SANITARY SEWER DESIGN STANDARDS AND CONSTRUCTION DETAILS

IN

Township of HOPEWELL
Mercer County | New Jersey

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TOWNSHIP ENGINEER

Adopted by Ordinance No. 20-1735
Dated 11/23/2020

PREPARED BY

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TOWNSHIP OF HOPEWELL
MERCER COUNTY, NEW JERSEY

ORDINANCE NO. 20-1735

ORDINANCE ETABLISHING STANDARD DESIGN SPECIFICATIONS AND CONSTRUCTION DETAILS FOR PUBLIC SANITARY SEWER COLLECTION FACILITIES IN HOPEWELL TOWNSHIP

WHEREAS, the Township of Hopewell chooses to amend its ordinances from time to time to update outdated provisions and procedures and clarify requirements; and

WHEREAS, the Township of Hopewell desires to incorporate energy efficiency and reliability into all existing and future public sanitary sewer collection systems within the township, while reducing operating and ownership costs; and

WHEREAS, there is a need to develop standard design and construction specifications as a guide for the repair of existing and construction of future public sanitary sewer collection systems throughout the township to achieve these goals; and

WHEREAS, the Township Engineer recommends standard construction specifications and details be established, published and available to the public as the technical regulations all public sanitary sewer collection systems owned by the municipality shall conform to when constructed, or altered.

NOW, THEREFORE, BE IT ORDAINED AND ESTABLISHED by the Township Committee of the Township of Hopewell, County of Mercer, State of New Jersey that Chapter 17 (XVII), Article VI, of the Code of the Township of Hopewell, entitled "Design Standards", and Chapter 19 (XIX) of the Code of the Township of Hopewell entitled "Sewer and Water Matters" be amended, modified and supplemented as follows:

Section 1. PUBLIC SANITARY SEWER STANDARDS

In Chapter 17, "Land Use and Development", Article VI "Design Standards", add new Section 17-117 "Public Sanitary Sewers" as follows:

§17-117: Public Sanitary Sewers

a. All public sanitary sewer collection systems to be constructed that will be owned and under the jurisdiction of the Township of Hopewell shall conform to the standard construction specifications and details established in Section 19-1.7.

Section I1. SEWER MATTERS

In Chapter 19-1, "Sewer Matters", add new Section 19-1.7 "Sanitary Sewer Design Standards" as follows:

§19-1.7: Sanitary Sewer Design Standards

a. All public sanitary sewer collection systems owned and under the jurisdiction of the Township of Hopewell shall conform to the standard construction specifications and details established by the township for the construction of new or alteration of existing collection systems.
b. Standard requirements for the construction or alteration of public sanitary sewer

collection systems owned and under the jurisdiction of the Township of Hopewell shall conform to the "Sanitary Sewer Standards and Construction Details in the Township of Hopewell", dated October 2020, or latest edition as prepared by the Township Engineer, which is incorporated herein by reference and available through the Office of the Township Engineer.

c. Public sanitary sewer collection systems that are located within the township and are owned or under the jurisdiction of private developments, homeowners' associations or regional sewage authorities are not required to conform to the standards established herein by reference.

d. Individual sewage disposal systems located on private property are not required to conform to the standards established herein by reference.

SECTION VI. SEVERABILITY.

If any section, subsection, paragraph, sentence or other part of this Ordinance is adjudged unconstitutional or invalid, such judgment shall not affect or invalidate the remainder of this Ordinance, but shall be confined in its effect to the section, subsection, paragraph, sentence or other part of this Ordinance directly involved in the controversy in which said judgment shall have been rendered and all other provisions of this Ordinance shall remain in full force and effect.

SECTION VII. INCONSISTENT ORDINANCES REPEALED.

All Ordinances or parts of Ordinances which are inconsistent with the provisions of this Ordinance are hereby repealed, but only to the extent of such inconsistencies.

SECTION VIII. EFFECTIVE DATE.

This Ordinance shall take effect immediately upon final adoption and publication in the manner prescribed by law and the filing of same with the Mercer County Planning Board pursuant to N.J.S.A. 40:55d- 16.

Date Introduced: November 9, 2020
Date Advertised: November 13, 2020
Date Adopted: November 23, 2020

Kristin L. McLaughlin
Mayor

Attest:

Laurie E. Gompf
Municipal Clerk

HOPEWELL TOWNSHIP
SANITARY SEWER DESIGN STANDARDS

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SECTION 1.0 - Design of Gravity Sewers

Material used in the construction of gravity sewers shall be as follows: gravity sewers shall be constructed of Polyvinyl Chloride (PVC), Reinforced Concrete (RCP), Ductile Iron (DIP) or Cast Iron (CIP). Inverted siphons shall be constructed of ductile iron pipe unless otherwise permitted by the Township.

All sewers and force mains shall be designed to flow with a minimum velocity of not less than two feet per second at full flow and a maximum velocity of ten feet per second, utilizing a Hazen-Williams coefficient of 120 (C=120). Inverted siphons shall be designed for a minimum velocity of three feet per second and a maximum velocity of six feet per second.

All gravity sewer mains shall be designed to carry four times the average daily flow upon full development of the tributary area.

Average flow shall be assumed to be 100 gallons per capita per day, and each unit to be occupied by four persons (300 gallons per day per EDU), unless it can be demonstrated to the Township's satisfaction that a different standard should be applied because of the unique nature of the proposed use.

For commercial, industrial, or residential developments, design flows shall be in accordance with NJDEP Rules and Regulation for Preparation of Plans for Sewer Systems and Wastewater Treatment Plants, latest revision, and are subject to approval by the Township's Engineer.

The Township will establish flow standards for any construction not included in the above.

Minimum size of gravity sanitary sewer mains shall be eight inch (8") diameter, with a minimum desirable slope of 0.4% and a minimum desirable velocity of 2 feet per second (2 FPS). Minimum size of force mains shall be two inch (2") diameter. Where terminal manholes and gravity sewers are designed, and the average design flow through the pipe is less than 8,000 gallons per day, the minimum slope shall be such that the design flow produces a velocity of 2 feet per second (2 FPS).

Connections made into existing manholes shall be cored and an approved watertight adapter shall be installed.

Where the proposed gravity sewer main passes improved lots other than the Applicant's proposed lots, it will be the applicant's responsibility to furnish and install laterals, deep house connections and wye cleanouts to the improved lots.

All sewers must be designed on a separate plan in which all water from roofs, sump pumps, cellars, streets and any other storm water collection must not be allowed to enter the proposed sanitary sewerage facilities. Discharge from any HVAC system is expressly prohibited to enter the sanitary sewerage system.

Sanitary sewer mains shall be constructed as close to the centerline of the road as possible. All sewer mains shall clear other utility crossings or obstructions. Sanitary sewers shall be eighteen inches (18") minimum below water lines. Twelve inches (12") minimum clearance is required with all other utilities (gas, storm, electric, etc.). Clearances shall be shown at all crossings.

Where sewers are constructed in wet easement areas, they shall be constructed with twelve foot wide stable stone access roads so that Township vehicles can access the entire length of the wet area. The Township Engineer shall determine the need for stone access roads in all other easement areas.

Sanitary sewer mains shall be located a minimum of ten (10) feet horizontally from parallel proposed or existing water mains.

Where water and sewer mains are parallel and a four (4) inch sewer lateral cross the water main, the sanitary sewer lateral shall be eighteen inches (18") minimum below the water line unless otherwise approved by the Township Engineer.

Pipe type and strength classification shall be selected based on accepted engineering design practice for the service, depth of bury, and loading.

Distances between manholes shall not exceed three hundred (300) feet.

Individual connections to the sewer main in the street shall be provided for each individual family dwelling proposed for connection. Each connection shall be provided with a clean out between the ROW line and curb.

Materials used in the construction shall be in accordance with these standards and the Township's Standard Details. Each house connection shall include a complete four inch (4") diameter PVC cleanout assembly with protection box as shown on the Standard Details.

SECTION 2.0 - Pipe Materials

Reinforced Concrete Pipe (RCP)

RCP shall meet all the requirements of the A.S.T.M. Specification C76, Wall B.

RCP shall not be used for gravity sewers less than thirty (30) inches in diameter.

In no case shall pipe with a strength classification of less than Class IV be permitted. For depths less than three feet, measured from top of the pipe, installed under traffic areas, Class V pipe shall be required. Pipe shall have maximum length of 20 feet.

RCP joints shall be the steel and rubber gasketed joint as described in Gifford-Hill American Specification SP-32, and as manufactured by Gifford-Hill American, Price Brothers or equal, and shall conform to AWWA C-302. Joints shall be made up in accordance with the manufacturer's recommendations, and shall be properly cleaned and lubricated and prepared prior to making the joint. After making up the joint, the gasket shall be verified as to proper positioning using a feeler gage supplied by the manufacturer. Upon proper jointing, the joint shall be externally wrapped with special grout bands furnished by the pipe manufacturer and filled with grout to the full circumference of the joint. The internal joint shall be filled with mortar to the flush inside face of the pipe.

Interior of RCP and fittings shall be shop coated with two (2) coats of a coal tar epoxy coating, equal to Carboline 300M, for a total dry film thickness of 16 mils, applied in strict accordance with the

manufacturer's written instructions. At a minimum, surface preparation shall include removal of all dirt, laitance and other foreign materials, and abrasive blasting. Prior to coating, the manufacturer shall perform testing on every tenth section of pipe produced in accordance with ASTM D4263 to verify that capillary moisture in the concrete is absent prior to coating. Upon completion of mortar coating of interior joint, the mortar coating shall be given two (2) field coats of the coal tar epoxy applied to a total dry film thickness of 16 mils, applied in strict accordance with the manufacturer's written instructions.

The applicant shall evaluate the soil conditions in the location of the pipe installation and report on the corrosiveness of the soil to the pipeline. An exterior pipe protective coating suitable for exposure to the soil and moisture conditions shall be applied to the pipe based on the evaluated soil conditions, and where required by the Township. Acceptable coating shall be Carboline 300M Coal Tar Epoxy, or approved equal, applied in strict accordance with the manufacturer's written recommendations. The pipe may alternatively be wrapped with a polyethylene wrap of a suitable thickness.

Ductile Iron Pipe (DIP)

DIP shall be centrifugally cast in metal or sand molds in accordance with A.N.S.I. Specification A21.51, cement lined and bituminous seal coated in accordance with A.N.S.I. Specification A-21.4, latest revision, minimum thickness Class 52.

The joint shall conform to the requirements of A.N.S.I. A.21.11 and shall be of a type that employs a single elongated groove gasket to effect a joint seal such as United States Pipe Company's "Tyton" joint, American Ductile Iron Pipe "Fastite" joint, or equal. Gaskets shall be of a composition suitable for exposure to sewage, and to soil conditions surrounding the pipeline. Pipe shall be furnished with flanges where connections to flanged fittings are required.

The pipe shall have smooth dense interior surfaces and shall be free from fractures, excessive interior surface crazing, and roughness. All surface preparation, coating, curing and handling shall be in strict accordance with the manufacturer's recommendations.

The exterior of ductile iron pipe shall be coated with a 1-mil asphaltic coating in accordance with AWWA Cl51.

Where required by the Township, and where required by acid soil conditions, furnish and install a continuous polyethylene sleeve, conforming to the requirements of AWWA C105. The sleeve shall consist of a tubular 8 mil thick linear low-density film or 4 mil thick high-density cross laminated film.

Cast Iron Pipe (CIP)

Cast iron pipe and fittings shall be pit cast extra heavy thickness in accordance with A.N.S.I. Specification A74, and shall only be permitted for use in house service connections.

The joint shall incorporate a neoprene gasket in accordance with ASTM C-564.

The pipe shall have smooth dense interior surfaces and shall be free from fractures, excessive interior surface crazing, and roughness. The cast iron pipe shall have an internal lining of amine cured Novalac epoxy containing at least 20 percent by volume of ceramic quartz pigment, Protecto 401 Ceramic

Epoxy® or approved equal, applied at a dry film thickness of 40 mils. All surface preparation, coating, curing and handling shall be in strict accordance with the manufacturer's recommendations.

The exterior of cast iron pipe shall be coated with a minimum 1-mil asphaltic coating in accordance with AWWA C 151.

Where required by Township and where required by acid soil conditions, furnish and install a continuous polyethylene sleeve, conforming to the requirements of AWWA C105. The sleeve shall consist of a tubular 8 mil thick linear low-density film or 4 mil thick high-density cross-laminated film.

Polyvinyl Chloride Pipe (PVC)

PVC solid wall sewer pipe shall be permitted for all gravity collection system pipelines and for gravity connection laterals.

The material from which the pipe and fittings are extruded shall be high impact types of PVC, un-plasticized, having high mechanical strength and maximum chemical resistance conforming to TYPE 1, Grade 1, of the specification for rigid polyvinyl chloride compounds, ASTM D1784, latest edition. Pipe shall be free from defects, bubbles and other imperfections in accordance with accepted commercial practice.

PVC solid wall pipe shall meet the requirements of ASTM D3034. Plastic pipe and fittings shall conform to ASTM D 3034 latest revision, with a wall thickness designated for SDR 35 (minimum) for pipes 8 to 15 inches; ASTM F679 for pipes 18 to 27 inches. Pipes 4" to 6” shall be Schedule 40.

SDR 35 PVC pipe shall not be used if less than four (4) feet of cover or more than twenty feet (20') will be provided. SDR 26 PVC pipe shall be used for depths greater than twenty feet (20’).

See Standard Details for minimum required PVC pipe bedding details. The Applicant shall submit for approval, details of the pipes, joints, fittings, beddings, etc., which they intend to use.

Plastic pipe shall be polyvinyl chloride sewer pipe with bell and spigot ends. 0-Ring rubber gasketed joints shall conform to ASTM D3212.

The adequacy of the pipe gasketed joint shall be demonstrated, by a test at the manufacturing plant in accordance with ASTM D2444 Stiffness, latest revisions.

Rubber ring gaskets shall be manufactured as per ASTM F477 latest revision. The gasket shall be the sole element depended upon to make the joint watertight.

SECTION 3.0 - Pipe Appurtenances

Manholes

Manholes shall be provided at ends of sewer lines, at intersections and at changes of grade or alignment. Distances between manholes shall not exceed 300’ feet. Where sewers enter manholes at elevations two feet or more above the invert out, drop manholes shall be provided and drop pipes

shall be built. The maximum permitted drop shall be six (6) feet. Additional manholes shall be provided if required to meet the six (6) feet maximum drop requirement.

Manholes shall be of pre-cast concrete or cast-in-place concrete.

If pre-cast manhole bases, barrels and cones are used, they shall be equal to reinforced concrete pipe and: fittings conforming to A.S.T.M. Specification C-478, with round rubber gasketed joints, conforming to A.S.T.M. specification C-361, Maximum absorption shall be 8% in accordance with A.S.T.M. specification C-76.

Manhole frames and covers shall be of cast iron conforming to specifications A.S.T.M. A-48-83, Class 30B and be suitable for A.A.S.H.T.O. H-20 Highway loading. Frame and covers shall be as shown on the Standard Details. The letters "H T Sewer" shall be cast integrally in the cover; or "SANITARY SEWER" if to remain private.

All manhole covers in easements or in remote areas shall be Campbell Foundry catalog No. 1486 or equal with locking covers. All manhole covers in low lying or flood prone areas shall be watertight Campbell Foundry catalog No. 6548 or equal and be set six (6) inches above finished grade unless located in an improved area (lawn, roadway, driveway, etc.).

Manholes shall be supplied with suitable flexible watertight connections cast into all pipe openings, with capability of deflecting a minimum of nine (9) degrees.

Cleanouts

All cleanouts shall be left a minimum of 24" above finished grade during initial construction, immediately after final testing of all cleanouts, installation of the cleanout protection box as shown on the Standard Details will be required and installed to final grade. Cleanout shall be located two (2) feet behind the face of curb or edge of pavement.

Inverted Siphons

Inverted siphons, if permitted, shall be constructed of ductile iron, lined with a hydrogen sulfide sewer safe coating and shall not have less than two barrels. Provision shall be made for jetting and for flushing. Velocity shall not be less than 3 feet per second and adjustable flow control gates in chambers shall be provided. Inlet and outlet chambers shall be furnished and installed to facilitate inspection, isolation of each barrel, and cleaning of each barrel. These are special conditions and further standards will be provided by the Township.

Special Structures

Special structures, including diversion structures, doghouse manholes, bypass manholes and metering structures shall be reviewed and approved on a case by case basis. The Township reserves the right to supplement these standards with additional requirements where they are in the interest of the Township for the proper design and construction of the sewerage system.

SECTION 4.0 - Service Connections

General Requirements

Connections shall be made in accordance with the Township's Standard Details, and shall be PVC Schedule 40 (Schedule 80 for deep house connections) or heavy duty cast iron.

All connections must have an inspection/observation cleanout, with a PVC plug when used with ductile iron or a bronze or brass plug when used with PVC to be placed two (2') feet from the face of the curb or edge of pavement. To the maximum extent possible, the cleanouts must not be situated in the sidewalk or in driveways.

Deep house connections shall be installed where required as shown on the Standard Details.

The maximum length of four (4") inch PVC piping to the first cleanout shall be 20' and slopes shall be not less than ¼" per foot.

House connections shall be constructed of a minimum diameter of four (4) inches. Deep house connections shall be provided where the sewer main centerline is more than ten (10) feet below the finished surface. Pipe materials shall be as required based on the requirements of the Standard Details.

Each house connection shall include a complete four (4) inch diameter cast iron or PVC clean out assembly with a protective box as indicated in the Standard Details.

Where water and sewer mains are parallel and a four (4) inch sewer lateral cross the water main, the sanitary sewer lateral shall be eighteen inches (18") minimum below the water line unless otherwise approved by the Township Engineer.

Pipe type and strength classification shall be selected based on accepted engineering design practice for the service, depth of bury, and loading.

Service Connections to Existing Sewer Mains

Connections to the sewer shall be made through an approved wye, saddle or other types as approved by the Township. Refer to Standard Details.

The Applicant's Contractor will be responsible for locating and protecting all existing utilities including, but not necessarily limited to, water, steam, oil, gas, sanitary sewers, storm sewers, drains, telephone ducts and electric conduits, or any other similar facilities which may be encountered during the construction operation. He shall be held solely responsible for locating all underground structures. He shall, at his own expense, arrange with the owners of such utilities for their aid and assistance in locating and protecting them and shall pay all charges, costs and expenses in connection therewith.

The Applicant's Contractor shall be required to obtain any and all necessary Road Opening Permits.

Cast iron (pit cast) house connection pipe, fittings and cleanouts shall be used when connecting existing ACP mains to individual houses. The material shall be extra heavy thickness conforming to the

requirements of ANSI specification A-74. Neoprene gasket joints shall conform to ASTM C-564. PVC laterals can also be used upon pre-approval by the Township.

Service Connections to New Sewer Mains

Service connections to new sewer mains shall be with approved materials and in accordance with the Standard Details.

Where the proposed gravity sewer main passes lots other than the Applicant's proposed lots, it will be the applicant's responsibility to furnish and install laterals, deep house connections and cleanouts to improved lots. The lateral shall terminate 12" beyond the cleanout and shall be capped for future use.

Residential Service Connections

Individual connections to the sanitary sewer main in the street shall be provided for each individual family dwelling or fee simple townhouse proposed for connection. Each connection shall be provided with a clean out two (2) feet from the face of curb line or edge of pavement. All lateral connections shall be made perpendicular to the sewer main, and shall be labeled by station along the run from the upstream manhole.

Connections from the cleanout to the dwelling are under the jurisdiction of the Building Department through its Plumbing Inspector. His/her approval will be required before the Township will accept discharge of sewage into its mains.

Commercial and Industrial Service Connections

Connections to commercial and industrial sites shall be DIP heavy duty CIP or PVC, manufactured in accordance with ASTM D-1785. Fittings shall conform to the requirements of ASTM D-2467 for socket type. Socket type connections shall be joined with a primer and PVC solvent cement in accordance with ASTM D-2564.

SECTION 5.0 - Testing and Televising

Sanitary sewer systems must be complete before testing is witnessed by the Township. This includes finished manholes inside and out, cleanouts in proper location, and base course pavement (or completed stone access road) over lines to be tested.

All gravity sewer facilities shall be subjected to air pressure testing and televising. Prior to testing all lines and manholes shall be cleaned.

The tests shall be performed between two (2) manholes or as otherwise directed by the Township Engineer and shall include all related sewerage including laterals and cleanouts.

The Applicant's contractor shall furnish all labor, material and equipment necessary for the testing.

The sewer pipe shall be tested under a 5.0 psi pressure and shall be maintained for a period of five (5) minutes with no drop in pressure.

All sewer mains will be televised by the applicant's contractor. The video camera shall be specifically designed for sewer inspections, with its own light source suitable to provide a clear picture of the entire periphery of the pipe. The camera shall be self-propelled and not be pulled by means of a water jetting nozzle. Two (2) copies of the televising on CD, or other approved digital media format compatible with standard/conventional computer equipment such as a portable document or similar format with audio log superimposed on the visual log, shall be submitted to the Township Engineer and shall be accompanied by two (2) copies of a legible log. The CD and case or other digital equivalent as applicable shall be labelled clearly, indicating the project name, date and sewers inspected. The label shall correspond to the log sheet. The audio log and written log shall contain the following information (as a minimum): project name, section, video inspection firm and crew chief's name, name of the Owner representative, date, manhole to manhole designation, direction of camera, type of pipe, type of joints, joint spacing, cleanliness, manhole conditions, pipe conditions, section length, pipe size, depth of pipe, clarity of flow, continuous distance measurement, and location of all connections to the sewer line. All televising work shall be witnessed by the Township Engineer. Video inspection work shall be performed immediately following the sewer cleaning operations such that the highest quality inspection can be made. Water used during cleaning shall be allowed to drain by natural gravity flow before starting this work.

Force mains shall be subjected to a hydrostatic pressure test in accordance with A WWA C600, with the test equal to two (2) times the maximum operating pressure or 100 psi (minimum) for a two-hour period. The test shall be performed on all portions of the force main.

All force main cleanout assemblies and air release assemblies shall be included in the tests. The air release valve assembly shall be observed for expulsion of air during the filling operation. After the force main is full, the lower outlet valve on the release valve shall be opened to verify the presence of water up to that level.

Sanitary sewer lines require mandrel testing with a nine (9) point mandrel with a diameter of ninety-five percent (95%) of the pipe diameter. If directed by the Township Engineer, the Applicant shall furnish a proving ring to verify the mandrel size.

Any piping found to have deflected excessively or be out-of-round, as determined by the Township Engineer shall be replaced or repaired as directed.

Any pipe, joint or other part of the sewer construction found to show leakage shall be repaired, or removed and replaced in accordance with latest revision of "Repair Guidelines" published by Utility Contractor's Association of New Jersey.

<u>As-Built</u>

Provide an "AS-BUILT" of all sanitary sewer mains, manholes, laterals, and clean outs installed. Include plan view and invert elevations.

Provide "AS-BUILT" in CAD and GIS format for all work covered in this section. CAD and GIS files to be provided on CD/DVD or other compatible digital media with clear labeling.

The "AS-BUILT" shall Identify and describe any unexpected variations to subsoil conditions or discovery of uncharted utilities when encountered.

SECTION 6.0 - Pump Stations

Pump station and other equipment specified herein identifying a specific manufacturer are intended to match other equipment located throughout the township, and are intended to be as indicated with no substitutions. The specific manufacturers indicated are installed within other facilities, and the Township has employed a policy of uniform equipment and parts for maintenance purposes.

Site Layout and Access

All pump stations shall be located in areas that are not subject to flooding and that are accessible by motor vehicle. Each pumping station must be on a parcel of land adequate to meet the requirements of the Township for operations and maintenance.

The site shall be arranged to provide vehicular access to all structures and equipment as generally shown on the Standard Details. Vehicular access is required to the Control Building, wet well, comminutor chamber, bypass valve chamber, wet well pumping chamber and meter chamber. The area shall be paved with hot mix asphalt (HMA) as shown on the Standard Details. Vertical clearance shall be twelve (12) feet. Turning radii shall be suitable for a SU-30 vehicle with trailer.

Provide a concrete apron in front of the roll-up door and man doors of the Control Building. The concrete aprons shall be a minimum of six (6) inches thick, 4500 psi concrete with WWF and shall slope away from the Control Building at a minimum slope of 2% and maximum slope of 12:1.

The property boundaries shall be clearly marked with concrete survey monuments at all corners. The pump station shall be entirely fenced as shown on the Standard Details.

Fences and Gates

The pump station site shall be secured with a 6-foot high galvanized steel black vinyl coated chain link fence. One 16 foot wide cantilever sliding gate is required for vehicular access and one 4 foot wide single swing gate is required for pedestrian access. See Standard Details. Gates shall be equipped with locking hardware and shall be keyed to match current Public Works key system.

Pavement

Provide paved access driveway and parking areas as shown on the Standard Details. Paved parking area shall extend to each structure or equipment which requires vehicular access.

Landscaping

The plans must include provisions for lawns, ground cover, shrubbery, and landscaping as shown on the Standard Details. The landscaping plan proposed by the Developer shall be reviewed and approved by the Township. The Developer is responsible for maintenance of all landscaping until final acceptance by the Township. Any damaged, dying or dead landscaping shall be replaced prior to acceptance. Developer is responsible for irrigation until final acceptance.

Pre-Cast Chambers

Minimum structural member thickness for chambers or vaults shall be 5 inches. Cement shall be Type V Portland Cement in accordance with ASTM Cl 50. Minimum 28-day concrete compressive strength shall be 4,000 psi. All reinforcing shall be embedded in the concrete with a minimum clear cover as recommended by ACI 318. Chambers in areas subject to vehicular traffic shall be designed for H-20 traffic loading. Chambers in other areas shall be designed for a vertical live load of 300 psf. Top slab of chambers that are not subject to vehicular traffic shall be set at a minimum of two (2) foot above existing grade. Wall and base design of square or rectangular chambers shall be in accordance with the requirements of ASTM C913, with water table assumed at grade, and lateral soil pressure coefficients developed as a result of investigated soil conditions. All chambers shall be designed to prevent uplift without being backfilled, or relying on backfill for prevention of uplift.

Joints

Where joints are designed in pre-cast concrete vaults, such joints shall be interlocking to secure proper alignment and to prevent migration of soil through the joint. Structural sections at joints shall be sized sufficiently to reinforce the section against localized stress during transportation and handling and excess contact bearing pressures through the joint. Joints shall be made waterproof through the use of acceptable butyl bentonite seal strips applied and adhered to the lower pre• cast section prior to placement of the upper pre-cast section. Joints shall be parged with cement grout inside and out after setting.

Coatings

The exterior of all below grade pre-cast and cast in place chambers shall be coated with two (2) coats of polyimide epoxy. Coating shall be applied in strict accordance with the manufacturers written guidelines.

The interior of chambers shall be coated with two (2) coats of polyimide epoxy based on the location as indicated below. Coating shall be applied in strict accordance with the manufacturers written guidelines. Interior coatings are required at the following locations:

- At or within 100 feet downstream or 30 feet upstream of a sanitary sewer force main discharge location.
- At or within 100 feet downstream or 30 feet upstream of a sanitary sewer drop manhole location.
- At any other location where the Township determines it is necessary based on existing sewer conditions at the location of the chamber.

Cast-in-Place Chambers

Cast-in-place reinforced concrete chambers shall be designed by qualified engineers to provide for the necessary strength and durability of the structure as required by the design conditions. Minimum structural member thickness for cast in-place reinforced concrete chambers shall be 6 inches. All chambers exposed to sewage shall be constructed using Type V Portland Cement in accordance with ASTM Cl50. Minimum 28-day concrete compressive strength shall be 4,000 psi. All concrete shall be air entrained. All reinforcing steel shall be embedded in the concrete with a minimum clear cover as

recommended by ACI 318. Reinforcing steel shall be in accordance with ASTM A615, Grade 60; welded wire fabric in accordance with ASTM A185; and bending details in accordance with ACI-SP66. Chambers in areas subject to vehicular traffic shall be designed for H-20 traffic loading. Chambers in other areas shall be designed for a vertical live load of 300 psf Top slab of chambers that are not subject to vehicular traffic shall be set at a minimum of one (1) feet above existing grade. Wall and base design of square or rectangular chambers shall be designed in accordance with the water table assumed at grade, and lateral soil pressure coefficients developed as a result of investigated soil conditions. All chambers shall be designed to prevent uplift without being backfilled, or relying on backfill for prevention of uplift.

Openings and Hatches

Provide full clear space openings as required, without obstructions from brackets and supports. Top slab frames and covers shall be all-welded aluminum or stainless steel (Type 316), complete with all stainless steel Type 316 hardware as manufactured by Bilco or equal. No ferrous metal parts shall be permitted. Frames shall incorporate a perimeter drainage channel, which shall be piped and directed away from the chamber interior. All aluminum in contact with concrete shall be coated with an asphaltic paint to protect against galvanic action. Where sidewall or roof penetrations into the chamber are required for piping, conduit, or ductwork, such penetrations shall be made with cast openings with waterstopped galvanized or plastic sleeves. The Township may allow core drilling on a case-by-case basis. All drilled openings shall be smooth and free of surface irregularities and without exposed steel reinforcing. Any reinforcing steel exposed shall be cut back 1.5 inches and parged over with a non shrink cement grout. Final sealing of openings shall be made using stainless steel Link-Seal materials suitable for the intended use, or cast-in-place resilient compression seals equal to Atlantic Products A-Lok gaskets for piping.

Curing and Protection of Concrete

Curing and protection of cast-in-place concrete shall be at a minimum in accordance with procedures set forth in ACI 301, ACI 305, Hot weather Concreting; and ACI306, Cold Weather Concreting.

