STANDARD

SANITARY SEWER

REQUIREMENTS

PREPARED FOR:

North Kingstown

Department of Public Works

2050 Davisville Road

North Kingstown, RI 02852

PREPARED BY:

JAMES J. GEREMIA & ASSOCIATES, INC

272 WEST EXHANGE STREET, SUITE 201

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SECTION I

It is the policy of the Town of North Kingstown, which authority owns, operates, administers and maintains a wastewater collection system for the conveyance of wastewater to the treatment facility owned by the Quonset Development Corporation (QDC) to accept any request for service to a new development within the service area of the Town as defined by the then current Agreement with the QDC so long as the request for service meets the intent of this policy and these standards and all Town ordinances. The decision to approve any proposed sanitary sewer extension to the existing system shall be approved so long as capacity exists in the collection system for conveyance, capacity exists at the QDC facility for treatment, the flows are permitted in the Agreement and no prohibited wastes are discharged and all other regulations of both authorities and the State of Rhode Island are met. In the event subject sewers are accepted by the Town, the responsibility for operation and maintenance of those sewers will be assumed by the Town unless special circumstances and conditions are set as determined by the Planning Commission in the Development Plan approval.

It is the policy of Town to follow the TR-16 Guides for the Design of Wastewater Treatment Works and these guidelines for the design and construction of sanitary sewers that connect to Town sewers, including, however, the standards and specifications described below.

Building sewer: All plumbing and fixtures located within private property, within five (5) feet of the building are under the Town's Office of Code Enforcement. Contact the Building Official for permitting and inspections.

Sewer lateral: The segment of pipe, appurtenances and fixtures that connect the building sewer to the Town sewer main. The portion of the pipe within the public right-of-way or an easement shall be subject to the Public Works Department's review, permitting and inspection and shall comply with the policies and requirements set forth herein.

SECTION II

1. PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS:

A. All requirements of the Town of North Kingstown's Sewer Ordinance, including the Standard Sanitary Sewer Requirements set forth herein and the regulations of the Town of North Kingstown's Department of Public Works, shall be adhered to.

B. Plans, specifications, and design calculations for proposed sanitary sewage system(s) connections shall be submitted to the North Kingstown Department of Public Works for review in accordance with the Code of Ordinances, Town of North Kingstown, entitled "Utilities" Chapter 20, Article III. Design calculations shall conform to the Department of Environmental Management requirements.

C. Plans, specifications, and calculations for sanitary sewage system extensions shall be prepared and stamped by an Engineer currently registered in the State of Rhode Island.

D. An Order of Approval shall be obtained from the Department of Environmental Management when applicable.

E. The applicant must comply with the North Kingstown Department of Public Works' road opening requirements for any Town roads and/or Rhode Island Department of Transportation requirements for any State roads. The applicant shall submit a copy of the approved application(s) to the Director prior to receiving a sewer construction permit from the Department of Public Works.

1.2 DRAINLAYER REQUIREMENTS:

A. General:

1. The licensed Drainlayer or Master Plumber shall perform his or her work in the Town of North Kingstown in accordance with all applicable sections of the Town of North Kingstown's Sewer Ordinance and the Standard Sanitary Sewer Requirements.

2. The licensed Drainlayer shall notify DIG SAFE to locate existing utilities within the roadway right-of-way.

3. Licenses for Drainlayers shall expire on the first day of December of each year.

B. Qualifications:

1. Drainlayer must comply with the Sewer Ordinance, Section 20-151.

C. Application: The Drainlayers License Application shall be submitted to the Director for review and recommendation.

D. "DIG SAFE" Damage Prevention System: The Licensee shall contact utility companies having responsibility for underground transmission systems for information relative to locations of existing underground utilities prior to commencement of excavation.

E. Drainlayers Bond: The Drainlayer or Master Plumber shall keep in force during the duration of License, a Blanket Bond in the amount of $25,000.00 and shall be submitted with the application.

F. Insurance:

1. The drainlayer must comply with requirements for insurance set in the Sewer Ordinance, Section 20-119.

2. Worker's Compensation – Waiver of subrogation applies to Worker's Compensation.

G. Upon approval, a license shall be issued to the applicant. During the course of any work related to main or building sewers, the licensed Drainlayer doing the work must have in his possession a valid Drainlayer's license or Master Plumber's license. The licensed individual must be present at the site for all operations.

H. Notice must be given to the Director at least two (2) days prior to the beginning of any work on a sewer. No construction may begin nor will inspections be scheduled until any and all conditions of the application have been completed and documented, and the construction permit application has been duly signed by the Drainlayer and returned to the Director of the Department of Public Works. All sewer permits shall be posted in a visible manner at the site of any and all sewer work. Such information as the Director has with regard to the existence or location of main or building sewers will be available for review to the Drainlayers at the office of the Department of Public Works, but the Department of Public Works assumes no risk as to the accuracy of the information. No materials shall be used or work covered until inspected and approved by the Director or his/her designee, and the drainlayer's return portion of each building sewer connection permit shall be promptly returned to the Director after the work has been thoroughly inspected and the return has been signed by the inspecting authority.

I. Failure to comply with any provisions of this article by the Drainlayer or Master Plumber may result in the forfeiture of the right, as determined by the Director, to perform

building or main sewer work within the Town. The Director also reserves the right to withhold the issuance of any sewer permits to any Drainlayer or Master Plumber found in violation of any provisions of this article.

1.3 PRIVATELY-OWNED WASTEWATER TREATMENT FACILITIES:

A. Privately-owned and operated pump stations and collection systems connected to the Town of North Kingstown's wastewater system must adhere to the Sewer Ordinance and Standard Sanitary Sewer Requirements. In addition, the owner must submit, for the Director's approval, the following.

1. Owners of Privately-Owned Wastewater Treatment Facilities shall maintain the system in good working order and operate as efficiently as possible. Proper operation and maintenance shall include, but not be limited to, effective performance based on facility design, adequate operator staffing and training, and adequate laboratory and process controls, including quality assurance procedures as determined to be appropriate by the Director and backup or auxiliary facilities or similar systems to assure compliance or effective performance. Proper operation and maintenance must include emergency procedures and reporting requirements in case of power outages, natural disaster, labor shortage (whether the result of intentional work stoppages or epidemic), equipment failure, acts of terrorism/vandalism or sanitary sewer overflow. Reporting requirements shall include verbal notification to the Director and the Rhode Island Department of Environmental Management (RIDEM) as soon as possible, but not exceeding twenty-four (24) hours of discovery of the event; a written report must be submitted to the Director and RIDEM not more than five (5) business days of the event's ending.

2. The owner shall submit, for review and approval by the Director, an Operations and Maintenance Manual describing standards and procedures by which the Wastewater Treatment Facilities, pump station(s) and/or collection system(s) will be staffed, operated and maintained during normal and emergency conditions. Should development of the Plan include the practice of engineering, the Plan must then be prepared and certified by a Registered Professional Engineer registered in the State of Rhode Island. The Operations and Maintenance Plan must be approved prior to commencement of the construction of the new Wastewater Treatment Facility.

a. Owners of existing privately owned pump stations shall submit an Operations and Maintenance Manual within one (1) year of passage of this Standard Sanitary Sewer Requirements.

b. For newly constructed privately owned pump stations, the Operations and Maintenance Manual must be submitted prior to the Director

issuing a Sewer Permit. The fee shall be submitted at the time of the submittal.

3. The owner shall pay an annual Permit Fee for the operation of the facilities. The fee shall be adopted by the Town annually.

4. The owner is required to conduct (at a minimum) monthly inspections of the pump station. The inspection reports shall be forwarded to the Director within three (3) business days after the inspection. At a minimum, the inspection report shall provide the name of the individual or firm performing the inspection, hours of operation for each pump, generator run time, summary of alarms, any maintenance undertaken during that month, condition of the station, and recommendations.

5. The Operations and Maintenance Plan shall include, but not be limited to, the following elements:

   a. Describe the detailed operating procedures for the pump station(s) and collection system;

   b. Provide a Preventative Maintenance Plan for the pump station;

   c. Provide staffing requirements;

   d. Provide a list of material suppliers and essential spare parts necessary to be kept on site for normal and emergency conditions;

   e. Provide operating procedures for the emergency generator and automatic transfer switch;

   f. Provide a Spill Prevention Plan;

   g. Provide a description of the auxiliary system, such as water, heating and ventilation, sump pump and dehumidifying;

   h. Provide a description of the alarm system and response procedures;

   i. Provide names, addresses and telephone numbers of all emergency contacts, facility owners and facility operators;

   j. Provide a list of subcontractors that are on call for emergency equipment rental (i.e., septage hauler, portable pump or generator).

   k. Provide emergency procedures and reporting requirements in case of power outages, natural disasters, equipment failure, acts of vandalism, or sanitary sewer overflow;

l. Provide a description of the means of recordkeeping (the records must be accessible for a three (3) year period);

m. Provide as-built plans for the pump station and/or collection system;

n. Provide a sewer map of the collection system, including but not limited to, the overall service area, diameter of pipes, distance between manholes, slope and direction of flow; and

o. Provide all required easements that will allow the Town of North Kingstown access to the site for unannounced periodic inspections

1.4 SEWER EXTENSIONS:

A. Sewer extensions will be allowed only if the receiving sewers and pump stations are capable of adequately processing the added hydraulic load. Documentation assessing the existing sewer(s) and pump station(s) shall be submitted to the Director. The documentation shall be stamped by a professional engineer registered in the State of Rhode Island.

B. The proposed sewer extension must be consistent with the most recent Wastewater Management Facilities Plan adopted by the Town and the Rhode Island Department of Environmental Management.

1.5 GREASE, OIL AND SOLIDS INTERCEPTORS:

A. Grease, oil and solids interceptors shall comply with the Quonset Development Corporation's requirements.

1.6 DRAWINGS:

A. The applicant must furnish, with a complete application, drawings showing the location of the premises together with the location of all underground piping, proposed connection points, applicable details, general notes, utility conflict corrections, and other appurtenances to be installed on the premises at the time of making the application.

B. Drawings shall be submitted on a maximum size of 24" by 36" prints. Four (4) sets shall be submitted at the initial submission for indication of comments during the review stage. If a project is to be implemented in stages or phases, a master plan showing the entire site development, including all future expansion areas, shall be submitted for review during the first submission.

C. Drawings shall not be at a scale less than 1-inch per 40-feet and no more than 1-inch per 20-feet.

D. All site plans shall contain contours at a minimum of 2-foot intervals based on National Geodetic Vertical Datum (NAVD 1988) and not with assumed elevations. The horizontal elevation shall be based on the Rhode Island Plane Coordinate System. Site plans shall include a locus map at a scale of not less than 1-inch = 2,000 feet and a north arrow.

E. All drawings are to be signed and wet-stamped by a registered, Professional Engineer licensed in the State of Rhode Island under whose direction the design has been designed.

1.7 AS-BUILT / RECORD DRAWINGS:

A. Prior to final acceptance of the project / system by the Director, a complete set of "As-Built Record Drawings" must be submitted, reviewed and approved by the Director.

B. The project / system shall be isolated from the sanitary sewer system until all terms, conditions and requirements are complied with, any fees due are paid in full, and the applicant receives written final acceptance from the Director.

C. The following is the required list of General Standards for As-Built Drawings:

1. Original drawings should be prepared on 4-mil (min.) Mylar film suitable for blackline reproduction. Overall sheet size should be 24" by 36". Line work and labeling should be black ink on mylar.

2. Four (4) blackline copies should be provided for each original. Blacklines should be properly assembled in sequence and adequately bound.

3. Each original drawing should be stamped and signed by a Professional Engineer and/or land surveyor registered in the State of Rhode Island. Said stamp and signature serves to attest to the accuracy and completeness of the record drawing information provided.

4. Such as-built drawings shall also be provided in digital format, AutoCAD Release 13 or updated, and .pdf file.

5. The scale(s) of the drawing should be clearly indicated. Minimum scales should be as follows:

   a. Plan view: Horizontal 1-inch = 40 feet
   b. Profile Section: Horizontal 1-inch = 40 feet / Vertical 1-inch = 4 feet

6. Survey controls and elevations should be consistent with the following datum:

   a. Horizontal Datum: Rhode Island State Plane Coordinate System
   b. Vertical Datum: NAVD 1988

7. Projects requiring multiple record drawing sheets should provide an overall reference plan of the site clearly indicating the sequence of sheet layout as it relates to its location within the project area. An index of all drawings should also be provided for specific title references.

8. A title block should be provided in the lower right-hand corner of each sheet clearly identifying the name of the development and developer, the individual or firm preparing the record drawing on behalf of the developer, the specific contents of the drawing (i.e., street name, sewer stations, etc.), the date of preparation, the sheet number or reference, and any other information deemed applicable.

9. Provide a north arrow in the upper left-hand corner of each plan.

10. Compile and accurately show the limits of all properties, easements, roads and rights-of-way for the project area.

11 Identify, by name, all streets, roads and highways as applicable.

12. Identify all abutting properties based on the current North Kingstown Assessor's Plat and lot numbers.

13. Indicate an accurate property frontage for each lot abutting the streets, roads, highway, easements and rights-of-way identified. Provide centerline stationing and overall measurement of any roads, drives or rights-of-way constructed. Centerline measurements are not to be used for sewer locating purposes.

14. Locate and identify, by street address, all dwellings and/or other structures currently existing within the project area. Identify each lot with its Assessor's Map and lot.

15. Benchmark locations and elevations utilized during record drawing preparation should be clearly noted and located on the plans.

16. Sewer stationing should be cumulative and begin at the downstream manhole and continue upstream to the end manhole or conform to road stationing. Stationing should be based on "as-built" measurements (not design proposals). Center-to-center distances between manhole structures should be clearly noted on the plan.

17. Locate and clearly identify (by item, sewer stationing, depth of cover, and, if applicable, elevation) all elements of the completed sewer system:

    a. Locating swing ties should be provided from masonry foundation corners wherever possible. Ties to porches, utility poles, hydrants, trees, fences, steps or other objects which could be removed, should be taken only when more permanent structures are not available. All

measurements should be to the nearest 0.1 ft. Ties should form an angle of about 90 degrees, and be less than 100 ft. in length. Where swing ties are impractical, an angle and distance should be provided from an adjacent manhole on the sewer. Fully identify all stationary points utilized for swing ties.

b. Pipe size, type of material and calculated "as-built" slope should be clearly noted on the plan and profile sections.

c. At manhole structures:

1) Identify each manhole by cumulative stationing (i.e., SMH Sta. 0+00) on plan and profile section.

2) Provide coordinates to the center of the manhole cover.

3) Provide center-to-center distances between manhole structures.

4) Provide rim and invert elevations.

5) Indicate specific components of each manhole, as applicable (i.e., drop inlets, shallow manholes, stubs and stoppers, locking covers, watertight covers, etc.).

d. At wye branches and chimneys:

1) Provide the stationed distance along the completed sewer centerline from the center of the downstream manhole base to the branch or chimney in question.

2) Provide the depth of cut to (and the elevation of) the tops of chimneys.

e. At service connection ends:

1) Provide a minimum of three (3) swing ties to the end point of all service connections or bearing and distance by survey grade GPS.

2) Provide the distance of pipe installed from the centerline of the completed sewer to the end of the service connection stub. If the grade of the connection is very steep, both the horizontal distance and the distance on the slope of the connection should be provided.

3) Provide the depth of cut and/or the elevation of the invert at the end point of all sewer connections.

1.8 QUALIFICATIONS OF MATERIAL AND EQUIPMENT

A. Specific manufacturers' names and catalog numbers are used herein to establish quality and design of a particular item.

