIT SHALL BE LIFTED INTO PLACE USING THE EYE BOLTS, NOT THE TANK.

CHART 1

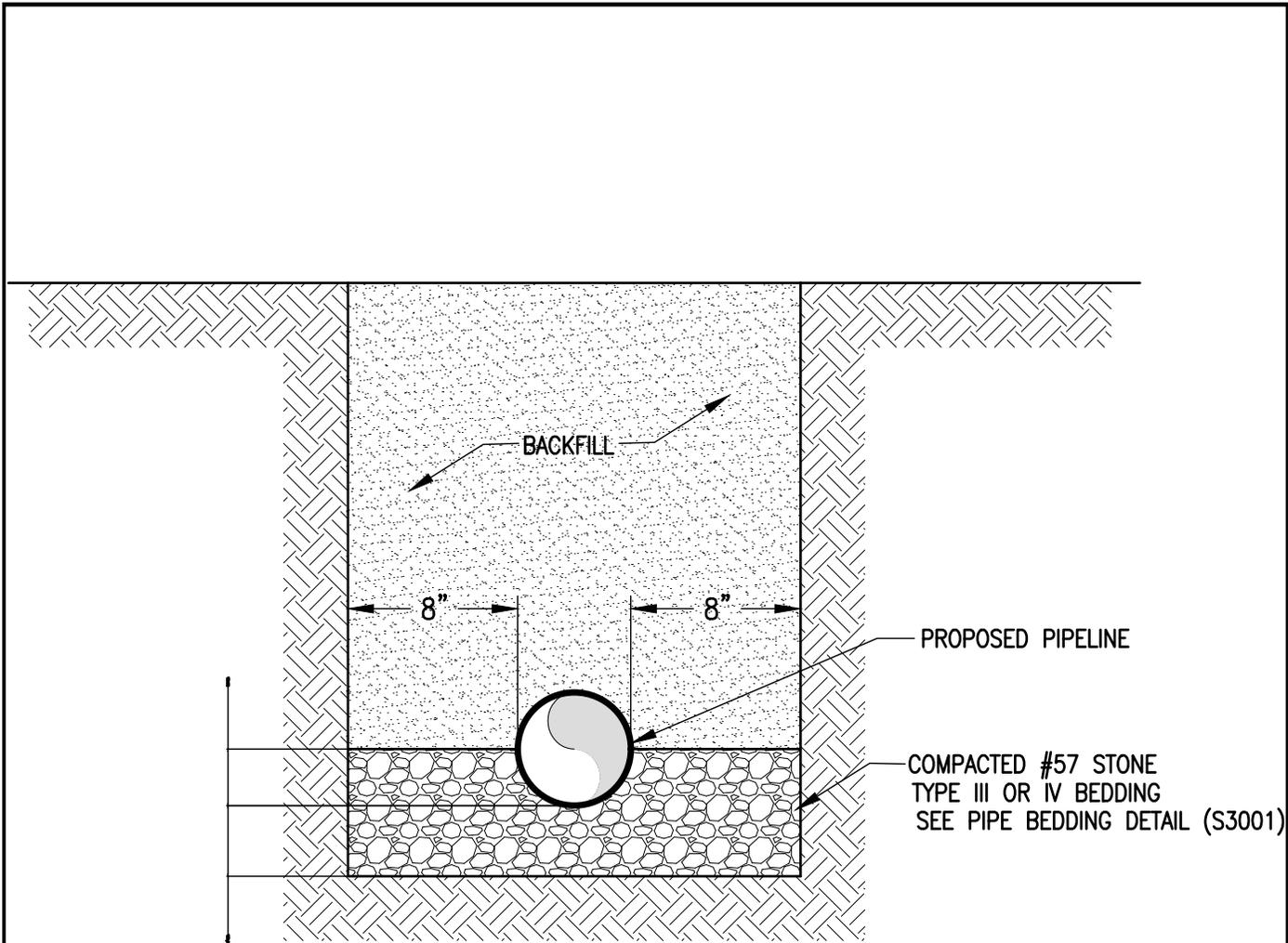
STATION HEIGHT	SLAB LENGTH	SLAB WIDTH	SLAB THICKNESS
4'-0" THRU 4'-6"	4 FT	4 FT	8 INCHES
4'-6" THRU 5'-0"	4 FT	4 FT	9 INCHES
5'-0" THRU 5'-6"	4 FT	4 FT	10 INCHES
5'-6" THRU 6'-0"	4 FT	4 FT	11 INCHES
6'-0" THRU 6'-6"	4 FT	4 FT	12 INCHES
6'-6" THRU 7'-0"	4 FT	4 FT	13 INCHES
7'-0" THRU 7'-6"	4 FT	4 FT	14 INCHES
7'-6" THRU 8'-0"	4 FT	4 FT	15 INCHES
8'-0" THRU 8'-6"	4 FT	4 FT	16 INCHES
8'-6" THRU 9'-0"	4 FT	4 FT	17 INCHES
9'-0" THRU 9'-6"	4 FT	4 FT	18 INCHES
9'-6" THRU 10'-0"	4 FT	4 FT	19 INCHES

ENVIRONMENT ONE MODEL DH071 GRINDER PUMP DETAIL
NOT TO SCALE



**SANITARY SEWER
STANDARDS AND SPECIFICATIONS**
COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S2030



NOTES:

1. WHEN PLACED IN THE ROADWAY, BACKFILL MATERIAL SHALL BE SELECT MATERIAL SAND AND/OR STONE COMPACTED TO 95% OF THE DRY WEIGHT DENSITY. TOP 12" TO BE COMPACTED TO 100% OF THE DRY WEIGHT DENSITY.
2. WHEN PLACED OUTSIDE THE VDOT R/W, BACKFILL MATERIAL MAY BE NATIVE MATERIAL COMPACTED TO 85% OF THE DRY WEIGHT DENSITY. SELECT MATERIAL BACKFILL SAND MAY BE REQUIRED AS DIRECTED BY THE OWNER.