Wet Well

The wet well shall be a pre-cast or cast-in-place concrete structure with a minimum diameter of six (6) feet. The floors of the wet well shall slope at least 45 degrees toward the pump suction.

Wet well interior walls shall be coated with two equal coats of High Build Epoxy Polymide, DFT eight (8) mils or equal.

Provide a shear gate or flapper valve on all influent piping entering the wet well.

All equipment and fixtures within the wet well shall be explosion proof, damp proof and non-corrosive conforming with applicable standards. All support brackets, anchors, bolts and miscellaneous hardware shall be 316 stainless steel. When anchoring into concrete within the wet well, use exclusively chemical anchors.

The wet well shall be equipped with an aluminum access hatch, minimum size 3 feet by 4 feet and ladder rungs. The ladder rungs shall be located opposite from the influent pipe.

The wet well shall be equipped with removable aluminum or FRP safety gratings. At a minimum, a safety grating over the influent pipe is required. If the wet well depth exceeds 16 feet, other intermediate safety platforms are required.

A frost free yard hydrant shall be located near the wet well to allow for manual washdown.

The capacity of the wet well shall not exceed 10 minutes of detention time at the calculated average dry weather flow rate.

A wet well ventilation system is required. Fan activation shall be through a switch which energizes the fan whenever the access hatch is opened.

Sealed LED lighting equivalent to 300 Watts is required inside the wet well.

Pumps

At least two (2) pumps shall be provided, each capable of handling the total peak flow individually. If more than two (2) pumps are used, their capacities shall be such that upon the failure of the largest pump, the others will handle the peak flows. All pumps shall be equipped with variable speed controls which shall be continuously variable based upon wet well level.

Pumps shall be vertical, close coupled, non clog centrifugal wet well mounted (submersible) sewage pumps with filtered mechanical seals and shall be provided with hand holes and lifting eyes. Both the casing and impeller shall be constructed of cast iron with passages large enough to pass a minimum of a 3 inch solid. All pumps shall be Flygt submersible pumps.

Pump motors shall have a minimum service factor of 1.15 and shall be non-overloading through the full operating range of the pumps. The motors shall be designed to operate with the specified pump. Pump motors shall be equipped with a stainless steel shaft sleeve.

All pumps and equipment shall be explosion proof and damp proof. Shut-off valves shall be provided for pump isolation and check valves shall be provided on all discharges. Check valves shall be ball check valves for discharges up to six (6) inch diameter. Larger discharges shall be equipped with outside weight and lever cushioned check valves. Each pump shall be isolated from the system by plug valves provided on both the suction and discharge connections with the exception of submersible pumps.

In large pumps stations (with separate wet well and pump room configuration), pump suction shall terminate with a 90 degree flared elbow.

Pump Operation Control

For indoor installations, all control equipment shall be mounted within a NEMA Type 4, dead-front, powder coated or epoxy coated steel enclosure. For outdoor installations, or installations in wet or damp locations, all control equipment shall be mounted within a NEMA Type 3, stainless steel

enclosure. All enclosures shall be reinforced as required. All components within the control panel shall be UL listed or recognized, and the complete station control panel itself shall be labeled UL 508A General Use Industrial Control Panel. All reset buttons, level control devices, pilot lights, selector switches, etc., shall be mounted on an inner hinged panel. The hinged panel shall contain cut-outs for circuit breaker operators, motor starter reset buttons, etc., such that they are operable without opening the hinged panel and exposing the high voltage section of the cabinet. All devices in the panel shall be labeled and a coded wiring diagram shall be provided in a pocket within the panel.

Thermal magnetic air circuit breakers shall be provided for branch disconnect service and over-current protection of all auxiliary circuits. Instantaneous trip magnetic type motor circuit protectors, matched to the motor inrush current, shall be provided for each pump motor.

The pumps shall be controlled through a duplex pump controller. The pump control shall be a MultiSmart Controller compatible with Flygt pumps. The controller shall be SCADA ready. Primary liquid level sensing shall be via a submersible pressure probe except. A five float backup system (three floats for control, one high level, one low level) shall be provided in the event of failure of the primary level sensing system. The high water alarm float shall be a dry contact for direct use by the Township. Any floats, transducers, etc., mounted in the wet well shall be intrinsically safe.

Submersible pressure transducers shall be of the direct submersible type with stainless steel housing. The transducer shall be able to be mounted at the bottom of a pit with a support bracket and be cable connected providing an analog input signal to a meter/controller. The analog signal shall be 4-20 ma. The transducer operating temperature shall exceed the limits of expected temperature of the wet well liquids.

The five float backup system shall be capable of operating the pump system in normal alternating duplex mode until the primary level control system failure is corrected. Float circuits shall be intrinsically safe.

The duplex pump controller shall have the following minimum control functions:

- Operator front panel controls for each pump for selecting Manual-Off• Automatic control. Color touch-screen controllers are acceptable provided they revert to a separate backup float system upon primary controller failure.
- A 3-position selector switch to select either pump as "LEAD" or to automatically alternate the pumps on each start cycle.
- Signal inputs for stop, lead pump start, lag pump start, and high & low alarms with pilot lights showing each input signal.
- Pilot light indicators: Green “Pump Running" pilot light, Red “Pump Failure” pilot light, Red "Pump Seal Failure” pilot light (if required).
- Short cycle timers to keep the pump running after the start input deactivates for the delay time setting.

Delay start timer for delaying the start of the lag pump for a preset amount of time if the lead pump fails or if both pumps are called for at the same time. Minimum delay time shall be 5 seconds.

Adjustable failure time delay for each pump to start the lag pump if the lead pump fails or of the lead pump selector switch is placed in the "Off" position. Individual field adjustable time controls to delay starting each pump in the automatic mode after a power failure or during initial startup.

Manual override inputs for each pump. Improper sequence alarm.

Automatic pump alternation on pump failure and seal failure when the pumps are in automatic mode.

Lamp test feature.

Operator selectable set points for Pump Stop, Lead Pump Start, Lag Pump Start, High Level Alarm with pilot lights to indicate when each set point is activated. Provide relay outputs for each set point.

Wet well level indicator.

Start, stop and speed signal outputs to interface with variable frequency drives (if required).

PID controls as required to regulate the speed of the pump motors to maintain a wet well level set point.

Provide MultiSmart controllers that cover all points above at each pump station for all controlling functions.

Comminutor Chamber

Provide a comminutor chamber upstream of the wet well. Two channels shall be provided inside the comminutor chamber. The first channel shall be for the main flow and shall be equipped with a comminutor. The second channel shall be a bypass channel and shall be equipped with a 316 SS removable basket strainer.

Both channels shall be equipped with 316 SS guides and frames for 316 SS slide gates for isolation of the comminutor or the bypass channel, as needed. Provide two 316 SS stop gates which will fit into either channel.

Two aluminum waterproof access hatches shall be provided, one over the basket strainer and another over the access ladder. The hatches shall be lockable.

Ventilation is required.

Provide a portable davit crane foundation adjacent to the comminutor chamber.

Comminutor Equipment

The unit shall be of two-shaft design and capable of continuous operation, processing wet or dry.

The hydraulic power unit shall be located in the control building with submersible hydraulic motor(s) in the wet well and a programmable motor controller. Direct drive units are not permitted.

The comminutor manhole shall be equipped with a high level float and high level alarm from the float shall be wired to the alarm system

Manufacturer: Muffin Monster as manufactured by JWC Environmental or approved equal.

Pump Station Bypass Valve Chamber

A valve chamber is required downstream of the pump station to enable the Township to bypass the pump station as needed. The purpose of the valve chamber is to pump flow from the wet well to a point in the force main downstream of the pump station using a temporary pump. The following components are required:

- Provide a pre-cast or cast in place concrete vault, centered over the force main, minimum dimension of 8-foot square.
- Provide two (2) ball valves for 2" to 3" force mains or two (2) cast iron plug valves for force mains 4" and larger, one to prevent backflow to the pump station during bypass operations and another to isolate the temporary pump connection. Ball valves and plug valves shall be sized in accordance with the size of the force main.
- Provide check valve with outside spring and lever at the temporary pump connection.
- The temporary pump connection shall terminate at a 6" inch Ever-Tite quick coupling.
- The access hatch shall be water tight and shall be positioned to provide maximum clear opening over the temporary pump connection.
- A sump equipped with a sump pump is required. The sump pump shall discharge into the wet well and the discharge line shall be equipped with a double check valve and an isolation valve.

Wet Well Pumping Chamber

A chamber is required adjacent to the wet well to enable the Township to bypass the pump station as needed. The purpose of the pumping chamber is to pump flow from the wet well to the pump station bypass manhole using a temporary pump. The following components are required:

- Provide a pre-cast or cast in place concrete vault, minimum dimension of 8 foot square.
- Provide one 6" cast iron plug valve.
- The temporary pump connection shall terminate at a 6 inch Ever-Tite quick coupling.

- The access hatch shall be water tight and shall be positioned to provide maximum clear opening over the temporary pump connection.

- A sump equipped with a sump pump is required. The sump pump shall discharge into the wet well and the discharge line shall be equipped with a double check valve and an isolation valve.

For further details of the wet well pumping chamber, see Standard Details.

Meter Chamber

A meter Chamber is required downstream of the pump station bypass manhole to enable the Township to meter flows leaving the pump station. The following components are required:

- Provide a pre-cast or cast in place concrete vault, minimum dimension of 8 foot square.

- Provide a meter sized to fit the force main and flows anticipated. A remote meter reader shall be provided in the control building.

- Provide meter bypass piping and valves as shown on the Standard Details to allow the meter to be services without interrupting flow.

- The access hatch shall be water tight and shall be positioned to provide maximum clear opening over the meter and piping.

- A sump equipped with a sump pump is required. The sump pump shall discharge into the wet well and the discharge line shall be equipped with a double check valve and an isolation valve.

For further details of the meter chamber, see Standard Details.

Control Building

A Control Building is required to house the emergency generator and miscellaneous generator appurtenances pump station equipment control panels, the alarm system, the intrusion alarm system panel, the chart recorder, and lighting and electrical panels. The control Building shall also house a restroom, complete with toilet, emergency shower, and emergency eyewash, sink and water heater. The size of the building shall be determined based on the size of the generator and other equipment and shall be approved on a case by case basis. A basic layout showing minimum acceptable clearances is shown in the Standard details.

The following must be incorporated into the Control Building design:

- Ventilation for the generator room and the restroom. Ventilation for the generator room shall be in addition to make up air for the generator.

- Unit heaters for the generator room and the restroom.

- Insulated roll up door, minimum 10 foot wide and 8 foot high.

- Man door, minimum 36 inches wide.

- Hose bib with a minimum of 100 feet of hose on wall rack. The backflow preventer shall be located inside building. The hose bib and the backflow preventer must be located a minimum of five (5) horizontal feet from any electrical equipment and cannot be placed directly above or below electrical equipment.

Minimum requirements for various building components are set forth in subsequent sections.

Interior and exterior color and texture finishes shall be selected by the Township based on samples provided by the Developer.

Roofing

Fiberglass Asphalt Roofing system shall be complete with shingles, underlayment, ridge vents, ridge caps and a leak barrier at eaves, hips, rake edges, around penetrations, ridges, flashings and transitions.

Provide shingles of heavy weight construction, minimum 340 pounds per square nominal. The shingles shall have Class A fire and wind ratings from Underwriters Laboratories.

The shingles shall be treated with an algae killing compound to resist staining.

Manufacturer: Grand Timberline by GAF Corporation or approved equal.

4" Aluminum gutter gutters and downspouts shall be provided. Concrete splash bocks shall be provided at each downspout that discharges to grade.

Concrete Masonry Units (CMU)

Design of concrete masonry units and accessories shall comply with the requirements of ACI 531 - Building Code Requirements for Masonry Structures; ACI 530- Specifications for Masonry Construction; and ASTM C-90 Load Bearing Masonry Units. Units shall be Split Face masonry units, normal weight, Type 1. Units shall be provided with an integral water repellant.

Minimum acceptable width of units shall be 8-inches. All masonry shall be constructed in running bond pattern. Masonry shall be manufactured to provide a minimum 3000 psi net compressive strength. All masonry shall be reinforced at a minimum every other course with standard weight Dur-O-Wal, or equal, or more as required by design. All framed opening shall be reinforced as required.

The exterior of the building shall consist of brick. Color and brick pattern to match existing pump stations in the Township.

Precast concrete buildings are not permitted.

Insulation

Foundation Wall/Slab Insulation: In addition to CMU insulation, furnish and install 1.5 inch thick rigid board Foamular 250 insulation as manufactured by Owens-Corning or equal around the full perimeter of the foundation. Foundation insulation board shall be a installed at the inside face of exterior masonry or concrete foundation walls to a depth of two-feet below the floor slab, providing an insulation value of R=7.5 minimum. Foamular 250 shall also be placed under the floor slab a dimension extending two feet from the exterior foundation wall all around the perimeter of the foundation.

CMU shall be insulated with manufacturer inserted polystyrene insulation blocks in accordance with ASTM C578, Type 1.

Ceilings shall be fully insulated between rafters with thermal batt insulation providing a minimum insulation value of R-30. Insulation shall meet ASTM C665, Type II, Class C, be a nominal 9.5 inches thick and shall be Kraft faced. Insulation shall be as manufactured by Owens Corning, PINK Fiberglass Batt Insulation, or equal.

Plumbing Accessories

Toilet and lavatory shall be floor mounted, designed and installed to comply with ADA and ANSI 117.1.

Exposed brass, faucets, valves, traps and escutcheons shall be chrome plated.

Wall hydrants shall be non-freeze, anti siphon and automatic draining.

Stainless steel grab bars are required.

Provide wall mounted soap and toilet paper dispenser.

Provide mirror over sink and paper towel dispenser.

Provide a tank-less water heater for the lavatory. Minimum of 40 degrees Fahrenheit temperature rise at 2 gallons per minute is required.

Provide floor drain in generator area and restroom. To be connected to gravity sanitary sewer system.

Emergency Generator

An Emergency generator shall be required for all pump stations. The generator shall be installed inside the control building on structural concrete pad, a minimum of 4-inches high isolated from the remainder of the building floor. The generator shall be sized for the electrical requirements of all pump station equipment while sustaining no more than a 10% voltage drop with the application of the largest load. Sizing calculations shall be provided showing voltage dips, frequency dips, and current dips as loads are applied to the generator. The sizing calculations shall confirm that the voltage dips, frequency dips and current dips are acceptable to the various equipment manufacturers for their electrical equipment. The entire installation shall conform to the latest versions of the NEC and the International Mechanical and Fuel Gas Codes, and the National Standard Plumbing Code.

The generator shall be powered by natural gas. Diesel generator are not permitted unless approved by the Township Engineer due to the lack of natural gas service. The generator shall be liquid cooled and sized for operation in 130 degree Fahrenheit ambient temperatures. The following minimum accessories shall be provided:

- Block heater with thermostat
- Radiator duct flange
- Critical grade exhaust silencer
- Pre-formed, lace-on exhaust piping and silencer insulation
- 12-volt battery, battery rack, cables & equalizer/float type battery charger
- Main line circuit breaker with auxiliary contacts to provide trouble indication if the breaker is in the "Tripped" or "Off" position.
- Run relay with four-pole, double-throw 10-ampere contacts and a battery operated coil connected to the ending ignition circuit for use as load shedding
- Instruments:
    - AC Voltmeter
    - AC Ammeter
    - AC Frequency Meter
    - DC Voltmeter
    - Engine Water Temperature
    - Engine Oil Pressure
    - Run Time Meter
    - Phase selector switch
- Equipment:
    - Lamp test switch
    - Overcrank/re-engagement protection
    - Overspeed detection
    - Voltage adjusting rheostat
    - Run-Off/reset switch
    - Emergency stop pushbutton
    - Low coolant level detection
    - Panel lamps
    - Alarm package with alarm contacts
    - Alarm horn & silencing switch
    - Cool down timer
    - Generator exerciser

Provide an automatic transfer switch rated for the full load of the generator, with solid neutral, voltmeter and ammeter in a NEMA 1 enclosure. The transfer switch shall have microprocessor controls, 0-60 second programmable transition (programmed timed HOLD in the "neutral" position) from stand-by to utility power and from utility power to stand-by power.

Pump Station Instrumentation

Provide 4" diameter, stainless steel case, liquid filled pressure gauges of appropriate range at the discharge of each pump. Provide compound vacuum• pressure gauges at each pump suction.

Provide a shut-off ball valve, air bleed valve and snubber at each gauge. Each gauge shall be protected with a diaphragm seal.

An ABB RVG200 (or current direct replacement) paperless chart recorder shall be provided and installed in the control building.

Alarm System

The Township currently utilizes a private alarm company that monitors security (intrusion), fire and environmental (all pump alarms, wet well alarms and failures including generator) alarms through a 24 hour central monitoring system. All pump stations shall be connected to the Township current system and monitoring company.

The following minimum alarm functions shall be wired to and programmed into the alarm system:

- Comminutor chamber high level
- Comminutor failure
- Wet well high level (transducer)
- Wet well high level (float)
- Wet well low level (transducer)
- Wet well low level (float)
- Lead pump failure (check valve fail to open)
- Lag pump failure (check valve fail to open)
- Station Intrusion (from all entry points)
- Generator low fuel
- Generator failure
- Station loss of power (station on generator backup)
- Station flooding.

Intrusion Alarm System

Provide an intrusion alarm system as follows:

- Provide entry alarms for the wet well, wet well pump chamber, pump station bypass valve chamber, meter chamber, comminutor chamber covers and all doors of the Control Building.

- All listed areas shall be connected to the alarm system through an approved switch.

- The alarm control panel shall be placed inside the Control Building and shall be owner programmable.

- All alarms shall be connected through a common channel to the alarm system and also connected to a loud horn or bell outside the control building if directed by the Township.

- The system chosen will be approved by the Township on a case by case basis to be sure it is compatible with the Township System.

Metal Fabrications

General: Metal fabrications shall be furnished and installed as required. Protect all materials from galvanic action. All fasteners shall be Type 316 stainless steel.

Loose Lintels: Loose lintels shall be constructed of ASTM A36 galvanized steel angles, channels or wide flange sections in accordance with the span of opening.

Plate Covers and Frames: Plate covers and frames shall be constructed of welded mitered aluminum angle frames with welded anchor straps and aluminum checker plate reinforced with aluminum bars for support. Covers shall be designed for a minimum of 300 psf uniform load with less than a 4 inch deflection. Covers shall fit neatly and accurately into frames. Hinged covers shall be provided where required and shall be Bilco Model J-AL or JD-AL with all stainless hardware, perimeter drains, and locking devices as required by the Township. No ferrous metal materials shall be used in hardware assemblies.

Pipe Rails and Grab Bars: All welded assemblies of 1.5 inch JPS Sch. 80 pipe, Alloy 6063-T6 for stanchions (minimum), and Sch. 40 for top and middle rails (minimum). Design and fabricate to withstand 50 plf along rail or concentrated load of 200 pounds anywhere on rail. Finish all aluminum with anodic finish and shop coat of methacrylate lacquer.

Gratings: Riveted or swage locked aluminum gratings with welded bearing band bars. Depth as required to limit deflection to less than 1/4 inch under 100 psf load. Welded mitered angle frames around full perimeter of grated area and minimum 4 hold-down clips per grating panel. No panel greater than 14 square feet.

Stairs: Aluminum channel stringers and supports of 6061-T6 aluminum, pipe handrails, treads with abrasive nosing, and grating platforms as required.

Ladders: Aluminum or fiberglass ladders with slip resistant rungs and safety extension.

Pipe Bollards: Pipe bollards shall consist of minimum 7 foot long by 6-inch diameter DIP posts embedded 3 .5 feet into a concrete base, concrete filled and covered with a plastic sleeve containing reflective stripes. Pipe bollards shall be used to protect equipment and structures as required by the Township.

Stop Gates: Provide embedded frame stainless steel stop gates with lifting handle, UHMW seat and seals and neoprene seal on the invert. All hardware associated with mounting frame shall be stainless steel.

Heating and Ventilation

Underground Chambers Fresh Air Supply; Provide a fresh air supply fan for each underground structure including but not limited to the wet well, comminutor chamber, meter chamber, wet well pumping chamber and the pump station bypass valve chamber. Minimum requirements for fresh air supply systems are as follows:

- Provide a minimum of 12 air changes per hour.

- Fans shall be direct drive, centrifugal blowers of fiberglass reinforced plastic (FRP) construction. Provide factory applied spark resistant and UV protective coating and gravity backdraft damper on fan discharge.
- Fans shall be interlocked to energize upon opening of the chamber hatch.
- Ductwork shall be PVC. In wet chambers, the PVC duct shall terminate one foot above the high water level. In chambers that require a safety platform, the duct will terminate one foot above the safety grating.

Control Building Exhaust Fans; Provide separate exhaust fans for the generator room and the restroom as follows:

- Generator room exhaust fan shall be designed for a minimum of 8 air changes per hour. Provide direct drive exhaust fan with speed controller, backdraft damper, OSHA approved rear fan guard, remote mounted thermostat and fan switch. The fan shall be interlocked with an appropriately sized louver with a motorized damper. Damper actuator shall be wired to the exhaust fan. The louver shall be designed to fail in the open position. Materials of construction for the fan shall be approved on a case by case basis.
- Restroom exhaust fan shall be designed for a minimum of 12 air changes per hour. The fan shall be equipped with speed controller and vibration isolation. Provide an exhaust duct through the roof terminating with a rain cap. The exhaust fan shall be interlocked with the restroom light switch.

Louvers; Provide a louver with a motorized damper, appropriately sized for room make up air for emergency generator operation. The motorized damper shall be wired to the emergency generator control panel and the louver shall be designed to fail in the open position. The louver frame and blades shall be 6063 extruded aluminum. Provide aluminum bird/insect screen in removable frame.

Unit Heaters; Provide unit heaters in the generator room, the restroom and the dry well. Unit heaters shall be of the electric, horizontal type, with enameled steel cabinet, mounting bracket, adjustable horizontal louvers, spiral finned, enclosed heating element, automatic reset overheat protection, thermal protected, permanently lubricated fan and motor, fuses, and contactors. Provide wall-mounted low voltage thermostats and control transformers for the heater. The size of the unit heater shall be approved on a case-by-case basis.

<u>Portable Davit Crane</u>

Provide a portable davit crane with a manual winch.

Provide stainless steel pedestal base with cover adjacent to the cornmunitor chamber and the wet well. All anchoring devices shall be Type 316 stainless steel.

Boom length and height shall be adjustable while under load.

Power winch shall be equipped with pendant control and brake. Provide limit switches to limit load travel.

Wire rope assembly shall be Type 304 stainless steel.

Control switch shall be NEMA 4 watertight.

Provide galvanized finish for the crane and epoxy finish for the winch.

Electrical

The work shall comply with the latest editions of:

- National Electrical Code (NEC)
- OSHA Federal Safety Codes and Standards
- NFPA National Fire Codes and Life Safety Code (NFPA 101)
- Illumination Engineering Society (IES) Standards
- Underwriters Laboratory (UL) Standards
- Uniform Construction Code
- CABO Accessible Buildings Standards
- Telephone Service Installation requirements by local phone provider
- Electric Service installation per local provider's requirements.

The incoming service, equipment and devices shall meet the requirements

Provide local utility company approved surge arrestors rated 3-phase, 4-wire, 600 VAC.

Provide specification grade lighting fixtures for the control building. All fixtures shall be rated for 120 VAC service and shall be LED. Provide vapor-tight covers for all outdoor LED fixtures.

Site pole light shall be 400 Watt equivalent LED pole light fixtures with a 2700 Kelvin temperature color or lower (per latest Township Lighting Ordinance) with a round straight 18-foot tall, bronze colored aluminum pole. Provide a vandal shield, and photocell for the light fixture. Site lighting shall be 277 VAC.

Chamber lights shall be Class 1, Division 1, explosion proof sealed LED fixtures with
100 Watt equivalent, 120VAC, optical globe with guard, surface or wall mounted as required. Locate lights within easy reach for bulb changes.

Provide exterior pump station control building lighting. All lighting shall be LED or and shall be controlled by a lighting timer or motion sensor as indicated on the Standard Details.

Lighting timers shall be electronic, 7-day, 24-hour programmable by Intermatic or compatible with the lighting fixtures to be controlled.

Use rigid galvanized steel or thick wall nonmetallic conduit for all underground conduit. Use rigid galvanized steel or thick wall nonmetallic conduit in or under slabs in grade. Conduit passing through concrete shall be coated with two coats of bituminous paint extending a minimum of 6-inches beyond all points of concrete contact. Minimum size shall be 3/4 inch.

In slabs above grade use rigid galvanized steel conduit. Conduit passing through concrete shall be coated with two coats of bituminous paint extending a minimum of 6-inches beyond all points of concrete contact. Minimum size shall be 3/4 inch.

In Class l, Division 1 Hazardous Locations use PVC coated rigid galvanized steel conduit. All conduits shall be filled and sealed per NEC.

All other locations use rigid galvanized steel conduit. Minimum size shall be 3/4 inch.

Flexible Metallic Conduit shall be interlocking steel construction with integral ground. Length shall be limited to 18-inches.

Wire and Fittings shall match conduit.

For wet and dry locations use Type THWN wire rated to 90 degrees C. Conductors shall be stranded, soft-drawn copper. All power wire shall be minimum #12 size. Aluminum wire is not allowed.

Use specialty power cables provided by the pump manufacturer. Instrumentation cable shall be minimum 18 AWG, twisted/shielded. Install UL type SE cable for service entrances.

Properly ground all electrical boxes. Provide a ground for every branch and feeder circuit, sized per NEC Article 250. Provide a grounding loop around the pump station control building and a minimum of two 10-foot long ground rods. Provide CAD welded connections at the grounding grid and ground rods.

Wall switches shall be quiet type, 20 Amp rated, 120 VIC and 277 VAC. Provide Hubbell specification grade or equal.

Receptacles shall be duplex, 20 Amp rated, 120 VAC, Hubbell specification grade or equal.

Provide Ground Fault Circuit Interrupters of the "termination" type with duplex receptacles, only capable of protecting integral duplex receptacles, 20 Amps, 120 Volts, 60 HZ; with solid state ground fault sensing and signaling, Hubbel specification Grade or equal.

Provide safety disconnect switches appropriately sized to meet electrical requirements. Provide NEMA 1 enclosures for interior installations, NEMA 3R for exterior installations and wet and damp locations. Provide NEC Class 1, Division 1 explosion-proof devices where required by code.

Provide a Master Label Lightning Protection System for the Control Building complying with UL 96A. Provide the Township with a UL Master Label for the overall system which is suitable for fastening to the building for display purposes.

Provide float switches sealed in a smooth chemical resistant polypropylene casing, ITT Flygt Model No. ENM-10. Float switches shall be supported by their own type SE cables.

Provide NEMA 4 sealed hatch switches for all chamber hatches. Switches in Class 1, Division 1 locations shall be explosion proof rated.

Provide variable speed drives of the PWM type for the pump motors. The VFD shall be rated for controlling a NEMA B design AC motor. The drive shall have a user programmable interface and shall be provided with an across-the-line bypass starter that engages automatically in case of drive fault. The drive shall incorporate over-current, short circuit, ground fault, under-voltage, over temperature and phase loss protection. The VFD shall accept start, stop and speed signals from the pump control system and shall provide failure alarm signals to the alarm system. The VFD shall have a circuit breaker main disconnect. Each pump will have a separate VFD for controlling flow.

SECTION 7.0 - Force Mains

Force mains shall be designed and constructed of DIP or PVC pipe.

PVC pipe used for force mains shall be C900 PVC and joints shall be gasketed.

DIP shall be centrifugally cast in metal or sand molds in accordance with A.N.S.I. Specification A21.51, minimum thickness Class 52, unless otherwise required. Force main velocities shall be two (2 fps) feet per second at the average pumping rate. Minimum design pressure shall be two times the working pressure plus an allowance for surge. Minimum size of force mains shall be 2 inch. Properly sized blowoff (cleanout) manholes shall be provided at all low points and properly designed air release or combination automatic air/vacuum release valves within manholes shall be furnished at high points. Minimum cover shall be 4 feet. Design shall minimize high and low points.

Use of 90 degree bends in force mains shall be avoided wherever possible. Force mains shall not terminate at manholes; connections shall be a minimum of ten (10) feet downstream of a manhole.

All force mains shall be provided with an approved metallic warning tape buried two feet (2') below grade.

DIP joint shall conform to the requirements of A.N.S.I. A.21.11 and shall be of a type that employs a single elongated groove gasket to effect a joint seal such as United States Pipe Company's "Tyton" joint or equal. Gaskets shall be of a composition suitable for exposure to sewage, and to soil conditions surrounding the pipeline. Pipe shall be furnished with flanges where connections to flanged fittings are required. All bends shall be restrained using properly designed concrete thrust blocks in combination with restrained pipe joints.

The DIP pipe shall have smooth dense interior surfaces and shall be free from fractures, excessive interior surface crazing, and roughness. DIP shall be centrifugally cast in metal or sand molds in accordance with A.N.S.I. Specification A21.51, cement lined and bituminous seal coated in accordance with A.N.S.I. Specification A-21.4, latest revision, minimum thickness Class 52.

The exterior of ductile iron pipe shall be coated with a 1-mil asphaltic coating in accordance with AWWA C151.

Force main cleanout shall be provided at all low points and other locations as directed by the Township Engineer. Frame and covers on cleanout manholes shall be Bridgestate Foundry Corporation model No. 1460B or equal. The words “H T Sewer” shall be cast into the covers. Refer to the Standard Details for further information on cleanout manholes.