B. Wherever in the Specifications any item of equipment or material is designated by reference to a particular brand, manufacturer, or trade name, it is understood that a reviewed equal product, acceptable to the Department of Public Works, may be submitted by the Contractor.

C. If the Contractor proposes to use a material which, while suitable for the intended use, deviates in any way from the detailed requirements, he shall inform the Department of Public Works in writing of the nature of such deviations at the time the material is submitted for review, and shall request a review of the deviation from the requirements.

D. In requesting a review of deviations or substitutions, the Contractor shall provide evidence leading to a reasonable certainty that the proposed substitution or deviation shall provide a result at least equal in quality to that specified. If, in the opinion of the Department of Public Works, the evidence presented by the Contractor does not provide a sufficient basis for such reasonable certainty, the Department of Public Works will reject such substitution or deviation without further investigation, in which case it shall be the responsibility of the Contractor to provide another product which is satisfactory to the Department of Public Works.

2. PART 2 - PRODUCTS

2.1 SANITARY SEWER INFORMATION REQUIRED:

A. All vertical and horizontal alignment (profile and plan).

B. Size, slopes, and materials to be used.

C. Invert and rim elevations.
D. Location and details of manholes.

E. Other existing and proposed utilities should be shown in order to avoid conflicts during construction.

F. Design sanitary flow calculations with Professional Engineer's stamp, except for sanitary service connections. Calculations shall conform to the Department of Environmental Management (DEM) requirements.

G. The minimum size building sewer shall not be less than 6-inches in diameter with a minimum cover of 48-inches and a minimum slope of ¼-inch per foot.

H. At such time as a public sewer becomes available to a property served by a private wastewater disposal system, the owner shall connect to the public sewer, as provided in the Sewer Ordinance. All existing cesspools or septic tanks shall be emptied into licensed tank truck septage disposal vehicles only. And then filled with crushed stone, or gravel, by the drainlayer immediately upon sewer service being placed into active service. No contents of septic tanks or cesspools shall be discharged to the public sewer by any person or septage disposal vehicle owner or operator.

3. PART 3 - EXECUTION

3.1 SEWER CONSTRUCTION REQUIREMENTS:

A. General Requirements: Sanitary sewer improvements shall conform to the requirements of the Department of Public Works, Department of Environmental Management, and any other agencies having jurisdiction.

B. Sanitary Sewers:

1. Depth: Sewers shall be designed deep enough to drain basement fixtures and to prevent freezing. The minimum depth of cover for street installation shall be 6-feet and for cross country installation it shall be 4-feet.

2. Slope: The following minimum slopes may be used only if necessary because of grade restrictions.

a. Sewer Size - Minimum Slope

Inches	Feet/Foot
8	0.0040
10	0.0028
12	0.0022
14	0.0017
15	0.0015
16	0.0014
18	0.0012
21	0.0010
24	0.0008
27	0.0007
30	0.0006
36	0.0005

3. Velocity: The minimum velocity for design purposes is 2-feet per second and the maximum velocity is 10-feet per second.

4. Alignment: Sewers shall be laid with a straight alignment between manholes.

5. Increasing Pipe Size: When a smaller sewer joins one of a larger one, the invert of the larger sewer should be lowered sufficiently to maintain the same hydraulic gradient.

6. Materials: Sewers shall be constructed of materials described in Section II. Sewers crossing streams or any body of water shall be ductile iron encased in concrete.

7. Manhole Locations: Manholes shall be installed at the end of each sewer line, at changes in grade, size, or alignment and at all intersections. The maximum spacing of manholes shall not exceed 300-feet.

8. Drop Manhole Type: A drop pipe should be provided for a sewer entering a manhole at an elevation of 24-inches or more above the manhole invert. The size of the drop pipe will be the same size as the sewer inlet pipe. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24-inches, the invert shall be so constructed so that there is a smooth transition of flow in the manhole.

9. Manhole Diameter: The minimum internal diameter of manhole shall be 48-inches and internal drop manholes shall have a minimum internal diameter of 60-inches.

10. Flow Channel: A drop of at least 0.1-feet shall be provided between incoming and outgoing sewers on all manholes.

11. Elevation: In all buildings in which any building drain is too low to permit gravity flow to the public sewer, sanitary sewage carried by such building drain shall be lifted by a grinder pump system as specified in Section III and discharged to the building sewer.

12. Clean Outs: Clean-outs shall be installed at the property line, at every fitting over 22½ degrees and at 100 foot intervals. Service connections which are longer than 150 feet shall have sanitary manholes installed as per approved plan

13. Pipe Size: All lateral sewer pipes shall have a minimum diameter of eight (8) inches. Sewer pipes for house connections from the sewer main to the property line shall have a minimum diameter of six (6) inches.

14. Backwater Valve: One backwater valve per unit shall be installed prior to connection to the sewer system for all residential and multi-unit dwellings.

15. Grease, Oil and Solids Interceptors: Grease, oil and solids Interceptors shall be in accordance with Section 1.5 of this section.

16. Identification:

    a. Underground-Type Line Markers for Piping: Manufacturer's standard permanent detection tape, bright colored, continuous-printed polyethylene tape with a metallic core for easy detection of underground installations, intended for direct burial service; not less than 6-inches wide x 4 mils thick. Provide green detection tape with black printing reading **"CAUTION SEWER LINE BURIED BELOW"**.

    b. Installation marker 2-feet above top of pipe.

END OF SECTION

SECTION III- SANITARY SEWAGE SYSTEM

1. PART 1 – GENERAL

1.1 DESCRIPTION OF WORK:

A. The work consists of furnishing and installing a sanitary sewerage system(s) including precast concrete manholes with accessories, pipe, pipe fittings and accessories, connections to other piping and structures, testing of manholes and piping, jointing, and jointing materials, by-pass sewage handling, excavation and backfill, bedding material, sand blanket, and all other related and appurtenant work, complete in place in accordance with the requirements set forth, and/or as directed.

1.2 SPECIAL REQUIREMENTS:

A. All approvals and permits as set forth in the Town of North Kingstown's Sewer Ordinance must be obtained prior to constructions of sanitary sewage system.

B. The Director shall be notified a minimum seven (7) days in advance to inspect construction, witness testing of pipelines and manholes and making connections to existing sanitary manholes.

C. A plan of the proposed sewer system shall be submitted with the application. Plans shall be prepared and stamped by a Rhode Island Professional Engineer.

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of sanitary sewerage system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

1.4 SUBMITTALS:

A. General: All submittals shall be submitted to the Town of North Kingstown, Department of Public Works, 2250 Davisville Road, North Kingstown, RI 02852.

B. Contract Drawings: Submit four (4) sets of drawings of proposed sanitary sewage system for review.

C. Record Drawings: At completion of project, submit record drawings of installed sanitary sewerage piping showing a minimum of three ties from permanent installations such as poles, hydrants, etc., for service connections at main, property line, dwelling units and distances, and coordinates for manholes.

2. PART 2 - PRODUCTS

2.1 IDENTIFICATION:

A. Underground-Type Line Markers for Non-Metallic Pipelines: Manufacturer's standard permanent detection tape, bright-colored, continuous-printed polyethylene tape with a metallic core for each detection of non-metallic underground installations, intended for direct-burial service; not less than 6" wide x 4 mils. thick. Provide green detection tape with black printing reading "CAUTION SEWER LINE BURIED BELOW" as manufactured by Seton or equal.

B. Tracer/Locator Wire for Force Main: Tracer/Locator wire shall be as manufactured by Kris-Tech Wire. It shall be insulated with 30 mil. high molecular weight polyethylene specifically used for direct burial applications. Color shall be green and 30 volt. The tracer wire's purpose is to carry an electronic signal for use in locating the force main. Tracer/Locator wire shall be UL approved. The wire shall be terminated in the cleanout manholes, metering chamber and pump station. Connections shall be made with direct bury wire nuts. Tracer wire shall be installed on top of the force main and secured every 5-feet with tape. At locations where the trader wire will be brought into manholes, chamber or pump station, a direct bury lug shall be used.

2.2 PIPE:

A. Polyvinyl Chloride Pipe (6"-15") and Fittings: Polyvinyl chloride (PVC) sewer pipe and fittings shall be in accordance with the latest issue of ASTM D3034, SDR35 and applicable documents. The PVC sewer pipe and fittings shall be composed of clean, virgin, Class 12364C compounds conforming to ASTM D1784 and shall be bell and spigot with rubber ring joints. The bell shall consist of an integral wall section with a solid cross section rubber ring securely locked in place to prevent dislocation of the ring. Standard lengths shall be 20-feet and 12.5-feet, plus or minus 1-inch. Minimum "pipe stiffness": at 5% deflection shall be 46 for all sizes when tested in accordance with ASTM Designation D2412, external loading properties of plastic pipe by parallel-plat loading. All fittings and accessories shall be manufactured and furnished by the pipe supplier and have bell and/or spigot configurations compatible with that of the pipe fittings and shall be of the same strength and quality as the pipe.

B. Polyvinyl Chloride Pipe (greater than 15") and Fittings: Polyvinyl chloride (PVC) sewer pipe and fittings shall be in accordance with the latest issue of ASTM F679. The PVC sewer and fittings shall be composed of clean, virgin, Class 12454C or 13364C compounds and shall be bell and spigot with rubber ring joints. The bell shall consist of integral wall section with a solid cross section rubber ring. Standard lengths shall be 13-feet plus or minus 1-inch. Minimum "pipe stiffness": at 7½% deflection shall be 46 for all sizes when tested in accordance with ASTM Designation D2412. All fittings and accessories shall be as manufactured and furnished by the pipe supplier and have bell and/or spigot configurations compatible with that of the pipe fittings and shall be of the same strength and quality as the pipe.

C. Polyvinyl Chloride Pressure Pipe (6"-12") and Fittings: Polyvinyl Chloride (PVC) pressure pipe and fittings shall be in accordance with AWWA C900 and shall be bell and spigot with rubber ring joints. The pipe shall be manufactured from PVC cell Class 12454-13 in accordance with ASTM D1784. The pipe and fittings shall be with a pressure rating of 233 psi and with bell and spigot.

1. Restrained Joint Pipe Fittings:

a. In lieu of thrust blocks, mechanical joint restraints may be used. Calculations shall be submitted to the Department of Public Works as to the pipe lengths that will require the restraints.

b. Retainers for PVC pipe bells shall be cast from 60-42-10 ductile iron, as manufactured by EBAA Iron, or equal. These devices shall have a sufficient number of ductile tie bolts to restrain working and test pressures as stated by the manufacturer. Each ductile clamp shall have serrations on the I.D. sufficient to hold working and test pressures. These devices shall be used to restrain pipe joints adjacent to the restrained fittings. The 1500 and 6500 are used in place of concrete thrust blocks, steel clamps and tie rods.

c. When it is required to restrain PVC push-on joints adjacent to restrained fittings, a harness restraint device shall be used. This harness restraint shall be split to enable installation of the restraint after the spigot has been installed into the bell. The restraint shall consist of three major parts: the first part being a split ring that fits behind the bell; the second part being a split restraint ring that installs on the spigot; the third part being a number of tie bars to connect parts one and two to facilitate joint restraint. All of these components shall be cast of ductile iron conforming to ASTM A536-80. The restraint ring shall consist of a plurality of individually activated gripping surfaces to hold the spigot and maximize restrain capability. The harness restraint shall have a working pressure of at least 100 psi with a minimum safety factor of 2:1 and shall be EBAA Iron, Inc., MEGALUG® series 1100HV, or equal.

D. Ductile Iron Pipe and Fittings: Ductile iron pipe shall be furnished in accordance with ANSI Designation A21.51. The ductile iron pipe shall be thickness Class 52. Pipes shall have normal laying lengths of at least 18-feet. In addition, each length of pipe shall be double cement lined and receive a factory applied interior and exterior coating of Kopper's Bitumastic Super Service Black or an approved coating of equal specifications in accordance with ANSI Designation A21.4. Ductile iron pipe shall be push-on type of joint which employs rubber gasket. Joints shall be in accordance with the latest ANSI standard for "Rubber Gasket joints for Ductile Iron Pressure Pipe and

Fittings", Designation A21.11. Fittings shall be in accordance with ANSI 23.53 with mechanical joints and shall be double cement lined. Fittings shall be manufactured in the **USA**. The fittings shall be coated inside and outside with a bituminous asphalt paint.

1. Restrained Joint Pipe and Fitting:

   a. In lieu of thrust blocks, mechanical joint restraints may be used. Calculations shall be submitted to the Department of Public Works as to the pipe lengths that will require the restraints. Mechanical joint restraints shall be incorporated in the design of the follower gland and shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases.

   b. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A536. Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to ANSI/AWWA A21.11 and ANSI/AWWA C153/A21.53 of latest revision. Twist-off nuts shall be used to ensure proper actuating of the restraining devices. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1 and shall be EBAA Iron, Inc. MEGALUG® or equal.

E. Flexible Couplings: Flexible couplings where used shall be as manufactured by Fernco Co. or equal. Flexible couplings shall conform to ASTM C443, C425, C564 and D1869. The couplings shall be stainless steel clamps. Donuts are not allowed to be used in lieu of flexible couplings.

F. Mechanical Couplings: Mechanical couplings shall be ductile iron Style 38 as manufactured by Dresser, or equal, coated with a corrosion resistant coating applied by the factory.

G. Insulation of Underground Piping:

1. Insulation: Foam glass insulation, ASTM C552, "Specifications for Cellular Glass Thermal Insulation" shall be a minimum of 3-inches in thickness as manufactured by Pittsburgh Corning Corporation or equal.

2. Jacketing: The jacketing shall be Pittwrap Jacketing as manufactured by Pittsburgh Corning Corporation or equal.
3. Asphalt Coating: Pittcote 300 finish by Pittsburgh Corning Corp. or equal.

4. Reinforcing Fabric: PC Fabric 79 by Pittsburgh Corning Corp. or equal.

5. Strapping Tape: Glass fiber reinforced, 1-inch wide, Scotch Brand No. 880 by 3M or equal.

6. Bore Coating: Hydrocal B-11 by U.S. Gypsum or equal.

H. Thrust Blocks: Concrete for trust blocks shall be 3000 psi concrete.

2.3 CHIMNEYS:

A. Precast Units: The concrete shall be 5000 psi conforming to ASTM C150. Air entraining shall conform to ASTM C233, and the reinforcing shall conform to ASTM A615. All brackets, bolts, and nuts shall be stainless steel, and between each precast section there shall be a neoprene gasket.

2.4 MANHOLES:

A.

Precast Concrete Manholes: Manhole barrels, cone sections, bases, and entrance slabs shall consist of precast reinforced concrete manufactured in accordance with ASTM Standard Specifications for "Reinforced Concrete Manhole Risers and Tops", Designation C478 latest revision. The horizontal joints between sections shall be sealed using a flexible butyl resin sealant and shall conform to Federal Specifications SS-S-210A and AASHTO M-198B. The exterior of the manhole shall be damp-proofed with an asphaltic compound as manufactured by Hydrocide.

B. Drop Manholes: Drop piping shall be the same size as sewer inlet.

C. Pipe Connectors: Resilient complying with ASTM C923. For pipes up to 24-inches, the pipe connectors shall be Kor-N-Seal and for pipe over 24-inches, the pipe connector shall be A-Lok or equal.

D. Manhole Steps: Manhole steps shall be of safety type and shall be cast into the units during process of manufacture. Steps shall be steel reinforced copolymer polypropylene plastic step conforming to ASTM C478 or aluminum forgings alloy 6016, Temper T-16 and those parts which are embedded in the concrete shall be thoroughly cleaned and given a heavy coating of zinc chromate or other approved paint. In addition, steps shall conform to OSHA regulations.

