

TOWN OF LEWISTON

STANDARD DETAILS AND SPECIFICATIONS

FOR THE

CONSTRUCTION OF PUBLIC IMPROVEMENTS

August 2016

January 2018 (latest revision)



Town of Lewiston

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Town of Lewiston

Standard Details and Specifications

for the

Construction of Public Improvements

Revision	Date	Description
Rev. 1	8/9/2017	Detail P-20 – Roadway Crossing Trench Restoration – August 2017 (Pavement, Curb, and Sidewalk Details section)
Rev. 2	1/30/2018	Spec Section 02620 – Curbing – December 2017
Rev. 2	1/30/2018	Detail P-01 – 6” Upright Curb Detail – December 2017
Rev. 2	1/30/2018	Detail P-06 – New Town (Local) Road Section – January 2018
Rev. 2	1/30/2018	Detail P-08 – Sidewalk Ramp Detail – December 2017
Rev. 2	1/30/2018	Detail P-10 – (Not Used)
Rev. 2	1/30/2018	Detail P-11 – Curb Bubbler Detail – December 2017
Rev. 2	1/30/2018	Detail P-12 – (Not Used)
Rev. 2	1/30/2018	Detail P-13 – Alternate 1 Temporary Turnaround Detail – December 2017
Rev. 2	1/30/2018	Detail P-13 – Alternate 2 Temporary Turnaround Detail – December 2017
Rev. 2	1/30/2018	Detail P-14 – Typical Cul-de-sac Detail – December 2017
Rev. 2	1/30/2018	Detail P-19 – (Not Used)
Rev. 2	1/30/2018	Detail P-21 – Typical Driveway Curb-Cut Detail – January 2018
Rev. 2	1/30/2018	Detail ST-17 – Drop Inlet Details – January 2018

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SECTION 02102
SITE CLEARING

PART I - GENERAL

1.01 SCOPE OF WORK

- A. The DEVELOPER/CONTRACTOR shall clear and grub in the areas required for construction and remove all debris resulting from the work. The DEVELOPER/CONTRACTOR shall confine his operations within the limits indicated on the Design Drawings, and shall not enter any area outside these limits without prior written consent of the TOWN or ENGINEER.
- B. The work also consists of salvaging, stockpiling, and stripping suitable topsoil for use in designated areas.
- C. Existing features, trees and vegetation to remain shall be protected, and if damaged or destroyed, shall be repaired or replaced in kind by the DEVELOPER/CONTRACTOR's.

1.02 MATERIAL OWNERSHIP

- A. Except for stripped topsoil or other materials indicated to remain OWNER's property, unsuitable and cleared materials shall become Contractor's property and shall be removed from Project site.

1.03 QUALITY ASSURANCE

- A. The Developer/Contractor shall notify the TOWN and ENGINEER of the intended location and source of the material in advance of the scheduled use of the material to allow time for sampling and testing.
- B. Topsoil shall meet the following requirements

Topsoil – Type A

- The pH of the material shall be between 5.5 and 7.6
- The organic content shall be not less than 6% or more than 12%, (dry weight basis).
- Gradation:

Sieve Size	Percent Passing by Weight
2 inch	100
1 inch	85 to 100
¼ inch	65 to 100
No. 200	20 to 65
2 micron particle	0 to 20

Topsoil – Type B

- The pH of the material shall be between 5.5 and 7.6
- The organic content shall be not less than 2% or more than 20%, (dry weight basis).
- Gradation:

Sieve Size	Percent Passing by Weight
2 inch	100
1 inch	85 to 100
¼ inch	65 to 100
No. 200	20 to 80

PART II - PRODUCTS

2.01 GENERAL

- A. Topsoil shall consist of the natural loam, sandy loam, silt loam, or clay loam humus-bearing soils adapted to the sustenance of plant life, and such topsoil shall be neither excessively acid or alkaline.
- B. Topsoil shall be free from foreign material such as hard pan, stones larger than one inch diameter, concrete, cinders, brick, asphalt, or other undesirable materials. It shall also be reasonably free from weeds and objectionable plant material.

PART III - EXECUTION

3.01 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly flag trees and vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.

3.02 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways in accordance with the Storm Water Pollution Prevention Plan (SWPPP) including all permits/requirements of the New York State Department of Environmental Conservation.
- B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal upon approval of the on-site inspector or Town Engineer.

3.03 TOPSOIL STRIPPING

- A. Strip topsoil to full depth of topsoil in designated areas.

- B. Imported topsoil shall be hauled to the site and stockpiled in locations designated by the TOWN and ENGINEER.
- C. If soil or weather conditions are unsuitable, as determined by the ENGINEER, the DEVELOPER/CONTRACTOR shall cease stockpiling operations until permission to resume stripping and stockpiling operations is obtained from the ENGINEER.

3.04 STOCKPILING

- A. Stockpile materials on site at a location approved by the TOWN and ENGINEER.
- B. Separate differing materials with dividers or stockpile apart to prevent mixing.
- C. Stockpile topsoil to a maximum height of 8-feet.
- D. Prevent intermixing of soil types or contamination.
- E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
- F. Do not stockpile topsoil within tree protection zone(s).
- G. Stockpile unsuitable materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.05 STOCKPILE CLEANUP

- A. Leave unused materials in neat, compact stockpile.
- B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

3.06 CLEARING AND GRUBBING

- A. Except as otherwise directed, cut, grub, remove and dispose of all stumps, brush, shrubs, roots and any other objectionable material within the limits defined on the Drawings. All stumps, brush and roots shall be grubbed and removed from areas to be occupied by buildings, structures, roads, pipelines and any other areas if designated by the ENGINEER.
- B. Tree stumps shall be removed to a minimum depth of 18" below the finished grade.
- C. Trees or foliage designated by the ENGINEER to remain shall be protected from damage by erecting suitable barriers, or by other approved means. Clearing operations shall be conducted in a manner to prevent damaging trees or other existing features designated to remain.
- D. Where it is necessary to cut branches of trees that are to remain, the cut shall be made flush with trunk or larger branch, with care being taken to prevent tearing the bark beyond the cut. An acceptable commercial tree paint shall then be applied over cut or damaged areas.

- E. Areas outside the limits of clearing shall be protected and equipment or materials shall not be stored or allowed to damage these areas.
- F. Stumps, trees, limbs, or brush shall not be buried in any fills or embankments or disposed of in any stream corridor, wetland or any surface water.

3.07 DISPOSAL OF MATERIALS

- A. All tree limbs, roots, stumps, brush, foliage and other vegetation shall be removed and properly disposed of by the DEVELOPER/CONTRACTOR off the project site, in a manner satisfactory to the ENGINEER.
- B. Vegetative spoil as set forth in Paragraph "A" is prohibited from being buried, burned, and dumped above grade, save at a landfill licensed to accept such material.
- C. The DEVELOPER/CONTRACTOR is however encouraged to chip/grind this material and uniformly spread the chipped/ground material throughout the project area, as mulch/soil conditioner, excepting areas to be paved, receive sidewalks, and to become structure foundation(s).
- D. Dumping of spoil material into any stream corridor, wetland, floodplain or surface water is prohibited.

END OF SECTION

SECTION 02200
EARTHWORK

PART I - GENERAL

1.01 SCOPE OF WORK

- A. The DEVELOPER/CONTRACTOR shall furnish all labor, materials, tools, equipment, services and incidentals necessary to perform all earth and rock excavation, ground water control, sheeting and shoring, backfilling, compacting and grading for all structures, pipelines and utilities.
- B. Site Grading
1. The surface area of the site, including all excavations, cuts, fills and embankments, shall be finished to the lines, grades and cross-sections shown on the Design Drawings, and shall be cleaned of all loose material.
 2. Erosion control procedures, including mulching, shall be utilized along the right-of-way and access roads. Erosion control shall occur as required and immediately following (weather permitting) completion of pipeline construction.
- C. Site Investigation
1. The DEVELOPER/CONTRACTOR's shall be responsible to investigate the actual conditions existing at the site.
- D. Excavating and Backfilling
1. The work shall include but not be limited to excavation for the structures, footings, manholes and chambers, pipes, ducts, roadways, pavements and ditches; all bedding, backfilling and fill material; embankment construction, protection of excavations, structures and utilities above and below grade requiring sheeting, shoring and bracing; handling of water, including pumping and bailing; dewatering as required; restoration of surfaces; filling unauthorized excavations, disposal of surplus materials and all incidental work.
 2. Trenches and other excavations shall be properly cutback, sheeted, shored and braced as necessary to prevent shifting of materials; to prevent damage to structures, pavement and pipes; and to provide safe working and site conditions in accordance with the minimum requirements of OSHA and the State Department of Labor. **No person shall be permitted to enter any trench or similar excavation where he/she may be exposed to side or bank failure or cave-in unless proper safeguard(s) for his/her protection are in-place.**
 3. At intersections and elsewhere, where there are existing services, such as watermains, gas lines, electric conduits, etc., the DEVELOPER/CONTRACTOR shall uncover said pipes and structures a sufficient time in advance of the construction of the proposed work to definitely determine the line and elevation of the existing structures with reference to the new work so that, if required, change in line and/or grade can be made in the new work. The DEVELOPER/CONTRACTOR shall be responsible to advise the TOWN and utility companies of the extent, scope and schedule of his operation.

4. Where water and sewer lines are within 10 feet or less horizontally, and/or 18-inches or less vertically of each other, the DEVELOPER/CONTRACTOR shall comply with the provisions of the *Ten States Standards For Wastewater Facilities*, Section 38, "Protection of Water Supplies."
5. The DEVELOPER/CONTRACTOR shall be responsible at all times for carrying out excavation and trenching work in a safe and prudent manner, to protect the workmen and public from hazard, and conform to Federal OSHA and the New York Department of Labor Part 23. All applicable local, State and/or Federal requirements shall be observed and necessary permits acquired by the DEVELOPER/CONTRACTOR.

E. Definitions

1. The term "earth excavation" as herein defined shall be construed to mean all classes of material, wet or dry, and shall include so-called muck, hardpan, soft shale or slate, loose disintegrated or decomposed ledge rock, old macadam, topsoil, sod, masonry, and boulders up to ½ cubic yard in volume, all of which can be readily removed with a pick, trenching machine or backhoe equipment.
2. Rock shall be defined as boulders exceeding ½ cubic yard in volume and solid bed rock or ledge rock which, in the opinion of the ENGINEER, requires drilling and blasting, wedging or sledging for removal from its original bed. Excavation of soft or disintegrated rock or weathered shale that can be removed readily with a pick, trenching machine, or backhoe equipment; loose, shaken or previously blasted rock; masses of broken stone in rock fill walls or elsewhere, except such individual pieces that exceed ½ cubic yard in volume; concrete, asphalt or brick pavements and concrete or stone curbs and sidewalks shall not be considered as rock excavation.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Temporary sheeting, shoring and bracing - Section 02400.

1.03 REFERENCES

- A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m<sup>3 - 2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - 3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³</sup>

4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Excavated Material

1. Excavated materials to be reused shall be stored in locations which will not interfere with construction operations.
2. Unsuitable and surplus excavated material and debris shall be disposed of by the DEVELOPER/CONTRACTOR outside the limits of the project site. Disposal shall be in accordance with the requirements of the New York State Department Environmental Conservation.

B. Explosives

1. Are not allowed to be used nor allowed on-site without proper planning, design, and written approval from the TOWN and ENGINEER.

1.05 JOB CONDITIONS

A. Protection of Property

1. Necessary arrangements shall be made by the DEVELOPER/CONTRACTOR with all persons, firms and corporations owning or using any poles, pipes, tracks or conduits, etc., affected by the construction.
2. Excavated materials shall be stockpiled on the site in a location approved by the Town Engineer. Unsuitable and surplus materials shall be immediately removed from the site. Care shall be taken to avoid depositing excavated material on pavements, sidewalks or grass plots, except with written authorization, and then only when adequate temporary provisions have been made for passage and protection of pedestrians and vehicles. Adequate bridging (e.g. steel plate, etc.) must be provided and maintained across all open trenches for pedestrian and vehicle crossing and safety.
3. The DEVELOPER/CONTRACTOR shall shore up or otherwise protect all fences, buildings, walls, walks, curbs or other property adjacent to any excavation that might be disturbed during the progress of the work. The DEVELOPER/CONTRACTOR shall be liable for any damage that may result to neighboring property from excavation, backfill or grading operations.

PART II - PRODUCTS

2.01 MATERIALS

A. Earth Fill

1. Earth fill shall be fine loose material from the excavations, free from trash, frozen lumps, organic substances, rocks over 4 inches in diameter and other materials which, in the opinion of the Town Engineer, are unsuitable for the proposed use (e.g. wet soils, contaminated materials, corrosive materials, materials which will readily degrade, etc.). Physical properties shall be such that it can be readily spread and compacted.

B. Select Granular Backfill

1. For Pipe Lines, Chambers and Manholes

- a. Select granular backfill shall be No. 2 run-of-crusher stone, per NYS Dept. of Transportation Specifications 304-2.02/703-0201, latest edition.
- b. Crushed slag and gravel will not be allowed.

2. For Structures

- a. Select granular backfill shall be No. 2 run-of- crusher stone, per NYS Dept. of Transportation Specifications 304-2.02/703-0201, latest edition.
- b. Crushed slag and gravel will not be allowed.

C. Controlled Low Strength Material (CCSM)

1. CLSM shall be non-flyash type per NYS Department of Transportation Specification 204.02 with a compressive strength between 150 psi – 180 psi for the use as a select type backfill material.
2. Precautions must be considered to counteract pipe and structure buoyancy. Anti-flotation calculations shall be provided to the ENGINEER for review and approval.

D. Pipe Bedding Materials

1. Unless otherwise indicated on the Drawings, pipe bedding material shall be NYS Dept. of Transportation Size Designation No. 1 Crushed Stone, per NYSDOT Specification 703-0201, latest edition, with the following gradations:

100 percent (by weight) of the material shall pass screens with 1" square opening

90-100 percent (by weight) of the material shall pass screens with 1/2" square opening

0-15 percent (by weight) of the material shall pass screens with 1/4" square openings

2. Crushed stone for bedding pipe shall meet all the requirements of New York State Department of Transportation Specifications Material Designation 703-0201, latest edition, and shall consist of clean, durable, sharp angled fragments of rock of uniform quality. Crushed stone for bedding pipe shall be obtained from sources conforming to the requirements of the New York State Department of Transportation as to sampling, testing methods, quarry reports and any other required procedures.
3. Crushed slag and gravel will not be allowed.

PART III - EXECUTION

3.01 EXCAVATION

A. General Requirements

1. Excavation shall be made to such widths as will give suitable room for the proposed work, including materials, equipment, forms, sheeting and bracing, pumping and draining, etc. The bottom of the excavation shall be rendered firm and stable, and in all respects acceptable to the ENGINEER.
2. Excavation and dewatering shall be accomplished by methods that preserve the undisturbed state of subgrade soils. Subgrade soils that either are in their undisturbed state, or become soft, loose, "quick", or otherwise unsatisfactory for support of structures as a result of inadequate excavation, dewatering or other construction methods shall be removed and replaced by concrete or granular fill as required by the ENGINEER.

B. Excavation

1. Excavations shall be carried to the depth and dimensions necessary for the proper installation of all work. Where any unauthorized excavation is made below the grades indicated, the excavations shall be restored to the proper elevations with compacted, select granular backfill material, or, if under footings, the heights of the walls or footings shall be increased. In any event, the operations necessary to correct an excess of excavation shall meet with the consent of the ENGINEER. If deemed necessary, concrete instead of granular fill shall be used to correct unauthorized excavations.

C. Trench Excavation

1. The DEVELOPER/CONTRACTOR shall generally excavate trenches to the depth necessary for proper pipe installation. Trench width shall be kept to a minimum, allowing only the space necessary for trench shoring and bracing, and pipe installation, and in accordance with the appropriate standard detail(s). Exceptions will be on a case by case basis and shall be approved by the Town Engineer. An example might involve unstable soils where benching of the trench is required to advance the shoring and/or upload underlying soil(s).
2. In some circumstances trench width may vary depending upon the depth, nature of material excavated, and method by which excavation is accomplished. In any case, sufficient clearance around the pipe shall be provided to properly lay the pipe, make the joint, and install and compact the backfill.

3. The trench shall be kept as narrow as practical, with sides as nearly vertical as consistent with good workmanship and safety. The trench dimensions and procedure of trench excavation shall be subject to the acceptance of the ENGINEER and standard TOWN details.
4. The length of open unshored and braced trench shall be kept to a minimum (that required to advance shoring and bracing) in an effort to protect adjacent facilities.
5. The trench shall be braced, sheeted and dewatered, as required to provide safe, stable conditions, and shall comply with all requirements of Specification Section 02400.
6. Care shall be taken to avoid damage to existing structures, utilities, and pipes in the performance of the work. In locations where the excavation is carried beneath or adjacent to existing structures, utilities, or pipes, sheeting and bracing shall be installed as necessary to support such structures, utilities or pipes in their original position, and shall be responsible for any damage caused to such utilities by his work. The support or bracing of existing utilities shall be acceptable to the utility company having ownership and/or jurisdiction of the existing utility.

D. Rock Excavation

1. Rock shall be excavated in general so that there will be a clear space of at least 12" from the outside barrel of the pipe to the side of the trench. Isolated points of rock shall not come nearer than 9" to the outside of all pipes. At joints, there shall be sufficient room for properly making the joint.
2. Rock shall be stripped in sections satisfactory to the ENGINEER.
3. Where pipe is laid in rock cut, a minimum of 6" of pipe bedding material shall be carefully placed and tamped over the rock before the pipe is installed, then the balance of the pipe bedding and backfill shall be placed as described herein. Excess rock or rock which cannot be used with earth to provide satisfactory backfill in upper portions of trench shall be disposed of by the DEVELOPER/CONTRACTOR. No pieces of rock in excess of 1/3 cubic foot in volume shall be used in backfilling.

3.02 EROSION CONTROL

- A. All necessary precautions shall be taken to preclude the contamination of any wetland or waterway by suspended solids, sediment, fuels, solvents, lubricants, epoxy coatings, paints, concrete leachate or any other environmentally deleterious substance associated with the project.
- B. All necessary precautions shall be taken to prevent the entry of raw concrete or concrete liquors into the waters and/or wetlands of the State of New York. Equipment washwater shall not be allowed to enter any waterway or wetland.

- C. All sediments are to be retained on the project site through the use of hay bales, silt fences or other barriers, as specified or approved by the Town Engineer and local authority having jurisdiction, to prevent erosion.
- D. All areas of soil disturbance resulting from this project shall be seeded with an appropriate perennial grass seed and mulched with hay or straw within one week of final grading. Mulch shall be maintained until a suitable vegetative cover has been established.
- E. Pumped groundwater collected from excavations shall not be allowed to be discharged directly to any wetland, waterway, or other water body.
- F. Contamination of any wetland, waterway, or other water body shall be cleaned and/or restored to the satisfaction of the Town Engineer and governing authorities at the expense of the CONTRACTOR.

3.03 DRAINAGE AND DEWATERING

A. General

1. Prevent surface and subsurface water from flowing into excavations and from flooding adjacent areas.
2. Remove water from excavation as fast as it collects.
3. Maintain the ground water level at least 2 feet below the bottom of the excavation to provide a stable surface for construction operations and to prevent damage to the work during all stages of construction.
4. Provide and maintain pumps, sumps, suction and discharge lines and other dewatering system components necessary to convey water away from excavations.
5. Provide sediment traps when water is conveyed into water courses.
6. Notify the ENGINEER before shutting down dewatering systems for any reason.
7. Standing water shall not be permitted in the excavation at any time. If the Material at the design grade becomes unsuitable or contaminated due to the actions of the CONTRACTOR, the CONTRACTOR shall excavate additional material to the depth necessary and shall backfill to the proposed grade with select fill or crushed stone.
8. Any hardships created by the temporary dewatering for this Contract which adversely affects the water supply to local property owners, shall be satisfactorily resolved by the CONTRACTOR, including the provision of temporary water service, if required, at no additional cost to the OWNER.
9. Trench and excavation waters must be treated for the removal of sediment. The applied measure of treatment shall be such that no visible increase of turbidity

shall be identified in the receiving waters. Also, the DEVELOPER/CONTRACTOR shall maintain a "non-erosive" discharge.

3.04 BACKFILLING

A. Requirements

1. All trenches and excavation shall be backfilled to the original surface of the ground or to such other grades as may be shown on the plans or directed by the ENGINEER.
2. Systematically backfill to allow maximum time for natural settlement. Do not backfill on porous, wet, frozen, or spongy subgrade surfaces.
3. For all bedded pipeline construction, the bedding material shall be installed, graded and compacted prior to placing the lengths of pipe in the trench. No other method shall be allowed unless authorized in writing by the ENGINEER.
4. For all excavation under pavement and sidewalks and adjacent to new and/or existing structures, select granular fill material shall be installed and compacted.
5. For utility trench excavations within the 45 degree influence of adjacent pavement, structures, or traveled areas, select backfill material shall be used as backfill and restored accordingly.
6. The method and degree of compacting backfill will be governed by the type of material and the extent to which any subsequent settlement can be permitted.

B. Placement of Fill Material

1. In all backfilling of trenches and around structures, loose lumber, braces, rubbish and refuse shall be removed from the areas to be backfilled.
2. Backfilling shall be done with sound material, free from waste, objectionable organic matter, rubbish, boggy or other unsuitable materials. No frozen material shall be used for backfilling.
3. Backfilling shall begin as soon as practicable after structures and pipelines have been installed and inspected. Material for bedding and backfill shall be as shown on the standard details and as specified in this section. The material shall be firmly compacted below and around conduits and pipelines. Temporary blocking shall not be allowed.
4. Backfill shall be placed in uniform horizontal layers and shall be tamped or otherwise consolidated as the work progresses. In no case shall the consolidated layers of backfill be more than 6 inches in depth. Lumps of earth shall be broken up and if there are any stones or lumps that cannot be readily broken up, they shall be distributed throughout the mass so that all interstices are solidly filled with fine materials.
5. The backfilling around and over conduits and pipes shall be carefully done by hand and tamped with suitable tools, to a point two feet above the top of such

conduits and pipes. This material shall be placed in layers approximately 6 inches thick, each layer being thoroughly tamped and compacted in place. No stone fragments shall be placed in the backfill nearer than 2 feet from the pipe or conduit at any point, or from any concrete wall. In special cases where conduits and pipes are susceptible to fracturing, every effort shall be made to extend the pipe zone and use bedding material which does not require mechanical compaction to a depth as directed by the ENGINEER.

6. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
7. The remaining upper portion of the trench may be backfilled by machine, but the work shall be done in such a way as to prevent dropping of material directly on top of the conduit or pipe through any great vertical distance.
8. Rock and/or earth material may be encountered during the work that is unsuitable for backfilling. When this material is encountered, it shall be disposed of in the specified manner, possibly resulting in a shortage of suitable backfill material. In this event, clean earth or select backfill materials shall be installed to properly and completely backfill the excavation. Backfill material for these situations may be obtained from other areas of the project where suitable material or from offsite locations approved by the ENGINEER. All backfill is subject to the ENGINEER's review and must meet the minimum requirements of the specifications herein.

3.05 COMPACTION OF MATERIALS

- A. All materials shall be properly placed and compacted to correct any deficiencies resulting from insufficient or improper compaction of such materials. The DEVELOPER/CONTRACTOR shall determine the type, size and weight of compactor best suited to the work at hand, select and control the lift (layer) thickness, exert proper control over the moisture content of the material, and other details necessary to obtain satisfactory results.
- B. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture-density relationship (cohesive soils) determined in accordance with ASTM D1557 and not less than the following percentages of relative density, determined in accordance with ASTM D4253 and D4254, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).
 1. Under Structures, Building Slabs, Steps, Pavement And Curb And Gutter: Compact the top 12 inches below subgrade and each layer of backfill or fill material at 95 percent maximum dry density unless otherwise indicated on the drawings. (Exception: Utility trenches under pavements; compact the top 6 inches at 95 percent maximum dry density and each layer of backfill or fill material below subgrade at 90 percent maximum dry density unless otherwise indicated on the drawings.) Where the native soil is cohesionless, compact top 12 inches to a minimum relative density of 72 percent.

2. Under Lawn or Unpaved Areas: Compact the top 6 inches below subgrade and each layer of backfill or fill material at 85 percent maximum dry density for clayey soils (more than 35 percent passing No. 200 sieve) and 90 percent relative density for all other soils.
3. Under Walkways: Compact the top 6 inches below subgrade and each layer of backfill or fill material at 90 percent maximum dry density for clayey material or 90 percent relative density for all other material.

C. Compaction Equipment

1. The selection of compaction equipment is the DEVELOPER/CONTRACTOR's responsibility, but shall be subject to the approval of the ENGINEER. Generally, the following shall apply for the type of material to be compacted.
 - a. Sheepsfoot rollers shall be used to compact clay and glacial till soils. The proper ballasted weight shall be determined such that the feet penetrate to their full length on a loose lift to be placed, and with further passes, compact the layer as required.
 - b. Pneumatic or vibratory rollers shall be used to compact sands and gravels. Pneumatic rollers shall have operating weights between 2,000 and 3,500 pounds per tire.
 - c. Smooth steel wheel, pneumatic tired or vibratory rollers shall be used to compact coarse gravel or crushed stone. Smooth steel wheel rollers shall have a minimum weight of 10 tons. Where possible, rock fill shall be compacted using a self-propelled vibratory steel drum roller weighing at least 10 tons.
 - d. Plate compactors mounted to a machine (e.g. excavator, backhoe, etc.) arm shall be used to compact coarse gravel or crushed stone.
 - e. In all cases, loads shall be adjusted to give the most suitable results for the material being compacted. For heavier, or more efficient types of approved compaction equipment, the minimum number of passes required on all portions of each successive layer shall be determined by the ENGINEER after appropriate field tests to evaluate the efficiency of the equipment have been made. However, layer thicknesses shall not, under any circumstances, exceed those specified.
 - f. In confined areas, and adjacent to utilities, compaction shall be made using hand guided mechanical vibratory plate tampers or rollers similar to units manufactured by Kelly, Jay Jackson, or Ingersoll Rand.
 - g. In special cases where mechanical compaction of backfill is prohibited due to the susceptibility of conduits and pipes to fracturing, alternative means of consolidating excavated material backfill (e.g. pressing with machine in short lifts, etc.) shall be used, as directed by the ENGINEER.

3.06 SITE GRADING

- A. Grading in preparation for placing of topsoil, planting areas, paved walks and drives and appurtenances shall be performed to the lines and grades shown on the approved Design Drawings and as directed by the ENGINEER. All material encountered, of whatever nature, within the limits indicated, shall be removed and disposed of as directed. During the course of grading, the subgrade shall be maintained in such condition that it will be well drained at all times. When directed, temporary drains and drainage ditches shall be installed to intercept or divert surface water that may affect the prosecution or condition of the work. Temporary erosion and sedimentation control measures shall also be provided along areas as determined by the ENGINEER to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties.
- B. When access roads are no longer needed, road fill shall be removed and the access area shall be restored. Care shall be taken to avoid damage to adjacent vegetation and to prevent the formation of depressions that would serve as mosquito pools.
- C. If at the time of grading it is not possible to place any material in its proper section of the permanent structure, it shall be stockpiled in approved areas for later use.
- D. The right is reserved to make minor adjustments or revisions in lines or grades if found necessary as the work progresses.
- E. All loose or protruding rocks shall be barred loose or otherwise removed to line or finished grade of slope. All cut and fill slopes shall be uniformly dressed to the slope, cross-section and alignment as directed by the ENGINEER.
- F. Rough grading shall be stopped four inches below final grade and leveled off, and topsoil shall be placed and finished to final grade.
- G. Topsoil shall be uniformly distributed over all denuded areas. Topsoil shall have a minimum thickness of 4 inches after natural settlement and light rolling, or greater depth if specified on the plan drawings. Topsoil shall conform to the grades and elevations as shown on the plans. Hand rake areas inaccessible to machine grading. Topsoil shall be compacted by one pass of a cultipacker, roller, or other approved equipment weighing 100-160 pounds per linear foot of roller. Topsoil shall not be placed when either the topsoil or the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading.
- H. The DEVELOPER/CONTRACTOR shall replace all surface material, and restore paving, curbing, sidewalks, gutters, fences and all other items that were disturbed by the construction so that they shall be equal to the original condition.

3.07 SITE RESTORATION

- A. Upon completion of site grading, all vegetation shall be restored, as a minimum, to a condition as near as practical to original conditions. All landscaped as well as all areas of wild growth (including areas of scrub brush) and open fields supporting plant life disturbed by construction activities shall be planted and nurtured until a full healthy growth has been established.
- B. Areas within New York State or Niagara County Highways shall be restored as set forth in the Highway Work Permit and the Minimum Standards that follow (whichever is stricter).

- C. Seed mixtures shall be selected that best conform with, or are best suited for the particular site conditions. Seed shall provide for a quickly germinating initial growth to prevent erosion, and for secondary growth that will survive without continuing maintenance by the OWNER.
- D. Mulching shall occur immediately after seeding, and in no case shall more than three (3) days elapse between seeding and mulching.
- E. Seeding

After completion of construction, areas to be seeded shall be seeded in accordance with the following:

1. All areas to be seeded shall be graded to blend smoothly into adjacent ground, the topsoil shall then be rolled with a light roller or cultipacker until the topsoil is firm, but not hard packed.
2. When fine grading has been completed, the entire area so graded shall be fertilized and seeded.
3. Fertilizer shall be 5-10-5 applied at the rate of 40 pounds per 1,000 square feet.
4. Grass seed shall consist of 40% Kentucky Blue, 35% Creeping Red Fescue, 10% Red Top and 15% Perennial Rye applied at the rate of 200 pounds per acre.
5. After fertilizing and seeding, the DEVELOPER/CONTRACTOR shall place and secure a 100% agricultural straw blanket. The blanket shall be of consistent thickness and shall be covered on the top side with a photodegradable polypropylene netting having a 1½" square mesh. The specified material shall be North American Green S75, or approved equal.
6. The DEVELOPER/CONTRACTOR shall check the condition of the soil prior to fertilizing and seeding and if necessary, apply lime at a sufficient rate to raise the pH of the soil to 7.0.

Seed shall be sown at the earliest practical date. The finished surface grade shall be maintained in a true and even condition during the seeding operation. The soil shall be raked to a depth of approximately 3/4 of an inch by using iron rakes, immediately previous to sowing seed. All raking shall be done along contour lines; not uphill or downhill. All rocks, stones, weeds or trash appearing on the surface shall be removed.

After the seed is sown, the surface shall be lightly rolled. The DEVELOPER/CONTRACTOR shall maintain the area sown until all work is completed and accepted by the TOWN and ENGINEER. This maintenance shall consist of occasional mowing, watering during periods of drought, and removal of large and conspicuous weeds.

END OF SECTION

SECTION 02400
TEMPORARY SHEETING, SHORING AND BRACING

PART I - GENERAL

1.01 SCOPE OF WORK

- A. The DEVELOPER/CONTRACTOR shall provide, practice, and maintain all measures necessary to protect the following from damage, failure, or injury:
1. existing utilities in their original position,
 2. existing structures in their original position,
 3. workmen and other persons,
 4. adjacent trench and excavation face(s)/way(s),
 5. trench/excavation cross section as per approved detail(s),
 6. construction equipment and traffic (both vehicle and pedestrian) adjacent the excavation, and,
 7. other completed and/or adjacent new work.

All sheeting, shoring, and bracing shall be designed at the DEVELOPER/CONTRACTOR's expense by a Professional Engineer currently licensed to practice in the State of New York. The seal of the ENGINEER performing the design of sheeting and bracing shall appear on all drawings and design sheets. The DEVELOPER/CONTRACTOR shall be solely responsible for the design, adequacy, application, and maintenance of all sheeting and bracing, and for all damage and claims resulting from its failure or from placing, maintaining and removing it.

The DEVELOPER/CONTRACTOR shall supervise and direct the work and he shall be solely responsible for all construction means, methods, techniques, sequences and procedures including maintenance and removal.

- B. All sheeting, shoring and bracing shall conform to the provisions of the federal government, New York State Department of Labor, and other unnamed agencies and groups having jurisdiction over said work.

As a minimum, the DEVELOPER/CONTRACTOR's attention is directed to, and he specifically agrees to, Subpart 23-4, Excavation Operations, of the New York State Department of Labor Board of Standards and Appeals Industrial Code Rule 23 as amended effective April 17, 1991 and to 29 CFR 1926, Subpart P - Excavations, Trenching and Shoring - Section 1926.650, 1926.651, 1926.652 and 1926.653 of the 1983 Occupational Safety and Health Administration (OSHA) Safety and Health Standards, and any subsequent amendments thereto. These requirements are minimum requirements and may be increased by the DEVELOPER/CONTRACTOR depending upon the hazard.

- C. Bracing, sheeting and shoring shall be so arranged as not to place any stress on portions of completed work until the construction has proceeded far enough, in the opinion of the

DEVELOPER/CONTRACTOR's Engineer, to provide ample strength. If the DEVELOPER/CONTRACTOR's Engineer is of the opinion that the sheeting or supports furnished are inadequate or unsuited for the purpose, he may order additional sheeting or supports to be installed. Whether so ordered by the DEVELOPER/CONTRACTOR's Engineer or not, sufficient sheeting or supports shall be installed to protect against damage to new work, and existing structures and utilities as required.

PART II - PRODUCTS

2.01 MATERIALS

- A. Wood sheeting, shoring and bracing shall be of such quality and size that it will not split. Sheeting and bracing shall be Southern Pine, a structural grade, of 1800 psi stress class, and furnished in accordance with the standard rules for grading, dressing and inspection of joints, planks, beams and stringers of the Southern Pine Association. Douglas Fir or other timber of equivalent grade may be substituted. Materials may be either new or used in good condition. Where close or tight sheeting is required, wood sheeting shall be tongued and grooved.
- B. Steel sheeting and piles shall be manufactured from steel conforming to ASTM Designation A-328, latest revision. Steel sheet piling and interlocks shall not have excessive kinks, camber, or twists that would prevent the pile from free sliding. Steel H-piles, WF shapes, bracing members, fabricated connections, and all other accessories shall conform to the standard specifications for bridges and buildings ASTM Designation A-36, latest edition. Steel trench boxes shall be constructed of steel conforming to ASTM A-36/A-36M, latest edition. All necessary welding of supporting members shall be done in accordance with requirements of the American Welding Society Code.

PART III - EXECUTION

3.01 INSTALLATION

- A. Sheeting, shoring and bracing shall be installed/used in accordance with all code requirements.
 - 1. All sheeting shall be right and continuous, and driven vertically in place ahead of the excavation by means of steam, vibratory or pneumatic hammers. Any material that stops the driving of sheet piling shall be removed by the DEVELOPER/CONTRACTOR.
 - 2. The sheeting shall extend at least 2 feet above the surface of the ground. If, in the opinion of the ENGINEER, an excavation will constitute a safety hazard, the sheeting shall extend at least 4 feet above the surface of the ground.
 - 3. As soon as sheeting/trench box is placed, if there is a space between the sheeting and the side of the trench, the space shall be backfilled with suitable material thoroughly compacted in place.

B. Removal of Sheeting

1. In general, the sheeting and bracing shall be removed as the excavation is refilled in such a manner as to avoid the caving in of the bank or disturbance to adjacent areas or structures. The voids left by the withdrawal of the sheeting shall be carefully filled by ramming or otherwise, as directed. Permission of the ENGINEER shall be obtained before the removal of any shoring, sheeting or bracing.
2. Such permission by the ENGINEER shall not relieve the DEVELOPER/CONTRACTOR from the responsibility for injury to structures, or to other property or persons, from failure to leave such sheeting and bracing in place.

C. Sheeting Left in Place

1. The ENGINEER may order, in writing, any or all sheeting or bracing to be left in place for the purpose of preventing injury to the structures or to other property or to persons, whether such sheeting or bracing was shown on the Design Drawings, or placed at his direction, or otherwise. If left in place, such sheeting shall be cut off at the elevation ordered, or shown on the Design Drawings, but in general, such cut off shall be at least 18" below the final ground surface. Bracing remaining in place shall be driven up tight.

END OF SECTION

SECTION 02520
STORM SEWER PIPING

PART I - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, tools, equipment and incidentals necessary for the furnishing and installation of storm sewer piping and fittings as specified herein.

PART II - PRODUCTS

2.01 CORRUGATED SMOOTH BORE PIPE (Storm)

A. Pipe

1. The storm pipe sewer shall be high density polyethylene (HDPE) with smooth interior or polyvinyl chloride (PVC) with smooth interior. Pipe and fittings shall be bell and spigot type with gasketed water tight joints.
2. Pipe and fittings shall be Hancor Mega Green, ASTM 2648, ASTM D3212, ASTM F2306, and ASTM F477, or Contech A-2000, ASTM F949, ASTM D1784, ASTM D2412, and ASTM D3212, or Approved Equal.

PART III - EXECUTION

3.01 LAYING PIPE

A. Pipe

1. The Contractor shall lay and maintain all storm drainage piping to the lines and grades as shown on the Design Drawings and in accordance with the requirements for installation as specified in Section 02200.
2. All work shall be performed in accordance with the Standard Details.
3. No blocking will be allowed under the pipe.
4. All pipe shall be cleaned before placing, bulkheaded when pipe laying is stopped, and otherwise constructed to secure first class work, free from defects and debris.

END OF SECTION

SECTION 02521
STORM SEWER MANHOLES

PART I - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals necessary for the installation of storm sewer manholes as specified herein.

PART II - PRODUCTS

2.01 CAST-IN-PLACE MANHOLE BASE SECTIONS

- A. The concrete base shall be 4000 psi concrete and the fill forming the invert channel shall be 4,000 psi concrete as specified in Section 03300 – Cast-in-Place Concrete. Both shall be poured in the field.

2.02 PRECAST CONCRETE MANHOLE BASE SECTIONS

- A. Precast bases shall be monolithic reinforced concrete, and shall comply with the requirements specified in Section 02521 - 2.03 for manhole barrels, including gasket joints and approved joint compound.
- B. The bottom or floor of the monolithic precast base shall have a minimum thickness of 8", and shall project no less than 6" beyond the outside walls of the monolithic precast base to form a flange or annular footing intended to resist uplift.
- C. The lowest edges of cutouts for line and branch sewers shall be no less than 6" above the inside surface of the floor or footing of the monolithic precast base. The highest edges of holes or cutouts for line and branch sewers shall be no less than 6" from joint surfaces as detailed on the Plans. After installation of the line and branch sewers, manhole channels or inverts shall be formed by using 4000 psi fill concrete as specified in Section 03300 – Cast-in-Place Concrete of these Specifications.
- D. At the points where sewers are connected to the monolithic precast bases or manhole barrels, the annular spaces between the pipes and holes shall be sealed with assemblies consisting of rubber sleeve type gaskets or mechanically compressed rubber links to form watertight seals.

Such sealing assemblies shall be: Press-Seal Gasket Corporation "PSX" or "Press-Boot" with stainless steel or reinforced plastic expansion ring/sleeve, LINK-SEAL consisting of solid synthetic rubber links connected to each other with heavy, elongated washers, bolts and nuts, as manufactured by the Thunderline Corporation of Wayne, Michigan, or approved equal. After installation, metal parts and annular spaces of the above assemblies that are accessible from inside the manholes shall be coated/filled with compound as specified for manhole barrel joints.

2.03 MANHOLE BARREL AND CONE

- A. All manhole cones and barrels shall be precast concrete, constructed in accordance with the latest ASTM Specification C-478 "Precast Reinforced Concrete Manhole Sections," with the following exceptions: the manhole barrel walls shall be 5" (min.) thick for a 4 foot diameter manhole; 6" (min.) thick for a 5 foot diameter manhole; and 7" (min.) thick for a 6 foot diameter manhole.
- B. The DEVELOPER/CONTRACTOR shall submit to the Town Engineer for approval, details of manhole barrels and cones that he proposes to use. Precast cones shall be a maximum height of 4 feet as shown on the Standard Details.

2.04 JOINTS

- A. The manhole barrel and cone joints shall be concrete with a confined "O" ring, neoprene gasket in accordance with the latest ASTM Specification C-443.
- B. In addition to the neoprene gasket, each joint shall be buttered prior to assembly with an approved joint compound such as "DeWitt's No. 10," Duralseal 3101, Pioneer 301, or other equal compound. The excess shall be troweled off on the inside and some excess shall be placed on the outside and covered with a 6" wide band of Kraft paper.

2.05 ADJUSTING RINGS

- A. There shall be a maximum of two (2) concrete adjusting rings up to a maximum of 12" for grade adjustment. The adjusting ring joints shall be installed with an approved joint compound as specified in Section 02521-2.04(B). The outside of the adjusting rings shall be buttered with the same joint compound and wrapped with a band of waterproof paper as specified in Section 02521-2.04(A), from casting to cone.

2.06 MANHOLE STEPS

- A. Manhole steps shall be steel reinforced co-polymer polypropylene, and shall be placed in the forms while the manhole barrel and cone sections are being cast, or, after casting, shall be driven or securely grouted in place.

2.07 MANHOLE FRAMES AND COVERS

- A. Manhole frames and covers shall be heavy duty cast iron construction. Rims shall be set flush with surrounding grade in pavement or sidewalk areas. Manufacturer's drawings of all castings which the DEVELOPER/CONTRACTOR proposes to use shall be submitted to the Town Engineer and approved prior to the castings being ordered for the work.
- B. Materials and manufacturers shall meet standards and requirements set forth in ASTM A48 Class 30B.
- C. Manhole frame and covers shall be manufactured by East Jordan Iron Works, Neenah Foundry, or Approved Equal.

2.08 MANHOLE INVERT CHANNELS

- A. Invert channels shall be smooth and semi-circular in shape conforming to the inside of the adjacent sewer section. Changes in directions of flow shall be made with a smooth curve of as large a radius as the size of the manhole will permit. Changes in size and grade of the channels shall be made gradually and evenly. Precast inverts may be used or the invert channels will be formed directly in the precast base sections after it/they are set and pipe is laid. The floor of the manhole outside the channel shall be semi-smooth and shall slope toward the channel not less than one inch per foot, nor more than two inches per foot.

PART III - EXECUTION

3.01 INSTALLATION

- A. Excavation, temporary sheeting, shoring, and bracing, and backfilling shall be done in accordance with the requirements of Sections 02200 and 02400, respectively.
- B. The concrete for poured-in-place base sections and inverts shall reach a 4500 psi minimum compressive strength at 28 days. A minimum of two (2) test cylinders shall be taken for the base pour. One cylinder shall be tested at 7 days and the other at 28 days. Two copies of the test reports shall be submitted to the ENGINEER within 5 days of testing, which will be done in accordance with the latest ASME Standards.
- C. Refer to Standard Details for notes regarding backfill requirements for depths up to 12 feet (measured from ground to lowest invert).
- D. Backfill around pipes at manholes shall be carefully tamped.

END OF SECTION

SECTION 02522
STORM SEWER CATCH BASINS AND CATCH BASIN CONNECTIONS

PART I - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals necessary for the installation of storm sewer catch basins and connections as specified herein.

PART II - PRODUCTS

2.01 PRECAST CATCH BASINS

- A. Precast basins shall be monolithic reinforced concrete of the type shown on the Standard Details.
- B. The bottom floor of the monolithic precast basin shall have a minimum thickness of 6", and a 12" depth sump (depth below the lowest invert).

2.02 FRAMES AND GRATES

- A. Frames and grates shall be as shown on the standard details.

2.03 CATCH BASIN CONNECTIONS

- A. Catch basin connections shall be as shown on the Standard Details.

PART III - EXECUTION

3.01 INSTALLATION

- A. Manufacturers' drawings of all precast catch basins, frames and grates and connecting pipes shall be submitted to the Town Engineer for review prior to the DEVELOPER/CONTRACTOR ordering the material.
- B. Excavation, temporary sheeting and backfilling shall be done in accordance with the requirements of Sections 02200 and 02400, respectively.
- C. Backfill around pipes at catch basins shall be carefully tamped.
- D. The top of the precast concrete catch basin shall be set to the correct grade such that setting of the frame/grate will reflect design finished grade. Concrete bricks and mortar grade adjustment shall be used to adjust the frame/grate to finish elevations.