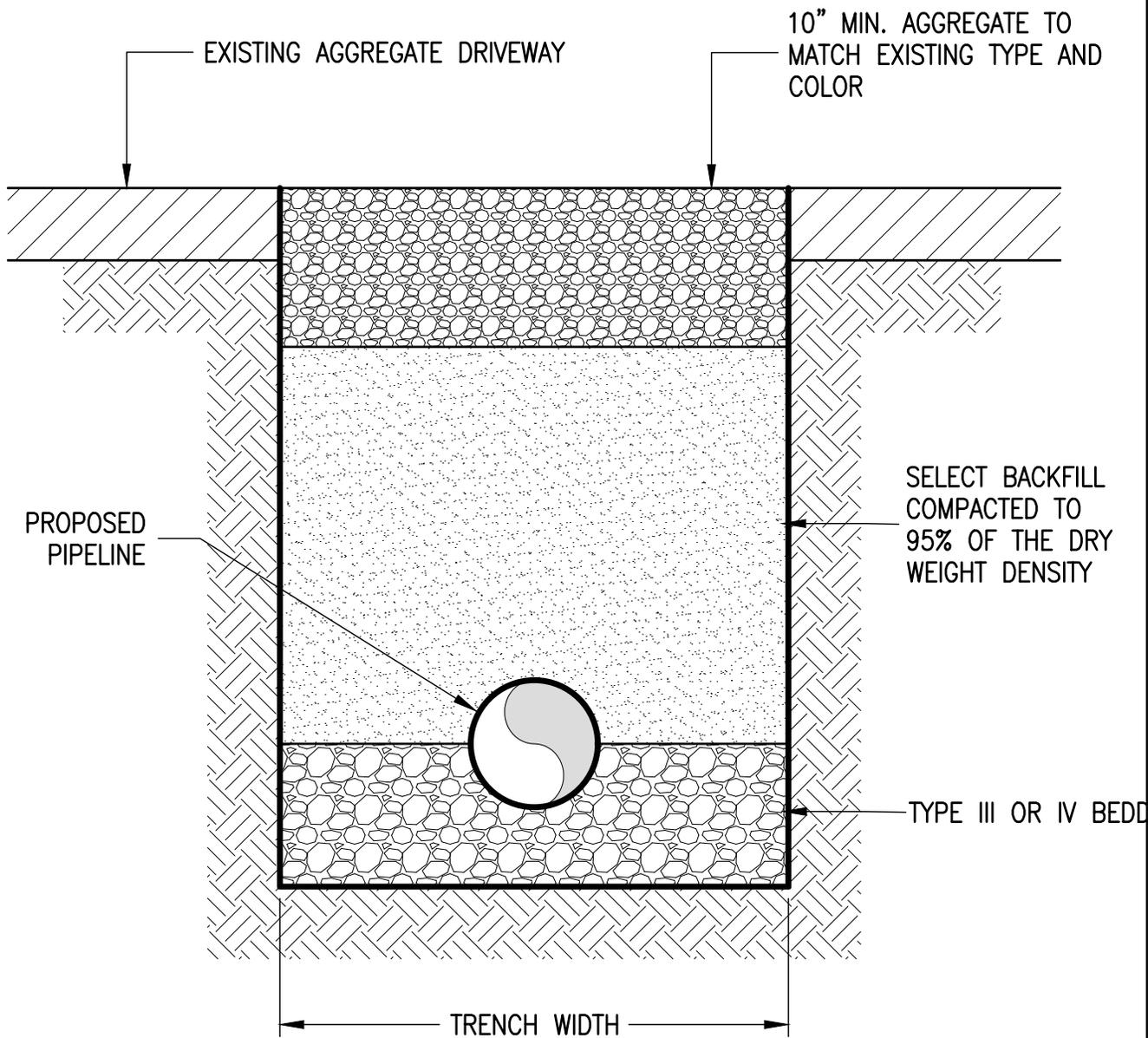
TYPICAL TRENCH DETAIL

NOT TO SCALE



**SANITARY SEWER
STANDARDS AND SPECIFICATIONS
COUNTY OF YORK UTILITIES DIVISION**

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S2031



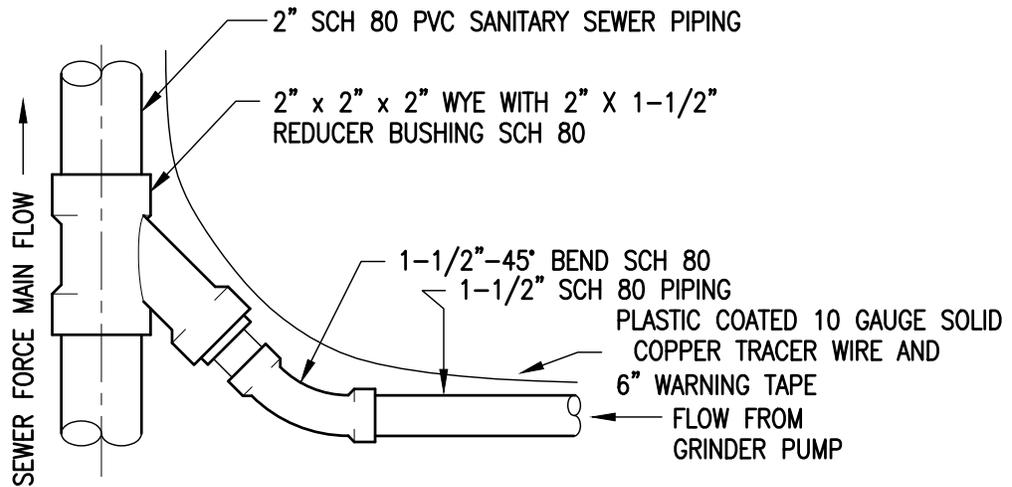
TYPICAL AGGREGATE DRIVEWAY RESTORATION

NOT TO SCALE



SANITARY SEWER STANDARDS AND SPECIFICATIONS
 COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S2032



PLAN

LOW PRESSURE GRINDER PUMP CONNECTION TO FORCE MAIN

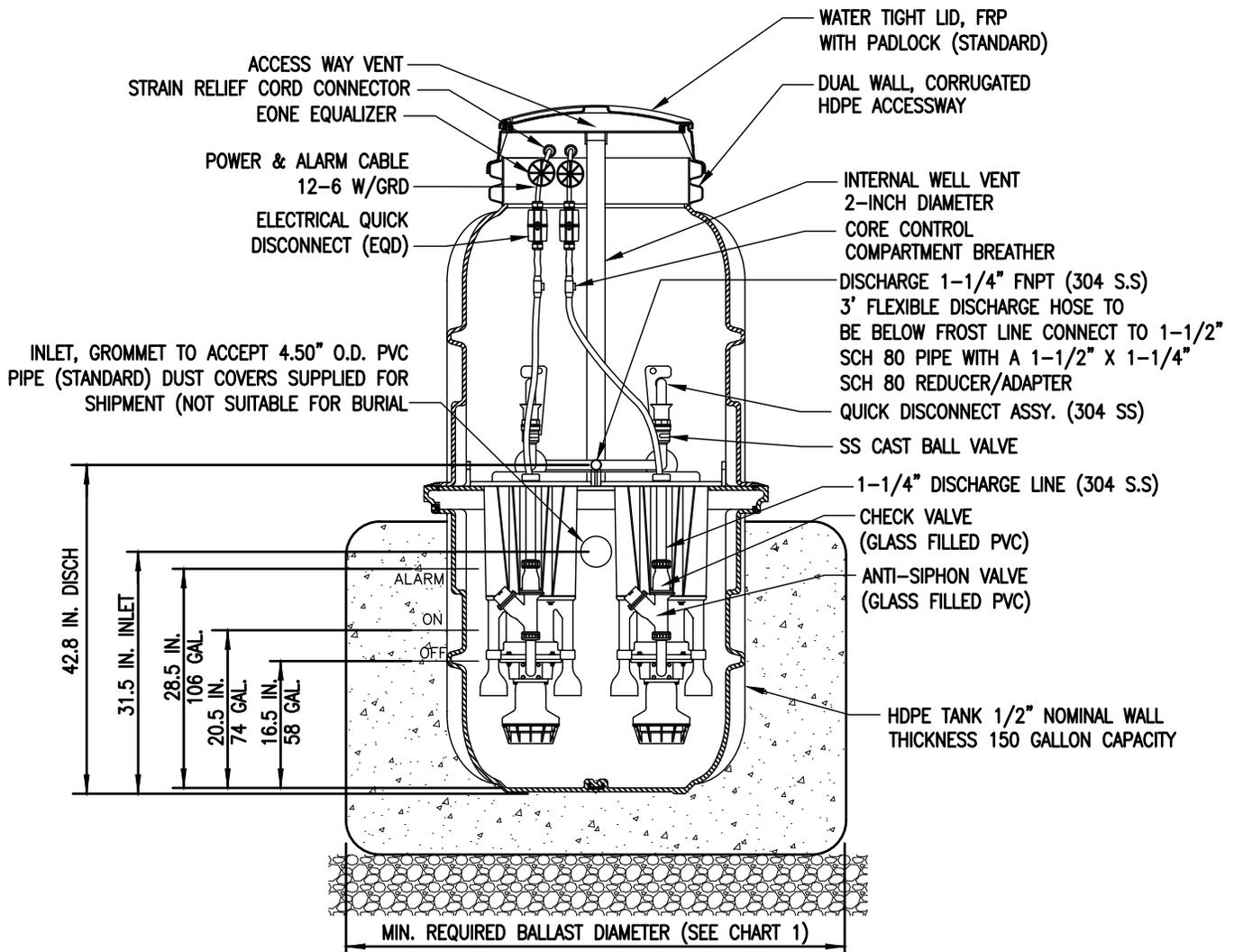
NOTES:

1. ALL PIPING AND FITTINGS TO BE SCH 80 PVC.



SANITARY SEWER STANDARDS AND SPECIFICATIONS COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S2033



SEMI-POSITIVE DISPLACEMENT TYPE PUMP DIRECTLY DRIVEN BY A 1 HP MOTOR CAPABLE OF DELIVERING 9 GPM AT 138' T.D.H. AND 12.0 GPM @ 70 T.D.H.

CHART 1

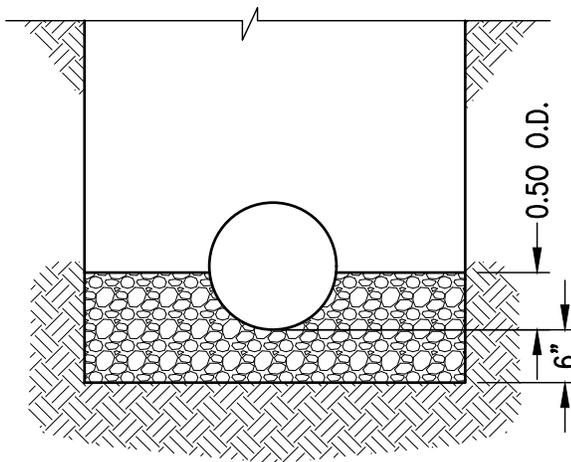
STATION HEIGHT (IN)	VOLUME CONCRETE	WEIGHT	MIN. DIA.
93 IN	24.33 CU. FT. (0.90 CU. YD.)	3400 LBS	55 IN.
129 IN	41.7 CU. FT. (1.5 CU. YD.)	5840 LBS	55 IN.
160 IN	45.18 CU. FT. (1.67 CU. YD.)	6325 LBS	55 IN.

ENVIRONMENT ONE MODEL DH152 GRINDER PUMP DETAIL
NOT TO SCALE



**SANITARY SEWER
STANDARDS AND SPECIFICATIONS**
COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S2034

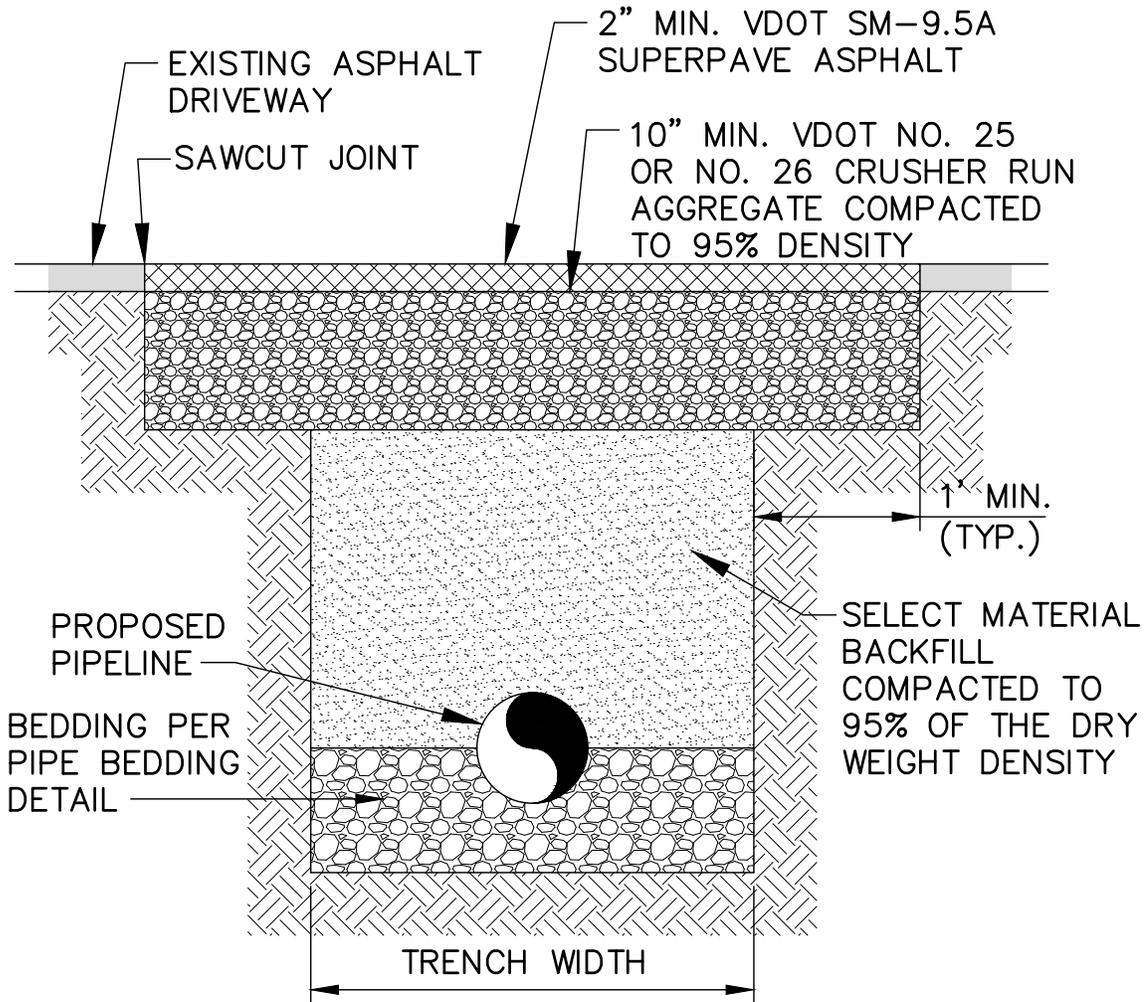


TYPE III

PIPE BEDDING DETAILS

NOTES:

1. BEDDING SHALL BE #57 STONE.
2. TRENCH BOTTOM SHALL BE FREE OF WATER BEFORE PLACEMENT OF BEDDING.
3. SHAPE RECESSES BY HAND FOR PIPE BELL.
4. BACKFILL ABOVE BEDDING WITH SPECIFIED BACKFILL MATERIAL.
5. UNLESS OTHERWISE DIRECTED BY THE COUNTY, USE TYPE III BEDDING FOR ALL PVC VACUUM, GRAVITY AND FORCE MAIN SEWERS.
6. CONTRACTOR TO PROVIDE MIN. 6" OF UNDERCUT EXCAVATION WITH BEDDING BACKFILLING.



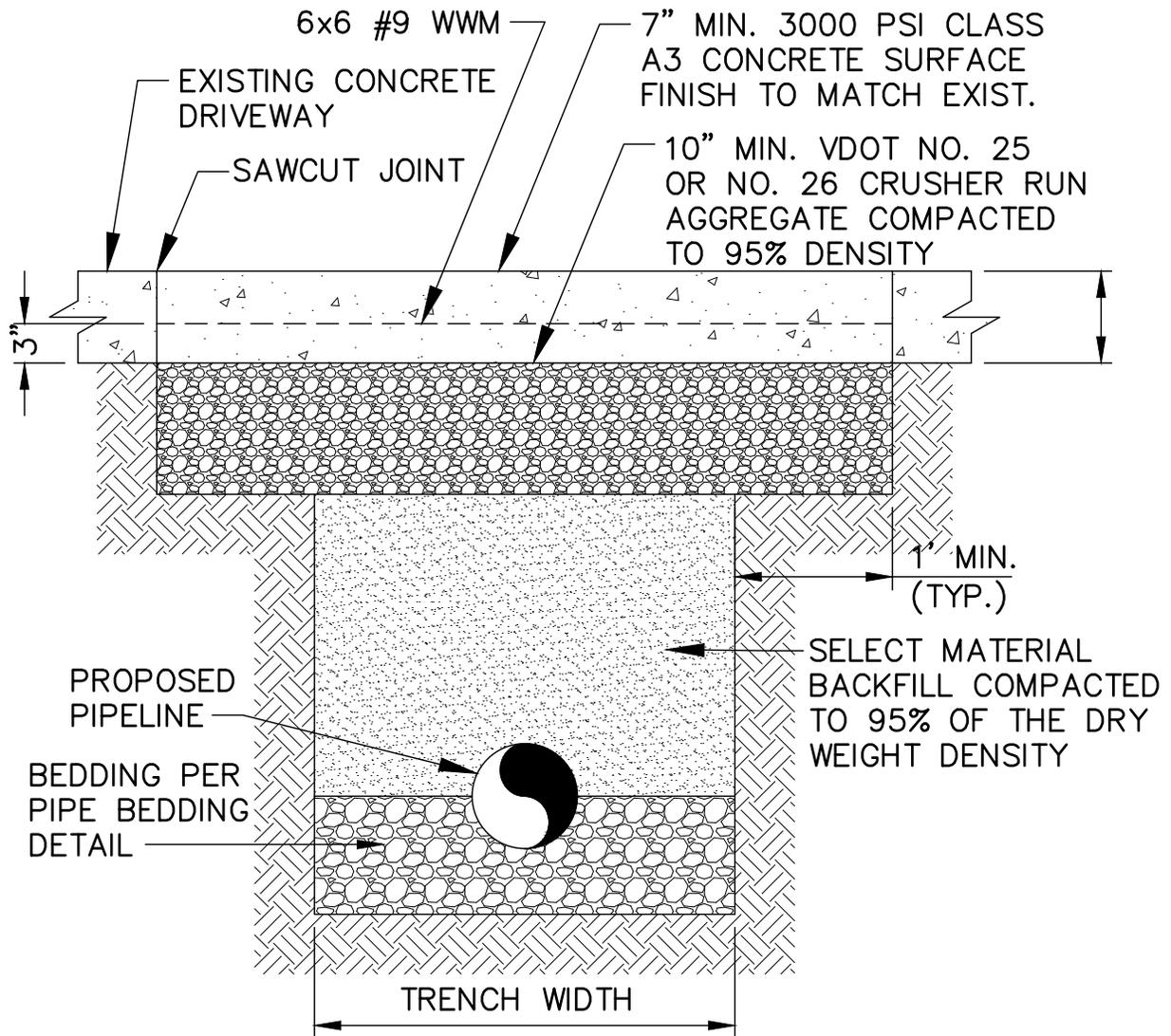
TYPICAL ASPHALT DRIVEWAY RESTORATION

NOT TO SCALE



SANITARY SEWER STANDARDS AND SPECIFICATIONS
 COUNTY OF YORK UTILITIES DIVISION

SCALE:
 NOT TO SCALE
 DATE APPROVED:
 2016
 DETAIL NO.
 S3002



NOTES:

1. CONCRETE SHALL BE 7" MIN. IN VDOT R/W. MATCH EXISTING THICKNESS OUTSIDE OF VDOT R/W (4" MIN).
2. WHERE EXISTING CONCRETE DRIVEWAY IS EXPOSED AGGREGATE, SURFACE FINISH OF RESTORATION SHALL MATCH EXISTING AS CLOSELY AS PRACTICAL.