E. Frame and Covers: Manhole frames and covers shall be ERGO XL Assembly as manufactured by East Jordon. Or equals are not allowed.

F. Brick Masonry and Mortar Cement: Brick shall be Grade SM, ASTM C32 or Grade SM, AASHT0 M91. All brick shall be common hard-rubber clay brick and shall be uniform and regular in shape and size. Mortar cement for masonry shall conform to ASTM

Designation C-144. The mortar shall be composed of one (1) part masonry cement to 2½ parts sand with water not to exceed 4.1 gallons per 70-pound bag of masonry cement. If using Portland cement, lime putty may be added in such amounts that the hydrated lime does not exceed 15% by weight of cement.

2.5 GRAVEL BASE

A. Gravel shall be free of foreign material such as loam, silt, clay and vegetable matter and meet the following requirements:

1.	Passing 1¼-inch sieve	100%
2.	Passing ¼-inch sieve	30-65%
3.	Passing No. 40	5-50%
4.	Passing No. 100	0-10%

2.6 CRUSHED STONE BEDDING MATERIAL:

A. The bedding material shall be crushed stone consisting of durable crushed rock or durable crushed gravel stone, free from ice, snow, sand, clay, loam or other deleterious material. The crushed stone shall conform to the following requirements:

1.	Passing ¾-inch sieve	100%
2.	Passing ½-inch sieve	10-50%
3.	Passing ⅜-inch sieve	0-20%
4.	Passing No. 4 sieve	0-5%

2.7 SAND:

A. The sand shall be free from ice, snow, roots, sod, rubbish, and other deleterious or organic matter. The sand blanket shall conform to the following requirements

1.	Passing ½-inch sieve	100%
2.	Passing ⅜-inch sieve	85-100%
3.	Passing No. 4 sieve	60-85%
4.	Passing No. 16 sieve	35-60%
5.	Passing No. 50 sieve	10-35%
6.	Passing No. 100 sieve	2-10%

2.8 BACKFILL:

A. Backfill shall be excavated material free-draining clean granular soil suitable for backfill. Up to 20% of backfill material may be rock-like materials not to exceed 0.05 cubic feet in volume, nor more than 6-inches in length. The backfill shall not contain any debris, pavement, frozen material, organic matter or peat.

3. PART 3 - EXECUTION

3.1 PROJECT CONDITIONS:

A. Protection of Water Line:

1. Horizontal Separation: Sewers shall be laid at a minimum at least 10-feet, horizontally, from any existing or proposed water main or service. Should local conditions prevent a lateral separation of 10-feet, the sewer line shall be constructed of AWWA C900 polyvinyl chloride or Class 52 ductile iron pressure pipe.

2. Vertical Separation: Whenever sewers cross under water mains, or services, the sewer shall be laid at such an elevation that the top of the sewer is at least 18-inches below the bottom of the water main. When the elevation of the sewer cannot be relocated to provide this separation, the sewer line shall be constructed of AWWA C900 polyvinyl chloride or Class 52 ductile iron pressure pipe for a distance of 10-feet on each side of the water main.

B. Private Wells: Sewers shall be laid at a minimum at least 50-feet, horizontally, from any existing or proposed private well. Should local conditions prevent a lateral separation of 50-feet, the sewer line shall be constructed of AWWA C900 polyvinyl chloride or Class 52 ductile iron pressure pipe from manhole to manhole reach including the service connection pipe.

3.2 INSPECTION:

A. The Department of Public Works shall be notified a minimum of seven (7) days prior to installation of a sanitary sewer system so that inspections can be made throughout the project.

B. The testing of sewer lines and manholes shall be conducted in the presence of the representatives of the Department of Public Works. The Department of Public Works shall be notified a minimum of seven (7) days in advance of any testing.

C. Connections made to existing manholes for lateral sewers shall be inspected by representatives of the Department of Public Works prior to backfill.

D. Connections to manholes for service connections are not allowed.

E. If during inspections it is found that the sewage system is not in compliance with the specifications or details, the deficiencies shall be corrected immediately to the satisfaction of the Department of Public Works. The Department of Public Works will not allow any further construction of the sewage system until such time the deficiencies are corrected.

3.3 PRODUCT HANDLING:

A. Each product shall be handled into its position in the trench in such a manner and by such means as the manufacturer recommends as satisfactory, and these operations will be restricted to those considered safe for the workmen and such as to cause no injury to the product or any property.

B. The Contractor will be required to furnish slings, straps, and/or other devices to provide satisfactory support of the pipe when it is lifted. Transportation from delivery areas to the trench shall be restricted to operations which can cause no injury to the product. The products shall not be dropped from trucks or into the trench.

C. The Contractor shall have on the job site with each crew, all the proper tools to handle the products being installed. The use of hammer and chisel or any other method which results in rough edges, chips and damages, shall be prohibited.

3.4 EXCAVATION AND BACKFILL FOR PIPES:

A. The width of the trench shall be held to a minimum consistent with the space required to permit satisfactory jointing of the pipe and tampering of the bedding and backfill material under and around the pipe. In general, the maximum trench width shall be the pipe diameter plus 2-feet or a minimum width of 3-feet, whichever is greater. If necessary, sheeting and/or shoring shall be used to prevent overcutting at the level of the top of the pipe and to maintain the trench sides. The trench bottom should be smooth, level and all large stones or rocks lying on or protruding from the trench bottom shall be removed.

B. Over-excavation shall be refilled in 6-inch lifts with approved granular material and compacted to 95% maximum density.

C. Where unsuitable material is encountered at the trench bottom, the material shall be excavated to a stable bottom and refilled with compacted crushed stone bedding material in 6-inch lifts.

D. Backfill from the centerline of the pipe to the height 2-feet above the pipe shall be with sand placed evenly the full width of the trench and compacted. The remainder of the trench shall be backfill material and compacted in 12-inch layers. Cushion and backfill material shall be compacted to 95% maximum density by tamping and compacting in layers (1-foot maximum) to achieve the required compaction.

3.5 INSTALLATION OF PIPE:

A. Each pipe length shall be inspected for cracks, defects in coating or lining, and any other evidences of unsuitability. Before lowering in place, the pipe shall be struck with a suitable tool to verify its soundness.

B. Pipe shall be laid in the dry and at no time shall water in the trench be permitted to flow into the sewer.

C. The pipe shall then be laid on the trench crushed stone bedding as shown in the trench detail, and the spigot pushed home. Jointing shall be in accordance with the manufacturer's instructions and appropriate ASTM standards, and the Contractor shall have on hand for each pipe-laying crew, the necessary tools, gauges, pipe cutters, etc. necessary to install the pipe in a workmanlike manner. Pipe laying shall proceed upgrade with spigot ends pointing in the direction of flow.

D. Blocking under the pipe will not be permitted except where a concrete cradle is proposed, in which case precast concrete blocks shall be used.

E. After the pipe has been set to grade, additional bedding material shall be placed in 6-inch layers up to the spring line of the pipe. Tamping bars shall be carefully employed to assure compaction of the bedding under the lower quadrants of the pipe for the full width of trench excavation.

F. If a trench box is being used and the trench box is below the spring line of the pipe, the trench box shall be lifted vertically and the stone bedding shall be thoroughly compacted to the trench wall. The trench box shall not be pulled horizontally along the trench.

G. At any time that work is not in progress, the end of the pipe shall be suitability closed to prevent the entry of animals, earth, water, etc.

H. Unsatisfactory work shall be dug up and re-installed to the satisfaction of the Department of Public Works.

I. House service installations shall be as shown on the "Standard House Connection Detail". House services shall not be connected directly to manholes unless otherwise approved by the Department of Public Works. The opening of the house service, wye branch or chimney shall be suitably plugged with a watertight cap or plug. Before backfilling, the Contractor shall make the necessary measurements to locate the opening with a minimum of three ties later and the information shall be given to the Department of Public Works. In addition, an approved ferrous rod or pipe shall be placed over the plugged opening, extending to within 2-inches of the final ground surface and metallic detection tape shall be installed a minimum of 24-inches above the pipe.

3.6 INSTALLATION OF MANHOLES:

A. Bases for all sanitary sewer manholes shall be placed on a minimum of 6-inches of compacted crushed stone bedding material. The excavation shall be properly dewatered and maintained dry while placing bedding material and setting the bases. Manholes shall be backfilled evenly and in layers, maximum 1-foot thick, with suitable backfill material and compacted to achieve 95% maximum density.

B. Sheeting and/or bracing shall be used when required.

C. Manhole barrel and cone sections shall be set so as to be vertical and in true alignment.

D. Where required for future connections, openings shall be cast in the manholes at the proper location and shall be sealed with plugs.

E. Drop manholes shall be built in accordance with the details.

F. The inverts of all manholes shall be constructed of brick and formed in accordance with the details.

G. Bricks shall be laid in a workmanlike manner, true to line and the joints shall be carefully struck and pointed on the inside. Bricks shall be thoroughly wet when laid and each brick shall be laid in mortar so as to form full bed, end and side joints in one operation. The outside of the brickwork shall be neatly plastered with ½-inch layer of cement mortar as the work progresses. The brickwork shall be satisfactorily bonded to the concrete and cast iron frame. No brick masonry shall be laid in water, or any water allowed to rise on the brickwork until the masonry has set for at least 24-hours.

H. All lift holes shall be filled with non-shrinking mortar such as Quick-Plug prior to backfilling.

3.7 CONNECTIONS TO EXITING MANHOLES:

A. Connections to existing manholes of lateral sewers shall be made so as not to damage the structure and shall be watertight with zero leakage. The crown of the new pipe shall be at the same elevation as the main of the largest existing pipe. The openings shall be cored and Kor-N-Seal joint sleeve shall be installed. The inverts shall be modified as directed to accommodate flow from the new pipe.

3.8 PLACEMENT OF THRUST BLOCKS:

A. Thrust blocks shall be of sufficient size to withhold the test pressure, and they shall be paired against undisturbed earth. The concrete shall be kept clear of pipe joints.

3.9 RESTRAINED JOINTS:

A. The mechanical joint restraints shall be installed in accordance with the manufacturer's written instructions.

3.10 BY-PASS SEWAGE HANDLING:

A. As the construction of the sewer progresses and it becomes necessary to interrupt live sewage flow in any existing sanitary sewer, house lateral, manhole or portion thereof, the Contractor shall be required to divert such flows around the area of interruption.

B. The existing sewage flow rate shall be continually maintained at all times and no loss of sewer service up or downstream of the interruption shall occur. The Contractor shall utilize quality materials and equipment in good repair in meeting the requirements of this special provision and all damages resulting from interruptions in the functioning of the by-pass sewage handling system shall be borne totally by the Contractor. The Contractor shall complete the adjacent construction in a timely fashion to minimize the duration of by-pass sewage handling required. Existing sewage flows shall be diverted and maintained until the new sewer construction is leakage tested and accepted for service by the Department of Public Works.

3.11 TESTING GRAVITY SEWERS:

A. General: Testing of each section of sewer installed shall include the portions of service connections that are to be installed in the presence of representatives of the Department of Public Works. The Contractor shall test each manhole reach as soon as construction of such reach is complete. The Contractor will be required to perform the pipe deflection test on each section of pipe installed, vacuum test of manholes and an infiltration test or low pressure test as applicable.

B. Pipe Deflection: Test each section of PVC sewer pipe for vertical ring deflection sixty (60) days following installation. In the presence of the Department of Public Works or their designee, maximum allowable ring deflection shall be 7½% of inside diameter.

1.	6-inch pipe, inside dia.:	5.742", 7½% deflection	-	5.31"
2.	8-inch pipe, inside dia.:	7.665", 7½% deflection	-	7.09"
3.	10-inch pipe, inside dia.:	9.563", 7½% deflection	-	8.84"
4.	12-inch pipe, inside dia.:	11.361", 7½% deflection	-	10.51"
5.	15-inch pipe, inside dia.:	13.858", 7½% deflection	-	12.86"

C. Infiltration Test: An infiltration test requires groundwater levels to be a minimum of 2-feet above the crown of the pipe of the high end of the section being tested. The Contractor shall have on hand all plugs, pumps, weirs, water trucks, etc., necessary to conduct the tests.

1. Each manhole to manhole reach of pipeline shall be tested.

2. With all connecting pipes plugged (other than those included in test section), a V-notch weir shall be installed in the downstream end of pipe. The V-notch weir must be constructed accurately and installed to maintain a watertight seal between weir and pipe.

3. Time shall be allowed for water to build up behind weir until steady, uniform flow passes through V-notch.

4. Readings shall then be taken under direction of representatives of the Department of Public Works and recorded.

5. Should the work fail the infiltration test, corrective action shall be taken by the Contractor, in a manner approved by the Department of Public Works. The sewer pipe shall be internally inspected with a camera to identify and locate the infiltration source(s). The Contractor shall excavate and make the necessary repair to the satisfaction of the Department of Public Works. The repair(s) shall be air tested with zero pressure drops after two minutes.

6. Leakage shall not exceed 0 gallons per inch diameter, per day, per mile of pipe. Should the pipe, as laid, fail to meet the requirements, the Contractor shall perform the necessary work to meet these requirements.

D. Low Pressure Air Test:

1. After completing backfill of the pipeline, the Contractor shall conduct a line acceptance test using low pressure air. The test shall be performed according to stated procedures and in the presence of representatives of the Department of Public Works. The line shall be flushed and cleaned prior to testing.

2. All pneumatic plugs shall be seal tested before used in the actual test installation. One (1) length of pipe shall be laid on ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psig. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.

3. After a manhole to manhole reach of pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psig. Low pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psig greater than the average back pressure of any groundwater that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize.

4. After the stabilization period (3.5 psig minimum pressure in the pipe), the air hose from the control panel to the air supply shall be disconnected. There shall be 0 pressure drop and shall not be less than the time shown for the given diameters in the following:

a.	8 inches --	4 minutes
b.	10 inches --	5 minutes
c.	12 inches --	6 minutes
d.	18 inches --	9 minutes
e.	21 inches --	10 minutes
f.	24 inches --	12 minutes
g.	27-inches --	13 minutes
h.	30 inches --	15 minutes
i.	36 inches --	17 minutes
j.	42 inches --	20 minutes
k.	48 inches --	23 minutes

5. If the installation fails the air test, the Contractor shall, at his expense, determine the source of leakage. The sewer pipe shall be internally inspected with a camera and each pipe joint shall be tested. The identified defect shall be repaired. The Contractor will not be allowed to use sealants but will be required to excavate and make the necessary repair to the satisfaction of the Department of Public Works and the pipeline shall be retested.

3.12 TESTING OF PRESSURE LINES:

A. Upon completion of installation of the force main, the line shall be tested for leaks. The Contractor shall make all necessary arrangements for obtaining potable water, furnishing all pumps, piping, hose, installing corporation stops if necessary, etc.

B. Air shall be expelled by filling the main slowly and permitting air to escape at high points. Air bleeder shall be installed in location directed by the Department of Public Works.

C. Pressure pipelines shall be subjected to a pressure test of 150 psi. The test pressure shall be maintained for a minimum of two (2) hours. The leakage rate allowed is 0.

D. Any defective joints shall be immediately repaired, and any cracked or otherwise defective pipe shall be replaced by the Contractor and the test repeated.

