

**BOLTON LAKES REGIONAL
WATER POLLUTION CONTROL AUTHORITY**



**DESIGN AND CONSTRUCTION STANDARDS
FOR
SANITARY SEWERS**

222 Bolton Center Road
Bolton, CT 06043
(860) 649-8066

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GENERAL POLICIES

This *Design and Construction Standards for Sanitary Sewers* is to be used as a supplement to *Sewer Rules and Regulations and Sewer Connection and Extension Policy & Procedure* also published by The Bolton Lakes Regional Water Pollution Control Authority (BLRWPCA). Issues regarding bonding, insurance certificate requirements, disclaimers, indemnification, proper licensing, and other policies can be found in the above mentioned publications by the BLRWPCA.

Failure of the permit applicant to comply with these and other regulations, standards, policies, or procedures will make the applicant subject to suspension of the current and/or future permits authorized by the BLRWPCA.

CONTAINED HEREIN

The BLRWPCA Specifications and Design Standards contained herein provide minimum requirements. Specialized instances may require increased and/or supplemental levels of construction. Portions of the *Regulations and Technical Standards for Subsurface Disposal Systems* published by State of Connecticut Department of Public Health are included in Appendix A.

SPECIFICATIONS

BOLTON LAKES SEWER PROJECT

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PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Excavating and backfilling for structures.
 - 2. Excavating and backfilling trenches for utilities.
 - 3. Excavating and backfilling test pits.
 - 4. Disposal of unsuitable material.
 - 5. Disposal of surplus suitable material, if required.
 - 6. Disconnecting, capping or sealing, and abandoning site utilities in place.

1.2 DEFINITIONS

- A. Backfill: Soil materials used to fill trench, structure or pit excavations.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe. Also see bedding course.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe, and material placed beside and over pipe in a trench, including haunches, to support sides of pipe.
- C. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
- D. Excavation: Removal of material encountered above subgrade elevations.
 - 1. Additional Excavation: Excavation below subgrade elevations or indicated dimensions as directed by BLRWPCA.
 - 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by BLRWPCA. Unauthorized excavation, as well as remedial work directed by BLRWPCA, shall be without additional compensation.
- E. Fill: Soil materials used to raise existing grades.
- F. Gravel Fill: Soil materials that conform to a specific gradation that are used to promote drainage and soil structure.
- G. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cubic yard.

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- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, base course, or topsoil materials.
- J. Utilities include on-site underground pipes, conduits, ducts, and cables.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Each type of warning tape.
- B. Material Certificates: From a qualified testing agency indicating compliance of the materials with requirements indicated.
 - 1. Gravel fill.
 - 2. Rolled Gravel Base.
 - 3. Processed Aggregate Base.
 - 4. 3/4-inch Crushed Stone.
 - 5. Bedding Material.
- C. Test Drilling Information. Submit test drilling data and plans/profiles indicating depth of rock. Submit prior to beginning sewer pipe installation.
- D. For Record Purposes.
 - 1. Dewatering Plan: Identify location and duration of system, and process for removing particulate matter from pumped or drained water.
 - 2. Excavation Protection System: Proposed system and design data in accordance with OSHA regulations 1926.652.C.
 - a. For each excavation 20 feet or deeper, submit an excavation protection system design certified by a professional engineer registered in the State of Connecticut.
 - b. Include temporary shoring required to perform the work in accordance with OSHA required slopes. Provide plans and engineering calculations for any required temporary shoring and slopes stamped by a Connecticut Professional Engineer.
 - 3. Blasting Video Survey and Report: Performed by an independent professional engineer, sufficiently detailed, of existing conditions of structures, adjoining construction, and site improvements.
 - a. Perform pre-blasting and post-blasting survey.
 - b. Provide audio narration, including location of each site improvement.

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- c. Format: DVD.
- d. Copies: Two, minimum.
- 4. Blasting Permit. Submit two copies.
- 5. Blasting Log. Submit to BLRWPCA two copies of blasting log. Include the following information:
 - a. Location of blasting operation.
 - b. Time and date of blasting.
 - c. Number of holes.
 - d. Amount and type of explosives used per hole.
 - e. Names of persons, companies, corporations, or utilities who own, lease or occupy property or structures in proximity to the intended site of explosive use.
 - f. Seismograph readings
 - g. Peak particle velocities and airblast overpressures resulting from each blast at locations adjacent to nearest structure from blast.

1.4 QUALITY ASSURANCE

- A. Perform excavation operations in accordance with OSHA Regulations 1926.651 and 1926.652.
- B. Utility Owners. Perform excavations within the vicinity of utilities in accordance with utility owner regulations and requirements, with specific attention to blasting or rock removal applications.
- C. Right-of-Ways. Perform excavations within the Local ROW and easements in accordance with local regulations and requirements, with specific attention to blasting or rock removal applications.
- D. Perform blasting in accordance with applicable laws, rules, ordinances and regulations governing transportation, storage, handling and use of explosives including OSHA Regulations 1926, Subpart U, and the requirements of State of Connecticut Department of Safety, Division of Fire and Building Safety.
 - 1. Use a qualified blasting expert licensed by the State of Connecticut with similar experience in rock excavation and controlled blasting techniques.
 - 2. Familiarize blaster with existing condition video survey.
- E. Testing Agency: Engage a qualified independent geotechnical engineering testing agency to perform field quality-control compaction testing.
 - 1. The testing agency must be approved by the BLRWPCA.

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1.5 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities unless permitted in writing by the utility owner and BLRWPCA and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify the utility owner and BLRWPCA not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without the utility owner and BLRWPCA's written permission.
 - 3. Contact "Call-Before-You-Dig" at 1-800-922-4455 before excavating. Proceed with excavation only after utility completes marking of utility locations.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.
- C. Abandon on site existing underground utilities indicated to be abandoned. Coordinate with utility companies to shut off services if lines are active.
- D. Extent of trench excavation and excavated areas will be controlled by site conditions and BLRWPCA's requirements.
- E. Place excavated material, backfill and equipment a minimum of 2 feet from edge of excavation. Cast excavated material so as not to interfere with ordinary use of the traveled way.
- F. Remove and immediately dispose of unsuitable excavated material.
- G. All excavations made within the Municipal right-of-ways or easements shall be closed and protected during non work hours. Steel plates may be used in lieu of backfill material. All excavations will be made in compliance with Municipal Permit restrictions.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory native soil materials are not available from excavations.
- B. Satisfactory Soils: Free of debris, waste, frozen materials, vegetation, clay and other deleterious matter; adequately graded for satisfactory compaction.
 - 1. On-Site Material: Native soil additionally free of organic matter, roots, and stones larger than 3 inches in any dimension, subject to approval by the BLRWPCA.
 - 2. Borrow: Free of rock or gravel larger than 3 inches in any dimension; Form 816, Section M.02.01, Grading A.

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- C. Backfill and Fill: Satisfactory soil materials.
- D. Gravel Fill: Naturally or artificially graded mixture of natural or crushed gravel, broken or crushed stone, and natural or crushed sand; Form 816, Section M.02.06, Grading A.
- E. Bedding (Pipe, Conduit, and Utilities):
 - 1. Gravel:
 - a. For Low Pressure Sewer Systems
 - 1) ASTM D2487, GW or GP and contains less than 5% passing the #200 sieve.
 - a) For 6 to 8 inch diameter pipes: 3/4 inch maximum particle size.
 - b) For Pipes 4 inches or less in diameter: 1/2 inch maximum particle size.
 - 2. Sand: Form 816, Section M.08.01-21.
 - 3. Crushed Stone: Form 816, Section M.01.01, size as indicated
- F. Impervious Earth Material:
 - 1. Clayey soil that when dry passes at least 15 percent of its total weight through a No. 100 sieve.
- G. Bentonite Grout:
 - 1. Bentonite Grout certified to ANSI/NSF Standard 60

2.2 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 5 mils thick, continuously inscribed with a description of utility, with solid aluminum foil core encased in a protective jacket for corrosion protection.
 - 1. Detectable Underground Utility Marking Tape by Pro-Line Safety Products Company;
 - 2. Detectable Utility Tape by Everett J. Prescott, Inc;
 - 3. Approved equal.
 - 4. Identifying Colors for Utilities:
 - a. Red: Electric.
 - b. Yellow: Gas, oil, steam, and dangerous materials.
 - c. Orange: Telephone and other communications.
 - d. Blue: Water systems.
 - e. Green: Sanitary sewer and storm drain systems.

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- B. Filter Fabric:
 - 1. Minimum Tensile Strength: 90 pounds.
 - 2. Minimum Elongation: 50 percent.
 - 3. Flow Rate: 150 gpm/sq.ft.
 - 4. Minimum Ultraviolet Resistance: 70 percent at 150 hours.
 - a. Petromat 4599 by Amoco Fabrics & Fibers
 - b. Terra Tex NO4 by Webtec, Inc.
 - c. Approved equal.
- C. Lumber: Sound, straight grained spruce or fir, free from shakes, loose knots, and other defects liable to impair its strength or durability. Used shoring may be reused if in good condition.
- D. Excavation Protection Systems: OSHA 1926.652.

PART 3 - EXECUTION

3.1 GENERAL

- A. Reuse excavated material wherever possible, unless other material is indicated on the Drawings or specified. Stockpile suitable excavated material in an appropriate location for reuse on an ongoing basis until the project is complete.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect subgrades and foundation soils against freezing temperatures or frost.
- C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- D. Test Pits
 - 1. Excavate test pits where directed by the BLRWPCA to determine location of existing utilities and structures.
 - 2. Backfill test pits immediately after locating and identifying utility or structure relative to the project benchmarks.
 - 3. Excavate and backfill pits with hand tools when existing conditions prevent the use of machinery at no additional cost.

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4. Patch test pits within paved roadways with bituminous concrete in accordance with Section "Bituminous Concrete Paving"
 - a. Patch test pits in paved roadways with bituminous concrete.
- E. Test drill project areas where geotechnical data indicates rock excavation will be expected. Expand limits as necessary to determine the extent of existing rock.
 1. Plot on plans/profiles and provide test drilling data to the BLRWPCA prior to beginning sewer pipe installation.

3.3 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding or damaging Project site and surrounding area.
- B. Protect excavations, backfills, fills and subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches. Provide positive drainage of backfill and fill.
 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain dewatering until structures, pipes and appurtenances will not be damaged by surface or ground water. Maintain until dewatering is no longer required.
- C. Conform to the requirements that are detailed in the erosion and sedimentation control plans.
- D. Remove particulate matter from pumped or drained water.

3.4 EXPLOSIVES

- A. Blasting: When Contractor chooses blasting as method of rock excavation, obtain Blasting Permit from Town Fire Marshal a minimum of two weeks prior to blasting.
 1. Use of explosive is not permitted on weekends, holidays, and eve of holiday.
 2. Advise BLRWPCA a minimum of one working day in advance of dates on which blasting will be performed, and provide approximate hour and duration of blasting.
- B. Conduct blasting in accordance with applicable local, state and federal laws and regulations including State of Connecticut Department of Safety, Division of Fire and Building Safety, and OSHA 1926 Subpart U.
 1. Use a qualified blasting expert licensed by the State of Connecticut. Familiarize blaster with existing condition video survey.
 2. Inform property owners and residents within the vicinity of blasting operations.

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3. Conduct baseline sampling of water supply wells prior to beginning blasting activities.
 4. Protect water supply wells from damage or degradation of water quality
 5. Identify and confirm conditions of existing structures before and after blasting operations.
- C. Blasting Limit Criteria:
1. Peak Particle Velocity Limits.
 - a. At existing above grade structures

<u>Distance from Blast to Structure or Watercourse</u>	<u>Maximum Peak Particle Velocity (PPV)</u> <u>(inches per second)</u>
Less than or equal to 100 feet	2.0
100 to 200 feet	1.5
Greater than 200 feet	1.0
 2. Airblast Overpressure Limit: 0.014 psi maximum, measured at nearest above ground, occupied structure.
- D. Blast Monitoring Equipment: Utilize equipment calibrated within 6 months to a standard traceable to National Bureau of Standards, with instrumentation with the following capabilities.
1. Measure peak particle velocity in three mutually components of velocity in directions: vertical, radial and perpendicular to vibration source.
 2. Measure and display maximum peak particle velocity and airblast overpressure immediately after each blast.
 3. Provide permanent time history of particle velocity and airblast overpressure waveforms.
- E. The use of explosive materials that contain perchlorate will not be permitted.
- F. The contractor shall be responsible for the satisfactory resolution of all water supply issues during construction.
1. Includes supplying temporary water as needed to the affected party at no additional cost
 2. Includes the reestablishment of a permanent water supply of equal or better quality that pre-existed construction activities

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3.5 UTILITIES

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed or abandoned in place.
- B. Existing Utilities: Do not interrupt utilities unless authorized under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify utility owner and BLRWPCA not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without utility owner and BLRWPCA's written permission.
- C. Abandoned Piping: Close open ends of abandoned underground piping. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed.
 - 1. Close open ends of piping with caps, plugs, or other manufactured products designed for plugging of below-grade piping for size and type of pipe being closed. Do not use wood plugs.
- D. Abandoned Structures: Excavate around structure as required and use one procedure below:
 - 1. Remove structure and close open ends of remaining piping.
 - 2. Remove top of structure down to at least 24 inches below final grade.
 - a. Puncture or break bottom slab of structure to facilitate drainage.
 - b. Backfill with concrete.

3.6 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including soil materials, and obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials, replace with satisfactory soil materials.
 - 2. Excavate abandoned in-place utilities as required to complete the work. Incidental concrete (structures) shall be considered rock and measured for payment
- B. Remove and dispose of pavement in accordance with Section "Site Clearing".
- C. Rock Excavation: Excavate rock where required to permit construction, within horizontal pay limits and to indicated or directed depth.
 - 1. Rock excavation includes removal of rock, and if necessary, disposal of rock off-site.

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2. Do not excavate rock until it has been classified and cross-sectioned by BLRWPCA. Quantity of rock will be based upon measurements taken at time of BLRWPCA's inspection.
3. Observe special precautions where rock is encountered close to buildings or other structures or utilities. In some cases, due to proximity of properties including homes, water supply wells, water mains, gas mains, and retaining walls, rock may be required to be removed without the use of explosives.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations. Prepare finished bottom of excavation accurately with hand tools.
 1. Trench shoring and bracing located below the narrow limit of trench must be left-in-place.
- B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit.
 1. Minimum Clearance: As indicated.
- C. Trench Bottoms: Excavate trenches deeper than bottom of pipe elevation to allow for bedding course.
 1. Excavate trenches an additional 2 inches deeper than elevation required in rock or other unyielding bearing material to allow for additional bedding course.

3.8 APPROVAL OF SUBGRADE

- A. Notify BLRWPCA when excavations have reached required subgrade.
- B. If BLRWPCA determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
 1. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by BLRWPCA.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation beneath bottom limits of excavation with gravel fill, sand, bedding material, or concrete as directed by BLRWPCA.

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3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Prevent windblown dust. Provide erosion control measures.
 - 1. Stockpile soil materials 2 feet minimum away from edge of excavations. Do not store within drip line of remaining trees.
 - 2. When excavating in or near a road or walk, place excavated material so as not to interfere with ordinary use of traveled way.

3.11 UTILITY TRENCH BACKFILL

- A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Where indicated, install filter fabric around bedding material.
- B. Place and compact initial backfill of bedding material, to indicated height over the utility pipe or conduit.
 - 1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
 - 2. Pipes 4 Inches and Larger
 - a. After joint of pipe is checked by BLRWPCA, fill bedding material to spring line of pipe and tamp backfill. Do not use wooden sticks, shovel handles and similar make-shift devices as tamping tools.
 - 3. Pipes 2 Inches and Smaller:
 - a. Place and compact bedding material. After joint of pipe is checked by BLRWPCA, fill bedding material to 12 inches above top of pipe.
 - 4. Install layer of filter fabric over top of bedding material.
- C. Place and compact final backfill of satisfactory soil material to final subgrade. Completely embed rocks in soil. Do not place large rocks closer than 24 inches to top of pipe.
- D. Remove stones heavier than 100 pounds from material that is otherwise suitable for backfilling. Do not nest stones in backfill.
- E. Coordinate backfilling with utilities testing.
- F. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.

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G. Install warning tape directly above utilities along centerline of pipe 18 inches above pipe crown.

1. Install detectable warning tape over non-ferrous piping.

3.12 BENTONITE TRENCH DAMS

A. For sanitary sewer open-cut installations, install bentonite trench dams at indicated locations or as directed by the BLRWPCA. Bentonite for non-drilling applications shall be mixed with 2 parts sand.

B. Construct bentonite dams to the minimum thickness. Extend along bottom and sides of trench excavation, and to 6 inches above top of bedding or bedding stone.

1. Install bentonite trench dams along all building service connects at intervals of 100 feet with a minimum of one per service for non-directionally drilled service connection.

C. When filter fabric is used interrupt filter fabric at each dam. Do not extend fabric over dam.

3.13 CLAY TRENCH DAMS

A. For sanitary sewer open-cut installations, clay trench dams may be used in lieu of bentonite. Install clay trench dams at indicated locations or as directed by the BLRWPCA.

B. Construct clay dams to the minimum thickness. Extend along bottom and sides of trench excavation, and to 6 inches above top of bedding or bedding stone.

C. When filter fabric is used, interrupt filter fabric at each dam. Do not extend fabric over dam.

3.14 MOISTURE CONTROL

A. If necessary, uniformly moisten or aerate subgrade and each subsequent backfill layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF BACKFILLS

A. Place backfill and fill materials in layers not more than 12 inches.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

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- C. Compact soil to not less than the following percentages of maximum dry unit weight according to AASHTO T190, Method D:
 - 1. For utility trench bedding material, compact each layer at 90 percent.
 - 2. For utility trench final backfill material, compact each layer at 95 percent.
 - 3. Under structures, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill material at 95 percent.
 - 4. Under roads and walks, compact each layer of backfill or fill material at 95 percent.
 - 5. Under lawn or unpaved areas, compact each layer of backfill or fill material at 90 percent.
- D. For compacting backfill, use equipment specifically designed for compaction purposes, and which provides satisfactory results as approved by the BLRWPCA.

3.16 GRADING

- A. General: Excavate and uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades. Provide temporary transitions/ramps to maintain pedestrian and vehicular traffic during construction.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Lawn or Unpaved Areas: Plus or minus 1 inch, however, not consistently in one direction.
 - 2. Walks: Plus or minus 1 inch.

3.17 FIELD QUALITY CONTROL

- A. Engage testing agency to inspect and test each fill and backfill layer. Proceed with subsequent earthwork operations only after test results for previously completed work comply with requirements.
- B. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable and when directed by the BLRWPCA. Tests will be performed at the following locations and frequencies:
 - 1. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet or less of trench length, but no fewer than two tests.

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- C. When testing agency reports that fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.18 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by BLRWPCA; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off-site.

END OF SECTION

EARTHWORK

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SANITARY SEWERAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Gravity Sewer System
 - a. Sanitary sewer piping and appurtenances for gravity system.
 - b. Sanitary sewer manholes.
 - c. Connections to existing sanitary facilities.
 - d. Service connections.
 - 2. Low Pressure System
 - a. Sanitary sewer piping and appurtenances for low pressure system.
 - b. Low pressure sewer clean out pipes and structures.
 - c. Air-release/vacuum valve, chambers with Odor Control.
 - d. Tee Assembly at intersections.
 - e. Service connections.

1.2 DEFINITIONS

- A. Abbreviations
 - 1. DI: Ductile Iron
 - 2. HDPE: High density polyethylene.
 - 3. PVC: Polyvinyl chloride plastic.
 - 4. LPS: Low pressure sewer.

1.3 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure-Piping and Manhole Pressure Ratings: At least equal to system test pressure.
- B. Low Pressure Piping Ratings: At least equal to system operating pressure, but not less than 160 psig.
- C. Thrust Restraint: In accordance with details shown on the Drawings.

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1.4 SUBMITTALS

- A. Product Certification: Pipe, fittings, precast concrete units, metal items, and miscellaneous appurtenances.
 - 1. Manufacturer shall demonstrate successful product experience of 5 years or more for HDPE pipe and fittings.
- B. Product Data: For the following:
 - 1. Submit manufacturer's catalog cuts, specifications and installation instructions, for pipe and coupling systems.
 - 2. LPS piping QC/QA inspections and testing recommendation from the manufacturer.
 - 3. Pipe, valves, and fittings.
 - 4. Precast concrete units.
 - 5. Metal items.
- C. Shop Drawings: Include plans, elevations, details, and attachments for the following:
 - 1. Precast concrete manholes, including frames and covers.
 - 2. Precast chambers including frames and covers, piping with supports and appurtenances.
 - 3. Thrust Restraint: Indicate method, and minimum length of restraint at each location.
- D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- E. LPS Butt Fusion Testing:
 - 1. Fusion Joint Records. Prepare and submit daily written records of each joint, identifying the following:
 - a. Machine type, serial Number, time, joint number, project number, pipe or pipe and fitting size, joint cycle, date
 - b. Compare actual with permissible values for the following:
 - 1) Bead pressure, joint pressure, drag, heater temperature, bead-up pressure, initial bead size, heat soak time, heat soak time, dwell time (change-over time) and fusion pressure.
 - 2. Submit daily report for a minimum of one week prepared by pipe manufacturer's representative certifying that observed installation meets manufacturer's guidelines.
 - a. Thereafter, submit monthly reports by pipe manufacturer's representative certifying that observed installation meets manufacturer's guidelines until LPS piping has been completely installed.

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F. Record Drawings: Submit record drawings.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with Connecticut Department of Environmental Protection, State Health Department, Public Health Code regulations the following:
1. For gravity-sewer, main line or service connection, provide PVC pressure pipe in accordance with AWWA C900 when installed within 25 feet of private well that yields 10 gal per minute or less.
 2. For gravity-sewer, main line or service connection, provide PVC pressure pipe in accordance with AWWA C900 when installed within 75 feet of private well that yields greater than 10 gal per minute.
- B. Sewer and Water Line Separation. Perform work in accordance with New England Interstate Water Pollution Control Commission (NEIWPCC) Technical Report Number 16, and the following.
1. Horizontal Separation from Water Mains: 10 feet minimum.
 - a. If existing conditions prevent 10-foot horizontal separation, install sewer in separate trench with top (crown) of sewer 18 inches below the bottom (invert) of existing water main.
 2. Vertical Separation at Crossing of Sewer and Water Main. Install top of sewer 18 inches below bottom of water main. Locate sewer joints equidistant from water main joints, and install sewer joints at a maximum distance from water main joints.
 - a. If existing conditions prevent minimum vertical separation, reconstruct water main for 10 feet beyond crossing; or relocate water main.
 - 1) Center one full-length of water main piping over sewer.
 - b. Where a water main crosses under a sewer, provide adequate structural support for sewer to maintain line and grade.
 3. When horizontal or vertical separation cannot be achieved, construct watertight, structurally-sound sewer system and water main of mechanical-joint cement-lined ductile iron pipe or approved equal.
- C. All piping, fittings and appurtenances shall be new, clean, and in accordance with material specifications. Damaged or unspecified materials are not acceptable.
- D. Fusion Joining Training: Prior to commencing work, a qualified pipe manufacturer's representative will be required to thoroughly train the Contractor's personnel, BLRWPCA, and Owner's Representative in the proper butt fusion and electro-fusion processes

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1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic structures, pipe, and fittings in direct sunlight. Keep plastic items at ambient outdoor temperature.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Inspection: Upon delivery of pipe, assist BLRWPCA in inspecting pipe.
 - 1. Any pipe section with a gash, blister, abrasion, nick, scar, or other deleterious fault greater in depth than 10 percent of the wall thickness shall be construed as damaged, must not be used, and must be removed from the site.
 - 2. Rejection of Manufacturer and Product: Remove all pipe supplied by a manufacturer if more than five percent of shipment is rejected.
- D. Do not drag pipe along the roads. Pipe shall be placed on skids while transporting from one location to another.
- E. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

- A. Connect sanitary sewer pipe to existing sewer system with active sewage flow.
- B. Coordinate installation of gravity and low pressure sewers in street right-of-way or easement with existing utilities. Complete the Work and prepare record drawings of street work, indicating field location, elevations, slopes, and inverts.

PART 2 - PRODUCTS

2.1 GRAVITY SEWER SYSTEM

- A. PVC Sewer Pipe and Fittings: According to the following:
 - 1. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, for gasketed joints.
 - 2. Gaskets: ASTM D 3212, elastomeric seals; resistant to common sewage and industrial wastes including oil and groundwater.
 - 3. PVC Pipes shall be push-on bell and spigot joints. Straight pipe will be furnished in lengths not more than 13 feet, unless otherwise indicated on the plans.
- B. PVC Pressure Pipe: AWWA C900, Class 150, for gasketed joints.
 - 1. PVC Pressure Fittings: AWWA C907, for gasketed joints; resistant to common sewage and industrial wastes.

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2. Gaskets for PVC Piping: ASTM F 477, elastomeric seals; resistant to common sewage and industrial wastes.

C. HDPE Pipe: See Article herein "Low Pressure Sewer System."

2.2 SPECIAL PIPE COUPLINGS AND FITTINGS

A. SDR35 PVC to C900 Couplings: Harrington Corporation, HARCO, or approved equal.

- a. Working Pressure: 150 psi.
- b. PVC Compound: ASTM D1784.
- c. Gaskets: ASTM F477.

B. Transition Couplings for Ductile Iron to HDPE: Ductile iron, ASTM A536, Grade 65-45-12.

1. Gaskets: AWWA C111, rubber for sewer service.
2. Bolts and Nuts: AWWA C111, high strength low-alloy steel.
3. Finish: Shop coat paint.

C. Flexible Sewer Coupling: Fernco or approved equal for lateral connections.

2.3 PRECAST CONCRETE STRUCTURES

A. Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated.

1. LPS Manhole Gaskets: C990 rubber joints
2. Base: Monolithic combination base and riser section. Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation. Fabricate pipe openings and sleeves to accommodate outside diameter of pipe to be connected.
3. Riser Sections: Lengths to provide depth indicated.
4. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches diameter of grade rings.
5. Grade Rings: Reinforced-concrete rings, maximum of 4-inch total thickness, that match diameter of frame and cover.
6. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast into sidewalls with steps at 12- to 16-inch intervals.
 - a. M.A. Industries, Model PS-2-PF-SL;
 - b. Press Seal Gasket, Model 14850;
 - c. Or equal.

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7. Waterproofing: Bay oil / precaster's standard.
- B. Chambers: ASTM C 913, precast, reinforced concrete, of depth and shape indicated.
 1. Joint sealant is butyl rubber mastic type seal that conforms to latest AASHTO specification M-198.
 2. The chamber shall be designed for H-20 loading.

2.4 STRUCTURE AND PIPE CONNECTORS

- A. New Structures: ASTM C923, resilient, of size required, for each pipe connecting to manhole section.
 1. Lock Joint Flexible Manhole Sleeve by Interpace Corporation;
 2. KOR-N-SEAL;
 3. Or approved equal
- B. Existing Structures: ASTM C923, resilient, of size required, for each pipe connecting to manhole section.
 1. KOR-N-SEAL;
 2. Kwik-Seal;
 3. Or approved equal.

2.5 STRUCTURE ACCESSORIES

- A. Flexible Annular Space Filler: Manufactured by KOR-N-SEAL, Interpace Corp., or approved equal.
- B. Frames and Covers:
 1. Bolton
 - a. ASTM A 48, Grade 30, gray cast-iron. Include diamond design with "SEWER" lettering 3-inches high cast into cover.
 - 1) Paved Areas: Standard manhole frame and cover.
Manufacturers:
 - a) LeBaron Foundry, LA328
 - b) Campbell Foundry, Patten No. 1012B
 - c) Or approved equal.
 - 2) Off-Road: Bolted and gasketed frame and cover.
Manufacturers:
 - a) LeBaron Foundry, LB 328
 - b) Campbell Foundry, Pattern No. 1503

- c) Or approved equal.

2.6 SEWER CHIMNEY

- A. Chimney: Precast concrete transferring sewage flows from a higher elevation service connection line to a lower elevation mainline pipe. Transfer vertical chimney loads to base through a captive seal slide unit. Include an elastomeric seal within a PVC sleeve within monolithic bridge section of sewer chimney. Base units shall accept PVC lateral tee, AWWA C900.
- B. The materials incorporated into the precast chimney shall be 4,000 psi concrete, cement per ASTM C150, reinforcing per ASTM A615, captive "O" rings and captive seal unit gaskets shall be vulcanized natural rubber or vulcanized synthetic rubber and PVC fittings per ASTM D3034.
- C. The sewer chimney assembly and design shall consist of three basic units:
1. Base Section: shall be of bridge and base pad design with both pads and bridge cast as a monolithic unit and with pads having a total minimum bearing area of 6 square feet. Bridge section shall encapsulate a captive gasket unit and be joined to the mainline vertical positioned Tee with a 6" PVC nipple, minimum length 12" tapered at both ends. Upper side of captive gasketed unit shall receive 6" PVC SDR-35 pipe. Vertical riser pipe shall be of sufficient length to protrude up through the uppermost intermediate section. Multiple sections of pipe with gasketed bell shall be acceptable to make up the necessary rise. Bridge outside width perpendicular to mainline pipe shall be 36" for mainline pipe 15" and smaller and 48" for mainline pipe 18" and larger unless approved otherwise by the Owner.
 2. Intermediate Section: Desired ultimate elevation of sewer chimney to the lateral shall be obtained through the use of 12", 24", 36" or 48" vertical intermediate sections, used individually or in combination. Sections shall be hollow cored with minimum outside measurement of 18" square and a round 8.4" inside diameter. Intermediate sections shall be installed by lowering over 6" PVC riser pipe and seal to the base, or other intermediate sections and captive "O" rings. PVC riser pipe shall be cut-off and have taper 2" above last intermediate section.
 3. Cap Block (Top Section): Cap block shall be precast and capable of rotation of 180 degrees and/or 15 degrees from right angle to accept lateral connections of various degrees of angle. Precast cap shall encapsulate a 6" x 6" PVC Tee to accept lateral on one side and have 6" PVC plug clean-out on top. Bottom side of encapsulated Tee in Cap Block shall be gasketed and form a tight seal when installed over tapered riser pipe.
 - a. Lateral connection (bell) in cap block shall be capable of accepting PVC C-900 with tight sealing gasket. PVC lateral pipe entering chimney cap shall be C900 and will extend to three feet beyond the beginning of undisturbed trench wall at the lateral invert elevation. Transition back to SDR-35 shall be accomplished with a tight sealing rubber or PVC coupling.

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- D. Cap, intermediate and base sections shall be attached to each other on opposite sides with 2-1/2" x 2-1/2" x 1/4" bolt-on brackets with bolts and nuts. Chimney shall eliminate infiltration and exfiltration and shall accept normal low pressure air testing. Bridge and pad assembly shall allow for normal amount of settling to occur without transmitting weight of assembly to the mainline pipe.
- E. Chimneys shall accept a PVC lateral tee, AWWA C900.
 - 1. Manufacturers:
 - a. Superior Products Distributors, Inc.
 - b. Or approved equal.