END OF SECTION

SECTION 02555
PUBLIC WATER DISTRIBUTION SYSTEMS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, tools, equipment and incidentals necessary for the installation of all water distribution piping and fittings including connections to existing watermains and water service connections, as specified herein.

PART 2 - PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) PRESSURE PIPE

A. Pipe

- 1. Unless otherwise specified, all PVC pressure pipe shall conform in all respects to the latest revision of AWWA C900-07 Specifications, "Polyvinyl Chloride (PVC) Pressure Pipe, 6 Inch Through 12 Inch, for Water," with plain end and elastomeric-gasket integral wall-thickened bell end. The outside diameter dimensions of the PVC pressure pipe shall conform with the outside diameter dimensions of ductile iron pipe.
- 2. All PVC pressure pipe shall be pressure Class 235 psi with a minimum DR 18 wall thickness, "Blue Brute" as manufactured by J-M Eagle, IPEX or Approved Equal.

B. Fittings

- 1. All tees, elbows, bends, closure pieces, adapters, reducers, etc., shall be mechanical joint ductile iron having a minimum pressure rating of 350 psi, and shall conform to AWWA C153/ANSI A21.53 Specifications.
- 2. Fittings shall be provided with ductile iron retainer glands, EBAA Iron Sales, Inc. Series 2000 PV or Approved Equal.

C. Joints

- 1. The joint shall provide a permanent seal against exfiltration or infiltration. The gasket shall be the only element depended upon to make the joint flexible and watertight.
- 2. All joints within the stationing limits indicated to be restrained on the Design Drawings shall be harnessed for restraint with ductile iron retainer glands, EBAA Iron Sales, Inc. Series 2000 PV, Series 1600 PV, or Approved Equals.

D. Magnetic Marking Tape

1. Detectable marking tape shall conform to Item 2.06 of this section.
2. Tape shall be buried 12-24 inches below finished grade.

E. Applicable Standards

1. PVC pipe shall comply with the following standards:

<u>Standard Designation</u>	<u>Subject</u>
AWWA C900/ASTM 1784	Pipe and Products
ASTM F477	Gaskets
ASTM D3139	Joint
ANSI/NSF-61/UL 1285	Pipe and Products

2.02 DUCTILE IRON PIPE (DIP)

A. Pipe

1. All ductile iron pipe shall comply with physical and chemical properties of ASTM A536 minimum grade 60-42-10, centrifugally cast in metal molds with wall thickness and pressure rating to accommodate the pipe depths and pressure requirements, all in accordance with the latest revision of ANSI A21.50 (AWWA C150) and ANSI A21.51 (AWWA C151).
2. Ductile iron pipe shall be minimum Class 52, cast in 20 foot laying lengths, clearly marked "ductile iron" and the working pressure class rating.
3. Ductile iron pipe shall be cement lined in accordance with ANSI A21.4 (AWWA C104) except that the cement mortar lining shall be 1/8" for 6" through 12", 3/16" for 14" through 24", and 1/4" for 36" and 48". The interior and exterior of all ductile iron pipe shall be coated at the factory with bituminous paint.
4. Ductile iron pipe shall be as manufactured by U.S. Pipe and Foundry Company, American Cast Iron Pipe Co., Clow Corp., or Approved Equal.

B. Joints

1. Ductile iron pressure pipe and fittings for buried application is available with many gasketed joint types, including bell and spigot, mechanical joint, and various proprietary glandless locking/self-restrained configurations. All are available and acceptable for the noted use and application. The DEVELOPER/CONTRACTOR shall submit the proposed pipe joint(s) to the Town Engineer for review and approval.

2. For those instances where the approved pipe joint is bell and spigot and/or mechanical joint, joint restraint within the stationing limits on the approved plans, or as ordered by the ENGINEER, shall be EBAA Iron Series 1700 and 1100 respectively, or Approved Equal.

C. Fittings

1. All fittings shall be ductile iron, gasketed, restrained, cement lined, and having a pressure rating of 350 psi through 24-inch diameter, and 250 psi for diameters greater than 24 inch. The fittings shall be restrained in similar fashion and materials as the pipe joint types. Fittings shall conform to AWWA C153/ANSI A21.53 Specifications.
2. Fittings shall be marked "ductile iron" and the working pressure class rating.

D. Mechanical Joint Pipe and Fittings

1. Ductile iron mechanical joint pipe, joint accessories and fittings shall conform in all respects to the applicable ANSI, AWWA and ASTM Specifications required for mechanical joint type joint pipe and fittings.
2. Pipe and fitting gaskets shall be plain rubber as required for the particular installation.
3. Bolts shall be high strength corrosion resistant low alloy steel with tee head and hexagon nut. Bolts and nuts shall be fluorocarbon coated.
4. Plain ends of mechanical joint fittings shall be beveled.

E. Polyethylene Encasement

1. All buried ductile iron pipe and fittings shall be wrapped for corrosion protection with polyethylene encasement, in accordance with AWWA C105 latest edition, as manufactured by Christy's or Approved Equal. Minimum thickness shall be 8 MILS. Material shall be black color.

F. Applicable Standards

1. Ductile iron pipe and fitting shall comply with the following standards:

Standard Designation	Subject
ANSI/AWWA C104/A21.4	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
ANSI/AWWA C105/A21.5	Polyethylene Encasement for Ductile-Iron Pipe Systems
Standard Designation	Subject
ANSI/AWWA C110/A21.10	Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water

ANSI/AWWA C111/A21.11	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
ANSI/AWWA C150/A21.50	Thickness Design of Ductile-Iron Pipe
ANSI/AWWA C151/A21.51	Ductile-Iron Pipe, Centrifugally Cast for Water
ANSI/AWWA C153/A21.53	Ductile-Iron Compact Fittings, for Water Service
ANSI/AWWA C600	Installation of Ductile-Iron Watermains and their Appurtenances
ASTM A674	Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids
ANSI/NSF 61	Drinking Water System Components-Health Effects
ASTM G62	Standard Test Methods for Holiday Detection in Pipeline Coatings

2.03 SERVICE MATERIALS

- A. All materials, including but not limited to corporation stops, curb stops, couplings, connectors, saddles, pipe, fittings, etc., made of brass or similar alloys and contacting potable water shall comply with the “reduction of lead in drinking water act” of January 2014 limiting lead content to less than or equal to a weighted average of 0.25%.
- B. Buried Tubing
 - 1. Copper tubing to be installed in buried locations, for conveyance of water, shall be Type K soft temper tubing with compression joints and fittings conforming to ASTM B88 (latest edition).
 - 2. Polyethylene (PE) tubing, SDR-9, 200 PSI rated, conforming to AWWA C901/ASTM D3035 for use in potable water systems. **Use of PE tubing will not be allowed within Town right-of-way (corporation stop or connection to the curb stop located at the highway boundary).**
- C. Service Materials
 - 1. Corporation stops shall be ball type as manufactured by Mueller Company (Style 300) or Approved Equal as follows:
 - ¾” through 2” Mueller H-15000 /H-15076
 - 2. Curb stops shall be ball type as manufactured by Mueller Company (Style 300) or Approved Equal as follows:
 - ¾” through 2” Mueller H-1504-2

3. Service saddles shall be manufactured by Smith-Blair, Inc. or Approved Equal for use on A-C, cast iron, ductile iron, and AWWA C900 PVC, as follows:

½" – 2" – Smith-Blair #372 (stainless steel service saddle with double bolt)

4. Curb boxes shall be manufactured by Bibby Ste-Croix or Approved Equal as follows:

¾", 1" service boxes – Code #V009

1½", 2", 2 ½" service/roadway – Code #V009

Accessories – 48" stainless steel extension rod

2.04 JOINT RESTRAINT

- A. Pipe joints, fittings, valves, and other unnamed connections shall incorporate approved restraining materials and practice as set forth herein, and in accordance with the approved calculated minimum length(s) of restrained pipe to resist imposed forces working to push joint(s) apart.

B. Pipe Restraint

1. All watermains shall require anchorage, at each fitting causing a change in direction of 7½° or greater, plugs, bulkheads, line valves, hydrant, and isolation valves. All connections to existing mains will require restrained joints with mechanical harness devices. All 24" diameter pipe or larger shall be anchored together with either a bolted type or harness type of restrained joint.
2. Joint deflection shall not exceed one-half of that recommended by the manufacturer for the type of pipe or joint used. Fittings shall be added as required if proper alignment of the pipelines cannot be made by deflecting joints.

C. Mechanical Joint Wedge Action Retainer Gland

1. Restraint shall be accomplished by use of a retainer gland that incorporates mechanical joint restraint into the follower gland with individually actuated wedges that increase their resistance to pull-out as pressure or external forces increase.
2. The joint restraint ring and its wedging components shall be made of grade 65-45-12 ductile iron conforming to ASTM A536. The wedges shall be ductile iron heat treated to a minimum hardness of 370 BHN. T-bolts shall be fluorocarbon coated as specified herein.
3. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell conforming to AWWA C111 and AWWA C153.
4. Torque limiting twist off nuts shall be used to insure the proper actuation of the

wedges. When the nut is sheared off, a standard hex head shall remain.

5. Mechanical Joint Wedge Action Retainer Gland
 - a. EBAA Iron Series 1100 for ductile iron pipe and fittings.
 - b. EBAA Iron Series 2000 PV for AWWA C900 and C905 PVC Pipe.
 - c. Star Pipe Products Series 3000 for Ductile Iron Pipe and Fittings.
 - d. Star Pipe Products Series 4000 for AWWA C900 and C905 PVC Pipe.
 - e. Approved Equal.

D. Bell and Spigot Joint Restraint

1. When specified or allowed by the ENGINEER, restraining bell and spigot type gasketed pipe joints shall be accomplished by use of a joint restraint system that consists of restraining rods and split ductile iron clamping rings, installed on the spigot and behind the bell. The clamping ring shall incorporate a series of machined serrations on the inside surface to provide 360 degree contact and support of the pipe barrel. Lateral thrust restraint is provided when the side clamping bolts are tightened allowing the serrations to lock onto the pipe barrel.
2. Threaded restraining rods and bolts, and clamping bolts and nuts shall be fluorocarbon coated or type 304 stainless steel. All stainless steel connectors shall be coated with an approved anti-galling material such as "Never Seez".
3. The joint restraint rings shall be made of high strength, grade 65-45-12 ductile iron conforming to ASTM A536.
4. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell conforming to AWWA C111 and AWWA C153.
5. Restraining push-on joints as specified herein shall not be allowed for hydrant branches.
6. Restraining push-on joints shall be used on pipe sizes 6-inch to 12-inch only when allowed or specified. Restraining push-on joints in this manner shall not be allowed on pipe larger than 12 inches.
7. Bell and Spigot Restraint Materials:
 - a. Uni-Flange Series 1450,
 - b. EBAA Series 1700,
 - c. Or Approved Equal.

2.05 PIPE APPURTENANCES

A. Couplings

1. Sleeve Type, Flexible Couplings:
 - a. Material: Steel, with epoxy coated sleeve.

- b. Gasket: Manufacturer's standard best quality for the service intended.
- c. Bolts and Nuts: Buried or submerged couplings shall be provided with Type 304 stainless steel or fluorocarbon coated bolts and nuts.
- d. Manufacturer:
 - 1) Dresser Industries, Style 138, for sizes up to 12-inches, Dresser Industries, Style 38, for sizes over 12-inches,
 - 2) Smith-Blair, Type 411, (or type 441 where specified),
 - 3) Or Approved Equal.

2. Hymax Coupling:

- a. Material: Center sleeve shall be fabricated of high strength carbon steel tubing. Compression end rings to be either one bolt or two fabricated of carbon steel.
- b. Gasket: Two layered gaskets of which the inner ring is removable to expand the range of the coupling. Material shall be EPDM according to NSF61.
- c. Bolts and Nuts: Buried or submerged couplings shall be provided with type 304 stainless steel. Bolts to be coated with an anti-seize coating to prevent galling.
- d. Coating: Interior and exterior shall be provided with NFS-61 approved fusion bonded epoxy coating.
- e. Harnessing couplings to restrain pressure piping as specified herein.

B. Flanged Coupling Adapter

- 1. The body shall be ductile iron conforming to ASTM A536. The bolt circle, bolt size, and spacing shall conform to AWWA C115 flange drilling.
- 2. The follower gland shall be ASTM A536 ductile iron.
- 3. Gaskets and "O" rings shall be grade 30 standard.
- 4. Nuts and bolts shall be fluorocarbon coated or Type 304 stainless steel, high strength, low alloy.
- 5. Provide fusion bonded epoxy coating on the gasket ring and shop prime enamel on the body.
- 6. Flange coupling adapter shall not be provided with anchor studs, which are not allowed.
- 7. Flange coupling adapter shall be suitable for use on ductile or cast iron pipe to the outside diameter specified.
- 8. Flange coupling adapters shall be restrained as shown, specified, or required.

9. Manufacturer:
 - a. Smith-Blair, Style 912;
 - b. Dresser, Style 128;
 - c. Ford FFCA;
 - d. Hymax 2100;
 - e. Or Approved Equal.

C. Restrained Flanged Adapter

1. Restraint shall be accomplished by use of a gland that incorporates wedges that increase their resistance to pull out as pressure or external forces increase.
2. The restrained flange adapter shall be comprised of two rings made of ductile iron conforming to ASTM A536.
3. The restraining ring shall be suitable for flanges conforming to AWWA C115 flange drilling.
4. Nuts and bolts shall be fluorocarbon coated or Type 304 stainless steel, high strength, low alloy.
5. Torque limiting twist off nuts shall be used to insure the proper actuation of the wedges. When the nut is sheared off, a standard hex head shall remain.
6. Provide fusion bonded epoxy coating on the gasket ring and shop primer on the body.
7. Restrained flange adapter shall be suitable for use on ductile iron pipe.
8. Manufacturer:
 - a. EBAA Iron, Series 2100 Megaflange
 - b. Star Pipe Products Series 3200
 - c. Approved Equal.

D. Repair Clamps

1. Repair clamps shall be full circle, 18-8 type 304 stainless steel single band provided in minimum length of 12-inches unless otherwise specified. Bands are to be single section for sizes to 12 inches and double sections for sizes over 12 inches.
2. Nuts and bolts shall be Type 304 stainless steel or fluorocarbon coated.
3. Manufacturer:
 - a. Smith-Blair, Series 262, or Approved Equal.

E. Joint Clamps

1. Joint clamps shall be furnished to permanently stop or prevent leaks through the jointing materials of bell and spigot joints.
2. Clamp shall be fully adjustable to provide a close fit on the bell and spigot and shall be designed to be installed on pipes without interruption of water service.
3. Manufacturers standard rubber gasket shall shut the leak off when compressed by the spigot ring drawn up, in turn, by bolts connected to a bell ring.
4. Manufacturer:
 - a. Smith-Blair, Style #274,
 - b. Dresser, Style 160,
 - c. Or Approved Equal.

2.06 DETECTABLE MAGNETIC PIPE MARKER TAPE

- A. Magnetic pipe marking tape as manufactured by C.H. Hanson Products, Paul Potter Warning Tape, or approved equal shall be installed above all new watermain.
1. Tape shall be 6 inches wide consisting of two (2) exterior plies of polyethylene with an aluminum alloy foil core.
 2. Tape shall be blue color and labeled: "WATER" in black letters.
 3. Minimum overall thickness 5.0 mils.

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS FOR WATERMAINS

- A. Fittings, valves, and other unnamed appurtenances shall be properly supported in accordance with the minimum practice set forth in the standard and details for the avoidance of placing undue stress on the main.
- B. AWWA C900 watermain shall be installed in accordance with the minimum standards and practice set forth in AWWA C605 (latest version).
- C. Ductile iron watermain shall be installed in accordance with the minimum standards and practice set forth in AWWA C600 (latest version).
- D. All watermain, as a minimum, shall be bedded and backfilled in accordance with the Standard Details.
- E. Service connection to PVC pipe shall be made on service saddles that fit the pipe providing full support around the circumference of the pipe and having a bearing area of sufficient area so that the pipe will not be distorted when the saddle is tightened. The saddle shall be placed at a 45° angle to the horizontal and a tapping drill of the shell type

cutter which works through the corporation shall be employed.

F. Concrete Thrust Blocking

1. Generally, concrete thrust blocking is not required given the proper design application, and installation of mechanical joint restraint. However, when required the concrete thrust block shall be placed against undisturbed soil and the face of the block must be perpendicular to the direction of and centered on the line of action of the thrust. All thrust blocking shall be formed and poured. Use of dry mix is prohibited.
2. The size(s) of thrust blocking shall be determined by calculation and provided to the ENGINEER for review and record.
3. Generally, thrust blocking shall be limited to main diameters of 12 inches, and less.

G. Caps and Plugs

1. Approved watertight end caps or plugs, shall be furnished by the DEVELOPER/CONTRACTOR for the purpose of capping the ends of pipe when pipe laying is not actually in progress. Materials such as burlap, canvas or plywood will not be acceptable for this purpose. Water standing in the trench when work is resumed shall be pumped out prior to the removal of the cap or plug.

3.02 POLYETHYLENE ENCASEMENT

- A. All outside, buried, ductile iron pipe and fittings shall be wrapped for corrosion protection with polyethylene encasement in accordance with AWWA C105, latest edition.

3.03 COPPER AND POLYETHYLENE TUBING

- A. Service tubing shall be installed and connected to corporation and curb stops and/or existing service lines, using approved compression fittings.

3.04 CONSTRUCTION IN VICINITY OF TREES

- A. The DEVELOPER/CONTRACTOR shall exercise due care not to injure trees, other than those he is permitted to cut within or adjacent to the line of the trenches. No trees may be cut without written permission of the municipal authority having jurisdiction, or property owner. The DEVELOPER/CONTRACTOR shall protect trees with boards, burlap, padding or other protective material as may be required to avoid injury. If trees are accidentally injured, repair shall be promptly made by proper trimming and painting of scars.
- B. The DEVELOPER/CONTRACTOR shall replace trees that are damaged beyond repair, or are removed, with new trees of similar size, species and quality.

3.05 DETECTABLE MAGNETIC PIPE MARKER TAPE

- A. Magnetic pipe marker tape shall be placed above all new watermains as shown on the Standard Details.
- B. Magnetic pipe marker tape shall be tied to watermain valve boxes.
- C. Splices, where needed, shall be made in accordance with manufacturer's recommendations.
- D. At completion of the project the DEVELOPER/CONTRACTOR shall test the entire length of the pipe using pipe locating equipment. Tests shall be made only in the present of the ENGINEER. Any section of tape not continuous or that is undetectable shall be removed and replaced at the DEVELOPER/CONTRACTOR's expense.

PART 4 - HYDROSTATIC TESTING

4.01 PRESSURE AND LEAKAGE TESTS

- A. After the newly installed lines and appurtenances have been placed and joints completed, a concurrent pressure and leakage test shall be conducted on valved or isolated sections in accordance with AWWA C-600.
- B. The test pressure shall be 175 psi and allowable leakage as defined in this section, 4.06 tables.
- C. DEVELOPER/CONTRACTOR shall prepare a testing plan and submit to the ENGINEER prior to the start of the Work.
- D. All testing shall be conducted in the presence of the ENGINEER.
- E. All watermains shall be flushed in accordance with Item 5.01.A of this section, to the satisfaction of the ENGINEER, prior to the start of testing.
- F. Where connections to existing mains are required, only one (1) such connection will be allowed.
- G. Pressure testing shall be conducted from valve to valve, or valve to bulkhead, or bulkhead to bulkhead.
- H. In addition to the main line pressure and leakage tests outlined herein, all line valves (butterfly or gate valves) shall have a field leakage test performed with the pressure differential (175 psi pressure on one side; 0 psi on the other) applied in both directions.

4.02 DURATION

- A. The duration of the pressure and leakage test shall be a minimum of two (2) hours.

4.03 PROCEDURE

- A. The pipe shall be slowly filled with water and the specified test pressure, measured at the point of lowest elevation, shall be applied by means of a pump connected to the pipe in a satisfactory manner.
- B. When filling of the new line is achieved by accepting water from an existing watermain, a double check valve assembly or a backflow preventer at the source of the supply shall be installed to protect against the backflow of water from the new line into the existing line. Water for these purposes shall be metered.
- C. Testing shall be done as soon as the line is installed as determined by the ENGINEER and at least 7 days have elapsed since the last concrete thrust block was poured on that particular line. Three (3) days will be permitted if a high early strength, Type III Portland cement is used for the blocking concrete.
- D. The DEVELOPER/CONTRACTOR should make himself fully aware of and be knowledgeable of the AWWA requirements and accepted procedures for testing and disinfection of potable water systems, including the certified (Town approved) lab testing.

4.04 EXPELLING AIR BEFORE TESTING

- A. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made, if necessary, at various locations and elevations in the test section including the points of highest elevation in the test section. After satisfactory test results these taps shall be tightly plugged. However, if the taps are of the correct size and in a suitable location, they may be utilized for reconnection of house services. If a tap is provided at the end of a line segment for flushing purposes, it shall be a minimum size of 2" diameter or large enough to achieve a discharge velocity of 2.5 ft/sec. per AWWA C-601 Table 1.

4.05 ALLOWABLE LEAKAGE: (175 PSI)

- A. Suitable means (acceptable to the ENGINEER) shall be provided by the DEVELOPER/CONTRACTOR for determining the quantity of water loss by leakage under the specified test pressure. No pipe installation will be acceptable until, or unless, this leakage is less than that specified in Section 02555, 4.06, at the test pressure specified in Section 02555, 4.01B.
- B. Should any test of pipe laid disclose leakage greater than that specified in paragraph 4.06, the CONTRACTOR shall, at his own expense, locate and repair the defective joints or pipe until the leakage is within the specified allowable.