3.13 TESTING OF MANHOLES:

A. General: Tests shall be made and observed by representatives of the Department of Public Works on each manhole.

B. Vacuum Test Before Backfilling: Install vacuum tester and inflate compression band to effect a seal between the vacuum base and the manhole, connect vacuum pump to the outlet part with the valve open, draw a vacuum of 10 inches of mercury (HG), and close the valve. The manhole shall pass the test if the vacuum remains at 10-inches of HG or drops to 9-inches of HG in a time greater than 60 seconds for a 48-inch diameter manhole, time greater than 75 seconds for 60-inch diameter manhole and time greater than 90 seconds for 72-inch diameter manhole. If the manhole fails the initial test, the Contractor shall make proper repairs or replace the manhole and retest at no additional compensation.

END OF SECTION

SECTION III- SANITARY SEWAGE SERVICE CONNECTIONS

1. PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. The work consists of furnishing and installing service connections from the property line to building or from the main line to the building including, but not limited to, installation of appropriate fittings at the main sewer line, fittings at property line, construction of chimneys if required, construction of clean-outs, excavation, bedding, sand cushion, backfilling, recording location, and all other related and appurtenant work, complete in place in accordance with details and specifications, submitted and approved by Department of Public Works.

1.2 SPECIAL REQUIREMENTS:

A. The property owner shall file an Application for Approval - Sewer System Connection/Expansion/Modification and the drainlayer shall obtain all required permits as set forth in the Town of North Kingstown, Sewer Ordinance and the Standard Sanitary Sewer Requirements prior to undertaking construction of sanitary sewage service connection(s).

B. A plan of the proposed connection is required to be submitted with the application. For properties with an existing building connection lateral the plan may be prepared by a licensed drain-layer. All other must be prepared and stamped by a Rhode Island Professional Engineer.

C. The Department of Public Works shall be notified a minimum of seven (7) days in advance to inspect the installation of the sanitary sewage service connection(s).

D. Connections to sanitary manholes are not allowed.

2. PART 2 - PRODUCTS

2.1 PIPE:

A. Polyvinyl Chloride and Fittings: Polyvinyl chloride (PVC) sewer pipe and fittings shall be in accordance with the latest issue of ASTM Specification D3034, SDR-35 and applicable documents. The PVC sewer pipe and fittings shall be composed of clean, virgin, Class 12454-B compounds conforming to ASTM D1784 and shall be bell and spigot with rubber ring joints. The bell shall consist of an integral wall section with a solid cross section rubber ring securely locked in place to prevent dislocation of the ring. Standard lengths shall be 20-feet and 12.5-feet, plus or minus 1-inch. Minimum "pipe stiffness" at 5% deflection shall be 46 for all sizes when tested in accordance with

ASTM Designation D2412, external loading properties of plastic pipe by parallel-plate loading. All fittings and accessories shall be manufactured and furnished by the pipe supplier and have bell and/or spigot configurations compatible with that of the pipe fittings and shall be of the same strength and quality as the pipe.

B. Polyvinyl Chloride Pressure Pipe and Fittings: Polyvinyl chloride (PVC) pressure pipe and fittings shall be in accordance with AWWA C900, etc. bell and spigot with rubber ring joints. The pipe and fittings shall be Class 150 (DR18) with bell and spigot.

2.2 CHIMNEYS:

A. Precast concrete units (5000 psi concrete) with stainless steel brackets, bolts, and nuts, and neoprene gaskets between sections will be allowed.

2.3 FLEXIBLE COUPLINGS:

A. Flexible couplings shall be as manufactured by Fernco or equal. The flexible coupling shall conform to ASTM C443, C425, C564, and D1869. The coupling shall have stainless steel clamps. Donuts are not allowed to be used in lieu of flexible couplings.

2.4 SEWER PIPE SADDLE:

A. Sewer pipe saddles shall be Sealtite Type "D" Tee Sewer Pipe Saddle or Type "E" Wye Sewer Pipe Saddles as manufactured by Geneco Products or equal.

B. Saddle shall be cast iron conforming to ASTM A-48, Class 35 and shall be coated with black asphaltum type paint.

C. Saddle gaskets shall be one piece, rubber O-rings, maintaining a leak-proof connection, conforming to ASTM DT869.

D. Saddle shall be secured to the existing sewer main with type C304 stainless steel band with stainless steel bolts.

E. All saddles shall be fully encased in concrete.

2.5 BACKWATER VALVE:

A. A backwater valve shall be installed between the property line and the dwelling unit. The backwater valve shall be manufactured by Clean Check, Inc., or equal.

2.6 GRAVEL BASE:

A. Gravel shall be free of foreign material such as loam, silt, clay and vegetable matter and meet the following requirements:

1.	Passing 1¼-inch sieve	100%
2.	Passing ¼-inch sieve	30-65%
3.	Passing No. 40	5-50%
4.	Passing No. 100	0-10%

2.7 CRUSHED STONE BEDDING MATERIAL:

A. The bedding material shall be crushed stone consisting of durable crushed rock in durable crushed gravel stone, free from ice, snow, sand, clay, loam, or other deleterious material. The crushed stone shall conform to the following requirements:

1.	Passing 1-inch sieve	100%
2.	Passing ¾-inch sieve	90-100%
3.	Passing ½-inch sieve	10-50%
4.	Passing ⅜-inch sieve	0-20%
5.	Passing No. 4 sieve	0-5%

2.8 SAND:

A. The sand shall be free from ice, snow, roots, rubbish, and other deleterious or organic matter. The sand blanket shall conform to the following requirements:

1.	Passing ½-inch sieve	100%
2.	Passing ⅜-inch sieve	85-100%
3.	Passing No. 4 sieve	60-85%
4.	Passing No. 16 sieve	35-60%
5.	Passing No. 50 sieve	10-35%
6.	Passing No. 100 sieve	2-10%

2.9 BACKFILL:

A. Backfill shall be excavated materials free-draining clean granular soil suitable for backfill. Up to 20% of backfill material may be rock-like materials not to exceed 0.05 cubic feet in volume, nor more than 6-inches in length. The backfill shall not contain any debris, pavement, frozen material, organic matter, or peat.

3. PART 3 - EXECUTION

3.1 PROJECT CONDITIONS:

A. Protection of Water Line:

1. Horizontal Separation: Sewers shall be laid at a minimum at least 10-feet, horizontally, from any existing or proposed water main or service. Should local

conditions prevent a lateral separation of 10-feet, the sewer line shall be constructed of AWWA C900 polyvinyl chloride or Class 52 ductile iron pressure pipe.

2. Vertical Separation: Whenever sewers cross under water mains, or services, the sewer shall be laid at such an elevation that the top of the sewer is at least 18-inches below the bottom of the water main. When the elevation of the sewer cannot be relocated to provide this separation or the sewer line shall be constructed of AWWA C900 polyvinyl chloride or Class 52 ductile iron pressure pipe for a distance of 10-feet on each side of the water main.

B. Private Wells:

1. Sewers shall be laid at a minimum at least 50-feet, horizontally, from any existing or proposed private well. Should local conditions prevent a lateral separation of 50-feet, the sewer line shall be constructed of AWWA C900 polyvinyl chloride or Class 52 ductile iron pressure pipe from manhole to manhole reach including the service connection pipe.

3.2 INSPECTION:

A. The Contractor shall notify the Director a minimum of seven (7) days in advance to make an inspection of the sanitary connection. The inspection(s) will be made prior to backfilling the trench. If more than one inspection is required to be made by the Department of Public Works, the Contractor will be required to reimburse the Department of Public Works for the associated costs involved in the re-inspection(s).

B. If during the inspection(s) it is found that the installation of the service connection is not in compliance with these specifications or details, the Contractor shall immediately take corrective measures, and the service connection will be re-inspected at the Contractor's expense.

3.3 CONNECTIONS MADE AT EXISTING SEWER MAIN:

A. The Contractor shall install a new wye connection (if a wye does not exist) to the property.

B. If a wye connection cannot be installed, the Contractor, with the approval of the Director, shall permit a saddle. The saddle must be installed per manufacturer's recommendations and shall be fully encased in concrete.

3.4 CONNECTIONS MADE AT PROPERTY LINE:

A. The Contractor shall connect to the sewer service pipe located at the property line with a flexible coupling.

B. The Contractor shall install a clean-out just upstream from the flexible coupling.

3.5 CLEAN-OUTS:

A. Clean-outs shall be installed at the property line, at every fitting over 22½ degrees and at 100 feet. Service connections which are longer than 150 feet shall have sanitary manholes installed at a location(s) as per the approved plan.

3.6 EXCAVATION AND BACKFILL:

A. The width of the trench shall be held to a minimum consistent with the space required to permit satisfactory jointing of the pipe and tamping of the crushed stone bedding and backfill material under and around the pipe. In general, the maximum trench width shall be the pipe diameter plus 2-feet or a minimum width of 3-feet, whichever is greater. If necessary, sheeting and/or shoring shall be used to prevent overcutting at the level of the top of the pipe and to maintain the trench sides. The trench bottom should be smooth, level and all large stones or rocks lying on or protruding from the trench bottom shall be removed. Over-excavation will be refilled in 6-inch lifts with approved granular material and compacted to 95% maximum density.

B. Where unsuitable material is encountered at the trench bottom, the material shall be excavated to a stable bottom and refilled and compacted bedding material in 6-inch lifts.

C. Backfill from the centerline of the pipe to a height of 2-feet above the pipe shall be sand blanket material placed evenly the full width of the trench and compacted in 12-inch layers. The remainder of the trench shall be backfilled evenly with suitable (excavated or borrow) backfill material and compacted in 12-inch layers. Cushion and backfill material shall be compacted to 95% maximum density by tamping and compacting in layers (1-foot maximum) to achieve the required compaction.

3.7 INSTALLATION OF PIPE:

A. Each pipe length shall be inspected for cracks, defects in coating or lining, and any other evidences of unsuitability. Before lowering in place, the pipe shall be struck with a suitable tool to verify its soundness.

B. Pipe shall be laid in the dry and at no time shall water in the trench be permitted to flow into the sewer.

C. The pipe shall then be laid on the trench crushed stone bedding as shown on the standard trench detail, and the spigot pushed home. Jointing shall be in accordance with the manufacturer's instructions and appropriate ASTM standards, and the Contractor shall have on hand for each pipe-laying crew, the necessary tools, gauges,

pipe cutters, etc., necessary to install the pipe in a workmanlike manner. Pipe laying shall proceed upgrade with spigot ends pointing in the direction of flow.

D. Blocking under the pipe will not be permitted except where a concrete cradle is proposed, in which case precast concrete blocks shall be used.

E. After the pipe has been set to grade, additional bedding material shall be placed in 6-inch layers up to the spring line of the pipe. Tamping bars shall be carefully employed to assure compaction of the bedding under the lower quadrants of the pipe for the full width of trench excavation.

F. If inspection of the pipe is satisfactory, the Contractor may then backfill the remainder of the trench in accordance to the specifications and details.

G. If a trench box is being used and the trench box is below the spring line of the pipe, the trench box shall be lifted vertically, and the stone bedding shall be thoroughly compacted to the trench wall. The trench box shall not be pulled horizontally along the trench.

H. At any time that work is not in progress, the end of the pipe shall be suitability closed to prevent the entry of animals, earth, etc.

I. Unsatisfactory work shall be dug up and re-installed to the satisfaction of the Department of Public Works or their designee.

3.8 RECORDING LOCATION:

A. The Contractor shall submit to the Director, after completion of the service connection(s), installation of a sketch showing the location of the service connection utilizing distances from permanent structures. The depth at the sewer main property line and at the dwelling unit shall be recorded.

END OF SECTION

SECTION III- LOW PRESSURE SEWER GRINDER PUMP STATIONS

1. PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. The work consists of furnishing and installing a grinder pump system including excavation and backfill, bedding material, grinder pump, pump chamber with accessway, piping and valves, electrical work, factory and on-site testing, and all other incidentals as specified and as shown on the contract drawings.

B. All approvals and permits as set forth in the Town of North Kingstown's Sewer Ordinance and the Department of Environmental Management requirements, when applicable, shall be obtained prior to the installation of the low pressure grinder pump station system.

1.2 SPECIAL REQUIREMENTS:

A. Contractor shall obtain all required permits as set forth in the Town of Kingstown's Sewer Ordinance, QDC and the Department of Environmental Management prior to undertaking construction of sanitary sewage service connection(s).

B. The Director shall be notified a minimum of seven (7) days in advance to inspect the installation.

1.3 SUBMITTALS:

A. Contract Documents: Submit contract documents of proposed low pressure sewer grinder pump system including design calculations.

B. Record Drawings: At completion of project, submit record drawings of installed system.

1.4 QUALIFICATIONS OF MATERIAL AND EQUIPMENT:

A. Specific manufacturers' names and catalog numbers are used herein to establish quality and design of a particular item.

B. Wherever in the Specifications any item of equipment or material is designated by reference to a particular brand, manufacturer, or trade name, it is understood that a reviewed equal product, acceptable to the Department of Public Works, may be submitted by the Contractor.

C. If the Contractor proposes to use a material which, while suitable for the intended use, deviates in any way from the detailed requirements, he shall inform the Department of Public Works in writing of the nature of such deviations at the time the material is submitted for review, and shall request a review of the deviation from the requirements.

D. In requesting a review of deviations or substitutions, the Contractor shall provide evidence leading to a reasonable certainty that the proposed substitution or deviation shall provide a result at least equal in quality to that specified. If, in the opinion of the Department of Public Works, the evidence presented by the Contractor does not provide a sufficient basis for such reasonable certainty, the Department of Public Works will reject such substitution or deviation without further investigation, in which case it shall be the responsibility of the Contractor to provide another product which is satisfactory to the Department of Public Works.

2. PART 2 - PRODUCTS:

2.1 LOW PRESSURE GRINDER PUMP UNIT:

A. Low pressure grinder pumps shall be manufactured by Environment One. The unit shall consist of a grinder pump, level controls, siphon breaker, check valve and 70 gallon high density polyethylene tank. The unit shall be equipped with an electrical quick disconnect plug, a discharge line shut-off valve and a quick disconnect assembly. The alarm/disconnect panel shall contain circuit breakers, an audible and visual alarm transfer switch and generator receptacle. A second check valve shall be provided at the curb stop.

2.2 PIPING:

A. Low pressure pipe and fittings shall be polyvinylchloride pipe Class 200 (SDR 21) with push-on joints. Bell shall be gasketed joint conforming to ASTM D3139 with gaskets conforming to ASTM F477.

B. Schedule 80 PVC pipe and fittings shall be rigid, unplasticized, Type I, Grade I, polyvinylchloride conforming to ASTM D1784, NSF listed.

2.3 ELECTRICAL EQUIPMENT:

A. Manual transfer switch shall be a double throw non-fuse, 3-pole square "D" 30 amp enclosed in a NEMA 3R enclosure.

B. A generator hook-up shall be a single outlet (2P - 3 wire) twist lock with a weatherproof cover plate NEMA L6-30 or with a 12-2 with ground power supply cord connected to the transfer switch with a male plug.

C. All materials shall be U.L. listed, PVC conduits, conduit wall seals and conductors-copper and shall be acceptable to the local electrical inspector.

3. PART 3 - EXECUTION

3.1 INSTALLATION OF GRINDER PUMPING UNIT:

A. Installation of grinder pumping unit shall be in accordance with the manufacturer's written instructions.

B. Installation of piping and valves shall be in accordance to sanitary sewage system or sanitary sewage service connections specifications.

3.2 ELECTRICAL:

A. Contractor shall obtain all required certificates of inspection of his work as required by state and local officials and deliver same to the Director.

B. All materials furnished and all work installed shall comply with the national fire codes of the National Fire Protection Association, with the requirements of all Town, State and governmental departments having jurisdiction, including applicable requirements of the U.S. Department of Labor's occupational safety and health standards.