Air release valves shall be placed in manholes along all force mains at all high points and where directed by the Township Engineer. Frame and covers on air release valve manholes shall be Bridgestate Foundry Corporation model No. 1460B or equal. The words “H T Sewer” shall be cast into the covers. Refer to the Standard Details for further information on air valve manholes.

Upon completion of installation of force mains, they shall be subject to pressure testing. A two-hour high pressure hydrostatic test in accordance with AWWA C600, with the test pressure equal to 200% of the maximum operating pressure, or 100 psi (minimum), shall be performed on all portions of the force main. If the system fails the pressure test, the pipe shall be removed and reinstalled until the entire system passes. All force main cleanout assemblies and air release valve assemblies shall be included in the tests.

Force mains shall be bedded and backfilled in accordance with the Standard Details.

SECTION 8.0 - Submittals

The Contractor shall submit four (4) copies of manufacturer's shop drawings and details which shall describe the materials, dimensions, construction, control system, performance and operating characteristics for all pipeline and pump station equipment.

The review of shop drawings will be general only, and nothing contained in this section shall relieve, diminish or alter the responsibilities of the Contractor and/or design engineer.

No materials or equipment shall be purchased or fabricated until the Township Engineer has reviewed the shop drawings. No work shall be done upon any part of a structure, the design or construction of which is dependent upon the features for which the review is required until comments have been solicited by the designer.

The Contractor shall submit five (5) bound copies of operation and maintenance manuals, as applicable, including product data, installation instructions, parts listing, recommended parts inventory listing, purchase source listing and emergency instructions and troubleshooting guide for equipment supplied.

SECTION 9.0 - Confined Space Entry Safety Equipment

Confined Space Entry Equipment requirements for pump stations are as follows:

- Davit arm over wet well man entrance.
- Davit arm over dry well man entrance.
- Retracting lifeline device.
- Safety harness and lifeline.
- Rescue winch.
- Atmospheric monitoring device(s) to monitor for:
    - Hydrogen Sulfide
    - Oxygen content
    - Explosive atmosphere (gases)

If the collection system to be constructed is to be operated and maintained by the Township the following confined space safety equipment must be supplied:

- Safety Tripod for man entering and exiting manholes.
- Retractable lifeline.
- Safety harness and lifeline.
- Rescue winch.
- Atmospheric monitoring device(s) to monitor for:
    - Hydrogen Sulfide
    - Oxygen content
    - Explosive atmosphere (gases)

The actual quantity and specific type of equipment necessary shall be determined by the Township on a case-by-case basis dependent upon the size of the system.

SECTION 10.0 - Spare Parts and Tools

In addition to the equipment to be furnished above, the following supplies shall be furnished.

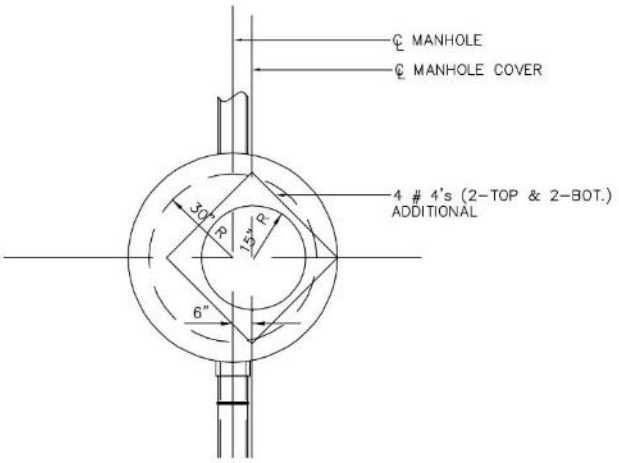
- All spare parts as recommended by the manufacturer of the equipment furnished shall be furnished and delivered to the Township.
- A 2 year supply of all lubricants shall be provided.
- All special tools required for proper maintenance of the equipment shall be furnished.
- A spare parts cabinet shall be furnished and installed in the Control/Generator Building for the proper storage and inventory of spare parts, tools, MSDS sheets and O&M Manuals
- Fire extinguisher(s) per file code shall be supplied.
- A first aid kit shall be supplied.

SECTION 11.0 - Computer Equipment

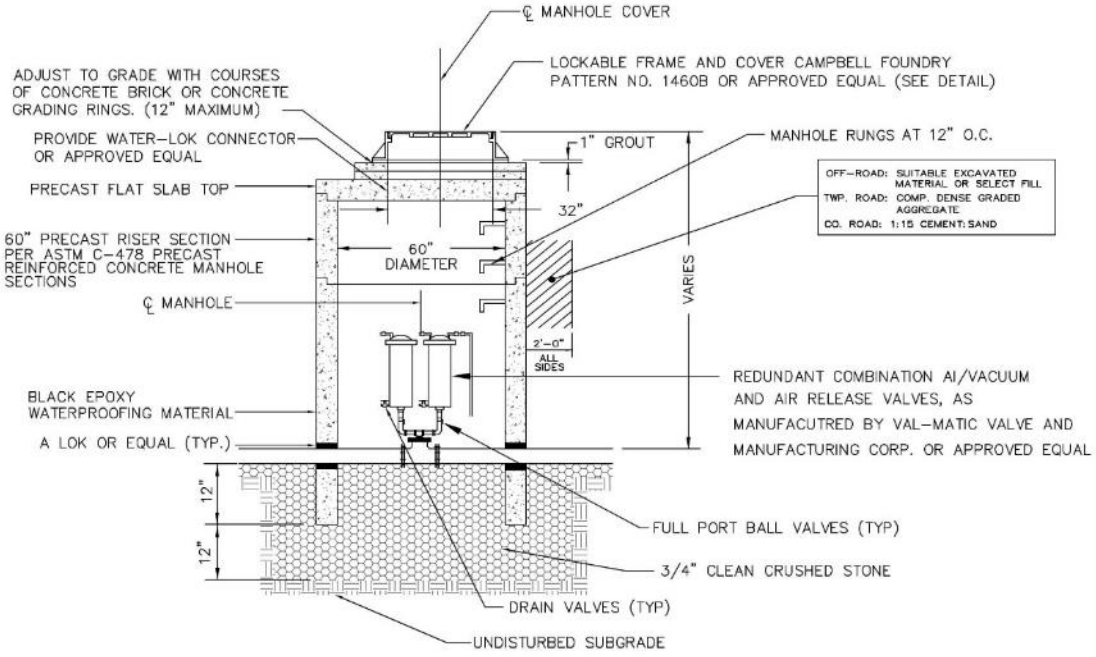
Special computer equipment required for the setting or adjustment of equipment furnished shall be provided with the equipment. Hardware and software necessary to make connections with and perform adjustments to equipment shall be provided. Computer equipment shall be as recommended by the equipment supplier, and shall be compatible with standard portable laptop computers.

SECTION 12.0 – Standard Details

See following pages.



FLAT SLAB TOP



SECTION

AIR VALVE MANHOLE

N.T.S.

NOTES:

1. THE ENTIRE INTERIOR OF THE STRUCTURE SHALL BE LINED WITH P.V.C. "DURA PLATE 100 BY A-LOK", OR APPROVED EQUAL, DURING THE PRECASTING PROCESS.
2. SUBMIT SHOP DRAWINGS FOR APPROVAL.
3. DESIGN FOR H-20 LOADING

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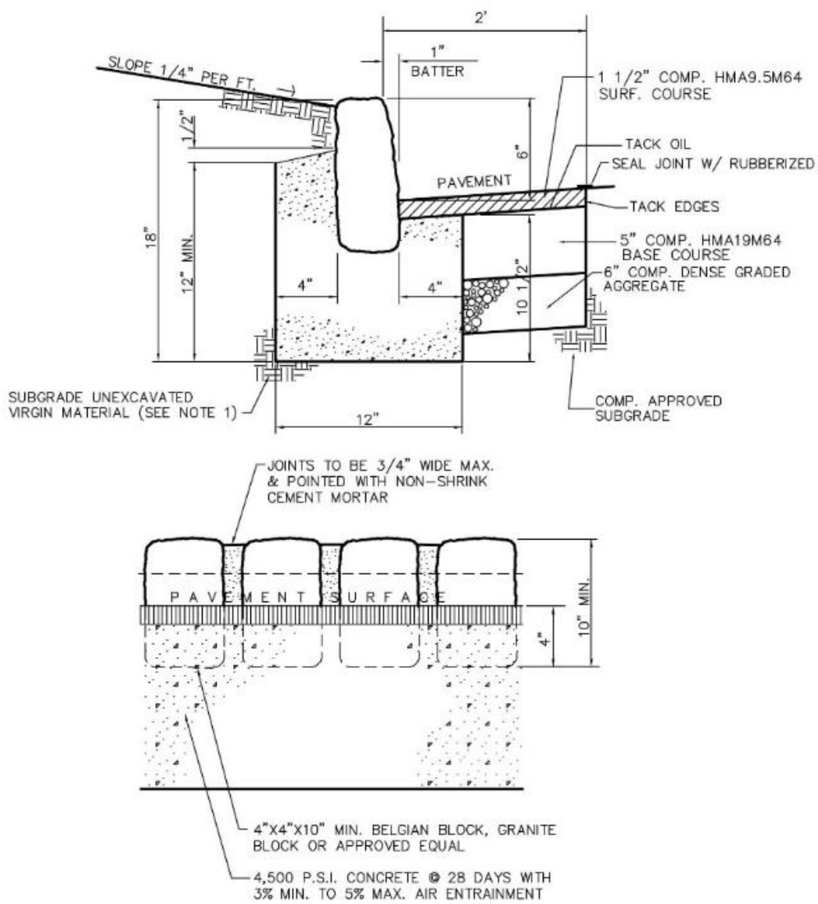
AIR VALVE MANHOLE

REVISIONS	AUTH.	DATE



NOTES:

1.) ANY EXCAVATION BELOW DESIRED GRADE DUE TO OVER EXCAVATION OR WET SOIL CONDITIONS SHALL BE BACKFILLED WITH 3/4" CLEAN CRUSHED STONE. ALL SUBGRADES SHALL BE APPROVED BY THE TOWNSHIP ENGINEERING PRIOR TO POURING

2.) EXPANSION JOINTS SHALL BE PROVIDED AT EQUAL DISTANCES OF NOT MORE THAN 20' AND AT ALL STORM SEWER INLETS. JOINTS SHALL BE FILLED WITH PREMOLDED EXPANSION JOINT FILLER, 1/2" THICK, CONFORMING TO NEW JERSEY DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD ANS BRIDGE CONSTRUCTION. CONTRACTION JOINTS SHALL BE PROVIDED EVERY 10'. THE JOINT SHALL BE RECESSED 1/4" FROM THE TOP AND FRONT OF THE CURB.

3.) CURB SHALL BE TEMPORARILY BACKFILLED TO FINISHED GRADE WITH SOIL BEHIND AND STONE ON THE ROAD SIDE AS SOON AS IT HAS ATTAINED SUFFICENT SUPPORTING STRENGTH OR WITHIN 24 HOURS OF POURING (WHICH EVER IS LESS).

4.) WHEN NEW CURB IS INSTALLED ALONG AN EXISTING PAVED AREA, THE EXISTING PAVEMENT SHALL BE CUT 2 FEET IN FRONT OF THE NEW CURB FACE IN A STRAIGHT LINE WITH A SAW. THE NEW PAVEMENT SHALL BE TACKED AND BUTTED TO THE EXISTING PAVEMENT.

BELGIAN BLOCK CURB

NO SCALE

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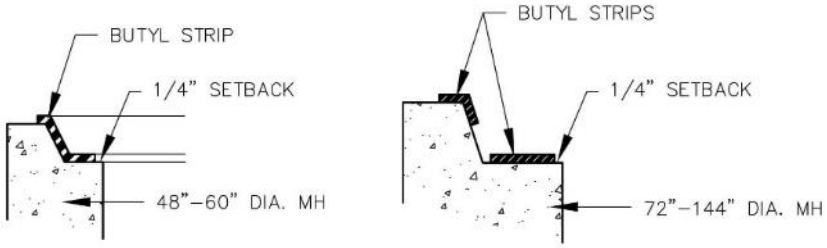
BELGIAN BLOCK CURB

REVISIONS	AUTH.	DATE



N O T E S :

1.) DURA–PLATE BUTYL–LOK SEALANT TO BE USED ON ALL MANHOLE JOINTS AND UNDER ALL CASTINGS

2.) CLEAN SURFACE TO ENSURE PROPER ADHESION. BEST RESULTS ARE OBTAINED WITH AN APPLICATION OF PRIMER.

3.) PLACE BUTYL MATERIAL AS INDICATED BY APPROPRIATE DIAGRAM. BUTT ENDS OF MATERIAL TOGETHER, NEVER OVERLAP.

4.) CENTER AND LOWER TOP SECTION. USE SUFFICIENT PRESSURE FOR PROPER JOINT COMPLETION AND SQUEEZE OUT.

5.) CARE SHOULD BE TAKEN TO PROPERLY PLUG ALL LIFT PIN INSERTS OR HOLES.

BUTYL–LOK SEALANT

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BUTYL–LOC SEALANT

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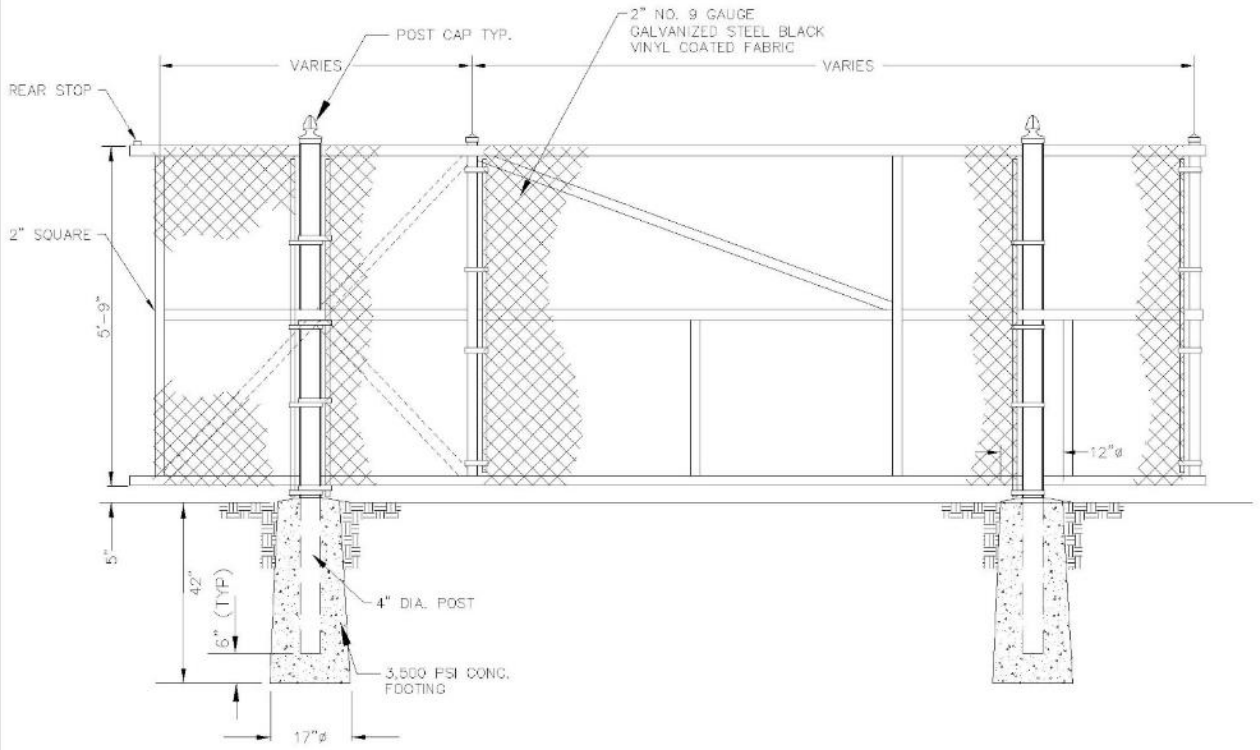

MANUAL CANTILEVER SLIDING GATE

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MANUAL CANTILEVER SLIDING GATE

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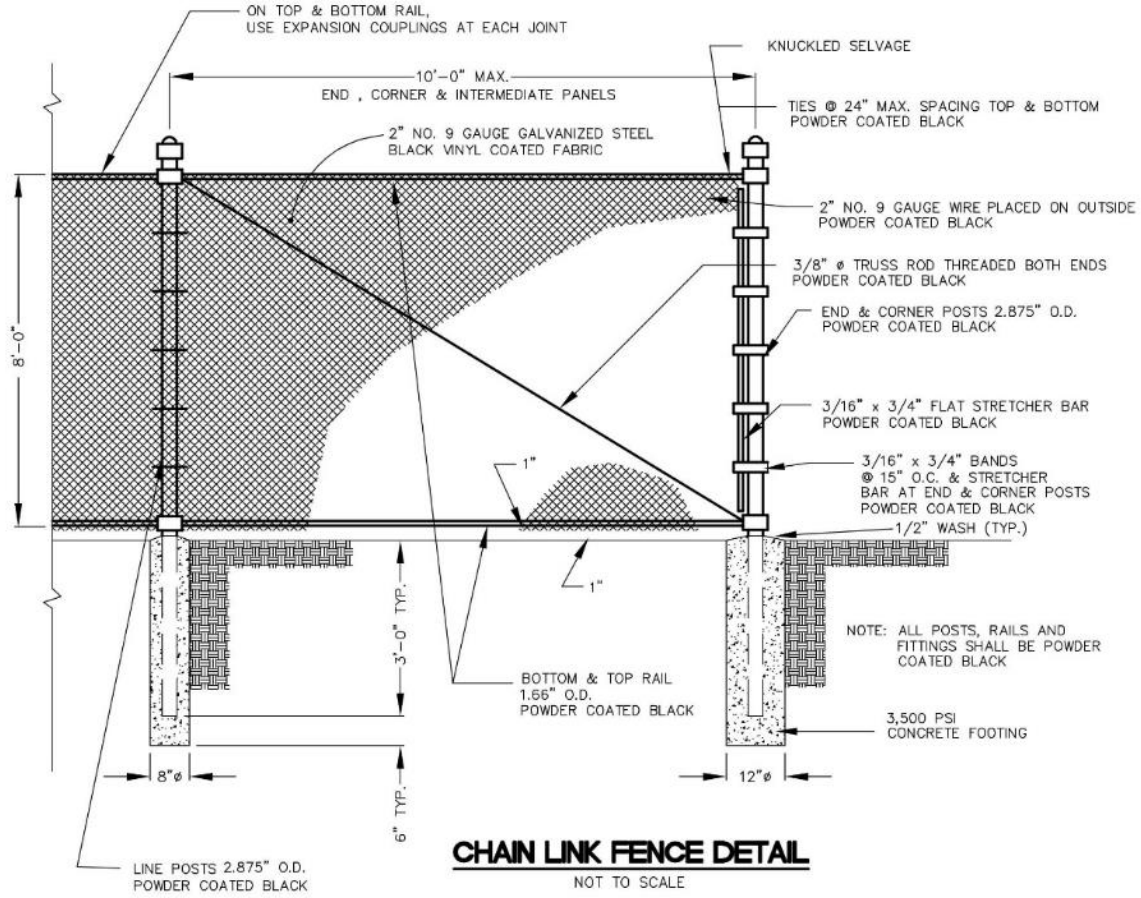

CHAIN LINK FENCE DETAIL

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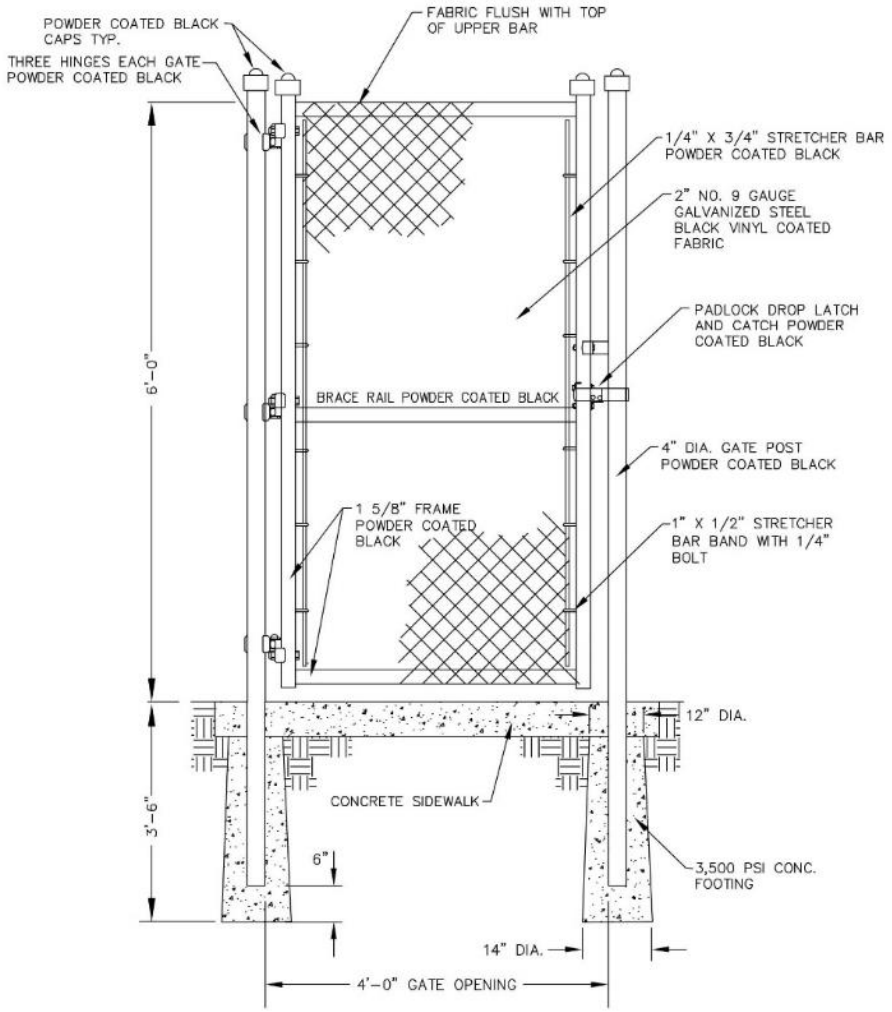
CHAIN LINK FENCE

REVISIONS	AUTH.	DATE



NOTE:

1. ALL POSTS, RAILS AND FITTINGS SHALL BE POWDER COATED BLACK.

4' SINGLE SWING GATE DETAIL

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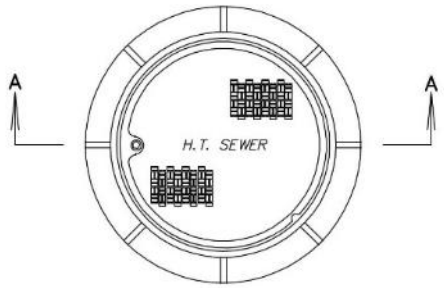
CHAIN LINK GATE 4'

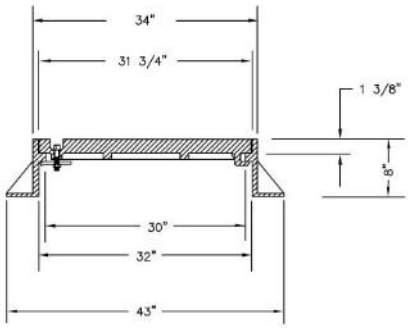
REVISIONS	AUTH.	DATE

NOTES:

1. ALL DIMENSIONS ARE TO BE HELD TO A TOLERANCE OF 1/32" ON ALL CASTINGS TO PERMIT INTERCHANGING OF PARTS
2. CASTINGS SHALL BE DIPPED IN "ASPHALTUM" PAINT
3. CAMPBELL FOUNDRY #1460B OR EQUAL
4. SUBMIT SHOP DRAWINGS FOR APPROVAL



PLAN



SECTION A–A

CLEANOUT AND AIR VALVE FRAME AND COVER

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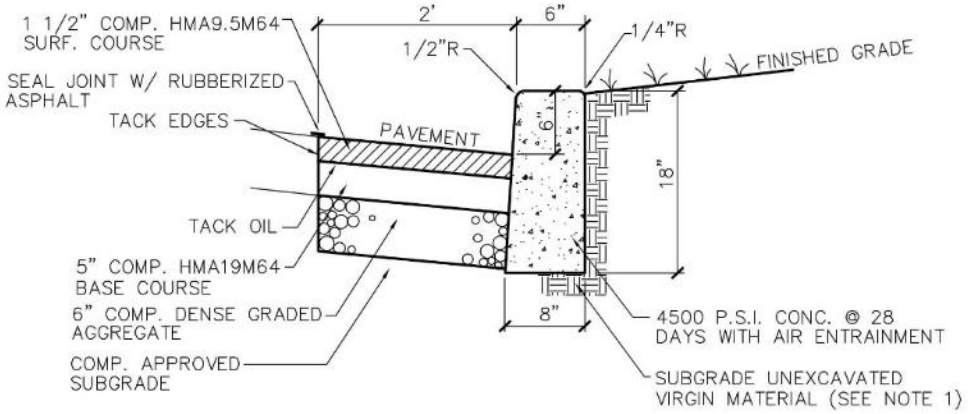
CLEANOUT & AIR VALVE FRAME & COVER

REVISIONS | AUTH. | DATE



N O T E S :

1.) ANY EXCAVATION BELOW DESIRED GRADE DUE TO OVER EXCAVATION OR WET SOIL CONDITIONS SHALL BE BACKFILLED WITH 3/4" CLEAN CRUSHED STONE. ALL SUBGRADES SHALL BE APPROVED BY THE TOWNSHIP ENGINEERING PRIOR TO POURING

2.) EXPANSION JOINTS SHALL BE PROVIDED AT EQUAL DISTANCES OF NOT MORE THAN 20' AND AT ALL STORM SEWER INLETS. JOINTS SHALL BE FILLED WITH PREMOLDED EXPANSION JOINT FILLER, 1/2" THICK, CONFORMING TO NEW JERSEY DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION. CONTRACTION JOINTS SHALL BE PROVIDED EVERY 10'. THE JOINT SHALL BE RECESSED 1/4" FROM THE TOP AND FRONT OF THE CONCRETE CURB

3.) CURB SHALL BE TEMPORARILY BACKFILLED TO FINISHED GRADE WITH SOIL BEHIND AND STONE ON THE ROAD SIDE AS SOON AS IT HAS ATTAINED SUFFICENT SUPPORTING STRENGTH OR WITHIN 24 HOURS OF POURING (WHICH EVER IS LESS).

4.) WHEN NEW CURB IS INSTALLED ALONG AN EXISTING PAVED AREA, THE EXISTING PAVEMENT SHALL BE CUT 2 FEET IN FRONT OF THE NEW CURB FACE IN A STRAIGHT LINE WITH A SAW. THE NEW PAVEMENT SHALL BE TACKED AND BUTTED TO THE EXISTING PAVEMENT.

5.) ALL EXPOSED CONC. SURFACES TO BE TREATED WITH LUMISEAL PLUS CURE AND SEAL COMPOUND OR EQUAL PER MANUFACTURER'S INSTRUCTIONS.

HOPEWELL TWP. CONCRETE CURB

NOT TO SCALE

C:\Projects\7402\dwgs\2020 Hopewell Sewer Details\2020 DETAILS\CONCRETE CURB.dwg

Township of HOPEWELL Mercer County | New Jersey

Van Cleef ENGINEERING ASSOCIATES
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PHONE: (609) 689-1109 FAX: (609) 689-1120
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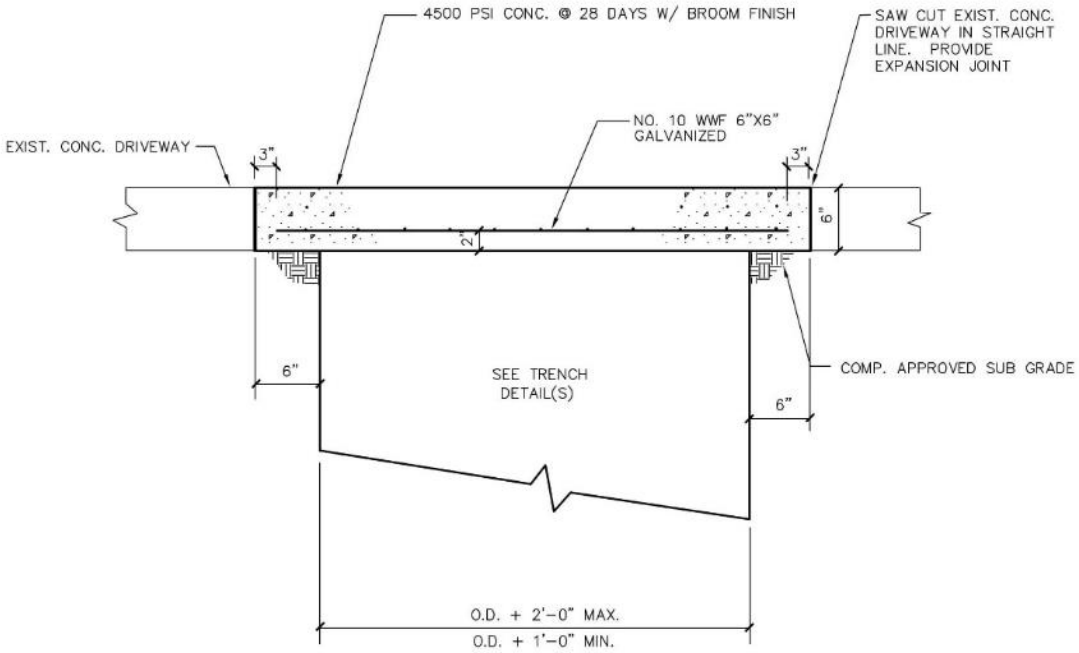
HOPEWELL TOWNSHIP
CONCRETE CURB DETAIL

REVISIONS	AUTH.	DATE



CONCRETE DRIVEWAY REPLACEMENT

NO SCALE

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CONCRETE DRIVEWAY REPLACEMENT

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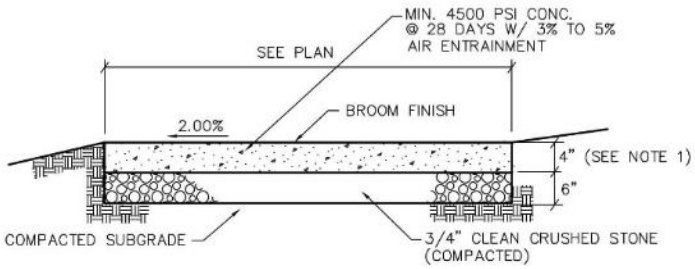

N O T E S :

1.) AT DRIVEWAY CROSSINGS, SIDEWALK SHALL BE 6" THK. AND SHALL CONTAIN No. 10 6" X 6" WIRE MESH 2" UP FROM THE BOTTOM OF THE SIDEWALK.