4.06 LEAKAGE DEFINED

- A. Leakage is defined as the quantity of water to be supplied into the newly laid pipe necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

POLYVINYL CHLORIDE PIPE
ALLOWABLE LEAKAGE PER 1000-FT. OF PIPELINE
(GALLONS PER HOUR)

Avg. Test Pressure (psi)	NOMINAL PIPE DIAMETER (INCHES)								
	2	3	4	6	8	10	12	14	16
	Allowable Leakage for 1,000 Linear Feet of Main or 50 Pipe Joints (gph)								
200	0.19	0.29	0.38	0.57	0.76	0.96	1.15	1.34	1.53
175	0.18	0.27	0.36	0.54	0.72	0.89	1.07	1.25	1.43
150	0.17	0.25	0.33	0.50	0.66	0.83	0.99	1.16	1.32
125	0.15	0.23	0.30	0.45	0.60	0.76	0.91	1.06	1.21
100	0.14	0.20	0.27	0.41	0.54	0.68	0.81	0.95	1.08

$L=(ND(P)^{1/2})/7,400$, where L=Leakage in gph, N=no. of pipe joints (50), nominal pipe dia. in inches, P=test pressure in psi

DUCTILE IRON PIPE
ALLOWABLE LEAKAGE PER 1000-FT. OF PIPELINE*
(GALLONS PER HOUR)

Avg. Test Pressure (psi)	NOMINAL PIPE DIAMETER (INCHES)								
	2	3	4	6	8	10	12	14	16
200	0.21	0.32	0.41	0.64	0.85	1.06	1.28	1.48	1.70
175	0.20	0.30	0.40	0.59	0.80	.099	1.19	1.39	1.59
150	0.19	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47
125	0.17	0.25	0.34	0.50	0.67	0.84	1.01	1.18	1.34
100	0.15	0.23	0.30	0.45	0.60	0.75	0.90	1.05	1.20

$L=(SD(P)^{1/2})/133,200$, where L=Leakage in gph, S=length in feet, D=nominal pipe dia. in inches, P=avg. test pressure in psi

* For mechanical or push-on joint pipe with 18 ft. nominal lengths. To obtain the recommended allowable leakage for pipe with 20 ft. nominal lengths, multiply the leakage calculated from the above table by 0.9.

If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

4.07 WATER FOR TESTING

- A. Water for performing all tests shall be furnished and disposed of by the DEVELOPER/CONTRACTOR. If the water for filling and testing is obtained from an existing line, a meter shall be installed to measure the quantity of water used for these purposes. No water shall be obtained from an existing water line unless the DEVELOPER/CONTRACTOR first obtains the consent of the Town, having jurisdiction over the existing main.

PART 5 - CHLORINATION

5.01 ADJUST AND CLEAN

A. Preliminary Flushing

1. After the pressure test and leakage test, and line valve tests, and before disinfection, each potable water system shall be flushed until the water runs clear. Each valved system of the newly installed piping system shall be flushed separately with potable water from the public supply.
2. When filling of the new line is achieved by accepting water from an existing watermain, a double check valve assembly or a backflow preventer shall be installed at the source of the supply to protect against the backflow of water from the new line into the existing line in accordance with the requirements of the water purveyor. Water for these purposes shall be metered.

B. Chlorination

1. Disinfect the piping system with chlorine applied by introduction of a hypochlorite solution. Calcium hypochlorite in commercial grades contains about 65% to 70% of free chlorine. Hypochlorite powder shall first be made into a paste and then thinned to about 1% chlorine solution. This will require about 7.5 gallons of water to each pound of dry powder. Solutions shall be prepared in wooden or plastic barrel and the solids permitted to settle out. The clear supernatant shall be applied to the main through a rubber hose by gravity, siphoning, injection, or by a suitable pump feeder.
2. The point of application of the chlorinating agent shall be at the beginning of the piping system or any valved sections thereof, through a corporation inserted in the top of the newly installed pipe. Water from the existing distribution system shall be controlled so as to flow slowly into the newly installed piping system during the application of the chlorine. The rate of chlorine mixture flow shall be in such proportion to the water entering the newly installed pipe that the chlorine dose applied to the new pipe at the opposite end shall produce at least 50 ppm of chlorine residual at the time of application and 25 ppm residual after standing 24 hours. Valves shall be manipulated so that the strong chlorine solution in the pipe being treated will not flow back into the line supplying the water.
3. The chlorinated water shall be retained in the main for at least 24 hours, during which time all valves and hydrants in the section treated shall be operated in order to disinfect the appurtenances. At the end of this 24-hour period, the treated water shall contain no less than 25 ppm chlorine throughout the length of the main.

C. Final Flushing

1. After the applicable retention period, the heavily chlorinated water shall be flushed from the main until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system, or less than 1 ppm.

Chlorine residual determination shall be made to ascertain that the heavily chlorinated water has been removed from the pipeline. The water flushed from the main shall be discharged into a sewer, upon approval from Town of Lewiston, or tank truck. In no instance will the heavily chlorinated water be emptied onto roadways, ditches, culverts, streams or wetlands.

2. Dechlorinating agent to be added prior to discharge.

PART 6 - BACTERIOLOGICAL TEST

6.01 PROCEDURE

- A. After completion of final flushing, bacteriological water samples shall be collected from an acceptable outlet(s) of the treated piping system. If laboratory testing of the sample shows results that are not satisfactory, the chlorine treatment shall be repeated until all samples show safe results. Bacteriological analyses will be performed at a certified testing laboratory samples must be taken by personnel of the certified testing laboratory for chain of custody certification.
- B. A minimum of two (2) bacteriological samples shall be collected at each sample location in accordance with AWWA Standard C-651, latest edition. The first sample shall be collected after final flushing, with the second sample collected 24 hours later. A standard heterotrophic plate count must be conducted in conjunction with each total coliform analysis. These analyses must be forwarded to the ENGINEER and Niagara County Department of Health for approval prior to placing the new waterline into service.
- C. All samples collected for laboratory testing shall be witnessed by the ENGINEER. The DEVELOPER/CONTRACTOR must give the ENGINEERS 24 hours' notice prior to sampling.
- D. As a minimum, bacteriological water samples shall be taken as follows:
 1. One for pipe sections less than 100 feet long.
 2. Within 20 feet of each of the end stations for pipe lengths less than 1,000 feet long and one near the mid-point.
 3. Within 20 feet of each of the end stations and two near the one-third points for pipe lengths less than 2,000 feet long.

PART 7 - SEPARATION OF WATERMAINS AND SEWERS

7.01 GENERAL REQUIREMENTS

- A. Conditions encountered in the field may make it necessary for the ENGINEER to order such changes, procedures, action and construction as may be necessary to attain compliance with Recommended Standards for Water Works for separation of water and sewer mains. To this end, alignment and depth of the proposed pipes may be revised;

sections of existing watermains may be ordered relocated; or sections of sewers and watermains may be ordered constructed of mechanical-joint ductile iron pipe and pressure tested to assure watertightness.

7.02 PARALLEL INSTALLATION

- A. Watermains shall be laid at least 10 feet horizontally from any existing or proposed sewer. The distance shall be measured edge to edge. In cases where it is not possible or practical to maintain a 10 foot separation, the Niagara County Department of Health may relax the standard on a case-by-case basis, as supported by appropriate data and information. Such variance may allow installation of the watermain closer to a sewer, provided that the watermain is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the watermain is at least 18" above the top of the sewer. The Town however reserves the right of final approval of any variance or deviation from the accepted standard(s). Department of Health approval must accompany any request for variance or deviation.

7.03 CROSSINGS

- A. Watermains crossing sewers shall be laid to provide a minimum vertical distance of 18" between the outside of the watermain and the outside of the sewer. This shall be the case where the watermain is either above or below the sewer. At crossings, one full length of water pipe shall be located so both joints will be equidistant from the sewer. Structural support of the water and sewer pipes is required. Refer to the Standard Town Details for pipe cradle.

END OF SECTION

SECTION 02594
SANITARY SEWER FORCE MAINS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, tools, equipment and incidentals necessary for the installation of force main sewer piping, fittings and appurtenances as specified herein.

PART 2 - PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) PLASTIC PIPE

A. Pipe

1. Unless otherwise specified, all PVC pipe for force mains shall conform to the ASTM Standard Specification D-2241 for polyvinyl chloride plastic pipe.
2. All PVC pipe shall be minimum thickness Class DR-21 unless otherwise specified and shall be manufactured in 20 foot laying lengths.
3. All PVC pipe shall be marked with the class.
4. The materials used in the manufacturing of the PVC pipe shall meet the ASTM Specification C-1784.

B. Fittings

1. Unless otherwise specified, all fittings shall conform to the ASTM Standard Specification D-2241 for PVC fittings.
2. All PVC fittings shall be manufactured in classes suitable for the class and size of pipe with which they are intended to be used.
3. The pipe male and female couplings shall be factory molded into the pipe.

C. Joints

1. All PVC pipe and fittings, unless otherwise specified, shall be furnished with couplings that are factory molded into the pipe and fittings. The couplings, male to female, shall be fitted with a rubber gasket, conforming to the following requirements:
 - a. All joints and gaskets shall conform to applicable requirements of ASTM D-2241 and D-1869, and shall be designed for the same pressure rating as the pipe or fitting of which it is a part.
 - b. Gaskets shall be rubber ASTM D-1869 and F-477.

D. Detectable Tracer Tape

1. Detectable tape shall be installed in PVC pipe trenches and manufactured for direct burial service.
2. Tape shall be bright colored (black on green), "Sanitary Force Main" continuous printed, having a minimum overall thickness of 5.0 mils and a width of 6 inches.
3. Detectable tape shall be Reef Industries Terra Tape "Sentry Line", Hanson, or Approved Equal.
4. Tape shall be installed 12-24" below finished grade.

PART 3 - EXECUTION

3.01 PVC PIPE

- A. Prior to assembly, clean the bell and spigot ends of the coupling to remove all dirt.
- B. Set the rubber gasket in the bell groove in accordance with the manufacturer's instructions.
- C. Lubricate the pipe spigot end with a light film of the lubricant.
- D. Immediately after the lubricant is applied, insert the spigot end until it is flush with the reference mark.
- E. All pipe shall be bedded and backfilled in accordance with the Standard Details.

PART 4 - TESTING

4.01 PRESSURE

- A. After the sewerage force main has been laid and the joints completed, this newly laid pipe shall, unless otherwise specified, be subjected to a minimum hydrostatic pressure of 200% of the normal operation pressure.
- B. All testing shall be conducted in the presence of the ENGINEER.

4.02 DURATION

- A. The duration of the pressure and leakage test shall be a minimum of 2 hours.

4.03 PROCEDURE

- A. The pipe shall be slowly filled with water and the specified test pressure, measured at the point of lowest elevation, shall be applied by means of a pump connected to the pipe in a satisfactory manner. The pump, pipe connections, all necessary apparatus, taps into the pipe, gauges, measuring devices, shall be furnished by the DEVELOPER/CONTRACTOR.
- B. When filling of the new line is achieved by accepting water from an existing watermain, a double check valve assembly or a backflow preventer at the source of the supply shall be installed to protect against the backflow of water from the new line into the existing line. Water for these purposes shall be metered.

4.04 EXPELLING AIR BEFORE TESTING

- A. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made, if necessary, at various locations and elevations in the test section including the points of highest elevation in the test section. After satisfactory test results these taps shall be tightly plugged. However, if the taps are of the correct size and in a suitable location, they may be utilized as a cleanout location.

4.05 LEAKAGE

- A. Suitable means (acceptable to the ENGINEER) shall be provided by the CONTRACTOR for determining the quantity of water loss by leakage under the specified test pressure. No pipe installation will be acceptable until, or unless, this leakage is less than that specified in Section 02594, 4.06, at the test pressure specified in Section 02594, 4.01A.
- B. Should any test of pipe laid disclose leakage greater than that specified in paragraph 4.06, the CONTRACTOR shall, at his own expense, locate and repair the defective joints or pipe until the leakage is within the specified allowable.

4.06 LEAKAGE DEFINED

- A. Leakage is defined as the quantity of water to be supplied into the newly laid pipe necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

POLYVINYL CHLORIDE PIPE
ALLOWABLE LEAKAGE PER 1000-FT. OF PIPELINE
(GALLONS PER HOUR)

Avg. Test Pressure (psi)	NOMINAL PIPE DIAMETER (INCHES)								
	2	3	4	6	8	10	12	14	16
	Allowable Leakage for 1,000 Linear Feet of Main or 50 Pipe Joints (gph)								
200	0.19	0.29	0.38	0.57	0.76	0.96	1.15	1.34	1.53
175	0.18	0.27	0.36	0.54	0.72	0.89	1.07	1.25	1.43
150	0.17	0.25	0.33	0.50	0.66	0.83	0.99	1.16	1.32
125	0.15	0.23	0.30	0.45	0.60	0.76	0.91	1.06	1.21
100	0.14	0.20	0.27	0.41	0.54	0.68	0.81	0.95	1.08
85	0.12	0.19	0.25	0.37	0.50	0.62	0.75	0.87	1.00
70	0.11	0.17	0.23	0.34	0.45	0.57	0.68	0.79	0.90
55	0.10	0.15	0.20	0.30	0.40	0.50	0.60	0.70	0.80
40	0.09	0.13	0.17	0.26	0.34	0.43	0.51	0.60	0.68
25	0.07	0.10	0.14	0.20	0.27	0.34	0.41	0.47	0.54

$L=(ND(P)^{1/2})/7,400$, where L=Leakage in gph, N=no. of pipe joints (50), D=nominal pipe dia. in inches, P=test pressure in psi

END OF SECTION

SECTION 02595
SANITARY SEWERS

PART I - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, tools, equipment and incidentals necessary for the installation of sanitary sewer piping and fittings as specified herein.

PART II - PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) PIPE (15" AND UNDER)

A. Pipe

1. Polyvinyl chloride (PVC) pipe shall be manufactured in accordance with the requirements of the latest ASTM Specification D-1784 (PVC Compound) and the latest ASTM Specification D-3033 "Type PSP Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings", or ASTM Specification D-3034 "Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings" and shall be SDR 35 or thicker wall. Pipe in compliance with these standards shall be clearly marked with pipe size (nominal), cell classification, SDR number, PVC Sewer Pipe and ASTM Designation.

B. Joints

1. The joint shall provide a permanent seal against exfiltration or infiltration. The joining technique shall be with elastomeric gasket.
2. Elastomeric Gasket Joints - The critical sealing dimensions of the bell, spigot and gasket shall be in accordance with the manufacturer's standard dimensions and tolerances. The elastomeric compound shall comply in all respects with the physical requirements specified in ASTM F477-76. The gasket shall provide an adequate compressive force against the sealing surfaces of the bell and spigot so as to effect a positive seal under all combinations of the joint tolerances. The gasket shall be the only element depended upon to make the joint flexible and water tight. The gasket material shall be oil and gasoline resistant.

C. Fittings

1. All PVC fittings, including but not limited to, wyes, tees, and elbows shall be manufactured to the minimum standards as set forth in ASTM D3034 SDR 35, ASTM F679, and ASTM F1336.

PART III - EXECUTION

3.01 INSTALLING PIPE

A. Pipe

1. All sanitary sewer pipe shall be bedded and backfilled as detailed in the Standard Details.
2. All pipe shall be cleaned before placing, bulkheaded when pipe laying is stopped, and otherwise constructed to secure first class work, free from defects and debris.
3. Pipe to be used shall be subjected to factory testing at the Town's option. Testing shall be in job lots for a maximum of 6% of pipe quantity or a minimum of 5% of pipe quantity or 2 pieces of each size in each class. Factory tests shall be hydrostatic or air tests up to 24" and hydrostatic tests for over 24", including all other material tests as specified by ASTM.

B. Wye Branches

1. The wye branches shall be bedded and supported as detailed on the Standard Details.

C. Riser Pipe

1. All riser pipes shall be constructed according to the Standard Details or as ordered by the ENGINEER in the field.

D. House Laterals

1. House laterals shall be 4 inch or 6 inch diameter, at minimum cover of 4 feet. Configuration and installation shall be as shown on the Standard Details.

E. Records

1. The location of wye branches, tee branches and riser pipes along with laterals shall be measured from the last downstream manhole and in addition, shall be located on a sketch by the use of at least two ties to existing structures preferably the corners of the house. Such records shall identify the house and laterals by house number; the records shall be kept by the DEVELOPER/CONTRACTOR with three copies delivered to the Town and ENGINEER within one day after installation. Each record of a wye branch, tee branch, riser pipe or house lateral shall be on a separate sheet. This information shall be transferred to the as-built tracings by the DEVELOPER/CONTRACTOR.

3.02 AIR TESTS, INSPECTION AND INFILTRATION OR EXFILTRATION REQUIREMENTS

A. Requirements

1. After backfilling and prior to the final acceptance, the DEVELOPER/CONTRACTOR will be required to perform the following tests:

Live:

- a. Visual Inspection
- b. Deflection Test
- c. Television Inspection

Sewers not in use:

- a. Air Test and/or Infiltration or Exfiltration Testing
 - b. Inspection (Lamping and Internal)
 - c. Deflection Test
 - d. Television Inspection, if required based on results of above
2. No more than 1,000 linear feet of installed sewer shall be allowed to remain untested.
 3. In view of the fact that laterals and riser pipes often contribute considerable infiltration, such laterals and risers are to be installed and capped, tied and blocked as the work progresses, and prior to the air testing of the lines.

B. Deflection Test (15" Dia. and Smaller)

1. Deflection test all flexible sewer pipe with a "go/no-go" mandrel. The mandrel shall have a diameter equal to 95% of the inside diameter of the pipe.
2. No pipe deflection shall exceed 5%.

C. Air Tests (Required for All Diameters up to and including 24")

1. Pipe lines in sizes up to 24" in diameter can be air tested from manhole to manhole for distances not to exceed 500 feet.
2. Some of the major equipment required for air tests is as follows:
 - a. Stop watch graduated in tenths of a second.
 - b. Compressor of 50 or 100 psi capacity.
 - c. Bulkheads for pipe.
 - d. Approximately 100 feet of 3/8" dia. air hose.
 - e. Pressure gauge - 0 to 5 psi graduated in 1/16th of a pound increments.
 - f. Pressure gauge - 0 to 35 psi.
 - g. Three 3/8" diameter check valves.
3. The following method shall be used for the testing:
 - a. Clean and wet thoroughly the inside of the pipe before test is performed.
 - b. Insert test plugs in ends of pipe to be tested.

- c. Slowly fill the pipe with air to a pressure of 4 psig. Maintain pressure between 4 and 3.5 psig for at least two (2) minutes for temperature stabilization.
 - d. Check all plugs for tightness.
 - e. With a pressure of approximately 4 psig in pipe, disconnect air supply.
 - f. Allow pressure to decrease to 3.5 psig.
 - g. Determine elapsed time for pressure drop from 3.5 psig to 2.5 psig
4. The line is considered acceptable if the time for the pressure to decrease from 3.5 psig to 2.5 psig is not less the amount determined by the following table, except that RCP shall be half this duration:

MINIMUM ACCEPTANCE TIMES

<u>Pipe Diameter (in.)</u>	<u>Minimum Time (min:sec)</u>	<u>Length for Minimum Time (ft.)</u>	<u>Time for Longer Length (sec.)</u>
4	3:46	597	0.380 L
6	5:40	398	0.854 L
8	7:34	298	1.520 L
10	9:29	239	2.374 L
12	11:20	194	3.418 L
15	14:10	159	5.342 L
18	17:00	133	7.692 L
21	19:50	114	10.470 L
24	22:40	99	13.674 L
27	25:30	88	17.306 L
30	28:20	80	21.366 L
33	21:10	72	25.852 L
36	34:00	66	30.768 L

Where L is the excess test length beyond the length for minimum time.

- 5. In In wet trenches where pumping to lower the water table is impractical, approved perforated pipe (with approved cap) shall be placed at each manhole to extend from a point 6" below the lowest invert to the top of the ground. Ground water elevations will be measured at each manhole so that adjustments to the air test pressure can be made.
- 6. In lieu of the air test for up to 24" pipe, the pipe may be tested hydrostatically, as specified under this Section.

C. Visual Inspection

- 1. All sewers under 36" in diameter shall be lamped manhole to manhole prior to final acceptance. If a line cannot be lamped from manhole to manhole or the desired results obtained, the CONTRACTOR will be required to televise that section at to determine if the line is acceptable.

2. All pipes 36" in diameter and larger shall be entered by the Town and visually inspected foot by foot and joint by joint both before and after installation. Some items of inspection are as follows:
 - a. Pipe free from obstructions and debris
 - b. Pipe free from cracks
 - c. Pipe joints properly sealed
 - d. Pipe invert is smooth and free of sags or high points
 - e. Hookups, diversions and connections properly made
 - f. Concrete pipe walls free from structural defects
 - g. Pipes and joints free from visible signs of leakage
 - h. Specified coatings properly installed.
3. Pipe sections and joints not meeting all of the above requirements shall be replaced or repaired as directed by the Town.

D. Infiltration Tests (Applicable Only if Ground Water is Above Pipe)

1. Infiltration tests for all sewers to be constructed under this project shall not exceed 100 gallons per inch diameter per mile of sewer, per 24 hours. Each individual run of sewer (from one manhole to the next manhole) shall comply with the allowable rate of infiltration.
2. The infiltration test is intended to measure the water tightness of a sewer, as related to the infiltration of ground water, and, therefore, is only applicable if the water table level is above the top of the pipe.
 - a. Approved perforated pipe (with an approved cap) shall be placed at each manhole to extend from a point 6" below the lowest invert to the top of the ground. Ground water elevations will be measured at each manhole so that the ground water level can be correlated with the infiltration measurements.
 - b. Before conducting the tests, the water table should be allowed to stabilize at its normal level such that water completely surrounds the pipe during the test period. The test is usually conducted between adjacent manholes with the upstream end of the sewer bulkheaded in a suitable manner to isolate the test section. All service laterals, stubs and fittings should be properly plugged or capped at the connections to the test pipe section to prevent the entrance of ground water at these locations.
 - c. A V-notch weir or other suitable measuring device should be installed in the inlet pipe to the downstream manhole. Infiltrating water is then allowed to build up and level off behind the weir until steady-uniform flow is obtained. When steady flow occurs over the weir, leakage is determined by direct reading consecutively for five (5) days from graduations on the weir and converting the flow quantity to gallons per unit length of pipe per unit of time.

- d. An important factor in applying the test criteria is to properly correlate the variable water head over the length of sewer being tested to the high ground water level. The downstream end of the test section will always be subjected to a greater external water pressure than the upstream end. To compensate for this variable external pressure, the test pressure should be that pressure corresponding to the average head of water over the test section. A minimum of .2 feet of water over the pipe is required at the upper manhole before the infiltration test will be allowed.
3. When a sewer run between two consecutive manholes or chambers is found to contribute infiltration at a rate above the allowable, inspection by television or other cameras shall be made by the DEVELOPER/CONTRACTOR. Each individual run of sewer (from one manhole to the next manhole) shall comply with the allowable rate of infiltration of 100 gallons per inch diameter per mile of sewer per 24 hours.