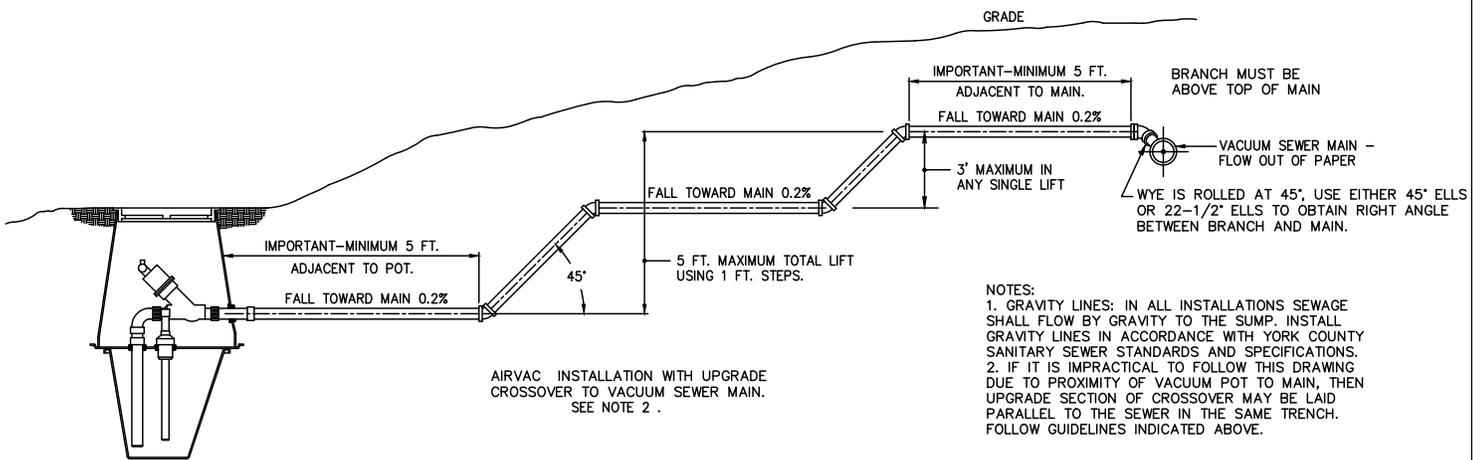
TYPICAL CONCRETE DRIVEWAY RESTORATION

NOT TO SCALE



SANITARY SEWER
STANDARDS AND SPECIFICATIONS
COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. S3003



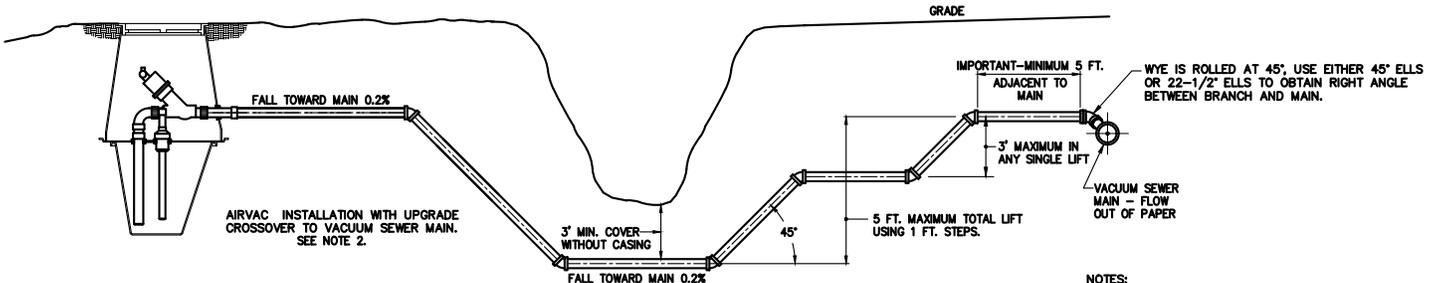
**TYPICAL VACUUM SERVICE CONNECTION
 VACUUM POT BELOW VACUUM MAIN**

N.T.S.



**SANITARY SEWER
 STANDARDS AND SPECIFICATIONS
 COUNTY OF YORK UTILITIES DIVISION**

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. SV2011



- NOTES:
1. GRAVITY LINES: IN ALL INSTALLATIONS SEWAGE SHALL FLOW BY GRAVITY TO THE SUMP. INSTALL GRAVITY LINES IN ACCORDANCE WITH YORK COUNTY SANITARY SEWER STANDARDS AND SPECIFICATIONS.
 2. IF IT IS IMPRACTICAL TO FOLLOW THIS DRAWING DUE TO PROXIMITY OF VALVE POT TO MAIN, THEN UPGRADE SECTION OF CROSSOVER MAY BE LAID PARALLEL TO THE SEWER IN THE SAME TRENCH. FOLLOW GUIDELINES INDICATED ABOVE.
 3. IF THERE IS NOT 3' OF COVER ACROSS THE DITCH THEN STEEL OR DI CASING IS NEEDED, EXTENDING 10' ON BOTH SIDES OF THE DITCH

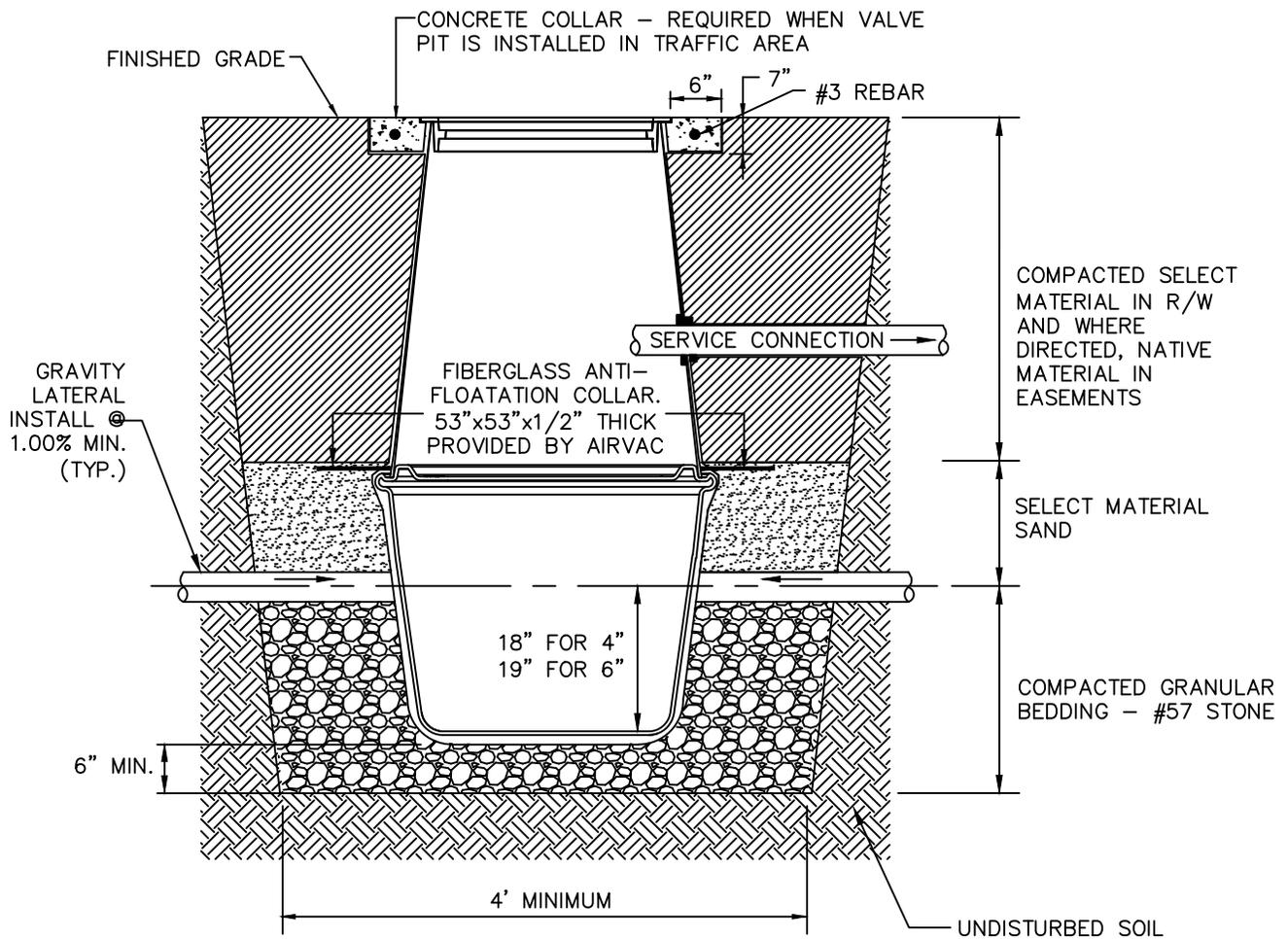
TYPICAL VACUUM SERVICE CONNECTION
VACUUM MAIN ABOVE DITCH BOTTOM

N.T.S.



SANITARY SEWER
STANDARDS AND SPECIFICATIONS
 COUNTY OF YORK UTILITIES DIVISION

SCALE:	NOT TO SCALE
DATE APPROVED:	2016
DETAIL NO.:	SV2012



NOTES:

1. ANTI-FLOATATION COLLARS SHALL BE INCLUDED WITH ALL VALVE PIT ASSEMBLIES.
2. THE ANTI-FLOATATION COLLAR HAS BEEN DESIGNED TO ELIMINATE CHAMBER FLOATING UNDER COMPLETE BACKFILLED CONDITIONS. THE CONTRACTOR SHALL EMPLOY APPROPRIATE MEANS DEEMED NECESSARY TO PREVENT CHAMBER FLOATING DURING CONSTRUCTION.

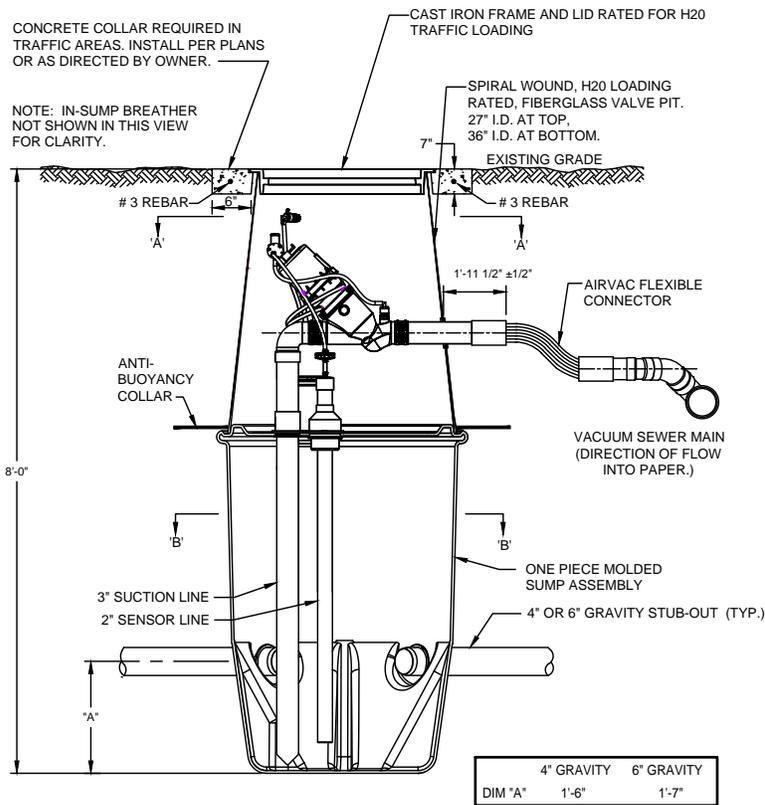
FIBERGLASS ANTI-FLOATATION COLLAR AND VALVE PIT BEDDING AND BACKFILL DETAIL

NOT TO SCALE



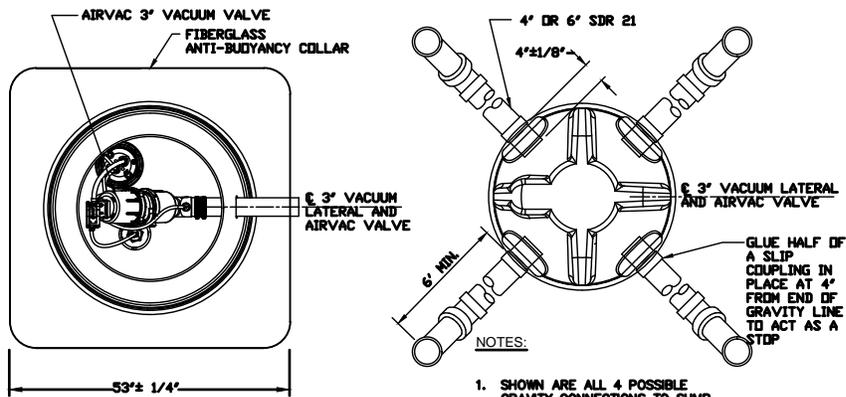
SANITARY SEWER STANDARDS AND SPECIFICATIONS
 COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. SV2013