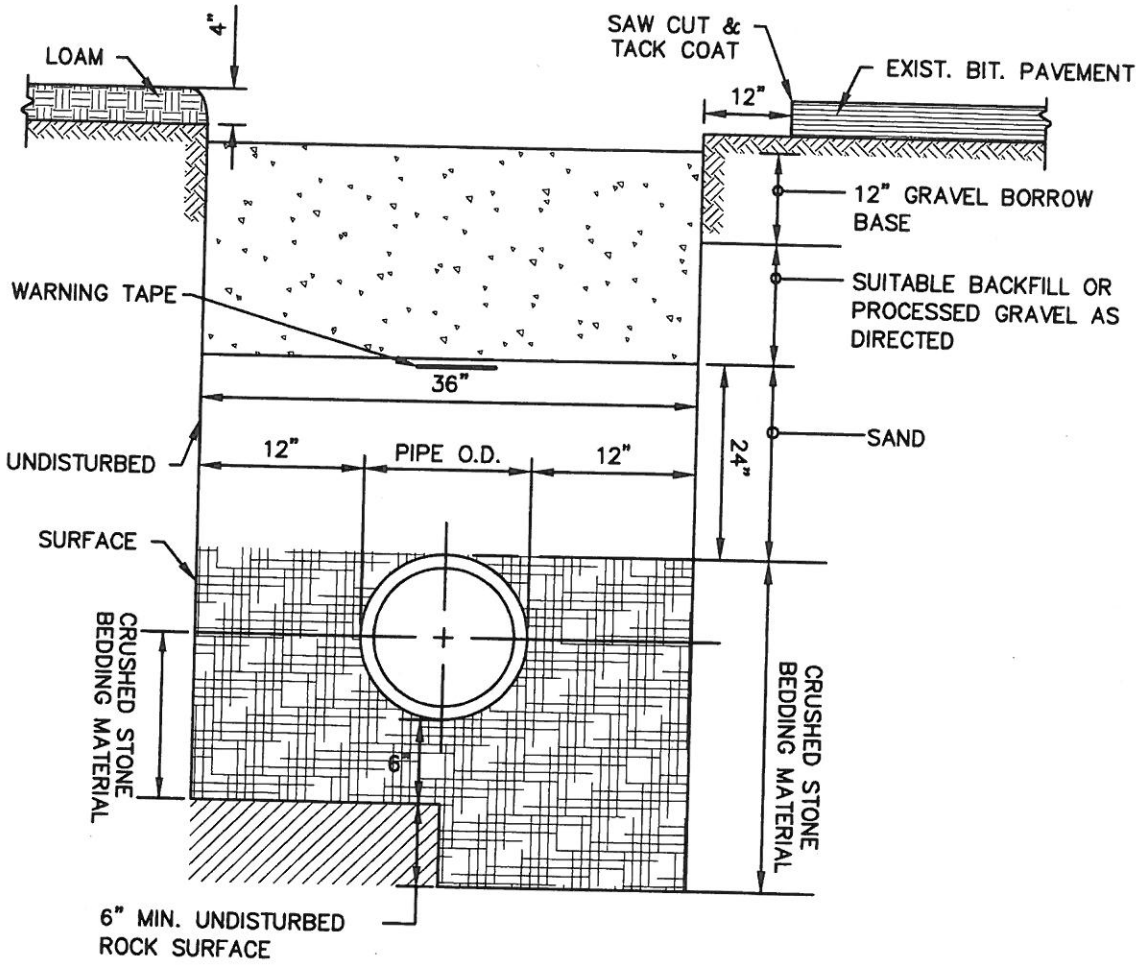
C. Materials and workmanship shall be new and of current production and shall conform in all respects to, applicable requirements of national electrical code, rules, and regulations governing installation of electrical work in the applicable requirements of the utility company and other state and local authorities having jurisdiction.

D. The high level indicator lamp assembly shall be installed in a standard device box in a visible location in the interior of dwelling.

END OF SECTION

DETAILS

SECTION IV



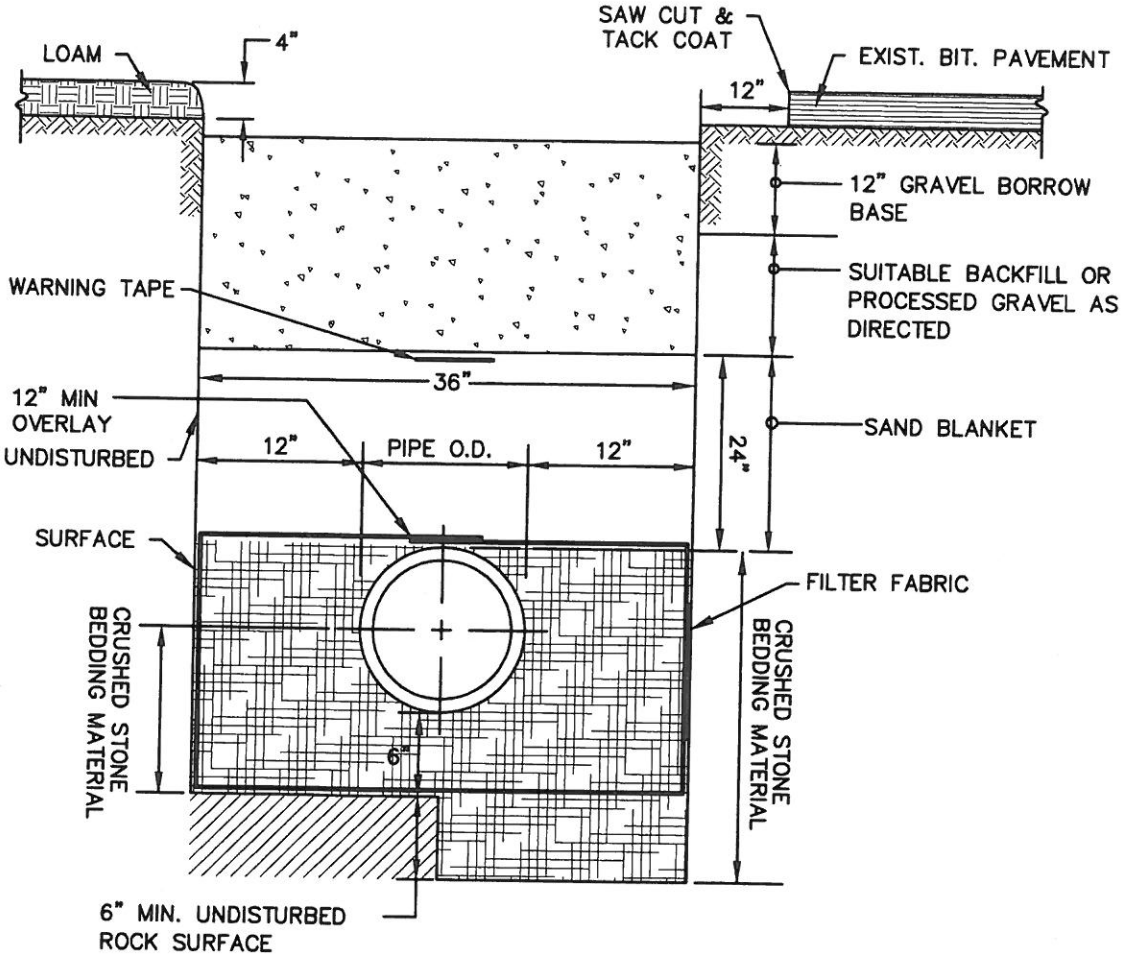
NOTES:
1. MINIMUM DEPTH OF COVER SHALL BE 4'–0"
2. PAVEMENT RESTORATION SHALL CONFORM TO THE DEPARTMENT OF PUBLIC WORKS REQUIREMENTS

TOWN OF
NORTH KINGSTOWN

Figure NK-1
TRENCH DETAIL

Standard Sanitary Sewer Requirements

Date: 2013 | Scale: No Scale



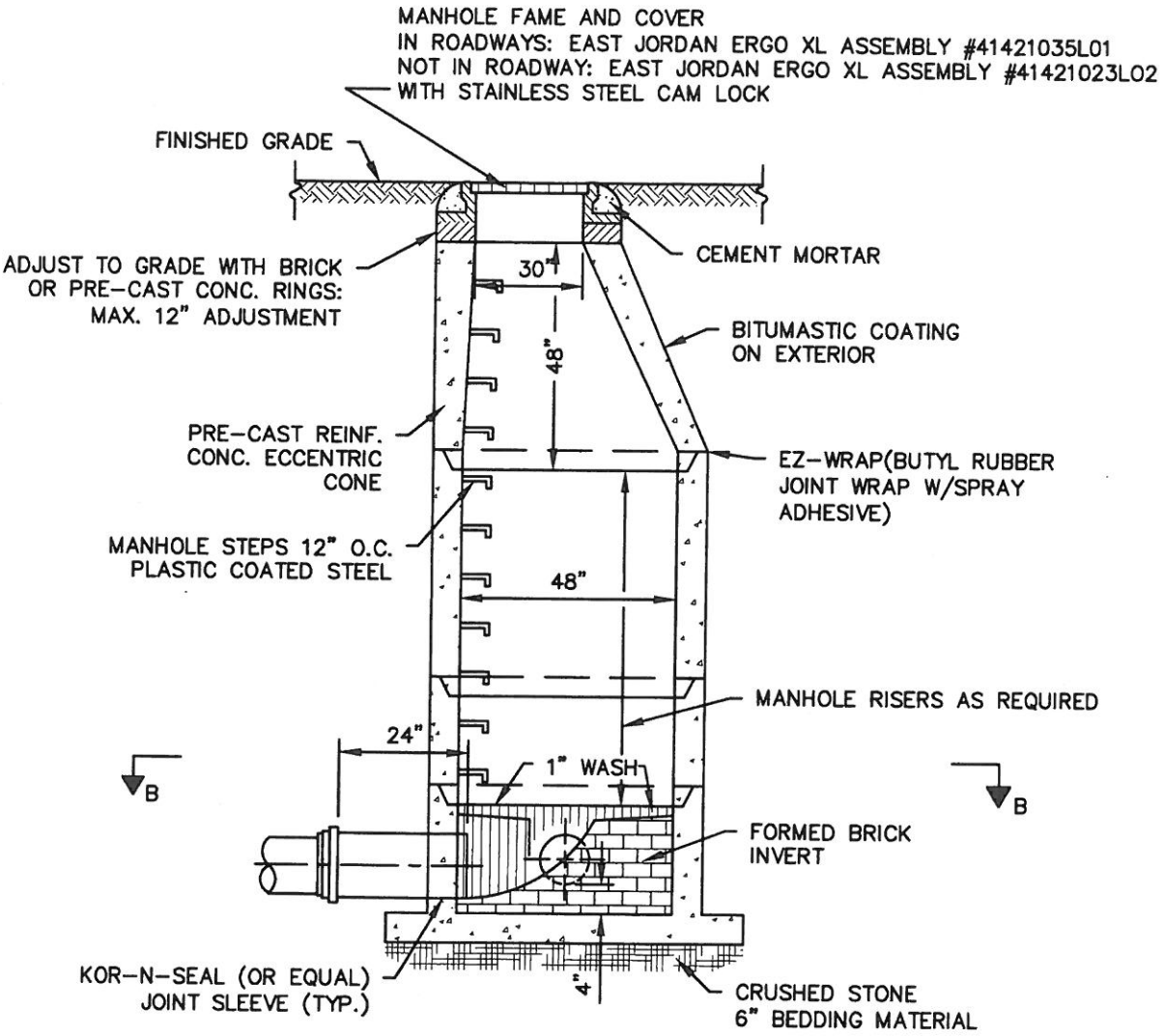
NOTES:
1. MINIMUM DEPTH OF COVER SHALL BE 4'–0"
2. PAVEMENT RESTORATION SHALL CONFORM TO THE DEPARTMENT OF PUBLIC WORKS REQUIREMENTS

TOWN OF
NORTH KINGSTOWN

Figure NK-2
TRENCH DETAILS WET CONDITIONS

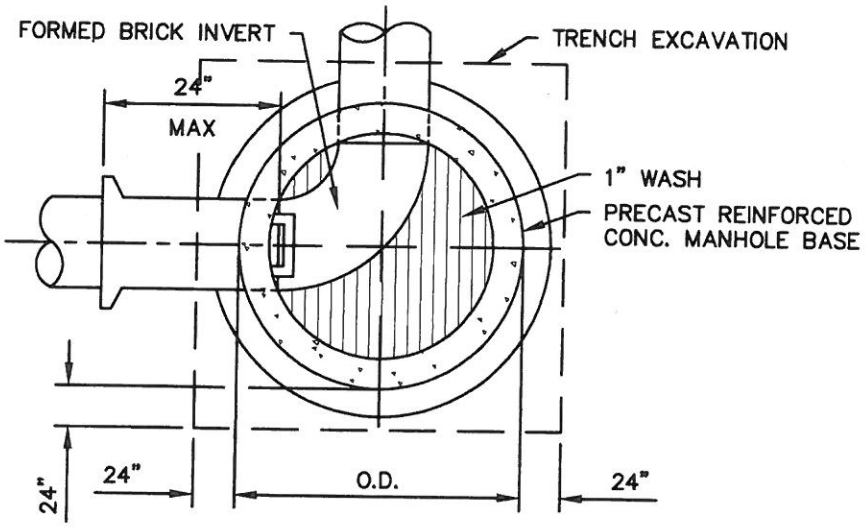
Standard Sanitary Sewer Requirements

Date: 2013 | Scale: No Scale



NOTES:
1. ALL LIFTING HOLES TO BE PLUGGED IN AND OUT WITH HYDRAULIC CEMENT

TOWN OF NORTH KINGSTOWN	Figure NK-3 SEWER MANHOLE DETAIL	
	Standard Sanitary Sewer Requirements	
	Date: 2013	Scale: No Scale