E. Exfiltration Tests

1. The exfiltration test for all diameter sewers shall be as described below. Although actual infiltration will normally be less than that indicated by the water exfiltration test, the test does provide a positive means of subjecting the completed sewer system to an actual pressure test. Since sanitary sewers are not designed or expected to operate as a pressure system, care must be exercised in conducting the test and correlating the results with the allowable exfiltration limits.
 - a. The test is usually conducted between adjacent manholes. Prior to the test, all service laterals, stubs and fittings within the test section should be plugged or capped and adequately braced or blocked to withstand the water pressure resulting from the test.
 - b. If manholes are to be included in the test, the inlet pipe to each manhole should be bulkheaded and the test section filled with water through the upstream manhole. To allow air to escape from the sewer, the flow should be at a steady rate until the water level in the upstream manhole provides an average pressure of 5 psi (11.6' head) at the center point of the test section. If necessary, provisions should be made to bleed off entrapped air during the filling of the test section.
 - c. Once the test section is filled, the water should be allowed to stand for an adequate period of time to allow the water absorption into the pipe and manhole. After water absorption has stabilized, the water level in the upstream manhole is brought up to the proper test level and this level established by measuring down from the manhole cover or other convenient datum point. After a set period of time, the water elevation should be measured from the same reference point and the loss of water during the test period calculated, or the water can be restored to the level existing at the beginning of the test, and the amount added used to determine the leakage.

- d. To exclude both manholes from the test, it is necessary to bulkhead the outlet pipe of the upstream manhole. Provision must be made in the bulkhead for filling the pipe and expelling trapped air.
- e. The water level at the upstream manhole shall be computed and varies above the top of the pipe. Since the sewer is installed on a grade, the test section downstream will be subjected to a greater pressure. Therefore, the test pressure head at the upstream manhole should be adjusted such that the maximum pressure on the pipe being tested is no greater than 10 psi.

F. Television Inspection

- 1. Provide the ENGINEER with three (3) copies of the report of the televising inspection of each section of completed sewer inspected. The report shall show the exact location and extent of all cracks, loose joints, holes, vertical and horizontal misalignment, faulty service connections, caved-in pipe, points of infiltration, obstructions, debris and all else detrimental to the proper functioning an service of the completed sewer. Photographs of the actual television inspection shall be included in the report showing all the above conditions found, at all wyes, tees, and laterals, and as directed by the ENGINEER. The ENGINEER will review the report and will instruct the DEVELOPER/CONTRACTOR, to repair any conditions, which, in the opinion of the ENGINEER, are detrimental to the proper function and service of the sewer. The ENGINEER will select the portions of the sewer to be inspected in this manner.

3.03 SEPARATION OF WATERMAINS AND SEWERS

A. Horizontal Separation

- 1. Whenever possible, sewers should be laid at least 10 feet, horizontally, from any existing or proposed watermain. Should local conditions prevent a lateral separation of 10 feet, a sewer may be laid closer than 10 feet to a watermain if,
 - a. It is laid in a separate trench, or
 - b. If it laid in the same trench with the watermains located at one side on a bench of undisturbed earth, and if
 - c. In either case the elevation of the top (crown) of the sewer is at least 18" below the bottom (invert) of the watermain.

B. Vertical Separation

- 1. Whenever sewer must cross under watermains, the sewer shall be laid at such an elevation that the top of the sewer is at least 18" below the bottom of the watermain. When the elevation of the sewer cannot be varied to meet the above requirements, the watermain shall be relocated to provide this separation or reconstructed with mechanical- joint pipe for a distance of 10 feet on each side of the sewer. One full length of watermain should be centered over the sewer so that both joints will be as far from the sewer as possible.

END OF SECTION

SECTION 02596
SANITARY SEWER MANHOLES

PART I - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals necessary for the installation of all sanitary sewer manholes as specified herein.

PART II - PRODUCTS

2.01 POURED-IN-PLACE BASES

- A. The concrete base shall be 4000 psi concrete and the fill forming the invert channel shall be 4000 psi concrete as specified in Section 03300 – Cast-in-Place Concrete. Both shall be poured in the field.

2.02 PRECAST BASES

- A. The precast bases shall be monolithic reinforced concrete, and shall comply with the requirements specified in Section 02596, 2.03, for manhole barrels, including gasket joints and approved joint compound.
- B. The bottom or floor of the monolithic precast base shall have a minimum thickness of 8", and shall project no less than 6" beyond the outside walls of the monolithic precast base to form a flange or annular footing intended to resist uplift.
- C. The lowest edges of holes or cutouts for line and branch sewers shall be no less than 6" above the inside surface of the floor or footing of the monolithic precast base. The highest edges of holes or cutouts for line and branch sewers shall be no less than 6" from joint surfaces as detailed on the Plans. After installation of the line and branch sewers, manhole channels or inverts shall be formed by using 4000 psi fill concrete as specified in Section 03300 – Cast-in-Place Concrete.
- D. At the points where line and branch sewers are connected to the monolithic precast bases or manhole barrels, the annular spaces between the pipes and holes shall be sealed with assemblies consisting of rubber gaskets or links mechanically compressed to form watertight barriers. Such sealing assemblies shall be: RES-SEAL consisting of rubber gasket, cast iron compression flange; "Press-Wedge II" gasket manufactured by Press Seal Gasket Corp., 3414 Wells Street, Ft. Wayne, Indiana, and Cor-Ten bolt assembly manufactured by the Scales Manufacturing Corporation of Newburgh, New York, LINK-SEAL consisting of solid synthetic rubber links connected to each other with heavy, elongated washers, bolts and nuts, as manufactured by the Thunderline Corporation of Wayne, Michigan, or equal. After installation, metal parts of the above assemblies that are accessible from inside the manholes shall be coated with compound as specified for manhole barrel joints.
- E. The edges of holes or cutouts in riser or barrel sections for line and branch sewers shall be no less than 6" from joint surfaces.

2.03 MANHOLE BARREL AND CONE

- A. All precast manhole cones and barrels shall be constructed in accordance with the latest ASTM Specification C-478 "Precast Reinforced Concrete Manhole Sections," with the following exceptions: the manhole barrel walls shall be 5" thick for a 4' diameter manhole, 6" thick for a 5' diameter manhole, and 7" thick for a 6' diameter manhole.
- B. All outside wall surfaces of manhole barrels and cones shall be factory coated with two coats of "Koppers Super Service Black," Metalife HBP, or other equal coating. The manhole coatings shall be applied to obtain a minimum total dry thickness of 22 mils. Inside coating of manhole barrels is not required.
- C. The CONTRACTOR shall submit to the ENGINEER for approval, details of manhole barrels and cones that he proposes to use. Precast cones shall be a maximum height of 4' as shown on the Standard Details. No lifting holes will be allowed.

2.04 JOINTS

- A. The manhole barrel and cone joints shall be concrete with a confined "O" ring, neoprene gasket in accordance with the latest ASTM Specification C-443. The manhole supplier will be required to test the manhole joint hydrostatically in the factory in the job lots as described in 2.03, all in accordance with the latest ASTM Specification C-443 at a test pressure of 13 psi. The hydrostatic joint test may be performed at the same time as the hydrostatic test that is described previously in Section 02596-2.03(D). The factory joint test shall be conducted without the joint compound specified below.
- B. In addition to the neoprene gasket, each joint shall be buttered prior to assembly with an approved joint compound such as "DeWitt's No. 10," Duralseal 3101, Pioneer 301, or equal compound. The excess shall be removed from the inside and some excess shall be troweled on the outside. The inside joints shall be troweled full of "Preco-Patch," or equal.

2.05 ADJUSTING RINGS

- A. There shall be a maximum of two rings for a maximum of 12" of concrete adjusting rings to allow for future grade adjustment. The adjusting ring joints shall be made with an approved cement mortar. The outside of the adjusting rings from casting to cone shall be coated with an approved "Preco-Patch," Rock Mount, "Waterplug," or equal.

2.06 MANHOLE STEPS

- A. Manhole steps shall be steel reinforced co-polymer polypropylene, and shall be placed in the forms while the manhole barrel and cone sections are being cast, driven in or securely grouted in place after casting.
- B. Materials and manufacturer shall meet the standards and requirements as set forth in ASTM C-478, AASHTO M-199, ASTM D-4101, and ASTM A-615.
- C. Manhole steps shall be as manufactured by Lane International, American Step Company, MA Industries, or Approved Equal.

2.07 MANHOLE FRAMES AND COVER

- A. Manhole frames and covers shall be heavy duty cast iron construction. The lid shall be lettered and drilled with four 3/4" diameter vent holes as shown on the Plans. Manhole rims shall be set above the adjacent ground level as required. Manufacturer's drawings of all castings that the DEVELOPER/CONTRACTOR proposes to use shall be submitted to the Town Engineer and approved prior to the castings being ordered for the work.

2.08 INSIDE DROP CONNECTION

- A. Inside drop connection/assembly shall consist of an approved fiberglass reinforced plastic drop bowl, SDR-35/SCH40 PVC drop pipe and fitting, and Type 304 stainless steel drop pipe anchor bands/hardware.
- B. Inside drop connection/assembly shall be as manufactured by Reliner/Duran, Inc.

PART III - EXECUTION

3.01 TESTING AND INSPECTION

A. Factory Testing

- 1. The precast bases and manhole barrel sections will be required to be hydrostatically factory tested in job lots per the following schedule, in accordance with the latest ASTM Specification C-497. The hydrostatic factory test pressure shall be 13 psi.

Factory hydrostatic tests shall be performed on linear footage of manhole barrel job lots as follows:

- First test for jobs requiring from 8' to 100' of manholes.
- Second test shall be performed on 101' to 300' lots.
- Third test shall be performed on 301' to 600' lots.
- Fourth test shall be performed on 601' to 1,000' lots.
- Fifth test shall be performed on lots over 1,001'.

B. Hydrostatic Pressure Testing

- 1. Prior to hydrostatic testing, manholes shall be visually inspected for leaks. Leaks or cracks shall be repaired prior to hydrostatic testing. Pipes entering the manhole shall be sealed at a point outside the manhole walls so as to include testing of the pipe/manhole joints. The manhole shall be filled with water to a level 2 inches below the top of the frame. Safety lines shall be secured to all plugs. After a period of at least one hour and when the water level has stabilized, the manhole shall be refilled (compensates for absorption and evaporation losses) and the water level shall be checked. The water level shall again be checked after a period of 4 hours. If the water level is reduced by more than 1/4-inch, the leakage shall be considered excessive, and the manhole shall be repaired and retested. The exterior of the manhole shall be inspected during this period for visible evidence of leakage. Moisture, sweating, or beads of water on the exterior of the manhole shall not be considered leakage, but any water

running across the surface will be considered leakage and the manhole shall be repaired.

3.02 INSTALLATION

- A. Excavation and backfilling shall be done in accordance with the requirements of Section 02200. Temporary sheeting shall be done in accordance with the requirements of Section 02400.
- B. The concrete for poured-in-place bases shall reach a 4000 psi minimum compressive strength at 28 days. A minimum of two (2) test cylinders shall be taken for the base pour. One cylinder shall be tested at 7 days and the other at 28 days. Two copies of the test reports shall be submitted to the ENGINEER within 5 days of testing, which will be done in accordance with the latest ASME Standards.
- C. For manhole foundation preparation, refer to notes on Standard Detail.
- D. For drop manholes, at all depths, monolithic precast bases shall be set on 12" thick 4000 psi concrete slab poured against undisturbed trench bottom.
- E. Backfill around pipes at manholes shall be carefully tamped.

END OF SECTION

SECTION 02598
REHABILITATION OF EXISTING BRICK MANHOLES

PART I - GENERAL

1.01 SECTION INCLUDES

- A. Rehabilitation of existing brick sanitary sewer manholes.
 - 1. Eliminate infiltration and exfiltration.
 - 2. Stop corrosive degradation by H₂S.
 - 3. Restore structural integrity.
 - 4. Restore access facilities (manhole steps).

1.02 REFERENCES

- A. AASHTO T-277, Rapid Determination of the Chloride Permeability of Concrete.
- B. ASTM C 109, Compressive Strength Hydraulic Cement Mortars (Using 2-Inch Cube Specimens).
- C. ASTM C 144, Standard Specification for Aggregate for Masonry Mortar.
- D. ASTM C 150, Standard Specification for Portland Cement.
- E. ASTM C 267, Chemical Resistance of Mortar and Grouts.
- F. ASTM C 321, Bond Strength of Chemical-Resistant Mortars.
- G. ASTM C 348, Flexural Strength Hydraulic Cement Mortars.
- H. ASTM C 666, Resistance of Concrete to Rapid Freezing and Thawing.

1.03 QUALITY ASSURANCE

- A. Manufacturer Certification of Applicators
 - 1. Submit manufacturer's certification of applicators' successful completion of training in use of the:
 - a. Application equipment.
 - b. Rehabilitation products.
 - c. Rehabilitation procedures.
- B. Test Reports
 - 1. Provide independent testing laboratory analysis of rehabilitation materials showing:
 - a. Compressive strength as determined by ASTM C 109.
 - b. Flexural strength as determined by ASTM C 348.
 - c. Bond strength as determined by ASTM C 321.
 - d. Permeability rating as determined by AASHTO T-277.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Keep materials dry and sealed until ready to be mixed at site.

PART II - PRODUCTS

2.01 APPLICATION EQUIPMENT

- A. Specifically designed for continuous mixing and spraying of rehabilitation material and for cleaning manhole structures prior to application process.

2.02 WATER PLUGGING COMPOUND

- A. Quick-setting (60 seconds or less) cement based mortar used to stop active infiltration of ground water.
- B. Excellent bonding characteristics conforming with ASTM C 150 and ASTM C 144 testing procedures.
- C. Quadex Hydra-Plug Fast Setting Cementitious Waterstop or approved equal.

2.03 PATCHING COMPOUND

- A. Self-bonding.
- B. High strength cement mortar:
 - 1. Compressive strength: 6000 psi at 28 days.
 - 2. Flexural strength: 875 psi at 28 days.
 - 3. Maximum volume change: 0.02 percent.
- C. Use to reform and resurface manhole benches and inverts and to fill large voids.
- D. Rapid setting to minimize interruption of flows.
- E. Quadex Hyperform fast-setting high earth strength patching material or approved equal.

2.04 REHABILITATION MORTAR

- A. Restores structural integrity to interiors and exteriors of concrete and masonry manholes.
- B. Provides a permanent bond to seal concrete and masonry manholes from infiltration and exfiltration in a high sulfide environment.
- C. Factory blended, one component repair material.
- D. High strength calcium aluminate mortar, polypropylene fiber reinforced, shrinkage compensated mortar enhanced with NSG aggregate (nepheline synte granite).
- E. Specifically designed for placement by low pressure spraying (shotcreting) to vertical and overhead surfaces of concrete and masonry structures.

- F. Designed for monolithic one pass application with a minimum thickness of 1/2 inch to 3 inches.
- G. High early and ultimate compressive, flexural, and bond strengths.
- H. Resistant to sulfide attack (H₂S).
- I. Extremely low permeability (350 Coulombs).
- J. Quadex Alumina Liner or approved equal.

2.05 MANHOLE STEPS

- A. Manhole steps shall be deep embedment steel reinforced copolymer polypropylene Model PS2-BG and PS1-B as manufactured by MA Industries, Inc. or Approved Equal.
- B. Applicable standards include ASTM C-478, ASTM D-4101, ASHTO M-199, and ASTM A-615.

2.06 MASONRY CONSTRUCTION

- A. Sewer Rated Brick: clay or shale, ASTM C32, Grade SW, Solid Units
- B. Mortar: Type M, conforming to ASTM C270 and ASTM C91

PART III - APPLICATION

3.01 ACCEPTABLE APPLICATORS

- A. Employ only manufacturer certified applicators for the work specified in this Section.

3.02 INSPECTION AND PREPARATION

- A. Practice all local, state, and federal (OSHA) standards regulating work in confined spaces.
- B. Remove manhole cover.
- C. Plug services or bypass pump lines where conditions require.
- D. With flows stopped, begin surface preparation.

3.03 SURFACE PREPARATION

- A. Provide a clean, damp surface to allow for good mechanical bond of rehabilitation materials.
- B. Begin cleaning from top of frame by removing unsound concrete, loose mortar, bricks, deteriorated steps, foreign material, and other debris by high pressure water blasting (3500 psi).

- C. Dispose of debris and sanitary waste materials in accordance with requirements of regulatory authorities.
- D. Remove existing manhole rungs to a minimum of 1" below the wall surface.

3.04 ACTIVE LEAKS

- A. Prepare plugging material in accordance with manufacturer's instructions on package label.
- B. Plug active leaks in manhole prior to application of rehabilitation material.

3.05 INVERTS AND BENCHES

- A. Prepare rapid-setting high-strength mortar in accordance with manufacturer's instructions on package label.
- B. Reform and/or repair inverts and benches as required.

3.06 LARGE VOIDS

- A. Prepare rapid-setting high-strength mortar in accordance with manufacturer's instructions on package label.
- B. Fill large voids created by missing bricks, removal of manhole rungs, etc.

3.07 RESTORATION OF WALL AND CONE

- A. Prepare rehabilitation material in accordance with manufacturer's instructions.
 - 1. Maintain proper water/cement ratio to achieve ultimate strengths and densities of cured matrix.
- B. Spray apply in accordance with manufacturer's application procedures and Operation and Maintenance Manual using specified application equipment.
 - 1. Begin spraying at bottom of wall.
 - 2. With one continuous application, spray to coat manhole wall and cone.
- C. Achieve monolithic one-pass application thickness of .5" (min.) on vertical and overhead surfaces.

3.08 FINISHING

- A. Immediately following spray application, use rounded pool trowel to finish surface.
- B. Use upward strokes to compress and light circular motions to gain a final smooth surface.
- C. Do not over trowel.

3.09 CURING

- A. Replace manhole cover and allow to cure.

3.10 REPLACE MANHOLE STEPS

- A. Replace the existing manhole steps with steel reinforced copolymer polypropylene steps as manufactured by M.A. Industries or Approved Equal.
- B. Steps shall be secured in place using an approved non-shrink epoxy grout in accordance with the rung manufacturer's requirements and guidelines.

END OF SECTION

SECTION 02600
PAVING AND SURFACING

PART I – GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, tools, equipment, and incidentals necessary for the installation of hot-mix, hot-laid bituminous pavements as specified herein.
- B. The materials and methods specified herein are intended for placement of the new bituminous paving. Where existing bituminous paving is removed or replaced during construction, modifications to these specifications to match existing conditions shall be made as directed by the ENGINEER.

PART II - PRODUCTS

2.01 MATERIALS

- A. Pavement Subbase Course Material
 - 1. The subbase course material shall be select granular backfill material as specified in Section 02200 of these specifications.
 - 2. Refer to Section 03300.
- B. Tack Coat
 - 1. The tack coat shall meet the requirements of Section 703 of the NYSDOT Standard Specification, Item 702-3401, Asphalt Emulsion (HFMS-2h).
- C. Bituminous Base Course
 - 1. Base course shall be placed in accordance with Section 403-Hot Mixed Asphalt Concrete Pavement. Materials shall be NYSDOT Item 403.118902, Type 1 Base Course.
- D. Bituminous Binder Course
 - 1. Binder course shall be placed in accordance with Section 403-Hot Mixed Asphalt Concrete Pavement. Materials shall be NYSDOT Item 403.138902, Type 3 Binder Course.
- E. Bituminous Top Course
 - 1. Top course shall be placed in accordance with Section 403-Hot Mixed Asphalt Concrete Pavement. Materials shall be NYSDOT Item 403.198202, Type 7F2 Top Course.
- F. Geotextile Fabric
 - 1. Geotextile fabric shall have a grab tensile strength (ASTM D4632) of 315 lbs, trapezoidal tear strength (ASTM D4533) of 113 lbs, apparent opening size of 40

US Sieve, woven polypropylene material, as manufactured by TenCate Mirifi 600X, or equal.

PART III - EXECUTION

3.01 INSTALLATION

A. Subgrade Preparation

1. Preparation of the subgrade including compaction shall be as specified in Section 02200 of these specifications.
2. After road section has been excavated to grade and prior to the installation of geotextile fabric and bituminous pavement courses, the subgrade shall be proof rolled in accordance with Item 203-3.14 of the NYSDOT Standard Specifications. Proof rolling shall consist of two complete passes over the subgrade area.

B. Construction of Pavements

1. The pavements shall be constructed to the lines, grades and typical sections as shown on the Drawings.
2. Construction of Town Road Sections
 - a. Town roads shall be constructed to the typical sections shown on the details and as follows:
 1. Pavement subbase of select granular backfill material as outlined in Section 02200.
 2. Base course pavement: 4-inch minimum compacted thickness.
 3. Binder course pavement: 2-inch minimum compacted thickness.
 4. Top course pavement: 1-1/2 inch minimum compacted thickness.

C. Sawcutting of Pavements

1. All exposed edges of existing pavements shall be sawcut to straight and even lines prior to placing any pavement. Sawcuts shall be performed using a machine capable of making straight, even and fine cuts completely through the pavement in a single pass.
2. Where existing pavement has been undermined, the DEVELOPER/CONTRACTOR shall cut back the pavement to a location where a solid subbase is available.

D. Installation of Bituminous Courses

1. Installation of bituminous pavements shall conform to Section 401 – Hot Mix Asphalt and all applicable sections of NYSDOT Specifications.

2. Prior to placement of permanent pavement, all service boxes, manhole frames and covers, valve boxes, drainage frames and grates, and similar structures within the area shall be adjusted to established grade and cross section.
3. Pavement materials shall be constructed in the maximum lifts as follows:
 - a. Base course pavement: Maximum lifts of 4-inches per course.
 - b. Binder course pavement: Maximum lifts of 2-inches per course.
 - c. Top course pavement: Maximum lifts of 2-inches per course.
4. The bituminous course mixtures shall be hauled to the site of paving and placed as soon as possible after mixing.
5. Placement of the bituminous courses shall be completed over the full width of the section under construction on each day's run.
6. The bituminous material shall be installed on the prepared surface with an approved finishing machine which has an edging attachment. Variations from the profile shall not exceed ¼-inch in 12 feet after rolling. The mixture shall be spread at a thickness required to produce the required final compacted thickness, when compacted with a suitable roller, until 92 percent of the theoretical maximum density is obtained.