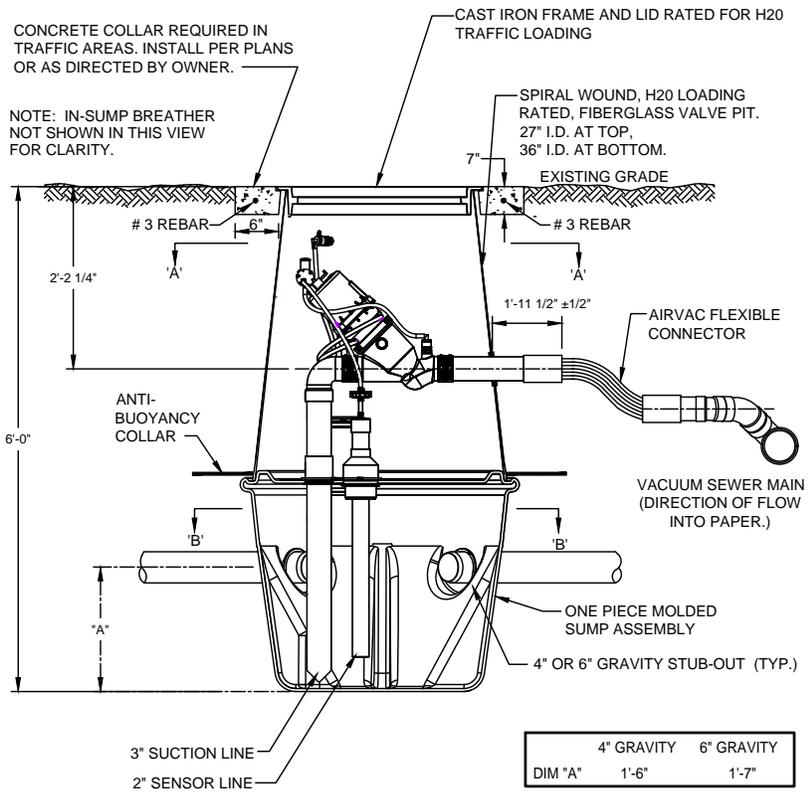
AIRVAC 2 PIECE VALVE PIT - 8' DEEP (MODEL VP5442H) - DEEP

NOT TO SCALE

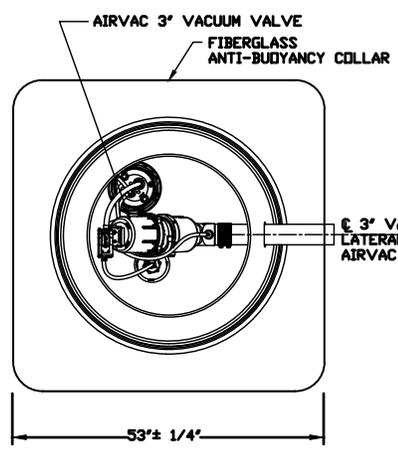


**SANITARY SEWER
STANDARDS AND SPECIFICATIONS**
COUNTY OF YORK UTILITIES DIVISION

SCALE:
NOT TO SCALE
DATE APPROVED:
2016
DETAIL NO.
SV2014_DEEP

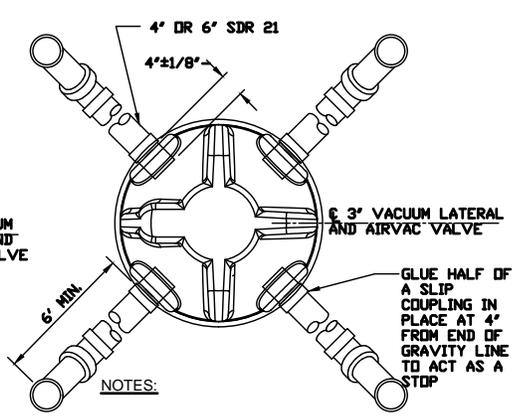


AIRVAC 2 PIECE VALVE PIT - 6' DEEP (MODEL VP3042H) - STD
NOT TO SCALE



- NOTE:**
1. WHEN INSTALLING ANY PIPE THROUGH A GROMMET, USE ONLY WATER, MILD DETERGENT, OR SILICONE LUBRICANT. NEVER USE PIPE JOINT GREASE.

SECTION 'A'-A'
NOT TO SCALE



- NOTES:**
1. SHOWN ARE ALL 4 POSSIBLE GRAVITY CONNECTIONS TO SUMP. NUMBER, LENGTH, AND SIZE OF GRAVITY CONNECTIONS TO BE AS PER PLAN SHEETS.
 2. WHEN INSTALLING ANY PIPE THROUGH A GROMMET, USE ONLY WATER, MILD DETERGENT, OR SILICONE LUBRICANT. NEVER USE PIPE JOINT GREASE.

SECTION 'B'-B'
NOT TO SCALE



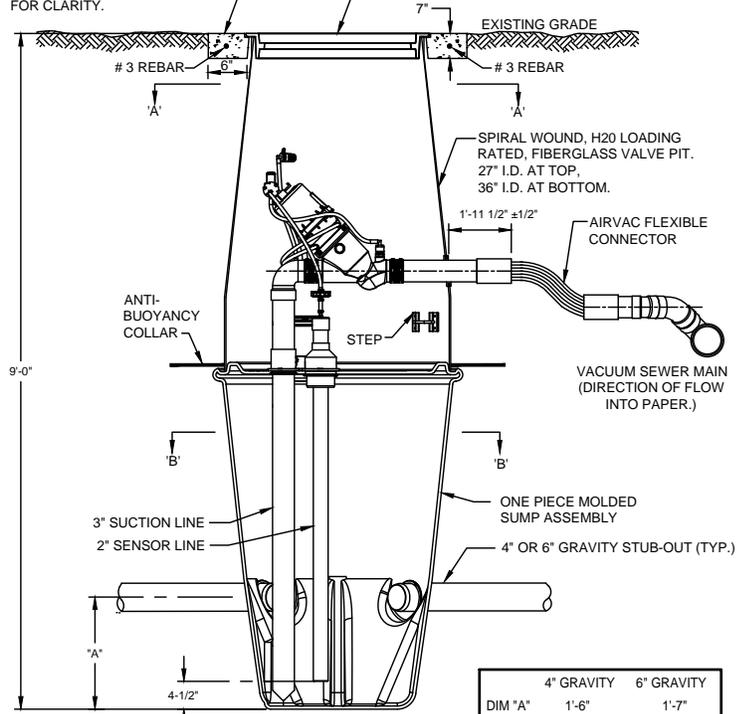
**SANITARY SEWER
STANDARDS AND SPECIFICATIONS
COUNTY OF YORK UTILITIES DIVISION**

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. SV2014_STD

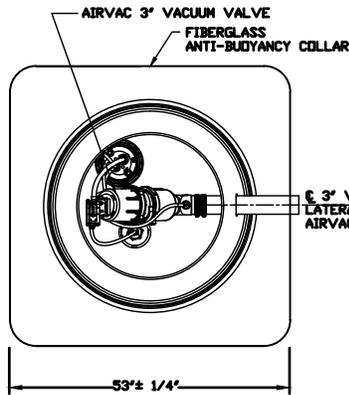
CONCRETE COLLAR REQUIRED IN TRAFFIC AREAS. INSTALL PER PLANS OR AS DIRECTED BY OWNER.

NOTE: IN-SUMP BREATHER NOT SHOWN IN THIS VIEW FOR CLARITY.

CAST IRON FRAME AND LID RATED FOR H20 TRAFFIC LOADING



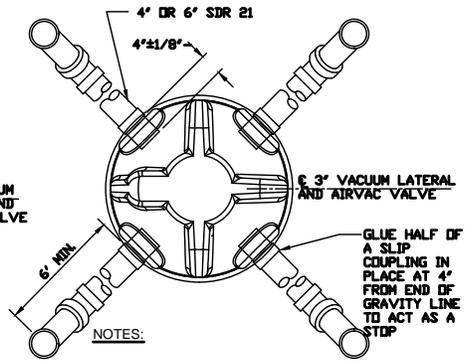
AIRVAC 2 PIECE VALVE PIT - 9' DEEP (MODEL VP5454H) - XDP
NOT TO SCALE



NOTE:

1. WHEN INSTALLING ANY PIPE THROUGH A GROMMET, USE ONLY WATER, MILD DETERGENT, OR SILICONE LUBRICANT. NEVER USE PIPE JOINT GREASE.

SECTION 'A'-A'
NOT TO SCALE



NOTES:

1. SHOWN ARE ALL 4 POSSIBLE GRAVITY CONNECTIONS TO SUMP. NUMBER, LENGTH, AND SIZE OF GRAVITY CONNECTIONS TO BE AS PER PLAN SHEETS.
2. WHEN INSTALLING ANY PIPE THROUGH A GROMMET, USE ONLY WATER, MILD DETERGENT, OR SILICONE LUBRICANT. NEVER USE PIPE JOINT GREASE.

SECTION 'B'-B'
NOT TO SCALE



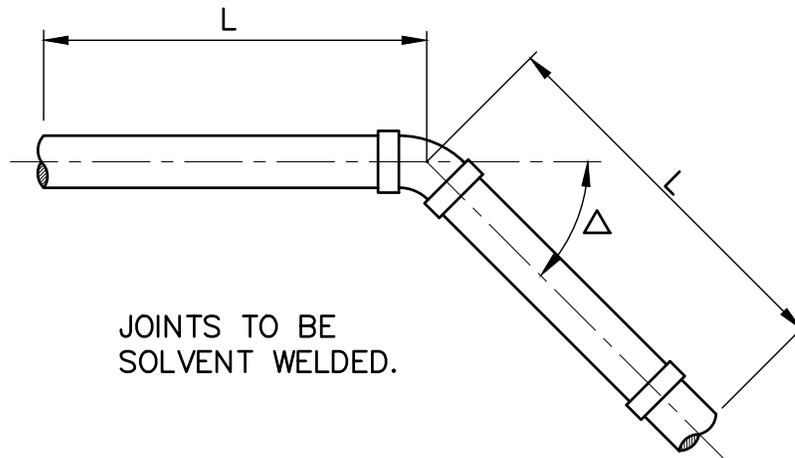
SANITARY SEWER STANDARDS AND SPECIFICATIONS

COUNTY OF YORK UTILITIES DIVISION

SCALE:
NOT TO SCALE

DATE APPROVED:
2016

DETAIL NO.
SV2014_XDP



PIPE SIZE	MIN. LENGTH OF PIPE WITH RESTRAINED JOINTS L (FT.)			
	VALVES OR TERMINAL ENDS	$\Delta=45^\circ$	$\Delta=22-1/2^\circ$	$\Delta=11-1/4^\circ$
4"	21	10	6	4
6"	29	12	8	6
8"	37	16	10	8
10"	45	20	15	10

VACUUM LINE RESTRAINED JOINT DETAIL

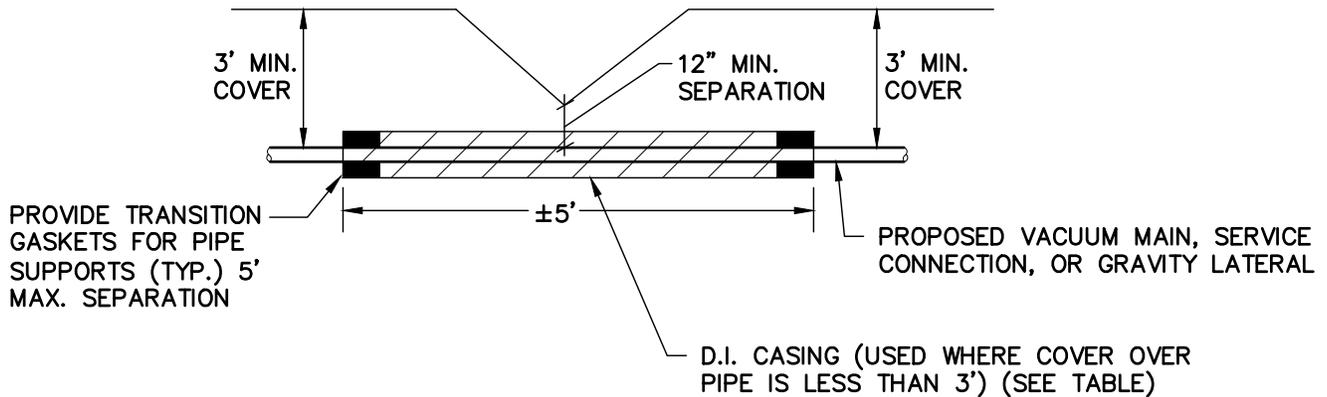
N.T.S.