2.7 LOW PRESSURE SEWER SYSTEM

- A. PE Pipe and Fittings:
 - 1. Pipe Less than 4 Inches in Diameter: ASTM D 3035.
 - 2. Pipe 4 Inches or Greater in Diameter: AWWA C906.
 - 3. Material: ASTM D3350, Grade 3408 or greater.
 - a. All pipe and fittings shall be resin compatible.
 - b. Pipe shall contain no recycled compound except that generated in the manufacturer's own production plant from resin of the same specification and from the same raw material supplier.
 - c. IPS, SDR 11, minimum pressure class of 160 psi.
 - 4. Pipe Service Identification: Co-extruded green stripes. Stripes painted on will not be acceptable.
 - 5. Molded PE Fittings: ASTM D3261 for butt-fusion type, made to match IPS outer dimensions. Sections to be joined by thermal butt fusion shall be of the same type, grade, and class of polyethylene compound and supplied from the same raw material supplier
 - 6. Electro-fusion PE Fittings: ASTM F1055.
 - a. Allowed only where:
 - 1) For pipe diameters greater than 4 inches where typical butt-fusion welding is impractical.
 - 2) When approved by BLRWPCA.
 - 3) Allowed for roll piping of any diameter.
 - 7. Saddle for service connections to 2 & 3 inches shall be field pressure tested at 5 psi at the time of installation prior to cutting the hole in the main line.
 - a. Saddle to be replaced with welded tee, if pressure test has failed.

2.8 LPS SEWER SERVICE CONNECTIONS

A. Engineered plastic

1. Combination Curb Stop/Check Valve Assembly: AWWA C901 or ASTM D2737, IPS, pressure rated for 160 psi.
 - a. Fully ported water works brass that is pressure tight in both directions
2. All fittings are to be molded from thermoplastic resins and shall be tested for compliance with ASTM D 1599 (Categories 7.1.1, 7.2.2 and 7.2.3)
 - a. Connections shall be made using a compression fitting with a BUNA-N O-ring for sealing the outside pipe
 - b. A split-collar locking device shall be integrated into the pipe and fittings to securely restrain the pipe
 - c. All fittings and valves shall be rated for 150 PSI
 - d. Lateral to be tested for 100 psi
3. Check Valves
 - a. Injection molded from non-corroding, glass fiber reinforced PVC
 - b. Check valve flapper shall include a non-fouling, internal hinge made from fabric-reinforced synthetic elastomer to ensure fatigue strength and trouble free operation
 - c. Shall introduce a friction loss of less than 6 inches of water at maximum rated flow
 - d. A non-metallic hinge integral with flapper assembly providing a maximum freedom of movement and to ensure seating at low flow.
4. Curb Stop Box
 - a. Clow Concord Curb Box;
 - b. Mueller's;
 - c. Or approved equal.

B. Conventional

1. Curb Stop: Cast brass or bronze construction; ball valve; female iron pipe threaded connections at each end.
 - a. Manufacturers and Models:
 - 1) Ford Meter Box Co., Inc. Ball Valve Curb Stop, Model B11-666;
 - 2) Mueller Company; Mueller 300 Ball Curb Valve, Model B-20283;
 - 3) Or approved equal.
2. Curb Stop Box:
 - a. Clow Concord Curb Box;

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- b. Mueller's;
- c. or approved equal.
- 3. Check Valve: Swing Check Valve or approved equal.
- 4. Compression Couplings:
 - a. Ford Meter Box Co., Inc. Pack Joint Coupling Model C86-55 IDR11;
 - b. Mueller's;
 - c. Or approved equal.
- 5. Brass Bushings:
 - a. Ford Meter Box Co., Inc. Brass Bushing Model C18-56;
 - b. Mueller's;
 - c. Or approved equal.
- C. Braided Coupling: Penflex Series 700 Stainless Steel hose or approved equal.

2.9 TEE ASSEMBLY & WYE ASSEMBLY

- A. Ductile-Iron Fittings
 - 1. Mechanical Joint Compact Fittings: AWWA C153, Class 350.
 - 2. Gaskets: AWWA C111, rubber.
 - 3. Nuts and Bolts: High strength, ANSI/AWWA A21.11/C-111
 - 4. Exterior Coating: Standard bituminous coating of either coal tar or asphalt base, 1 mil thick minimum.
 - 5. Inside Lining: ANSI/AWWA C104/A21.4, cement mortar with double lining.
- B. Isolation Gate Valve: AWWA C515, resilient wedge, ductile iron valve fully-encapsulated in synthetic rubber.
 - 1. Working Pressure: 200 psi.
 - 2. Mechanical Joint Ends: ANSI/AWWA C111/A21.11.
 - 3. Opening: Wrench-operated; left-turn open (LTO).
 - 4. Available Manufacturers: Clow, Waterous, or approved equal.
 - 5. Key: Provide one tee-handle key for each gate valve size.
- C. Riser: Stainless steel pipe with threaded nipple, size as indicated.
- D. HDPE Mechanical Joint Adapter: AWWA C906.

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- E. Ball Valves (2 Inch): Brass ball valve in compliance with AWWA C800. Include ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.
 - 1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.
 - a. Provide one tee-handle key for each gate valve size.
- F. HDPE Threaded Joint Adapter (2 Inch and Smaller): ASTM F714 with Type 304 stainless steel threaded insert.
- G. Valve Box: Cast iron base, slide-type extension sections, and adjustable slide-type top section designed for 5 feet of cover above top of pipe.
 - 1. Cover: Cast iron, drop type, with "SEWER" cast on top.
 - 2. H2O Loaded
 - 3. Furnish one tee-handle wrench.
 - 4. Diameters:
 - a. 3 Inch and 4 Inch Valves: 5-inch minimum.
 - b. 2 Inch Valves: 3-inch minimum.

2.10 SPECIAL PIPE COUPLINGS AND FITTINGS

- A. Transition Couplings: Ductile iron, ASTM A536, Grade 65-45-12.
 - 1. Gaskets: AWWA C111, rubber for sewer service.
 - 2. Bolts and Nuts: AWWA C111, high strength, low-alloy, steel.
 - 3. Finish: Shop coat paint.
- B. Repair Coupling: ASTM F679
 - 1. Gasket: ASTM F477.

2.11 LPS CLEANOUT CHAMBERS WITH AIR RELEASE/VACUUM VALVE AND ODOR CONTROL STRUCTURE WITHIN PAY LIMIT (TYPE "A", TYPE "C", AND TYPE "F")

- A. Pipe and Fittings:
 - 1. Ductile Iron: ANSI/AWWA A21.10/C110, Class 53, 250 psi, flanged.
 - a. Inside Lining: ANSI/AWWA A21.4/C104, cement mortar with double lining.
 - b. Exterior Coating: Standard bituminous coating approximately 1 mil thick.
 - 2. HDPE Mechanical Joint Adapter: AWWA C906.

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- B. Gate Valve: AWWA C515, resilient wedge, ductile iron valve fully-encapsulated in synthetic rubber, capable of drip-tight shut-off with flanged end.
 - 1. Working Pressure: 160 psi. (min)
 - 2. Opening: Hand-operated; left-turn open (LTO).
 - 3. Available Manufacturers: Clow, Waterous, or approved equal.

- C. Valve Box: Cast iron base, slide-type extension sections, and adjustable slide-type top section designed for 5 feet of cover above top of pipe.
 - 1. Diameter: 5-inch minimum.
 - 2. Cover: Cast iron, drop type, with "SEWER" cast on top.
 - 3. Furnish one tee-handle wrench.

- D. Air Release/Vacuum Valves: AWWA C512, single-body configuration, direct-acting, float-operated, hydromechanical device with large orifice to automatically release accumulated air or to admit air during filling or draining of piping.
 - 1. Connections: Thread connections, or flanged, ANSI Standard.
 - 2. Body for 3" Air Release Valve: Stainless Steel SAE 316
 - 3. Body for 2" Air Release Valve: Reinforced Nylon
 - 4. All inner metal parts: Stainless steel SAE 316
 - 5. Connection Size: 3-inch for Type "A" and 2-inch for Type "C"
 - 6. Operating Pressure for 3-inch S.S.: 3 - 250 psi
 - 7. Operating Pressure for 2-inch Reinforced Nylon: 3 - 150 psi
 - 8. Self Cleaning Mechanism
 - 9. Models and Manufacturers
 - a. A.R.I. USA Inc. 559-269-9653, A.R.I. Model D-025.
 - b. Or approved equal.

- E. Quick Disconnect: Stainless steel cam and groove, size as indicated.

- F. Eccentric Plug Valve: AWWA C517, full port valve to allow unrestricted flow, manually actuated with handwheel.
 - 1. Maximum Working Pressure: 175 psi.
 - 2. Valve Body and Cover: ASTM A126 cast iron.
 - 3. Plug: One-piece construction, ASTM A536 ductile iron.
 - a. Coating: Elastomer facing.
 - 4. Shaft Bearings: Self-lubricating Type 316 stainless steel.
 - 5. Connections: Flanged.

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6. Opening: Hand-operated; left-turn open (LTO).
 7. Models and Manufacturers
 - a. Series 5800R (Flanged) as manufactured by Val-Matic® Valve & Mfg. Corporation, Elmhurst, IL. USA.
 - b. Cam-Seal plug valve by GA Industries, LLC
 - c. Or approved equal.
 - G. Odor Control System (JAWS Vent-Smart).
 1. Self contained Jaws Vent-Smart (30 pounds Bucket)
 2. Quick Disconnect and NPT Connection
 - a. Jacobs Air Water Systems, Tampa, FL 813-854-2354
- 2.12 LPS COMPONENTS WITHIN AIR RELEASE/VACUUM VALVE AND ODOR CONTROL STRUCTURE WITH OR WITHOUT CLEANOUT (TYPE "C", AND TYPE "F")
- A. Pipe and Fittings:
 1. Ductile Iron: ANSI/AWWA A21.10/C110, Class 53, 250 psi, flanged.
 - a. Inside Lining: ANSI/AWWA A21.4/C104, cement mortar with double lining.
 - b. Exterior Coating: Standard bituminous coating approximately 1 mil thick.
 2. HDPE Mechanical Joint Adapter: AWWA C906.
 - B. Gate Valve: AWWA C509, resilient wedge, ductile iron valve fully-encapsulated in synthetic rubber, capable of drip-tight shut-off with flanged end.
 1. Working Pressure: 160 psi. (min)
 2. Opening: Hand-operated; left-turn open (LTO).
 3. Available Manufacturers: Clow, Waterous, or approved equal.
 - C. Valve Box: Cast iron base, slide-type extension sections, and adjustable slide-type top section designed for 5 feet of cover above top of pipe.
 1. Diameter: 5-inch minimum.
 2. Cover: Cast iron, drop type, with "SEWER" cast on top.
 3. Furnish one tee-handle wrench.
 - D. Air Release/Vacuum Valves: AWWA C512, single-body configuration, direct-acting, float-operated, hydromechanical device with large orifice to automatically release accumulated air or to admit air during filling or draining of piping.
 1. Connections: Thread connections, or flanged, ANSI Standard.
 2. Body for 3" Air Release Valve: Stainless Steel SAE 316

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3. Body for 2" Air Release Valve: Reinforced Nylon
 4. All inner metal parts: Stainless steel SAE 316
 5. Connection Size: 3-inch for Type "A" and 2-inch for Type "C"
 6. Operating Pressure for 3-inch S.S.: 3 - 250 psi
 7. Operating Pressure for 2-inch Reinforced Nylon: 3 - 150 psi
 8. Self Cleaning Mechanism
 9. Models and Manufacturers
 - a. A.R.I. USA Inc. 559-269-9653, A.R.I. Model D-025.
 - b. Or approved equal.
- E. Quick Disconnect: Stainless steel cam and groove, size as indicated.
- F. Eccentric Plug Valve: AWWA C517, full port valve to allow unrestricted flow, manually actuated with handwheel.
1. Maximum Working Pressure: 175 psi.
 2. Valve Body and Cover: ASTM A126 cast iron.
 3. Plug: One-piece construction, ASTM A536 ductile iron.
 - a. Coating: Elastomer facing.
 4. Shaft Bearings: Self-lubricating Type 316 stainless steel.
 5. Connections: Flanged.
 6. Opening: Hand-operated; left-turn open (LTO).
 7. Models and Manufacturers
 - a. Series 5800R (Flanged) as manufactured by Val-Matic® Valve & Mfg. Corporation, Elmhurst, IL. USA.
 - b. Cam-Seal plug valve by GA Industries, LLC
 - c. Or approved equal.
- G. Odor Control System (JAWS Vent-Smart).
1. Self contained Jaws Vent-Smart (30 pounds Bucket)
 2. Quick Disconnect and NPT Connection
 - a. Jacobs Air Water Systems, Tampa, FL 813-854-2354
- 2.13 LPS CLEANOUT (Type "E" and Type "G")
- A. Pipe and Fittings:
1. Ductile Iron: ANSI/AWWA A21.10/C110, Class 53, 250 psi, flanged.

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- a. Inside Lining: ANSI/AWWA A21.4/C104, cement mortar with double lining.
- b. Exterior Coating: Standard bituminous coating approximately 1 mil thick.
2. HDPE Pipe and Fittings: AWWA C906.
 - a. Material: ASTM D 3350, Grade 3408 or greater.
 - b. Minimum Pressure Class: 160 psi.
3. HDPE Mechanical Joint Adapter Flange: AWWA C906.
- B. Wedge Gate Valve: AWWA C515, resilient wedge, ductile iron valve fully-encapsulated in synthetic rubber, capable of drip-tight shut-off.
 1. Working Pressure: 160 psi. (min)
 2. Mechanical Joint Ends: ANSI/AWWA C111/A21.11.
 3. Opening: Hand-operated; left-turn open (LTO).
 4. Available Manufacturers: Clow, Waterous, or approved equal.
- C. Eccentric Plug Valve (3 Inch, Type E): AWWA C517, full port valve to allow unrestricted flow, manually actuated with handwheel.
 1. Maximum Working Pressure: 175 psi.
 2. Valve Body and Cover: ASTM A126 cast iron.
 3. Plug: One-piece construction, ASTM A536 ductile iron.
 - a. Coating: Elastomer facing.
 4. Shaft Bearings: Self-lubricating Type 316 stainless steel.
 5. Connections: Flanged.
 6. Opening: Hand-operated; left-turn open (LTO).
 7. Models and Manufacturers
 - a. Series 5800R (Flanged) as manufactured by Val-Matic® Valve & Mfg. Corporation, Elmhurst, IL. USA.
 - b. Cam-Seal plug valve by GA Industries, LLC
 - c. Or approved equal.
- D. Ball Valves (2 Inch, Type G): Brass ball valve in compliance with AWWA C800. Include handwheel, inlet and outlet matching service piping material with brass union to HDPE.
 - a. Provide malleable-iron
- E. Riser: Stainless steel pipe with threaded nipple, size as indicated.
- F. Quick Disconnect: Stainless steel cam and groove, size as indicated.

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2.14 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
 - 1. Cement: ASTM C 150, Type II.
 - 2. Fine Aggregate: ASTM C 33, sand.
 - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 - 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio.
- C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious materials ratio.
 - 1. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.15 MISCELLANEOUS

- A. Detectable Sewer Lateral End Marker:
 - 1. Steel Reinforcement: ASTM A 615/A 615M, deformed.
 - a. Bar Size: No. 4 minimum.
- B. Brick: ASTM C32, Grade MS except Grade SS for manhole shelves.
- C. Mortar: Composed by volume, of one part portland cement and two parts sand. Do not add lime to mortar.
- D. Grout: Form 816, Section M.03.01-14.
- E. Filter Fabric: Form 816, Section M.08.01-26.
- F. Flexible Gel:
 - 1. Hydrocide 700 by Degussa Building Systems.
 - 2. Parsonpoxy FG by Parson Environmental Products, Inc.
 - 3. Or equal.

2.16 PROTECTIVE COATINGS

- A. Description: Environmentally-safe crystalline waterproof coating; factory or field applied to the following surfaces:
 - 1. Concrete Manholes and Chambers: On exterior surface.
 - 2. Available Manufacturers: Bay Oil; Xypex, ICS Penetron International Ltd., or approved equal.

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PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 IDENTIFICATION

- A. Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.

3.3 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

- A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is indicated or specified. Do not use instead of indicated or specified joining methods.
 - 1. Repair Couplings for PVC SDR 35: gasketed rigid PVC SDR 35
 - 2. Use Electro-fusion couplings for HDPE joints.

3.4 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
 - 1. All open ends of abandoned pipelines which are created or exposed by the Contractor shall be removed to a distance of 5' (minimum) from new facilities and then sealed with concrete at that point prior to backfilling.
- B. Each pipe unit shall be handled into its position in the trench only in such manner, and by such means as acceptable to the BLRWPCA. Care shall be taken to avoid damaging the pipe and fittings. Where any two-pipe units do not fit each other closely enough to enable them to be properly jointed, they shall be removed and replaced with suitable units and new gaskets.
- C.
- D. Low Pressure Sewer: Install pressure piping according to the following:
 - 1. The length of open trench required for fused pipe sections shall be such that bending and lowering the pipe into the ditch does not exceed the manufacturer's maximum recommended bend radius and result in kinking.
 - 2. Trench bottom must support the pressure pipe smoothly and be free of ridges, hollows, and lumps.

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3. Install piping with restrained joints at tee and wye fittings and at horizontal and vertical changes in direction.
 - a. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
 - b. Use only one type of restraint throughout the Work.
4. Install HDPE force main piping according to ASTM D2774
- E. Install and support pipes and fittings with bedding material. Do not use saddles, blocking or stones as pipe supports. After each pipe has been properly bedded, enough pipe bedding shall be placed between the pipe and the sides of the trench and thoroughly compacted to hold the pipe in correct alignment. Holes provided for jointing shall be filled with pipe bedding and compacted. Then pipe bedding shall be placed and compacted to complete the pipe bedding, as indicated on the drawings.
- F. Each pipe unit shall be inspected before being installed. No single piece of pipe shall be laid unless it is generally straight. If a piece of pipe fails to meet this requirement for straightness, it shall be rejected and removed from the site. All pipe units or fittings discovered to be defective either before or after installation shall be removed and replaced with a sound unit.
- G. Pipe and fittings shall be installed to the lines and grades indicated on the drawings or as required by the BLRWPCA. Care shall be taken to ensure true alignments and gradients.
- H. Before any joint is made, the previously installed unit shall be checked to assure that the inverts are matched and conform to the required grade. The pipe shall not be driven down to the required grade by striking it with a shovel handle, timber or other unyielding object.
- I. All joint surfaces shall be cleaned. Immediately before jointing the pipe, the bell or groove shall be lubricated in accordance with the manufacturer's recommendation. Each pipe unit shall then be carefully pushed into place without damage to pipe or gasket. Suitable devices shall be used to force the pipe units together so that they will fit with a minimum open recess inside and outside and have tightly sealed joints. Care shall be taken not to use such force as to wedge apart and split the bell or groove ends.
 1. Lateral service connection pipe shall not exceed one (1) fusion per service connection.
 2. Contractor's layout responsibilities include verifying grades, and adjusting the inlet orientation to the grinder pumps.
- J. Clear interior of piping and structures of dirt and superfluous material as work progresses.
 1. Place plug in end of incomplete piping at end of day and when work stops.

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- K. In structures, fill joint with annular space filler.
- L. When work is not in progress, close open ends of pipe to prevent entry of groundwater, earth, or foreign materials.
- M. Gravity Service Connections: Extend connection a minimum of 48 inches beyond property line of property to be served unless directed otherwise by the BLRWPCA.
 - 1. Install bell end with cap or plug at end of lateral sewer pipes, fittings, and pipe stubs.
 - 2. Use plugs of same material as pipe.
 - 3. Mark terminal ends with 2 inch by 3 inch lumber end markers that extend from invert to final grade. Install markers plumb. Leave end of marker exposed above grade.
 - a. Attach a detectable reinforcing steel rod at grade to the marker. Bury a detectable reinforcing steel rod to 3" below grade adjacent to the marker.
 - 4. Arrange for inspection by BLRWPCA prior to backfilling.
- N. Grinder Pump Service Connection: Extend from tee and reducers to grinder pump station unless otherwise indicated or directed by the BLRWPCA. Install in location directed by the BLRWPCA. Arrange for inspection by the BLRWPCA prior to backfilling.

3.5 PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. PVC Pressure Pipe and Fittings: Join and install according to AWWA C605.
- B. PVC Sewer Pipe and Fittings: As follows:
 - 1. Join pipe and fittings with gaskets according to ASTM D 2321 and manufacturer's written instructions.
 - 2. If full entry of pipe joint is not achieved, remove pipe and replace with new unit and gasket.
- C. Low Pressure Sewer Butt Fusion: HDPE shall be joined by butt fusion method, having a completely uniform and monolithic pipe interior according to the fusion joining procedures as instructed by the manufacturer.
 - 1. Each individual performing fusion joining shall have experience in the use of the fusion process.
 - 2. Pipe shall be evenly trimmed, straight and true and conform to any other of the manufacture's recommendations for pipe fusion. The use of arced pipe will not be allowed.
 - 3. Beads shall be uniform on both sides of the joint, with no wrinkles or discontinuities. Beads shall be bent back in several positions and confirm there is no evidence of splitting. Any bead that is seen to split shall be cut from the pipeline and remade.

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4. **De-beading the internal bead is required for piping larger than 2 inches in diameter**, and shall be removed after the manufacturer's recommended cooling time using a suitable de-beading tool. The bead removal shall not induce any slits, gauges or defeats in the pipe wall.
 5. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both system materials and dimensions.
- D. Low Pressure Sewer electrofusion: Roll piping of any diameter, with the exception of service connections, shall be connected by an electrofusion coupling in lieu of the de-beading process.
1. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both system materials and dimensions.
 2. Pipe shall be evenly trimmed, straight and true and conform to any other of the manufacture's recommendations for pipe connection by electrofusion coupling. The use of arced pipe will not be allowed.
- E. Cold weather procedures
1. Use additional care in handling pipe. Avoid sharp impacts from dropping. Cold pipes are harder to bend or uncoil. Fusion operations should be shielded to avoid precipitation or blowing snow. Remove all frost, ice and snow from the OD or ID of areas to be fused surfaces must be clean and dry before fusing.
 2. Pipe and fittings may contract in the cold. Keeps materials warm prior to joining. Confirm ring clamps hold pipes adequately. Do not increase heat levels and adjust melt times. Follow the manufactures recommendations for cold weather operations.
- F. Field Testing: Provide on-site support by manufacture's representative for a minimum of 2 days, or as needed to ensure quality control and satisfy reporting needs.

3.6 HDPE LOW PRESSURE SEWER CONSTRUCTION AND INSTALLATION

- A. Join pipe by fusion welding process.
- B. In general, the pipe sections will be joined at ground level to a length recommended by the HDPE pipe manufacturer such that when positioning the pipe into position, the maximum allowable pipe stress is not exceeded.
- C. Install with backfill material as stated in ASTM D2774.
- D. Polyethylene pipe can be cold bent in the field in accordance with manufacturer's limits.
- E. Use appropriate materials and equipment to handle the LPS HDPE pipe.

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- F. Close terminal ends of pipe with caps or plugs secured in place.
- G. Utilize marking tape or tracer wire with all pipes.

3.7 MANHOLE/CHAMBER INSTALLATION

- A. General: Install structures true and plumb, complete with appurtenances and accessories indicated.
 - 1. Set structure base level on 8 inch minimum bedding material.
 - 2. Align structure steps.
 - 3. Clean joint surfaces and assemble sections before connecting pipe to structures.
- B. Install gaskets in accordance with manufacturer's recommendations. After assembly of all sections is completed, the joints shall be pointed with mortar on both inside and outside surfaces of structures. Point inside and outside joints with mortar. Close lifting holes with plastic plugs and non-shrink grout.
- C. Annular Space: Fill space between sewer pipe and manhole on inner side of flexible pipe to manhole joint with flexible annular space filler.
- D. Frames and Covers. Shall be set with the tops conforming to the finished grade. Set frame in full bed of mortar. Cover bottom flange of frame with a thick, smooth-surfaced ring of mortar that extends to outside edge of masonry. Slope mortar ring to shed water away from frame. The space between the bottom ring and masonry shall be made water tight.
 - 1. Set tops of frames and covers flush with finished surface of structures that occur in pavements and lawns. Set tops 2 inches above finished grade of turf, unless otherwise indicated.
 - 2. At unpaved locations, install bolted and gasketed manhole covers.
 - 3. At unpaved locations (except for lawns), surround frame and masonry with concrete anchor ring as indicated.
- E. Frame Adjustment. Adjust frames with collars, masonry units or bricks.
 - 1. Maximum Adjustment Height: 12 inches.
 - 2. For adjustments greater than 12 inches, install riser section for structure.
- F. Install piping, valves, and appurtenances as indicated.
 - 1. Install flanged piping and valves.
 - 2. Install transition couplings for adapting ductile iron piping to PE piping with flange adaptors.

3.8 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.9 CONNECTIONS TO EXISTING STRUCTURES

- A. Core drill existing structures, and install flexible pipe connector and pipe. Where called for on the plans, or directed by the BLRWPCA, or as necessary for the new construction, existing manholes shall be modified as required. Modify inverts and joints in sanitary manholes to conform with the pertinent sections of these specifications

3.10 SEWER CHIMNEYS

- A. Chimneys shall be furnished by the Contractor as shown on the Contract Drawings and where ordered by the Owner. As in the case of the branches, the exact number and location of chimneys shall be determined as the work progresses in the field.
 1. At locations designated by the Owner to receive precast sewer chimneys, crushed stone shall be placed and compacted in 6-inch lifts from the bottom of the trench to the top of the pipe. The area of crushed stone foundation shall be at least as great as the base of the precast chimney and the stone shall be compacted to at least 95% maximum density, per ASTM D1557 Method C.
 2. After installation, crushed stone bedding shall be placed in void area under base-bridge, but shall not be overfilled, chinked or compacted.
 3. The Contractor shall install the precast sewer chimney in accordance with the manufacturer's installation instructions.
 4. Earth Backfill around the chimney shall be placed with extreme care and compacted evenly to avoid unbalanced earth pressure on the chimney

3.11 FIELD QUALITY CONTROL

- A. Prior to any testing, the pipe installation shall be cleaned in the following manner, in the presence of the BLRWPCA.
 1. Flush piping to remove debris. Collect debris and dispose off of site.
 2. Flush piping between manholes and other structures to remove collected debris. The Contractor shall furnish an inflatable rubber ball of a size that will inflate to fit snugly into the pipe to be tested. The ball may, at the option of the Contractor, be used without a tag line; or a rope or cord may be fastened to the ball to enable the Contractor to know and control its position at all times. The ball shall be placed in the last manhole in the pipe to be cleaned and water shall be introduced behind it. The ball shall pass through the pipe with only the pressure of the water impelling it. All debris flushed out ahead of the base shall be removed at the first manhole where its presence is noted. In the event cemented or wedged debris or a damaged pipe shall stop the ball, the Contractor shall remove the obstruction. With absolutely no exceptions shall this waste debris be allowed into another sewerage line. Alternative methods of cleaning may be substituted only with the approval of the BLRWPCA.

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- B. Inspect interior of gravity sewer piping and structures to determine whether line displacement or other damage has occurred. Inspect after completion of backfill and compaction.
1. Submit reports for each system inspection.
 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of 5 percent deflection gage meeting ASTM D3034 Appendix X1.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 4. Reinspect and repeat procedure until results are satisfactory.
 5. Testing shall be done not less than 30 days following completion of installation. The sequence of all testing shall be as specified by the BLRWPCA.
- C. Test new structure and piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not put into service before inspection and approval.
 2. Schedule tests and inspections with BLRWPCA; provide at least one business day advance notice.
- D. Infiltration and Exfiltration Tests. Whenever groundwater is present, the Contractor shall, as directed by the BLRWPCA, perform infiltration and exfiltration tests. Groundwater infiltration or exfiltration into any sewer shall not exceed a maximum of 100 gallons per inch of pipe diameter per day per mile of sewer. The procedure for these tests is as follows:
1. Infiltration Test: All labor, temporary equipment, and materials, including weirs necessary for such tests, shall be furnished by the Contractor. The installation of the weir shall be made in such manholes as directed by the BLRWPCA. Where weir measurements are not suitable in the BLRWPCA's opinion, other methods of measurement, as he shall determine, may be adopted. In making infiltration tests, the BLRWPCA may flood the trench with water if, in his opinion, such procedure is necessary to fairly represent actual service conditions as they may vary throughout the year.
 2. Exfiltration Test: The Contractor shall supply all water, plugs and all labor and equipment required for that test.
 - a. The exfiltration test shall be made by filling the sewer line with water so as to obtain a hydrostatic head, on top of the pipe in the upstream manhole of the line under test, of at least four (4) feet, but not greater than ten (10) feet. The amount of exfiltration will be obtained by observing the rate of drop in the water level at

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the upstream manhole hourly for the first six (6) hours and thereafter, at intervals of time as directed by the BLRWPCA.

- E. Pressure gauges shall display pressure increments at every 2 psi.
- F. Low Pressure Sewers: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than one and one-half times maximum system operating pressure, but not less than 150 psig.
 - 1. Low Pressure Sewers laterals: Pressure test at 100 psi.
 - 2. Test according to ASTM D 2774, Section 11 "Pressure Testing" with the following clarifications and qualifications:
 - a. Perform testing after backfilling or partially backfilling pipeline or sections thereof. Identify in writing to BLRWPCA, lengths of pipeline to be tested and level of backfill, before proceeding with testing.
 - b. Maintain test pressure of 130 psi for a minimum of 1 hour with no more than 5 psi variation during test period.
 - c. Do not exceed test pressure, and pipe design limits.
- G. Gravity Sewers: Perform low pressure air tests for all gravity sanitary sewers to be accepted. Tests will be made after pipe installation is complete, including installations of lateral connections and manholes. Test will be performed after trenches are backfilled and compacted and prior to the placement of permanent pavement.
 - 1. The Contractor is required to provide all equipment, test plugs in the required sizes, appurtenances, connecting hose or pipe, labor and materials necessary to conduct and control the low pressure air test. The test shall be performed using the below stated equipment, according to stated procedures and under the supervision of the inspecting BLRWPCA. The Contractor or his subcontractor shall keep a written record, which will show the results of the tests conducted. The records should include sufficient data on length of line, pressure levels, time for pressure drop, and related features noted during the testing of each segment of the line. A copy of this record shall be given to the BLRWPCA. Equipment used shall meet the following minimum requirements and shall be subject to approval by the BLRWPCA.
 - a. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.
 - b. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
 - c. All air used shall pass through a single control panel.
 - d. Three (3) individual hoses shall be used for the following connections:
 - 1) From control panel to pneumatic plugs for inflation.
 - 2) From control panel to sealed line for introducing the low pressure air.