E. Installation of Tack Coat Material

1. The ENGINEER may require a tack coat be installed on pavement surfaces when the existing pavement surface has cooled or has been subject to delays in installation or excessive traffic. If a tack coat is required, the material shall be as specified in this Section.

F. Construction Joints

1. Construction joints shall be made in such a manner as to ensure a neat junction, thorough compaction, and bond throughout.
2. A traverse joint extending over the full width of the strip being laid shall be constructed as the end of each day's work and at any other times when the operations are suspended for a period of time which will permit the mixture to cool.
3. Install a tack coat at the interface of new and existing pavement materials prior to the start of new paving operations.

G. Testing Requirements

1. Testing of materials and of compaction requirements shall be the responsibility of a testing laboratory provided by the DEVELOPER/CONTRACTOR.
2. Responsibilities and Duties of DEVELOPER/CONTRACTOR: The use of testing service shall in no way relieve the DEVELOPER/CONTRACTOR of his responsibility to furnish materials and construction in full compliance with the

specifications. To facilitate the testing service, the DEVELOPER/
CONTRACTOR shall:

- a. Secure and deliver to the testing laboratory representative samples of the materials which are required to be tested.
- b. Advise the testing laboratory and ENGINEER sufficiently in advance of operations to allow for completion of quality tests.

H. Submittals

1. Design Mix: The design mix for the hot mix bituminous materials shall be submitted to the ENGINEER. The design mix shall include the percentage of asphalt cement and unit weight of dry aggregate. The design mix, upon acceptance by the ENGINEER, shall be the basis for the field mix to be used in the pavement construction.

END OF SECTION

SECTION 02620
CURBING

PART I – GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, tools, equipment, and incidentals necessary for the installation of concrete curbing as specified herein.
- B. The materials and methods specified herein are intended for placement of new concrete curbing. Where existing curbing is removed or replaced during construction, modifications to these specifications to match existing conditions shall be made as directed by the ENGINEER.

PART II - PRODUCTS

2.01 MATERIALS

- A. Concrete
 - 1. Materials used in the preparation of the concrete shall conform to NYSDOT Standards as presented in Section 501. Concrete used for conventionally formed curbs shall be Class "A" concrete. Concrete used for machine formed curbs shall be Class "J" concrete. Note: Crushed slag and gravel will not be accepted for use as coarse aggregate.
 - 2. Refer to Section 03300.
- B. Underdrain Filter Stone
 - 1. Underdrain filter stone under the curbing shall be NYSDOT Item No. 605.0901.
- C. Underdrain Pipe
 - 1. The curbing underdrain pipe shall be 6-inch diameter perforated PVC or HDPE pipe, Contech A-2000, Hancor Mega Green, or Approved Equal. Coil type piping is not acceptable.
- D. Expansion Joints
 - 1. Refer to Section 03300 for pre-molded bitumastic type joints, to be utilized for both concrete and granite curb replacement.
- E. Curing Compound
 - 1. Curing compound shall consist of a clear ready-mixed, wax-free vehicle containing a fugitive dye that will fade uniformly in accordance with NYSDOT Standards Section 711-05 B.
 - 2. Curing compound shall be Sonneborne Kure-N-Seal acrylate based polymer compound, or Approved Equal.

PART III - EXECUTION

3.01 INSTALLATION

A. Preparation

1. Concrete curbing shall be constructed on a compacted granular subbase as shown on the Standard Details.

B. Underdrain Filter Stone

1. The stone material shall be placed so that all areas of both the new and existing curbing will be adequately supported. The top elevation of the placed stone shall be controlled so that the proper curb cross-section can be maintained. The stone shall be wrapped in an approved geotextile drainage fabric and covered with a layer of tar paper or equal material to the full width of the new curbing so that concrete cannot bind the geotextile.

C. Underdrain Pipe

1. The underdrain pipe shall be laid to grade and properly bedded in the porous stone material. The pipe shall be connected to the curb receivers, storm manhole, or other drainage pipe or structure as required.

D. Expansion Joints

1. At 20 foot intervals, at the end of a day's run and/or adjacent to catch basins or receivers, a 3/4" expansion joint of pre-molded bitumastic material shall be installed.

E. Machine Formed Curb

1. Machine formed concrete curb shall be installed in accordance with the standards set forth in Section 609-2.02B of the NYSDOT Standards for Construction and Materials.

F. Conventionally Formed Curb

1. Conventionally formed concrete curb shall be installed in accordance with the standards set forth in Section 609-2.02A of the NYSDOT Standards for Construction Materials.

G. Curing Compound

1. All surfaces shall be prepared and maintained to the minimum requirements of the manufacturer and as ordered by the ENGINEER.
2. Curing compound shall be applied and maintained in accordance with the minimum requirements of the manufacturer and as ordered by the ENGINEER.

END OF SECTION

SECTION 02800
LANDSCAPING

PART I - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, material, tools, equipment, any incidentals required to place topsoil and seeding or sod as specified herein.

1.02 QUALITY ASSURANCE

- A. 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 performance of the work of this Section.

1.03 SUBMITTALS

- A. The location of source and data for off-site topsoil.
- B. Analysis of the seed.
- C. Material and application rate for hydroseeder, if used.

PART II - PRODUCTS

2.01 FERTILIZER

- A. Provide commercial balanced 11-8-4 fertilizer delivered to the site in bags labeled with the manufacturer's guaranteed analysis.

2.02 MULCH

- A. Provide a 100% agricultural straw blanket of consistent thickness and covered on the top with a photo-degradable polypropylene netting having a 1½" square mesh size. The specified material shall be North American Green S75, or approved equal.

2.03 TOPSOIL

- A. Topsoil shall consist of friable, natural earth of loamy character, without admixture of subsoil, uniform in quality, and free of refuse of any nature, hard clods, stiff clay sods, hard pan, pebbles larger than ¾ inch in diameter, coarse sand, noxious weeds, sticks, brush and other rubbish.
- B. The topsoil shall conform to the following requirements:
 - 1. Topsoil shall contain not less than 12% nor more than 20% clay.
 - 2. The topsoil shall contain not less than 5% nor more than 20% organic matter, as determined by loss or ignition of samples thoroughly oven dried to constant weight at a temperature of 221°F. The hydrogen ion value shall not be less than 5 or more than 7.

3. All material of oven-dried samples shall pass a one inch square sieve and the results of a sieve analysis shall conform to the following requirements:

Passing Sieve	Retained on Sieve
1 inch	0 - 3
No. 4	40 - 60
No. 100	40 - 60

4. Natural topsoils may be amended to meet the above requirements.

2.04 GRASS SEED

- A. General: Provide grass seed which is:

1. Free from noxious weed seeds, and re-cleaned;
2. Grade A recent crop seed;
3. Treated with appropriate fungicide at time of mixing; and
4. Delivered to the site in sealed containers with dealer's guaranteed analysis.

- B. Proportions by weight:

1. Kentucky Blue:	40%
2. Creeping Red Fescue:	35%
3. Red Top:	10%
4. Perennial Rye:	15%

2.05 SOD

- A. General: Provide Sod which is:

1. Free from weeds.
2. Shall consist of a mixture of permanent grasses such as Blue Grass and Creeping Red Fescue.
3. Sufficiently moist when delivered to site.

PART III - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 SPREADING TOPSOIL

- A. Topsoil shall be placed, spread and finish graded within the job limits in order to provide

a smooth surface without depressions or ridges and properly graded for drainage. Seeding shall be furnished, planted and maintained as shown, specified and ordered. Topsoil shall be placed to a depth of 4" (as measured after rolling and compaction).

- B. All topsoil, after uniform grading, shall be thoroughly rolled to provide maximum compaction.
- C. After placing the topsoil, the area shall be raked and all stones, rocks and weeds removed. A suitable commercial fertilizer shall then be evenly applied over the area, at the rate recommended by the manufacturer, and thoroughly raked in.

3.03 SOWING GRASS

- A. Preparation:
 - 1. Grade seed beds, thoroughly removing ridges and depressions, and making areas smooth, continuous, firm planes that ensure proper drainage.
 - 2. Remove soil lumps, rocks, sticks, and other deleterious material.
- B. Sowing:
 - 1. Sow with a seeder approved for that purpose by the ENGINEER.
 - 2. Sow at the rate of five lbs. per 1000 S.F.
 - 3. Promptly after seeding, wet the seed bed thoroughly and keep all areas moist throughout the germination period.
- C. Fertilizing: Apply the specified fertilizer at the rate of 20 lbs per 1000 S.F., raking lightly into the soil.
- D. Mulching: Place and secure the mulch according to the manufacturer's recommendations immediately after seeding, and in no case more than 3 days after seeding.
- E. Protect turf areas by erecting temporary fences, barriers, signs, and similar protection as necessary to prevent trampling.

3.04 SOD

- A. Preparation:
 - 1. Grade seed beds, thoroughly removing ridges and depressions, and making areas smooth, continuous, firm planes that ensure proper drainage.
 - 2. Remove soil lumps, rocks, sticks, and other deleterious material.
- B. Placing Sod:
 - 1. The sod shall be laid smoothly, edge to edge and all openings shall be plugged with sod.
 - 2. In drainageways and where continuous or solid sodding is called for in the contract documents the sod shall be laid with the longest dimension parallel to

the contours.

3. Vertical joints between sides shall be staggered.
4. Immediately after laying, sod shall be pressed firmly into contact with the sod bed by rolling.

3.05 MAINTENANCE

A. Work included:

1. Watering as necessary until a full healthy growth has been established.
2. Provide equipment and means for proper application of water.
3. Protect planted areas against damage, including erosion and trespassing, by providing and maintaining proper safeguards.

END OF SECTION

SECTION 03100
CONCRETE FORMWORK

PART I - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, tools, materials, equipment and incidentals required to complete all necessary formwork.

1.02 RELATED WORK

- A. Refer to Section 03200 - Concrete Reinforcement.
- B. Refer to Section 03300 - Cast-in-Place Concrete.
- C. Refer to Section 03310 - Concrete - General.

1.03 QUALITY ASSURANCE

- A. The installer must examine the substrate and the conditions under which concrete formwork is to be performed.
- B. Selection, design, and installation of formwork is the entire responsibility of the CONTRACTOR.

1.04 CODES AND STANDARDS

- A. Unless otherwise shown or specified, design, construct, erect maintain, and remove forms and related structures for cast-in-place concrete work in compliance with the American Concrete Institute Standard ACI 347, "Recommended Practice for Concrete Formwork".

1.05 ALLOWABLE TOLERANCES

- A. Construct formwork to provide complete concrete surfaces complying with the tolerances specified in ACI 347, Section 2.4, after removal of forms and prior to patching and finishing of cast-in-place formed surfaces.
- B. Check formwork during concrete placement to ensure forms, shores, falsework, ties and other features have not been unduly disturbed by concrete placement methods or equipment.

1.06 SUBMITTALS

- A. Manufacturer's Data - Concrete Formwork
 - 1. For information only, submit two (2) copies of manufacturer's specifications and installation instructions for proprietary materials and items as required, including form coatings, manufactured form systems, ties and accessories.

PART II - PRODUCTS

2.01 FORM MATERIALS

A. Forms for Exposed Finish Concrete

1. Construct formwork for exposed concrete surfaces with plastic-face plywood, metal, metal-frames, plastic-faced, plywood-faced or other panel type materials acceptable to the ENGINEER, to provide continuous, straight, smooth exposed surfaces. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.
2. Plywood forms complying with U.S. Product Standards PS-1, "B-B (Concrete Form) Plywood" Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing the legible trademark of an approved inspection agency.

B. Forms for Unexposed Finish Concrete

1. Form concrete surfaces that will be unexposed in the finished structure with plastic-faced plywood, metal or other acceptable material. Provide lumber that is dressed on at least two edges and one side for tight fit.

2.02 DESIGN OF FORMWORK

- A. Design, erect, support, brace and maintain formwork so that it will safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure. Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength for that purpose. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation and position.
- B. Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of structure during construction.
- C. Provide shores and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing operations using wedges or jacks or a combination thereof. Provide trussed supports when adequate foundations for shores and struts cannot be secured.
- D. Support form facing materials by structural members spaced sufficiently close to prevent deflection. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities and within allowable tolerances. Provide camber in formwork as required for anticipated deflections due to weight and pressures of fresh concrete and construction loads for long span members without intermediate supports.
- E. Provide temporary openings in wall forms, column forms and at other locations necessary to permit inspection and clean out.
- F. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

- G. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.

PART III - EXECUTION

3.01 FORM CONSTRUCTION

A. General

1. Construct forms complying with ACI 347, to the exact sizes, shapes, lines and dimensions shown, and as required to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required. Use selected materials to obtain required finishes.
2. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide forms for inclined surfaces where the slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses and the like, to prevent swelling and assure ease of removal.
3. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms in as inconspicuous a location as possible, consistent with project requirements.
4. Form intersecting planes to provide true, clean-cut corners, with edge grain of plywood not exposed as form for concrete.

3.02 FALSEWORK

- A. Erect falsework and support, brace and maintain it to safely support vertical, lateral and asymmetrical loads applied until such loads can be supported by in-place concrete structures. Construct falsework so that adjustments can be made for take-up and settlement.
- B. Provide wedges, jacks or camber strips to facilitate vertical adjustments. Carefully inspect falsework and formwork during and after concrete placement operations to determine abnormal deflection or signs of failure; make necessary adjustments to produce work of required dimensions.

3.03 FORMS FOR EXPOSED CONCRETE

- A. Drill forms to suit ties used and to prevent leakage of concrete mortar around tie holes. Do not splinter forms by driving ties through improperly prepared holes.
- B. Do not use metal cover plates for patching holes or defects in forms.

- C. Provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back joints with extra studs or girts to maintain true, square intersections.
- D. Use extra studs, walers and bracing as required to prevent bowing of forms between studs and to avoid bowed appearance in concrete. Do not use narrow strips of form material that produce bow.
- E. Assemble forms so they may be readily removed without damage to exposed concrete surfaces.
- F. Form molding shapes, recesses and projections with smooth-finish materials, and install informs with sealed joints to prevent displacement.

3.04 FORM TIES

- A. Provide factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal. In addition, for walls subjected to a hydrostatic pressure, provide neoprene waterstop form ties.
- B. Unless otherwise shown, provide ties so that portion remaining within concrete after removal of exterior parts is at least 1-1/2" from the outer concrete surface. Unless otherwise shown, provide form ties that will not leave a hole larger than 1" diameter in the concrete surface.
- C. Form ties fabricated on the project site and wire ties are not acceptable.

3.05 CORNER TREATMENT

- A. Form exposed corners of walls, beams and columns to produce square, smooth, solid, unbroken lines, except as otherwise shown. "Exposed" concrete is defined as concrete exposed to view in the finished structure, whether painted or unpainted.
- B. Form chamfers with 3/4" x 3/4" strips, unless otherwise shown, accurately formed and surfaced to produce uniformly straight lines and tight edge joints. Extend terminal edges to required limit and miter chamfer strips at changes in direction.
- C. Unexposed corners may be formed either square or chamfered.

3.06 CONTROL JOINTS

- A. Locate where shown or directed.

3.07 CLEANOUTS, CLEANING AND TIGHTENING

- A. Provide temporary openings in forms as required to facilitate cleaning and inspection. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is to be placed. Retighten forms immediately after concrete placement as required to eliminate mortar leaks.

3.08 FORM COATINGS

- A. Coat form contact surfaces with form-coating compound before reinforcement is placed. Provide commercial formulation form-coating compounds that will not bond with, stain,

nor adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds. Do not allow excess form coating material to accumulate in the forms or to come into contact with surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

- B. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.09 EDGE FORMS AND SCREED STRIPS FOR SLABS

- A. Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in the finished slab surface. Provide and secure units to support types of screeds required.

3.10 REMOVAL OF FORMS

A. General

1. Forms shall be removed and concrete temperature maintained in accordance with ACI 301 (latest) Chapter 12.
2. Forms shall not be removed until the concrete has attained the strength to support its own weight and any construction live loads. Under no circumstances shall forms be stripped before concrete is aged 48 hours (walls, columns, and beam faces) and 7 days (slab and beam soffits).

3.11 RE-USE OF FORMS

- A. Clean and repair surfaces of forms to be re-used in the work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new forms coating compound material to concrete contact surfaces as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces except as acceptable to the ENGINEER.

END OF SECTION

SECTION 03200
CONCRETE REINFORCEMENT

PART I - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, tools, materials, equipment and incidentals required to provide the required reinforcement for cast-in-place concrete, including but not limited to, conventional and epoxy-coated bars, welded wire fabric, ties, and supports.

1.02 RELATED WORK

- A. Refer to Section 03100 - Concrete Formwork
- B. Refer to Section 03300 - Cast-in-Place Concrete
- C. Refer to Section 03310 - Concrete - General

1.03 QUALITY ASSURANCE

- A. The installer must examine the substrate and the conditions under which concrete reinforcement is to be performed.

1.04 CODES AND STANDARDS

- A. Comply with requirements of the following codes and standards, except as herein modified:
 - 1. American Concrete Institute, ACI 315 - "Details and Detailing Reinforced Concrete Structures".
 - 2. American Concrete Institute, ACI 318 - "Building Code Requirements for Reinforced Concrete".
 - 3. Concrete Reinforcing Steel Institute - "Manual of Standard Practice".

1.05 SUBMITTALS

- A. Manufacturer's Data - Concrete Reinforcement
 - 1. For information only, submit two (2) copies of manufacturer's specifications and installation instructions for all proprietary materials and reinforcement accessories. Submit two (2) certified copies of mill reports covering the chemical and physical properties of each type steel used.

1.06 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Deliver reinforcement to the project site bundled, tagged and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.

- B. Protection: Use all means necessary to protect concrete reinforcement before, during and after installation and to protect the materials and installed work or all trades. Take all necessary precautions to maintain identification of fabricated bars after bundles are broken.
- C. Storage: Store concrete reinforcement materials at the site to prevent damage and accumulation of dirt or excessive rust. Epoxy-coated reinforcing bars shall be stored on protective cribbing.
- D. Epoxy-coated reinforcing bars - coating damage due to handling, shipment and placing need not be repaired where the damaged area is 0.1 square inches or smaller; damaged areas larger than 0.1 square inches shall be repaired in accordance with Section 2.01-D.5; the maximum amount of damage including repaired and unrepaired areas shall not exceed 2 percent of the surface area of each bar.

PART II - PRODUCTS

2.01 MATERIALS

- A. Reinforcing Bars: ASTM A615, and as follows.
 - 1. Provide Grade 60 for Bars No. 3 to 18, except as otherwise indicated.
- B. Steel Wire: ASTM A82
- C. Welded Wire Fabric: ASTM A185 and ASTM A82
- D. Supports for Reinforcement
 - 1. Bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcement in place, use wire bar type supports complying with PS7-66, unless otherwise indicated. Do not use wood, brick and other unacceptable materials.
 - 2. For slabs on grade, use supports with stand plates or horizontal runners where wetted base materials will not support chair legs.
 - 3. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide Class "D" stainless steel protected bar supports.
 - 4. Epoxy coated reinforcing bars where required shall be supported from formwork shall rest on coated wire bar supports, or on bar supports made of dielectric material or other acceptable materials. Wire bar supports shall be coated with dielectric material, compatible with concrete, for a minimum distance of 2 inches from the point of contact with the epoxy-coated reinforcing bars. Reinforcing bars used as support bars shall be epoxy-coated.
 - 5. Epoxy-Coated Reinforcing Bars: ASTM A775. When required, damaged epoxy coating shall be repaired with patching material conforming to ASTM A775 and done in accordance with the material manufacturer's recommendations. Reinforcing bars to be coated shall conform to Section 2.01(A).

6. Tie Wire: Wire shall be 16 gauge or heavier, black-annealed. Epoxy-coated reinforcing bars shall be tied with plastic-, epoxy-, or nylon-coated tie wire or other acceptable materials.
7. For epoxy grouting reinforcing steel use the Hilti; HIT Dowelling (C-10) Adhesive as supplied by Hilti Fastening Systems, 4115 South 100th East Avenue, Tulsa, OK 74146. Follow manufacturer's directions for installation and required surface preparation.

2.02 FABRICATION

A. General

1. Shop fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with ACI 315. In case of fabricating errors, do not re-bend or straighten reinforcement in a manner that will injure or weaken the material. Field bending is not acceptable.

B. Unacceptable Materials

1. Reinforcement with any of the following defects will not be permitted in the work:
 - a. Bar lengths, depths and bends exceeding specified fabrication tolerances.
 - b. Bars with reduced cross-section due to excessive rusting or other cause.

- C. When epoxy-coated reinforcing bars are cut in the field, the ends of the bars shall be coated with the same material used for repair of coating damage.

PART III - EXECUTION

3.01 INSTALLATION

- A. Comply with the specified codes and standards, and Concrete Reinforcing Steel Institute recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
- B. Bars shall be placed to the tolerance specified in ACI 318.
- C. Clean existing and new replacement reinforcement to remove loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
- D. Position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required. Steel reinforcing may not be heat bent.
- E. Place reinforcement to obtain minimum coverages for concrete protection. Arrange, space and securely tie bars and bars supports together with 16 gauge wire to hold reinforcement accurately in position during concrete placement operations. Set wire ties so that ends are directed away from exposed concrete surfaces.
- F. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with 16 gauge wire. Do not make end laps midway

between supporting beams, or directly over beams of continuous structures. Offset end laps in adjacent widths to prevent continuous laps. All welded wire fabric shall be supported.

- G. Provide sufficient numbers of supports and of strength to carry reinforcement. Do not place reinforcing bars more than 2" beyond the last leg of any continuous bar support. Do not use supports as bases for runaways for concrete conveying equipment and similar construction loads.

3.02 SPLICES

- A. Provide standard reinforcement splices by lapping ends, placing bars in contact, and tightly wire tying. Comply with requirements of ACI 318 for minimum lap of spliced bars. No welded splices and/or ties will be accepted.