2.) THE TOWNSHIP ENGINEER SHALL APPROVE ALL SUBGRADES PRIOR TO THE POURING OF ANY CONCRETE.

3.) EXPANSION JOINTS SHALL BE PROVIDED AT 20' (MAX.) INTERVALS JOINTS SHALL BE FILLED WITH 1/2" BIT. EXPANSION JOINT FILLER.

4.) ALL SIDEWALK THAT IS BROKEN, CRACKED OR OUT OF ALIGNMENT SHALL BE REPLACED PRIOR TO ACCEPTANCE.

5.) PROVIDE HALF DEPTH CONTRACTION JOINTS EVERY 4 FEET.

6.) ALL EXPOSED CONC. SURFACES TO BE TREATED WITH LUMISEAL PLUS CURE AND SEAL COMPOUND OR EQUIVALENT PER MANUFACTURER'S INSTRUCTIONS.

CONCRETE SIDEWALK

NO SCALE

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CONCRETE SIDEWALK

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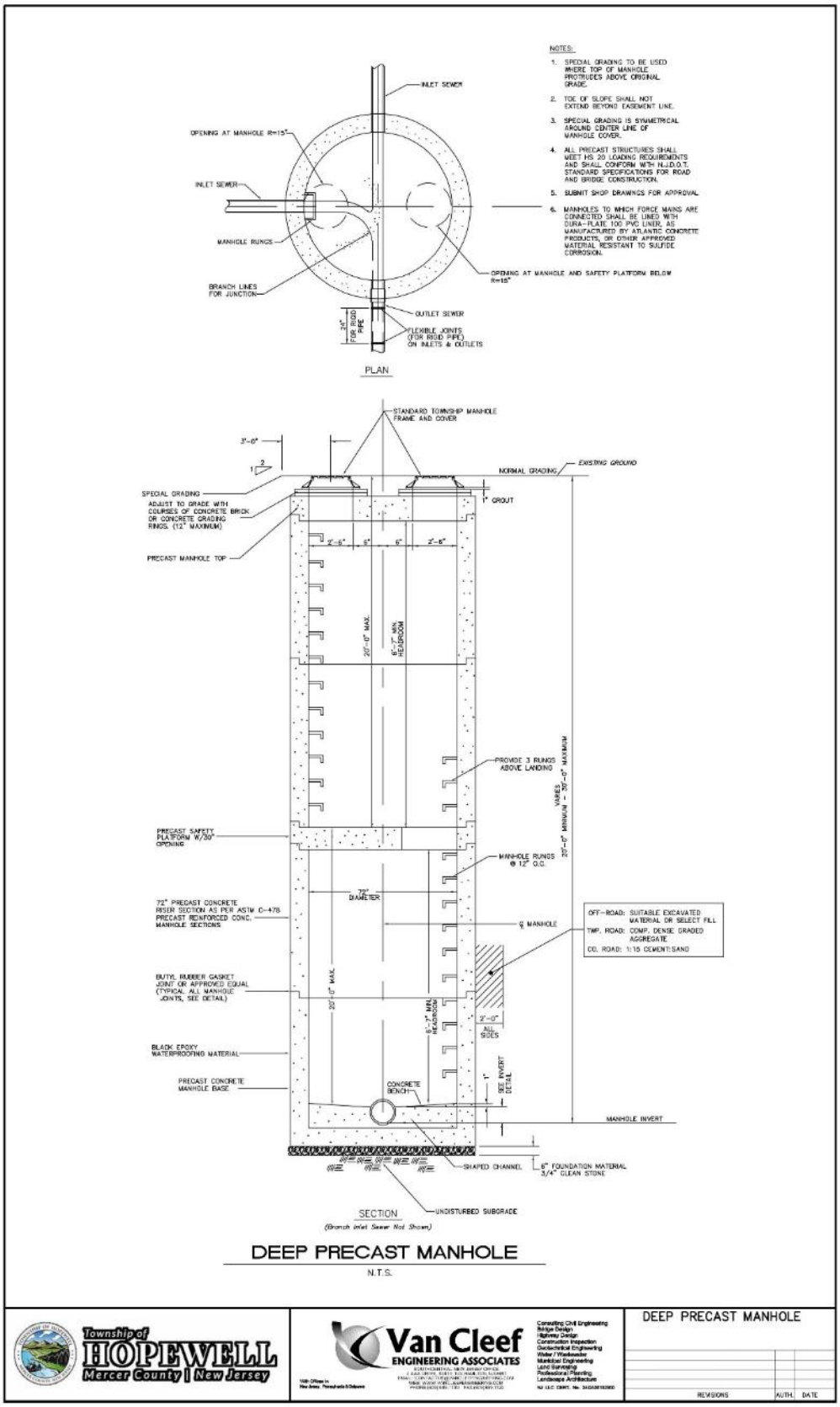
NOTES:
1. SPECIAL GRADING TO BE USED WHERE TOP OF MANHOLE PROTRUDES ABOVE ORIGINAL GRADE.
2. TOE OF SLOPE SHALL NOT EXTEND BEYOND EASEMENT LINE.
3. SPECIAL GRADING IS SYMMETRICAL AROUND CENTER LINE OF MANHOLE COVER.
4. ALL PRECAST STRUCTURES SHALL MEET HS 20 LOADING REQUIREMENTS AND SHALL CONFORM WITH N.J.D.O.T. STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.
5. SUBMIT SHOP DRAWINGS FOR APPROVAL
6. MANHOLES TO WHICH FORCE MAINS ARE CONNECTED SHALL BE LINED WITH DURA-PLATE 100 PVC LINER, AS MANUFACTURED BY ATLANTIC CONCRETE PRODUCTS, OR OTHER APPROVED MATERIAL RESISTANT TO SULFIDE CORROSION.
INLET SEWER
OPENING AT MANHOLE R=15"
INLET SEWER
MANHOLE RUNGS
BRANCH LINES FOR JUNCTION
OPENING AT MANHOLE AND SAFETY PLATFORM BELOW R=15"
OUTLET SEWER
24" FOR RIGID PIPE
FLEXIBLE JOINTS (FOR RIGID PIPE) ON INLETS & OUTLETS
PLAN
STANDARD TOWNSHIP MANHOLE FRAME AND COVER
3'-0"
2
1
NORMAL GRADING
EXISTING GROUND
SPECIAL GRADING
ADJUST TO GRADE WITH COURSES OF CONCRETE BRICK OR CONCRETE GRADING RINGS. (12" MAXIMUM)
1" GROUT
PRECAST MANHOLE TOP
2'-6"
6"
6"
2'-6"
20'-0" MAX.
6'-7" MIN. HEADROOM
PROVIDE 3 RUNGS ABOVE LANDING
VARIES 20'-0" MINIMUM - 30'-0" MAXIMUM
PRECAST SAFETY PLATFORM W/30" OPENING
MANHOLE RUNGS @ 12" O.C.
72" DIAMETER
72" PRECAST CONCRETE RISER SECTION AS PER ASTM C-478 PRECAST REINFORCED CONC. MANHOLE SECTIONS
Ø MANHOLE
OFF-ROAD: SUITABLE EXCAVATED MATERIAL OR SELECT FILL
TMP. ROAD: COMP. DENSE GRADED AGGREGATE
CO. ROAD: 1:15 CEMENT:SAND
BUTYL RUBBER GASKET JOINT OR APPROVED EQUAL (TYPICAL ALL MANHOLE JOINTS, SEE DETAIL)
20'-0" MAX.
6'-7" MIN. HEADROOM
2'-0" ALL SIDES
BLACK EPOXY WATERPROOFING MATERIAL
PRECAST CONCRETE MANHOLE BASE
CONCRETE BENCH
1" SEE INVERT DETAIL
MANHOLE INVERT
SHAPED CHANNEL
6" FOUNDATION MATERIAL 3/4" CLEAN STONE
UNDISTURBED SUBGRADE
SECTION
(Branch Inlet Sewer Not Shown)
DEEP PRECAST MANHOLE
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DEEP PRECAST MANHOLE
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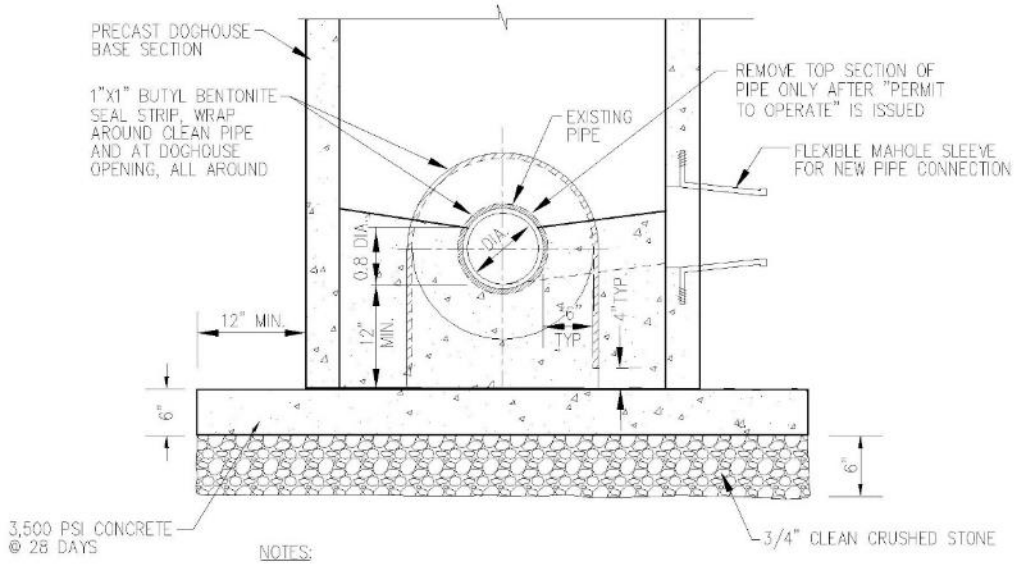

NOTES:

1. FOR ALL OTHER DIMENSIONS, WALL THICKNESSES, ETC., SEE PRECAST MANHOLE DETAILS AND NOTES.
2. FINISHED CONSTRUCTION SHALL BE WATERTIGHT.

DOGHOUSE MANHOLE

NOT TO SCALE

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DOGHOUSE MANHOLE

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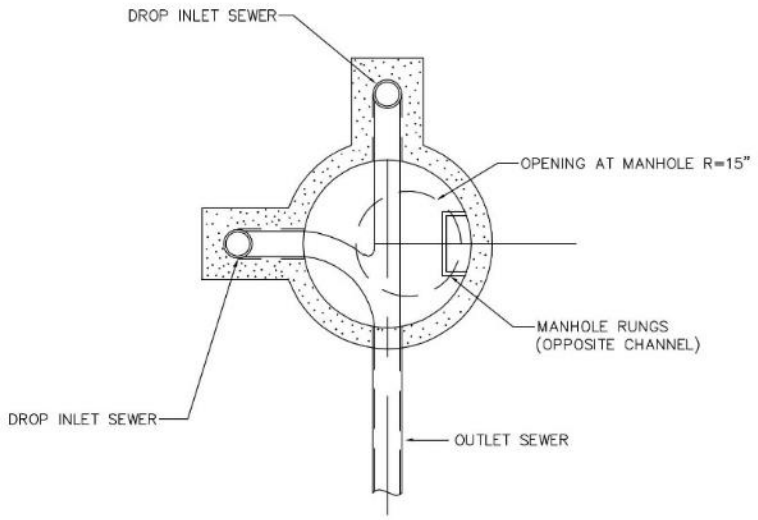
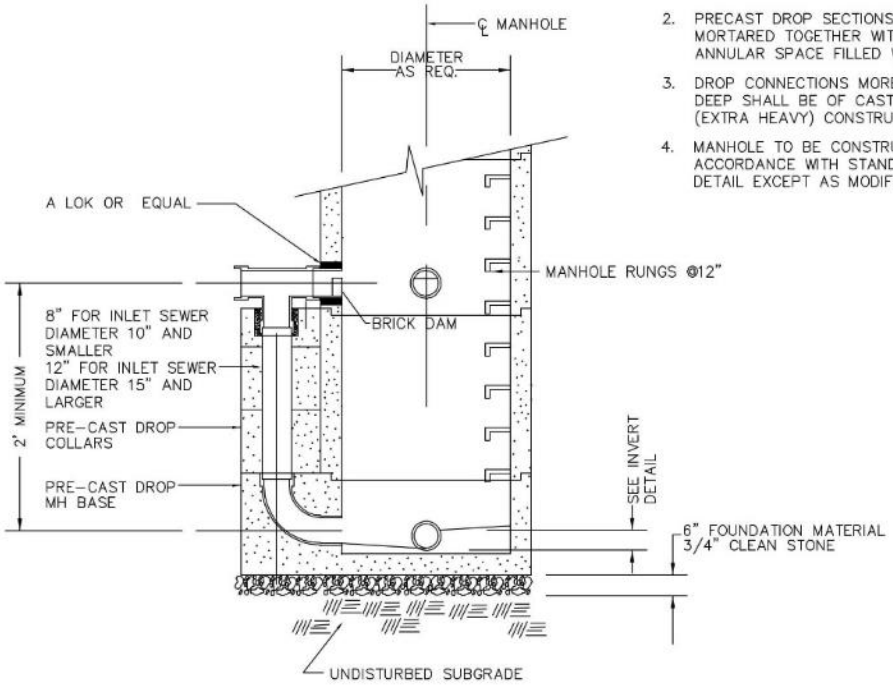


PLAN

NOTES:

1. SUBMIT SHOP DRAWINGS FOR APPROVAL.
2. PRECAST DROP SECTIONS SHALL BE MORTARED TOGETHER WITH THE ANNULAR SPACE FILLED WITH CONCRETE.
3. DROP CONNECTIONS MORE THAN 10 FEET DEEP SHALL BE OF CAST IRON PIPE (EXTRA HEAVY) CONSTRUCTION.
4. MANHOLE TO BE CONSTRUCTED IN ACCORDANCE WITH STANDARD MANHOLE DETAIL EXCEPT AS MODIFIED HEREIN.



SECTION

DROP CONNECTION

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DROP CONNECTION

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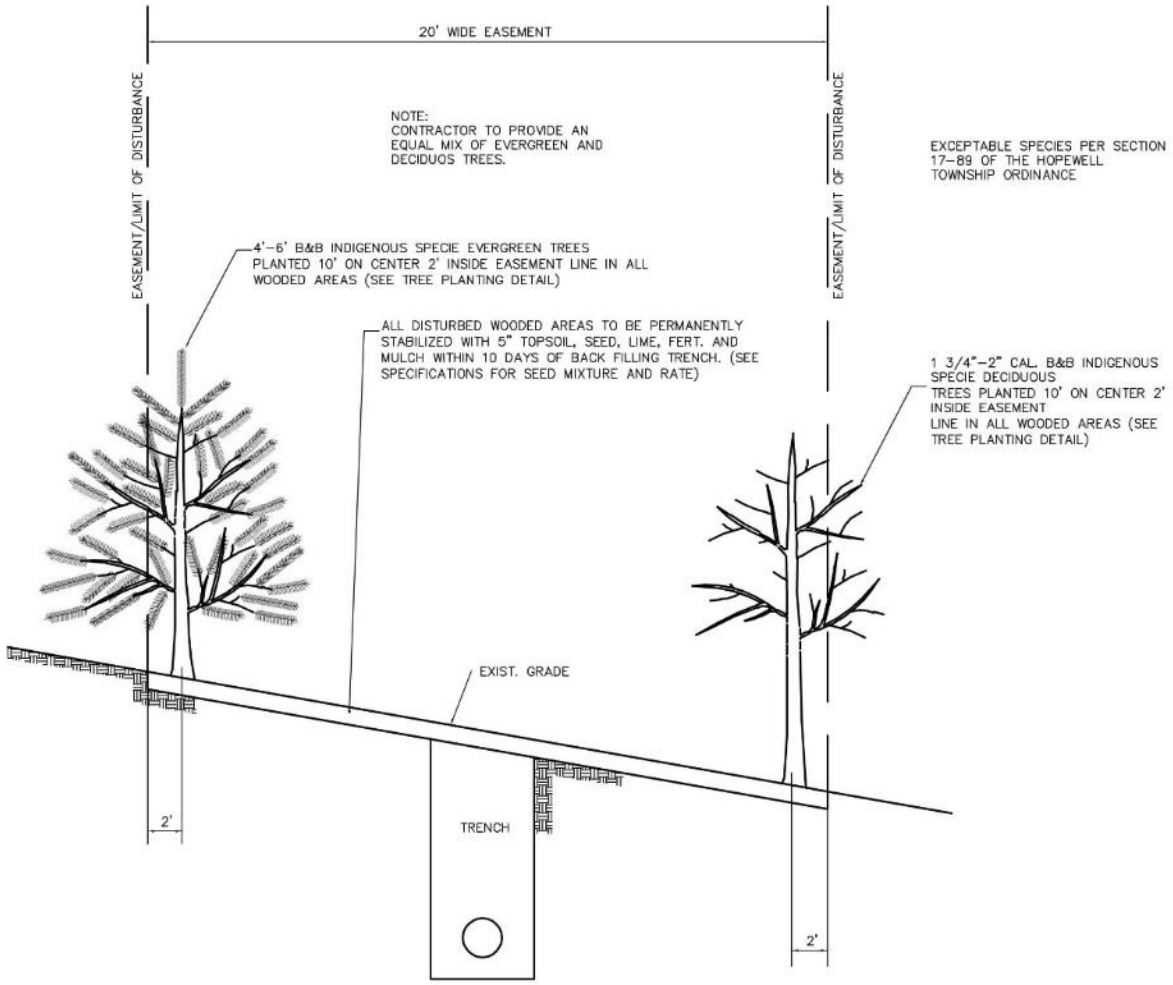

EASEMENT RESTORATION WOODED AREA

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EASEMENT RESTORATION WOODED AREA

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NUMBER AND SIZE OF RODS REQUIRED AND PIPE LENGTH IN FEET* TO BE RESTRAINED									
PIPE SIZE IN INCHES	09° TEE OR DEAD END PLUG			45°			22 1/2°		
	NO.	SIZE		NO.	SIZE		NO.	SIZE	
4	2	3/4"	30'	2	3/4"	10'	2	3/4"	5'
6	2	3/4"	40'	2	3/4"	10'	2	3/4"	5'
8	4	3/4"	50'	2	3/4"	15'	2	3/4"	5'
10	4	3/4"	60'	2	3/4"	20'	2	3/4"	5'
12	4	7/8"	70'	2	3/4"	20'	2	3/4"	5'
14	4	1"	80'	2	3/4"	25'	2	3/4"	5'
16	4	1"	80'	2	3/4"	25'	2	3/4"	5'

* LENGTH OF PIPE TO BE RESTRAINED IS FOR EACH SIDE OF BEND

NOTES:

1. USE MECHANICAL JOINT RETAINER MEGA LUG OR EQUAL. PROVIDE A THRUST RESTRAINT SYSTEM EQUIVALENT TO THAT LISTED IN THE TABLE FOR CLAMPS AND RODS. ALL JOINTS WITHIN THE LENGTH LISTED IN THE TABLE SHALL BE RESTRAINED.
2. LENGTHS ARE BASED ON THE FOLLOWING CRITERIA: 150 PSI MAXIMUM PRESSURE AND 3' –6' OF COVER. TABLE IS FOR USE WITH CI/DIP ONLY. IF TEST CONDITIONS ARE MORE SEVERE OR LARGER PIPES ARE PROPOSED, THEN SPECIAL COMPUTATIONS MUST BE MADE BY DESIGNER.
3. A ANTI–RUST COATING SHALL BE APPLIED TO ALL BOLTS, NUTS, WASHERS, RODS, THRUST, RESTRAINT BOLTS AND ALL UNCOATED HARDWARE.

FORCE MAIN JOINT RESTRAINT SCHEDULE

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FORCE MAIN JOINT RESTRAINT SCHEDULE

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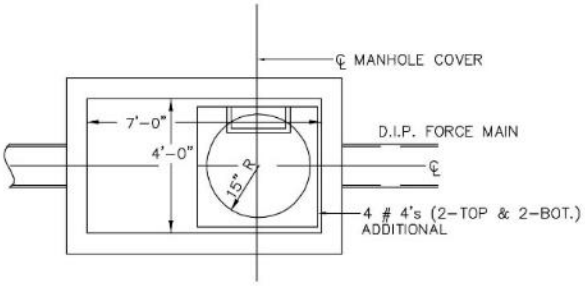
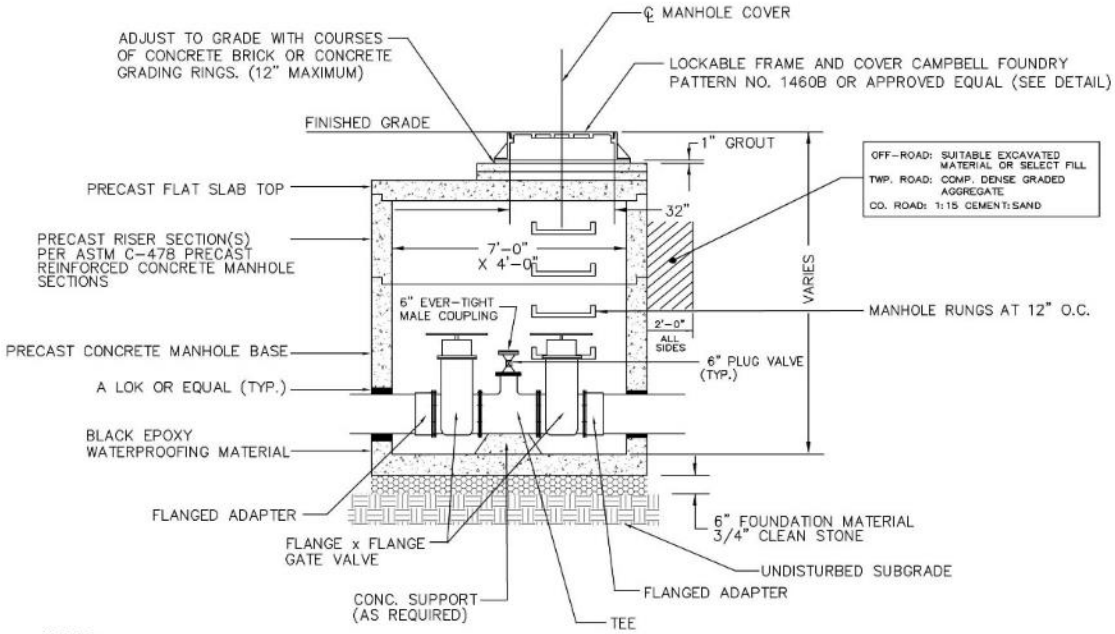


FLAT SLAB TOP



SECTION

NOTES:

1. SUBMIT SHOP DRAWINGS FOR APPROVAL.
2. DESIGN FOR H-20 LOADING

LARGE (6"-12") FORCE MAIN CLEAN-OUT MANHOLE

N.T.S.

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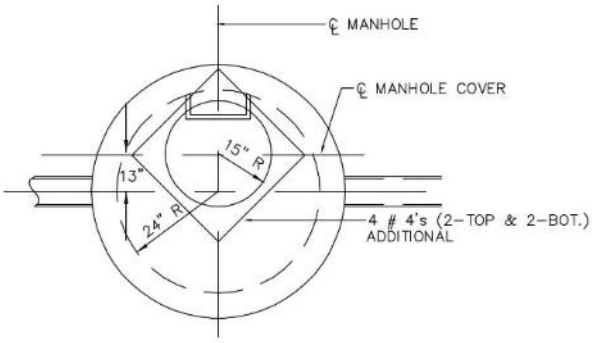
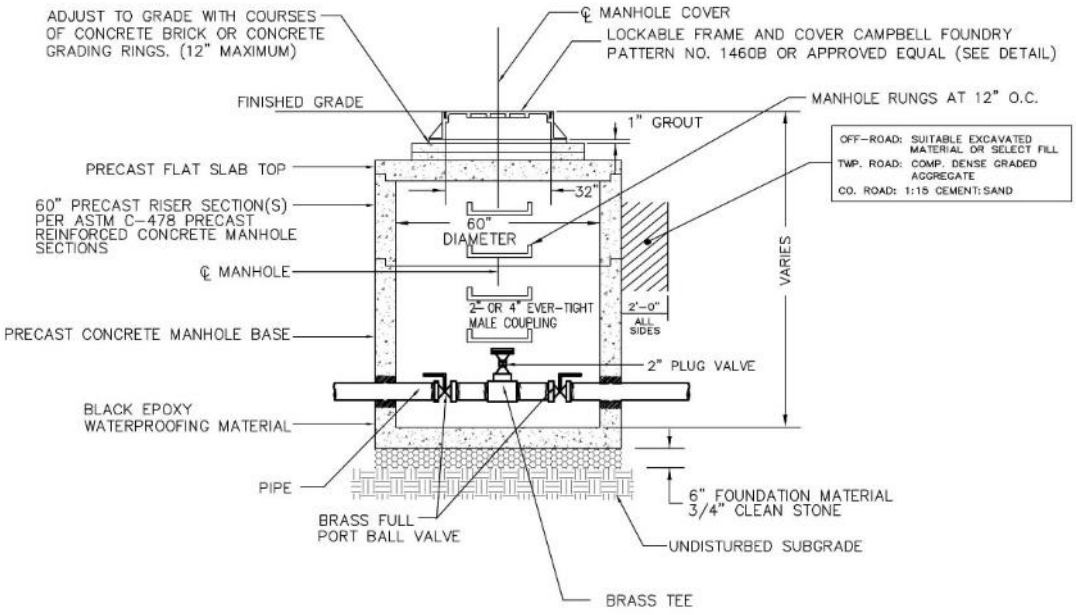
NJ LIC CERT. No. 24GA28152300

LARGE FORCE MAIN CLEANOUT MH

REVISIONS	AUTH.	DATE



FLAT SLAB TOP



NOTES:

1. SUBMIT SHOP DRAWINGS FOR APPROVAL.
2. DESIGN FOR H-20 LOADING

SECTION

SMALL (2"-4") FORCE MAIN CLEAN-OUT MANHOLE

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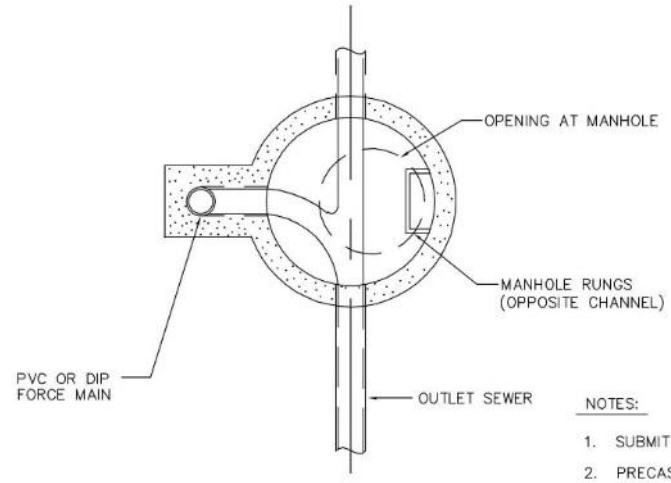
SMALL FORCE MAIN CLEANOUT MH

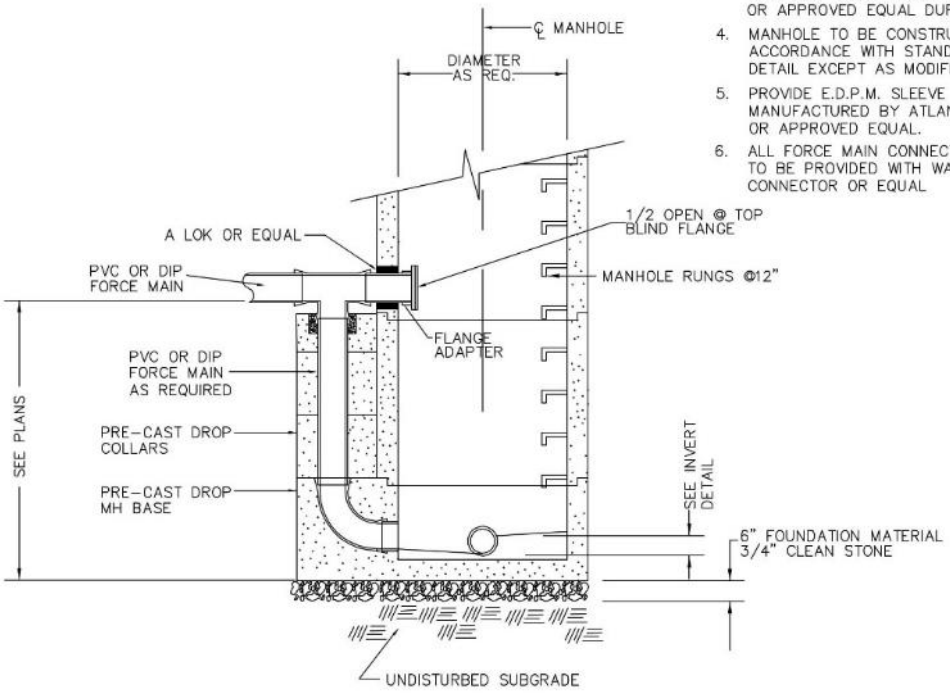
REVISIONS	AUTH.	DATE



PLAN

NOTES:

1. SUBMIT SHOP DRAWINGS FOR APPROVAL.
2. PRECAST DROP SECTIONS SHALL BE MORTARED TOGETHER WITH THE ANNULAR SPACE FILLED WITH CONCRETE.
3. ENTIRE INTERIOR OF MANHOLE TO BE LINED WITH PVC "DURA PLATE 100 BY A-LOK" OR APPROVED EQUAL DURING PRECASTING.
4. MANHOLE TO BE CONSTRUCTED IN ACCORDANCE WITH STANDARD MANHOLE DETAIL EXCEPT AS MODIFIED HEREIN.
5. PROVIDE E.D.P.M. SLEEVE AS MANUFACTURED BY ATLANTIC CONCRETE OR APPROVED EQUAL.
6. ALL FORCE MAIN CONNECTION MANHOLES TO BE PROVIDED WITH WATER-LOK CONNECTOR OR EQUAL



SECTION

FORCE MAIN CONNECTION MANHOLE

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FORCE MAIN CONNECTION MANHOLE

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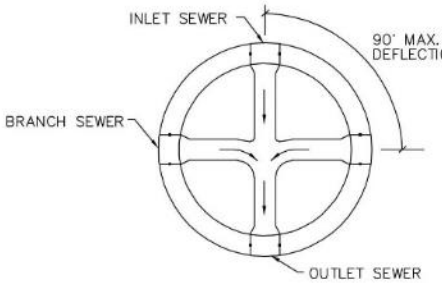


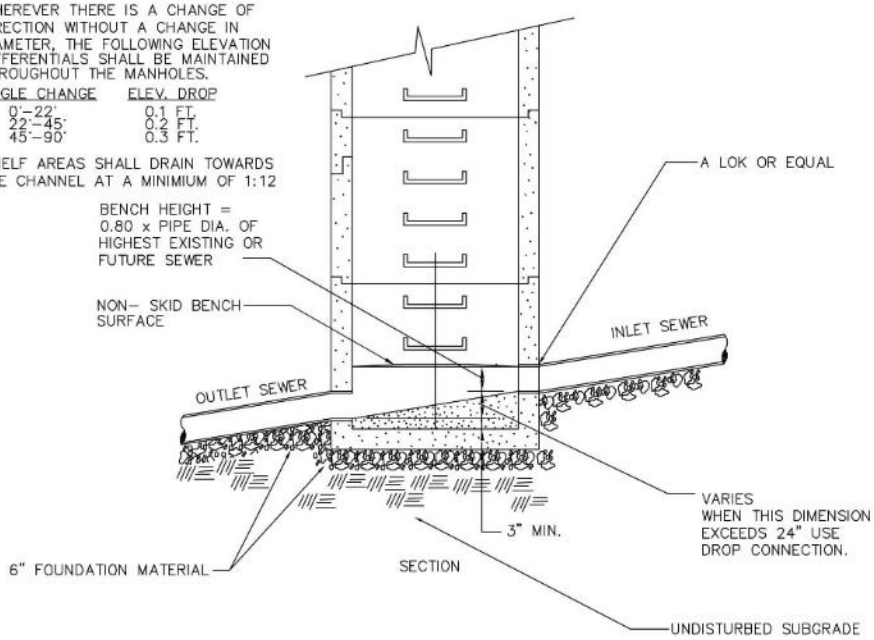
PLAN

NOTES:

1. WHEREVER THERE IS A CHANGE IN PIPE DIAMETER, THE 0.8 DEPTH POINT OF THE PIPES SHALL BE AT THE SAME ELEVATION.
2. WHEREVER THERE IS A CHANGE OF DIRECTION WITHOUT A CHANGE IN DIAMETER, THE FOLLOWING ELEVATION DIFFERENTIALS SHALL BE MAINTAINED THROUGHOUT THE MANHOLES.