**SANITARY SEWER
STANDARDS AND SPECIFICATIONS**
COUNTY OF YORK UTILITIES DIVISION

SCALE:
NOT TO SCALE
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2016
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SV2016

PIPE DIAMETER (INCH)	CASING DIAMETER (INCH)
3	6
4	6
6	8
8	10
10	12



DITCH CROSSING DETAIL

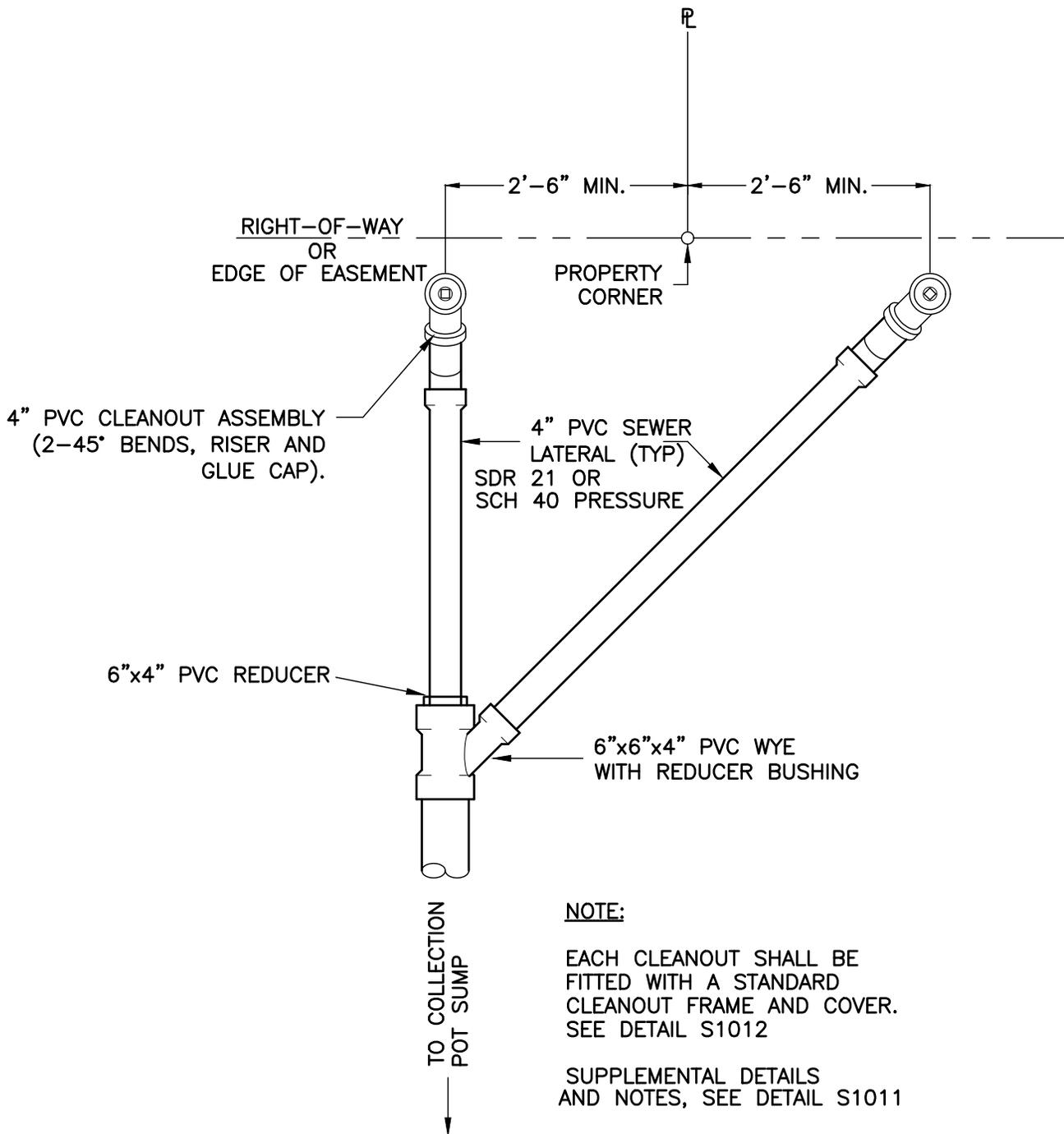
N.T.S.



SANITARY SEWER STANDARDS AND SPECIFICATIONS

COUNTY OF YORK UTILITIES DIVISION

SCALE:
NOT TO SCALE
DATE APPROVED:
2016
DETAIL NO.
SV2017



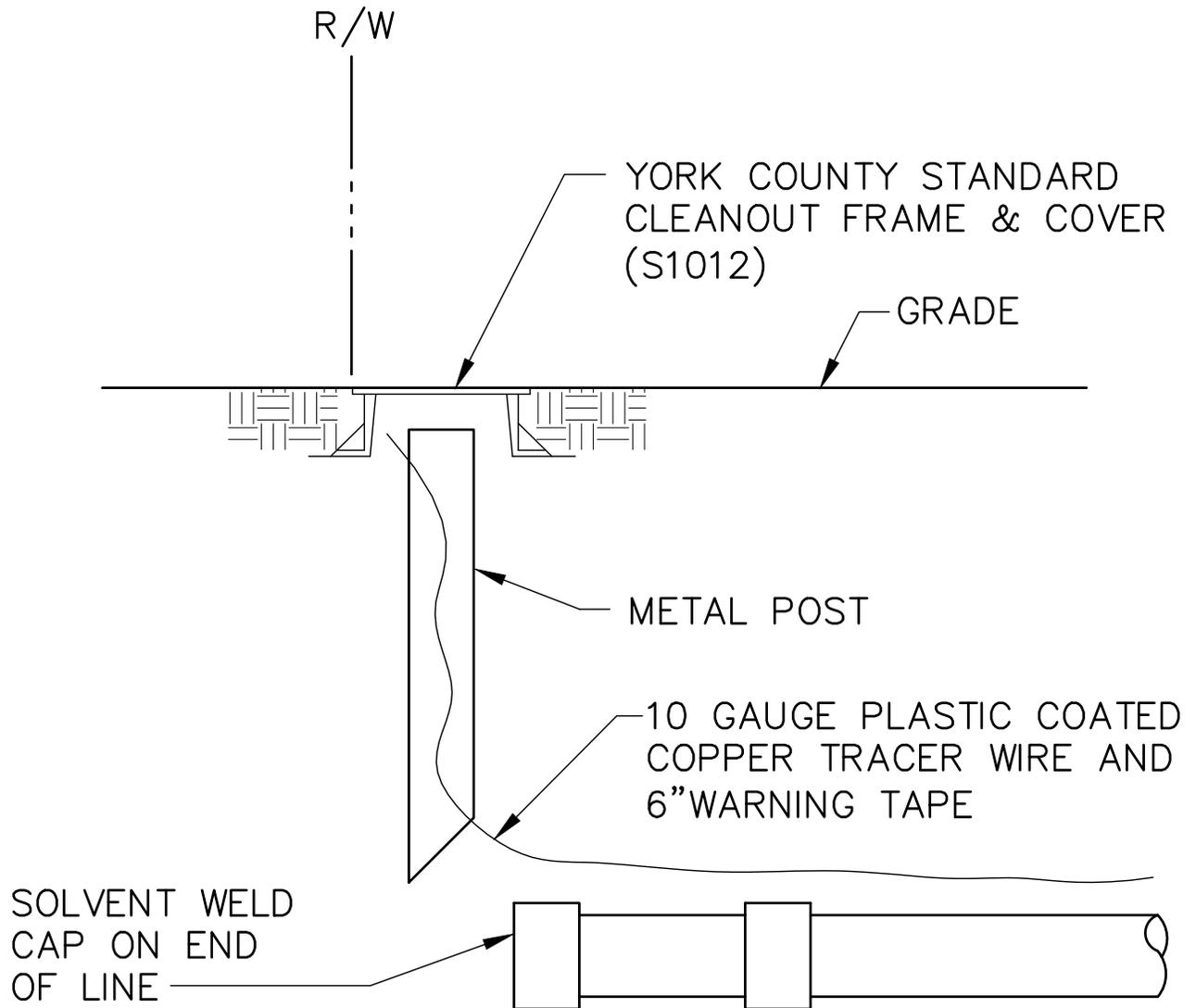
DUAL SERVICE GRAVITY LATERAL
FOR VACUUM SEWER

N.T.S.

NOTE:
EACH CLEANOUT SHALL BE FITTED WITH A STANDARD CLEANOUT FRAME AND COVER. SEE DETAIL S1012

SUPPLEMENTAL DETAILS AND NOTES, SEE DETAIL S1011

	<p>SANITARY SEWER STANDARDS AND SPECIFICATIONS COUNTY OF YORK UTILITIES DIVISION</p>	SCALE: NOT TO SCALE
		DATE APPROVED: 2016
		DETAIL NO. SV2018



NOTE: END OF LINE IDENTIFICATION MARKERS SHALL BE INSTALLED AT THE END OF ALL STUBS AND PLUGS AND AT OTHER LOCATIONS AS DIRECTED BY THE OWNER.

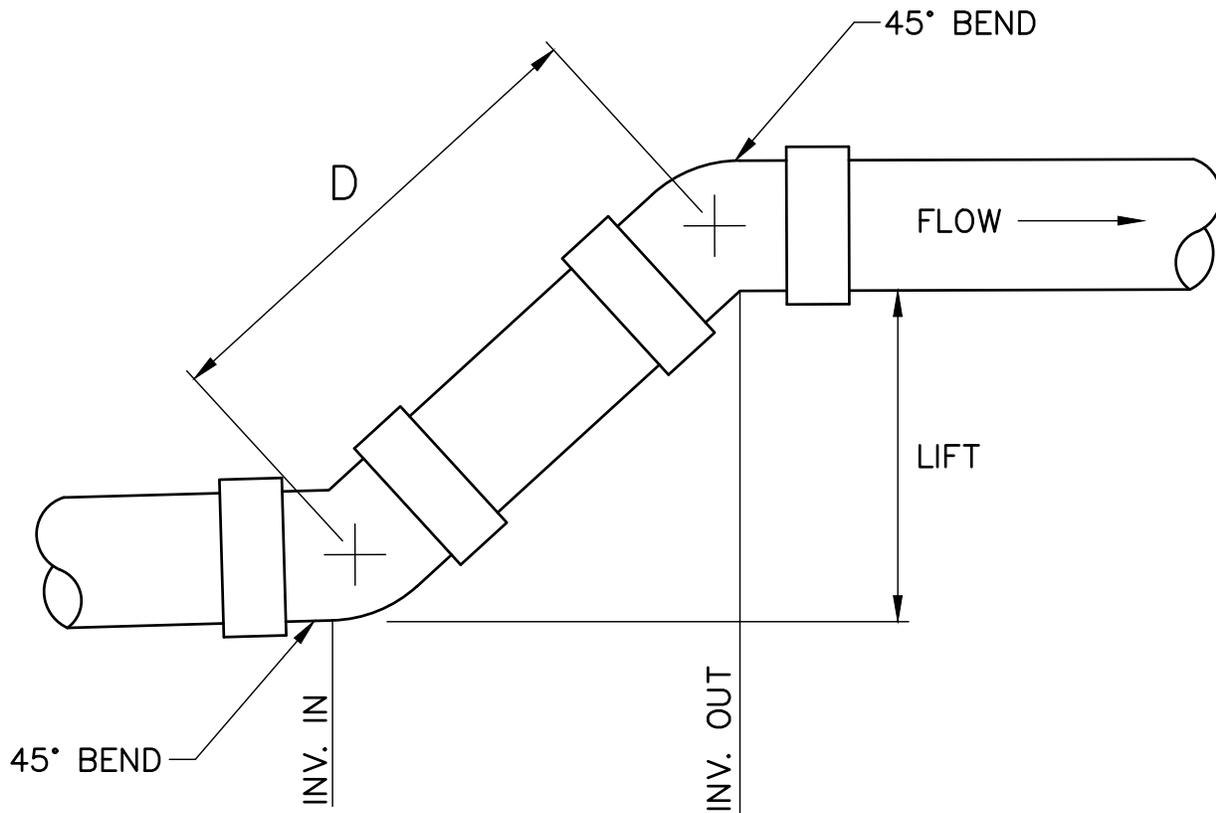
END-OF-LINE IDENTIFICATION MARKER

N.T.S.