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- 3) From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.
- e. All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psig. The sealed pipe shall be pressurized to 5 psig. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.
2. All tests shall be conducted on the completed sewer pipeline between manholes. Testing of shorter sections of pipeline will only be permitted with the approval of the BLRWPCA.
3. All gages, controls and appurtenances for equipment used to conduct the test will be located out of manholes. No one will be permitted in a manhole containing a test plug while air is under pressure in the pipeline being subjected to the test.
4. The Contractor shall determine the elevation of the ground water table in the area of the pipeline being subjected to the low pressure air test.
5. After a manhole-to-manhole section of pipe has been completed, cleaned and the pneumatic plugs 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 (2) minutes shall be allowed for the air pressure to stabilize.
 - a. After the stabilization period, the pressure shall be set at 3.5 psig greater than the average back pressure due to groundwater and the air hose from the control panel to the air supply shall be disconnected. The portion of line being tested shall be termed "Acceptable" if the time required in minutes and seconds for the pressure to decrease from 3.5 psig greater than the average back pressure due to groundwater to 2.5 psig greater than the average back pressure due to groundwater is not less than the time shown for the given diameters in the following table
6. Perform tests as follows:
 - a. PVC Gravity Sewer Low-Pressure Air Test:
 - 1) Plastic Pipe: Perform air test according to ASTM F 1417, Time Pressure Drop Method, modified as follows.
 - a) Minimum Allowable Time for 1.0 PSIG

Pipe Dia	Minimum Time (minutes)	Length (ft) for Min Time	Time (sec) for Longer Length (L) (Ft.)
6	5:40	398	0.854L
8	7:34	298	1.52L
12	11:20	199	3.418L

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- b) Calculate time for longer test lengths only when test length exceeds the lengths shown in the above table.
- c) If test section fails, recompute time to include lateral lengths not included in previous calculation. Use the following formula:

$$T = 0.085[(D_1^2L_1 + D_2^2L_2 \dots + D_n^2L_n)/(D_1L_1 + D_2L_2 \dots + D_nL_n)]K/Q$$

Where

T = Shortest time allowed for air pressure to drop 1.0 psig, seconds

K = 0.000419 (D₁L₁ + D₂L₂ + D_nL_n), but not less than 1.0

Q = 0.0015 cfm/sf

D₁, D₂, etc. = Nominal diameter of different size of pipe being tested

L₁, L₂, etc. = Respective lengths of different size pipes being tested

- d) Modify air test pressure when groundwater is above top of sewer line. Install 6 inch or 8 inch diameter well points adjacent to manhole installations. Measure groundwater elevation prior to testing. Add to air pressure the following:

$$P = H / 2.3$$

Where

P = Pound of additional pressure

H = Height of groundwater elevation above sewer line, in feet

- e) Do not exceed 9.0 psig for total air pressure.
- f) After completion and acceptance of test, backfill well points with bedding material specified in Division 2 Section "Earthwork". In roadways, terminate backfill below road subbase.

If the installation fails to meet the above requirements, the Contractor shall, at his own expense, determine the source of leakage and shall repair, replace and retest all defective work as necessary.

H. Manholes: Perform vacuum test according to ASTM C1244.

1. Test each manhole prior to backfilling.
2. Plug lift holes with a non-shrink grout.
3. Temporarily plug pipes entering manhole. Secure and brace pipes and plugs to prevent them from being drawn into the manhole during testing.

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4. Place test head at inside top of cone section and inflate seal in accordance with manufacturer's recommendations.
5. Draw a vacuum of 10 inches of mercury. Shut off pump.
6. With valves closed, measure elapsed time for vacuum to drop from 10 inches to 9 inches. Manhole shall pass if time meets or exceeds values indicated in Table 1.

Table1 - Minimum Test Times

Manhole Diameter		
48 inches	60 inches	72 inches
Time to Drop Vacuum from 10 Inches to 9 Inches		
60 seconds	75 seconds	90 seconds

7. **Re-test** each manhole after backfilling and prior to placing casting.
 8. Leaks and loss in test pressure constitute defects that must be repaired.
 9. Replace leaking piping and structures using new materials, and repeat testing until leakage is within allowances specified.
- I. CCTV Inspection Gravity Sewers. After cleaning, perform television inspection on all new gravity sanitary sewer installations under a no-flow condition.
1. The television camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, television monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of the BLRWPCA and, if unsatisfactory, equipment shall be removed and new equipment provided.
 2. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition. In no case will the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation, the television camera will not pass through the section, the Contractor shall set up his equipment so that the inspection can be performed from the opposite manhole.
 3. When manually operated winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two (2) manholes of the section being inspected to insure good communications between members of the crew.

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4. The importance of accurate distance measurements is emphasized. Measurement for location of defects shall be above ground by means of a meter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape, or other suitable device, and the accuracy shall be satisfactory to the BLRWPCA.
5. Documentation of the television results shall be as follows:
 - a. Television Inspection Logs: Printed location records shall be kept by the Contractor and will clearly show the location in relation to an adjacent manhole of each infiltration point observed during inspection. In addition, other points of significance such as location of laterals, unusual conditions, broken pipe and other discernible features will be recorded and a copy of such records will be supplied to the Town.
 - b. Video Recordings: The purpose of the recordings shall be to supply a visual and audio record of problem areas of the lines that may be replayed. Recording playback shall be at the same speed that it was recorded. Slow motion or stop-motion playback features may be supplied at the option of the Contractor. The video recordings shall be saved on DVD or BluRay media and shall be turned over to the Town at the completion of the Project. Video recording submittals saved on other media types (i.e. videotape) shall not be accepted.
6. The Contractor shall have all video recordings readily accessible for review by the BLRWPCA during the Project.
7. If any testing of sewers indicates problems, additional television testing may be ordered by the BLRWPCA.
- J. Final inspection of the work will include a visual inspection of each section of sewer by looking from structures, that are true to both line and grade; shall show no leaks; shall be free from cracks and from protruding joint materials and contain no deposits of sand, dirt, or other materials which will reduce the full cross-sectional area. Groundwater infiltration shall not exceed the rates hereinbefore stipulated. Wall joints shall be tight. All finished work shall be neat in appearance and of first class workmanship. The Contractor shall furnish two (2) laborers to assist in this inspection.
- K. In the event a facility needs to be connected to the sewer prior to acceptance of the project, additional dye tests will be conducted to insure that each unit is connected to the new facilities. BLRWPCA will assist with the dye tests during normal working hours.

3.12 CLEANING

- A. Clean dirt and superfluous material from interior of piping and structures.

END OF SECTION

SANITARY SEWERAGE

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GRINDER PUMP STATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Through a competitive bid process the BLRWPCA pre-selected a grinder pump supplier for Bolton Lake sewer project.
 - 1. Environmental One was selected based upon the "Request For Proposals, Grinder Pump Stations, Bolton Lakes Sewer Project" dated July 24, 2008.
 - 2. A copy of this document is available for viewing at the Town of Bolton Town Offices.

1.2 SUMMARY

- A. This Section includes factory-built, grinder pump system to convey an individual property owner's wastewater to a public sewer system. Grinder pump system includes:
 - 1. Pump station with attendant piping.
 - 2. Mechanical and electrical equipment.
 - 3. Water level sensing device(s).
 - 4. Electrical control panel with alarm panel
 - 5. Generator receptacle and transfer switch
 - 6. Force main outlet.
 - 7. Gravity inlet and connection.
 - 8. Start up service and testing.
 - 9. Site restoration, and all tools, labor, equipment and materials necessary to complete the work as specified.
- B. Determine site specific pipe layout for pump station inlet and outlet pipe locations, and depth of installation based on existing horizontal and vertical location of the sanitary outlet from the building.
 - 1. Layout and install electric branch circuit in conduit to grinder pump station.
 - 2. Install grinder pump unit, force main pipe, valves and valve access between the grinder pump station and the sewer in the street. Install electrical conduits, control panel, and connect to electrical panel.
- C. Work Not Included: Pipe installation between building and grinder pump unit.

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1.3 RELATED WORK

- A. Section - Sanitary Sewerage
- B. Sections for conduit and wiring associated with grinder pump station, and required electrical service upgrades.

1.4 SUBMITTALS

- A. General: Identify any components of grinder pump station and accessories that are different from previously supplied product for Bolton Contracts.
- B. Product Data: For each type of grinder pump and related equipment, include the following:
 - 1. Operational description, installation manual, specifications, and service manual with parts and part numbers clearly identified.
 - 2. Pump curves from the factory.
 - 3. Shop drawings.
- C. Low Pressure Sewer Network Analysis
 - 1. Confirm grinder pump locations prior to submitting schedule.
 - 2. For existing and future network conditions identify vertical static head for each pump location in accordance with manufacturer's performance curve criteria.
- D. Field Calculations. For each grinder pump, confirm the following:
 - 1. Field verify and identify existing sanitary outlet pipe invert elevation at exterior wall of structure on individual properties.
 - 2. Determine depth of grinder pump station.
 - a. Indicate a minimum of 2 percent slope for gravity feed from outlet to proposed grinder pump inlet connection.
 - 3. Identify if accessway extensions is required.
- E. Field quality-control test reports.
- F. Operation and Maintenance Manuals:
 - 1. Quantity: Furnish from pump manufacturer, 4 bound copies.
 - 2. Include user instructions, and operation and maintenance of furnished equipment, complete with wiring diagrams, lubrication schedules, drawings, functional descriptions, trouble shooting recommendations for problems and possible remedies, cuts, parts lists and other information for proper operation, maintenance, repair and adjustment of the equipment.

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- a. Include as part of diagrammatic information location drawings showing layout of panels, and equipment, clearly identifying parts by name, appearance and part number.

G. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. The grinder pump shall be free from electrical and fire hazards.
 1. Completely assembled and wired grinder pump, basin assembly, and station components shall be listed by Underwriters Laboratories, Inc.
 2. In absence of U.L. listing, the grinder pump station equipment shall conform to NEC requirements.

1.6 PROJECT CONDITIONS

- A. Coordinate field adjustments with the Local Health Department, property owner and the BLRWPCA.

1.7 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of pump station that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Twenty four months from date of Owner's acceptance of the grinder pump station start-up.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Environment One is the pre-selected grinder pump supplier.
 1. Contact information.
 - a. Water Resources Technologies
40 Hockanum Dr. Unit #5
Vernon, CT 06066
ATTN: Mr. Matthew Davis
Telephone: 860-871-8101

2.2 GRINDER PUMP STATIONS

- A. Subject to compliance with pre-selection proposal requirements of July 24, 2008 set forth in the Article 1.1 Related Documents of this Section.

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- B. Models:
1. Simplex Pump Station DH071-93 with appurtenances.
 2. Duplex Pump Station DH152-93 with appurtenances.
- C. Each grinder pump station shall include a NEMA 4X, UL-listed alarm panel suitable for wall or pole mounting. The NEMA 4X enclosure shall be manufactured of thermoplastic polyester to ensure corrosion resistance. The enclosure shall include a hinged, lockable cover with padlock, preventing access to electrical components, and creating a secured safety front to allow access only to authorized personnel. The enclosure shall not exceed 10.5" W x 14" H x 7" D, or 12.5" W x 16" H x 7.5" D if certain options are included.
- D. The alarm panel shall contain one 15-amp, double-pole circuit breaker for the pump core's power circuit and one 15-amp single-pole circuit breaker for the alarm circuit. The panel shall contain a push-to-run feature, an internal run indicator, and a complete alarm circuit. All circuit boards in the alarm panel are to be protected with a conformal coating on both sides and the AC power circuit shall include an auto resetting fuse.
- E. The alarm panel shall include a 20 amp, 250 VAC generator receptacle with a spring-loaded, gasketed cover suitably mounted to provide access for connection of an external generator while maintaining a 4X rating. An automatic transfer switch shall be provided, which automatically switches from AC power to generator power during a power outage. The alarm board power shall be provided through the generator receptacle during a power outage, allowing the audible and visual alarms to function normally in generator mode. When AC power is restored, the panel is automatically switched back to the AC power mode. When AC power is restored, the panel is automatically switched back to the AC power mode (no operator assistance is required to switch from one mode to the other so the mode cannot be inadvertently left in the generator position after pumping down the station in generator mode as is the case with a manual transfer switch).
- F. E|One Remote Sentry Display Module: Provide lithium battery-operated with batteries, high-level visual and audible (70dB minimum) alarm. Include "Push-to-Silence" audible alarm switch, "Push-to-Test" visual and audible alarm feature, and Low Battery audible/visual indications.
- G. Accessway Extensions
1. Shall be installed where the inlet invert of the pump basin is more than 34 inches below finished grade.
 2. Shall be constructed of corrosion-resistant UV stabilized polyethylene, and shall be of the same design and structural characteristics as the pump basin.
 3. To form a watertight connection, riser(s) shall be connected to the pump basin and sealed with a polyisoprene gasket and injection molded compression clamp secured with bolted lock tab.

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2.3 SOURCE QUALITY CONTROL

- A. Test and inspect sewage pumps at the factory. Include test recordings that substantiate correct performance of pumps at design head, capacity, suction lift, speed, and horsepower.
- B. Test accessories and controls through complete cycle. Include test recordings that substantiate correct performance.
- C. The Owner reserves the right to be present at the factory during testing procedures.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in of sewerage piping systems to verify actual locations of piping connections (horizontal and vertical) before pump station installation.
 - 1. Based upon existing conditions, determine actual vertical elevations required for proper operation of pump station.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Perform field calculations for each grinder pump and confirm the required information before proceeding with excavation.

3.2 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Section "Earthwork."
 - 1. Limited excavation access may occur due to close proximity of grinder pump station to existing buildings. Verify access in field.
 - 2. Excavate for grinder pump station to a sufficient depth to allow a minimum 2 percent slope for service connection from the building to the pump station inlet hub, and a minimum cover for the forcemain outlet as indicated.
 - a. Minimum Depth: 8 feet. Provide extension sections as required to bring grinder pump station top to indicated finished grade.
 - b. Maximum Depth: As per manufacturer's requirements.

3.3 GENERAL

- A. Install anti-siphon device when turn-off level elevation of the grinder pump station is above the discharge elevation of the service line connection into the main line sewer.

GRINDER PUMP STATION

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- B. Install grinder pump level and plumb on 6 inches of crushed stone bedding as indicated.
- C. Install grinder pump station and associated equipment in accordance with manufacturer's recommendations.
- D. Install grinder pump station detailed and as indicated.
 - 1. Inlet Flange. Mount in field at inlet height a minimum of 4 feet from bottom of basin. Install Fernco cap for PVC pipe for future connection.
 - 2. Anti-Siphon Valve: Arrange basin assembly for quick and easy acceptance of anti-siphon valve in field.
- E. Fill tank in grinder pump station with water prior to backfilling.
- F. Install anti-flotation materials, inlet grommet, inlet pipe and cap before backfilling.

3.4 ELECTRICAL WORK

- A. Perform Work in conformance with National Electrical Code, the requirements of the Connecticut State Building Code, and local rules, regulations and ordinances.
 - 1. Provide electrical materials, apparatus, equipment and labor unless specifically excepted.
 - 2. Secure and pay for permits and inspections required by local or state regulations.
 - 3. Ground electrical equipment as required by the National Electrical Code, Article 250.
- B. Install grinder pump station remote pump control cabinets with the alarm unit on exterior of building walls nearest to pump station, and where practical in the vicinity of the electrical power meter. Coordinate exact location with property owner.
 - 1. Locate control cabinet within 10 feet of building corner, and visible from the street.
- C. Visual-Audible Alarm Unit: Hard wire unit and install unit within pump control cabinet; mount buzzer and light on exterior of control cabinet.
 - 1. Provide circuitry to allow silencing of audible alarm by actuating a push button operated lockout circuit.
 - 2. Maintain visual alarm until alarm condition ceases to exist. Terminate visual alarm reset lock out circuit after alarm condition is rectified.
 - 3. Provide terminals and circuitry for additional audible-visual alarm remote unit.
- D. Remote Display Panel. Install remote display panel at interior rear entry of each residence.
 - 1. Interior location shall be coordinated with the owner and must be approved by the BLRWPCA.
 - 2. Hard wire remote panel to Visual-Audible Alarm unit.
 - a. Install wiring in accordance with electrical service upgrades requirements.

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- b. At interior unfinished spaces, wire may be surface mounted.
 - c. At interior finished spaces, conceal wiring behind finished surfaces. Repair finished surfaces damaged by installation to existing condition or better.
 - d. Wiring installed in exterior locations must be installed in weather tight conduit.
- E. Install wiring between wall mounted devices and pump station in buried rigid PVC electrical conduit. Make the necessary 240 VAC, 3-wire with ground electrical connections between the wall mounted pump control panel and the main electrical service panel in all buildings.
- 1. Seal conduit at both ends with a vapor tight sealant. The control cabinet end shall also have a vapor tight fitting.
 - 2. Each conduit shall be one trade size larger than required by code (at a minimum) or as indicated.
- F. Complete electrical wiring from connection points at the pump station to existing building electrical panel including wire, cable, conduit, grounding, tools, labor and equipment and necessary incidentals.
- 1. Obtain BLRWPCA's authorization to proceed before beginning installation of electric subpanel.

3.5 CONNECTIONS

- A. Sanitary sewer piping installation requirements are specified in Section "Sanitary Sewerage." Drawings indicate general arrangement of piping.
- B. Electrical power and wiring Sections.

3.6 FIELD QUALITY CONTROL

- A. Pressure gauges shall display pressure increments at every 2 psi.
- B. Perform the following field quality-control tests and inspections and prepare test reports:
 - 1. After installing grinder pump station and low pressure sewer; and after electrical circuitry has been energized, test for compliance with requirements. Furnish water required for pump tests.
 - 2. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation without vibration or overheating.
 - a. Engage qualified factory trained personnel to test and verify valves are operational, voltage is correct; alarm sounds, illuminates and can be silenced; proper amperage while the pump is running; and pump turns on/off at the proper liquid level.

GRINDER PUMP STATION

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4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 5. Remove malfunctioning units, replace with new units, and retest as specified above until satisfactory results are obtained.
- C. After inspection, testing, operation and adjustments have been completed by the manufacturer's representative, field test pumping equipment in presence of Owner's representative.
1. Correct deficiencies and retest at no additional cost.

3.7 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Complete installation and startup checks according to manufacturer's written instructions.
 1. Adjust pump, accessory, and control settings, and safety and alarm devices.

3.8 CLEANING

- A. Clean dirt and debris from wet wells, pumps, and piping.
- B. After completing equipment installation, inspect unit components. Remove dirt and debris, and repair damaged finishes to match original finishes.
- C. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove dirt and construction debris. Repair damaged finishes inside the building and exterior finishes near control box mounting location.

END OF SECTION

GRINDER PUMP STATION

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GENERAL ELECTRICAL – GRINDER PUMP

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes providing a complete, fully adjusted, and ready for use grinder pump electrical and control systems.
 - 1. Ensure that equipment is provided, installed and operating as described, regardless of the items in the specifications, sections and divisions.
 - 2. Factory installed provisions, features, accessories, are preferred to field installed.
 - a. Provide and coordinate work responsibilities between factory and field.
 - 3. Include devices not shown but necessary for the proper operation as described.
- B. Provide complete electrical system as indicated and as follows:
 - 1. Evaluate existing electrical service and electrical panels at properties requiring grinder pumps.
 - a. Schedule meeting times and access with the property owner. Where service is inadequate for operation of grinder pump, coordinate and oversee the installation of service upgrade with Connecticut Light and Power (CL&P) and property owner, and the BLRWPCA.
 - b. Upgrade the electric service to provide adequate capacity based on service load calculations. Provide materials and equipment related to new service including new service panel, main breaker, conduit, weatherhead, and meter socket.
 - c. Wire existing branch circuits to new branch breakers.
 - 2. Branch circuit from existing panel to grinder pump control panel and new branch circuit breaker.
 - 3. Grinder pump control panel, conduit and conductors from control panel to grinder pump station for power, and control and alarm functions.
 - 4. Electrical accessories required for grinder pump equipment as specified under this and other sections of the Contract Documents.
 - 5. Electric connections to ancillary apparatus required for grinder pumps.
 - 6. Conduits, fittings, outlet boxes, hangers, supports, fuses and other items required for a complete installation.
 - 7. Testing and startup for equipment requiring electric power.

1.2 RELATED WORK

- A. Section – “Grinder Pump Station.”

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1.3 SUBMITTALS

- A. Product Data: Submit complete descriptive literature, dimensions, performance data, parts lists and instruction and maintenance manuals for the following:
 - 1. Power panel.
 - 2. Disconnect switches and circuit breakers.
 - 3. Monitoring and control systems.
 - 4. Enclosures.
 - 5. Wiring devices.
 - 6. Conduit and fittings.
 - 7. Wire and cable.
 - 8. Meter socket.
 - 9. Weatherhead.
- B. Design Calculations:
 - 1. For all electric services, submit service load calculations to BLRWPCA.
 - 2. Conductor Sizing: From building's panel to grinder pump (includes conductor length from building's panel to control panel, and from control panel to grinder pump).
 - a. Include voltage drop calculations.
- C. Shop Drawings: Submit sketch indicating scope of work for service upgrade.
- D. Field Quality-Control Test Reports: From Contractor.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with standards of authorities having jurisdiction for electrical work including materials, installation, and testing.
- B. Qualification of Manufacturers' Products: Products used in the Work shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of satisfactory production acceptable to the BLRWPCA. Products and equipment shall be factory tested prior to shipment to the job site, and written verification or certification shall be provided.
- C. Qualification of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and the methods needed for proper installation of the work of this section and of the work in the other required sections.

BOLTON LAKES SEWER PROJECT

- D. Material, equipment and workmanship shall conform to the following applicable standards of the latest edition:
1. National Electrical Code
 2. Underwriter's Laboratories
 3. Connecticut Basic Building Code
 4. OSHA – U.S. Labor Department
 5. NFPA Codes.

1.5 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify BLRWPCA not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without BLRWPCA's written permission.

1.6 COORDINATION

- A. Schedule meeting times and access to the property with the property owner. Adjust work schedules accordingly.
- B. Inform each resident/owner of the required work. Obtain approval from the resident/owner for all work and improvements which include but are not limited to placement of the control box, conduit and items required by a service upgrade.
- C. The Contractor shall markout without damage, visual or otherwise, tentative locations of all work items for the resident/owner to review and approve. Damage created by the installation or improper installation will be corrected at the Contractors expense.
1. Prior to construction, obtain approval for each site from the BLRWPCA and the resident/owner.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide new equipment of the capacity and types specified, and as shown on the Equipment Schedule in the Drawings, and shall be the listed manufacturer and model number.
- B. Single Source: For ease of maintenance and part replacement, to the maximum extent possible use equipment of a single manufacturer.

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- C. Electrical materials and appliances for which Underwriters' Laboratories Label and/or Reexamination Service has been established shall be so approved and listed in the latest edition of the respective Underwriters' List or latest supplements at the time of bidding of this project. Failure to comply with this requirement shall justify disapproval of any such item.
- D. Materials and appliances shall be NEMA-rated for the use intended.
- E. Provide electric materials and electrified appliances not supplied in packaged grinder pumping stations.

2.2 CONDUIT

- A. PVC: Schedule 40.
- B. Flexible conduit shall be used where flexibility of exposed conduit is required. Galvanized steel strip spirally wound and coated with a flame and water resistant extruded polyvinyl covering. Use liquid-tight, galvanized conduit, with water-tight connectors. Use flexible conduit for connections to vibrating equipment and sensors.
 - 1. Conduit fittings for use with rigid steel conduit shall be threaded type, cast malleable iron galvanized or cadmium plated.
 - 2. Locknuts for securing conduit to steel enclosures shall have a sharp edge for digging though painted surface into the metal to ensure electrical ground continuity and have a ridged outside diameter for fastening.
 - 3. Bushing for terminating conduit less than 1-inch shall be smooth at outer edge to prevent injury to cable insulation. Bushings for terminating conduits 1-inch or larger shall be of the grounding insulated type with a screw terminal for wire connections.

2.3 WIRES

- A. Wiring and Cable: 98 percent conductivity copper with 600 Volt type THHN/THWN (dual rated) or XHWN insulation manufactured in strict accordance with the requirements of the National Electrical Code and IEEE.
- B. Wiring in all conduit shall include green grounding conductors.

2.4 OUTLET BOXES

- A. All exposed switch and receptacle outlet boxes shall be of the "FS" type with gaskets except in hazardous locations.
- B. All boxes shall be Surface install boxes. Space boxes off wall 1/4-inch minimum.
- C. Outlet Boxes: Manufactured by National Electric, Steel City or equal.

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2.5 JUNCTION AND PULL BOXES

- A. NEMA 4 or 4X rated pull boxes shall be provided in non-hazardous areas where more than three 90 degree bends are required between conduit terminations and also were required to facilitate cable pulling although not indicated on plans. All locations shall be subject to the BLRWPCA's approval.

2.6 SLEEVES

- A. Sleeve shall be provided to finish flush on inside, protruding on outside where conduit passes through floors or walls.
- B. Where conduit enters through building walls, install sleeves which will be cemented in around point of entry. All spaces around conduit or conduit sleeves shall be properly sealed against smoke, water and fire as required by Code and Local Authorities.

2.7 WIRING AND DEVICES AND PLATES

- A. Minimum Wire Size: As required to prevent voltage drop in power conductor exceeding 2 percent total, and #10 AWG at a minimum.
- B. Devices: 20A, specification grade, side wired and rated for the intended voltage and configuration.

2.8 BUILDING UNIT SERVICE ENTRANCE

- A. Determine existing connected load for each building unit to be served by a new grinder pump. If existing connected loads and the load associated with the new grinder pump exceeds capacity of existing electric service, upgrade the electric service to provide adequate capacity based on service load calculations. Size each service in accordance with Article 220 of the NEC.
- B. Provide meter sockets as required. Refer to utility company approved metering equipment list. Provide equipment with short circuit rating higher than that available per utility company.
- C. New Services include service entrance panelboards with enough circuit breakers for existing loads and a minimum of 5 spare spaces, weather head, service entrance cable, new grounding system, and necessary modifications to the existing branch circuits to accommodate new service.

2.9 BRANCH CIRCUIT BREAKER

- A. Grinder Pump Station: 30 Amp, 240V, single phase, 2 pole, compatible with building's panel.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Inspect installed work of other trades and verify that work is complete to the point where this installation may properly commence.
- B. In the event of discrepancy, immediately notify the BLRWPCA until such discrepancies have been fully resolved.

3.2 INSTALLATION OF EQUIPMENT

- A. Install equipment as indicated, except where specifically approved otherwise on the job by the BLRWPCA.
- B. Avoid interference with structure and with work of other trades, while preserving adequate headroom, and clearing doors and passageways to the approval of the Owner's representative.
- C. Inspect each piece of equipment for defects. Verify that parts are properly furnished and installed, that items function properly, and make required adjustments.

3.3 CONNECTIONS TO EQUIPMENT

- A. Make final electrical connections to grinder pump and related equipment.

3.4 UNINSPECTED WORK

- A. Uninspected work shall not be covered up or enclosed until it has been inspected, tested, and approved by the Owner's representative and by the authorities with the appropriate jurisdiction.
- B. Should any work be covered or enclosed before it has been completely inspected, tested and approved, uncover such work as requested. After the work has been completely inspected, tested, and approved, provide materials and labor necessary and make repairs necessary to restore the work to its original and proper condition.

3.5 CLEANING

- A. Leave the Work, including the inside of equipment, in a clean condition. Remove construction dust, debris and dirt from material and equipment.

3.6 COMPLETENESS

- A. Provide a complete system. All material and equipment shall be installed properly and adjusted so that, in the opinion of the BLRWPCA, all material and equipment are operating as designed.

3.7 ADJUSTMENT OF CONTROLS

- A. Adjust controls to the satisfaction of the BLRWPCA. At the completion of the project, arrange a meeting at the job site with the BLRWPCA and member Towns to demonstrate the proper operation of the electrical controls.

3.8 NOISE

- A. Any equipment that is generating objectionable noise, in the opinion of the BLRWPCA, shall be corrected and other noise shall be dampened as directed.

3.9 CONSTRUCTION

A. Interpretation of Drawings:

1. The Drawings do not show every item, piece of equipment wiring or detail. The Contractor shall provide complete operating systems.
2. Install the work as closely as possible to the layouts shown on the Drawings. The work may be modified as necessary to meet job specific conditions. Consult with the BLRWPCA before making changes affecting the function of systems or appearance.
3. The BLRWPCA reserves the right to order changes in layout of items if such changes do not substantially affect costs and if affected items have not been installed.

B. Installation of Conduit

1. Install conduit system for connection of outlet boxes, junction boxes, panel boards, cabinets, etc., and as indicated on the Drawings. Separate power conduits from control or low voltage conduits.
2. Run conduit continuously between points with a minimum number of bends.
3. Remove conduit that is damaged before installation from the premises.
4. Keep conduits dry and free of water or debris with approved pipe plugs or caps.
5. Where conduits pass through exterior concrete walls or footings below grade, the entrances shall be made watertight. This shall be done by providing pipe sleeves in the concrete with 1/2-inch minimum clearance around the conduit and caulking with oakum and sealant or by means of a conduit entrance seal.
6. Where conduits enter panelboards, pull boxes or outlet boxes, they shall be secured in place by galvanized locknuts and bushings, one locknut outside and one locknut inside of box with bushing on conduit end. The locknuts shall be tightened against the box without deforming the box. All bushings shall be of the insulating type. Bushings shall have the insulating material permanently fastened to the fittings. Conduits entering utility pad enclosures shall also be made watertight.
 - a. Do not penetrate top of enclosures installed in exterior applications.

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7. All field bends shall be made with standard tools and equipment manufactured especially for this purpose.

C. Grounding and Grounding Connections

1. Ground non-current carrying metallic parts of electrical equipment such as conduits, boxes, motor frames, grinder pump equipment, switches, etc., to an approved grounding electrode at the main service location, as required by the National Electrical Code and the Local Utility. No soldered connections shall be used in any of the grounding connections.
2. Connect the neutral leg of the main service to the grounding electrode with copper as shown on the Drawings.
3. Conduct test to determine that resistance of grounding path is less than 25 OHMS on each grounding source.

D. Equipment Wiring

1. Wire electrical equipment furnished under all sections of the specifications and provide safety disconnect switches ahead of each piece of equipment.
2. Refer to manufacturer's recommendations as to type and size of protective and control equipment required for electrical apparatus. Any damage resulting from operation of equipment with improperly sized protective and control mechanisms shall be completely replaced as part of the work included in this section of the specifications.

3.10 TEST AND ADJUSTMENTS

- A. Provide materials, labor, instruments, etc., and other services required for complete and satisfactory tests and adjustments of the electrical and alarm systems and related work.
- B. Tests required at the grinder pump include:
 1. Grounding system at system bonding jumpers and generators.
 2. Voltage measurements taken at service and at pumps when operating.
 3. Conduct alarm signal by creating an alarm condition by manually causing each alarm condition to occur and verify in grinder pump control panel.
- C. Provide, at no additional cost, minor revisions and adjustments in control apparatus to obtain the desired operation.

3.11 START-UP SERVICES

- A. Refer to "Grinder Pump Station" Section for start-up service requirements.

END OF SECTION

GENERAL ELECTRICAL – GRINDER PUMP

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BASIC ELECTRICAL MATERIALS AND METHODS - GP

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Raceways.
 - 2. Conductors and connectors.
 - 3. Supporting devices for electrical components.
 - 4. Electrical identification.
 - 5. Touchup painting.

1.2 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. IMC: Intermediate metal conduit.
- D. LFMC: Liquidtight flexible metal conduit.
- E. RNC: Rigid nonmetallic conduit.

1.3 SUBMITTALS

- A. Product Data: For conduit and wire.
- B. As-Built Data: Provide 1-line power distribution diagram for all protected circuits.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

1.5 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

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1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- C. Coordinate electrical service connections to components furnished by utility companies.
 1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
 2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

PART 2 - PRODUCTS

2.1 RACEWAYS

- A. EMT: ANSI C80.3, zinc-coated steel, with set-screw or compression fittings.
- B. FMC: Zinc-coated steel.
- C. IMC: ANSI C80.6, zinc-coated steel, with threaded fittings.
- D. LFMC: Zinc-coated steel with sunlight-resistant and mineral-oil-resistant plastic jacket.
- E. RNC: NEMA TC 2, Schedule 40 PVC, with NEMA TC3 fittings.
- F. Raceway Fittings: Specifically designed for the raceway type with which used.