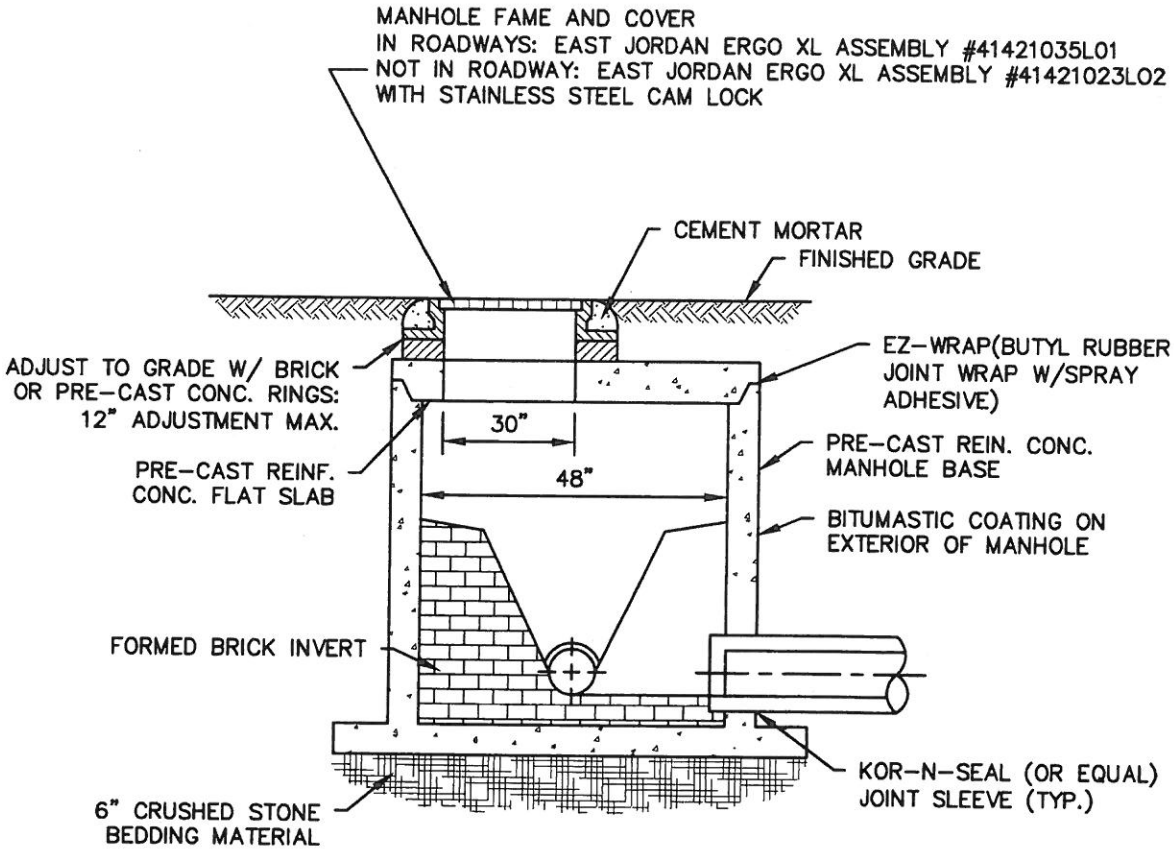


TOWN OF
NORTH KINGSTOWN

Figure NK-4
PRECAST MANHOLE DETAIL

Standard Sanitary Sewer Requirements

Date: 2013 | Scale: No Scale



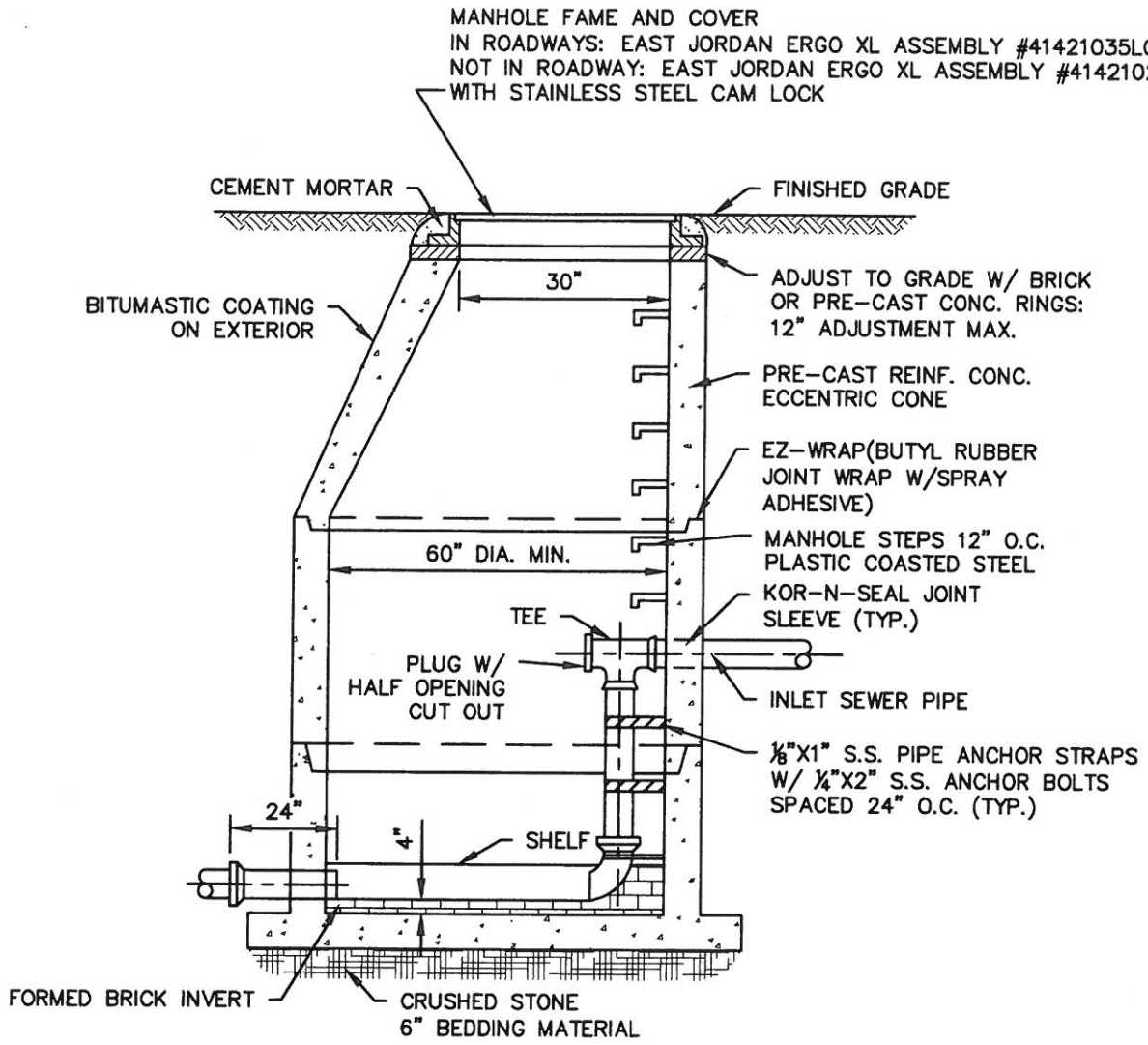
NOTES:
1. SHALLOW MANHOLES SHALL BE PROVIDED ONLY WHERE THE VERTICAL HEIGHT OF THE MANHOLE IS LESS THAN 6'-0"
2. ALL LIFTING HOLES TO BE PLUGGED IN AND OUT WITH HYDRAULIC CEMENT

TOWN OF NORTH KINGSTOWN

Figure NK-5
SANITARY SHALLOW MANHOLE DETAIL

Standard Sanitary Sewer Requirements

Date: 2013 | Scale: No Scale



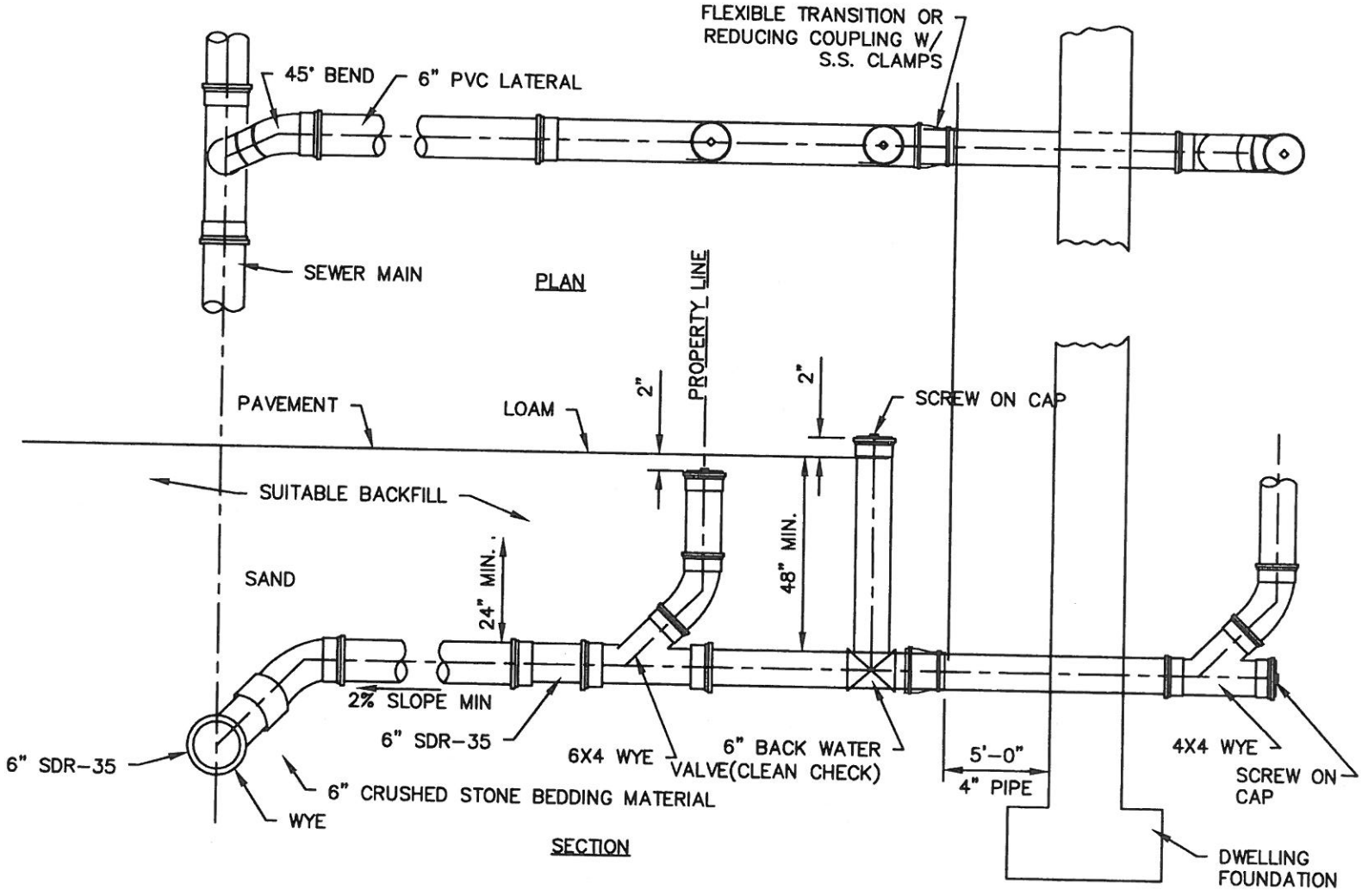
NOTES:
1. ALL LIFTING HOLES TO BE PLUGGED IN AND OUT WITH HYDRAULIC CEMENT
2. DROP PIPE SHALL BE PVC AND SAME SIZE AS INLET SEWER