ANGLE CHANGE	ELEV. DROP
0°–22°	0.1 FT.
22°–45°	0.2 FT.
45°–90°	0.3 FT.

3. SHELF AREAS SHALL DRAIN TOWARDS THE CHANNEL AT A MINIMUM OF 1:12



INVERT DETAIL

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INVERT DETAIL

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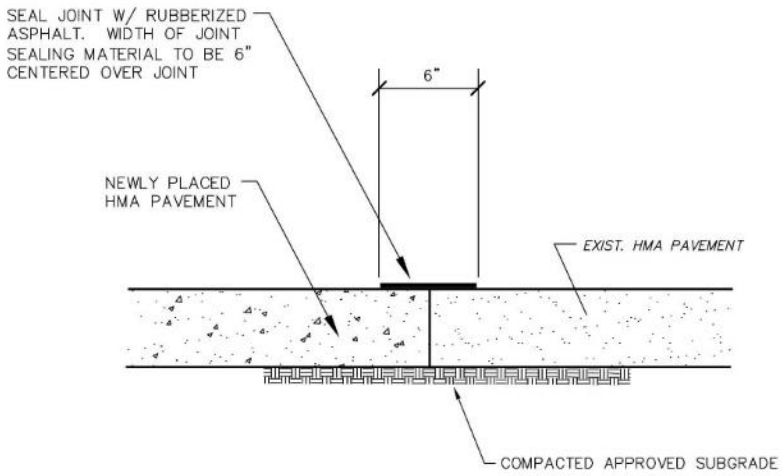

HMA JOINT SEALING

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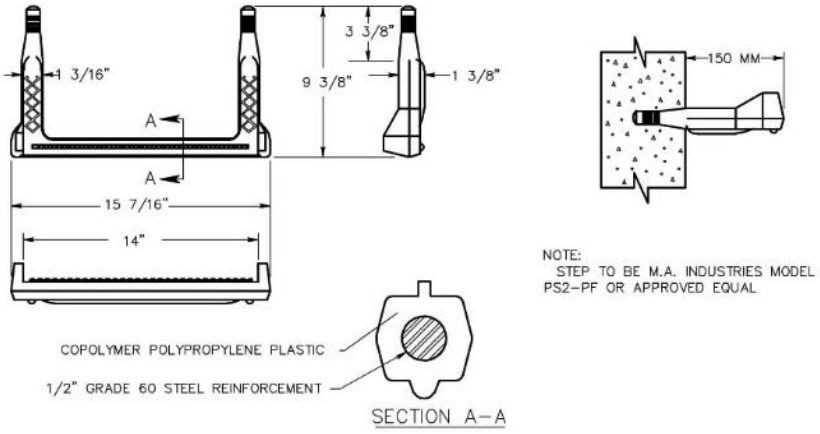
HMA JOINT SEALING

REVISIONS | AUTH. | DATE



LADDER RUNG DETAIL

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LADDER RUNG

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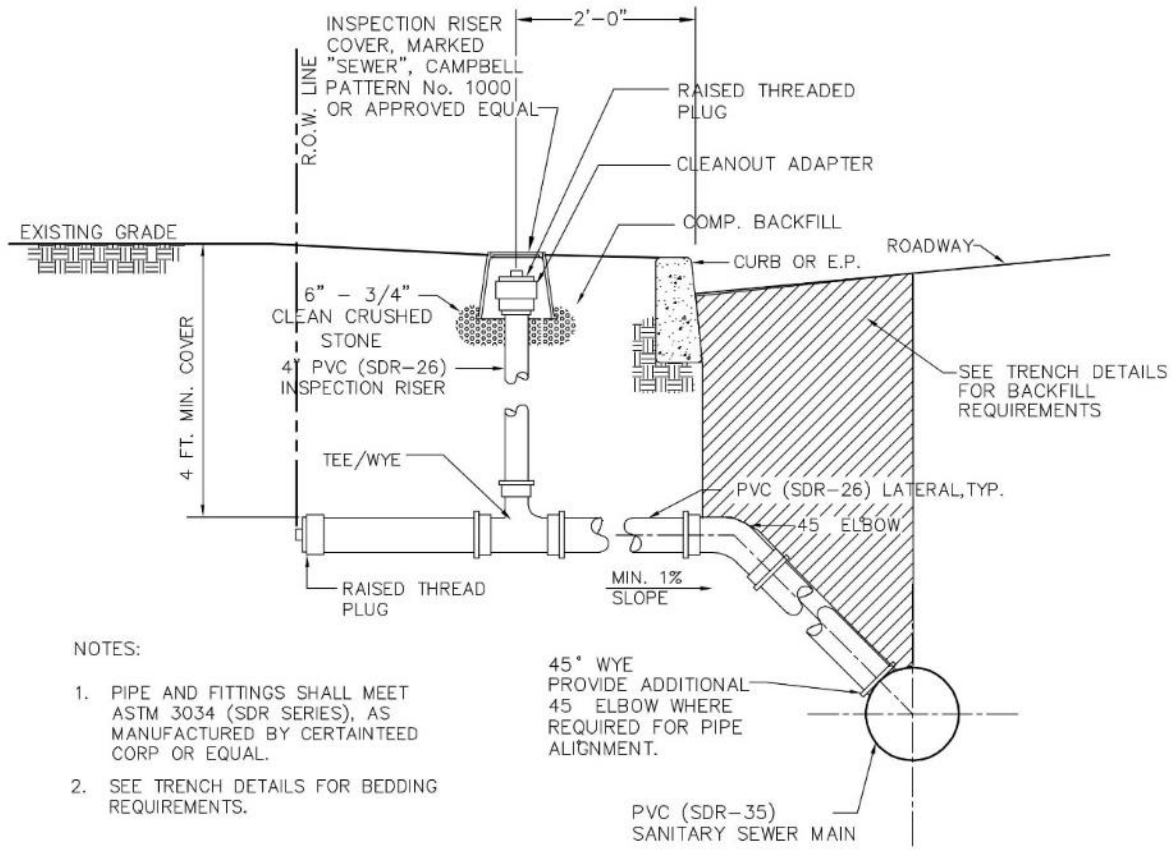

NOTES:

1. PIPE AND FITTINGS SHALL MEET ASTM 3034 (SDR SERIES), AS MANUFACTURED BY CERTAINTEED CORP OR EQUAL.
2. SEE TRENCH DETAILS FOR BEDDING REQUIREMENTS.

LATERAL
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LATERAL

REVISIONS	AUTH.	DATE

SIZE OF PIPE	MAXIMUM JOINT DEFLECTION IN DEGREES	DEFLECTION IN INCHES	APPROXIMATE RADIUS IN FEET OF PRODUCED BY SUCCESSION OF JOINTS
4	5°	19	206
6	5°	19	206
8	5°	19	206
10	5°	19	206
12	5°	19	206
14	5°	19	206

TYTON JOINT PIPE OR AS PER MANUFACTURE'S RECOMMENDATIONS FOR APPROVED EQUAL

MAXIMUM DEFLECTION FULL LENGTH PIPE

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MAX DEFLECTION FULL LENGTH PIPE

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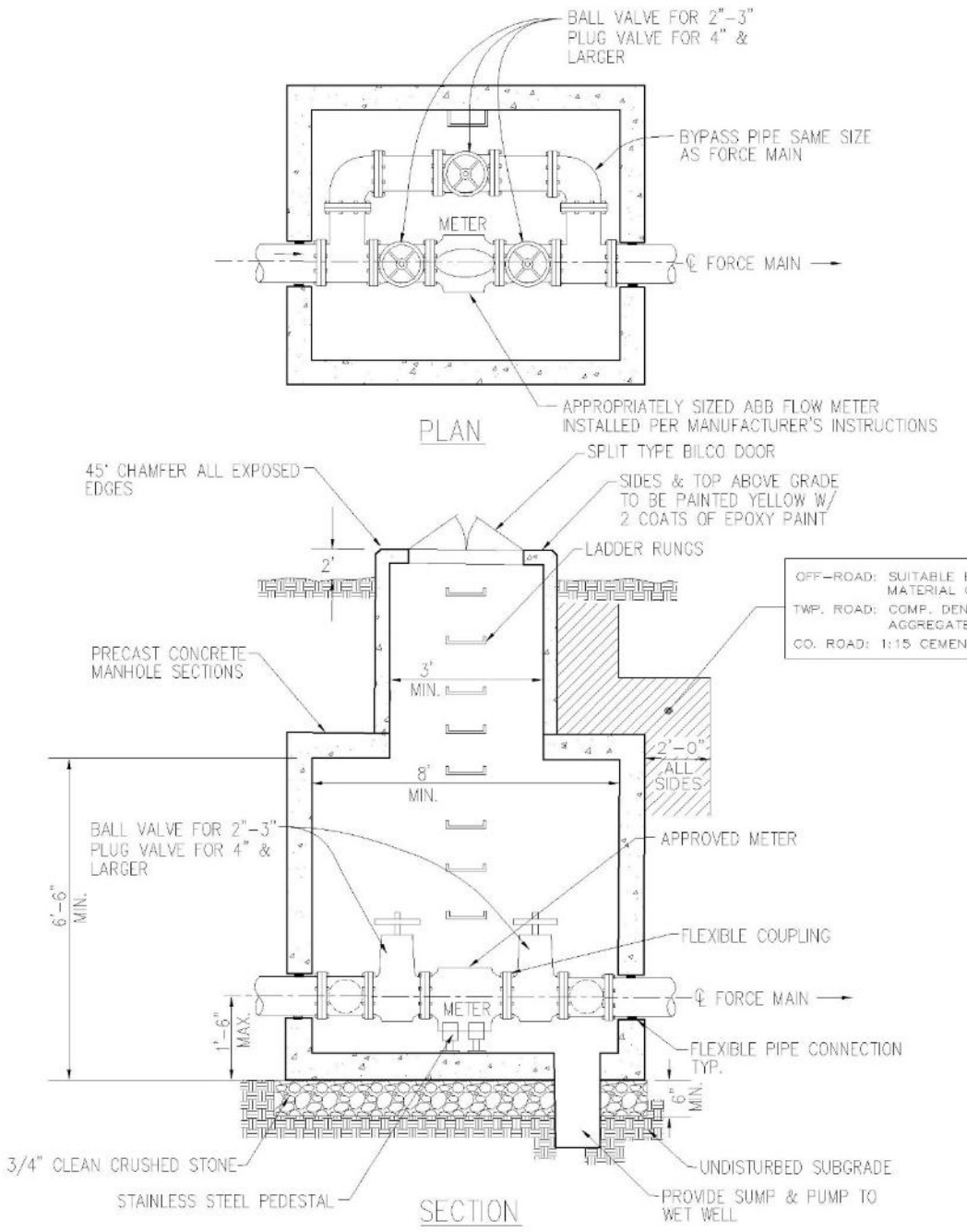

TYPICAL METER CHAMBER

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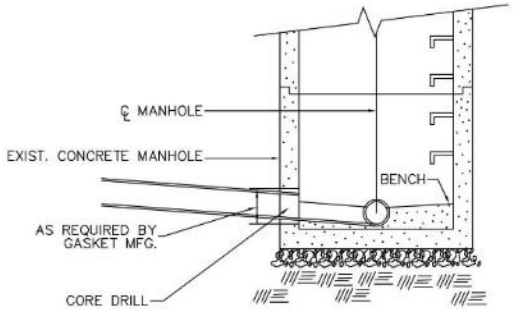
TYPICAL METER CHAMBER

REVISIONS | AUTH. | DATE

NOTES:

1. CLEAN AND ROUGHEN ALL SURFACES AGAINST WHICH NEW MORTAR IS TO BE PLACED.
2. WHERE REQUIRED, EXISTING CONCRETE SHALL BE REMOVED TO A LINE 1" BEYOND THE NEW CHANNEL LINE AND FINISHED OFF WITH NEW CEMENT MORTAR.
3. USE LINK-SEAL GASKET
4. SUBMIT SHOP DRAWING FOR APPROVAL.



NEW CONNECTION TO EXISTING M.H.

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NEW CONNECTION TO EXIST. MANHOLE

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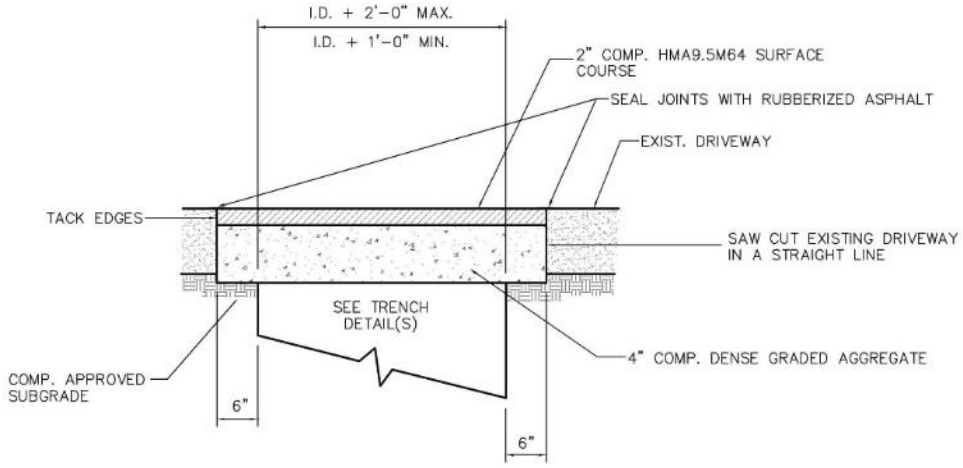

PERMANENT BIT. DRIVEWAY REPLACEMENT

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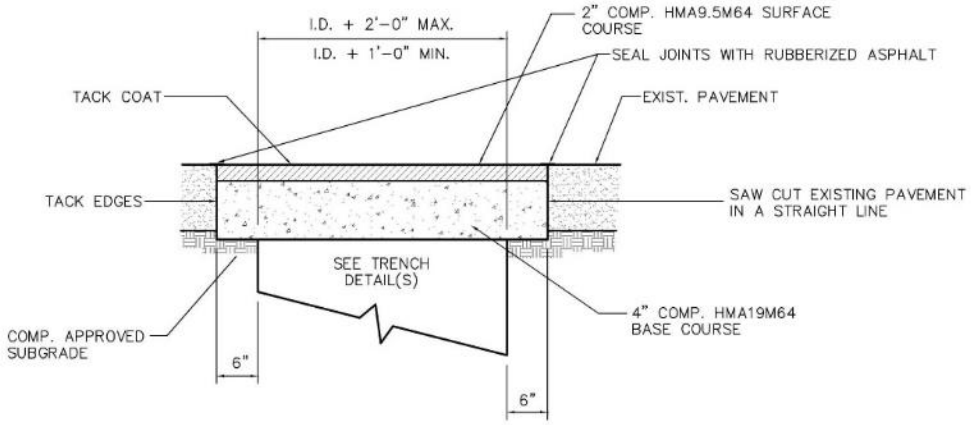
PAVEMENT REPLACEMENT
PERMANENT DRIVEWAY

REVISIONS	AUTH.	DATE



PERMANENT PARKING LOT/NON-RESIDENTIAL DRIVEWAY PAVEMENT REPLACEMENT

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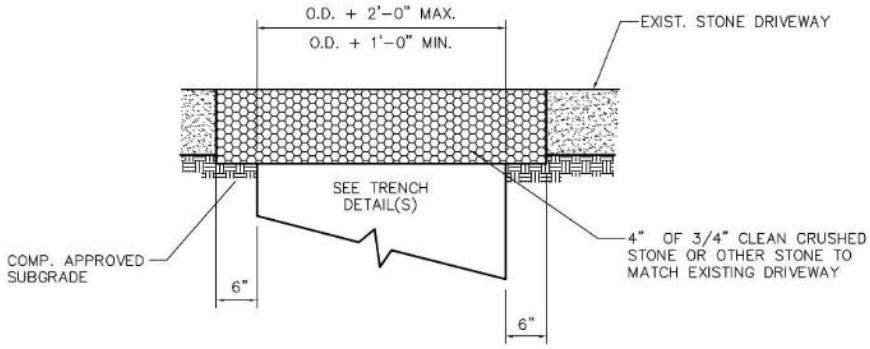
PAVEMENT REPLACEMENT
PERMANENT NON RESIDENTIAL
DRIVEWAY

REVISIONS	AUTH.	DATE



PERMANENT STONE DRIVEWAY REPLACEMENT

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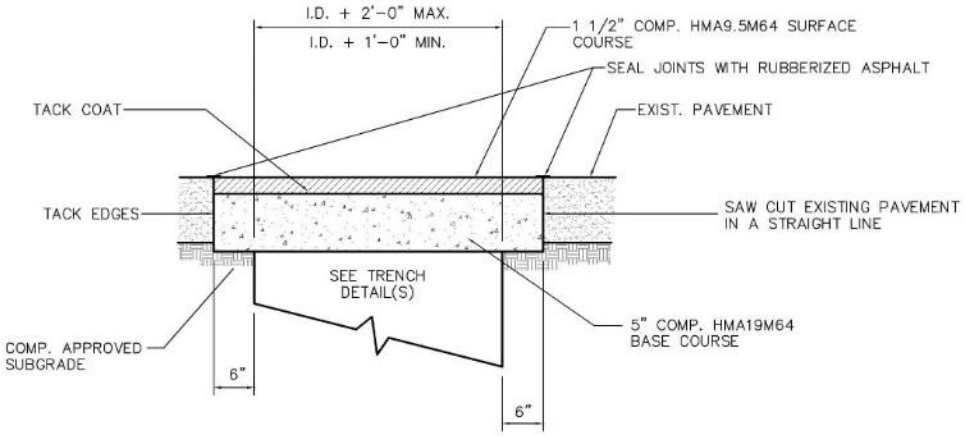
PAVEMENT REPLACEMENT
PERMANENT STONE DRIVEWAY

REVISIONS	AUTH.	DATE



1. ALL PAVMENT MARKINGS DISTURBED SHALL BE REPLACED IN-KIND USING THERMOPLASTIC PAVEMENT MARKING MATERIAL.

PERMANENT PAVEMENT REPLACEMENT HOPEWELL TWP. ROADWAY

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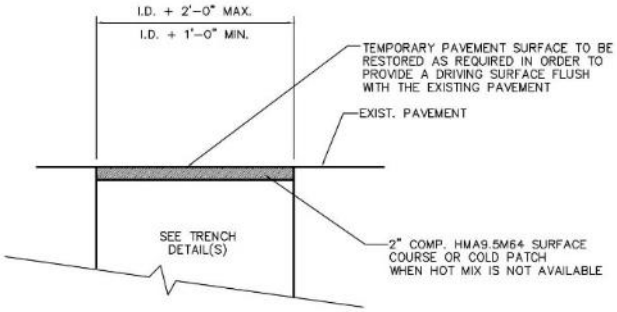
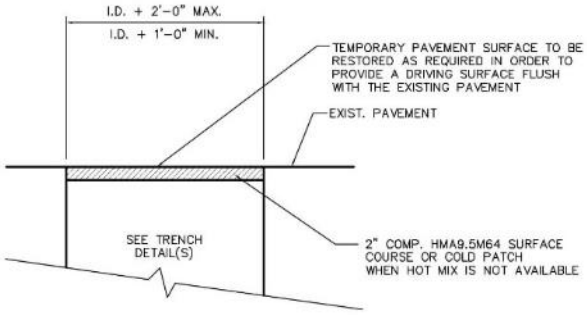
PAVEMENT REPLACEMENT
PERMANENT TOWNSHIP ROAD

REVISIONS	AUTH.	DATE



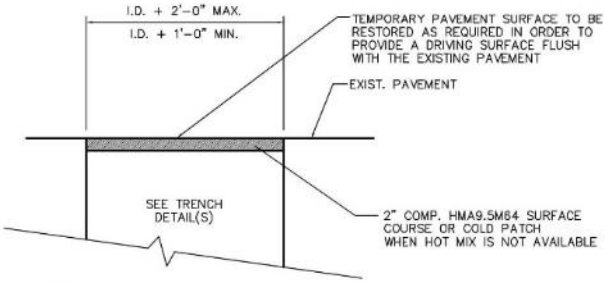
TEMP. DRIVEWAY REPLACEMENT

NOT TO SCALE



TEMP. PARKING LOT/NON-RESIDENTIAL DRIVEWAY PAVEMENT REPLACEMENT

NOT TO SCALE



NOTE:
1. ALL PAVEMENT MARKINGS SHALL BE TEMPORARILY REPLACED IN-KIND WITH LATEXPAINT WITH GLASS BEADS FOR REFLECTIVITY.

TEMP. PAVEMENT REPLACEMENT HOPEWELL TWP. ROADWAY

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PAVEMENT REPLACEMENT TEMPORARY

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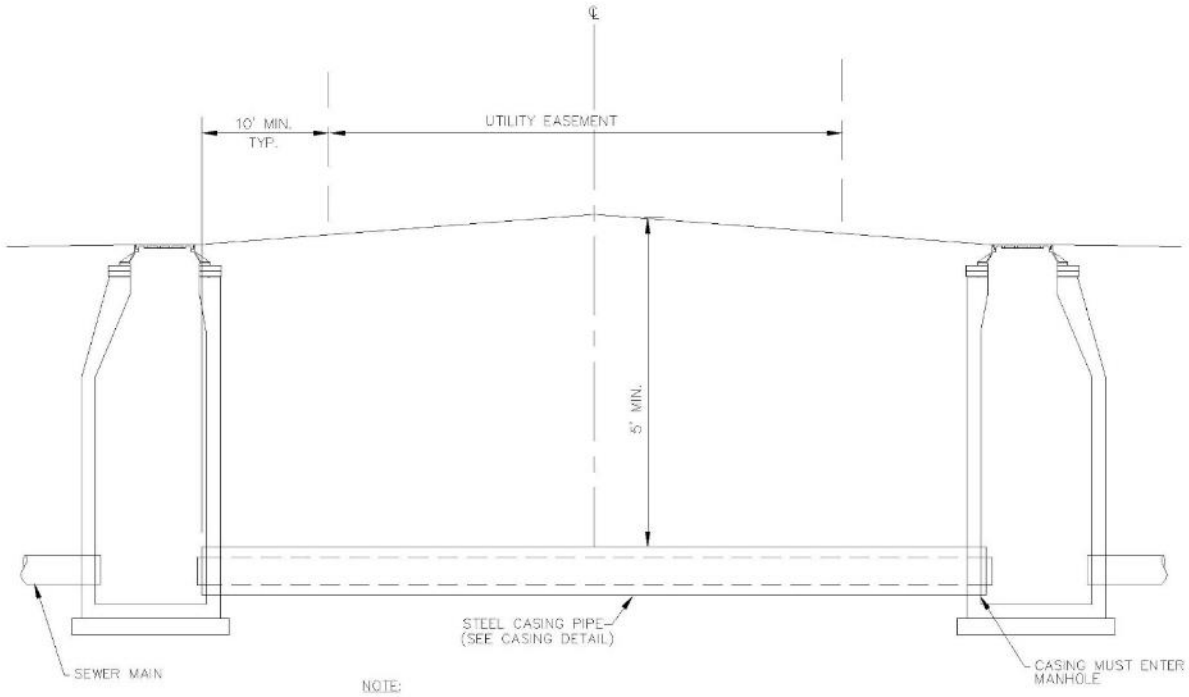

NOTE:

1. ALSO SEE DETAIL OF PIPE DRIVEN IN STEEL CASING.

TYP. PIPE CROSSING UNDER UTILITY EASEMENT/ R.O.W.