**SANITARY SEWER
STANDARDS AND SPECIFICATIONS**
COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. SV2019



NOTES:

1. SPECIFIC "INVERT IN" AND "INVERT OUT" ELEVATIONS ARE PROVIDED ON THE PROFILE SHEETS.
2. 3 FT. MAXIMUM IN ANY LIFT.
3. ALL FITTINGS ARE TO BE REIBER GASKETED FITTINGS MANUFACTURED BY "HARCO"

LIFT = INV. OUT – INV. IN	D = DISTANCE, CENTER TO CENTER, BETWEEN 45° BENDS
9" = 0.75'	12 3/4" = 1.06'
12" = 1.00'	17" = 1.41'
15" = 1.25'	21 1/4" = 1.77'
18" = 1.50'	25 1/2" = 2.12'
21" = 1.75'	29 3/4" = 2.48'
24" = 2.00'	34" = 2.83'
27" = 2.25'	38 3/16" = 3.18'

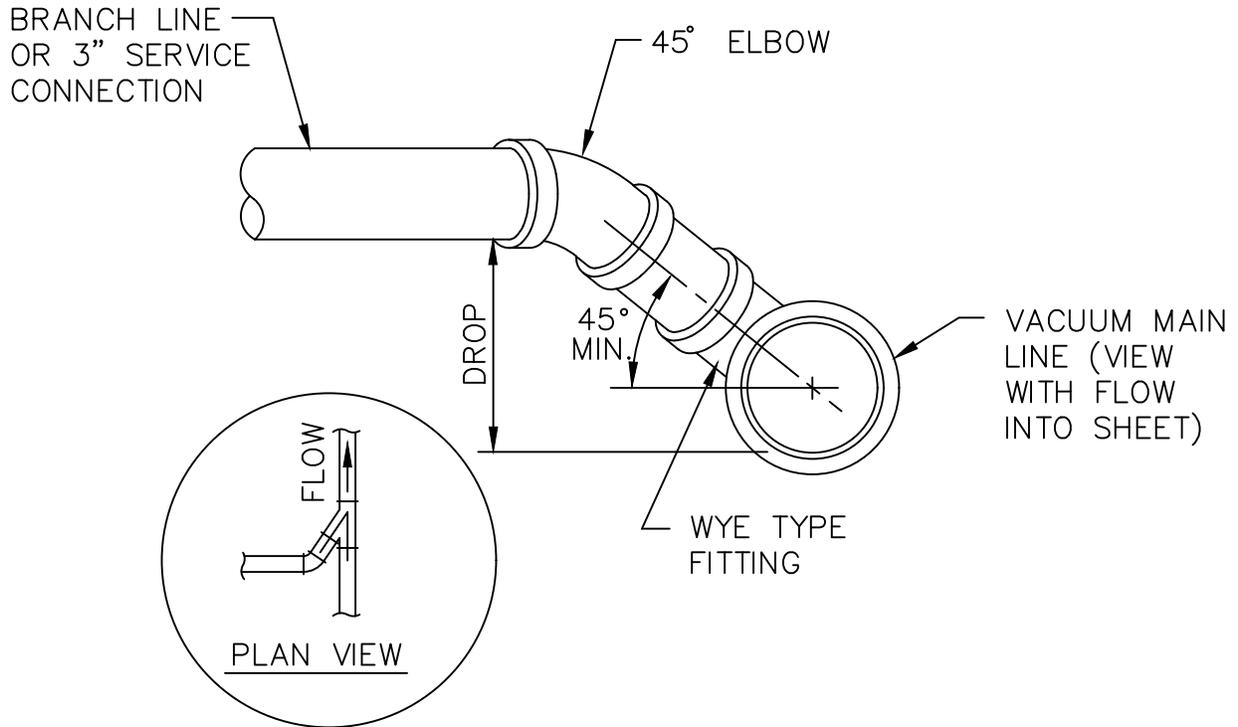
**TYPICAL VERTICAL LIFT
DETAIL FOR VACUUM SEWER**

N.T.S.



**SANITARY SEWER
STANDARDS AND SPECIFICATIONS**
COUNTY OF YORK UTILITIES DIVISION

SCALE:
NOT TO SCALE
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2016
DETAIL NO.
SV2020



NOTES: THIS DETAIL APPLIES TO ALL WYE FITTING BRANCH CONNECTIONS TO THE PROPOSED VACUUM MAIN, INCLUDING 3" VACUUM SERVICE CONNECTIONS.

ALL FITTINGS SHALL BE SCH 40 PRESSURE FITTINGS MANUFACTURED BY "HARCO"

TYPICAL CROSSOVER CONNECTION TO VACUUM MAIN

N.T.S.

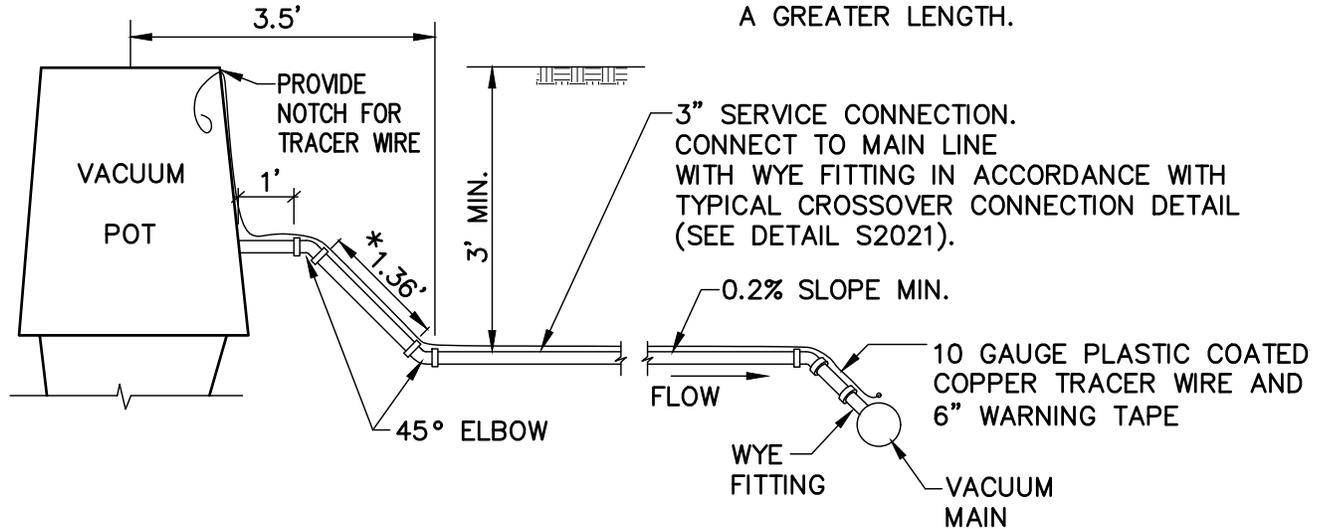


SANITARY SEWER STANDARDS AND SPECIFICATIONS

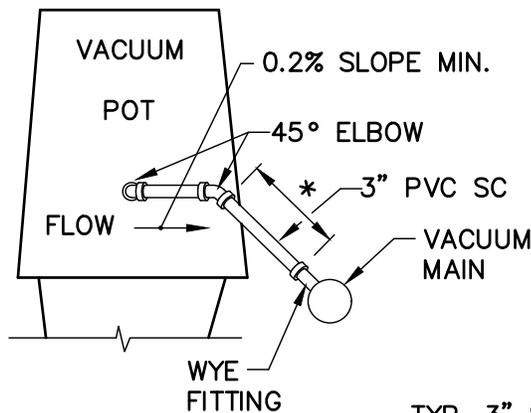
COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. SV2021

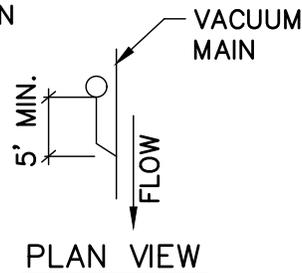
*MINIMUM TO OBTAIN 3' COVER;
FIELD CONDITIONS MAY DICTATE
A GREATER LENGTH.



TYP. 3" SERVICE CONNECTION (SC) DETAIL
IN VDOT R/W WHERE ϕ OF VACUUM
VALVE IS LOCATED 5 FT. OR GREATER
FROM ϕ OF VACUUM MAIN.



*LENGTH MAY VARY
DEPENDING ON
LOCATION OF
VACUUM MAIN



TYP. 3" SERVICE CONNECTION (SC) DETAIL
WHERE ϕ OF VACUUM MAIN IS LOCATED
LESS THAN 5 FT. FROM ϕ OF VACUUM
MAIN.

NOTE : ALL FITTINGS SHALL BE SCH 40 PRESSURE FITTINGS
MANUFACTURED BY "HARCO"

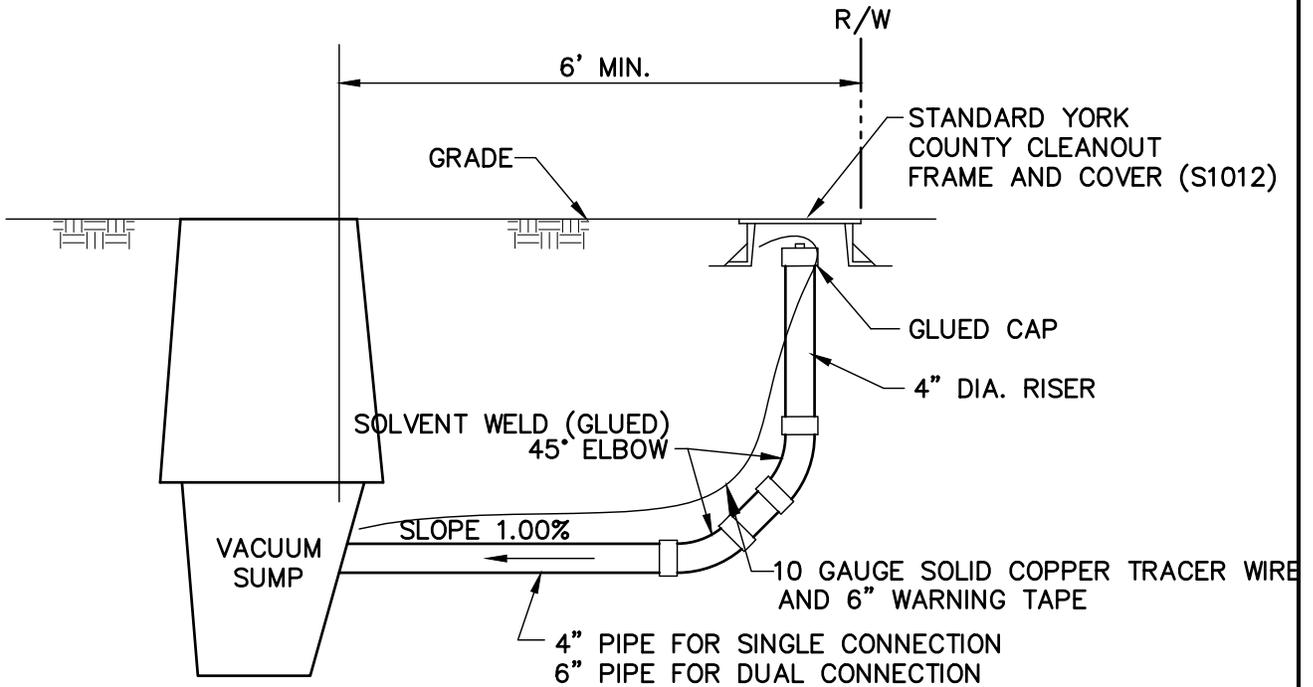
3" SERVICE CONNECTION DETAIL FOR VACUUM SEWER

N.T.S.



SANITARY SEWER
STANDARDS AND SPECIFICATIONS
COUNTY OF YORK UTILITIES DIVISION

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NOT TO SCALE
DATE APPROVED:
2016
DETAIL NO.
SV2023



THE CONTRACTOR SHALL NOTE THAT THE "MAXIMUM INVERT @ CLEANOUT" SHOWN ON THE DRAWINGS FOR VACUUM POTS INDICATES THE MAXIMUM INVERT ELEVATION AT WHICH THE PROPOSED CLEANOUT CONNECTION CAN BE INSTALLED AT THE PROPERTY LINE IN ORDER TO ACCOMMODATE GRAVITY FLOW FROM INDIVIDUAL DWELLINGS. THIS MAXIMUM INVERT DOES NOT INDICATE A REQUIRED INSTALLED INVERT ELEVATION, HOWEVER, IF THE MAXIMUM INVERT REQUIREMENT CANNOT BE MET, THE CONTRACTOR SHALL NOTIFY THE OWNER IMMEDIATELY. THE CONTRACTOR SHALL TAKE SPECIAL NOTE THAT ALL GRAVITY SEWER LATERALS SHALL BE INSTALLED AT 1% SLOPE UNLESS OTHERWISE APPROVED BY THE OWNER.