2.2 CONDUCTORS

- A. Conductors, No. 10 AWG and Smaller: Solid or stranded copper.
- B. Conductors, Larger than No. 10 AWG: Stranded copper.
- C. Analog/signal conductors: No. 20/2, shielded twisted pair cabling.
- D. Insulation: Thermoplastic, rated at 75 deg C minimum.
- E. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

2.3 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

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- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
 - C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch-diameter slotted holes at a maximum of 2 inches o.c., in webs.
 - D. Nonmetallic Channel and Angle Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch-diameter holes at a maximum of 8 inches o.c., in at least one surface.
 - 1. Fittings and Accessories: Products of the same manufacturer as channels and angles.
 - 2. Fittings and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
 - E. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
 - F. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
 - G. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.
 - H. Expansion Anchors: Carbon-steel wedge or sleeve type.
 - I. Toggle Bolts: All-steel springhead type.
 - J. Powder-Driven Threaded Studs: Heat-treated steel.
- 2.4 ELECTRICAL IDENTIFICATION
- A. Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.
 - B. Raceway and Cable Labels: Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway and cable size.
 - 1. Type: Preprinted, flexible, self-adhesive, vinyl. Legend is overlaminated with a clear, weather- and chemical-resistant coating.
 - 2. Color: Black letters on orange background.
 - 3. Legend: Indicates voltage.
 - C. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick.
 - D. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:

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1. Not less than 6 inches wide by 4 mils thick.
 2. Compounded for permanent direct-burial service.
 3. Embedded continuous metallic strip or core.
 4. Printed legend that indicates type of underground line.
- E. Tape Markers for Wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- F. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
- G. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch minimum thickness for signs up to 20 sq. in. and 1/8-inch minimum thickness for larger sizes. Engraved legend in black letters on white background.
- H. Interior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Preprinted, aluminum, baked-enamel-finish signs, punched or drilled for mechanical fasteners, with colors, legend, and size appropriate to the application.
- I. Exterior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch, galvanized-steel backing, with colors, legend, and size appropriate to the application. 1/4-inch grommets in corners for mounting.
- J. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.5 TOUCHUP PAINT

- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

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- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.
- E. Install grinder pump station and associated equipment in accordance with manufacturer's recommendations.

3.2 RACEWAY APPLICATION

- A. Use the following raceways for outdoor installations:
 - 1. Exposed: PVC.
 - 2. Concealed: PVC.
- B. Use the following raceways for indoor installations:
 - 1. Exposed: EMT.
 - 2. Concealed: EMT.
 - 3. Connection to Vibrating Equipment: FMC; except in wet or damp locations, use LFMC.
 - 4. Damp or Wet Locations: Schedule 40 PVC.
 - 5. Boxes and Enclosures: NEMA 250, Type 1, unless otherwise indicated.

3.3 RACEWAY AND CABLE INSTALLATION

- A. Use temporary raceway caps to prevent foreign matter from entering.
- B. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
- C. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.
- D. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.
- E. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inch flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.

3.4 WIRING METHODS FOR POWER, LIGHTING, AND CONTROL CIRCUITS

- A. Feeders: Type THHN/THWN insulated conductors in raceway.

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- B. Underground Feeders and Branch Circuits: Type THWN or single-wire, Type UF insulated conductors in raceway.
- C. Branch Circuits: Type THHN/THWN insulated conductors in raceway.
- D. Branch Circuits: Type THW or THHN/THWN insulated conductors in raceway where exposed.
- E. Remote-Control Signaling and Power-Limited Circuits: Type THHN/THWN insulated conductors in raceway for Classes 1, 2, and 3, unless otherwise indicated.

3.5 WIRING INSTALLATION

- A. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- B. Install wiring at outlets with at least 12 inches of slack conductor at each outlet.
- C. Connect outlet and component connections to wiring systems and to ground. Tighten electrical connectors and terminals, according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.6 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Locations: Steel materials.
- C. Support Clamps for PVC Raceways: Click-type clamp system.
- D. Selection of Supports: Comply with manufacturer's written instructions.
- E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

3.7 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

BOLTON LAKES SEWER PROJECT

- D. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- E. Install 1/4-inch- diameter or larger threaded steel hanger rods, unless otherwise indicated.
- F. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- G. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- H. Simultaneously install vertical conductor supports with conductors.
- I. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.
- J. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
- K. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- L. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
 - 1. Wood: Fasten with wood screws or screw-type nails.
 - 2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
 - 3. New Concrete: Concrete inserts with machine screws and bolts.
 - 4. Existing Concrete: Expansion bolts.
 - 5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
 - 6. Steel: Welded threaded studs or spring-tension clamps on steel.
 - a. Field Welding: Comply with AWS D1.1.
 - 7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.

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8. Light Steel: Sheet-metal screws.
9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.8 IDENTIFICATION MATERIALS AND DEVICES

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
- E. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.
- F. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
 1. Phase A: Black.
 2. Phase B: Red.
 3. Phase C: Blue.
- G. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
- H. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

3.9 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

BOLTON LAKES SEWER PROJECT

- B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.10 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work, including the following:
 - 1. Raceways.
 - 2. Building wire and connectors.
 - 3. Supporting devices for electrical components.
 - 4. Electrical identification.
 - 5. Electricity-metering components.
 - 6. Cutting and patching for electrical construction.
 - 7. Touchup painting.
- B. Test Owner's electricity-metering installation for proper operation, accuracy, and usability of output data.
 - 1. Connect a load of known kW rating, 1.5 kW minimum, to a circuit supplied by the metered feeder.
 - 2. Turn off circuits supplied by the metered feeder and secure them in the "off" condition.

3.11 REFINISHING AND TOUCHUP PAINTING

- A. Refinish and touch up paint.
 - 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
 - 2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
 - 3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.12 CLEANING AND PROTECTION

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

BOLTON LAKES SEWER PROJECT

- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION

BOLTON LAKES SEWER PROJECT

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.2 SUBMITTALS

- A. Product Data: For the following:
 - 1. Ground rods.
- B. Field Test Reports: Submit written test reports to include the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 1. Comply with UL 467.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following.
 - 1. Grounding Conductors, Cables, Connectors, and Rods:
 - a. Apache Grounding/Erico Inc.
 - b. Copperweld Corp.
 - c. Dossert Corp.
 - d. Salisbury: W. H. Salisbury & Co.

GROUNDING AND BONDING

- e. Thomas & Betts, Electrical.
- f. Or equal.

2.2 GROUNDING CONDUCTORS

- A. Material: copper.
- B. Equipment Grounding Conductors: Insulated with green-colored insulation.
- C. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- F. Bare Copper Conductors: Comply with the following:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Assembly of Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
- G. Copper Bonding Conductors: As follows:
 - 1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
 - 2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
 - 3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- H. Aluminum Bonding Conductors: As follows:
 - 1. Bonding Cable: 10 strands of No. 14 AWG aluminum conductor, 1/4 inch in diameter.
 - 2. Bonding Conductor: No. 4 or No. 6 AWG, stranded aluminum conductor.
 - 3. Bonding Jumper: Aluminum tape, braided bare aluminum conductors, terminated with aluminum ferrules; 1-5/8 inches wide and 1/16 inch thick.
- I. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

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2.3 CONNECTOR PRODUCTS

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
- B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel.
- B. Ground Rods: Sectional type; copper-clad steel.
 - 1. Size: 3/4-inch dia. by 120 inches in length.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.
- D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
- E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.
- F. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.
 - 2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.
- G. Underground Grounding Conductors: Use tinned- copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

GROUNDING AND BONDING

3.2 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install equipment grounding conductors in all feeders and circuits.
- C. Install insulated equipment grounding conductor with all circuit conductors.
- D. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

3.3 INSTALLATION

- A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
 - 1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
 - 2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.
- B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- E. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.
- F. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

3.4 CONNECTIONS

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.
- E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
- F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
 - 1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

GROUNDING AND BONDING

BOLTON LAKES SEWER PROJECT

2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
 - a. Equipment Rated 500 kVA and Less: 10 ohms.
 - b. Equipment Rated 500 to 1000 kVA: 5 ohms.
4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify BLRWPCA promptly and include recommendations to reduce ground resistance.

3.6 GRADING AND PLANTING

- A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION

STANDARD DETAILS

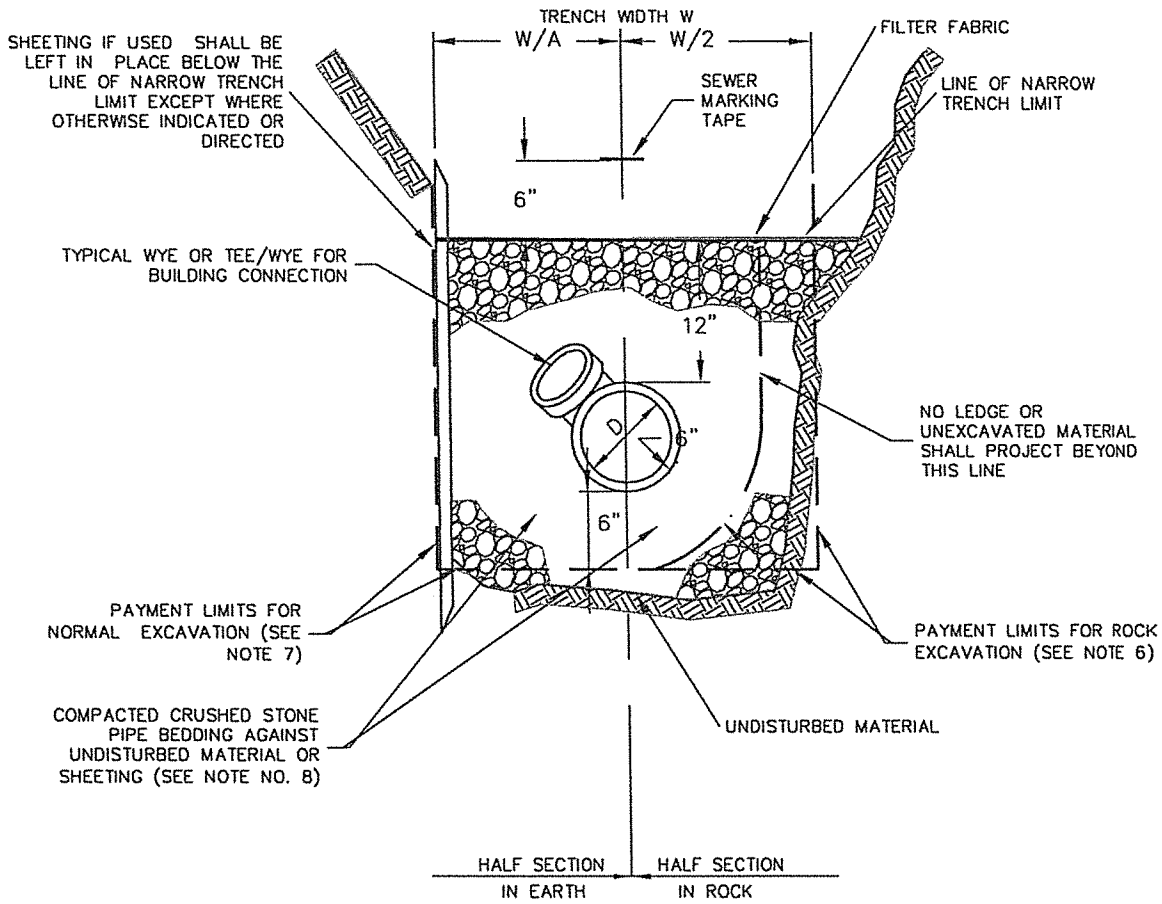
BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS

FIGURE INDEX

<u>FIGURE NO.</u>	<u>SEWER DETAILS</u>
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2.	LOW PRESSURE SEWER TRENCH
3.	GRAVITY LATERAL CONNECTION TO MAINLINE PIPE
4.	SANITARY SEWER PIMP TRENCH NOTES
5A.	GRAVITY LATERAL CONNECTION TO BUILDING SEWER
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6.	SANITARY SEWER CONNECTION AND WATER IN COMMON IN TRENCH
7.	4' SANITARY MANHOLE
8.	5' PRECAST MANHOLE
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10.	MANHOLE AND CHAMBER NOTES
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13.	BOLTED & GASKETED SANITARY MANHOLE FRAME & COVER
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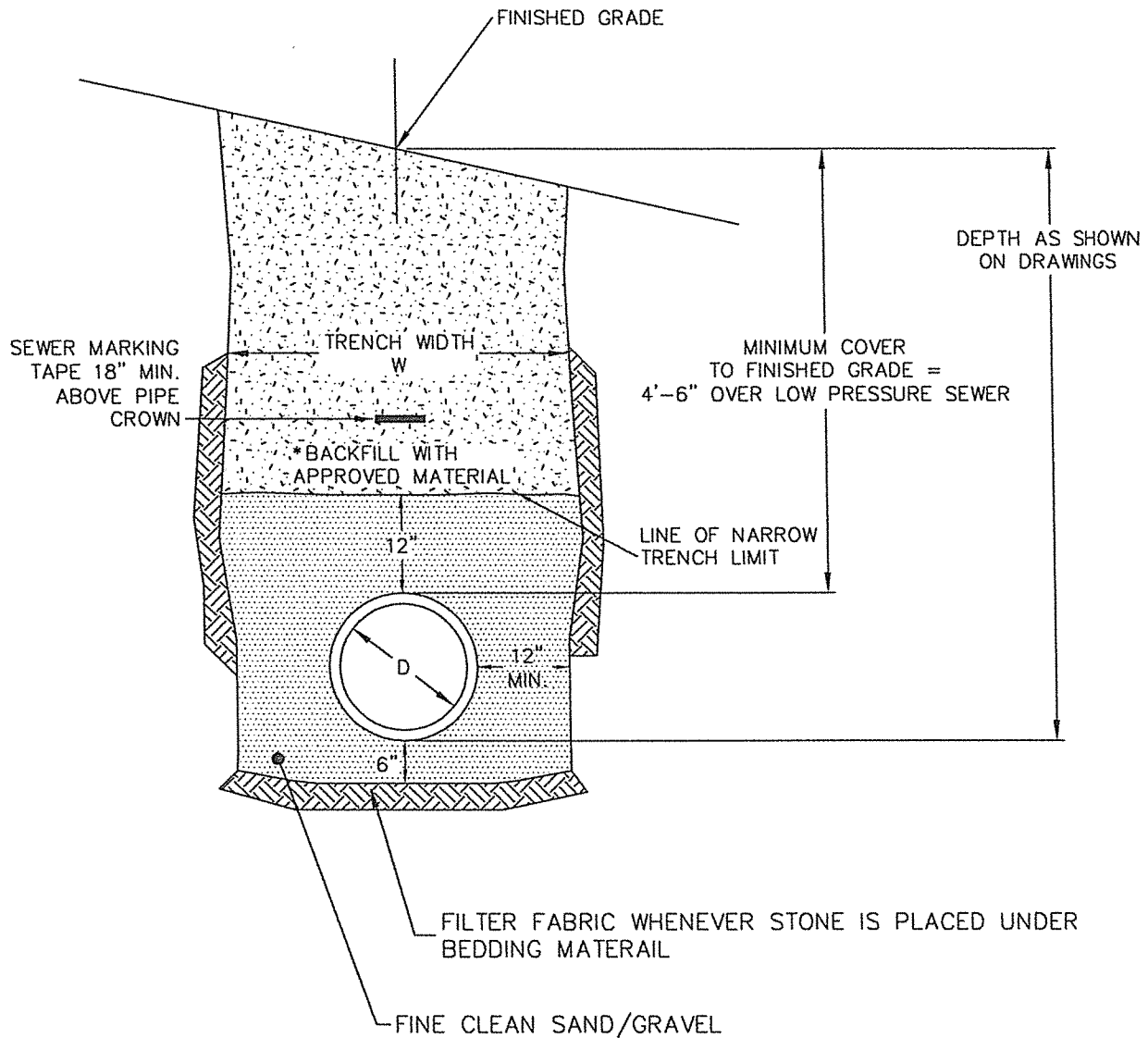


TYPICAL SEWER TRENCH

SCALE: N.T.S.

FIGURE 01
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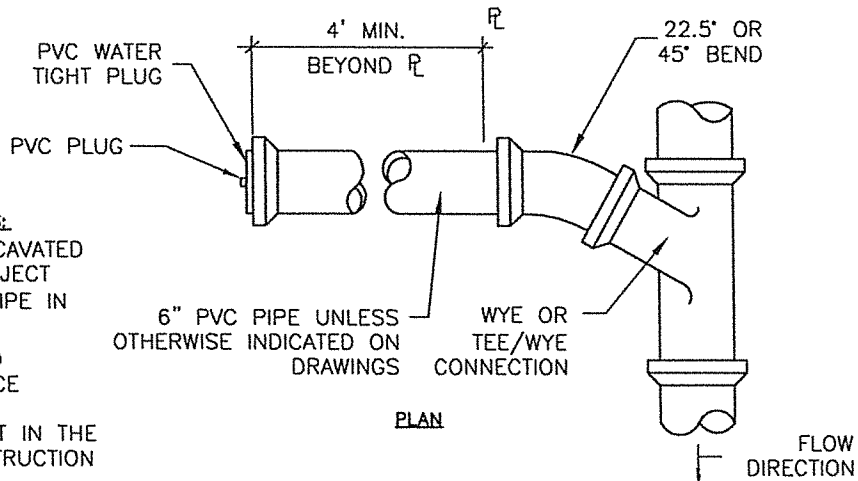


LOW PRESSURE SEWER TRENCH

SCALE: N.T.S.

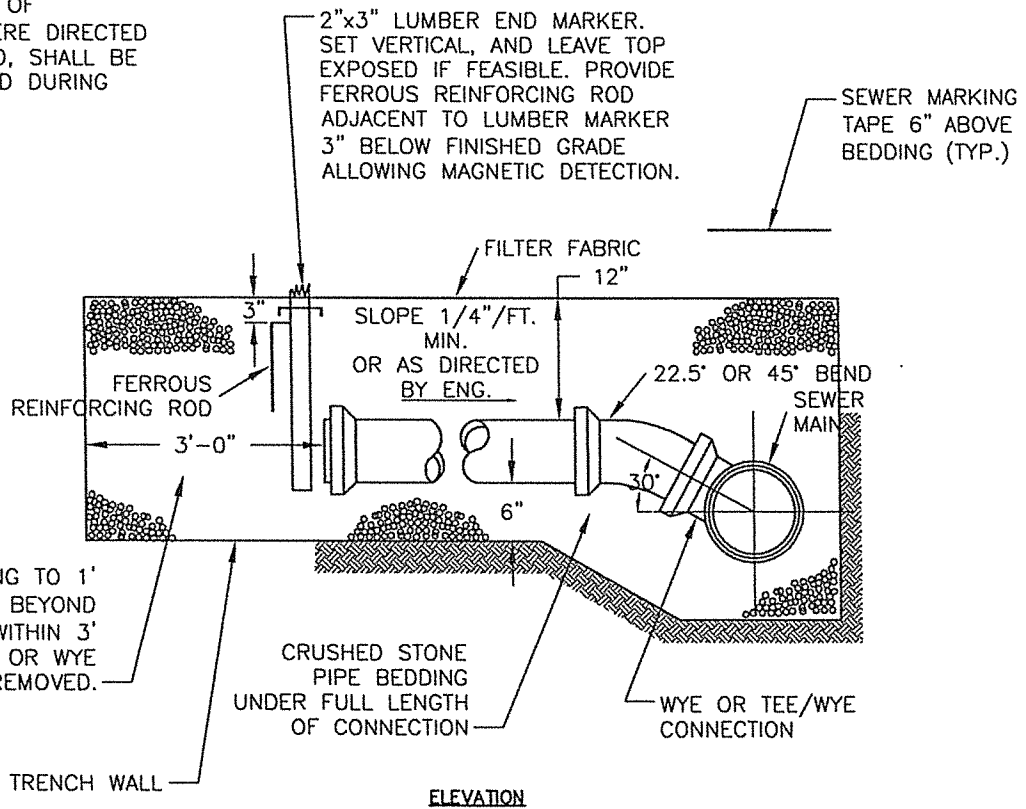
FIGURE 02
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SANITARY SEWER DETAILS



SERVICE CONNECTION NOTES:

- 1) NO LEDGE OR UNEXCAVATED MATERIAL SHALL PROJECT WITHIN 6" OF THE PIPE IN ANY DIRECTION
- 2) EXACT LOCATION AND ELEVATION OF SERVICE CONNECTIONS TO BE DETERMINED AND SET IN THE FIELD DURING CONSTRUCTION
- 3) EXACT LOCATION OF WYES/TEES, WHERE DIRECTED TO BE INSTALLED, SHALL BE SET IN THE FIELD DURING CONSTRUCTION.



GRAVITY LATERAL CONNECTION TO MAINLINE PIPE

N.T.S.

FIGURE 03
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BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS

SANITARY SEWER PIPE TRENCH NOTES

1. DEPTH OF SEWER SHALL BE AS SHOWN ON DRAWINGS.
2. SEWER TRENCHES MAY BE EXCAVATED WIDER THAN TRENCH WIDTH W ABOVE THE "LINE OF NARROW TRENCH LIMIT".
3. BELOW THE "LINE OF NARROW TRENCH LIMIT" THE TRENCH SHALL NOT BE EXCAVATED BEYOND THE TRENCH WIDTH W.
4. IF EXCAVATION AND BACKFILL BELOW NORMAL DEPTH IS REQUIRED, SHEETING MAY BE ORDERED.
5. SHEETING, IF USED, IN ALL CASES SHALL BE LEFT IN PLACE BELOW A LINE 1'-0" ABOVE THE TOP OF THE SEWER PIPE, UNLESS OTHERWISE INDICATED OR DIRECTED BY THE ADMINISTRATOR.
6. ALL ROCK WITHIN 3'-0" HORIZONTALLY OF THE ENDS OF BUILDING CONNECTIONS, BRANCHES AND STUBS, AND DOWN TO A HORIZONTAL PLANE 6" BELOW THE BOTTOMS OF SUCH ITEMS SHALL BE REMOVED.
7. TRENCH WIDTHS SHALL BE AS FOLLOWS:

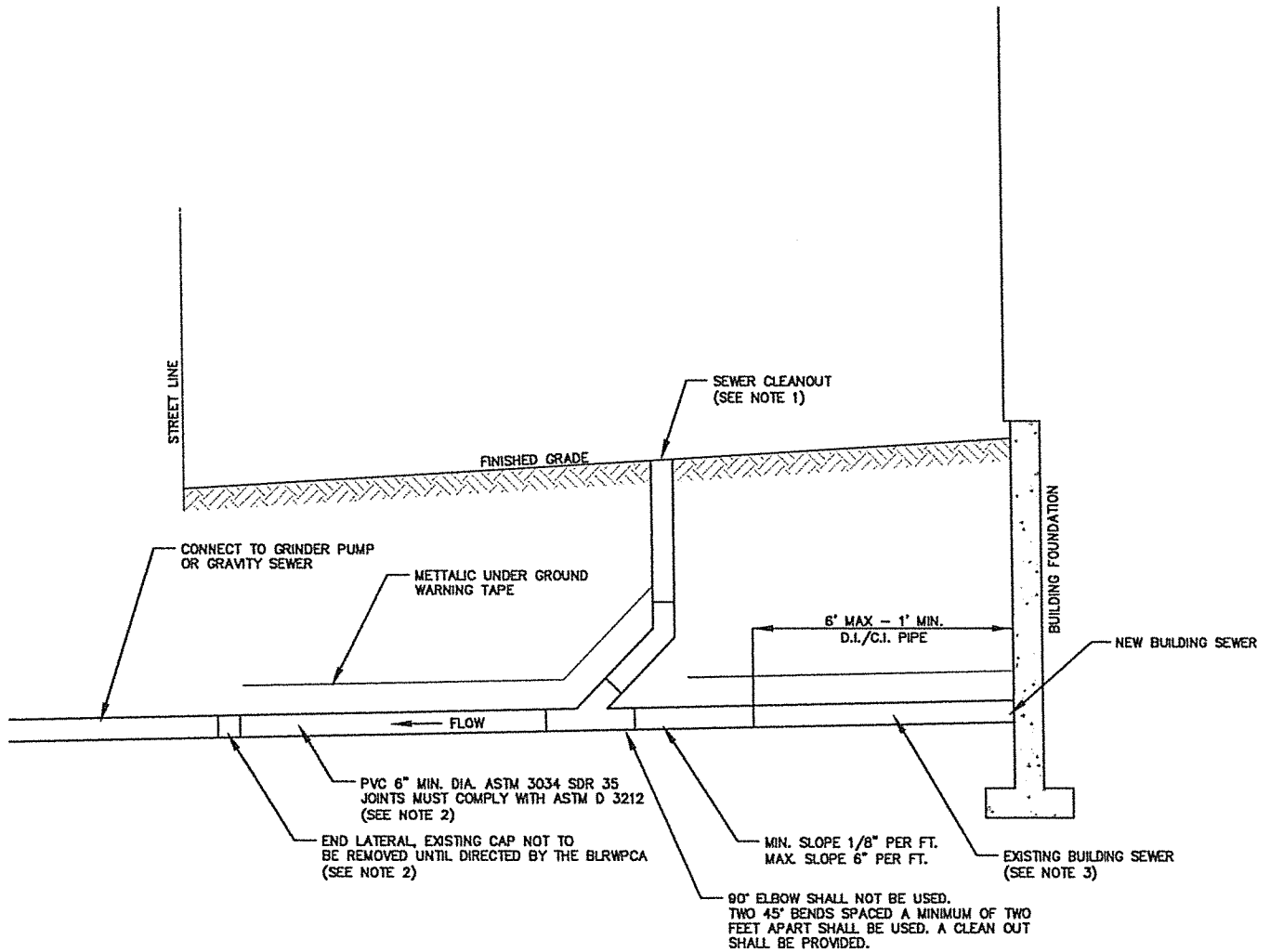
SURFACE	DIAMETER PIPE "D"	TRENCH WIDTH "W"
PAVED	12" AND SMALLER	4'-0"
UNPAVED	12" AND SMALLER	3'-0"

NUMBER OF PIPE IN TRENCH	DIAMETER PIPE "D"	TRENCH WIDTH "W"
ONE	12" AND SMALLER	4'-0"
TWO	12" AND SMALLER	7'-0"

8. WHERE CONCRETE ENCASEMENT IS CALLED FOR BY THE PLANS, OR WHEN DIRECTED BY THE ADMINISTRATOR, REPLACE BEDDING AND BACKFILL BELOW THE "LINE OF NARROW TRENCH LIMIT" WITH CLASS "A" CONCRETE.
9. SEWER MARKING TAPE SHALL BE INSTALLED A MINIMUM OF 18" ABOVE THE LOW PRESSURE SEWER AND SERVICE CONNECTION PIPE.
10. LOW PRESSURE SEWER PIPE AND SERVICE CONNECTION PIPE SHALL HAVE FILTER FABRIC INSTALLED ON TOP OF THE PIPE BEDDING AS SHOWN ON THE DETAILS.

FIGURE 04
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SANITARY SEWER DETAILS



GRAVITY LATERAL CONNECTION TO
BUILDING SEWER

SCALE: N.T.S.

FIGURE 05A
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(BLRWPCA)
SANITARY SEWER DETAILS

GRAVITY LATERAL CONNECTION NOTES

1. CLEANOUTS ARE REQUIRED:

- WITHIN 100 LINEAR FEET OF THE SEWER MAIN AND EVERY 100 LINEAR FEET THEREAFTER.
- IMMEDIATELY UPSTREAM OF BENDS GREATER THAN 45° AND EVERY 3 BENDS REGARDLESS OF DEGREE.
- WITHIN 10 FEET OF THE BUILDING FOUNDATION (INSIDE OR OUTSIDE) UNLESS A PRE-EXISTING INDOOR CLEANOUT IS NOT EASILY ACCESSIBLE IN WHICH CASE AN ADDITIONAL CLEANOUT WILL BE REQUIRED OUTSIDE OF THE FOUNDATION.
- CLEANOUTS MAY BE LEFT ABOVE GRADE BUT MAY NOT BE LESS THAN 6 INCHES BELOW GRADE.
- THE BLRWPCA ADMINISTRATOR (OR HIS AUTHORIZED AGENT) RESERVES THE RIGHT TO DETERMINE ACTUAL LOCATION OF CLEANOUTS.

2. TYPE OF PIPE:

- MINIMUM SIX (6) INCH DIAMETER SDR-35 PIPE SHALL BE USED FOR ALL LATERAL SERVICE CONNECTIONS. COMMERCIAL CONNECTIONS MAY REQUIRE THE USE OF LARGER DIAMETER PIPE AS TO BE DETERMINED BY THE BLRWPCA. ANY DEVIATION FROM SDR-35 REQUIRES APPROVAL FROM THE BLRWPCA.
- GASKETTED BELL & SPIGOT PIPE OR SOLVENT WELDED PIPE MAY BE USED.
- PIPE SHALL BE LAID AT A MINIMUM PITCH OF 1% BUT 2% IS PREFERRED.