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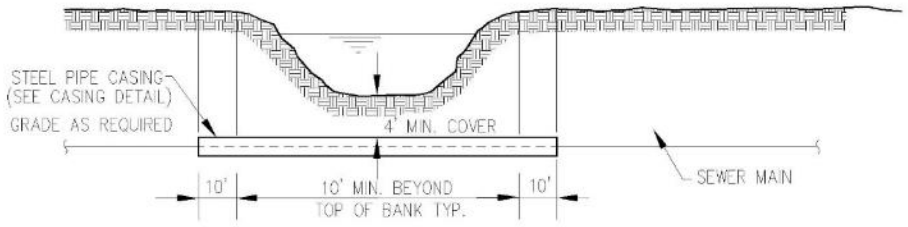
TYP. PIPE CROSSING UNDER UTILITY EASEMENT

REVISIONS | AUTH. | DATE



TYP. PIPE CROSSING UNDER STREAM

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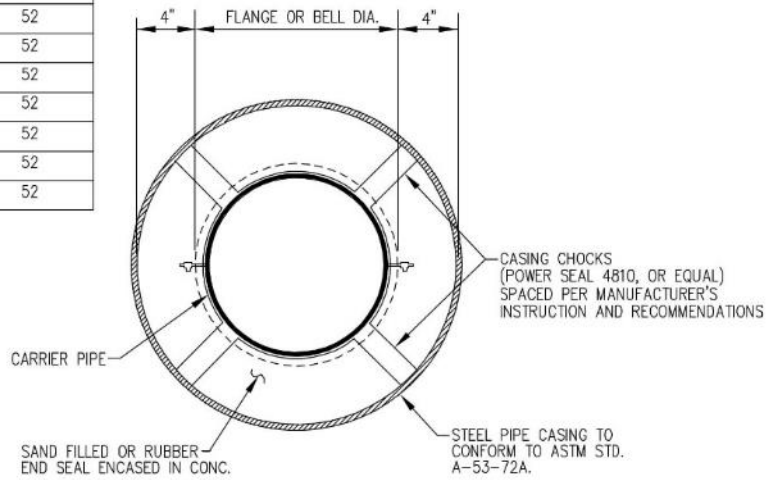
TYP. PIPE CROSSING UNDER STREAM

REVISIONS	AUTH.	DATE

CASING SCHEDULE

PIPE CARRIER SIZE	NOMINAL DIAMETER	STEEL WALL THICKNESS	DUCTILE IRON PIPE CLASS
6"	16"	1/2"	52
8"	18"	1/2"	52
10"	24"	1/2"	52
12"	30"	5/8"	52
16"	30"	5/8"	52
18"	36"	3/4"	52
20"	36"	3/4"	52
24"	42"	3/4"	52
20"	48"	3/4"	52



PIPE DRIVEN IN STEEL CASING

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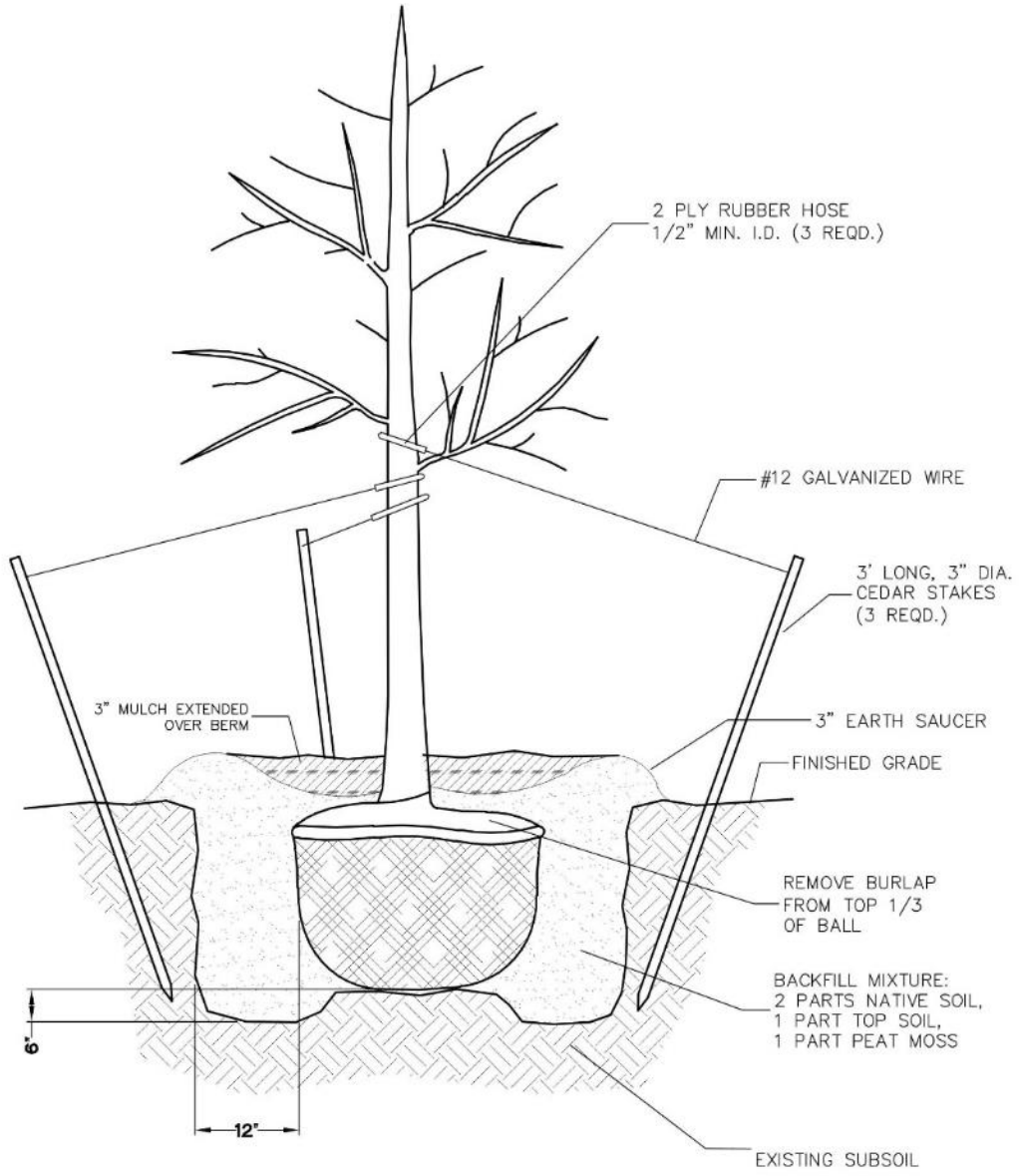
PIPE DRIVEN IN STEEL CASING

REVISIONS | AUTH. | DATE



PLANTING AND STAKING DETAIL FOR BALLED AND BURLAPPED DECIDUOUS TREES

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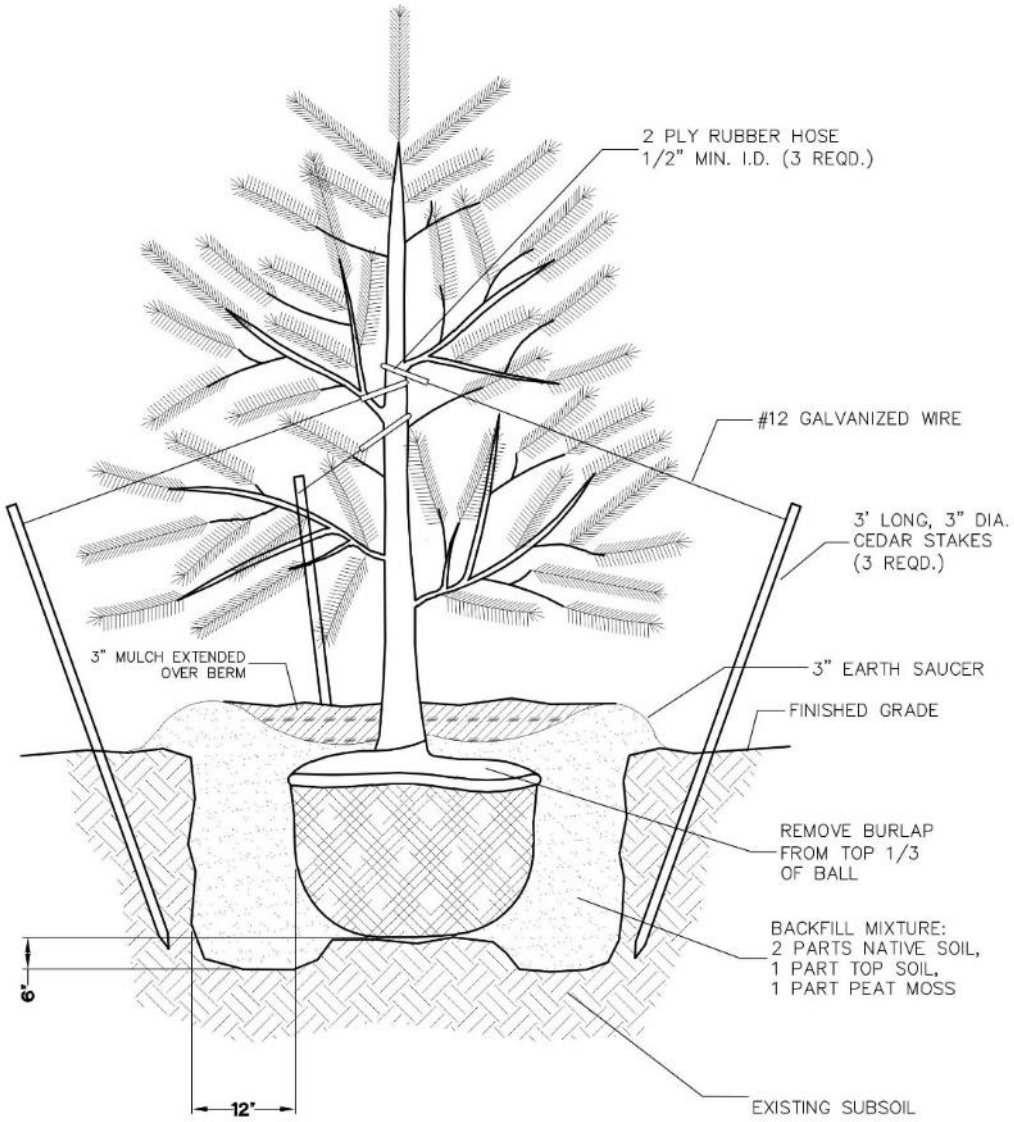
PLANTING FOR B&B DECIDUOUS TREES

REVISIONS	AUTH.	DATE



PLANTING AND STAKING DETAIL FOR BALLED AND BURLAPPED EVERGREEN TREES

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PLANTING FOR B&B EVERGREEN TREES

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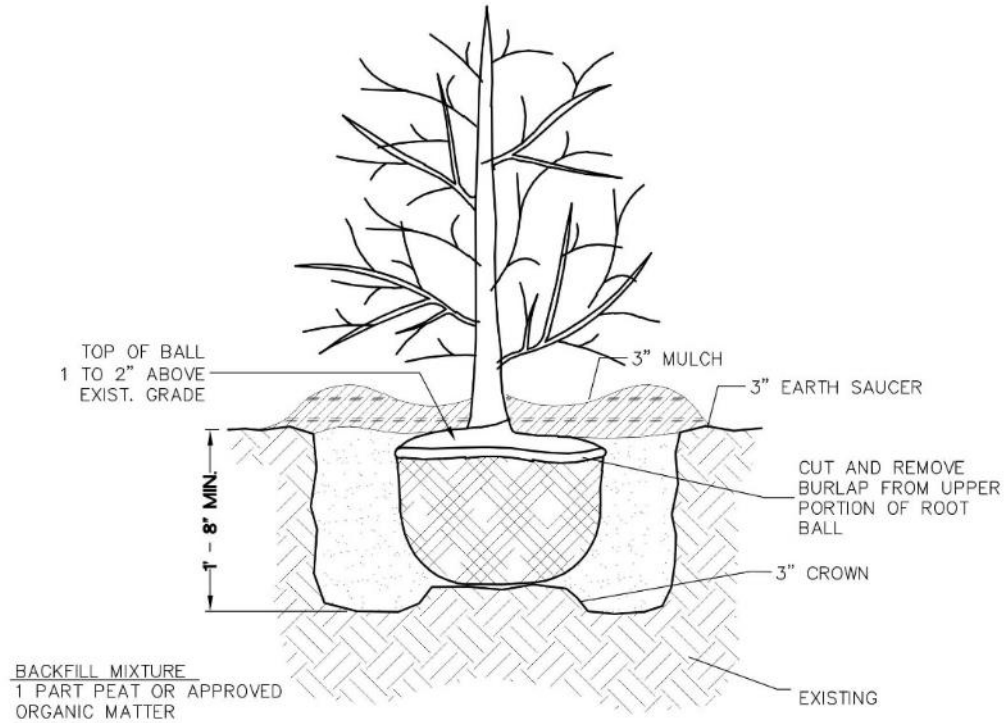

SHRUB PLANTING DETAIL

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PLANTING FOR SHRUBS

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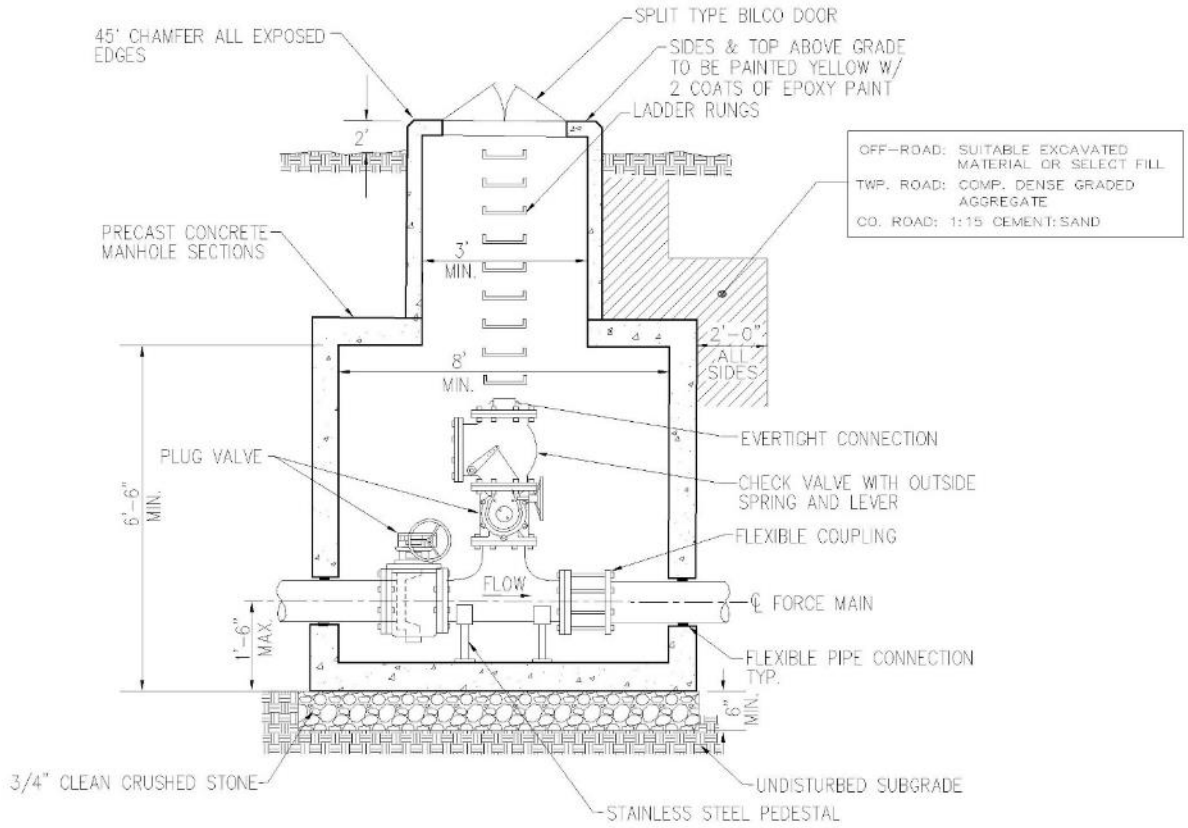

PUMP STATION BY-PASS CHAMBER

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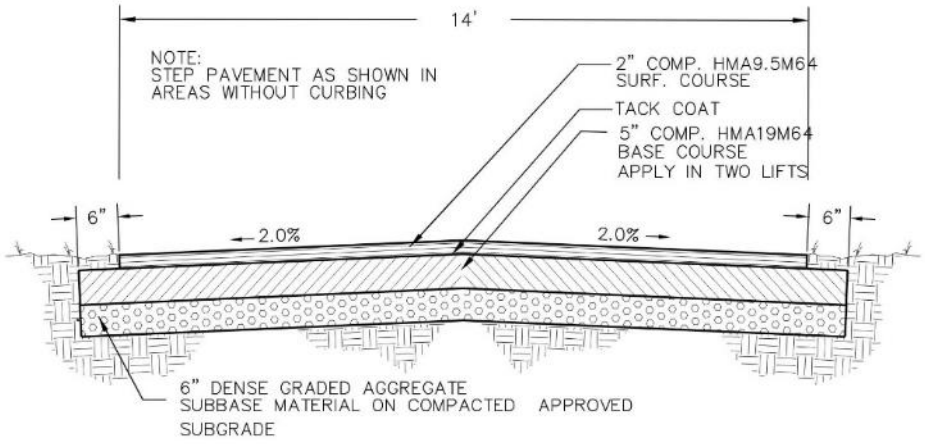
PUMP STATION BY-PASS CHAMBER

REVISIONS	AUTH.	DATE



PUMP STATION DRIVEWAY

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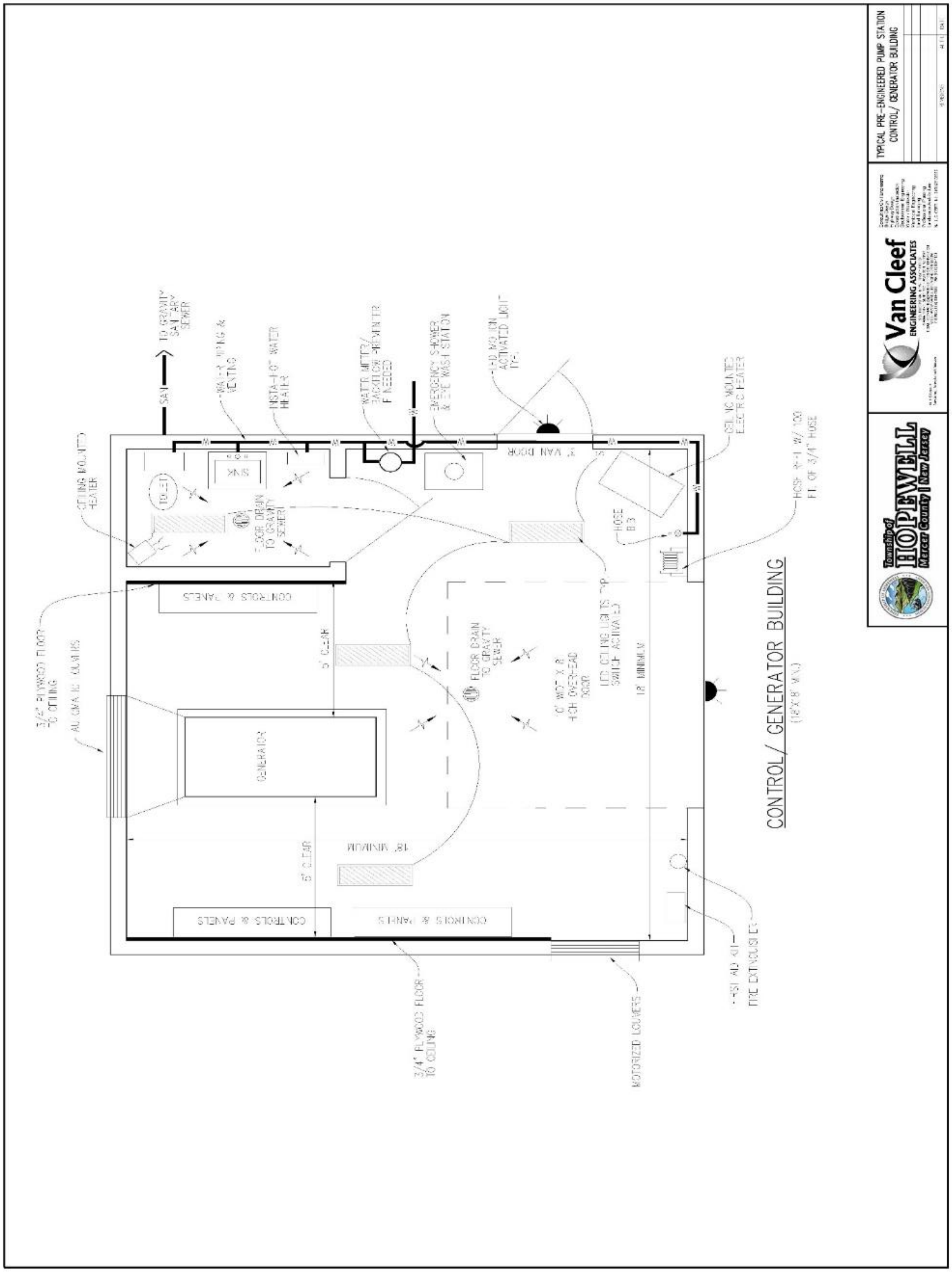
PUMP STATION DRIVEWAY

REVISIONS	AUTH.	DATE


TYPICAL PRE-ENGINEERED PUMP STATION
CONTROL/ GENERATOR BUILDING
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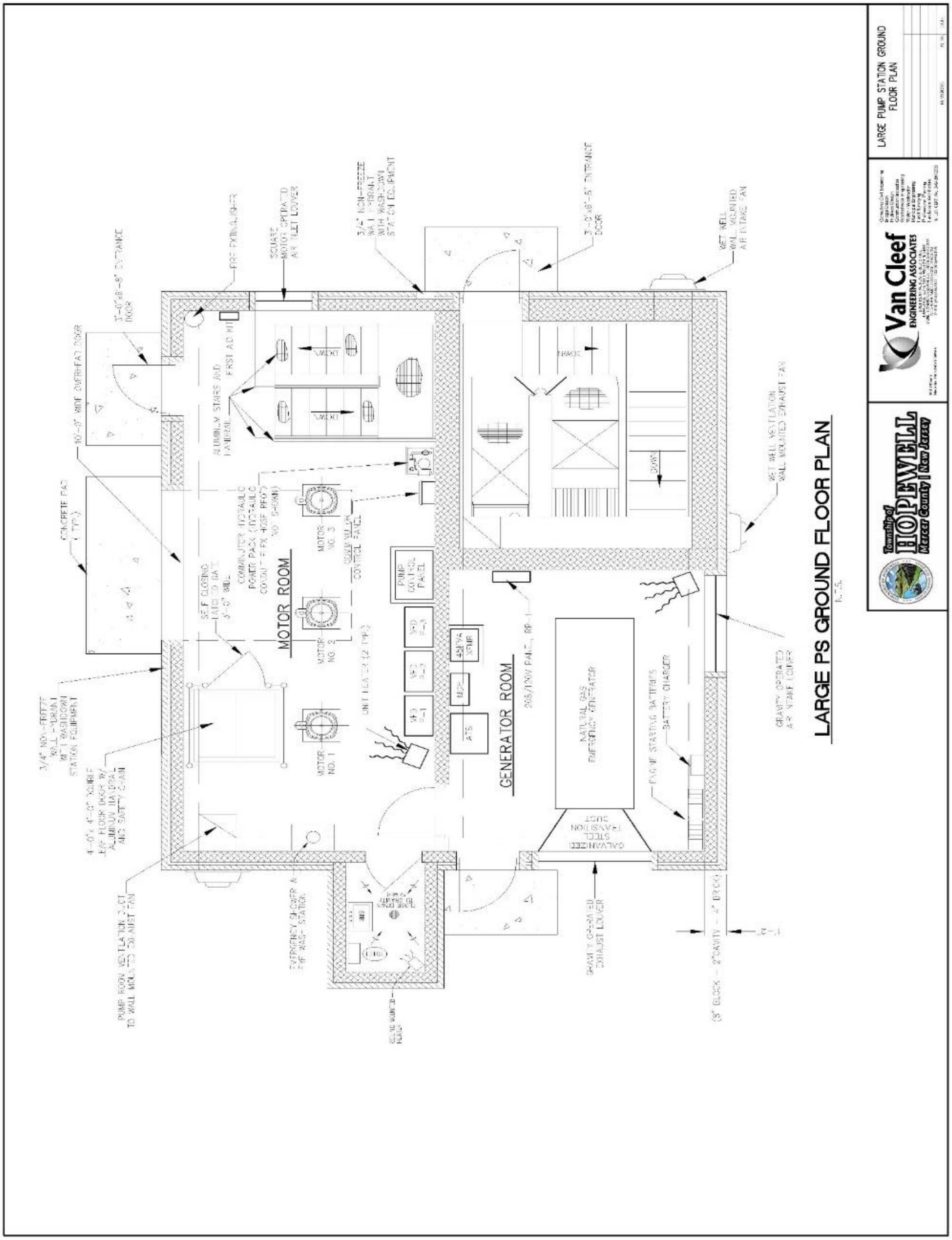
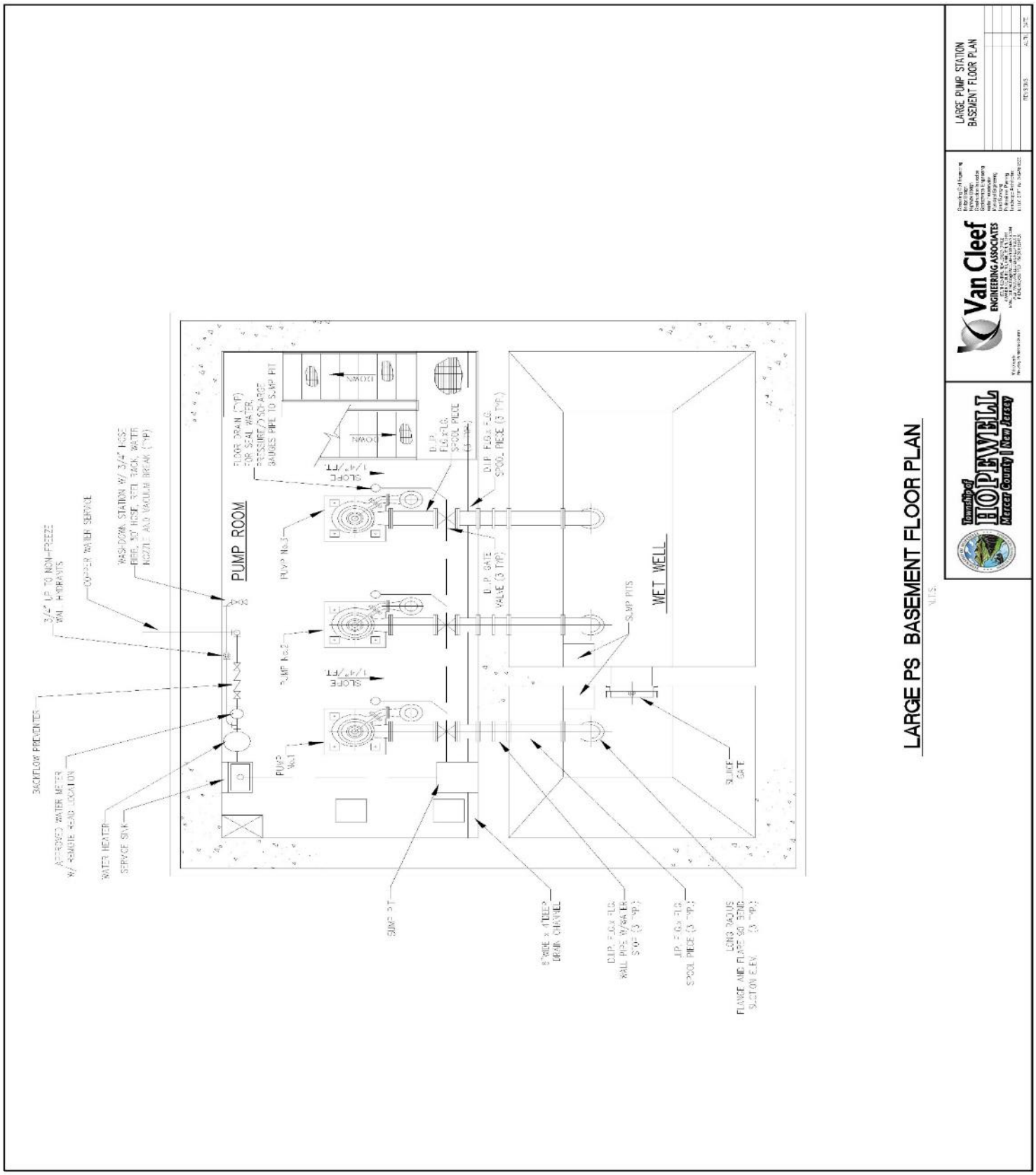
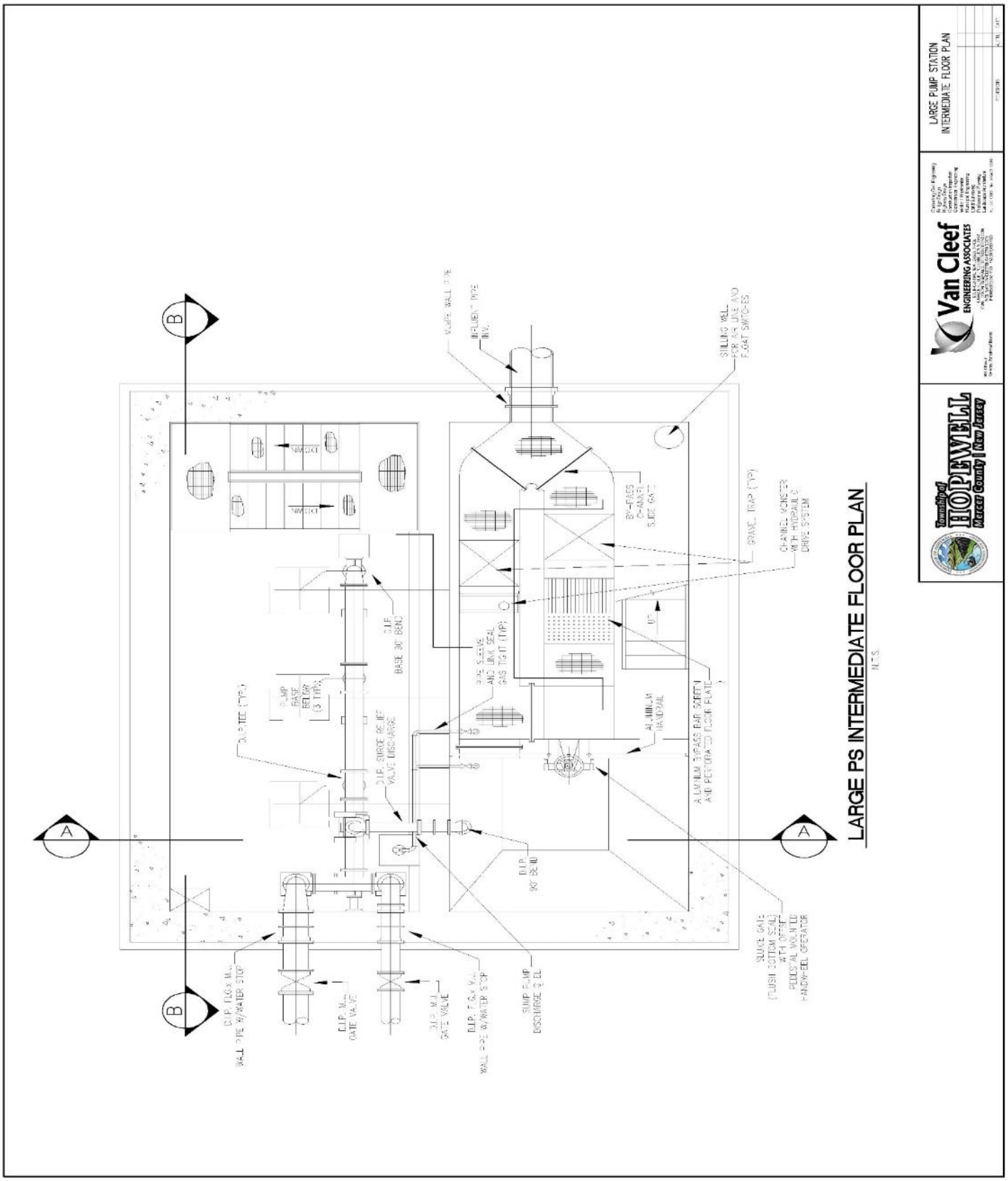
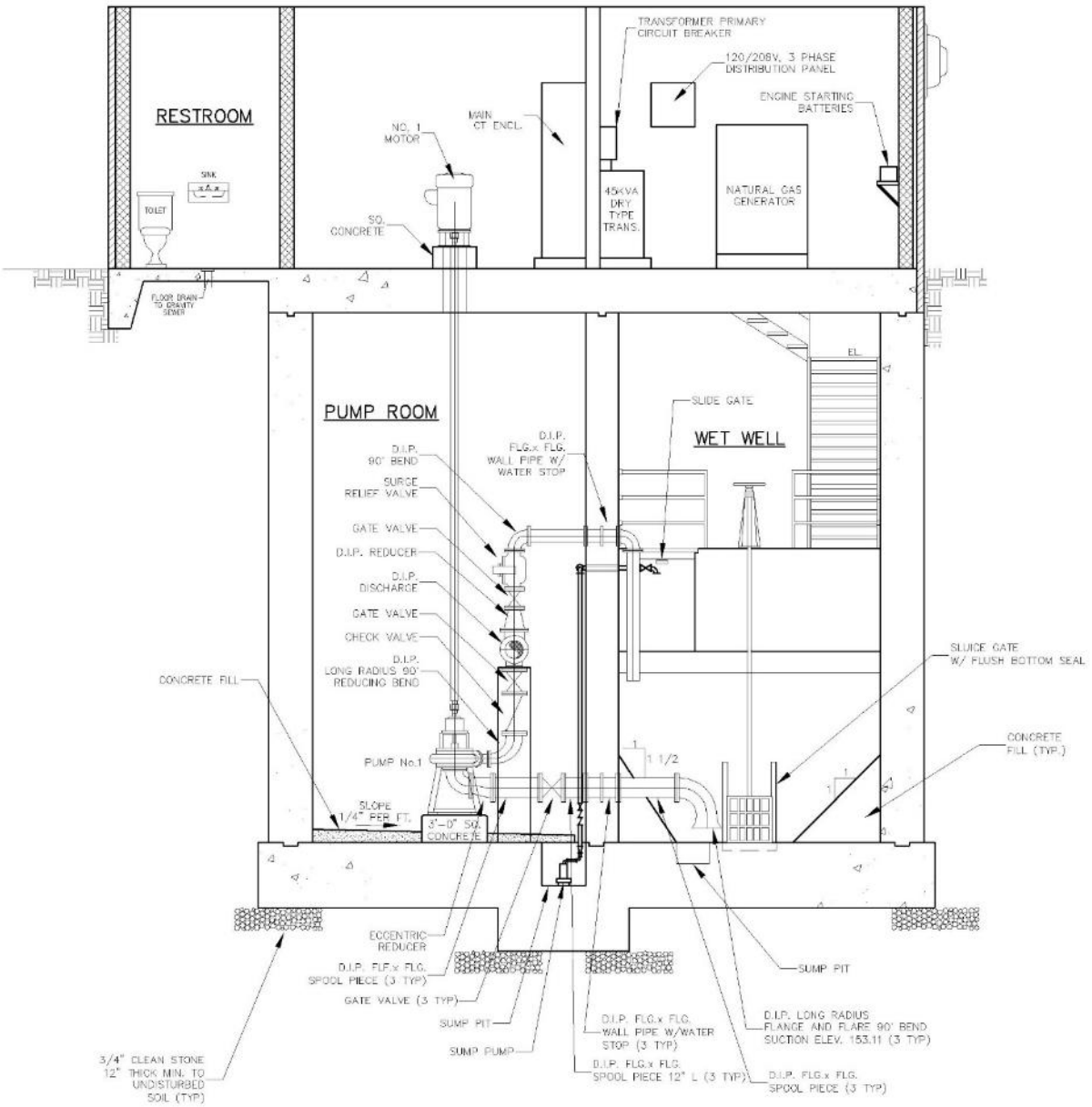
CONTROL/ GENERATOR BUILDING
GENERATOR
CONTROLS & PANELS
SINK
TOILET
MOTORIZED LOUVERS