TOWN OF NORTH KINGSTOWN

Figure NK-6
INSIDE DROP SANITARY MANHOLE

Standard Sanitary Sewer Requirements

Date: 2013 | Scale: No Scale



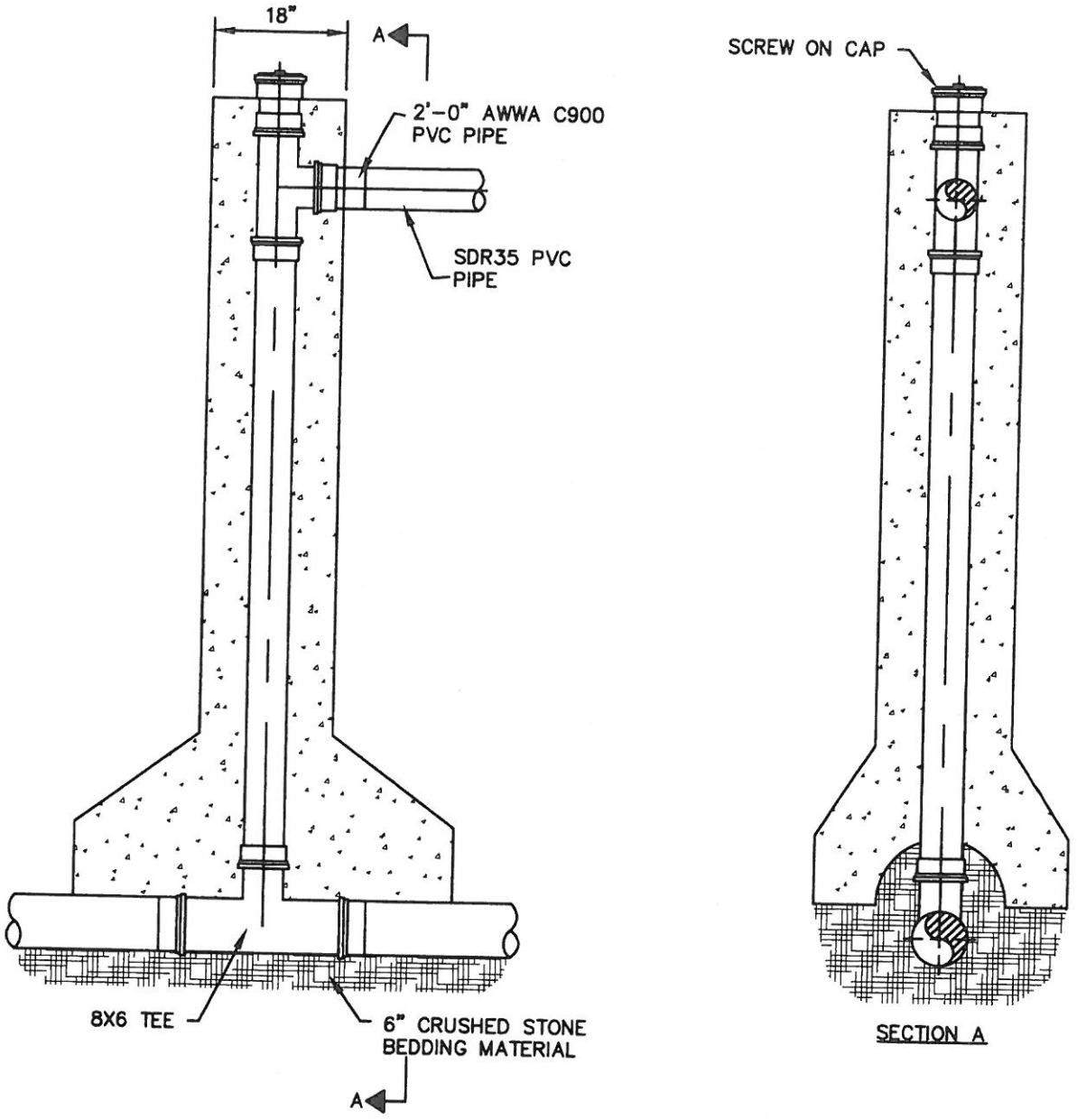
TOWN OF
NORTH KINGSTOWN

Figure NK-7
STANDARD HOUSE CONNECTION DETAIL

Standard Sanitary Sewer Requirements

Date: 2013

Scale: No Scale



NOTES:
1. FOR AN EXISTING SEWER MAIN THAT DOES NOT HAVE A TEE INSTALLED, THE CONTRACTOR SHALL INSTALL A TEE

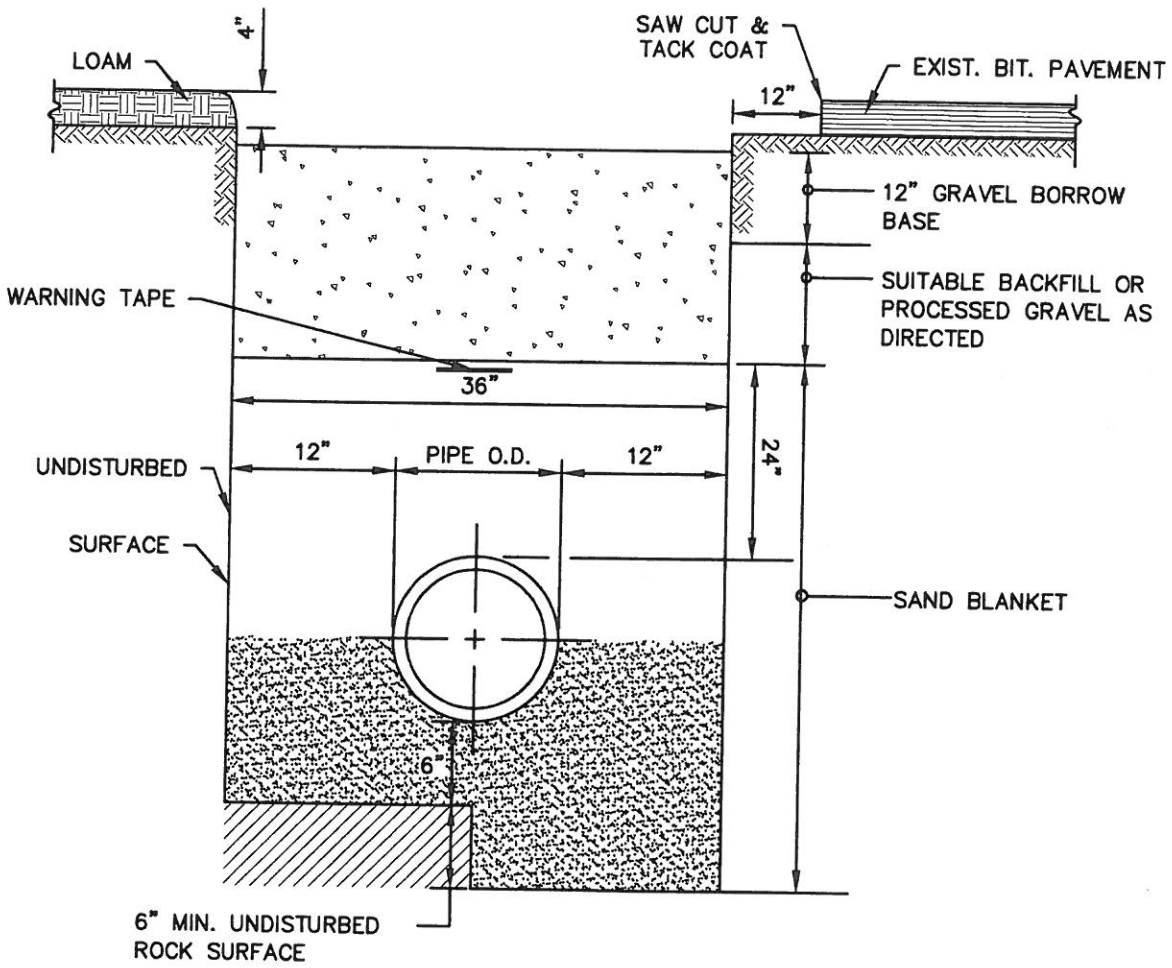
TOWN OF
NORTH KINGSTOWN

Figure NK-8
STANDARD DEEP HOUSE CONNECTION

Standard Sanitary Sewer Requirements

Date: 2013

Scale: No Scale



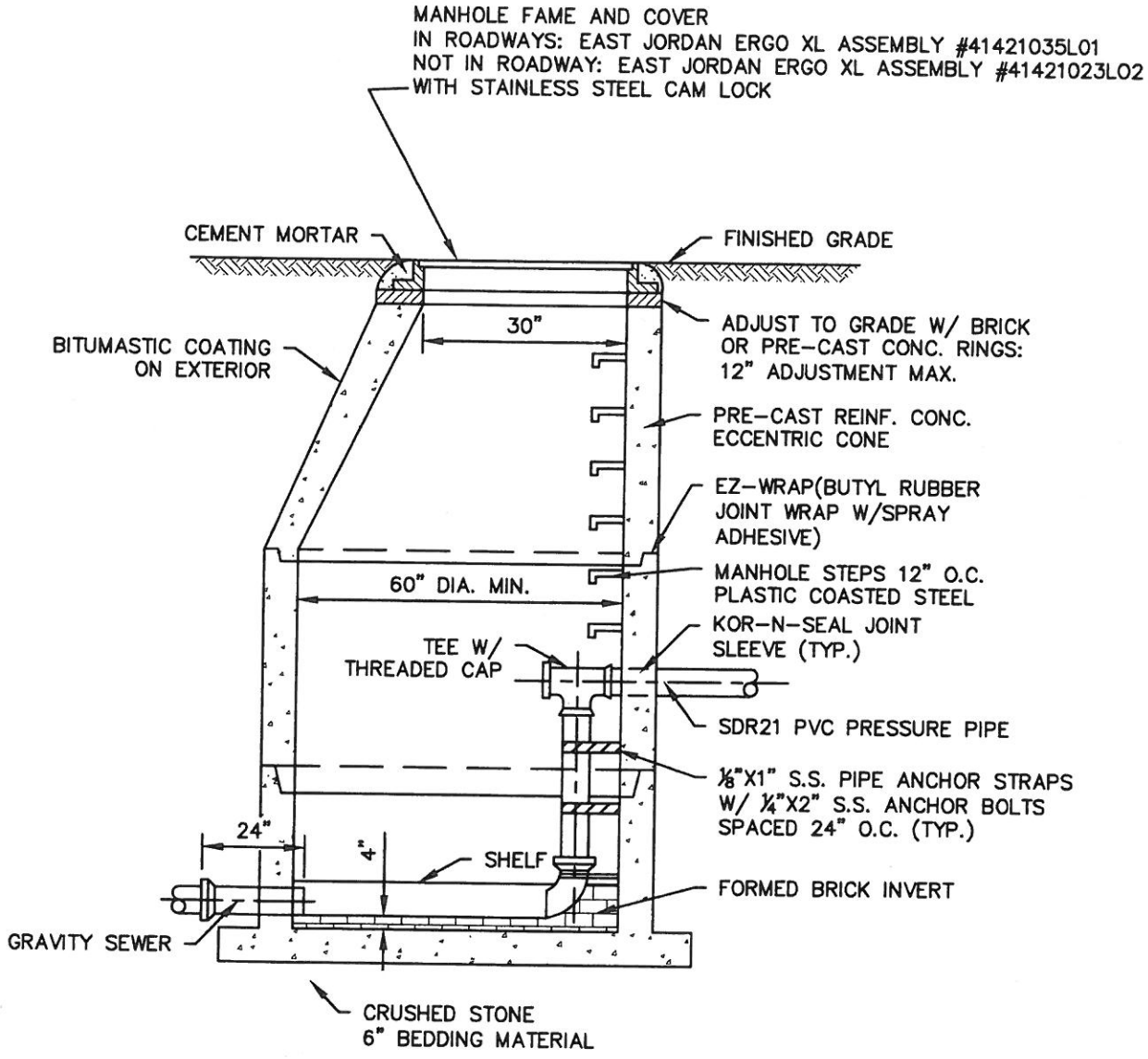
NOTES:
1. MINIMUM DEPTH OF COVER SHALL BE 4'–0"
2. WHEN IN GROUND WATER SEE DETAIL B–2
3. PAVEMENT RESTORATION SHALL CONFORM TO THE DEPARTMENT OF PUBLIC WORKS REQ.

TOWN OF
NORTH KINGSTOWN

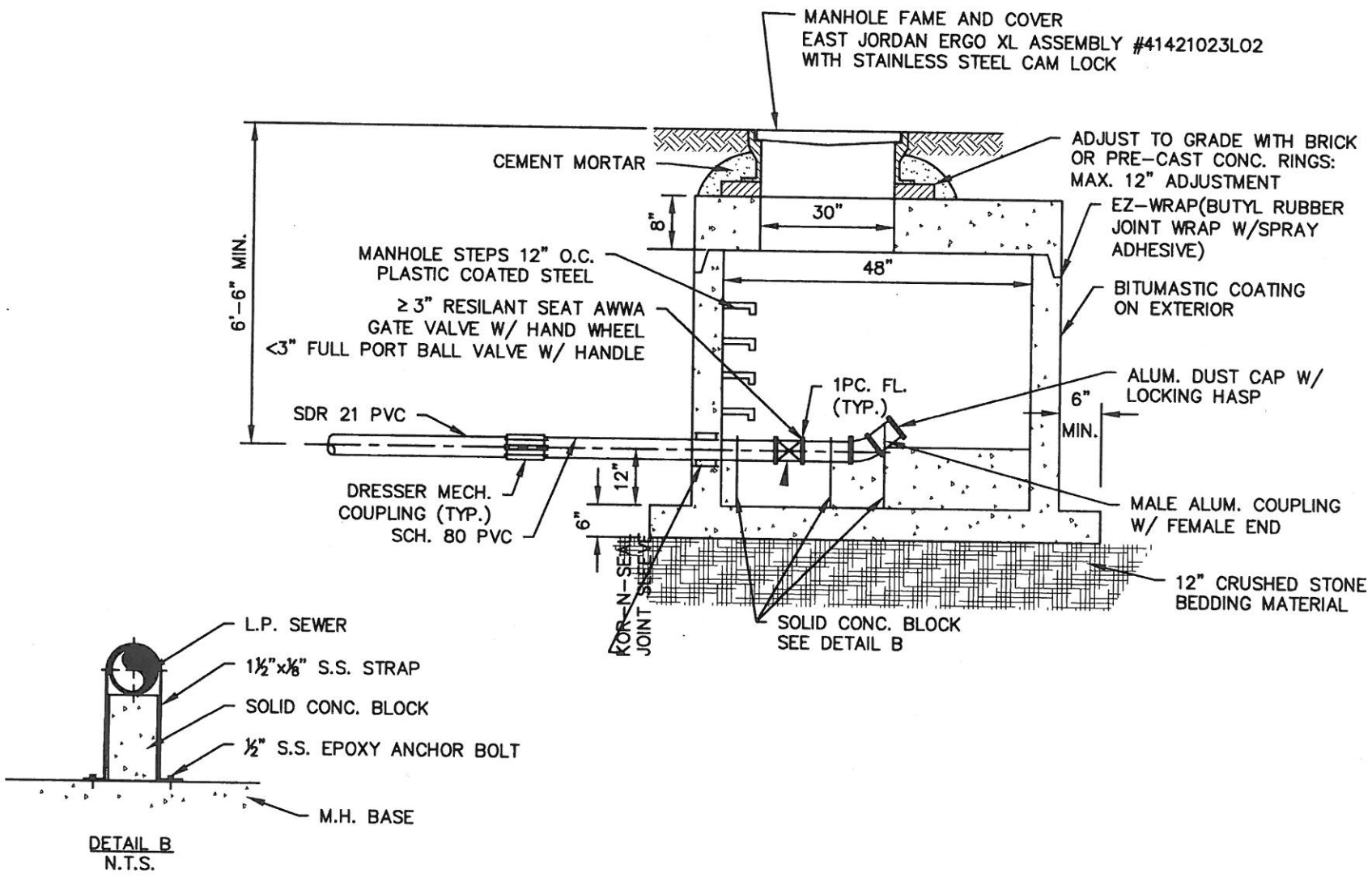
Figure NK-9
LOW PRESSURE SEWER TRENCH

Standard Sanitary Sewer Requirements

Date: 2013 | Scale: No Scale



TOWN OF NORTH KINGSTOWN	Figure NK-10 LOW PRESSURE SEWER INSIDE DROP MANHOLE	
	Standard Sanitary Sewer Requirements	
	Date: 2013	Scale: No Scale

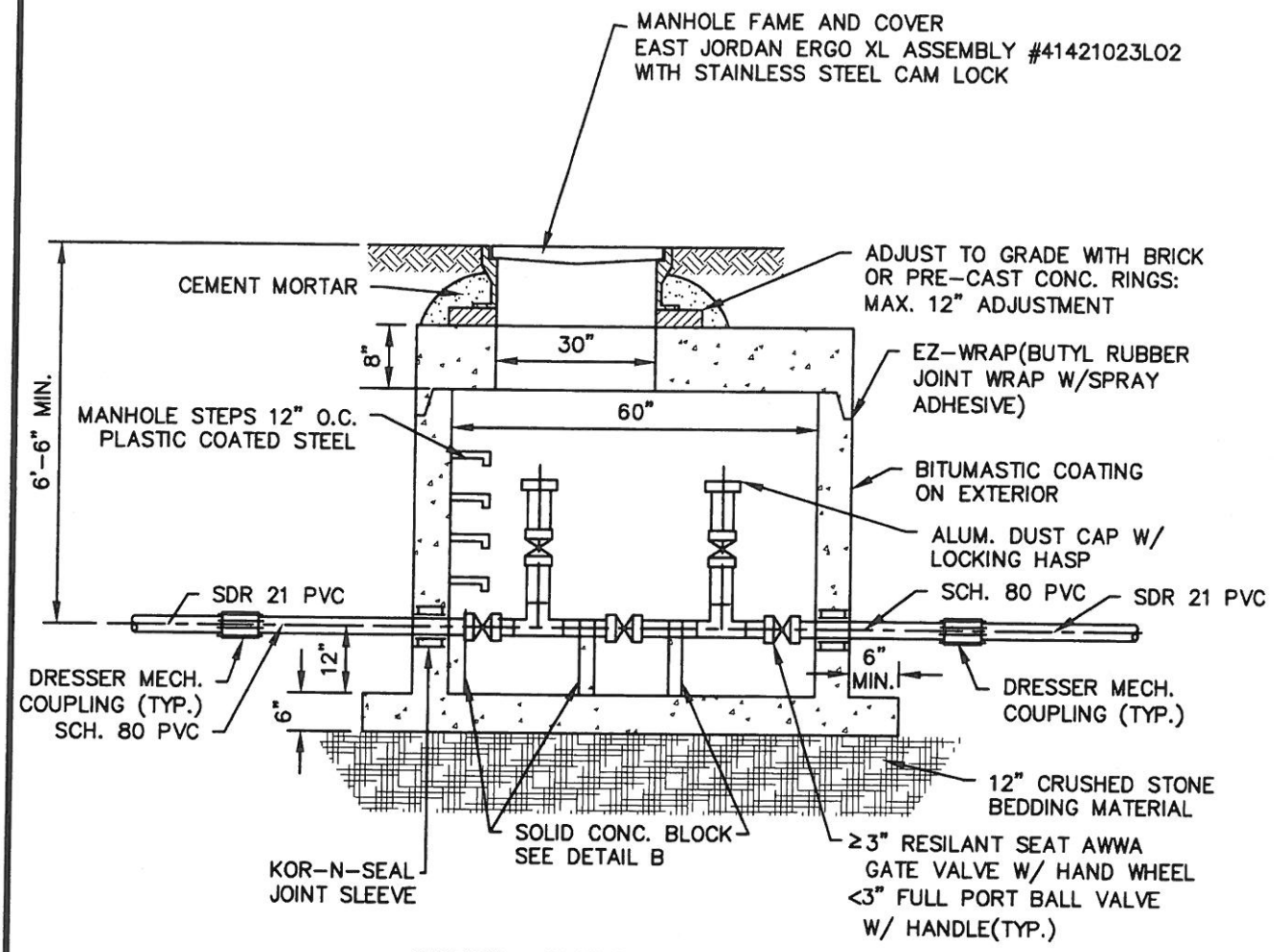


TOWN OF
NORTH KINGSTOWN

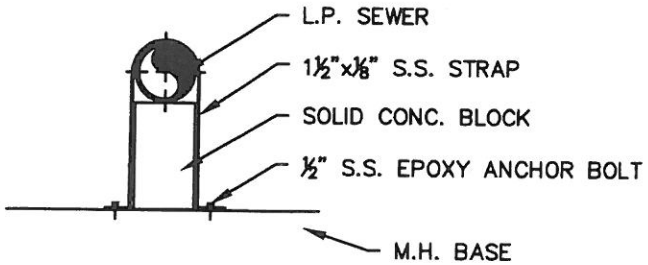
Figure NK-11
LOW PRESSURE TERMINAL END FLUSHING CONNECTION

Standard Sanitary Sewer Requirements

Date: 2013 | Scale: No Scale



SECTION – IN LINE FLUSHING CONNECTION
N.T.S.