3. CONNECTIONS TO EXISTING BUILDING SEWERS (THE EXISTING SEPTIC LINE IS USED)

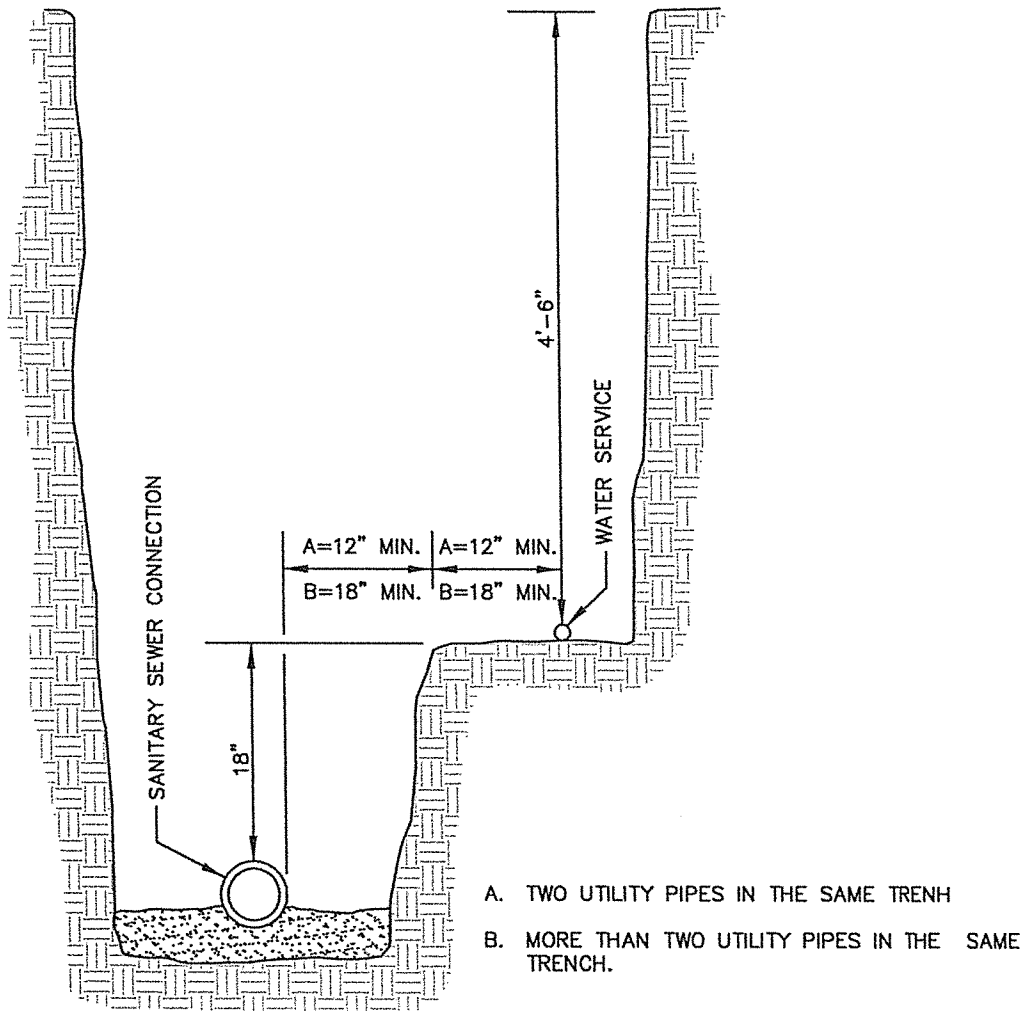
- A STEEL BANDED FLEXIBLE COUPLING (FERNCO) MAY BE USED TO CONNECT EXISTING CAST IRON/DUCTILE IRON PIPE TO SDR-35. FOUR (4) BANDED FLEXIBLE COUPLINGS.
- THE BLRWPCA RESERVES THE RIGHT TO DETERMINE IF THE CONDITION OF THE EXISTING BUILDING SEWER IS SUITABLE FOR MAKING THE SEWER CONNECTION. FIBER CONDUIT (ORANGEBURG) AND CLAY PIPES SHALL NOT BE USED.
- ROLL-ON DONUT TYPE GASKETS NOT ACCEPTED IF USED WITHIN 25' OF FOUNDATION WALL OR 75' OF WELL.

5. TRENCHING/PIPE BEDDING:

- ALL SEWER LINES MUST BE BEDDED IN 3/4 INCH STONE. FILTER FABRIC IS RECOMMENDED BUT NOT REQUIRED.
- NATURAL CLAY OR SILT DAMS SHALL BE PLACED IN THE TRENCH IN AREAS OF HIGH GROUNDWATER TABLE.
- AT LEAST 3 FEET OF COVER MUST BE PROVIDED; MORE IF PIPE IS LAID UNDER A DRIVEWAY OR OTHER AREA IN WHICH VEHICLES OR OTHER HEAVY OBJECTS ARE LIKELY TO PASS OR BE PLACED. IF BUILDING SEWER EXISTS FOUNDATION HIGHER THAN 3 FEET BELOW GRADE; 3 FEET OF COVER MUST BE ATTAINED AS SOON AS IS REASONABLY POSSIBLE.
- IN NO CASE WILL THE TRENCH BE DRAINED OF GROUNDWATER THROUGH THE SANITARY SEWER LATERAL.

FIGURE 05B
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS

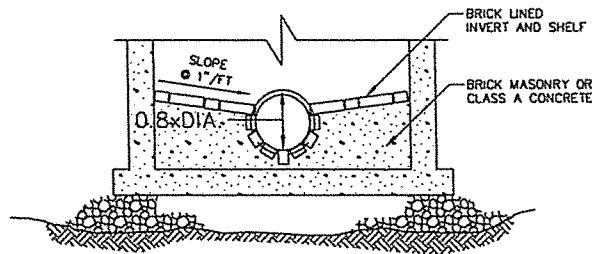
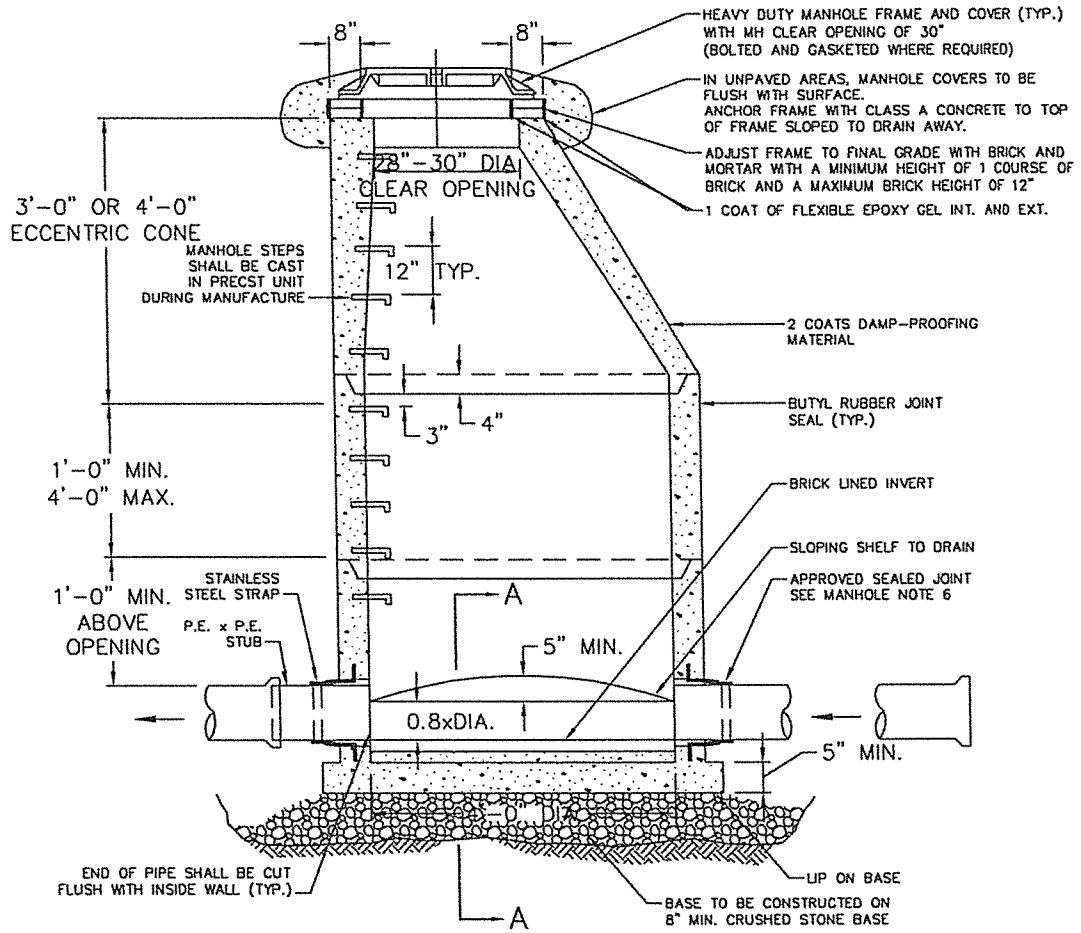


1. WATER SERVICE AND BUILDING SEWER LINES SHALL BE LOCATED IN SEPARATE TRENCHES A MINIMUM OF 10 FEET APART UNLESS APPROVED BY THE BLRWPCA.
2. WHERE APPROVED BY THE BLRWPCA AND THE UTILITIES ARE LAID IN THE SAME TRENCH, A WATER PIPE SHALL BE LAID ON A BENCH AT LEAST 18 INCHES ABOVE THE TOP OF THE SEWER PIPE AND AT LEAST 12 INCHES AWAY FROM THE SIDE OF THE SANITARY TRENCH.
3. IN NO CASE SHALL BUILDING SEWER PIPES BE LOCATED LESS THAN CT HEALTH CODES MINIMUM SEPARATION DISTANCE FROM WATER SUCTION PIPES.

SANITARY SEWER CONNECTION AND
WATER IN COMMON TRENCH

FIGURE 06
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS



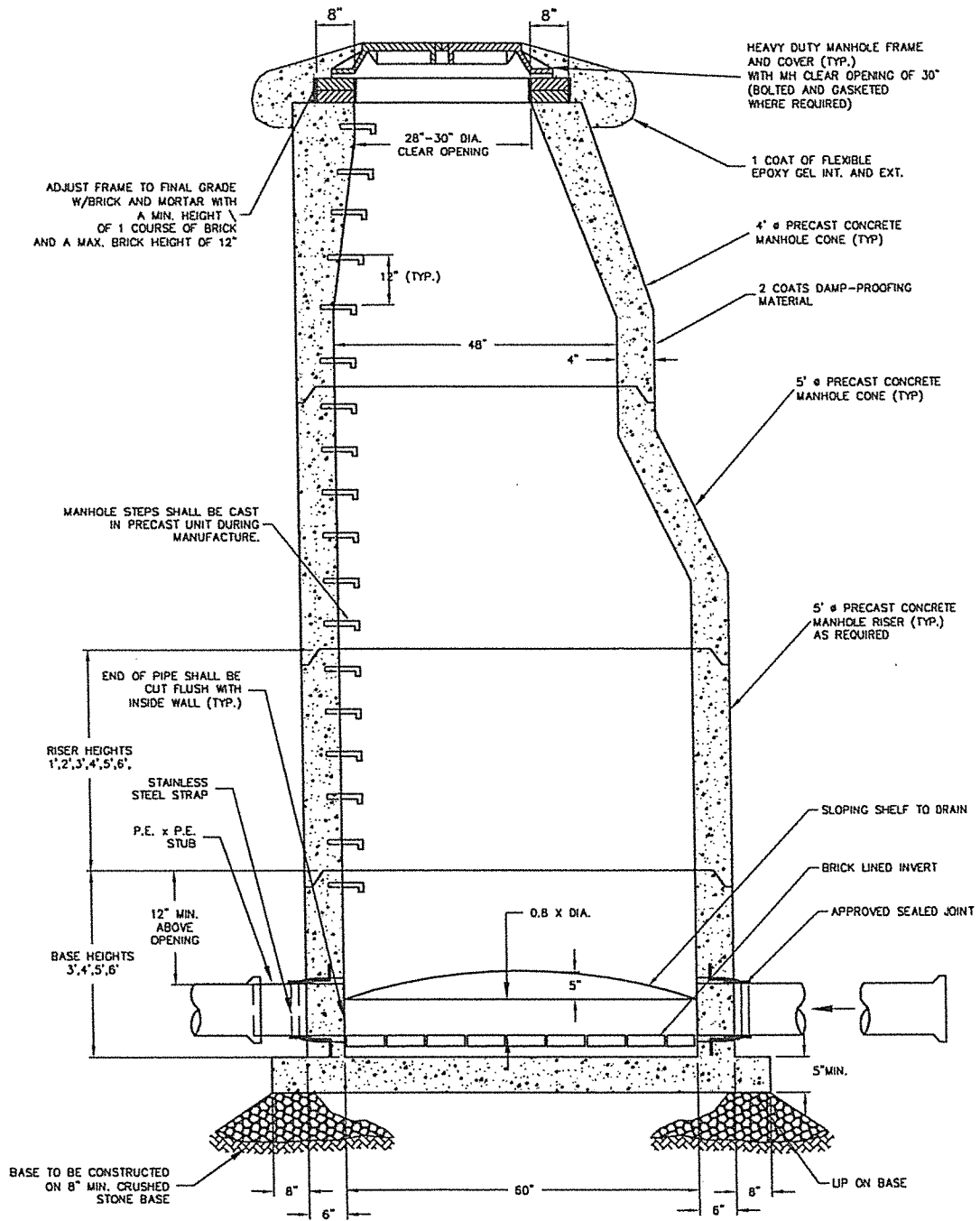
SECTION A-A

4' SANITARY MANHOLE

N.T.S.

FIGURE 7
JULY 2012

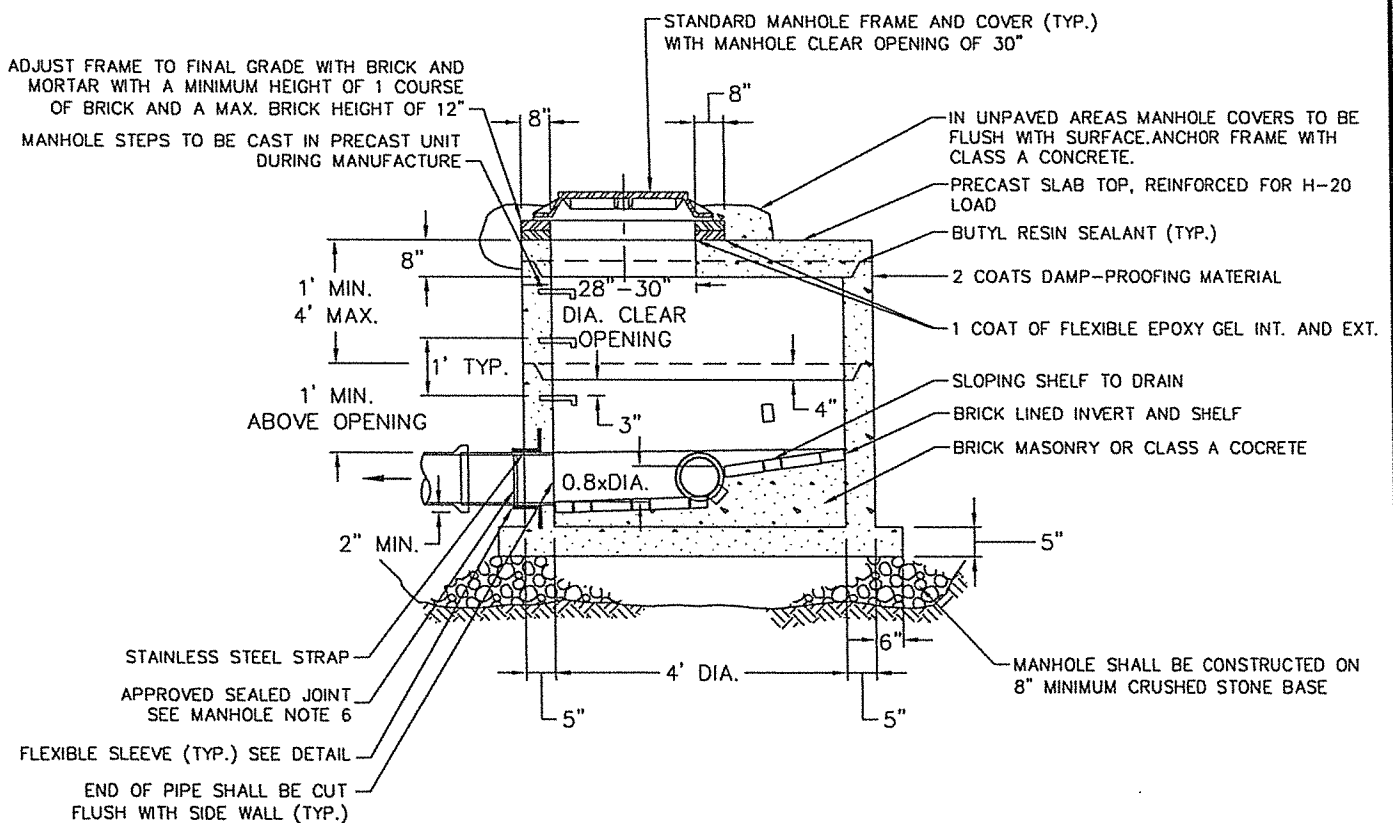
BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS



5' PRECAST MANHOLE
NOT TO SCALE

FIGURE 8
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS



NOTES:

1. FLAT TOP MANHOLE TO BE USED WHERE HEIGHT PROHIBITS THE USE OF CONE SECTION.
2. FLAT TOP MANHOLE FRAME, COVER AND STEPS SHALL BE PLACED ON THE DOWNSTREAM SIDE

FLAT TOP MANHOLE

NOT TO SCALE

FIGURE 9
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS

MANHOLE AND CHAMBER NOTES:

- 1.) CONTRACTOR TO CONFIRM CHAMBER DIMENSIONS ARE APPROPRIATE FOR PIPE & FITTING SIZES AS SHOWN PRIOR TO ORDERING MATERIALS.
- 2.) MANHOLES AND CHAMBERS SHALL BE PLACED ON 8" MINIMUM CRUSHED STONE BASE.
- 3.) MORTAR IN LIFTING HOLES AFTER INSTALLING RUBBER PLUGS.
- 4.) MANHOLES AND CHAMBERS SHALL RECEIVE A DAMP-PROOFING PRIOR TO DELIVERY TO THE SITE.
- 5.) MANHOLES AND CHAMBERS SHALL BE WATERTIGHT. PROVIDE WATERTIGHT STUB AND FLEXIBLE SLEEVE AS NOTED ON THE DRAWING OR AS DIRECTED BY THE ENGINEER.
- 6.) PIPE TO STRUCTURE JOINTS SHALL BE SEALED WATERTIGHT BY USE OF PRE-MOLDED ELASTOMERIC SEALED JOINTS CAST INTO CONCRETE STRUCTURE AND SHALL CONFORM TO ASTM C 443 AND ASTM C 923M.
- 7.) CONTRACTOR SHALL VACUUM TEST ALL STRUCTURES BEFORE AND AFTER BACKFILLING.
- 8.) STEPS SHALL BE STEEL REINFORCED POLYPROPYLENE.
- 9.) PAYMENT DEPTHS ARE MEASURED FROM TOP OF CONE TO INVERT OF STRUCTURE.
- 10.) PAYMENT LIMITS FOR EXCAVATION ARE 2 FEET FROM EACH FACE OF THE STRUCTURE.
- 11.) FRAME AND COVERS SHALL BE OF THE TYPE INDICATED BELOW OR APPROVED EQUAL, UNLESS OTHERWISE SPECIFIED.

TYPE

BOLTED & GASKETED
(BOLTS SHALL BE 1/2" STAINLESS STEEL.)

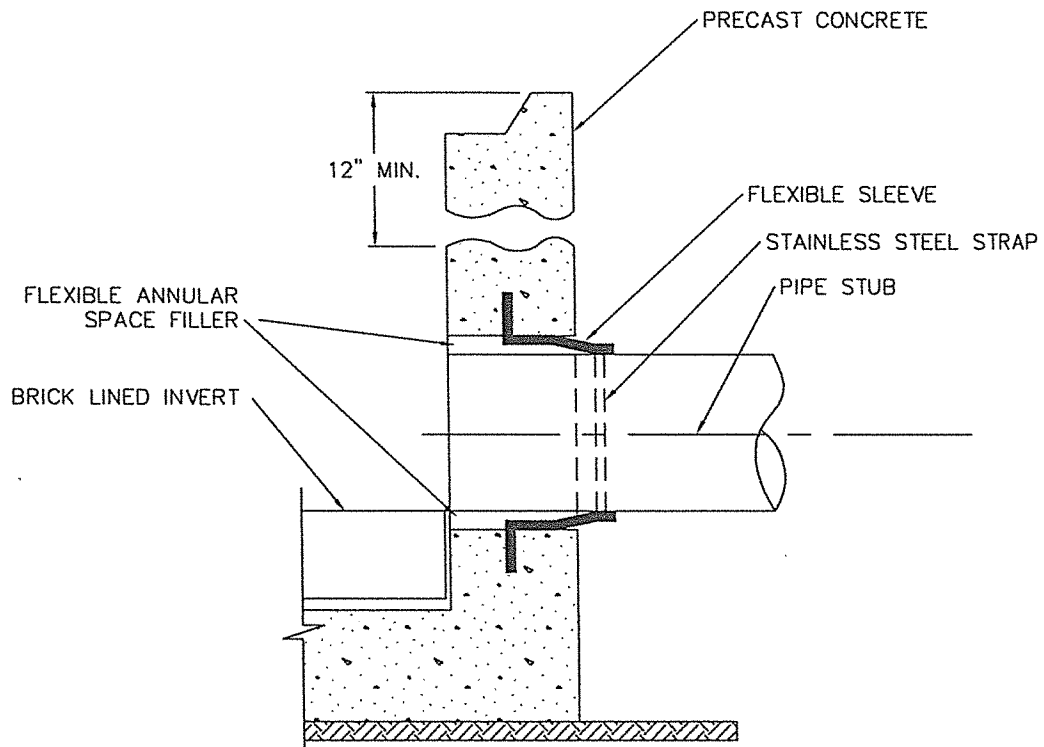
HEAVY DUTY

THE COVER SHALL HAVE THE WORDS "SEWER" CAST INTO THE COVER IN 2" LETTERS.

- 12.) PROVIDE CLEANOUT CHAMBERS WITH AIR RELEASE/VACUUM VALVES AND ODOR CONTROL AT LOCATIONS CALLED OUT ON PLAN SHEETS.

FIGURE 10
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS

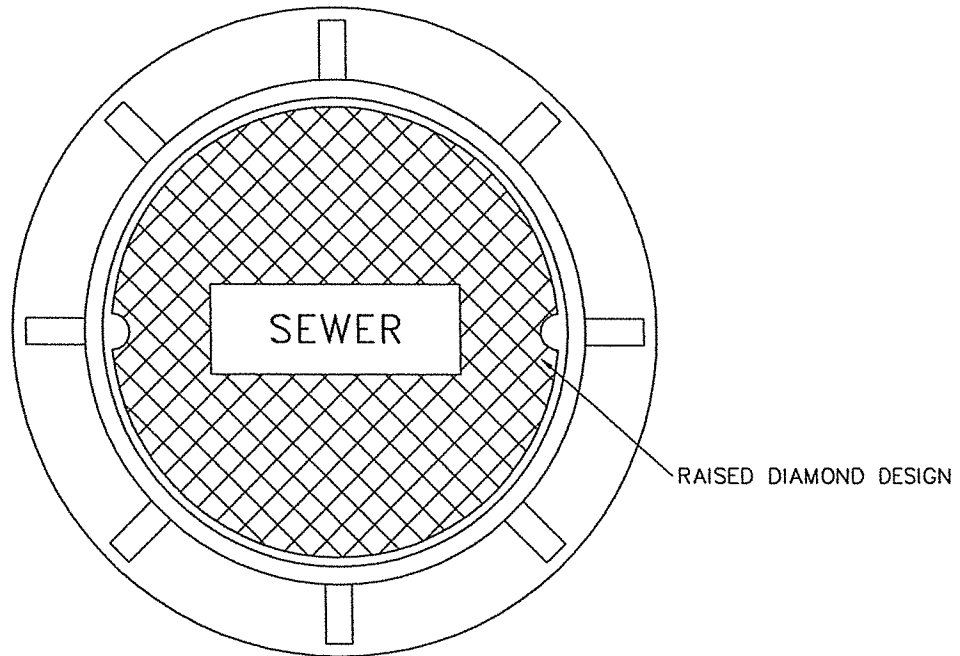


FLEXIBLE SLEEVE

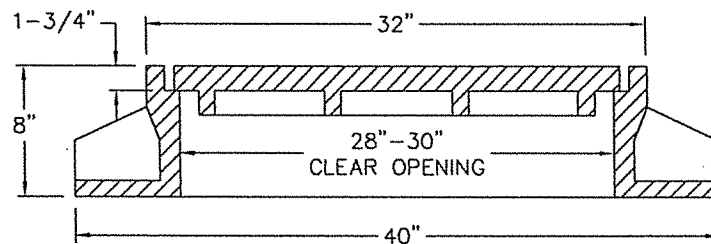
SCALE: N.T.S.

FIGURE 11
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS



PLAN



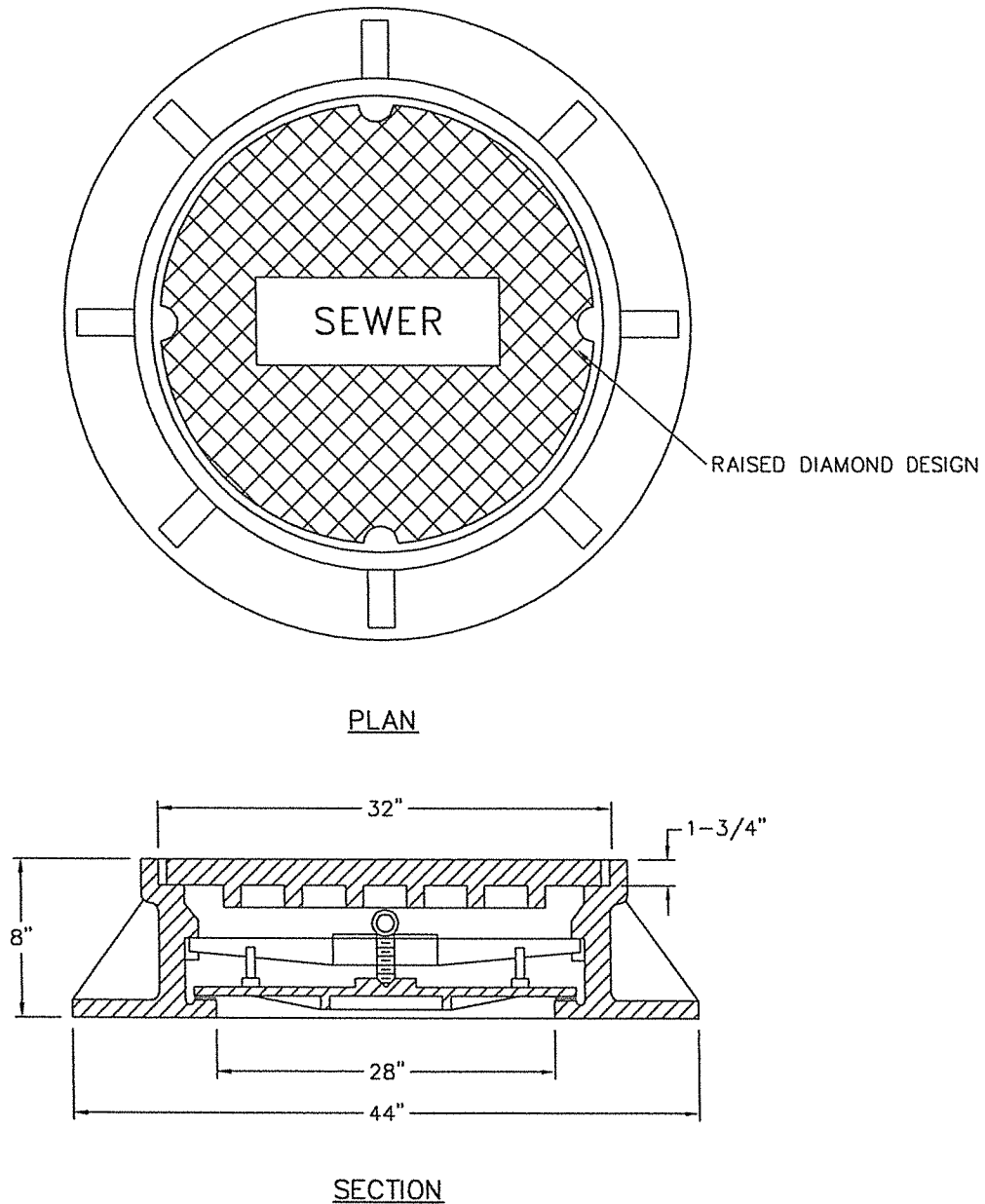
SECTION

STANDARD SANITARY MANHOLE
FRAME & COVER

SCALE: N.T.S.

FIGURE 12
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS

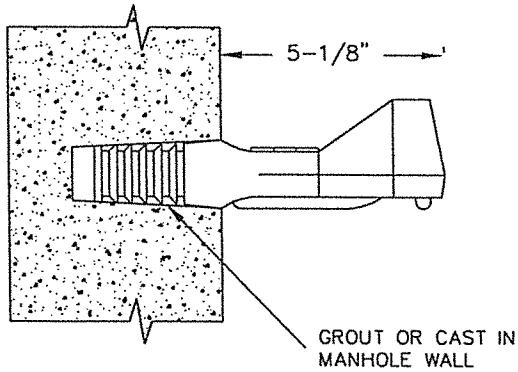
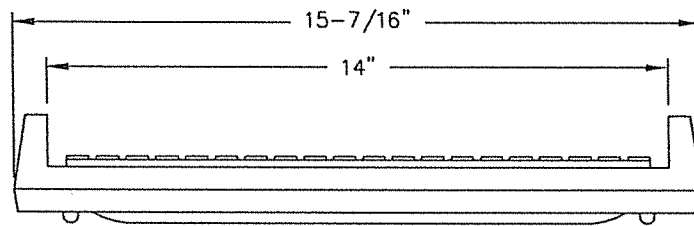
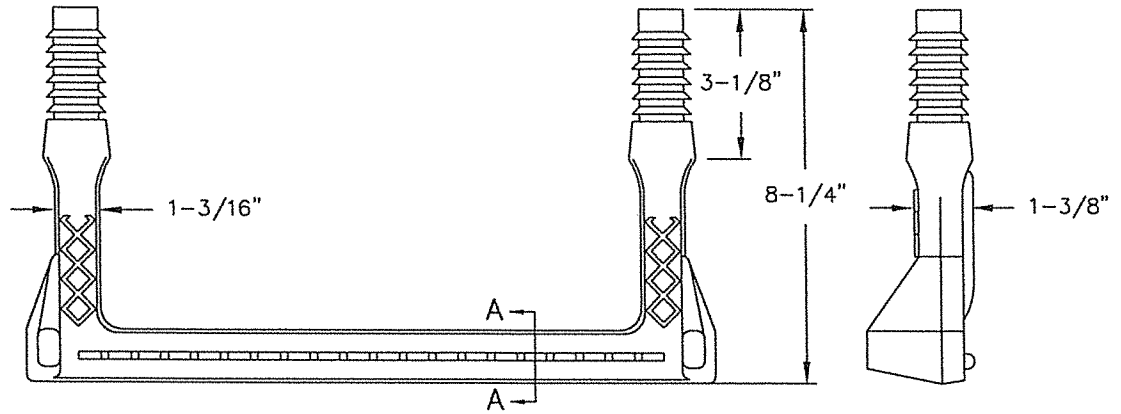


BOLTED & GASKETED SANITARY MANHOLE
FRAME & COVER

SCALE: N.T.S.