LARGE PS GROUND FLOOR PLAN
N.T.S.
MOTOR ROOM
GENERATOR ROOM
LARGE PUMP STATION GROUND FLOOR PLAN
Van Cleef
ENGINEERING ASSOCIATES
Township of HOPEWELL
Mercer County | New Jersey


LARGE PS BASEMENT FLOOR PLAN
N.T.S.
PUMP ROOM
WET WELL
LARGE PUMP STATION
BASEMENT FLOOR PLAN
Van Cleef
ENGINEERING ASSOCIATES
Township of
HOPEWELL
Mercer County | New Jersey


LARGE PS INTERMEDIATE FLOOR PLAN
N.T.S.
LARGE PUMP STATION
INTERMEDIATE FLOOR PLAN
Van Cleef
ENGINEERING ASSOCIATES
Township of
HOPEWELL
Mercer County | New Jersey



LARGE PS SECTION A-A

Township of HOPEWELL Mercer County | New Jersey

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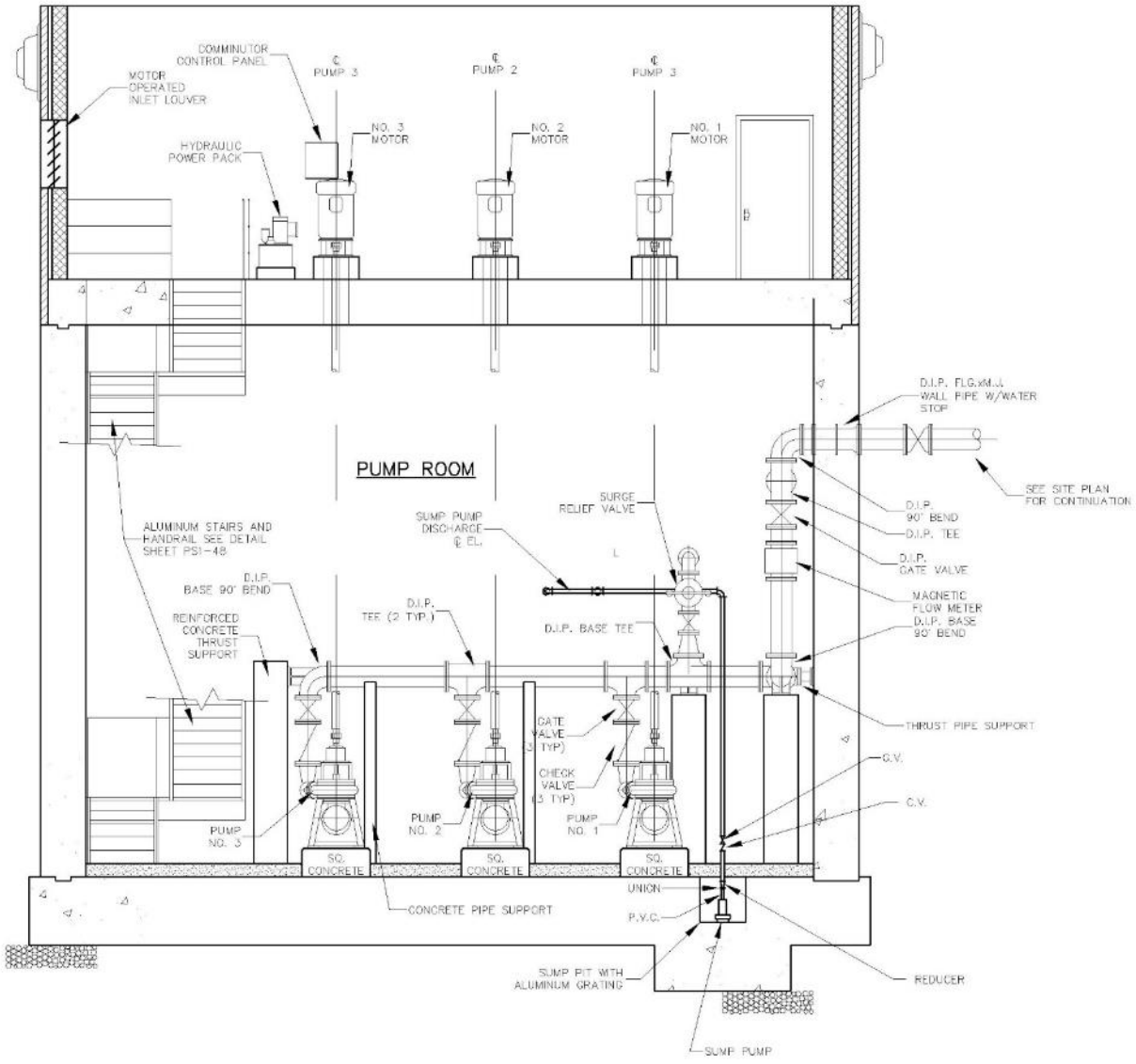
Municipal Engineering
Land Surveying
Professional Planning
Landscape Architecture
NJ LIC CERT. No. 24GA28132300

LARGE PUMP STATION SECTIONS

REVISIONS	AUTH.	DATE



SECTION B-B

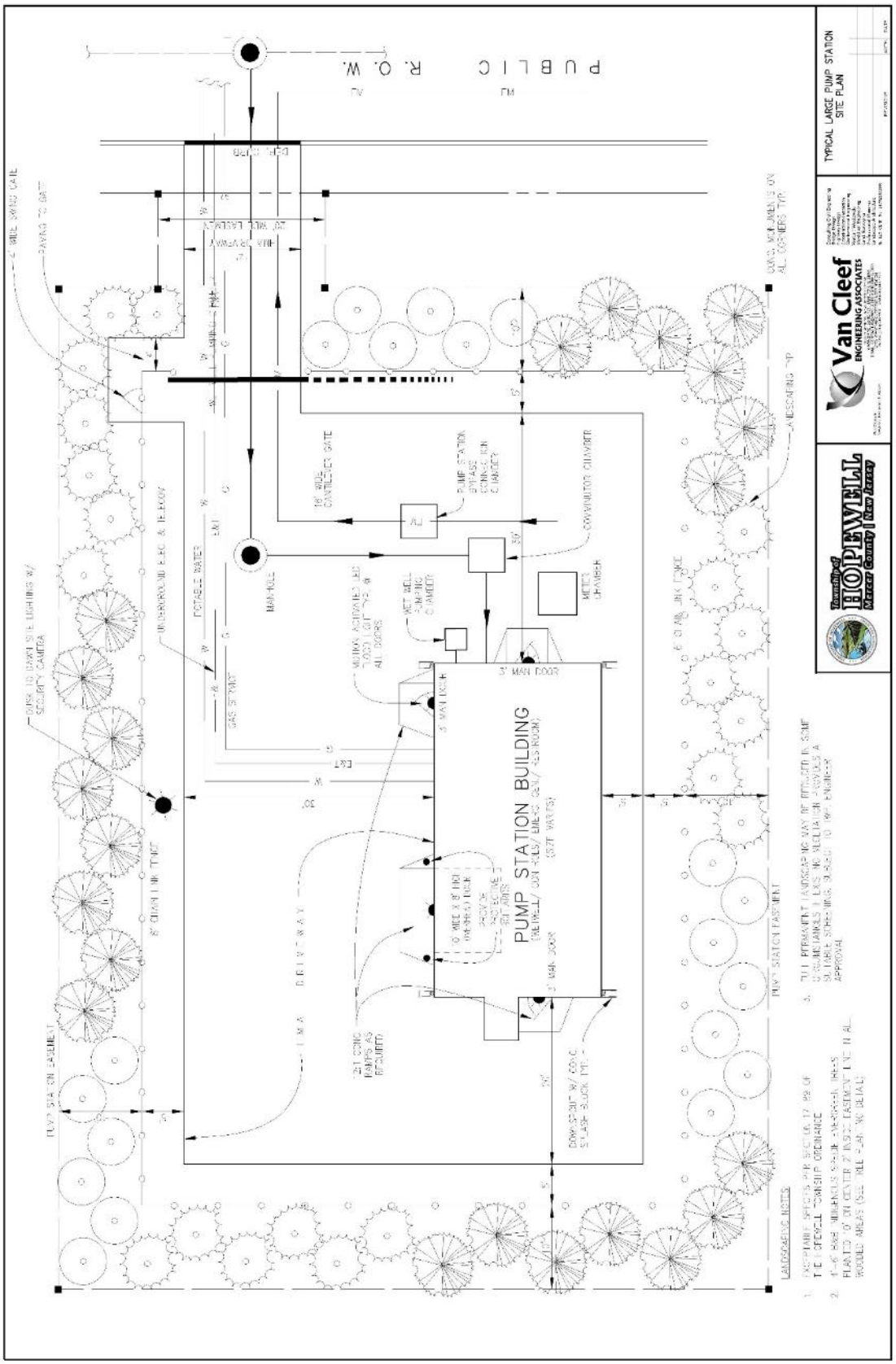
Township of HOPEWELL Mercer County | New Jersey

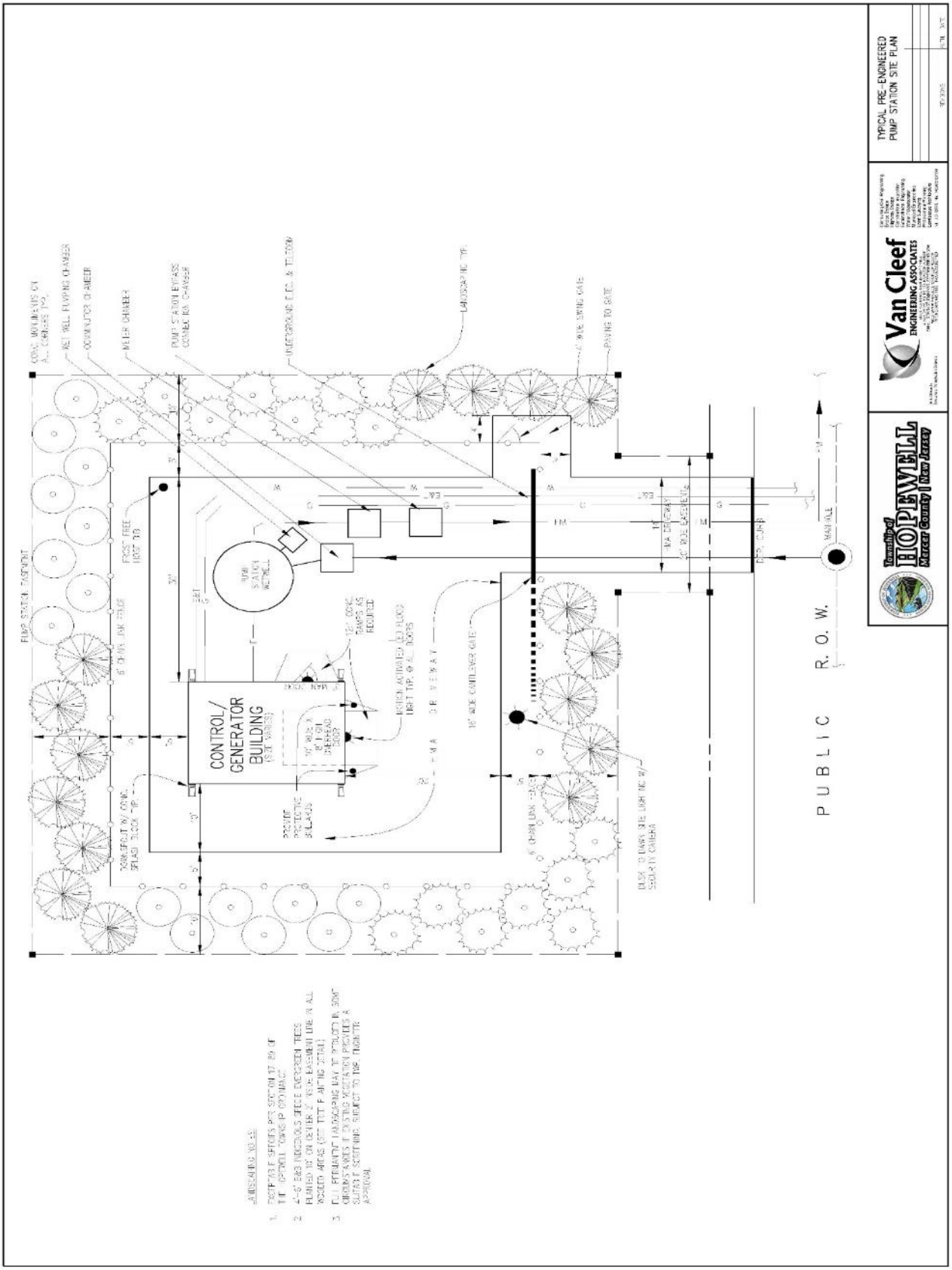
Van Cleef ENGINEERING ASSOCIATES

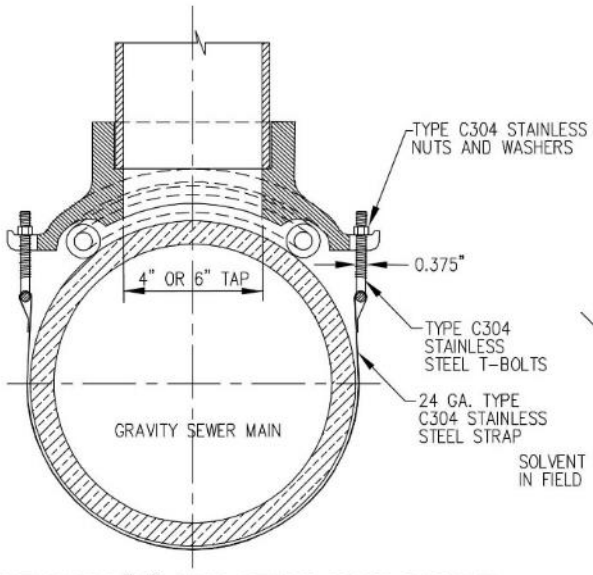
Consulting Civil Engineering
Bridge Design
Highway Design
Construction Inspection
Geotechnical Engineering
Water / Wastewater
Municipal Engineering
Land Surveying
Professional Planning
Landscape Architecture

LARGE PUMP STATION SECTIONS

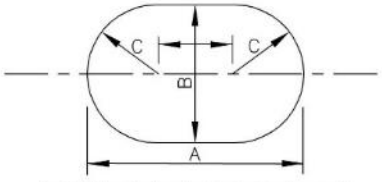
REVISIONS	AUTH.	DATE


TYPICAL LARGE PUMP STATION
SITE PLAN
Van Cleef
ENGINEERING ASSOCIATES
Township of
HOPEWELL
Mercer County New Jersey
PUBLIC R.O.W.
PUMP STATION BUILDING
DRIVEWAY
PUMP STATION EASEMENT
LANDSCAPING NOTES


TYPICAL PRE-ENGINEERED
PUMP STATION SITE PLAN
Van Cleef
ENGINEERING ASSOCIATES
Township of
HOPEWELL
Mercer County | New Jersey
CONTROL/
GENERATOR
BUILDING
PUBLIC R. O. W.

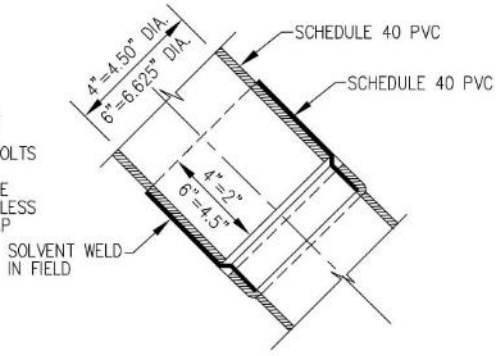


SEALTITE TYPE "E" WYE SEWER PIPE SADDLE



SIZE	A	B	C	D
4" INLET	6.50"	4"	2"	2.50"
6" INLET	9.25"	6"	3"	3.25"

SADDLE TAP DIMENSIONS



MODEL "E40P"

NOTE:

USE FOR SINGLE CONNECTIONS TO EXISTING MAINS

SADDLE CONNECTION

NOT TO SCALE

Township of HOPEWELL Mercer County | New Jersey

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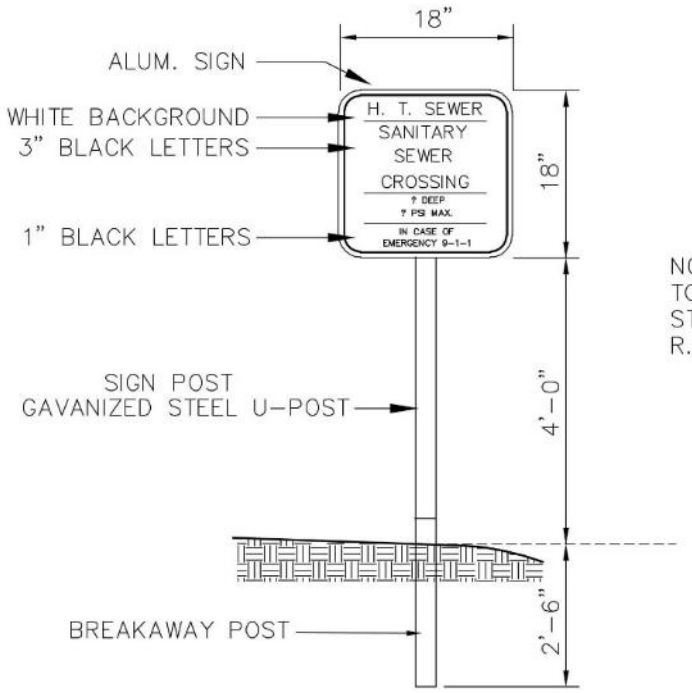
SADDLE CONNECTIOHN

REVISIONS | AUTH. | DATE



NOTE:
TO BE INSTALLED AT ALL STREAM, UTILITY EASEMENT & R.R. CROSSINGS

SEWER CROSSING SIGN

N.T.S.

Township of HOPEWELL Mercer County | New Jersey

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Municipal Engineering
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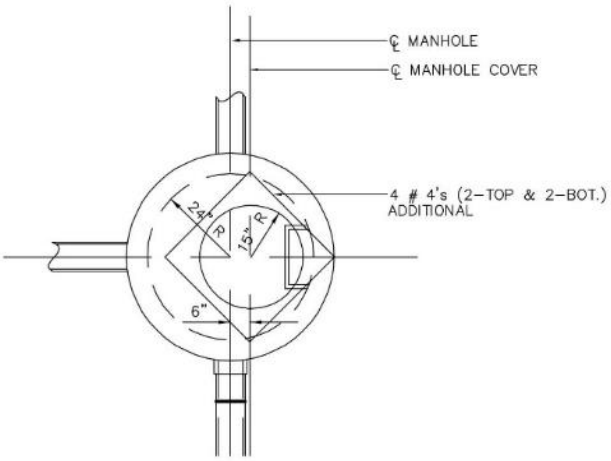
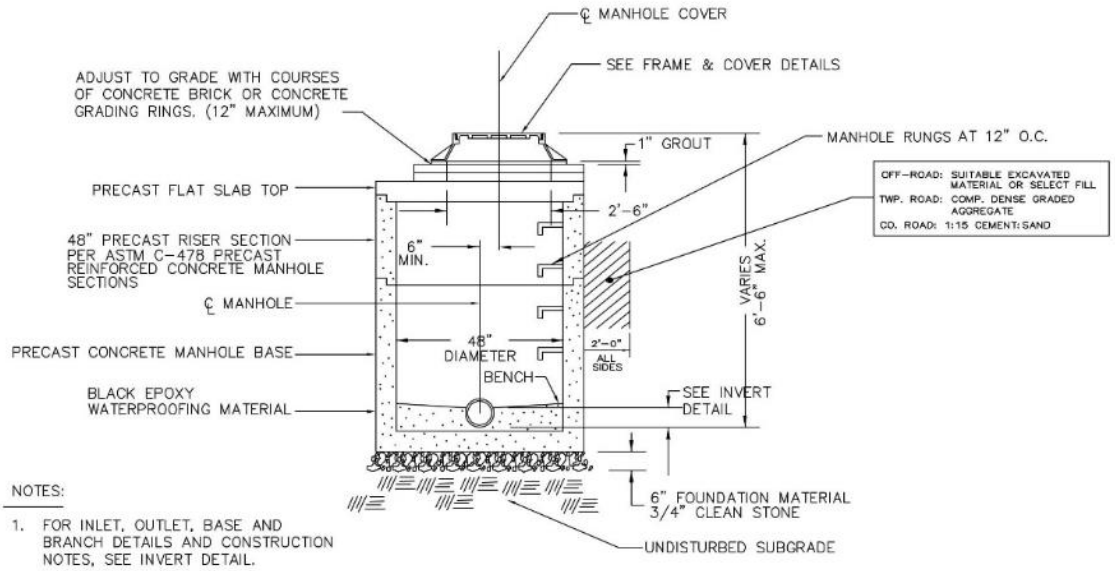
SEWER CROSSING SIGN

REVISIONS	AUTH.	DATE



FLAT SLAB TOP



NOTES:

1. FOR INLET, OUTLET, BASE AND BRANCH DETAILS AND CONSTRUCTION NOTES, SEE INVERT DETAIL.
2. SUBMIT SHOP DRAWINGS FOR APPROVAL.
3. DESIGN FOR H-20 LOADING.

SECTION

SHALLOW PRECAST MANHOLE

N.T.S.

Township of HOPEWELL Mercer County | New Jersey

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Municipal Engineering
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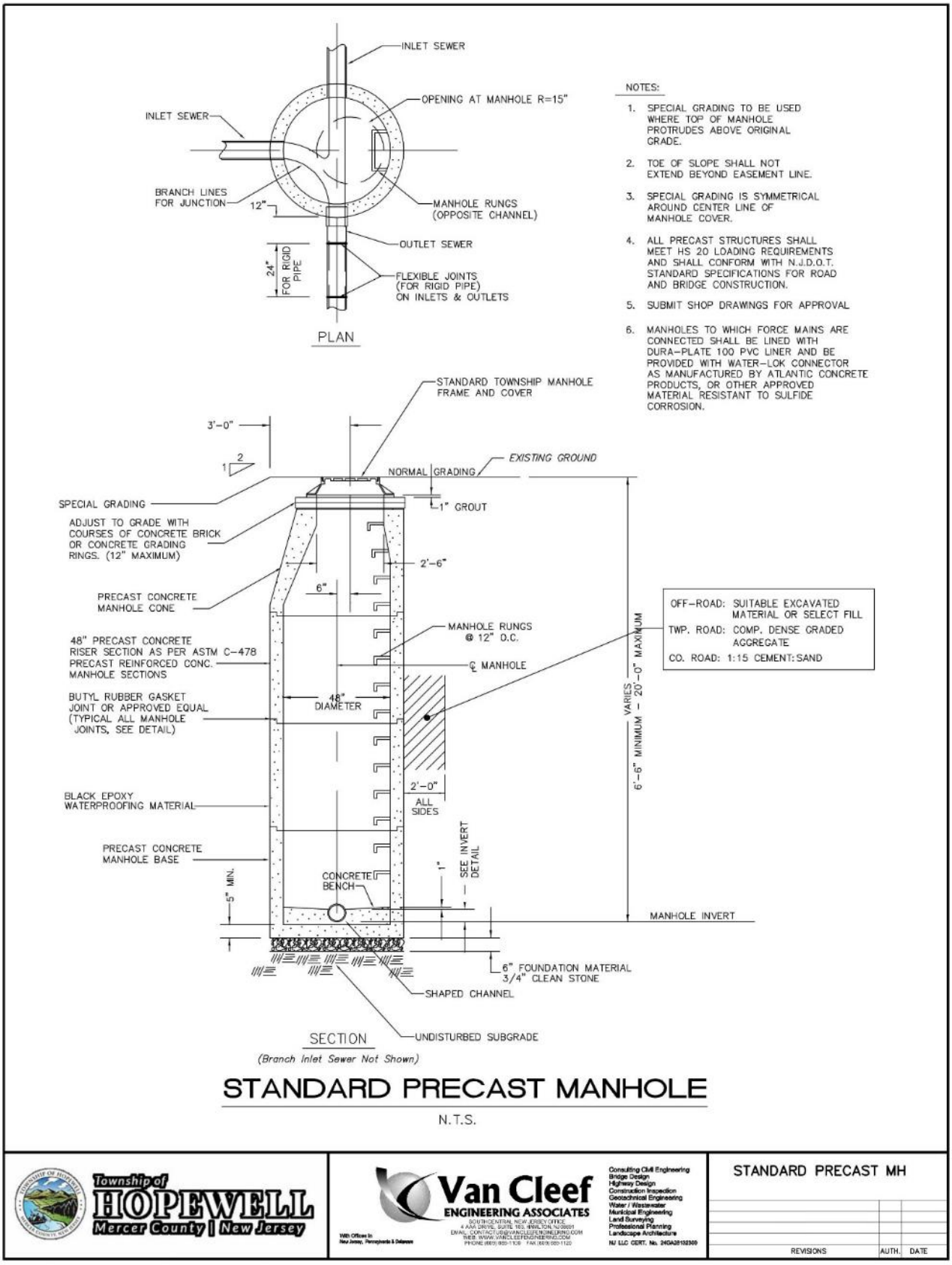
NJ LIC CERT. No. 24GA28152300

SHALLOW PRECAST MANHOLE

REVISIONS	AUTH.	DATE



STANDARD PRECAST MANHOLE

N.T.S.