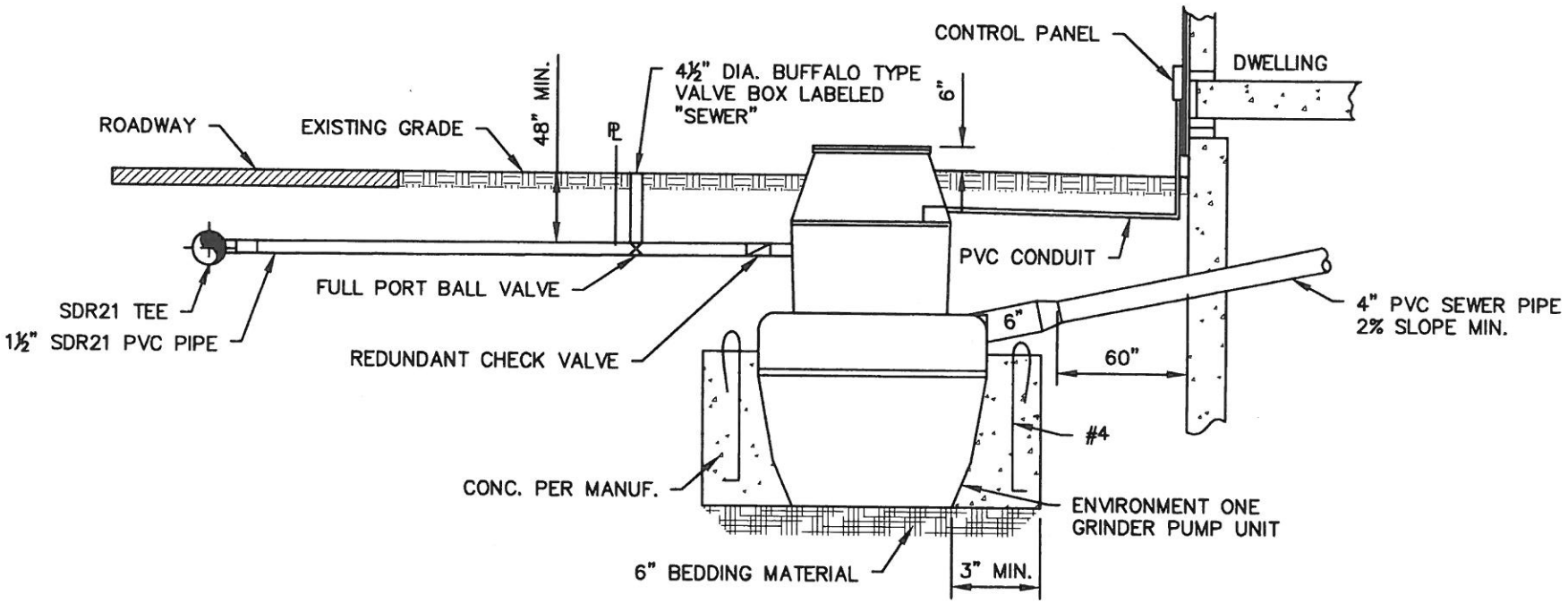
DETAIL B
N.T.S.

TOWN OF
NORTH KINGSTOWN

Figure NK-12
LOW PRESSURE IN-LINE STRAIGHT
THROUGH FLUSHING CONNECTION

Standard Sanitary Sewer Requirements

Date: 2013 | Scale: No Scale



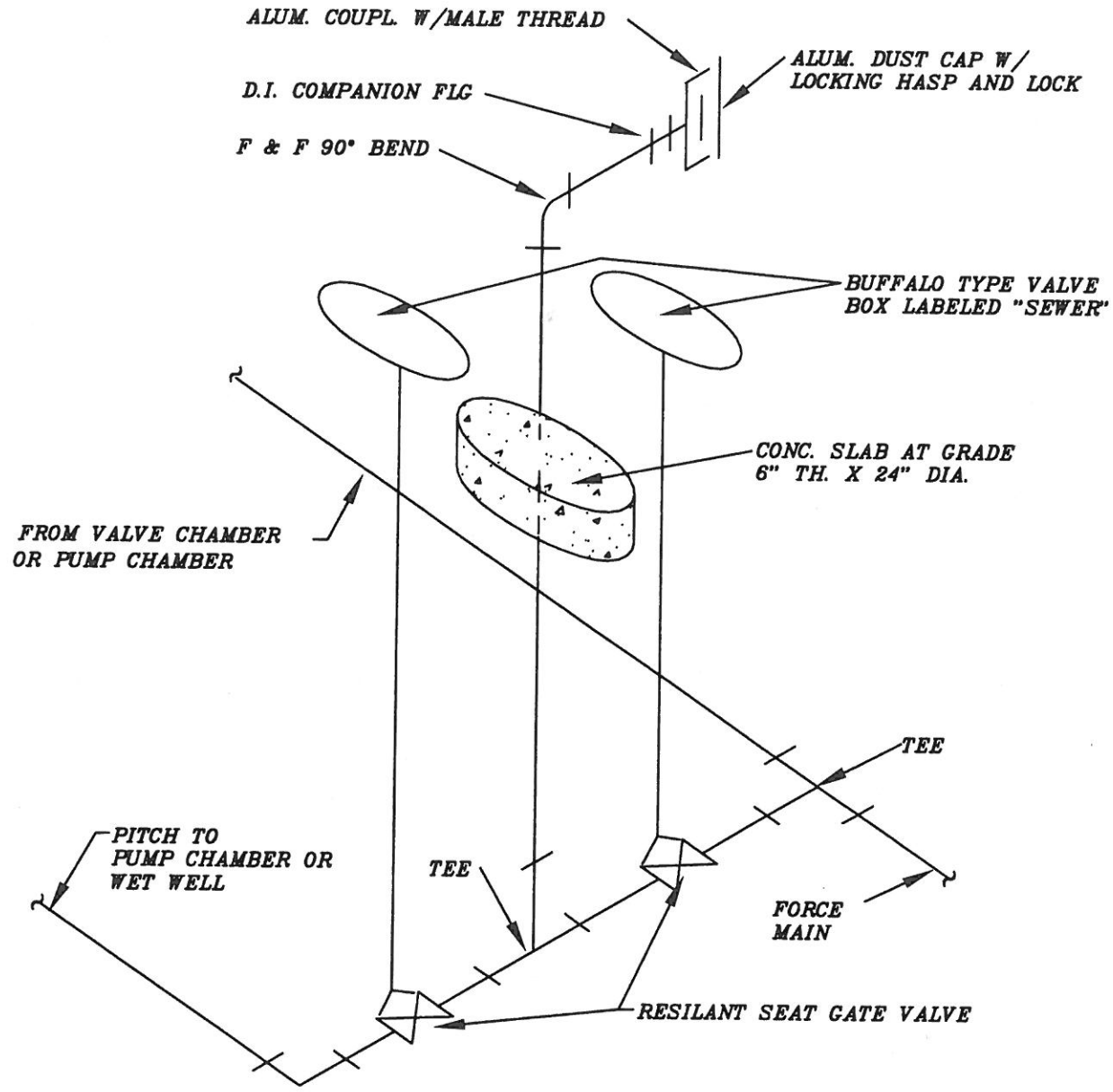
TOWN OF
NORTH KINGSTOWN

Figure NK-13
LOW PRESSURE SEWER SERVICE CONNECTION

Standard Sanitary Sewer Requirements

Date: 2013

Scale: No Scale



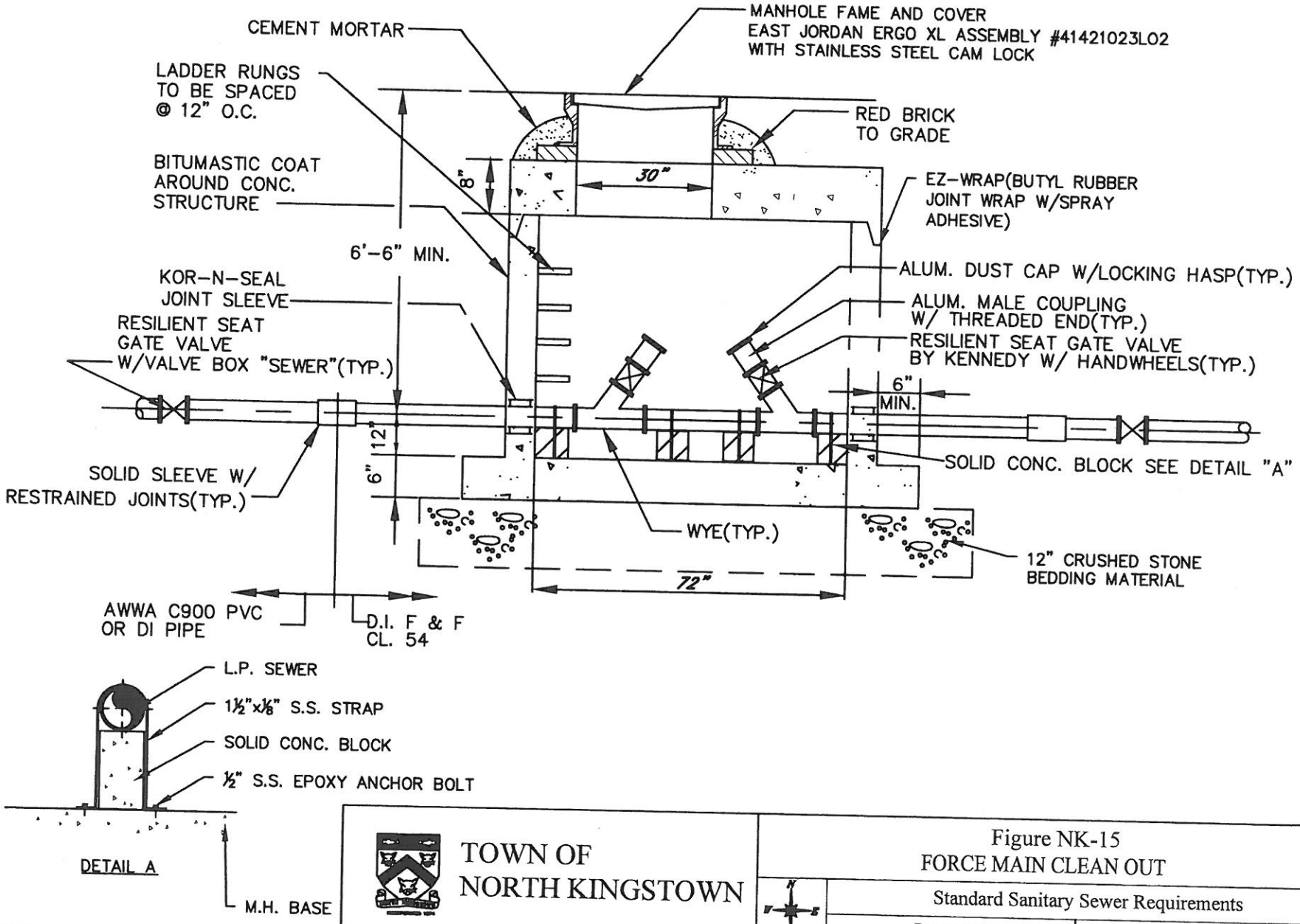
NOTE:
PROVIDE ONE VALVE KEY

TOWN OF NORTH KINGSTOWN

Figure NK-14
BYPASS PUMPING CONNECTION AT PUMP STATION

Standard Sanitary Sewer Requirements

Date: 2013 | Scale: No Scale



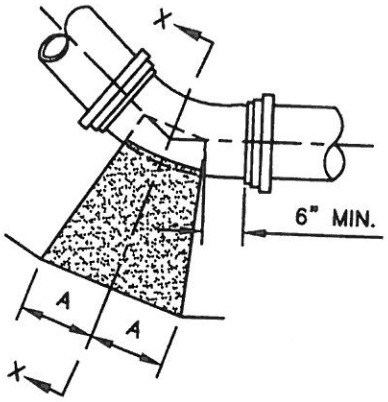
TOWN OF
NORTH KINGSTOWN

Figure NK-15
FORCE MAIN CLEAN OUT

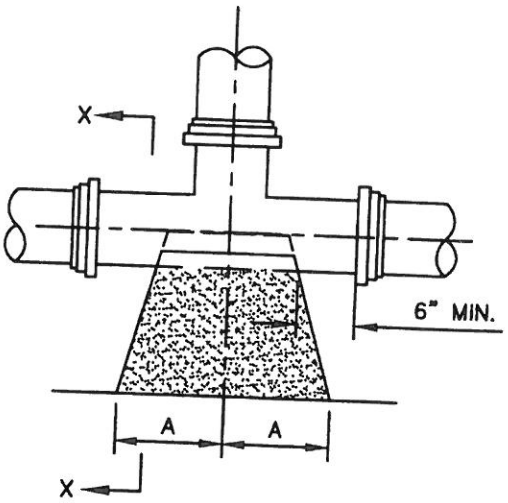
Standard Sanitary Sewer Requirements

Date: 2013

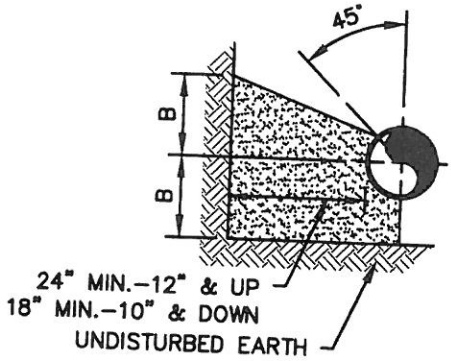
Scale: No Scale



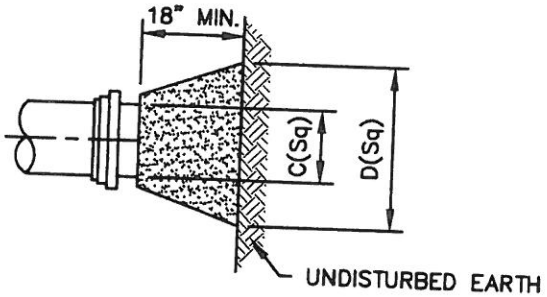
PLAN
BENDS



PLAN
TEES



SECTION X–X
BENDS & TEES



PLAN & ELEVATION
PLUGS

TYPE	SIZE	1/4 BENDS		1/8 BENDS		1/16 BENDS		TEES		PLUGS	
		A	B	A	B	A	B	A	B	C	D
TYPE 1 4000 PSF SOIL	6"	5"	10"	6"	8"	3"	8"	8"	8"	10"	15"
	8"	12"	12"	8"	10"	5"	9"	9"	12"	12"	20"
	10"	16"	14"	10"	12"	6"	10"	11"	14"	14"	25"
	12"	19"	16"	12"	14"	8"	11"	14"	16"	16"	30"
	14"	23"	18"	14"	16"	10"	12"	16"	18"	18"	34"
	16"	26"	20"	16"	18"	11"	13"	18"	20"	20"	38"
TYPE 2 2000 PSF SOIL	6"	16"	10"	9"	10"	6"	8"	10"	12"	10"	21"
	8"	22"	13"	12"	13"	8"	10"	13"	16"	12"	29"
	10"	26"	17"	14"	17"	10"	13"	16"	20"	14"	36"
	12"	29"	21"	16"	21"	11"	16"	18"	24"	16"	41"
	14"	35"	24"	19"	24"	12"	20"	22"	27"	18"	48"
	16"	38"	27"	21"	27"	12"	24"	24"	30"	20"	54"

TOWN OF
NORTH KINGSTOWN

Figure NK-16
THRUST BLOCKS

Standard Sanitary Sewer Requirements

Date: 2013

Scale: No Scale