FIGURE 13
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS



1/2" DIAMETER STEEL REINFORCEMENT (GRADE 60)

COPOLYMER POLYPROPYLENE PLASTIC

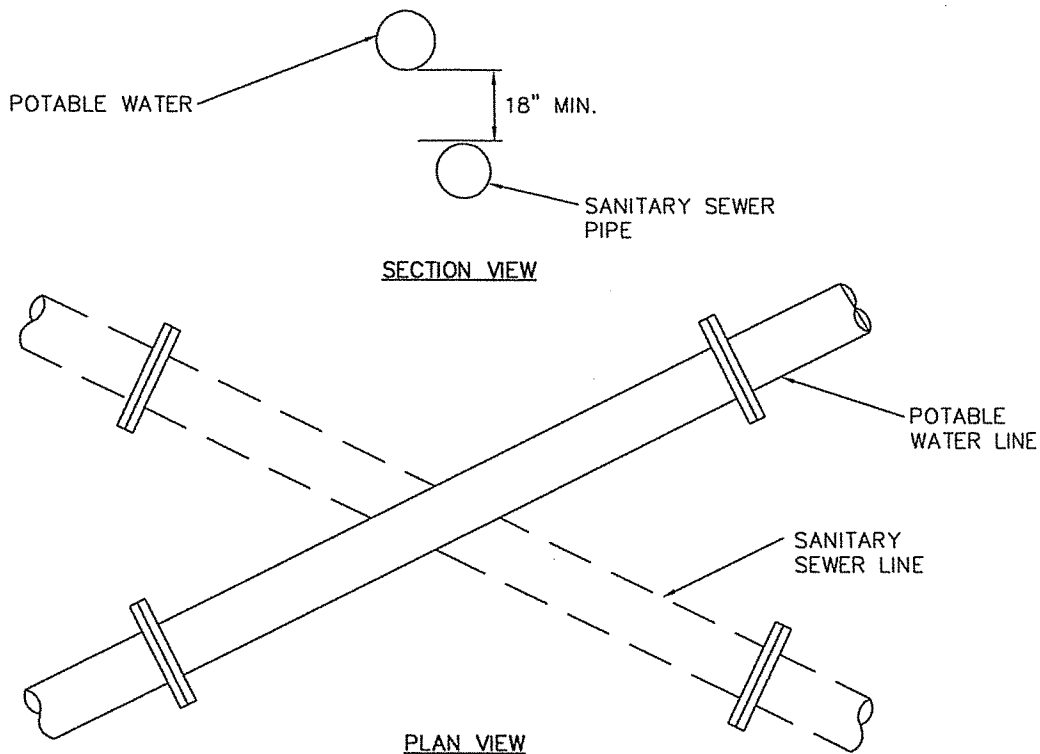
SECTION A-A

MANHOLE STEP DETAIL

SCALE: N.T.S.

FIGURE 14
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS



SEWER AND WATER CROSSING NOTES

1. SEWER JOINTS SHALL BE EQUIDISTANT FROM AND LOCATED AS FAR AS POSSIBLE AWAY FROM THE WATER LINE.
2. SEWER LINE SHALL BE CONSTRUCTED AT LEAST 10 FEET HORIZONTALLY FROM A WATER MAIN OR WATER SERVICE. THE DISTANCE SHALL BE MEASURED EDGE-TO-EDGE.
3. IF THE VERTICAL SEPARATION BETWEEN THE BOTTOM OF THE WATER MAIN AND THE TOP OF THE SEWER IS LESS THAN 18 INCHES (WATER MAIN IS ABOVE SEWER), USE ONE OF THE FOLLOWING PROCEDURES: A) THE WATER MAIN SHALL BE RECONSTRUCTED FOR A DISTANCE OF 10 FEET ON EACH SIDE OF SEWER WITH RUBBER-GASKETED MECHANICAL JOINT PIPE ONE FULL LENGTH WATER MAIN SHOULD BE CENTERED OVER SEWER, B) CONSTRUCT BOTH THE WATER & SEWER PIPE OF RUBBER-GASKETED, CEMENT-LINED DUCTILE IRON PIPE OR EQUIVALENT AND PRESSURE TEST BOTH PIPES, OR C) ENCASE BOTH PIPES IN CONCRETE.

CROSSING OF SEWER & POTABLE WATER LINES

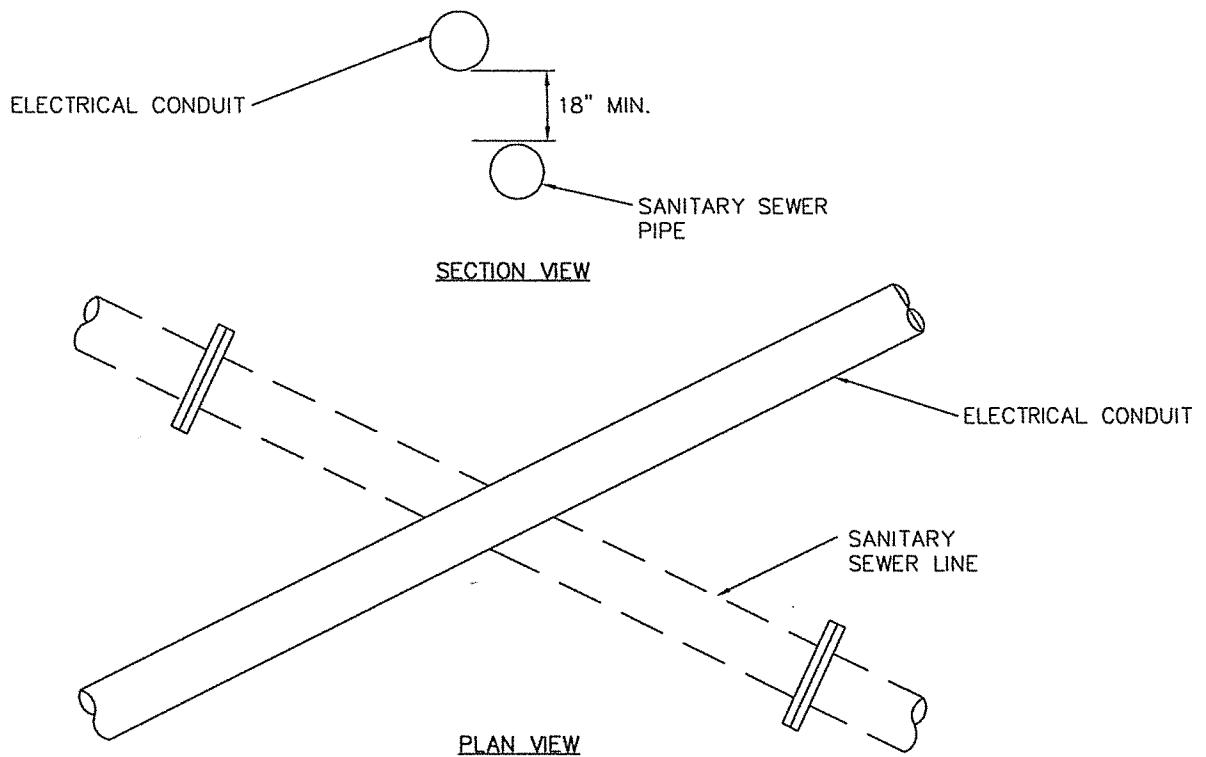
NOT TO SCALE

FIGURE 15
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS

NOTE:

SEWER LINE SHALL BE CONSTRUCTED AT LEAST 5 FEET HORIZONTALLY FROM AN ELECTRICAL CONDUIT.

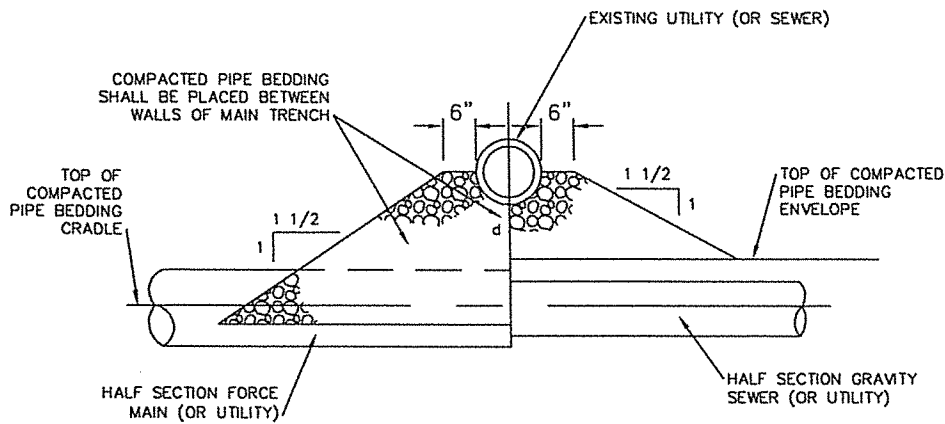


CROSSING OF SEWER & ELECTRICAL LINES

SCALE: N.T.S.

FIGURE 16
JULY 2012

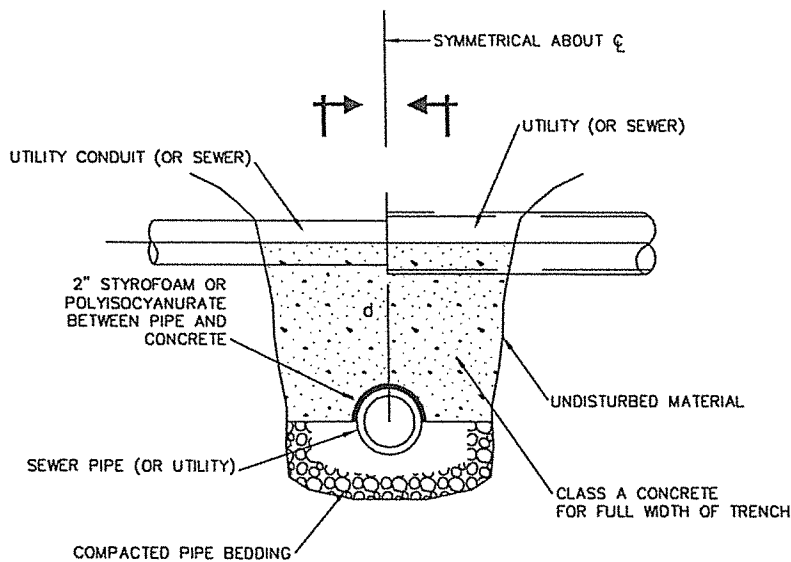
BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS



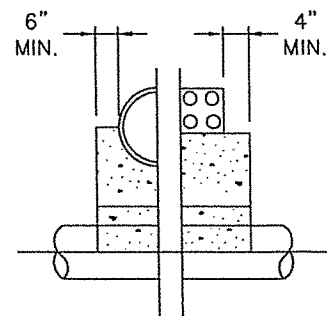
TYPE A ($d > 12"$)

UTILITY SUPPORT NOTES

1. d =DISTANCE FROM TOP OF SEWER PIPE TO THE BOTTOM OF THE UTILITY PIPE
2. SUPPORTS TO BE LOCATED AS SHOWN ON THE DRAWINGS OR AS DIRECTED BY THE ADMINISTRATOR



TYPE B ($d < 12"$)



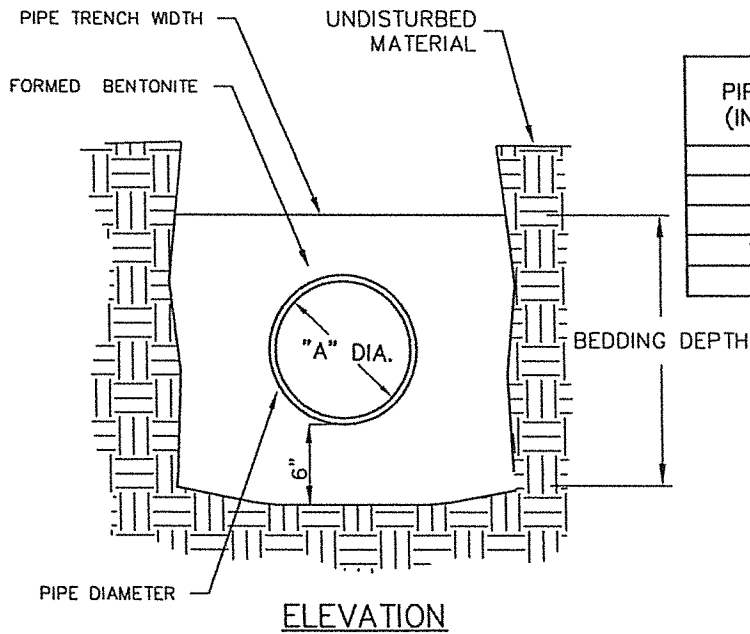
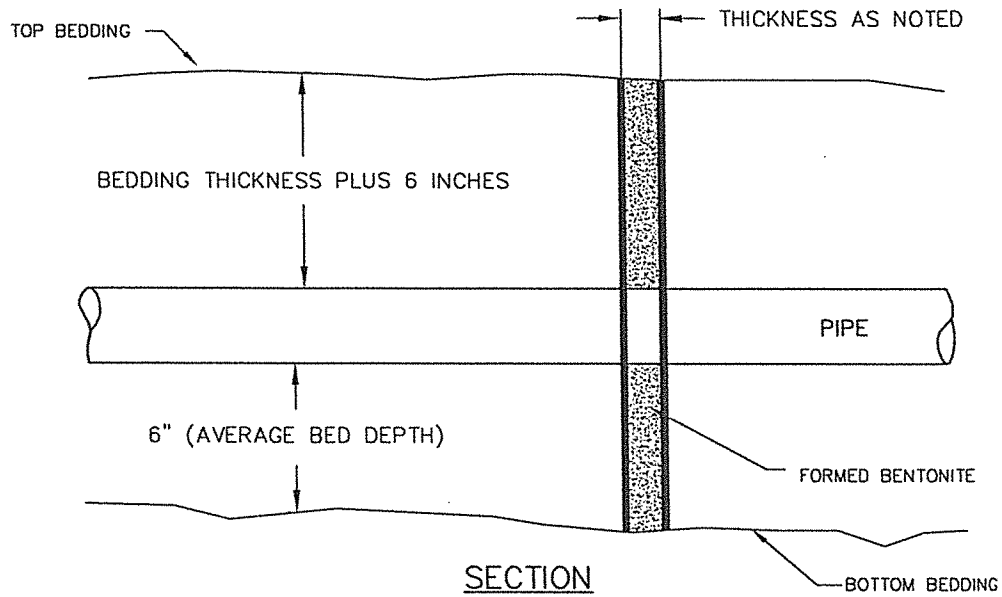
HALF SECTION

TYPICAL SUPPORT FOR UTILITIES

SCALE: N.T.S.

FIGURE 17
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS



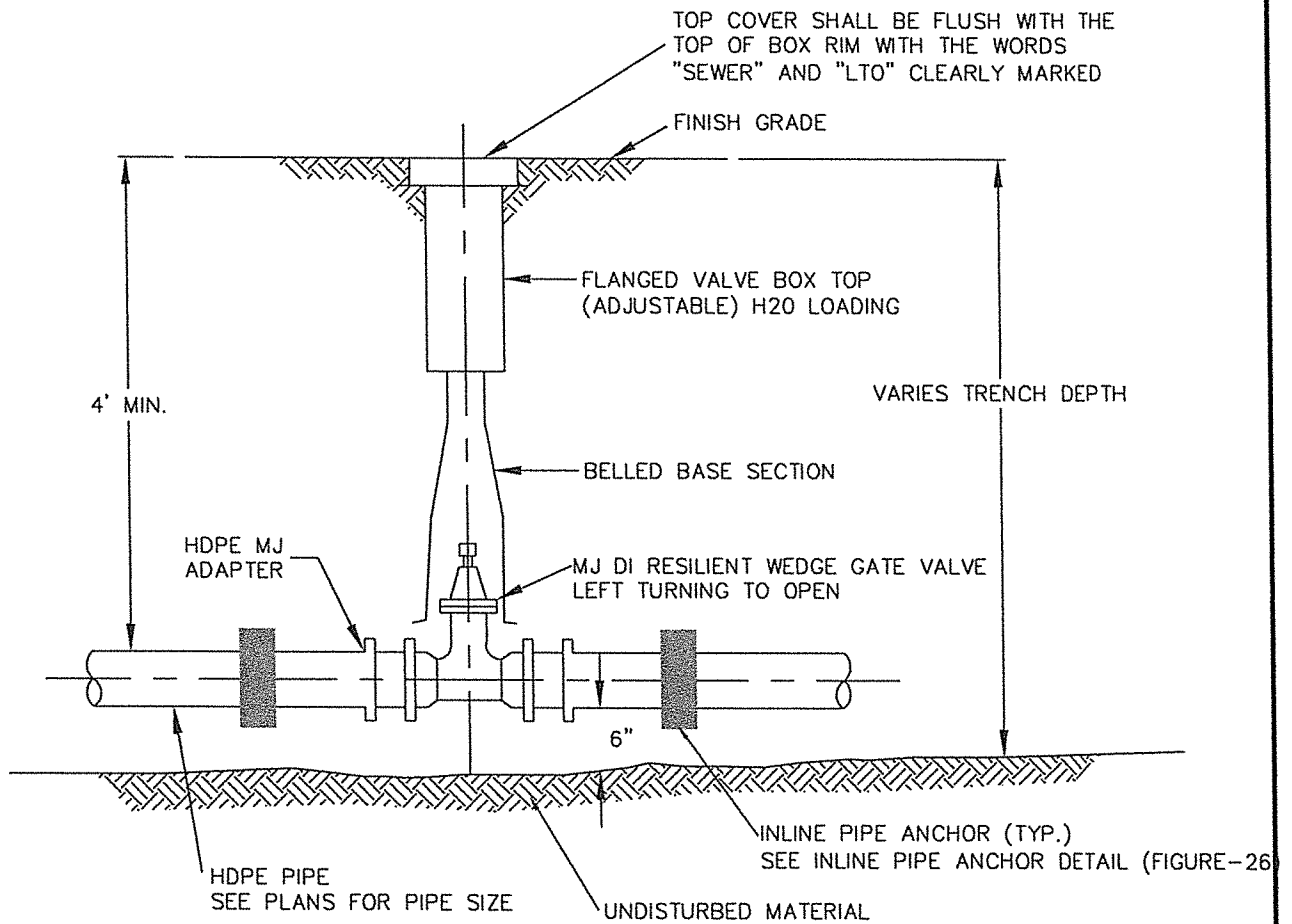
PIPE DIA. (INCHES)	BENTONITE THICKNESS (INCHES)
<3	12
6	12
8	16
10	20
12	24

BENTONITE TRENCH DAM

SCALE: N.T.S.

FIGURE 18
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS

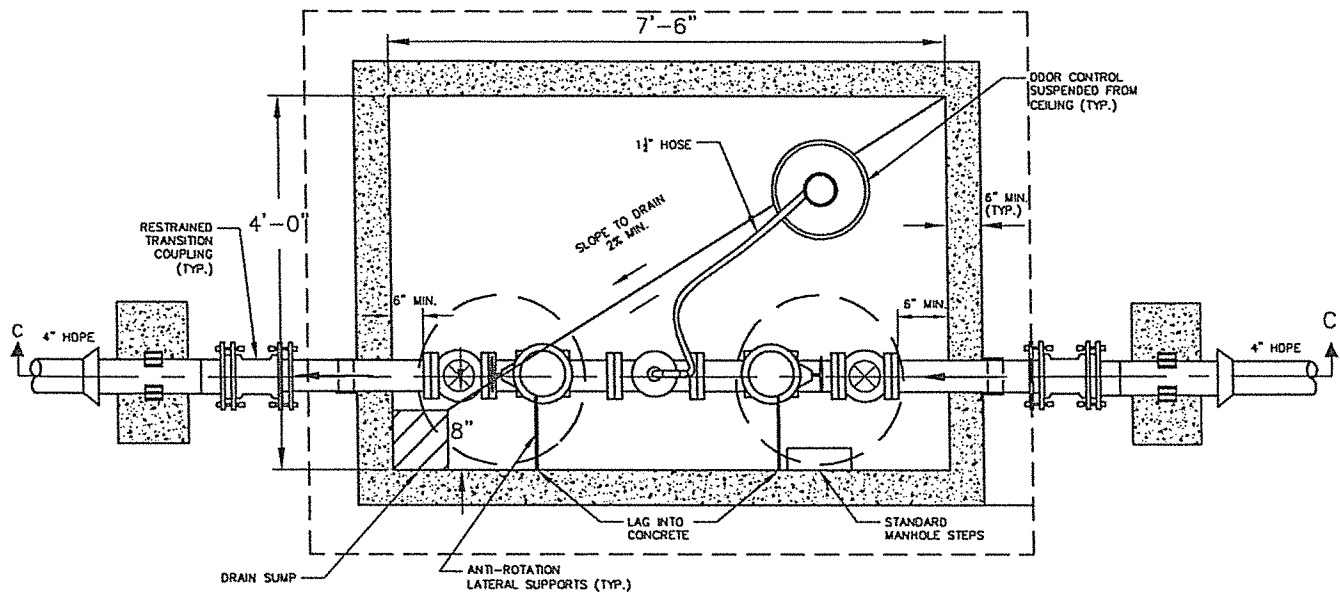


GATE VALVE

SCALE: N.T.S.

FIGURE 19
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS



PLAN

NOTES:

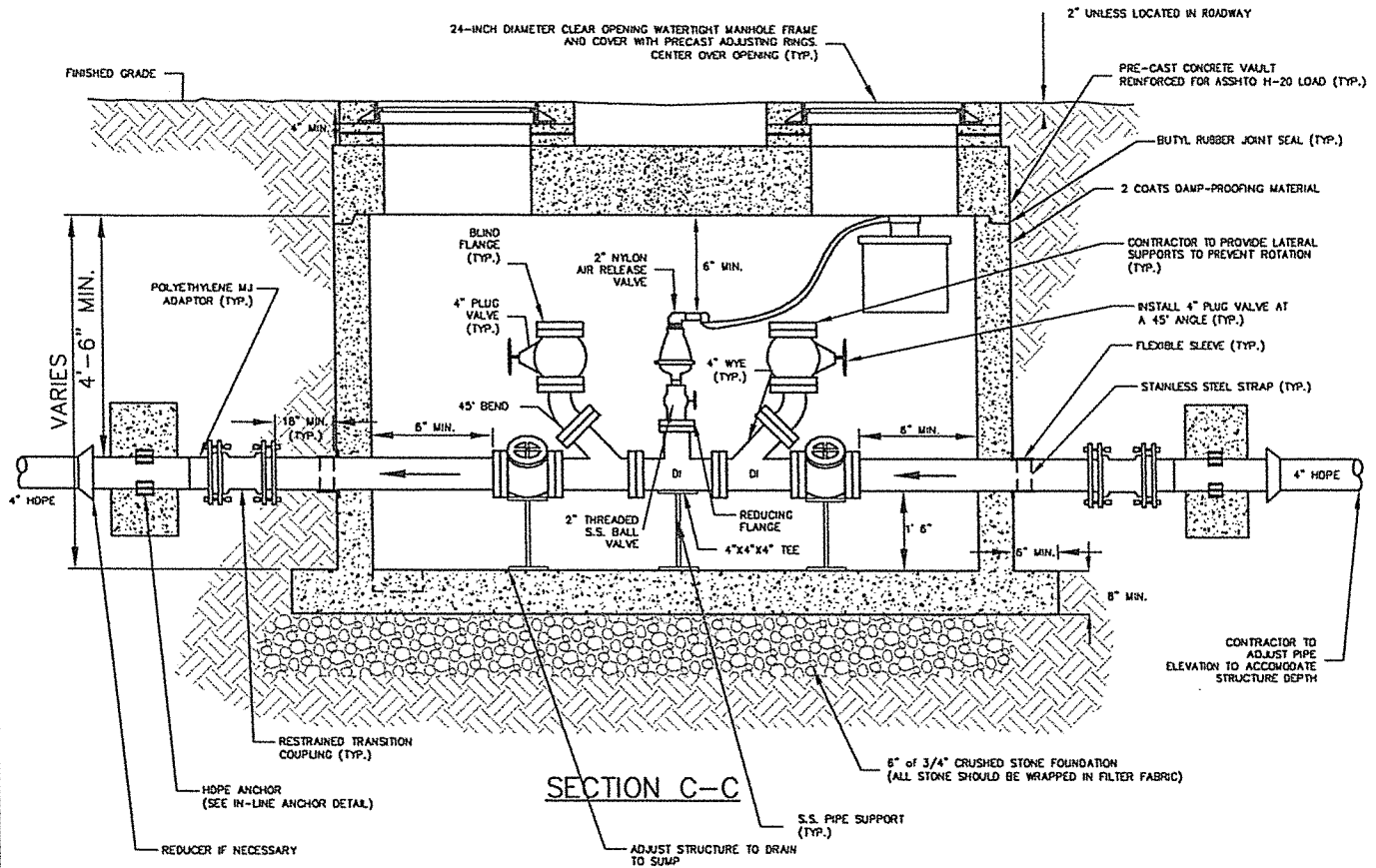
1. ALL PIPING IN CLEAN-OUT CHAMBER, EXCEPT AS NOTED, TO BE DUCTILE IRON CONNECTED WITH FLANGED JOINTS AND STAINLESS STEEL BOLTS.
2. ALL DUCTILE IRON PIPE, FITTINGS, AND VALVES TO BE 4 INCHES IN DIAMETER.

4" LPS CLEANOUT CHAMBER W/ AIR RELEASE/VACUUM VALVE (TYPE "C") – PLAN VIEW

SCALE: N.T.S.

FIGURE 20A
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS

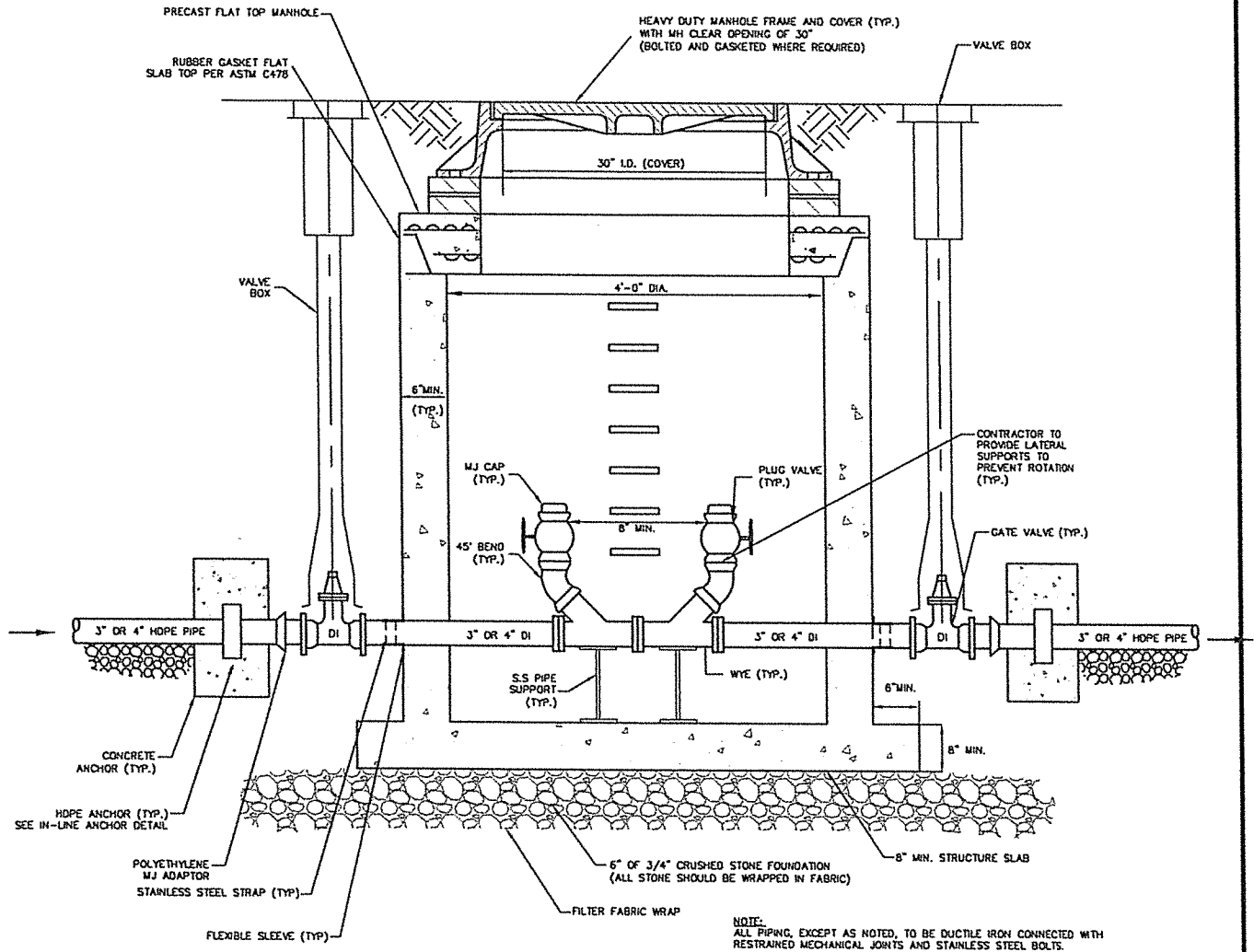


4" LPS CLEANOUT CHAMBER W/ AIR RELEASE/VACUUM VALVE (TYPE "C") – SECTION VIEW

SCALE: N.T.S.

FIGURE 20B
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS

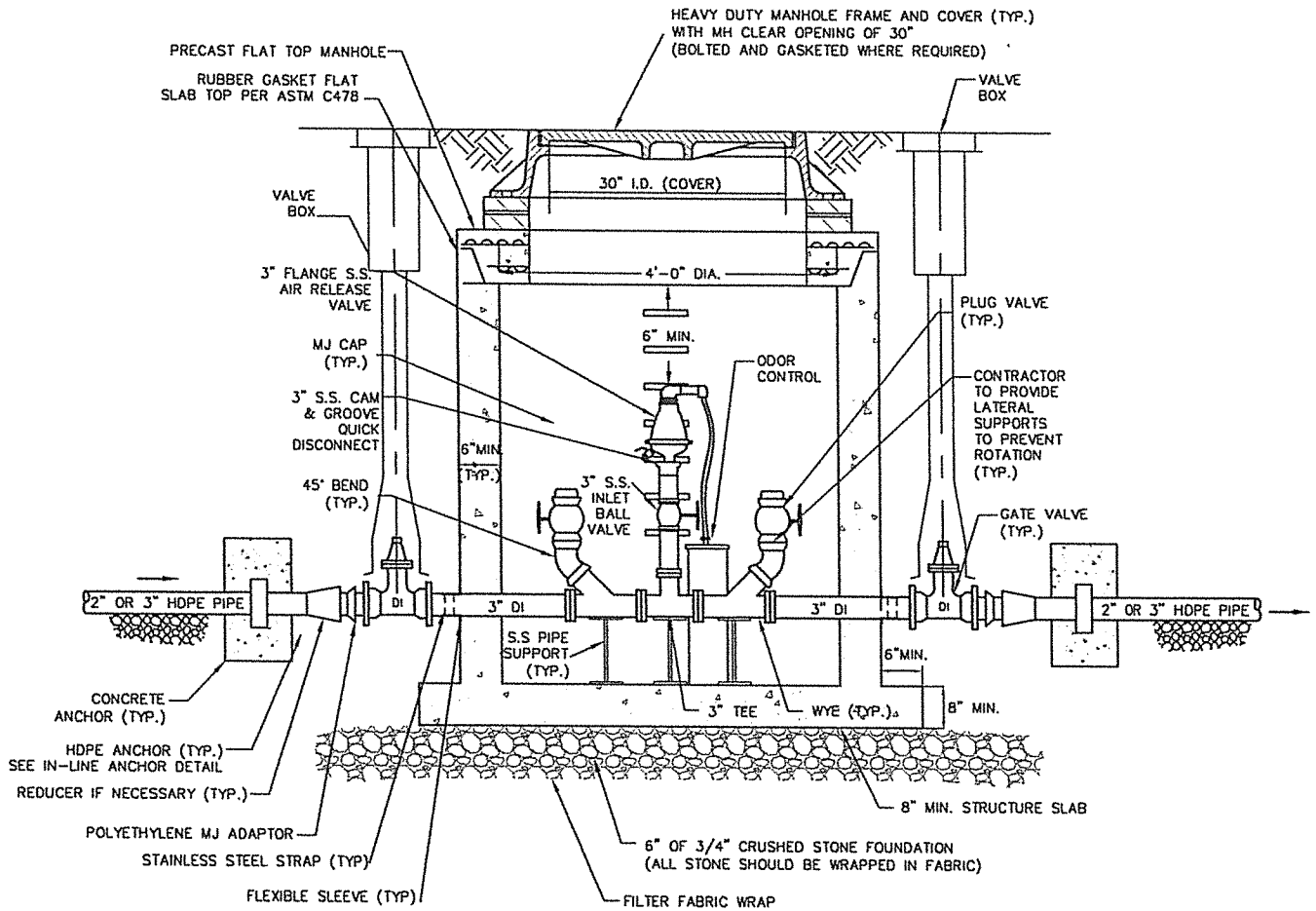


3" OR 4" LPS CLEANOUT (TYPE "E")

SCALE: N.T.S.