3.03 REINFORCING MECHANICAL SPLICES

- A. Bars to be spliced by the mechanical butt splicing process may be sawed or sheared providing that ends of sheared bars are straightened after shearing. All surfaces to be coupled shall be free of paint, oil, rust, scale, or other foreign material. Mechanical butt splicing shall be done using an approved cold forged mechanical splice applied by octagonal dies that involves the cold swedging by dies of a steel sleeve over the ends of the bars to be coupled. The splice shall be done in accordance with the manufacturer's recommendations that shall be submitted to the ENGINEER for approval.

The mechanical splice shall meet the full tension requirement of 100% of the yield strength (fy). The mechanical splice shall be performed using the bar-grip system developed by Dayton Barsplice Inc. (513) 252-3450, or other approved method.

Test assemblies shall include the same bars, couplers and anchors. The same equipment shall be used to make these assemblies as are to be used on the project.

- B. Unskilled operators must be trained and indoctrinated by an authorized representative of Dayton Barsplice, Inc. Upon satisfactory completion of the training, a certificate will be issued by DBI to show the splicer's name, badge number/social security number and date certified.

Newly trained splicers should make two test splices on the same bar to be used in the structure.

The test splice should be pulled to destruction by a testing agency in accordance with the requirements of ASTM A370.

Prerequisite to certification, the test splices must meet or exceed the design/code requirements.

- C. Test splices should be made on the same size, type and grade of rebar to be used in production.

If a change of size, type or grade of rebar occurs, new test results should be obtained.

Minimum rebar deformation heights and spacing within the splice must conform to the requirements of ASTM A615 or ASTM A706 as appropriate.

If minimum deformation heights and spacing requirements cannot be satisfied, DBI may at its option offer longer couplers to enhance tensile performance on rebar below satisfaction.

- D. The frequency of test splices shall be as follows:
- | | |
|-------------------------------------|----------|
| First fifty (50) | One Test |
| Next fifty (50) | One Test |
| Thereafter, every one hundred (100) | One Test |

The test splice shall be a SISTER SPLICE (removable splice in place and in sequence adjacent to production splices by the same operator and under same conditions).

Separate test frequencies are not necessary for horizontal, vertical, and diagonal splices.

- E. If any splice used for testing fails to meet the design code strength requirements, two splices in-place shall be cut from the previous lot and tested.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART I - GENERAL

1.01 SCOPE OF WORK

- A. The work includes providing cast-in-place concrete consisting of Portland cement, fine and coarse aggregate, water, and select admixtures; combined, mixed, transported, placed, finished and cured as herein specified.

1.02 RELATED WORK

- A. Refer to Section 03100 - Concrete Form Work
- B. Refer to Section 03200 - Concrete Reinforcement
- C. Refer to Section 03310 - Concrete, General

1.03 QUALITY ASSURANCE

A. Codes and Standards

- 1. Comply with the provisions of the following codes and standards, except as otherwise shown or specified and shall be made available on the job site a copy of these codes and standards:
 - a. ACI 318 - "Building Code Requirements for Reinforced Concrete"
 - b. ACI 301 - "Specifications for Structural Concrete for Buildings"
 - c. ACI 304 - "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete"
 - d. ACI 305 - "Recommended Practice for Weather Concreting"
 - e. ACI 306 - "Recommended Practice for Cold Weather Concreting"
 - f. ASTM C-94 - "Ready-Mixed Concrete"
 - g. ACI 302.1R-80 - "Guide for Concrete Floor and Slab Construction"
 - h. ACI 223-83 - "Standard Practice for the Use of Shrinkage-Compensating Concrete"
- 2. The continuity of color and texture for exposed concrete surfaces is of prime importance. Maintain such controls and procedures, in addition to those specified, as necessary to provide continuous match of concrete work.

1.04 SUBMITTALS

- A. Coordinate the work of this section with requirements for submittals specified in Section 03310.
- B. Delivery Tickets: Furnish copies of delivery tickets for each load of concrete delivered to the site. Provide items of information as specified.

PART II - PRODUCTS

2.01 MATERIALS

A. Concrete

1. For concrete materials, see Section 03310.

B. Joint Materials

1. Waterstops

- a. Flat dumbbell type waterstops at construction joints and other joints where no movement is expected, unless otherwise shown; web thickness not less than 3/8" for widths 9" and over.
- b. At expansion joints provide 9"x 3/8" dumbbell type with 3/4" diameter minimum center bulb.
- c. Provide either rubber or PVC waterstops at contractor's option, with rubber units complying with Corps of Engineers CRD-C513 and PVC units complying with CRD-C572.
- d. Manufacturers offering products to comply with requirements include the following: Electrovert, Inc.; W.R. Meadows, Inc.; Weatherguard Prod. Corp.; Gates Rubber Co.; and Serviced Products/W.R. Grace & Co., or equal.

2. Expansion Joints

- a. Pre-formed bitumastic expansion joint filler material where required shall conform with ASTM Spec. D-545 and D-1751.
- b. A resilient, closed-cell, cross-linked ethylene vinyl acetate material may also be used.
- c. Products offered by manufacturers to comply with the requirements include the following: Evazote 50 by E-poxy Industries, Inc., similar by Tremco, W. R. Grace & Co., or equal.

C. Concrete Bonding Grout

1. Shall consist of equal parts, by volume, of Portland cement and concrete sand, mixed with sufficient water to form a slurry.
2. Epoxy-Resin Bonding Agent - Shall not be used.
3. Bonding grout shall be thoroughly mixed at the site, in a well-lit area, in an approved mechanical mixer. The fine aggregate (concrete sand) and Portland cement shall be deposited into separate one cubic foot batch boxes. The fine aggregate shall be deposited in the mixer prior to the addition of cement. The aggregate and cement shall be dry mixed for one minute and then water shall be added to produce a slurry. After the water is added, the bonding grout shall be mixed for a minimum of three minutes. The prepared mix shall consist of equal parts, by volumes, of the above noted concrete sand aggregate and Portland cement.

4. The ENGINEER may require that the mixer be thoroughly cleaned and rinsed before mixing a fresh batch of bonding grout.
5. Bonding grout that has dried, or become unworkable, as determined by the Engineer, shall not be incorporated in the work. No re-tempering will be permitted.
6. Bonding grout shall be broomed with a stiff, synthetic, bristle brush or broom. At all joints, and in areas around or below reinforcing steel, brooming shall be done with straight brooms. Care shall be exercised to ensure that all prepared surface areas receive a thorough, even coating, and that no excess bonding grout be permitted to collect in pockets. This shall be done to ensure that the bonding grout is evenly absorbed into the prepared surface.
7. The rate of bonding grout application shall be limited to that surface area which can be covered with new concrete within a maximum of 5 minutes of placement of the bonding grout or before the bonding grout begins to dry out. Time limits will depend on atmospheric conditions and will be determined by the Engineer at the site. In the event drying does occur as evidenced by a light gray color, the CONTRACTOR shall remove the bonding grout and place new bonding grout. Bonding grout removal shall be by blastcleaning, or other means approved by the ENGINEER.

2.02 CONCRETE MIXING

A. General

1. Concrete shall be transit-mixed as specified herein. Batch plants must comply with the requirements of ACI 304, with sufficient capacity to produce concrete of the qualities specified in quantities required to meet the construction schedule. All plant facilities are subject to testing laboratory inspection and acceptance of the ENGINEER.

B. Ready-mix Concrete

1. Comply with the requirements of ASTM C-94, and as herein specified, provided the quantity and rate of delivery will permit unrestricted progress of the work in accordance with the placement schedule. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C-94 may be required, as specified below. Proposed changes in mixing procedures, other than herein specified, must be accepted by the ENGINEER before implementation.

C. Modifications to ASTM C-94 are as follows:

1. Quality of Concrete

- a. Provide concrete materials, proportions and properties as herein specified, in lieu of ASTM Section 4.

2. Tolerances in Slump
 - a. Provide concrete at slumps specified in Section 03310, 2.04, C. This limit shall be considered nominal slumps and limited as dictated in Section 6, paragraph 6.1.1.
3. Certification
 - a. All deliveries shall be accompanied by a ticket or tapes printed in accordance with New York State Department of Transportation requirements verifying quantities. Delete ASTM C-94 Section 15.
4. Maintain Equipment
 - a. Equipment should be maintained in proper operating condition, with drums cleaned before charging each batch. Schedule rates or holding dry-mixed materials too long in the mixer before the addition of water and admixtures.

PART III - EXECUTION

3.01 CONCRETE PLACEMENT

A. General

1. Place concrete in compliance with the practices and recommendation of ACI-304, and as herein specified.
2. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as herein specified. Perform concrete placing at such a rate that concrete that is being integrated with fresh concrete is still plastic. Deposit concrete as nearly as practicable to its final location to avoid segregation due to re-handling or flowing. Do not subject concrete to any procedure that will cause segregation.
3. Screen concrete that is to receive other construction to the proper level to avoid excessive skimming or grouting.
4. Do not use concrete which becomes non-plastic and unworkable, or does not meet the required quality control limits, or which has been contaminated by foreign materials. Do not use re-tempered concrete. Remove rejected concrete from the project site and dispose of in an acceptable location.
5. Do not place concrete in supporting elements until the concrete previously placed in columns and walls has obtained 75% of the design strength.

B. Pre-Placement Inspection

1. Before placing concrete, inspect and complete the formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts involved in ample time to permit the installation of their work; cooperate with

other trades in setting such work, as required. Thoroughly wet wood forms immediately before placing concrete, as required where form coatings are not used.

2. Soil at bottom of foundation systems is subject to testing for soil bearing value by the testing laboratory, as directed by the ENGINEER, at the CONTRACTOR's expense. Place concrete immediately after approval of foundation excavations. Dewater all areas as required before placing concrete.

C. Concrete Conveying

1. Handle concrete from the point of delivery and transfer to the concrete conveying equipment and to the locations of final deposit as rapidly as practicable by methods that will prevent segregation and loss of concrete mix materials.
2. Provide mechanical equipment for conveying concrete to ensure a continuous flow of concrete at the delivery end. Provide runways for wheeled concrete conveying equipment from the concrete delivery point to the locations of final deposit. Keep interior surfaces of conveying equipment, including chutes, free of hardened concrete, debris, water, snow, ice and other deleterious materials. No changes in mix or slump will be permitted for pumping without approval by the ENGINEER.

D. Placing Concrete into Forms

1. Deposit concrete in forms in horizontal layers not deeper than 18" and in a manner to avoid inclined construction joints.
2. Remove temporary spreaders in forms when concrete placing has reached the elevation of such spreaders.
3. Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use vibrators designed to operate with vibratory element submerged in concrete, maintaining a speed of not less than 7000 impulses per minute when submerged in the concrete. Vibration of forms and reinforcing will not be permitted, unless otherwise accepted by the ENGINEER. Use and type of vibrators shall conform to ACI 309 "Recommended Practice for Consolidation of Concrete."

E. Do not use vibrators to transport concrete inside of forms

1. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the machine. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit the duration of the vibration to the time necessary to consolidate the concrete and complete embedment of reinforcement and other embedded items without causing segregation of the mix.

F. Placing Concrete Slabs

1. Deposit and consolidate concrete slabs in a continuous operation, within the limits of construction joints, until the placing of a panel or section is completed.

- G. Consolidate concrete during placing operations using mechanical vibrating equipment, so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
1. Consolidate concrete placed in beams and girders of supported slabs, and against bulkheads of slabs on ground, as specified for formed concrete structures. Consolidate concrete in the remainder of slabs by vibrating bridge screeds, roller pipe screeds, or other acceptable methods. Limit the time of vibrating consolidation to prevent bringing an excess of fine aggregate to the surface.
 2. Bring slab surfaces to the correct level and strike off with a highway straight edge. Use bull floats or darbies to smooth the surface, leaving it free of humps or hollows. Do not sprinkle water on the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations.
- H. Maintain reinforcing steel in the proper position continuously during concrete placement operations.

3.02 BONDING

- A. Roughen surfaces of set concrete at all joints, except where bonding is obtained by use of a concrete bonding agent, and clean surfaces of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner to expose bonded aggregate uniformly and to not leave laitance, loose particles of aggregate, or damaged concrete at the surface.

3.03 COLD WEATHER PLACING

- A. Protect all concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with the requirements of ACI 306 and ACI 301 and as herein specified.
- B. General
1. Concrete shall not be placed when the air temperature is below 45°F and falling or below 40°F without permission of the ENGINEER.
 2. In addition, when air temperature has fallen to or is expected to fall below 40°F., uniformly heat all water and aggregates before mixing as required to obtain a concrete mixture temperature of not less than 50°F. and not more than 80°F. at point of placement.
 3. Unless otherwise modified, cold weather protection shall be in accordance with the American Concrete Institute's "Recommended Practice for Cold Weather Concreting," ACI 306R-78.
 4. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials. Ascertain that forms, reinforcing steel, and adjacent concrete surfaces are entirely free of frost, snow and ice before placing concrete.
 5. Only specified non-corrosive, non-chloride accelerator shall be used. Calcium chloride, thiocyanates or admixtures containing more than 0.05% chloride ions are not permitted.

C. Protection Method

1. The concrete shall be enclosed in an adequate housing and the air surrounding the concrete kept at a temperature of not less than 50°F or more than 80°F for a period of seven days after the concrete is placed. The protection and heating shall also be provided for the floor area directly beneath the concrete placement for the full and/or partial depth repairs. Concrete shall not be placed until the protection and facilities for heating have been approved by the ENGINEER. All repaired surfaces shall be cured in accordance with the methods specified in ACI 306.

D. At the end of the heating period the temperatures shall be decreased to the approximate temperature of the outside air at a rate not to exceed 15°F per 12 hour period, after which the housing may be removed. The surface of the concrete shall be permitted to dry during the cooling period.

3.04 HOT WEATHER PLACING

A. When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305 and ACI 301 and as herein specified.

B. Cool ingredients before mixing to maintain concrete temperature at time of placement below 85°F. Mixing water may be chilled, or chopped ice may be used to control the concrete temperature provided the water equivalent of the ice is calculated to the total amount of mixing water.

C. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

D. Wet forms thoroughly before placing concrete.

E. Retarding admixtures may be used with approval provided they are by the same manufacturer as the water reducer specified herein, and will have the same effect on water reduction, air entrainment and work ability.

3.05 UNDERWATER PLACING

A. Concrete placement in water will only be permitted if conditions render it impossible or inadvisable to dewater excavations before placing concrete, and only when acceptable to the ENGINEER.

B. Revise the concrete mix design to suit underwater placement requirements by utilizing a high range water reducer; e.g. DARACEM - 100 as manufactured by W. R. Grace & Co., or Eucon 37 by the Euclid Chemical Co., and maintaining the design w/c ratio, and submit to the ENGINEER for acceptance before commencing underwater placement operations. Deposit concrete by the tremie method, or other suitable means, in continuous placement to prevent formation of layers.

3.06 JOINTS

A. Construction Joints

1. Locate and install construction joints, so as not to impair strength and appearance of the structure, as acceptable to the ENGINEER. Locate construction joints on shop drawings if required but not shown, as follows:
 - a. In walls, at not more than 40 feet in any horizontal direction; at top of footings; at top of slabs on ground; at top and bottom of door and window openings or as required to conform to architectural details as directed by the ENGINEER; and at the underside of the deepest beam or girder framing into wall.
 - b. In columns or piers, at the top of footing; at the top of slabs on ground; and at the underside of the deepest beam or girder framing into the column or pier.
 - c. In slabs on grade maximum joint spacing shall be 36 times slab thickness, unless otherwise accepted by the ENGINEER. Conform to slab placement diagrams or pattern lay out for placement.
2. Provide keyways at least 1-1/2" deep in all construction joints in walls, slabs, and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.
 - a. Place construction joints perpendicular to the main reinforcements. Continue all reinforcement across construction joints.

B. Expansion Joints

1. Expansion joints shall be as directed by the ENGINEER.
2. Expansion joints shall be provided with flexible water stops as determined necessary by the ENGINEER.
3. Reinforcement or other embedded metal items bonded to the concrete (except dowels in floors bonded on only one side of joints) shall not extend continuously through any expansion joint.

C. Waterstops

1. Provide waterstops in all construction joints or as directed by the ENGINEER. Install waterstops to form a continuous diaphragm in each joint. Make provisions to support and protect waterstops during the progress of the work. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions. Protect waterstop material from damage where it protrudes from any joint.

D. Isolation Joints in Slabs on Ground

1. Provide isolation joints in slabs on ground at all points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, grade beams and elsewhere as indicated.

3.07 FINISH OF FORMED SURFACES

A. Standard Rough Form Finish

1. Provide standard rough finish to all concrete formed surfaces that are to be concealed in the finish work or by other construction, unless otherwise shown or specified.
2. Standard rough form finish shall be the concrete surface having the texture imparted by the form facing material used, with defective areas repaired and patched as specified, and all fins and other projections exceeding 1/4" in height rubbed down with wood blocks.

B. Standard Smooth Finish

1. Provide standard smooth finish for all concrete formed surfaces that are to be exposed to view, or that are to be covered with a coating material applied directly to the concrete or a covering material bonded to the concrete such as waterproofing, dampproofing, painting, or other similar system.
2. Standard smooth finish shall be the as-cast concrete surface as obtained with the form facing material, with defective areas, including air bubbles, repaired and patched as specified, and all fins and other projections on the surface completely removed and smoothed.

C. Grout Finish

1. Provide grout finish to all interior and exterior concrete vertical surfaces which are exposed to view in the finish structure, consisting of one part Portland cement to one part of fine sand passing a No. 30 mesh by volume, mixed with only enough water to produce a consistency of thick paint.
2. Blend the Portland cement portion of standard Portland cement and white Portland cement, proportioned as determined by trial mixes, so that the final color of grout, when dry will be approximately the same color as the adjacent concrete.
3. Thoroughly wet the concrete surface and apply grout immediately to the wetted surfaces. Spread grout with clean burlap pads or sponge rubber floats to fill all pits, air bubbles, and surface holes. Remove excess grout by scraping, followed by rubbing with clean burlap to remove any visible grout film. Keep grout damp during the setting period by means of fog spray in hot, dry weather. Complete any area in the same day it is started, with the limits of any area being the natural breaks in the finished surface.

D. Related Unformed Surfaces

1. At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike off smooth and finish surface treatment of formed surfaces uniformly across the adjacent unformed surfaces, unless otherwise shown.

E. Exterior Platforms and Steps

Concrete surfaces shall be finished with a float and troweled by skilled workmen. After the surfaces have been leveled and finished and before the concrete takes its final set, the surfaces shall be evenly stroked with a broom to give a slightly rough and uniform finish. Steps, unless otherwise shown on the Plans, shall be fitted with non-slip tread nosings.

3.08 FLOOR FLATNESS/LEVELNESS TOLERANCES

F_F defines the maximum floor curvature allowed over 24 inches. Computed on the basis of successive 12" (300mm) elevation differentials, F_F is commonly referred to as the "flatness F-Number".

$$F_F = \frac{4.57}{\text{Maximum difference in elevation, in decimals of inches, between successive 12" elevation differences.}}$$

F_L defines the relative conformity of the floor surface to a horizontal plane as measured over a 10 ft. (3.05m) distance. F_L is commonly referred to as the "levelness F-number".

$$F_L = \frac{12.5}{\text{Maximum difference in elevation, in inches, between two points separated by 10 ft.}}$$

All floors shall be measured in accordance with ASTM E-1155 "Standard Test Method for Determining Floor Flatness and Levelness Using the "F Number" System (Inch-Pound Units).

All slabs shall achieve the specified overall tolerance. The minimum local tolerance (1/2 bay or as designated by the ENGINEER) shall be 2/3 of the specified tolerances.

3.09 MONOLITHIC SLAB FINISHES

A. General

1. All monolithic slab finishes shall meet the specified floor flatness and levelness tolerances unless otherwise directed by the ENGINEER.

B. Scratch Finish

1. Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, Portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as shown on the Drawings.
2. After placing slabs, plane the surface to a F_F15/F_L13 tolerance. Slope surfaces uniformly to drains where required. After leveling, roughen the surface before the final set with stiff brushes, brooms or rakes.

C. Float Finish

1. Apply float finish to monolithic slab surfaces that are to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic water proofing, membrane or elastic roofing, or sand bed terrazzo.
2. After placing concrete slabs, do not work the surface further until ready for floating. Begin floating when the surface water has disappeared or when the concrete has stiffened sufficiently to permit the operation of a power-driven float, or both. Consolidate the surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level the surface plane to a F_F20/F_L17 tolerance. Cut down high spots and fill all low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat the surface to a uniform, smooth, granular texture.

D. Trowel Finish

1. Apply trowel finish to monolithic slab surfaces that are to be exposed to view, unless otherwise shown, and slab surfaces that are to be covered with resilient flooring, paint, or other thin-film finish coating system.
2. After floating, begin the first trowel finish operation using a power-driven trowel. Begin final troweling when the surface produces a ringing sound as the trowel is moved over the surface.
3. Consolidate the concrete surface by the final hand troweling operation, free of trowel marks, uniform in texture and appearance, and F_F25/F_L20 (F_L17 for elevated slabs) tolerance. Grind smooth surface defects which would telegraph through applied floor covering system.
4. Apply a solvent-free, high solids, epoxy resin, high-build protective and waterproofing coating to the cured concrete as specified. Use SiKagard C2 or approved equal as per manufacturer's instructions.

3.10 CONCRETE CURING AND PROTECTION

A. General

1. Protect freshly placed concrete from premature drying and excessive cold or hot temperature, and maintain without drying at a relatively constant temperature for a period of time necessary for hydration of the cement and proper hardening of the concrete.
2. Start initial curing as soon as free water has disappeared from the concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 72 hours.
3. Concrete temperature shall be maintained in accordance with ACI 301 (latest) Chapter 12.

4. For curing, use only water that is free of impurities which could etch or discolor exposed, natural concrete surfaces.
5. Begin final curing procedures immediately following initial curing and before the concrete has dried. Continue final curing for at least 168 cumulative hours (not necessarily consecutive) during which the concrete has been exposed to air temperatures above 50°F. Avoid rapid drying at the end of the final curing period.