LATERAL AND CLEANOUT PIPE AND FITTINGS SHALL BE SCH.40 OR SDR 21 PRESSURE RATED, CONFORMING TO ASTM D-2241 WITH A CELL CLASSIFICATION OF 12454 CONFORMING TO ASTM D-1784.

TYPICAL VACUUM SEWER LATERAL AND CLEANOUT DETAIL

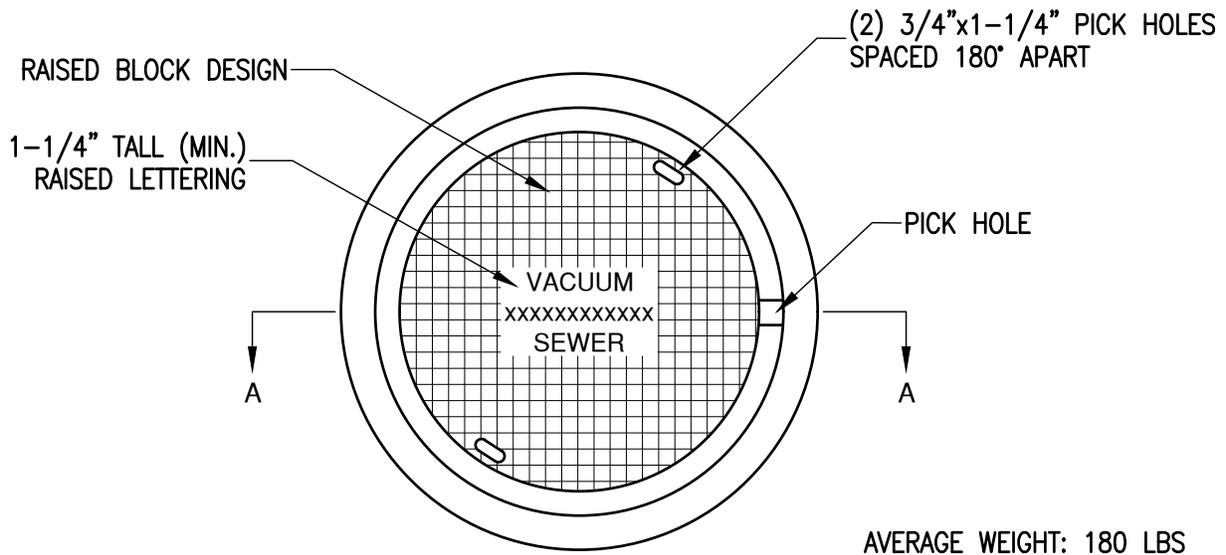
N.T.S.



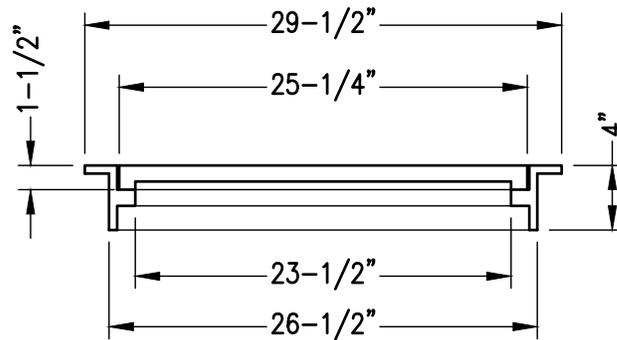
SANITARY SEWER STANDARDS AND SPECIFICATIONS

COUNTY OF YORK UTILITIES DIVISION

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. SV2024



PLAN



SECTION A-A

NOTES:

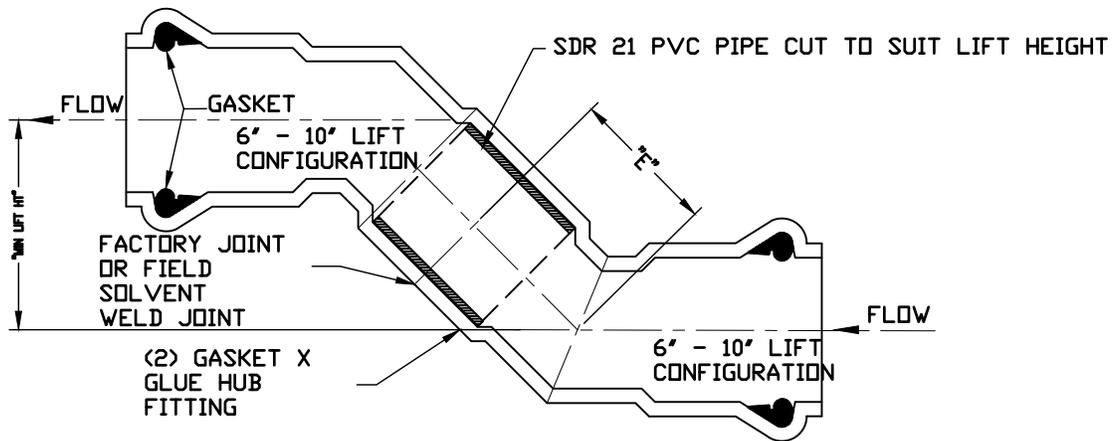
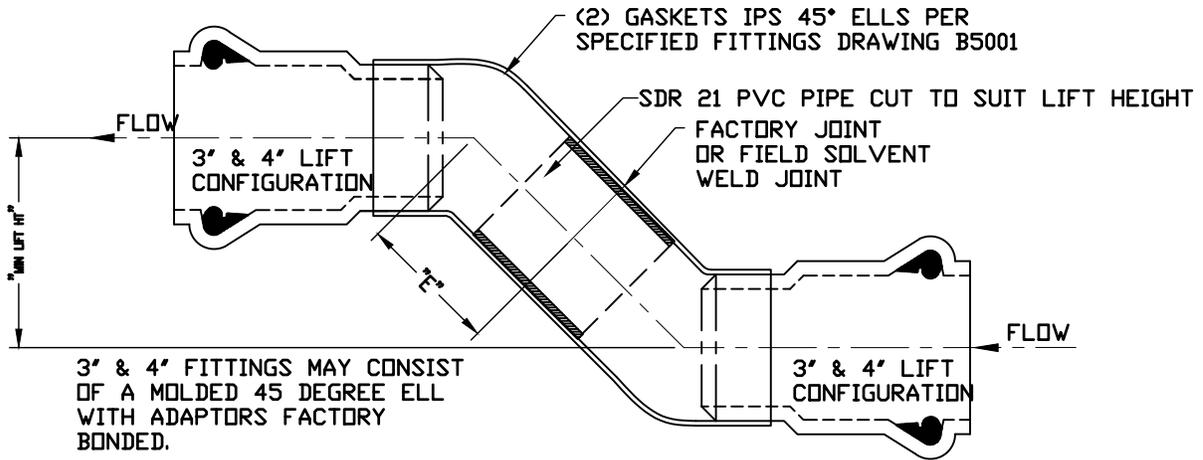
1. ALL GRAY IRON CASTINGS SHALL CONFORM TO ASTM A-48, CLASS 30 AND SHALL BE OF UNIFORM QUALITY.
2. ALL CASTING DIMENSIONS SHALL HAVE A TOLERANCE OF 1/8"±.
3. ALL CASTINGS SHALL BE CLEANED BY SHOT BLASTING AND HAND CHIPPING USING STANDARD INDUSTRY PRACTICES PRIOR TO SHOP APPLICATION OF ASPHALTIC COATING, BY DIPPING.
4. FRAMES AND COVERS SHALL BE NEENAH FOUNDRY R-5900-F OR EQUAL DESIGNED FOR H2O TRAFFIC LOADS WITH AIRVAC VALVE POTS.

**STANDARD VACUUM SEWER
MANHOLE FRAME AND COVER**



**SANITARY SEWER
STANDARDS AND SPECIFICATIONS
COUNTY OF YORK UTILITIES DIVISION**

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. SV2025



'SIZE'	'E'	MIN. LIFT IN.	MIN. LIFT FT.	PART NUM	LIFT HT REQ'D	ADD TO P.N.
3'	2.75'	3.89'	0.32 FT	305553M	1.00	-9
4'	3.00'	4.25'	0.35 FT	305554M	1.00	-8.5
6'	6.75'	9.55'	0.80 FT	305556M	1.50	-15.5
8'	8.00'	11.31'	0.94 FT	305558M	1.50	-14
10'	13.00'	18.38'	1.53 FT	3055510M	1.60	-9.125

NOTES:

1. DIMENSIONS OF ALL FITTINGS SHOWN ARE BASED ON SPECIFIED FITTING COMPANY BELLINGHAM, WA. & CAN VARY $\pm 1/2'$.
2. LARGER LIFTS ATTAINABLE BY INCREASING CONNECTING PIPE LENGTH.

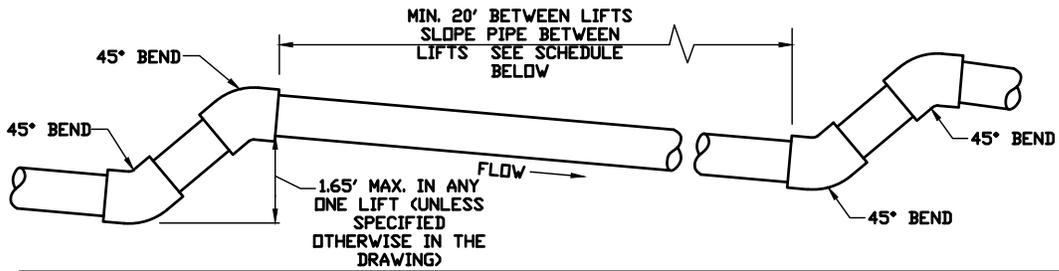
MINIMUM LIFT HEIGHTS GASKET X GLUE JOINTS

NOT TO SCALE



**SANITARY SEWER
STANDARDS AND SPECIFICATIONS**
COUNTY OF YORK UTILITIES DIVISION

SCALE:
NOT TO SCALE
DATE APPROVED:
2016
DETAIL NO.
SV2026



SLOPE SCHEDULE			
PIPE DIAMETER	MINIMUM FALL BETWEEN LIFTS	DISTANCE BETWEEN LIFTS	MIN. SLOPE BETWEEN LIFTS
3'	0.20 FT	LESS THAN 100 FT	0.20 FT/DISTANCE BETWEEN LIFTS
3'	0.20 FT	GREATER THAN 100 FT	0.20%
4' - 10'	0.25 FT	LESS THAN 125 FT	0.25 FT/DISTANCE BETWEEN LIFTS
4' - 10'	0.25 FT	GREATER THAN 125 FT	0.20%

NOTES:

1. SLOPE PIPE AS SHOWN ON DRAWINGS, BUT NOT LESS THAN SLOPES SHOWN IN SLOPE SCHEDULE ABOVE.
2. LIFT HEIGHT TO BE AS SHOWN ON DRAWINGS, BUT NOT MORE THAN MAX. LIFT HEIGHT SHOWN ABOVE.
3. FALL BETWEEN LIFTS TO BE AS SHOWN ON DRAWINGS, BUT NOT LESS THAN MIN. FALL SHOWN ABOVE.