FIGURE 21
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS



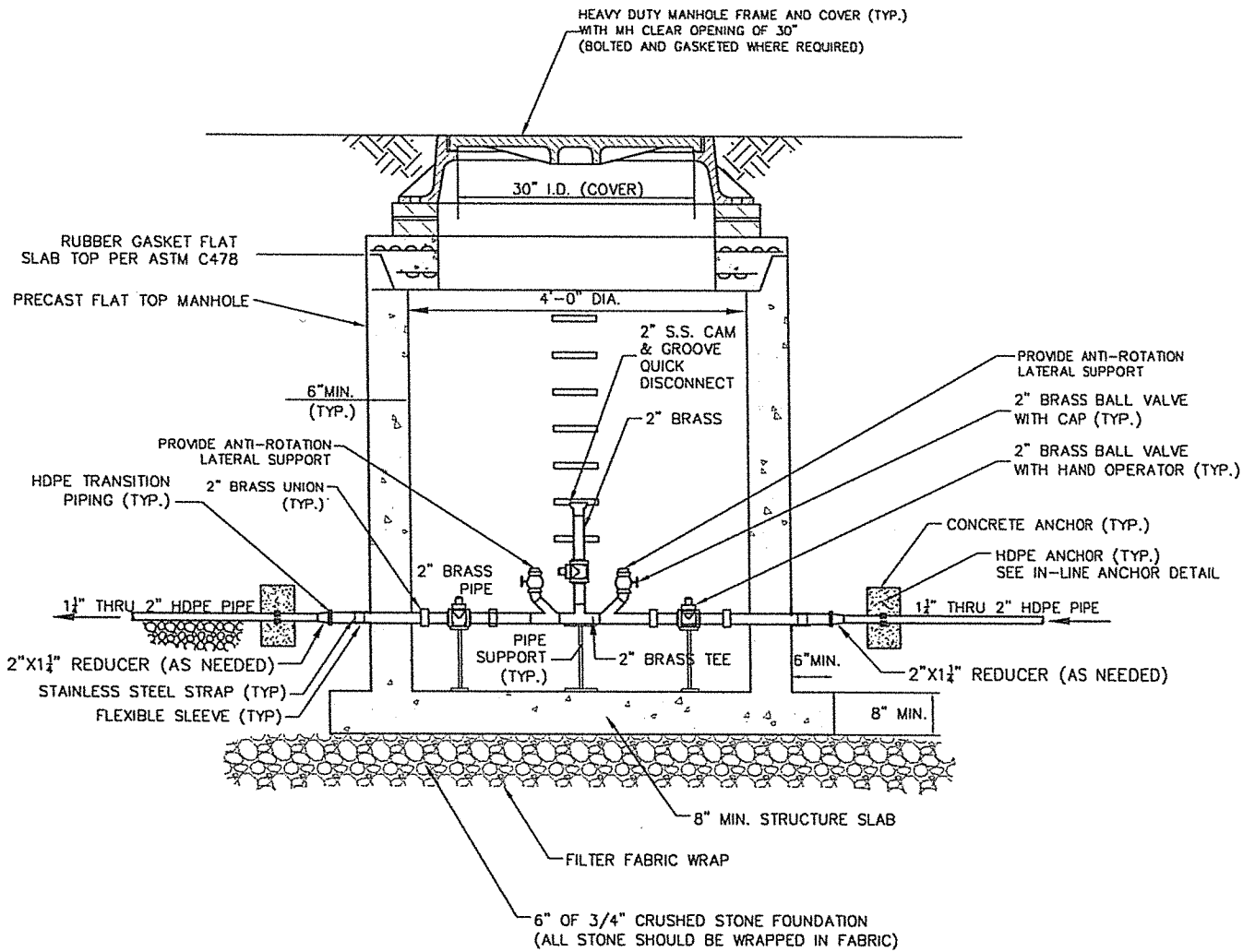
NOTE:
ALL PIPING, EXCEPT AS NOTED, TO BE DUCTILE IRON CONNECTED WITH RESTRAINED MECHANICAL JOINTS AND STAINLESS STEEL BOLTS.

3" LPS CLEANOUT CHAMBER W/ AIR
RELEASE/VACUUM VALVE (TYPE "F")

SCALE: N.T.S.

FIGURE 22
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS

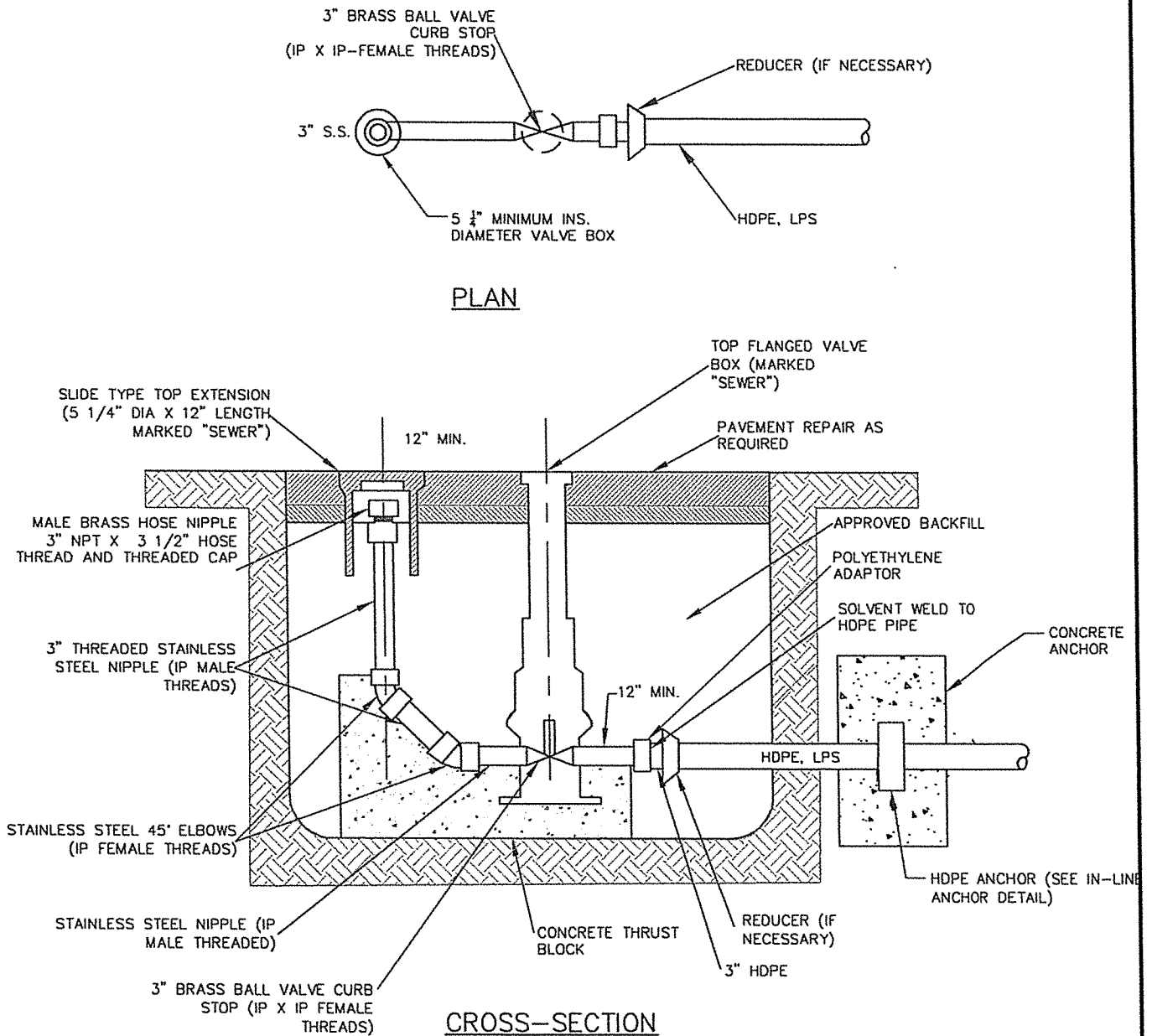


2" TWO WAY LPS CLEANOUT MANHOLE (TYPE "G")

SCALE: N.T.S.

FIGURE 23
JULY 2012

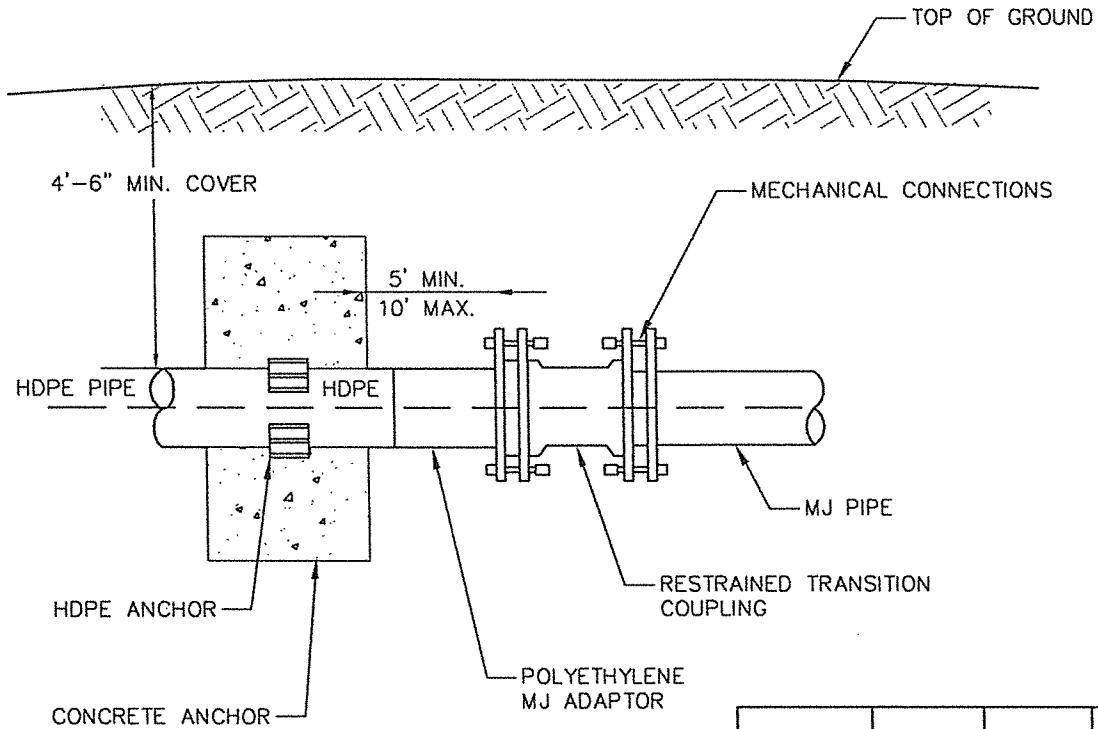
BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS



3" LPS CLEANOUT (TYPE "D")
NOT TO SCALE

FIGURE 24
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS



NOTE: IN-LINE PIPE ANCHORS REQUIRED
AT ALL D.I. TO HDPE PIPE TRANSITIONS.

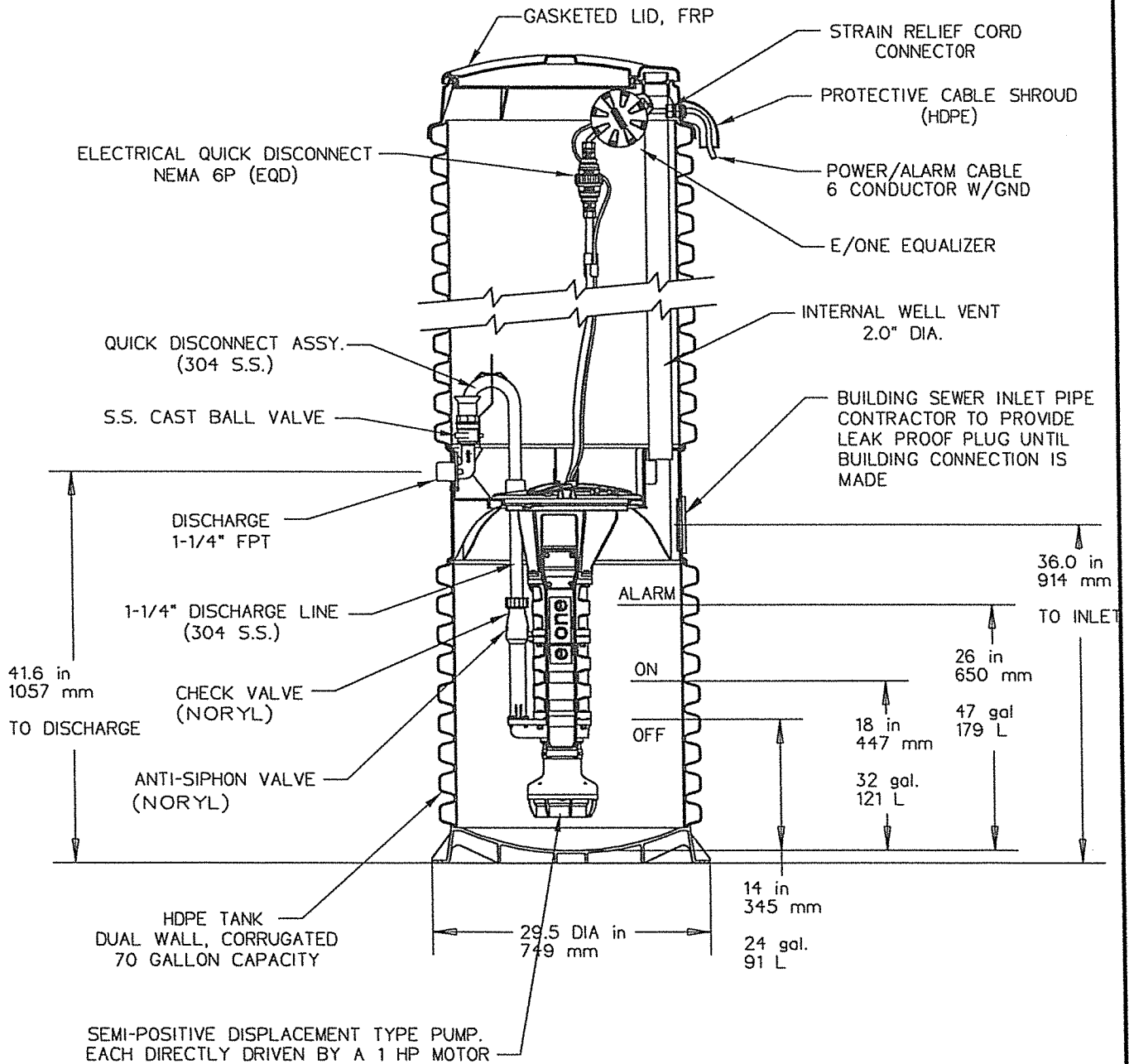
PIPE DIA. (INCHES)	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)
3	1	2	2
4	1	2	2
6	2	4	4

IN-LINE PIPE ANCHOR

SCALE: N.T.S.

FIGURE 25
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS

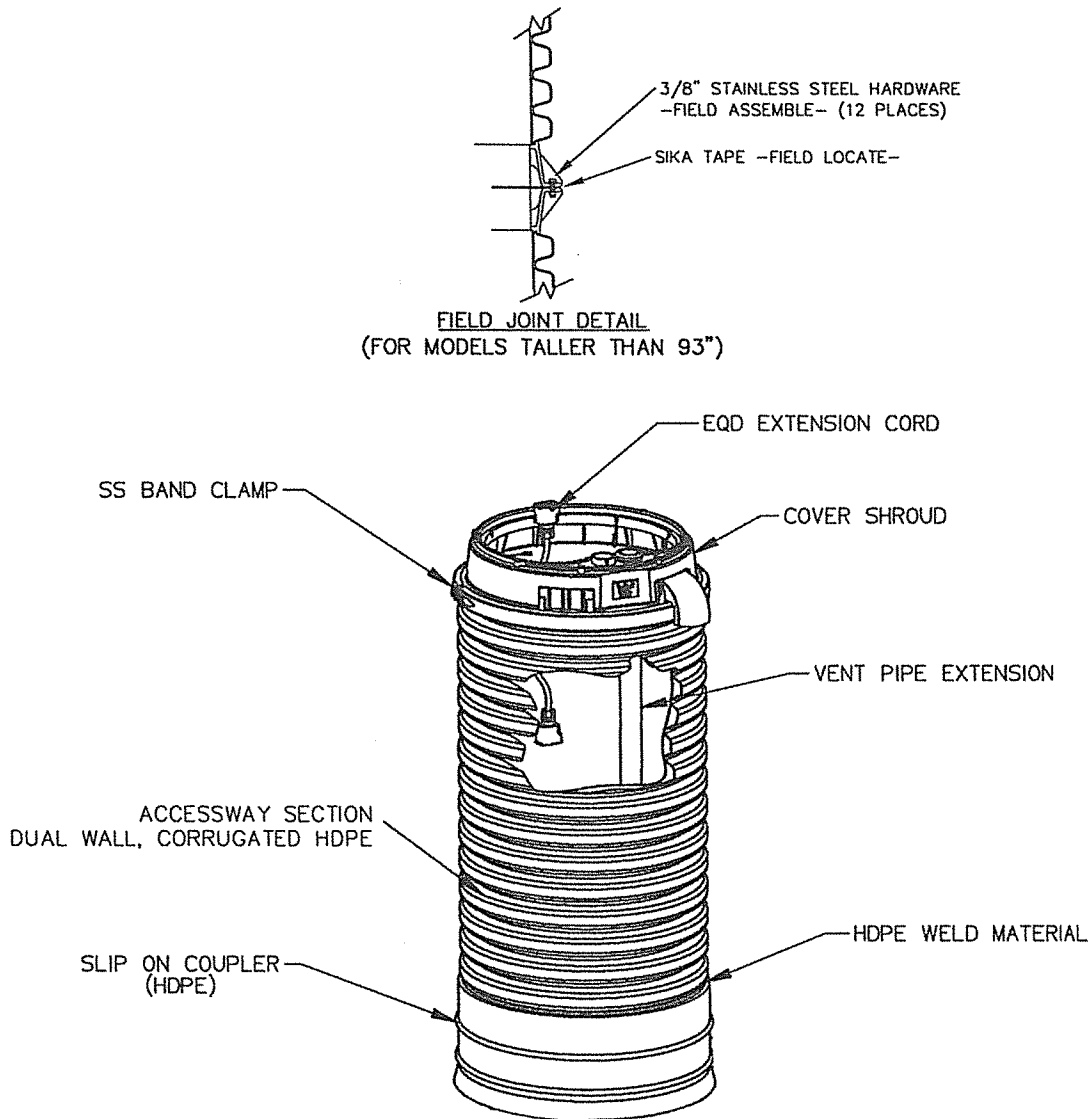


SIMPLEX GRINDER PUMP DETAIL

SCALE: N.T.S.

FIGURE 26
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS

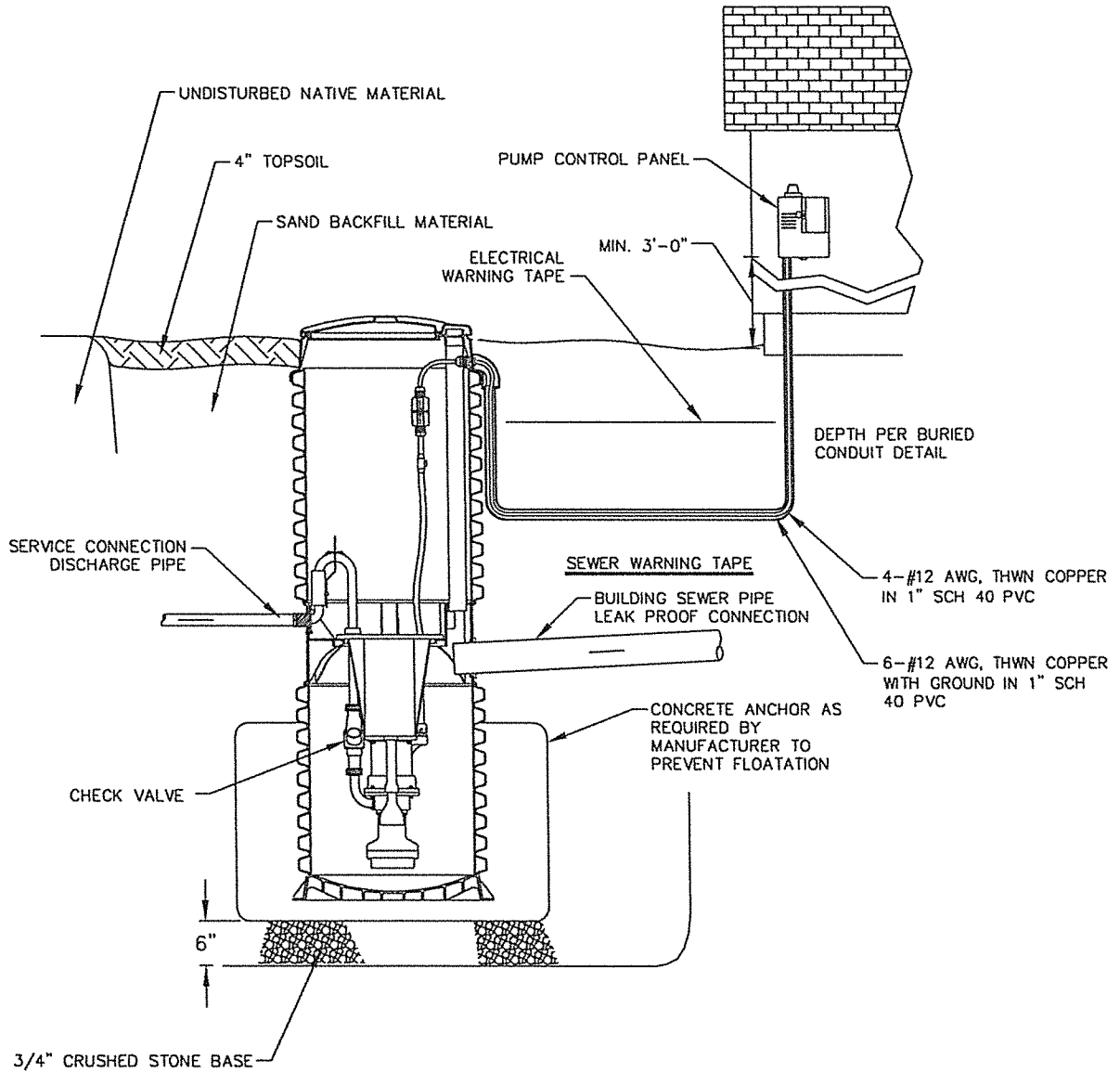


ACCESSWAY EXTENSION FOR SIMPLEX GRINDER PUMP

SCALE: N.T.S.

FIGURE 27
JULY 2012

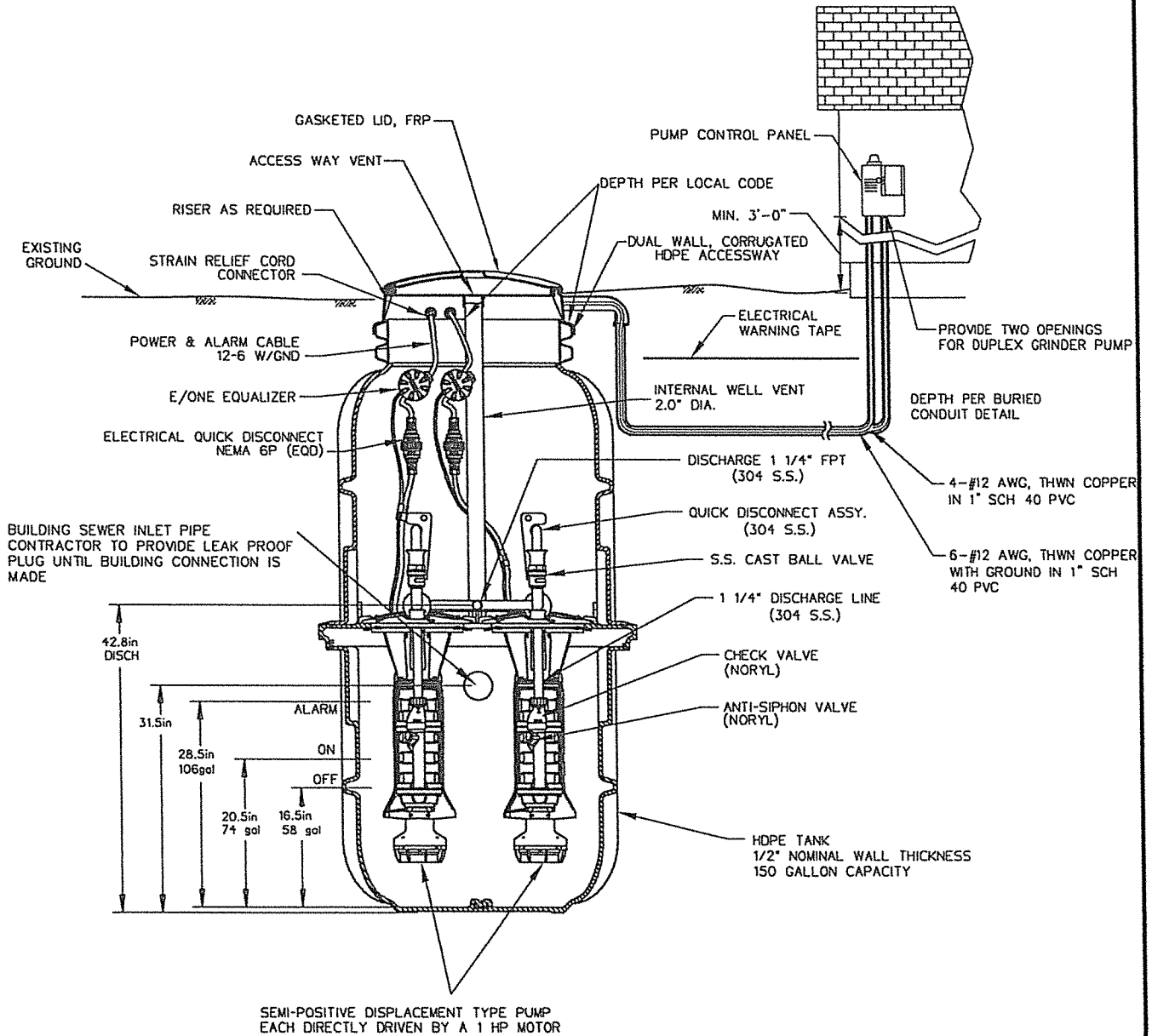
BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS



GRINDER PUMP CONNECTION DETAIL
NOT TO SCALE

FIGURE 28
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS

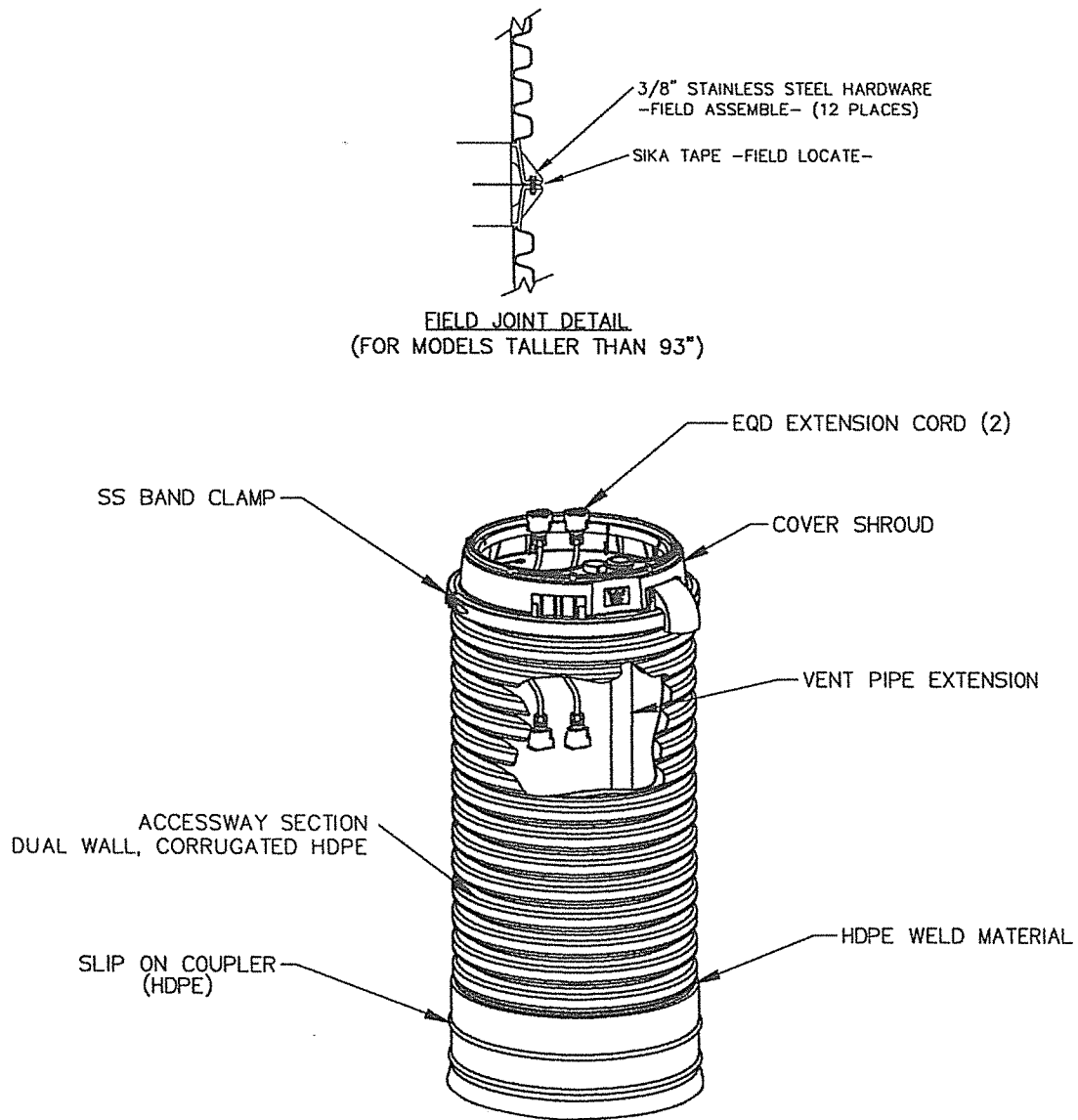


DUPLIX GRINDER PUMP DETAIL

SCALE: N.T.S.