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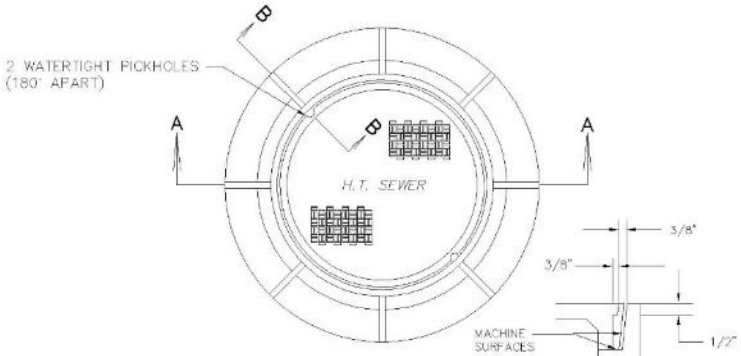
STANDARD PRECAST MH

REVISIONS	AUTH.	DATE

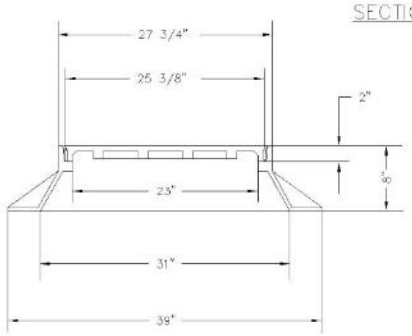


PLAN

SECTION B–B

NOTES:

1. ALL DIMENSIONS ARE TO BE HELD TO A TOLERANCE OF 1/32" ON ALL CASTINGS TO PERMIT INTERCHANGING OF PARTS
2. CASTINGS SHALL BE DIPPED IN "ASPHALTUM" PAINT
3. CAMPBELL FOUNDRY #1202B OR EQUAL WITH FLOW SEAL LID IN ROADWAYS
4. SUBMIT SHOP DRAWINGS FOR APPROVAL
5. ALL MANHOLES WITHIN EASEMENTS & REMOTE AREAS TO BE CAMPELL FOUNDRY #1486 W/ LOCKING COVERS



SECTION A–A

STANDARD FRAME AND COVER

N.T.S.

Township of HOPEWELL Mercer County | New Jersey

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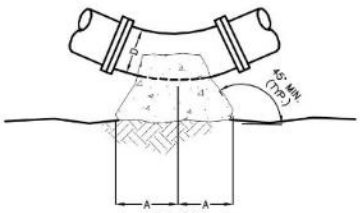
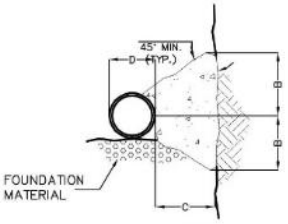
STANDARD FRAME & COVER

REVISIONS	AUTH.	DATE

HORIZONTAL AND VERTICAL BENDS



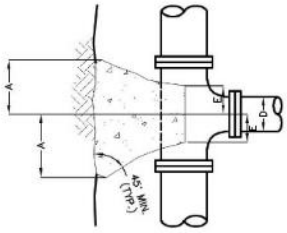
PLAN



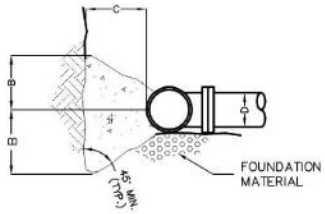
SECTION

BEND	D	4"	6"	8"	10"
11 1/4°	A	12"	12"	12"	12"
	B	12"	12"	12"	12"
	C	12"	12"	12"	12"
22 1/2°	A	12"	12"	12"	12"
	B	12"	12"	12"	12"
	C	12"	12"	12"	12"
45°	A	12"	12"	14"	18"
	B	12"	12"	14"	18"
	C	12"	12"	14"	18"
90°	A	12"	15"	18"	22"
	B	12"	15"	18"	22"
	C	12"	15"	18"	22"

TEES



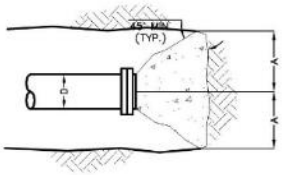
PLAN



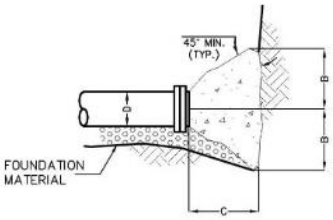
SECTION

D	4"	6"	8"	10"
A	12"	12"	16"	20"
B	12"	12"	16"	20"
C	12"	12"	18"	20"
E	6"	8"	8"	8"

PLUGS / CAPS



PLAN



SECTION

D	4"	6"	8"	10"
A	12"	12"	16"	20"
B	12"	12"	16"	20"
C	12"	12"	18"	20"

NOTES:

1 ALL THRUST BLOCKS ARE TO BE POURED IN FULL CONTACT WITH UNDISTURBED MATERIAL
2 THRUST BLOCKS ARE TO BE PLACED AT ALL BENDS OR AS DIRECTED BY THE ENGINEER
3 ALL THRUST BLOCK CONCRETE SHALL BE 2,500 PSI (MIN.)
4 ALL BOLTS AND CONNECTIONS TO BE COVERED WITH BURLAP ORPLASTIC BEFORE POURING CONCRETE
5 TIE RODS ,CLAMPS AND RETAINER GLANDS REQUIRED BUT NOT SHOWN

THRUST BLOCK DETAILS

N.T.S.

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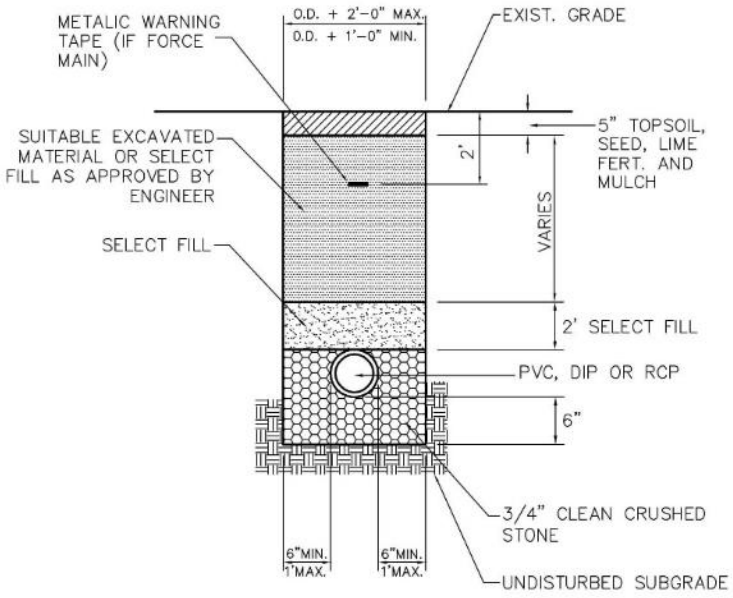
THRUST BLOCKS

REVISIONS	AUTH.	DATE



TRENCH OFF-ROAD AREA

NOT TO SCALE

Township of HOPEWELL Mercer County | New Jersey

Van Cleef ENGINEERING ASSOCIATES

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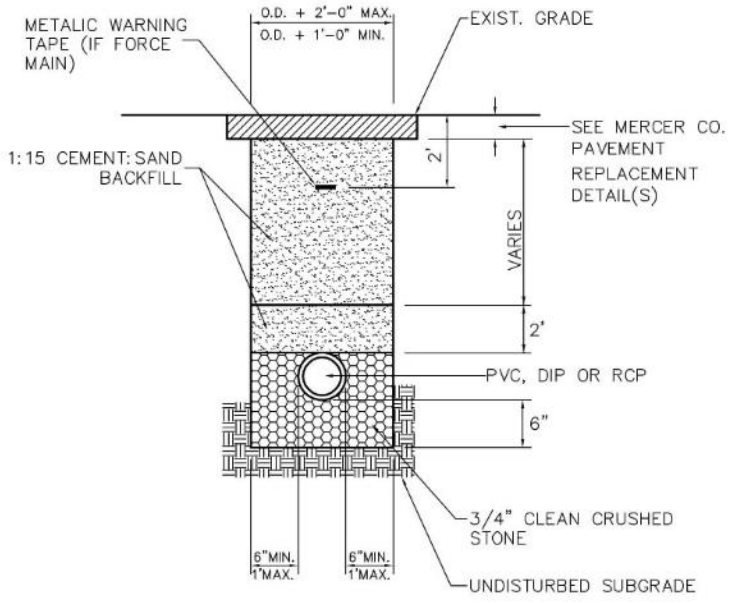
TRENCH OFF ROAD

REVISIONS	AUTH.	DATE



TRENCH MERCER CO. ROADWAY

NOT TO SCALE

Township of HOPEWELL Mercer County | New Jersey

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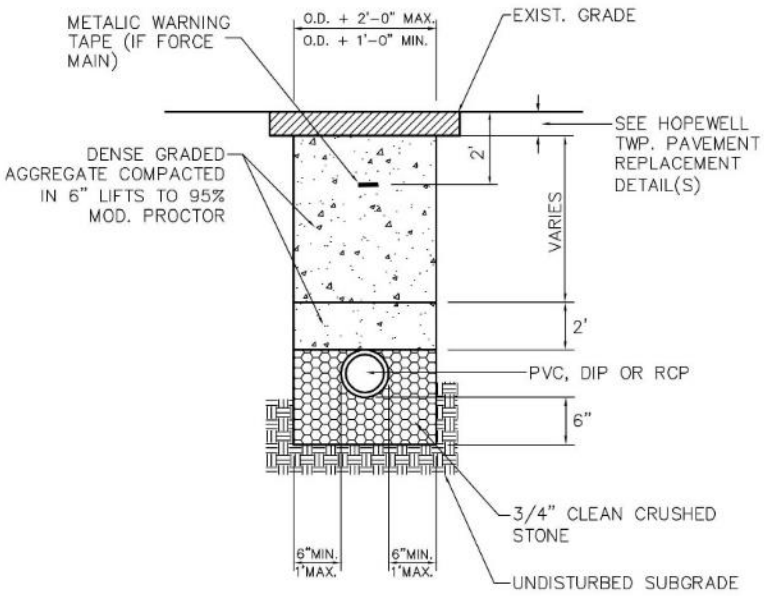
TRENCH MERCER COUNTY ROAD

REVISIONS	AUTH.	DATE



TRENCH HOPEWELL TWP. ROADWAY

NOT TO SCALE

Township of HOPEWELL Mercer County | New Jersey

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Municipal Engineering
Land Surveying
Professional Planning
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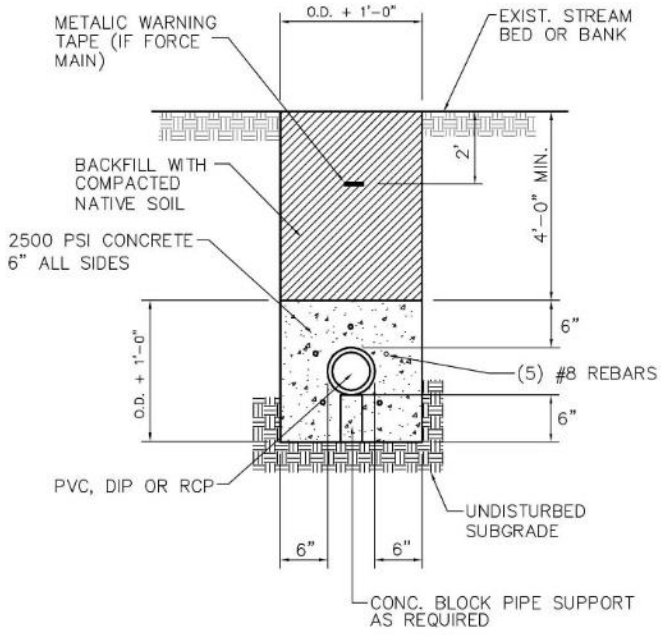
TRENCH TOWNSHIP ROAD

REVISIONS	AUTH.	DATE



STREAM CROSSING TRENCH DETAIL

NOT TO SCALE

Township of HOPEWELL Mercer County | New Jersey

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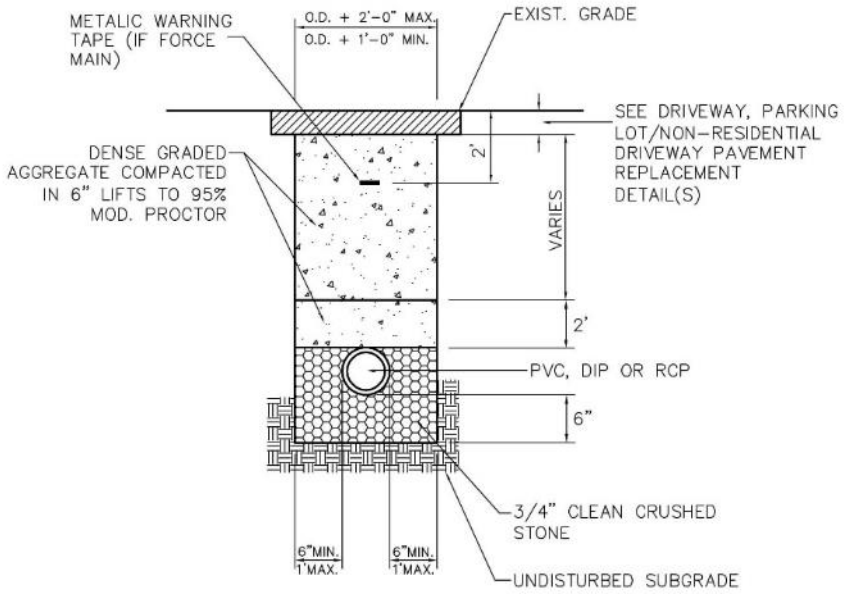
TRENCH STREAM CROSSING

REVISIONS	AUTH.	DATE



TRENCH DRIVEWAY AND PARKING LOT/NON-RESIDENTIAL DRIVEWAY

NOT TO SCALE

Township of HOPEWELL Mercer County | New Jersey

Van Cleef ENGINEERING ASSOCIATES

With Offices In New Jersey, Pennsylvania & Delaware

SOUTH/CENTRAL NEW JERSEY OFFICE
4 AAA DRIVE, SUITE 103, HAMILTON, NJ 08691
EMAIL: CONTACTUS@VANCLEEFENGINEERING.COM
WEB: WWW.VANCLEEFENGINEERING.COM
PHONE (609) 890-1100 FAX (609) 890-1120

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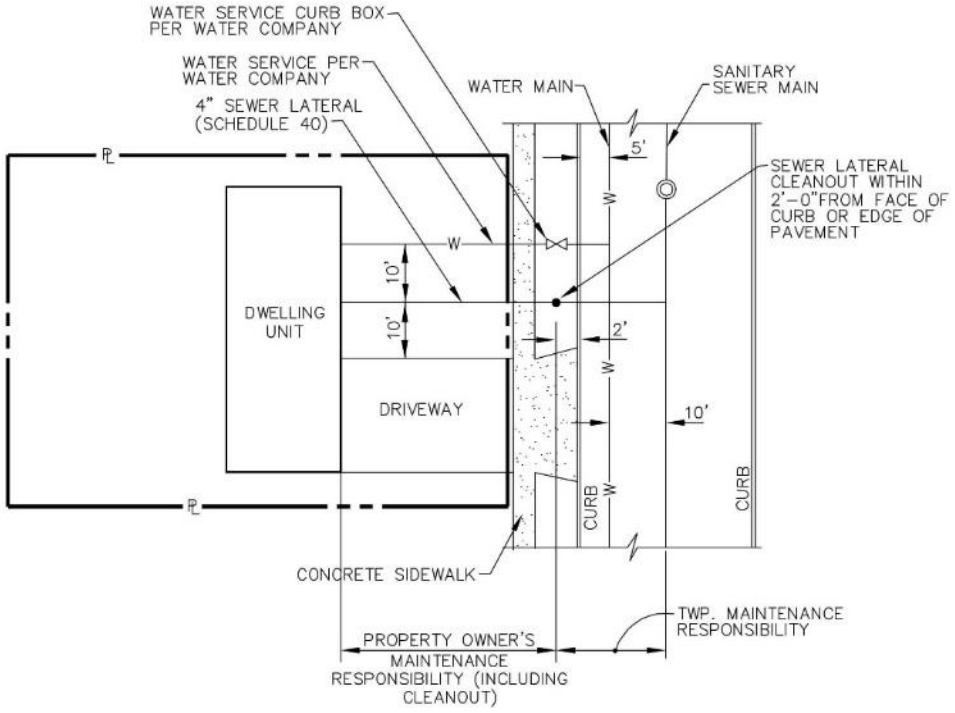
NJ LLC CERT. No. 24GA28152300

TRENCH RESTORATION
DRIVEWAY & PARKING LOT
NON-RESIDENTIAL

REVISIONS	AUTH.	DATE



TYP. SEWER AND WATER LATERAL CONNECTION DETAIL

NOT TO SCALE

Township of HOPEWELL Mercer County | New Jersey

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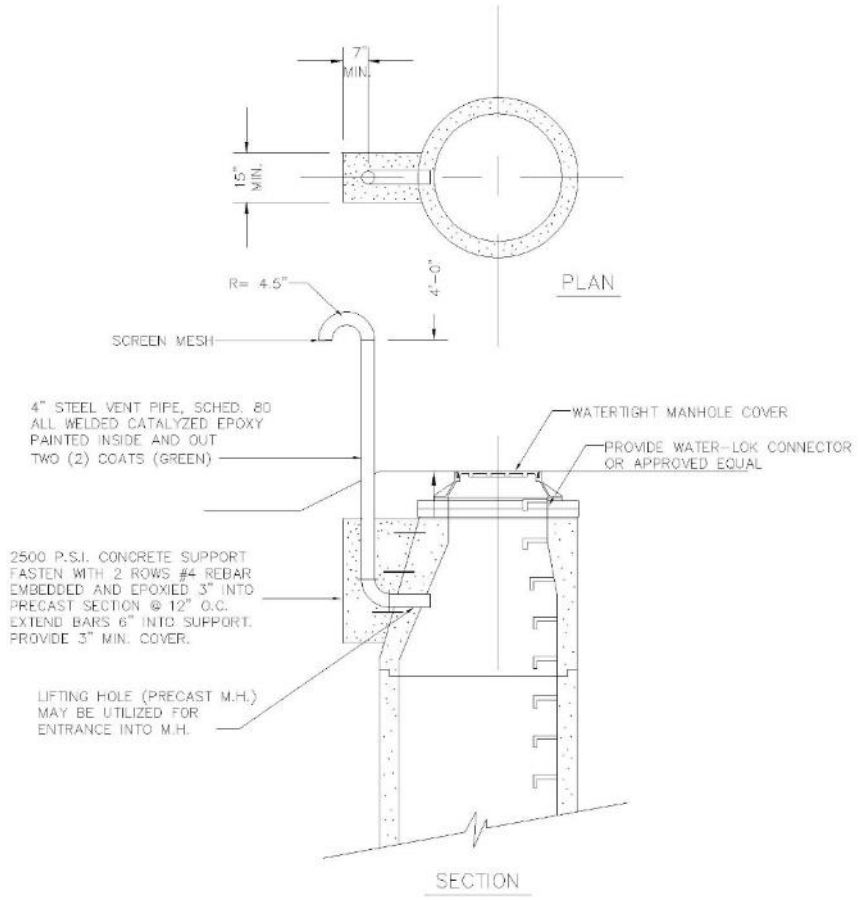
TYP. SEWER & WATER LATERAL CONNECTION

REVISIONS	AUTH.	DATE



WATERTIGHT MANHOLE VENT

N.T.S.

Township of HOPEWELL Mercer County | New Jersey

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Water / Wastewater
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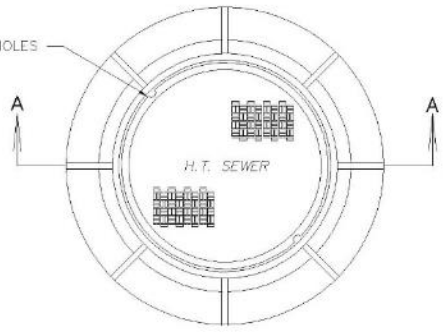
Landscape Architecture

WATERTIGHT MANHOLE VENT

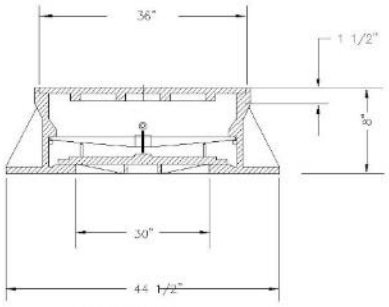
REVISIONS	AUTH.	DATE



PLAN

NOTES:

1. ALL DIMENSIONS ARE TO BE HELD TO A TOLERANCE OF 1/32" ON ALL CASTINGS TO PERMIT INTERCHANGING OF PARTS
2. CASTINGS SHALL BE DIPPED IN "ASPHALTUM" PAINT
3. CAMPBELL FOUNDRY #6548 OR EQUAL
4. SUBMIT SHOP DRAWINGS FOR APPROVAL
5. ALL WATERTIGHT MANHOLES TO BE PROVIDED WITH WATER-LOK CONNECTION OR APPROVED EQUAL



SECTION A-A

WATERTIGHT FRAME AND COVER

N.T.S.

Township of HOPEWELL Mercer County | New Jersey

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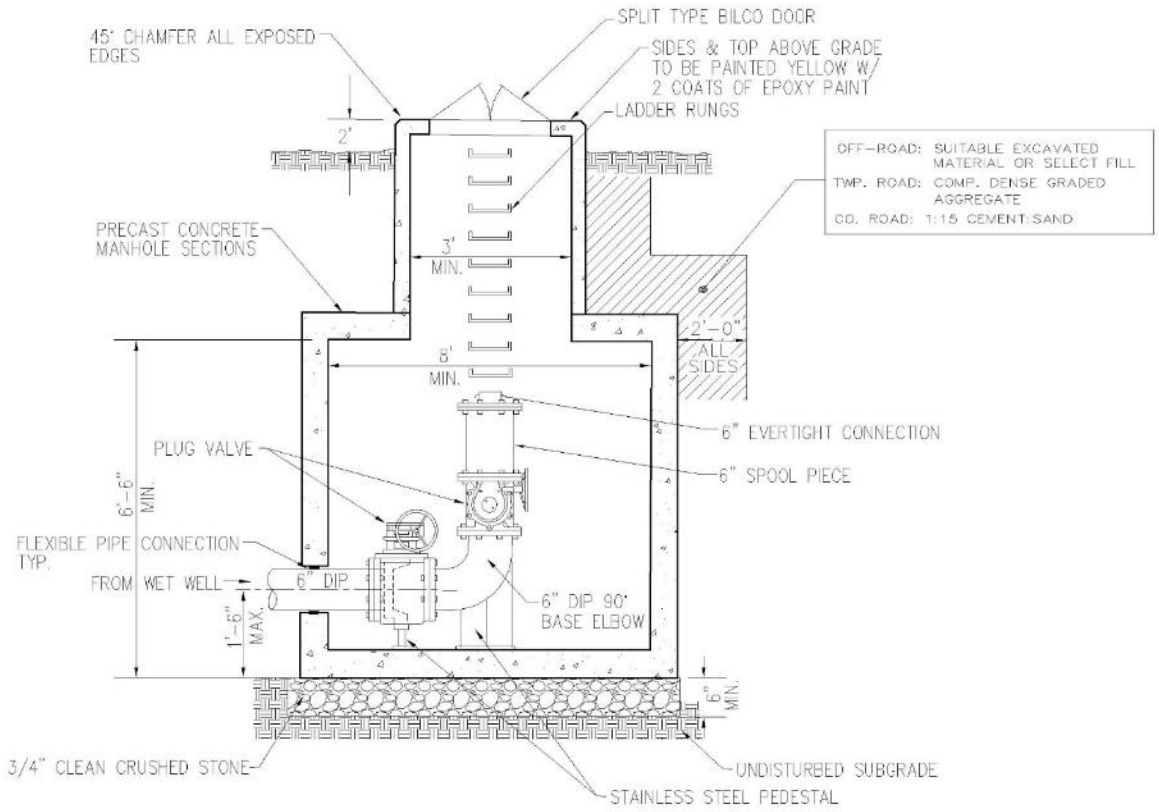
NJ LIC CERT. No. 24GA28123300

WATERTIGHT FRAME & COVER

REVISIONS	AUTH.	DATE



WET WELL PUMPING CHAMBER

NOT TO SCALE

Township of HOPEWELL Mercer County | New Jersey

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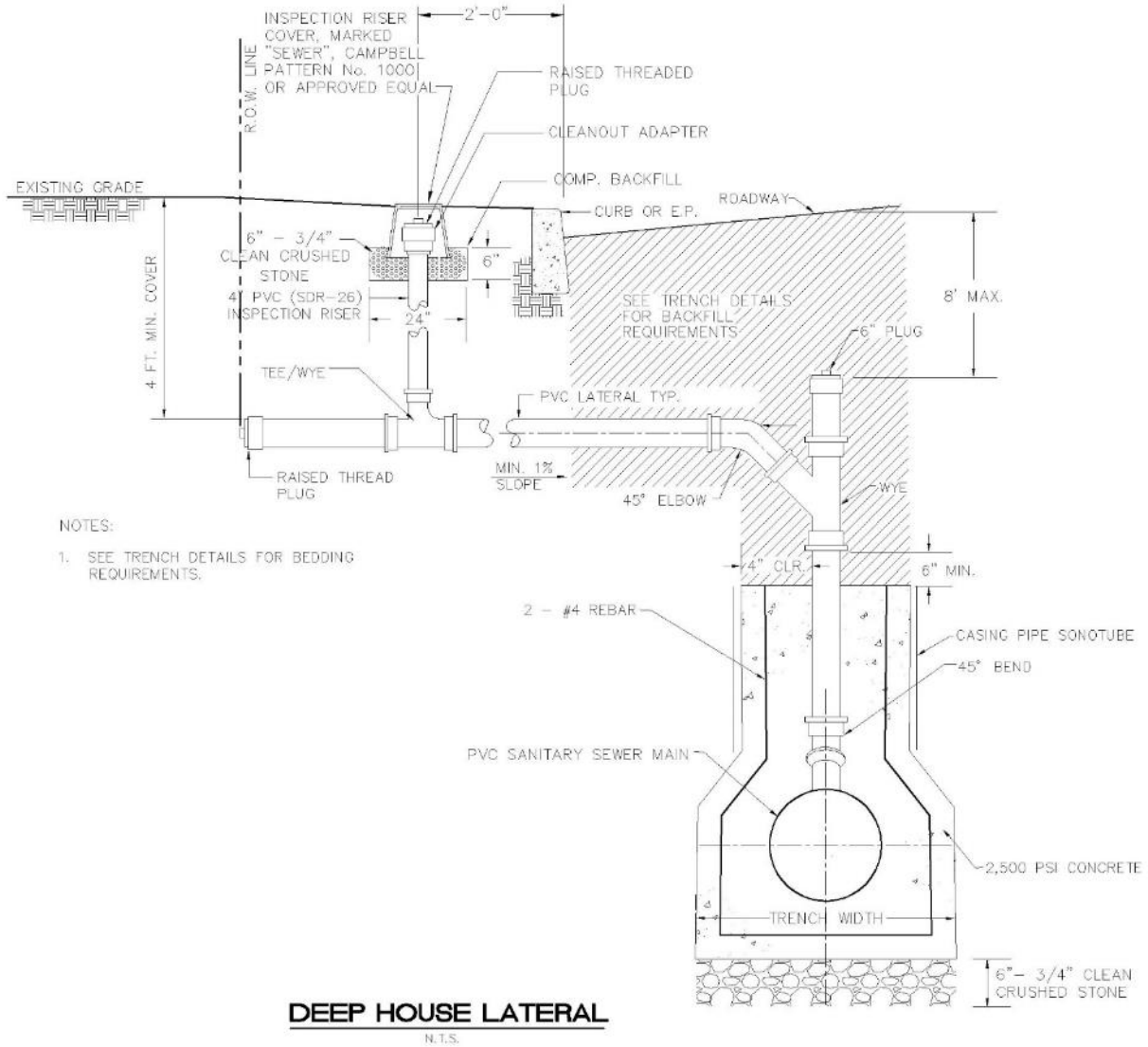
WETWELL PUMPING CHAMBER

REVISIONS	AUTH.	DATE



NOTES:

1. SEE TRENCH DETAILS FOR BEDDING REQUIREMENTS.

DEEP HOUSE LATERAL

N.T.S.

Township of HOPEWELL Mercer County | New Jersey

Van Cleef ENGINEERING ASSOCIATES

Consulting Civil Engineering
Bridge Design
Highway Design
Construction Inspection
Geotechnical Engineering
Water / Wastewater
Municipal Engineering
Land Surveying
Professional Planning
Landscape Architecture

DEEP HOUSE LATERAL

REVISIONS | AUTH. | DATE