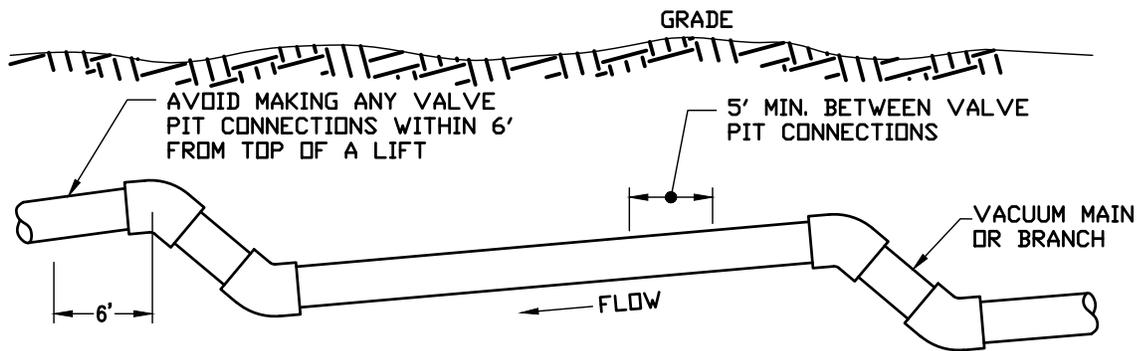
LIFT DETAIL AND SLOPE SCHEDULE

NOT TO SCALE



**SANITARY SEWER
STANDARDS AND SPECIFICATIONS
COUNTY OF YORK UTILITIES DIVISION**

SCALE:
NOT TO SCALE
DATE APPROVED:
2016
DETAIL NO.
SV2027



NOTE:

1. FIVE FEET (5') MIN. BETWEEN VALVE PIT CONNECTIONS APPLIES EVERYWHERE IN SYSTEM.

VALVE PIT CONNECTION LOCATIONS

NOT TO SCALE



**SANITARY SEWER
STANDARDS AND SPECIFICATIONS
COUNTY OF YORK UTILITIES DIVISION**

SCALE: NOT TO SCALE
DATE APPROVED: 2016
DETAIL NO. SV2028

11.3 Flow Factors, Peak Factors, and Units

Please use the table below to calculate sanitary sewer flows for your project

Land Use	Contributing Unit Type	Flow (gpd/Unit)	Flow Duration (hours)	Peak Factor
Residential				
Single Family Homes, Trailers, Apartments, Condos, Townhomes, Duplexes	Residential Dwelling	310	24	2.5
Medical Facilities				
Hospitals	Medical Bed	300	24	3
Nursing Homes & Assisted Living		160	24	3
Funeral Homes	Gross SF	0.25	12	3
Medical Office Building	Gross SF	0.25	12	3
Tourism Facilities				
Motels & Hotels	Room	130	24	3
Educational Facilities				
High School (w/ showers)	Student / Faculty	15	8	3
Elementary & Middle School		10	8	3
College/University Campus & Day Care		10	12	3
Boarding Schools		75	16	3
Recreational Facilities				
Picnic Areas, Parks & Amusement Parks	Person	5	12	3
Movie Theater	Seat	2.5	12	3
Religious Assembly		2.5	6	3
Campground / Cabins	Camping site	100	24	3
Dining /Eatery Facilities				
Restaurants	Seat	30	16	3
Service & Retail Facilities				
Shopping Mall & Retail Shops	Gross SF	0.2	12	3
Convenient Store		0.3	24	3
Office Building, Storage Units Office		0.1	12	3
Fitness Center		0.1	16	3
Service Stations		0.4	16	3
Laundromats	Machine	500	16	3
Industrial Facilities				
Heavy Industrial	Gross SF	0.35	16	3
Light Industrial		0.1	16	3
Warehouse		0.05	24	3

11.4 Manning's Roughness Coefficients

Manning's Roughness Coefficients for Open Channel Flow		
Pipe Material	Notes	Manning's Roughness Coefficient, n
Brick and Cement Mortar		0.015
Cast (CI) or Ductile Iron (DI), new	New	0.012
Concrete		0.013
Polyethylene (PE)	Smooth Wall	0.011
Polyvinyl Chloride (PVC)	Smooth Wall	0.011
Vitrified Clay Sewer Pipe	New	0.014

11.5 Minimum Pipe Slopes

York County Minimum Pipe Slope		
<i>The minimum slope per pipe diameter</i>		
Sewer Size in Inches	Design Minimum Slope in %	Constructed Minimum Slope in %
6	0.80%	0.75%
8	0.45%	0.40%
10	0.33%	0.28%
12	0.27%	0.22%
14	0.22%	0.17%
16	0.19%	0.15%
18	0.17%	0.12%
21	0.15%	0.01%
24	0.13%	0.08%
27	0.10%	0.07%
30	0.10%	0.06%
36	0.10%	0.05%

11.6 Approved Manhole Coatings

Appendix York County Approved Epoxy Manhole Coatings – Type A & B

MODIFICATIONS TO REGIONAL STANDARDS				
Section	Title	Page	Subsection	Modification
822	Manhole Rehabilitation	2	1.2.B.3	Products approved for York County Type A Manhole Coatings:
			1.2.B.3.A	<p>Tnemec</p> <ol style="list-style-type: none"> 1. New Manhole <ol style="list-style-type: none"> a. Fill voids and bug holes with Series 218 MortarClad b. Series 435 Perma-Glaze @ 40 mil. 2. Existing Manhole <ol style="list-style-type: none"> a. Series 218 MortarClad @ 1/16-inch skim coat b. Series 435 Perma-Glaze @ 40 mil.
			1.2.B.3.B	<p>Sauereisen</p> <ol style="list-style-type: none"> 1. New Manhole <ol style="list-style-type: none"> a. Fill voids and bug holes with Epoxy Filler Compound no. 209 b. Sewergard Glaze No. 210G – 40 mil. 2. Existing Manhole <ol style="list-style-type: none"> a. Leaks: InstaPlug No. F-180 b. Surfacing: Underlayment No. F-120 or Resurfacer No. F-121 c. Coating: Sewergard Glaze No. 120G – 40 mil.
			1.2.B.3.C	<p>Raven</p> <ol style="list-style-type: none"> 1. New Manhole <ol style="list-style-type: none"> a. Raven 405 Blue Epoxy Resin (80 mils) 2. Existing Manhole <ol style="list-style-type: none"> a. Mortar: Quadex Hyperform or Strong-Seal Profile Plus mix b. Coating: Raven 405 Blue Epoxy Resin (80 mil)
			1.2.B.3.D	<p>Sprayroc</p> <ol style="list-style-type: none"> 1. New Manhole <ol style="list-style-type: none"> a. One coat Spraywall polyurethane coating (100 mils) 2. Existing Manhole <ol style="list-style-type: none"> a. Mortar: Strong-Seal Profile Plus mix – min. ½ inch (fill voids and defects) b. Coating: Spraywall polyurethane coating (100 mils)
			1.2.B.3.E	<p>Permacast 10,000 with Dinjer SG Mastic</p> <ol style="list-style-type: none"> 1. New Manhole <ol style="list-style-type: none"> a. One coat Dinjer SG Mastic coating (65 mils)

Appendix York County Approved Epoxy Manhole Coatings – Type A & B

MODIFICATIONS TO REGIONAL STANDARDS				
Section	Title	Page	Subsection	Modification
				2. Existing Manhole <ul style="list-style-type: none"> b. Mortar: Permacast 10,000 – min. ½ inch (fill voids and defects) b. Coating: Dinjer SG Mastic coating (65 mils)
			1.2.B.4	Products approved for York County Type B Manhole Coatings:
			1.2.B.4.A	Tnemec <ul style="list-style-type: none"> 1. New Manholes <ul style="list-style-type: none"> a. Lining: Permashield H2S Series 434 (125 mil) b. Topcoat/Gelcoat: Perma-Glaze Series 435 (15 mil) (Backrolling when applied over Series 434) 2. Existing Manhole <ul style="list-style-type: none"> a. Surfaces: Mortarclad Series 218 b. Mortar: Mortarcast Series 219 c. Lining: Permashield H2S Series 434 (125 mil) d. Topcoat/Gelcoat: Perma-Glaze Series 435 (15 mil) (Backrolling when applied over Series 434)
			1.2.B.4.B	Sauereisen <ul style="list-style-type: none"> 1. New Manholes <ul style="list-style-type: none"> a. Lining: Sewergard No. 210T or 210RS (100 - 120 mils) b. Topcoat: Sewergard Glaze No. 210G (15 - 20 mils, 115 – 140 mils total) 2. Existing Manhole <ul style="list-style-type: none"> a. Leaks: InstaPlug No. F-180 b. Surfacing: Underlayment No. F-120 or No. F-121 Resurfacer c. Lining: Sewergard No. 210T or 210RS (100 – 120 mils) d. Topcoat: Sewergard Glaze No. 210G (15 – 20 mils, total 115 – 140 mils)
			1.2.B.4.C	Raven <ul style="list-style-type: none"> 1. New Manhole <ul style="list-style-type: none"> a. Coating: Raven 405 Blue Epoxy Resin (2 coats/100 mil total) 2. Existing Manhole <ul style="list-style-type: none"> a. AquaPoxy HB-1 (fill voids and defects) b. Mortar: Quadex Hyperform or Strong-Seal Profile Plus mix c. Coating: Raven 405 Blue Epoxy Resin (2 coats/100 mil total)

Appendix York County Approved Epoxy Manhole Coatings – Type A & B

			1.2.B.4.D	<p>Sprayroc</p> <ol style="list-style-type: none"> 1. New Manhole <ol style="list-style-type: none"> a. One coat Spraywall polyurethane coating (100 mils) 2. Existing Manhole <ol style="list-style-type: none"> a. Mortar: Strong-Seal Profile Plus mix – min. ½ inch (fill voids and defects) b. Coating: Spraywall polyurethane coating (200 mils)
			1.2B.4.E	<p>Permacast 10,000 with Dinjer SG Mastic</p> <ol style="list-style-type: none"> 1. New Manhole <ol style="list-style-type: none"> a. One coat Dinjer SG Mastic coating (80 mils) 2. Existing Manhole <ol style="list-style-type: none"> c. Mortar: Permacast 10,000 – min. ½ inch (fill voids and defects) b. Coating: Dinjer SG Mastic coating (100 mils)
MODIFICATIONS TO REGIONAL STANDARDS				
Section	Title	Page	Subsection	Modification
200	Products and Materials	87	5.21. H. 6.	Other Materials: <i>A polyurethane coating as supplied by Sprayroq Protective Lining Systems may be used for manhole coating in accordance with recommendations by the manufacturer and minimum requirements in the contract documents.</i>
822	Manhole Rehabilitation	7	II. 2.6	<p>Manhole Frame Sealing</p> <p>The manhole frame and the chimney above the cone shall be sealed in accordance with manufacturer’s recommendation. <i>The seal between the frame and manhole chimney/cone shall be addressed as a minor leak as stated in the previous subsection 2.2 C.</i></p>
822	Manhole Rehabilitation	8	III. A.	<i>Delete item 6. Removal of steps. Replace with Flow control or bypass pumping,</i>
		8	Add: III C.	<i>Measurement and payment shall be made for each manhole step removed and each invert bench (channel) rebuilt. Measurement and payment for pressure grouting to stop leaks shall be made per gallon of grout injected.</i>



11.7 Mandrel Size Chart

York County Mandrel Standard Based upon ASTM D 3034 and ASTM F 679

<u>Pipe Type</u>	<u>Nominal Pipe Size in Inches</u>	<u>Average Inside Diameter</u>	<u>Mandrel Size (5% Deflection)</u>
PVC ASTM D 3034 SDR 23.5	6	5.71	5.28
PVC ASTM D 3034 SDR 26	8	7.71	7.11
	10	9.64	8.87
	12	11.48	10.55
	15	14.05	12.90
PVC ASTM F 679	18	17.56	16.13
	21	20.70	19.00
	24	23.30	21.36
	27	26.26	24.06

11.8 Air Test Table

Air Test Table

The required specification times (MIN:SEC) for pressure to drop from 3.5 psi to 2.5 psi when testing one pipe diameter only

Line Length in Feet	Pipe Diameter in Inches								
	<u>4</u>	<u>6</u>	<u>8</u>	<u>10</u>	<u>12</u>	<u>15</u>	<u>18</u>	<u>21</u>	<u>24</u>
<u>25</u>	3:46	5:40	7:34	9:26	11:20	14:10	17:00	19:50	22:40
<u>50</u>	3:46	5:40	7:34	9:26	11:20	14:10	17:00	19:50	22:40
<u>75</u>	3:46	5:40	7:34	9:26	11:20	14:10	17:00	19:50	22:40
<u>100</u>	3:46	5:40	7:34	9:26	11:20	14:10	17:00	19:50	22:40
<u>125</u>	3:46	5:40	7:34	9:26	11:20	14:10	17:00	21:13	26:51
<u>150</u>	3:46	5:40	7:34	9:26	11:20	14:10	18:19	25:27	32:13
<u>175</u>	3:46	5:40	7:34	9:26	11:20	14:34	21:22	29:22	37:35
<u>200</u>	3:46	5:40	7:34	9:26	11:20	16:39	24:25	33:56	42:57
<u>225</u>	3:46	5:40	7:34	9:26	12:31	18:44	27:28	38:11	48:19
<u>250</u>	3:46	5:40	7:34	9:49	13:54	20:49	30:31	42:25	53:41
<u>275</u>	3:46	5:40	7:34	10:47	15:17	22:54	33:34	46:40	59:04
<u>300</u>	3:46	5:40	7:36	11:46	16:41	24:59	36:37	50:54	64:26
<u>350</u>	3:46	5:40	8:47	13:44	17:48	29:08	42:44	59:23	75:10
<u>400</u>	3:46	5:40	10:03	15:42	22:15	33:18	48:50	67:52	85:54
<u>450</u>	3:46	6:18	11:18	17:39	25:01	37:40	54:56	76:21	96:39
<u>500</u>	3:46	7:00	12:33	19:37	27:48	41:38	61:02	84:50	107:23

Notes

1. York County requires a minimum test pressure of 4.0 psi with no more than 1.0 psi pressure loss for the above duration times
2. Test pressures shall increase according to groundwater levels over the sewer line
3. The maximum testing pressure shall be no higher than 9.0 psi

11.9 Modeling Methodology

RESERVED, consult DPW-E staff for direction as needed.