FIGURE 29
JULY 2012

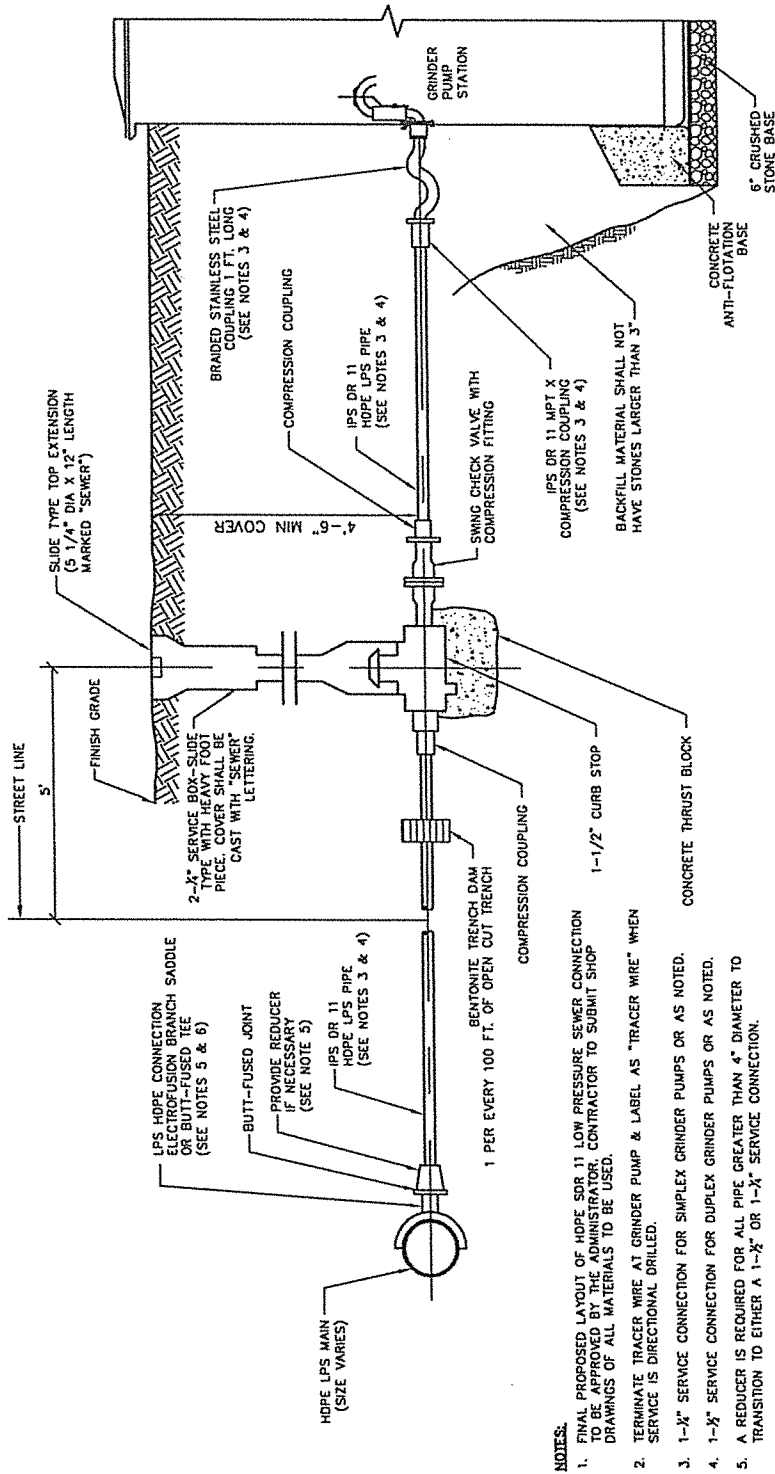
BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS



ACCESSWAY EXTENSION FOR DUPLEX GRINDER PUMP
SCALE: N.T.S.

FIGURE 30
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS

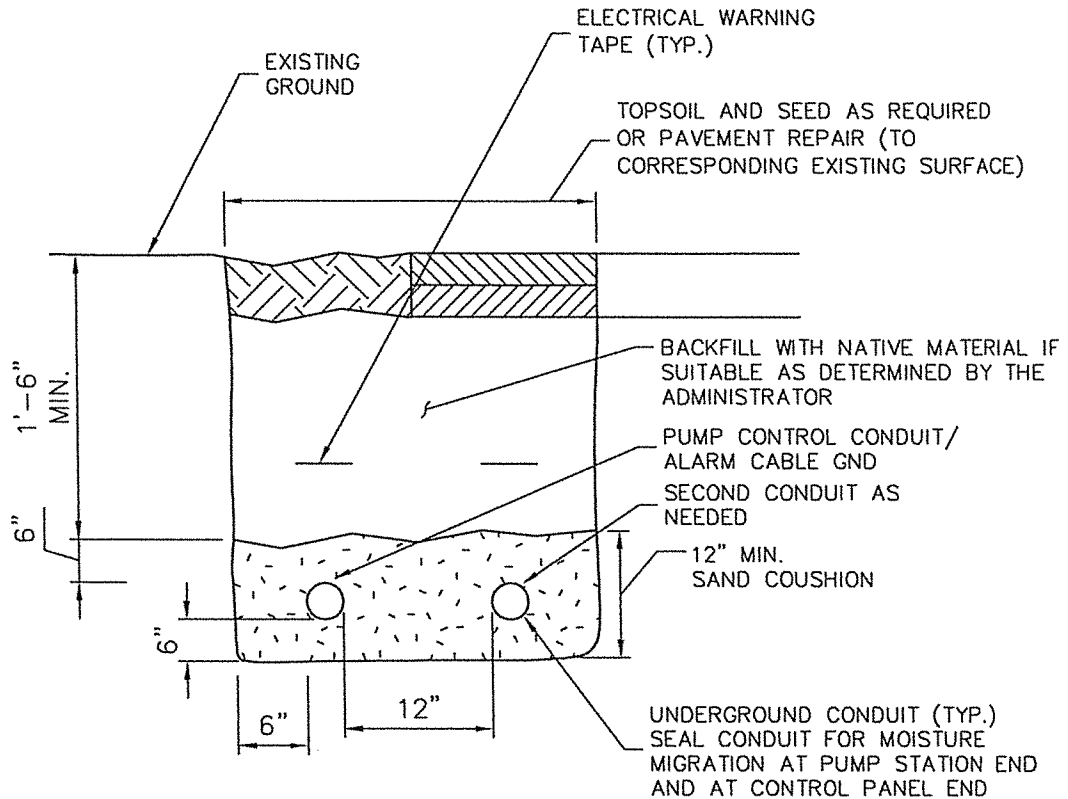


- NOTES:**
1. FINAL PROPOSED LAYOUT OF HOPE SDR 11 LOW PRESSURE SEWER CONNECTION TO BE APPROVED BY THE ADMINISTRATOR. CONTRACTOR TO SUBMIT SHOP DRAWINGS OF ALL MATERIALS TO BE USED.
 2. TERMINATE TRACER WIRE AT GRINDER PUMP & LABEL AS "TRACER WIRE" WHEN SERVICE IS DIRECTIONAL DRILLED.
 3. 1-1/2" SERVICE CONNECTION FOR DUPLEX GRINDER PUMPS OR AS NOTED.
 4. 1-1/2" SERVICE CONNECTION FOR DUPLEX GRINDER PUMPS OR AS NOTED.
 5. A REDUCER IS REQUIRED FOR ALL PIPE GREATER THAN 4" DIAMETER TO TRANSITION TO EITHER A 1-1/2" OR 1-1/4" SERVICE CONNECTION.
 6. CONTRACTOR TO VERIFY GRADES.

LPS SERVICE CONNECTION
SCALE: N.T.S.

FIGURE 31
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS



UNDERGROUND CONDUIT TRENCH NOTES:

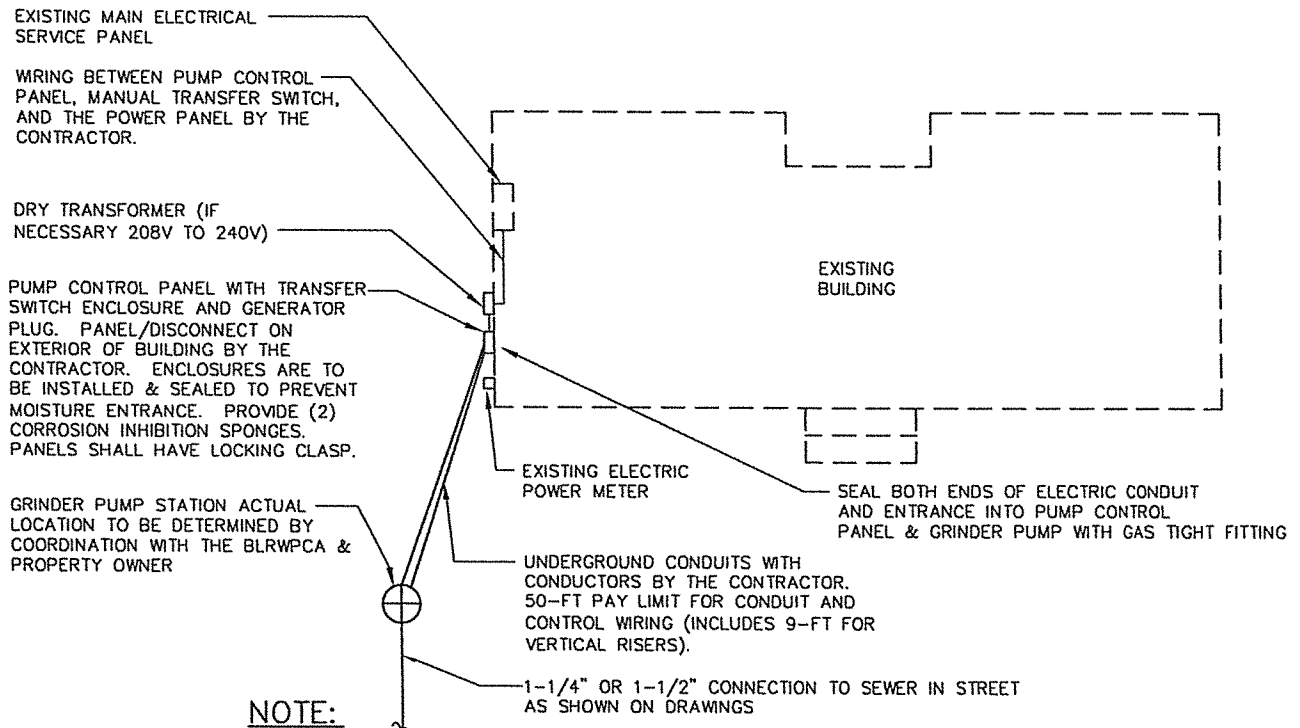
INSTALL ELECTRICAL MARKING TAPE ABOVE THE ELECTRIC CONDUIT AND BURIED ELECTRIC WIRING.

UNDERGROUND CONDUIT TRENCH DETAIL

SCALE: N.T.S.

FIGURE 32
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS



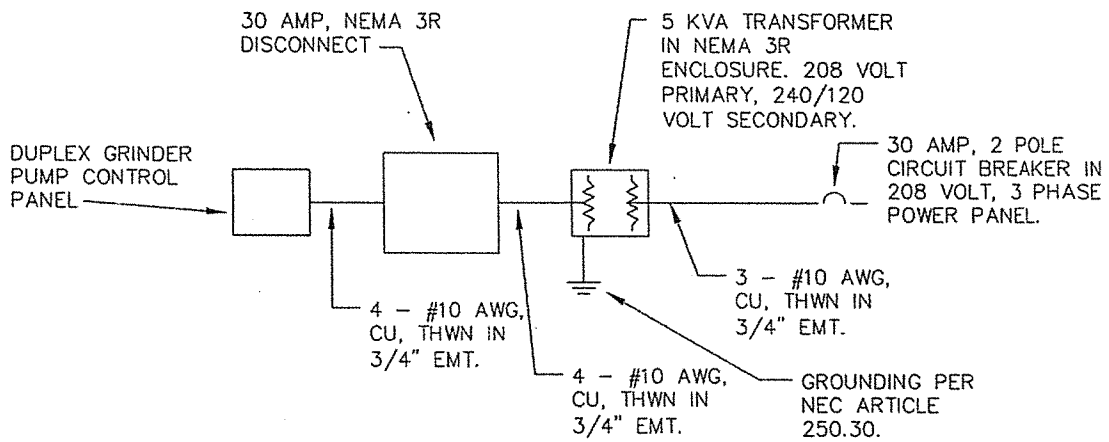
1. INSTALL GRINDER PUMP STATION CONTROL PANEL AS RECOMMENDED BY MANUFACTURER.
2. CONTRACTOR SHALL VERIFY THAT CAPACITY OF EXISTING ELECTRIC SERVICE WILL ACCOMODATE NEW LOAD.
3. CONTRACTOR SHALL PROVIDE FOR ADEQUATE CAPACITY IF UPGRADING IS REQUIRED.
4. AN AUTOMATIC TRANSFER SWITCH SHALL BE PROVIDED WITHIN THE CONTROL PANEL TO AUTOMATICALLY SWITCH FROM AC POWER TO GENERATOR POWER DURING A POWER OUTAGE
5. CONTROL PANEL TO BE LOCATED WHERE VISIBLE FROM GRINDER PUMP AND ROAD. COORDINATE WITH PROPERTY OWNER AND THE BLRWPCA

TYPICAL GRINDER PUMP STATION LAYOUT

SCALE: N.T.S.

FIGURE 33
JULY 2012

BOLTON LAKES REGIONAL WATER POLLUTION CONTROL AUTHORITY
(BLRWPCA)
SANITARY SEWER DETAILS



DRY TRANSFORMER SCHEMATIC WIRING DIAGRAM
FOR 208V 3 PHASE POWER PANEL

SCALE: N.T.S.

FIGURE 34
JULY 2012

APPENDIX

II. LOCATION OF SUBSURFACE SEWAGE DISPOSAL SYSTEMS

A. Minimum separating distances

The minimum separating distances specified in Table 1 are required and shall be maintained between the cited items and subsurface sewage disposal systems, except for approved piping. Tables 2, 2-C and 2-D list specific applications whereby approved piping shall have reduced separating distances to cited items. Groundwater control systems only need to comply with the separating distances cited in Item G. Proposed relocation of lot lines reviewed pursuant to PHC Section 19-13-B100a (e) shall comply with the distances cited in Item I. Separating distance compliance shall be based on horizontal measurements except for non-vertical closed loop geo-exchange bore holes that utilize measurements taken from the closest portion of the bore hole.

Table 1

Item	Separating Distance (feet)	Special Provisions
A. Water supply well (potable, open loop geo-exchange, irrigation, spring, or domestic water suction pipe). Required withdrawal rate: < 10 gal. per minute 10 to 50 gal. per minute > 50 gal. per minute	75 150 200	1. Separating distance to leaching system shall be doubled if the percolation rate is faster than one meter/diach and system is less than eight (8) feet above ledge rock. 2. Separating distance shall be increased as necessary to protect the sanitary quality of a public water supply well. 3. Separating distance between a domestic water suction pipe and a septic tank/pump chamber/egrease interceptor tank shall be reduced to 25 feet if tank is verified to be watertight.
B. Human habitation on adjacent property	15	Building without drains. See item G for distance to building with drains. Separating distance to a septic tank/pump chamber/egrease interceptor tank shall be reduced to 10 feet for building served without drains.
C. Building served	15	When not located on a public water supply watershed, distance shall be reduced as necessary to not less than 25 feet from the effective date of this regulation (8/1/02) and thereafter recorded as required by statute.
D. Open watercourse	50	
E. Public water supply reservoir	100	
F. Surface or groundwater drain connected to solid pipe	25	Tight pipe with rubber gasketed joints or approved equal (See Table 2-C) are exempted from this requirement as long as the pipe excavation is not backfilled with free draining material, however no tight pipe shall be less than 5 feet from system. Leakage tests may be required to verify water tightness.
G. Groundwater drain, retaining foundation, footing, etc., stormwater infiltration or retention system, or on-sides Downgradient	25 50 (D)	1. No such drain shall be sump/dumped downgradient of a leaching system for the purpose of collecting sewage effluent regardless of the distance. 2. Distance to septic tank/pump chamber/egrease interceptor tank shall be reduced to 25 feet if tank is verified to be watertight.
H. Top of embankment (downgradient and on sides of leaching system)	10	Cuts within 50 feet downgradient of leaching systems shall not be allowed if flood-out conditions are possible.
I. Property line Upgradient or on sides Downgradient	15 (E) 25 (2-B)	1. Separating distance to septic tank/pump chamber/egrease interceptor tank and reserve leaching system shall be reduced to 10 feet. 2. Separating distance shall be reduced to 10 feet if the top of the leaching system is below original grade, grading rights from the affected property owner are secured, or retaining walls are utilized (See Section VIII A. for retaining wall provisions). 3. Separating distance between the primary leaching system and downgradient property line shall be reduced to 15 feet if MLSS is not applicable or on flat groundwater table for.
J. Potable water and irrigation lines that flow under pressure	10	Excavations between 10 - 25 feet from system shall not be backfilled with free draining material.
K. Below ground swimming pool	25	See item G for downgradient pools with drains.
L. Above ground swimming pool	10	Includes hot tubs. Structure shall have no existing drains. See item G if drains installed.
M. Accessory structure	10	Structure without full wall, foot protected postures shall be reduced to 5 feet. Excavations between 5 - 25 feet from system shall not be backfilled with free draining material.
N. Utility service trench (Underground electric, gas, phone services, etc.)	5	Excavations between 5 - 25 feet from system shall not be backfilled with free draining material.
O. Water treatment wastewater system	10	See Section X.
P. Closed loop geo-exchange system Bore hole (BHH), Trench Geo-exchange piping to BHH, Trench	50 10	Separating distance to a septic tank/pump chamber/egrease interceptor tank shall be reduced to 25 feet if tank is verified to be watertight. Excavations between 10 - 25 feet from system shall not be backfilled with free draining material.

**Table No. 2
Accepted Building Sewer Pipe from Building Served to Septic Tank or Grease Interceptor Tank
& Accepted Sewer Pipe Within the Sanitary Radius of a Water Supply Well**

NOTE: The local director of health shall inspect all building sewer piping and joints prior to covering

USE	PIPE DESCRIPTION	ACCEPTABLE JOINT	REMARKS
Building sewer from foundation wall to septic tank or grease interceptor tank, within 25 feet of building served. OR Sewer pipe (building or distribution) within the sanitary radius of a water supply well. NOTE: The following minimum distances shall be maintained from wells based on withdrawal rates: <10 gpm: 25 feet 10 - 50 gpm: 75 feet >50 gpm: 100 feet NOTE: Building sewer may cross potable water lines under pressure. To reduce separation distances for the following other items listed in Table No. 1:	Cast iron hubless ASTM A 888 Cast iron bell and spigot ASTM A 74 PVC Schedule 40, ASTM D 1785 or ASTM D 2665	Cast iron split sleeve bolted joint with rubber gasket, MG coupling or equal OR 3" -wide, heavy -duty, stainless steel banded coupling with rubber gasket; clamp-all, ANACO SD 4000, or equal Rubber compression gaskets Rubber compression gasket couplings, Harco Mfg., ASTM D 3139 or equal* OR Solvent weld couplings/ fittings using proper two step PVC solvent solution procedure	Roll-on "donut type" gaskets not acceptable if connection is within 25 feet of foundation wall. Pipe must be properly bedded, laid in straight line on uniform grade FERNCO - stainless steel 3" wide shear band allowed for connection of dissimilar piping materials *Use of 3"-wide approved stainless steel banded couplings on PVC Schedule 40 ASTM D 1785 or 2665 is acceptable UL (gray) Piping - Schedule 40- 36" min. radius sweep piping (90°) may be utilized without a cleanout. ABS Schedule 40 is not acceptable
-Human habitation on adjacent property -Building served -Property line -Pressure water lines -Swimming pools -Accessory structures -Utility service trench -Closed loop geothermal borehole (10 feet minimum)	Ductile iron ANSI A 21.51 PVC AWWA C 900 (PC 100 psi min.) PVC ASTM F 1760, Schedule 40	Rubber compression gaskets Rubber compression gaskets Rubber compression gaskets	Connection to cast iron building sewer must be made with compression gaskets. "O"-ring gasket is not acceptable Only 4" pipe approved Minimum 1' cover in vehicular loaded traffic areas

SOURCE: CT PUBLIC HEALTH CODE - REGULATIONS AND TECHNICAL STANDARDS FOR SUBSURFACE SEWAGE DISPOSAL SYSTEMS SECTION 19-13-B103, JANUARY 2009

Table No. 2-A
Accepted Sewer Pipe for Sewer Connections/Laterals Within the Sanitary Radius of a Water Supply Well
 All sewer lines installed within the sanitary radius of a water supply well shall be inspected and approved by the local director of health or sewer inspector prior to back filling.

USE	PIPE DESCRIPTION	ACCEPTABLE JOINT	REMARKS
Sewer connections/laterals to public sewers within the sanitary radius of a water supply well. NOTE: The following minimum distances shall be maintained from wells based on withdrawal rates: <10 gpm: 25 feet 10 - 50 gpm: 75 feet >50 gpm: 100 feet	Cast iron hubless ASTM A 888	Cast iron split sleeve bolted connector with rubber gasket, MG coupling or equal to 3" wide, heavy-duty stainless steel banded coupling with rubber gasket; Clamp-all, ANACO SD 4000, or equal	Roll-on "donut type" gaskets not acceptable if used within 75 feet of well. Pipe must be properly bedded in accordance with pipe manufacturer's specifications, laid in a straight line on a uniform grade
Note: Pump (i.e., Grinder) vaults are sources of pollution and must be located at least 75 feet from <10 gpm water supply wells. Increased separating distances required for wells with withdrawal rates of 10 gpm or greater (See PHC Sec. 19-13-B51d)	Cast iron bell and spigot, ASTM A 74	Rubber compression gaskets	
	Ductile iron ANSI A21.51	Rubber compression gasket	
	Extra strength PVC pressure water pipe AWWA C 900 (PC 100 psi min.)	Rubber compression gasket	
Note: Force mains must use approved pipe rated for pressure applications.	Schedule 40, PVC ASTM D 1785 or ASTM D 2665	Rubber compression gasketed couplings, Hurco Mfg., ASTM D 3139 or equal OR Solvent weld couplings/ fittings using proper two step PVC solvent solution procedure	Use of 3" wide approved stainless steel banded couplings on PVC Schedule 40 ASTM D 1785 is acceptable ABS Schedule 40 is not acceptable Joints must meet ASTM D 3212 specifications
	PVC ASTM D 2241: SDR 21, 17 or 13.5	Integral rubber compression gaskets or roll-on compression gaskets	Bedding in accordance with ASTM D 2321 for PVC pipe
	PVC ASTM F 1760, Schedule 40 or SDR 35	Elastomeric gasket meets ASTM F 477 Gaskets meets ASTM F 477	Joints meet ASTM 3212
	PVC ASTM D 3034, SDR 35 PVC ASTM F 789 PVC ASTM F 679	No joints, Heat butt fused connections ok	Joints meet ASTM 3212
	PVC, CONTECH A-2026, ASTM F 949 PVC, CONTECH A-2000, ASTM F 949 PE, ASTM D 3035, SDR 11 or lower		

SOURCE: CT PUBLIC HEALTH CODE - REGULATIONS AND TECHNICAL STANDARDS FOR SUBSURFACE SEWAGE DISPOSAL SYSTEMS SECTION 19-73-B103, JANUARY 2009

**Table No. 2-B
Accepted Pipe for Public Sewer Mains Within the Sanitary Radius of a Water Supply Well**

All public sewer mains installed within the sanitary radius of a water supply well shall be low-pressure air tested in the presence of the design engineer. A report of the test results should be submitted to the local director of health.

USE	PIPE DESCRIPTION	ACCEPTABLE JOINT	REMARKS
Public sewer mains within the sanitary radius of a water supply well. NOTE: The following minimum distances shall be maintained from wells based on withdrawal rates: <10 gpm: 25 feet 10 - 50 gpm: 75 feet >50 gpm: 100 feet	Cast iron hubless pipe ASTM A 888	Cast iron split sleeve bolted connector with rubber gasket MG coupling or equal or 3"-wide heavy duty stainless steel banded coupling with rubber gasket; Clamp-All ANACO SD 4000 or equal	Roll-on "donut type" gaskets not acceptable if used within 75 feet of well. Pipe must be properly bedded, in accordance with pipe manufacturer's specifications, laid in a straight line on a uniform grade
	Ductile iron ANSI A21.51	Rubber compression gaskets	
Note: Force mains must use approved pipe rated for pressure applications.	Extra strength PVC pressure water pipe AWWA C 900 (PC 100 psi min.)	Rubber compression gaskets	
	Reinforced concrete water pipe, steel cylinder type, not pre-stressed AWWA C-300	Rubber compression gaskets	
Note: Pump stations/structures are sources of pollution and must be at least 75 feet from <10 gpm water supply wells. Increased separating distances required for wells with withdrawal rates of 10 gpm or greater (See PHC Sec. 19-13-B51d)	Schedule 40, PVC ASTM D 1785 or ASTM D 2665	Rubber compression gasketed couplings, Harco Mfg., ASTM D3139 or equal*	*Use 3"-wide stainless steel banded couplings on PVC Schedule 40 ASTM D 1785 is acceptable ABS Schedule 40 is not acceptable Joints must meet ASTM D 3212. Bedding in accordance with ASTM D 2321 for PVC pipe Joint meets ASTM D 3212 Joint meets ASTM D 3212
	PVC ASTM D 2241, SDR 21, 17 or 13.5	OR	
	PVC ASTM F1760, Schedule 40 or SDR 35	Solvent weld couplings/fittings using proper two step PVC solvent solution procedure	
	PVC ASTM D 3034, SDR 35 PVC ASTM F 789 PVC ASTM F 679	Elastomeric gasket meets ASTM F 477 Gaskets meet ASTM F 477	
	PVC, CONTECH A-2026, ASTM F 949 PVC, CONTECH A-2000, ASTM F 949 PE, ASTM D 3035, SDR 11 or lower	No joints, Heat butt fused connections ok	

SOURCE: CT PUBLIC HEALTH CODE - REGULATIONS AND TECHNICAL STANDARDS FOR SUBSURFACE SEWAGE DISPOSAL SYSTEMS
SECTION 19-13-B103, JANUARY 2009

**Table No. 2-C
Accepted Tight Pipe for Building Sewer & Distribution Piping Within 25 Feet of Open Watercourse or Drain,
or Groundwater or Surface Water Piping within 25 Feet of Subsurface Sewage Disposal System**

USE	PIPE DESCRIPTION	ACCEPTABLE JOINT	REMARKS
Building sewer or distribution piping within 25 feet of an open watercourse, surface or groundwater drain, cellar, footing or foundation drain OR Groundwater and surface water drainage pipes within 25 feet of a subsurface sewage disposal system. Note: Building sewer within 25 feet of building must be Table No. 2 piping.	Cast iron hubless pipe ASTM A-888	Cast iron split sleeve bolted connector with rubber gasket MG coupling or 3"-wide, heavy duty stainless steel banded coupling with rubber gasket; Clamp-All ANACO SD 4000 or equal	Roll-on "donut type" gaskets not acceptable if used within 25 ft. of watercourse. Pipe must be properly bedded in accordance with manufacturer's specifications, laid in a straight line on a uniform grade
	Cast iron bell and spigot ASTM A-74	Rubber compression gaskets	
	Ductile iron ANSI A21.51	Rubber compression gaskets	
	Extra strength PVC pressure water pipe AWWA C-900 (PC 100 psi min.)	Rubber compression gaskets	
	Reinforced Concrete Pipe ASTM C 76	Rubber compression gaskets, ASTM C 443	
Note: Building sewer within 25 feet of building must be Table No. 2 piping. To reduce separation distances for the following other items listed in Table No. 1:	Reinforced concrete water pipe, steel cylinder type, AWWA C-300/ C-301	Rubber compression gaskets	
	Schedule 40, PVC ASTM D 1785 or ASTM D 2665	Rubber compression gasketed couplings, Harco Mfg. -ASTM D3139 or equal* or Solvent weld couplings/fittings using proper two step PVC solvent solution procedure	*Use of 3"-wide approved stainless steel banded couplings on PVC ASTM D 1785 Schedule 40 is acceptable
	PVC ASTM D 2241: SDR 21, 17 or 13.5	Rubber compression gaskets or Solvent weld couplings/fittings using proper two step PVC solvent solution procedure	ABS Schedule 40 is not acceptable
	PVC ASTM F1760, SDR 35 PVC ASTM D 3034, SDR 35 PVC ASTM F 789 PVC ASTM F 679	Rubber compression gaskets or Solvent weld couplings/fittings using proper two step PVC solvent solution procedure	Joint must meet ASTM D 3212 specifications.
	PVC, CONTECH A-2026, ASTM F 949	Elastomeric gasket meets ASTM F 477	Joint meets ASTM D 3212
-Human habitation on adjacent property -Building served -Property line -Pressure water lines -Swimming pools -Accessory structures -Utility service trench -Closed loop geothermal borehole (10 feet minimum)	PVC, CONTECH A-2000, ASTM F 949	Gaskets meet ASTM F 477	Joint meets ASTM D 3212
	PE, ADS N-12, ASTM F 667, AASHTO M-294, 24-inch maximum diameter	Series 35 ADS coupling, o-ring gasket or WT Pipe/joint (Gasketed bell/spigot)	Coupling: ASTM D 3034/F 1336 Joints (Coupling and WT) meet ASTM D 3212
	PE, Hanco Blue Seal, ASTM F 667, AASHTO M-294, 24-inch maximum diameter	Blue Seal coupling/rubber compression gasket	Joint meets ASTM D 3212

SOURCE: CT PUBLIC HEALTH CODE - REGULATIONS AND TECHNICAL STANDARDS FOR SUBSURFACE SEWAGE DISPOSAL SYSTEMS SECTION 19-13-B103, JANUARY 2009

Table No. 2-D

Accepted Sewer Pipe for Use as Sewer Force Main for Specific Applications

USE	PIPE DESCRIPTION	ACCEPTABLE JOINT	REMARKS
Sewer force main piping within the sanitary radius of a water supply well. NOTE: The following minimum distances shall be maintained from wells based on withdrawal rates: <10 gpm: 25 feet 10 - 50 gpm: 75 feet >50 gpm: 100 feet OR Sewage force main within 25 feet of an open watercourse, surface or groundwater drain, footing or foundation drain.	PVC pressure pipe ASTM D 2241; SDR 21, 17, or 13.5 PVC pressure water pipe AWWA C-900 (PC 200 psi minimum)	Bell and spigot with compression rubber gaskets	
To reduce separation distances for the following other items listed in Table No. 1:	PVC ASTM D 1785 / ASTM D 2665, Schedule 40 or Schedule 80	Solvent welded, threaded joints or gasketed couplings	
<ul style="list-style-type: none"> - Human habitation on adjacent property - Building served - Property line - Pressure water lines - Swimming pools - Accessory structures - Utility service trench - Closed loop geothermal borehole (10 feet minimum) 	PE ASTM D 2239 PE ASTM D 2737 PE ASTM D 3035, SDR 11 or lower	No joints within 75 ft. of well or 25 ft. of open watercourse, ground or surface water drains No joints. Heat butt fused connections ok	Pipe available in 100-ft. and longer coiled lengths

SOURCE: CT PUBLIC HEALTH CODE - REGULATIONS AND TECHNICAL STANDARDS FOR SUBSURFACE SEWAGE DISPOSAL SYSTEMS SECTION 19-13-B103, JANUARY 2009