B. Curing Method

1. Except where specific methods of curing are specified, curing may be accomplished by one of the following:
 - a. Water Submersion: Keeping the surfaces of the concrete continuously wet by covering with water.
 - b. Continuous water-fog spray: Surfaces shall be kept continuously wet by the use of a continuous water-fog spray.
 - c. Moist Curing: Surfaces shall be kept continuously wet by covering with burlap, mats or sand, thoroughly saturated with water and covering kept wet by spraying or hosing. Place materials to provide complete surface coverage and lap all joints minimum 6 inches.
 - d. Curing Compound: Immediately following trowel finish in a non-yellowing compound for curing, sealing, hardening and dustproofing concrete slab surfaces shall be applied as specified. It shall be formulated to meet or exceed ASTM C309 as manufactured by A. C. Horn, Inc., L. Sonneborn Building Products, ProSoCo, Inc., or approved equal.
 - e. Impervious-Sheeting Curing: Surfaces shall be thoroughly wetted with a fine spray of water and then covered with water proof paper, white polyethylene sheeting or white polyethylene-coated waterproof paper. Edges and ends of sheeting shall be overlapped not less than 6 inches and securely cemented or taped to form a continuous cover. Sheeting shall be weighted down to prevent displacement and shall be repaired or replaced if torn, damaged or removed during curing period.
 - f. Moisture-Retaining Cover Curing: Cover the concrete surfaces with a specified moisture retaining cover from the list below for curing concrete, placed in the widest practicable width with sides and ends lapped at least 6" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during the curing period using cover material and waterproof tape.
 1. Waterproof paper, complying with ASTM C171, Type 1 or Type 2.
 2. White polyethylene sheeting, complying with AASHO M 171.
 3. White polyethylene-coated burlap.
 - g. Clear (Fugitive Dye) Membrane Curing Compound: Spray concrete surface immediately following finishing operation by means of a pressure spraying system at a rate to be not less than one gallon per 150 square feet of surface. The compound shall be applied as a fine spray with no surface damage to the concrete. Should the application

method produce a non-uniform film, or the equipment fail, curing shall be continued by another method acceptable to the ENGINEER.

C. Curing Formed Surfaces

1. Cure formed concrete surfaces, including the undersides of girders, beams, supported slabs and other similar surfaces by moist curing with the forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

D. Curing Unformed Surfaces

1. Initially cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by moist curing, whenever possible.
2. Final cure unformed surfaces, unless otherwise specified, by any of the methods specified above, as applicable.
3. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, direct application of curing compound, or other method acceptable to the ENGINEER.

E. Temperature of Concrete During Curing

1. When the atmospheric temperature is 40°F. or below, maintain the concrete temperature at not less than 55°F. continuously throughout the curing period. When necessary, make arrangements before concrete placing for heating, covering, insulation or housing as required to maintain the specified temperature and moisture conditions continuously for the concrete curing period. Provide cold weather protections complying with the requirements of ACI 306.
2. When the atmospheric temperature is 80°F. or above, or during other climatic conditions which will cause too rapid drying of the concrete, make arrangements before the start of concrete placing for the installation of wind breaks or shading, and for fog spraying, wet sprinkling, or moisture-retaining covering. Protect the concrete continuously for the requirements of ACI 305.
3. Maintain concrete temperature as uniformly as possible, and protect from rapid atmospheric temperature changes. Avoid temperature changes in concrete which exceed 5°F. in any one hour and 50°F. in any 24-hour period.

F. Protection from Mechanical Injury

1. During the curing period, protect concrete from damaging mechanical disturbances including load stresses, heavy shock, excessive vibration, and from damage caused by rain or flowing water. Protect all finished concrete surfaces from damage by subsequent construction operations.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling-In

1. Fill in holes and openings left in concrete structures for the passage of work by other trades, unless otherwise shown or directed. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide all other miscellaneous concrete filling shown or required to complete the work.

B. Curbs

1. Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.

C. Equipment Bases and Foundations

1. Provide machine and equipment bases and foundations. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of the manufacturer furnishing the machines and equipment.

D. Repair of Formed Surfaces

1. Repair exposed to view formed concrete surfaces, where possible, that contain defects which adversely affect the appearance of the finish. Remove and replace the concrete having defective surfaces if the defects cannot be repaired to the satisfaction of the ENGINEER. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, and holes left by the rods and bolts; fins and other projections on the surface; and stains and other discoloration that cannot be removed by cleaning.
2. Repair concealed formed concrete surfaces, where possible, that contain defects that adversely affect the durability of the concrete. If defects cannot be repaired, remove and replace the concrete having defective surfaces. Surface defects, as such, include cracks in excess of 0.01" wide, cracks of any width and other surface deficiencies which penetrate to the reinforcement or completely through non-reinforced sections, honeycomb, rock pockets, holes left by tie rods and bolts, and spalls except minor breakage at the corner.
3. Structures designed and intended to hold water or liquids shall be made watertight to conform with the following requirements. When the structures are filled with sewage or other liquids, any cracks or leaks shall be repaired.

E. Repair of Unformed Surfaces

1. Test unformed surfaces, such as monolithic slabs, for smoothness and to verify surface plane to the tolerances specified for each surface and finish. Correct low and high areas as herein specified.
2. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having the required slope. Correct high and low areas as herein specified.

3. Repair finished unformed surfaces that contain defects which adversely affect the durability of the concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to the reinforcement or completely through non-reinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets, and other objectionable conditions.
 4. Structures designed and intended to hold water or liquids shall be made watertight to conform with the following requirements. When the structures are filled with sewage or other liquids, any cracks or leaks shall be repaired.
- F. Correct high areas in unformed surfaces by grinding, after the concrete has cured at least 14 days.
- G. Concrete low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out the low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to the ENGINEER.
- H. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts, and expose reinforcing steel with at least 3/4" clearance all around. Dampen all concrete surfaces in contact with patching concrete, and brush with a neat cement grout coating or concrete bonding agent. Place patching concrete before grout takes its initial set. Mix patching concrete of the same materials to provide concrete of the same type or class as the original adjacent concrete. Place, compact and finish as required to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.
- I. Repair isolated random cracks and single holes not over 1" in diameter by the dry-packed method. Groove the top of cracks, and cut out holes to sound concrete and clean of dust, dirt and loose particles. Dampen all cleaned concrete surfaces and brush with a neat cement grout coating. Place dry-pack before the cement grout takes its initial set. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched areas continuously moist for not less than 72 hours.
- J. Repair methods not specified above may be used, subject to the acceptance of the ENGINEER.

END OF SECTION

SECTION 03310
CONCRETE - GENERAL

PART I - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, tools, materials, equipment and incidentals required to provide concrete where specified.

1.02 RELATED WORK

- A. Refer to Section 03100 - Concrete Formwork.
B. Refer to Section 03200 - Concrete Reinforcement.
C. Refer to Section 03300 - Cast-in-Place Concrete.

1.03 DESCRIPTION OF SYSTEM

- A. This section establishes general criteria for materials, mixes and evaluations of concrete as required for other related sections of these Specifications, and shall be made available on the job site a copy of these codes and standards.

1.04 QUALITY ASSURANCE

A. Codes and Standards

1. Comply with the provisions of the following codes, specifications and standards, except as otherwise shown or specified.
 - a. ACI 301 - "Specifications for Structural Concrete for Buildings"
 - b. ACI 318 - "Building Code Requirements for Reinforced Concrete"
 - c. ACI 304 - "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete"
 - d. ACI 305 - "Recommended Practice for Weather Concreting"
 - e. ACI 306 - "Recommended Practice for Cold Weather Concreting"
 - f. ACI 308 - "Recommended Practice of Curing Concrete"
 - g. ACI 311 - "Recommended Practice for Concrete Inspection"
 - h. ACI 233-83 - "Standard Practice for Use of Shrinkage-Compensating Concrete"

2. Where provisions of the above codes and standards are in conflict with the building code in force for this project, the building code shall govern.

B. Concrete Testing Service

1. The DEVELOPER/CONTRACTOR shall employ a testing laboratory experienced in design and testing of concrete materials and mixes to perform material evaluation tests and to design concrete mixes.
2. Approval of a testing laboratory shall be made by the ENGINEER.

3. Submit a written description of the proposed concrete testing laboratory giving qualifications of personnel, laboratory facilities and equipment, and other information as may be requested by the ENGINEER.
 4. The Town may employ a separate testing laboratory selected by the ENGINEER to perform other quality control testing and to submit test reports to the ENGINEER. The testing laboratory shall be responsible for conducting and interpreting the test, and shall state in each report whether or not the test specimens comply to the specified requirements, and shall indicate any deviations therefrom.
- C. Materials and installed work may require testing and retesting, as directed by the ENGINEER, at any time during the progress of the work. Allow free access to material stockpiles and facilities at all times.

1.05 TESTS FOR CONCRETE MATERIALS

- A. For normal weight concrete, test aggregates by the methods of sampling and testing of ASTM C 33.
- B. For Portland cement, conform to ASTM C 150.
- C. For Type E-1(K) shrinkage-compensating concrete, conform to ASTM C845-87.
- D. Submit written reports to the ENGINEER for each material sampled and tested, prior to the start of work.

1.06 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. Concrete shall be sampled and tested for quality control during the placement of concrete, as follows:
 1. Sampling fresh concrete: ASTM C 172.
 2. Slump: ASTM C 143; one test for each set of compressive strength test or air content specimens, to be taken at the point of discharge.
 3. Air Content: ASTM C 231, pressure method; one for each set of compressive strength test specimens.
 4. A plastic unit weight MUST be taken whenever samples are made for compressive strength test or air content.
- B. Compression Test Specimens
 1. ASTM C 31; one set of five (5) standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cured test specimens are required.
- C. Concrete Temperature
 1. Test hourly when air temperature is 40°F. or below, or when 80°F. and above; and each time a set of compression test specimens is made.

D. Compressive Strength Tests

1. ASTM C 39; one set for each 50 cubic yards or fraction thereof, of each concrete class placed in any one day or for each 5,000 square feet of surface area placed; one (1) specimen tested at 7 days for information, three (3) specimens tested at 28 days for acceptance, and one (1) specimen retained in reserve for later testing if required.
2. When the frequency of testing will provide less than five strength tests for a given class of concrete, conduct testing from at least five (5) randomly selected batches or from each batch if fewer than five (5) are used.
3. When the strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
4. The strength level shall be considered satisfactory so long as the average of all sets of three (3), 28 day specimens, consecutive strength test results equal or exceed the specified f'_c and no individual strength test result falls below the specified strength f'_c by more than 500 psi.

E. Test Reports

1. Report test results in writing to the ENGINEER, the ready mix producer and the DEVELOPER/CONTRACTOR on the same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of DEVELOPER/CONTRACTOR, name of concrete supplier and truck number, name of concrete testing service, concrete type and class, location of concrete batch in the structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day and 28-day tests, air content, actual slump and concrete temperature.

F. Core Tests

1. The testing service shall take core samples of in-place concrete when test results are such that there is reasonable doubt that the specified concrete strengths and other characteristics have not been attained in the structure, as directed by the ENGINEER. The testing service shall conduct tests to determine the strength and other characteristics of the in-place concrete by compression tests on cored cylinders complying with ASTM C 42, or by load testing specified in ACI 318, or others as directed. Petrographic studies of cores shall be performed as directed by the ENGINEER.

1.07 WORKMANSHIP

- A. Concrete work that does not conform to the specified requirements, including strength, tolerances, and finishes, shall be corrected as directed by the ENGINEER.
- B. Structures designed and intended to resist water or liquid pressure shall be made watertight to conform with the following requirements. When the structures are loaded with sewage or other liquids, any cracks or leaks shall be repaired.

1.08 SUBMITTALS

A. Manufacturer's Data, Concrete - General

1. For information only, submit two copies of manufacturer's specifications with application and installation instructions for proprietary materials and items, including admixtures, bonding agents, waterstops, joint systems, dry shake finish materials and non-shrink grout.

B. Samples, Concrete - General

1. Submit samples of materials as specified and as otherwise may be requested by the ENGINEER, including names, sources and descriptions as required.

C. Laboratory Test Reports, Concrete - General

1. Submit two copies of laboratory test reports for concrete materials and mix design tests. The ENGINEER's review will be for general information only.

PART II - PRODUCTS

2.01 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, as follows:

1.
 - a. Provide Type I cement for use in general concrete construction where low heat of hydration is not required and where no sulfate action is anticipated.
 - b. Provide Type II cement for use in general concrete construction subjected or adjacent to sewage, sludge, effluent, etc.
 - c. Provide Type III cement for use when high early strength is required for replacement of public pavements and commercial driveways.
2. Use only one (1) brand of cement for each required type throughout the project, unless otherwise accepted by the ENGINEER.

B. Aggregates, Normal Weight Concrete: ASTM C 33, and as herein specified.

1. Fine Aggregate

- a. Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances.
- b. Dune sand, bank run sand and manufactured sand are not acceptable.

2. Coarse Aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter, as follows:

- a. Crushed limestone processed from natural rock or stone.
- b. Maximum aggregate size - not larger than one-fifth of the narrowest dimension between sides of forms, one-third of the depth of slabs, not three-fourths of the minimum clear spacing between individual reinforcing bars or bundles or bars.

- c. These limitations may be waived if, in the judgment of the ENGINEER, workability and methods of consolidation are such that concrete can be placed without honeycomb or void.

3. Supply of Aggregates

- a. Provide aggregates from one source of supply to ensure uniformity in color, size and shape.
- b. Do not use aggregates containing soluble salts or other substances such as iron sulfides, pyrite, marcasite or ochre which can cause stains on exposed concrete surfaces.

C. Water

1. Clean, fresh, free from oil, acid, organic matter or other deleterious substances.

D. Pozzolan

1. Pozzolan may be substituted for cement in the mixture at a rate of 15-20%, Class F Fly Ash (NYSDOT 711-10).

2.02 CONCRETE ADMIXTURES

- A. Provide admixtures produced by acceptable manufacturers and use in compliance with the manufacturer's printed directions. Use only those admixtures that have been incorporated and tested in the accepted mixes, unless otherwise authorized in writing by the ENGINEER. Admixtures shall not contain more chloride ions than are present in municipal drinking water.

1. Water Reducing Admixture: Shall conform to ASTM C494, Type A. Approved admixtures are "Eucon WR-75 by The Euclid Chemical Co., "Pozzolith 200N" by Master Builders, "Plastocrete 160" by Sika Chemical Corp., or approved equal.
2. Water Reducing, Retarding Admixture: Shall conform to ASTM C494, Type D. Approved admixtures are "Eucon Retarder-75" by the Euclid Chemical Co., "Pozzolith 100XR" by Master Builders, "Plastiment" by Sika Chemical Corp., or approved equal.
3. High Range Water-Reducing Admixture (Superplasticizer): Shall conform to ASTM C494, Type F or G. Approved admixtures are "Eucon 37" by The Euclid Chemical Co., "Rheobuild 1000" by Master Builders, "Sikament" by Sika Chemical Corp., or approved equal.
4. Non-Corrosive, Non-Chloride Accelerator: Shall conform to ASTM C494, Type C or E. The admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory (of at least a year's duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures. Approved admixtures are "Accelguard 80" by The Euclid Chemical Company, "Daraset" by W.R. Grace, or approved equal.
5. Air Entraining Admixture: Shall conform to ASTM C 260. Approved admixtures are "Air-Mix" by The Euclid Chemical Co., "Darvair" by W.R.

Grace, "MB-VR or Micro-Air" by Master Builders, "Sika AER" by Sika Corp., or approved equal.

- B. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing more than 0.05% chloride ions are not permitted. No admixture shall cause an increase in shrinkage when tested in accordance with ASTM C494 and ASTM C157.
- C. Certification: Written conformance to the above-mentioned requirements and the chloride ion content of the admixture will be required from the admixture manufacturer prior to mix design review by the ENGINEER.

2.03 PROPORTIONING AND DESIGN OF MIXES

- A. Design mixes shall be in compliance with ACI 301 Chapter 3.
- B. Prepare design mixes for each type of concrete. Use an independent testing facility selected by the ENGINEER for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.
- C. Proportion mixes by laboratory trial batch method, using material to be employed on the project for each class of concrete required, complying with ACI 211.1 for normal weight and report to the ENGINEER the following data:
 - 1. Complete identification of aggregate source of supply.
 - 2. Tests of aggregates for compliance with specified requirements.
 - 3. Scale weight of each aggregate.
 - 4. Brand, type of cement.
 - 5. Brand, type and amount of each admixture.
 - 6. Amounts of water used in trial mixes.
 - 7. Proportions of each material per cubic yard.
 - 8. Gross weight and yield per cubic yard of trial mixtures.
 - 9. Measured slump.
 - 10. Measured air content.
 - 11. Theoretical yield and plastic unit weight.
 - 12. Mix temperature.
 - 13. Water-cement ratio.
 - 14. Compressive strength for 7 and 28 days.

Compressive strength developed at 7 days and 28 days, from not less than three (3) test cylinders cast for each 7 and 28 day test, and for each design mix.

- D. Reports
 - 1. Submit written reports to the ENGINEER of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by the ENGINEER.
- E. Mix Designs
 - 1. All mix designs shall be proportioned in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318-89. Submit mix designs on each class of concrete for review.

2. If trial batches are used, the mix design shall be prepared by an independent testing laboratory and shall achieve an average compressive strength 1200 psi higher than the specified strength. This over-design shall be increased to 1400 psi when concrete strengths over 5000 are used.
3. The proposed mix designs shall be accompanied by complete standard deviation analysis or trial mixture test data.

F. Adjustments to Concrete Mixes

1. Mix design (w/c ratio) adjustments may be requested by the DEVELOPER/CONTRACTOR when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by the ENGINEER. Laboratory test data for review mix designs and strength results must be submitted to and accepted by the ENGINEER before using in the work.

2.04 ADMIXTURES

- A. All concrete must contain the specified water-reducing admixture or the specified high-range water-reducing admixture (superplasticizer). All concrete slabs placed at air temperatures below 50°F shall contain the specified non-corrosive, non-chloride accelerator. All concrete required to be air entrained shall contain an approved air entraining admixture. All pumped concrete, concrete for industrial slabs, architectural concrete, concrete required to be water tight or concrete with a water/cement ratio below 0.45 shall contain the specified high-range water-reducing admixture (superplasticizer).
- B. Air Content: All concrete exposed to freezing and thawing and/or required to be watertight shall have an air content of 4.5% to 7.5%. All interior slabs subject to vehicular abrasion, shall have a maximum air content of 3%. Air content shall be determined in accordance with ASTM C231 or C173.
- C. Slump: Limits shall be determined in accordance with ASTM C143:
1. 1 inch minimum
 2. 3 inch maximum for footings, caissons, substructure walls, pavement and slabs on grade
 3. 4 inch maximum for slabs, beams, reinforced walls, columns
 4. 8 inch maximum for concrete utilizing high rang water reducer (superplasticizer). The concrete shall arrive at the job site at a slump of 2" to 3", (3" to 4" for concrete receiving a "shake-on" hardener or lightweight concrete), be verified, then the high range water-reducer admixture added to increase the slump to the approved level.
- D. Bonding and Repair Materials:
1. Bonding Admixture: The compound shall be a latex, non-rewettable type. Approved materials are "SBR Latex" or "Flex-Con" by the Euclid Chemical Co., "Daraweld C" by W.R. Grace, or approved equal.
 2. Epoxy Adhesive: The compound shall be a two (2) component, 100% solids, 100% reactive compound suitable for use on dry or damp surfaces. Approved materials are "Eucon Epoxy No. 452MV or No. 620" by The Euclid Chemical Co. or "Sikadure Hi-Mod" by the Sika Chemical Corp., or approved equal.

3. Underlayment Compound: Free-flowing, self-leveling, pumpable cementitious base compound. Approved materials are "Flo-Top" by the Euclid Chemical Co., or approved equal.
4. Repair Topping: Self-leveling, polymer modified high strength topping. Approved materials are "Thin Top SL" by The Euclid Chemical Co., or approved equal.

2.05 CONCRETE STRENGTH

- A. There shall be two classes of concrete, 4000 psi at 28 days with maximum water-cement ratio of 0.48 and 2500 psi at 28 days with maximum water- cement ratio of 0.67.
- B. The 2500 psi concrete is intended principally for pipe cradle and encasement or for backfill of unauthorized excavation. All other concrete, including all thrust blocks, shall be 4000 psi.
- C. Concrete using strictly Portland cement as per ASTM C150 exposed to de-icing salts or aggressive chemical exposure shall have a maximum w/c ratio of 0.39. This shall include concrete such as, but not limited to, slabs on grades, interior and exterior; foundation walls where any portion is above grade and can be in contact with chlorides or chloride solution.
- D. Minimum cement content (unless noted otherwise):

A.S.T.M. C-33 Coarse Aggregate No.	Lb. per Cu. Yd.
467 (1 1/2 inch maximum)	600
57 (1 inch maximum)	610
67 (3/4 inch maximum)	635
(1/2 inch maximum)	680

PART III - EXECUTION

3.01 CONCRETE EVALUATIONS

- A. Evaluation of Quality Control Tests
 1. The concrete quality control testing as specified in Part I will be evaluated by the following criteria:
 - a. Do not use concrete delivered to the final point of placement that has slump or total air content outside the specified values.
- B. Compressive strength tests for laboratory-cured cylinders will be considered satisfactory if the average of each set of three consecutive compressive strength tests results equal or exceed the 28-day design compressive strength of the type or class of concrete; and, no individual strength test falls below the required compressive strength by more than 500 psi.

1. Strength tests of specimens cured under field conditions may be required by the ENGINEER to check the adequacy of curing and protecting of the concrete placed. Mold these specimens at the same time and from the same samples as the laboratory cured specimens, as directed by the ENGINEER.
2. Provide improved means and procedures for protecting concrete when the 28-day compressive strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders.
3. When laboratory-cured cylinder strengths are appreciably higher than the minimum required compressive strength by more than 500 psi additional means for protecting the concrete may not be necessary, even though the 85% criterion is not met.
4. If individual tests of laboratory-cured specimens produce strengths more than 500 psi below the required minimum compressive strength, or if tests of field-cured cylinders indicate deficiencies in protection and curing, provide additional measures to assure that the load-bearing capacity of the structure is not jeopardized. If the likelihood of low-strength concrete is confirmed and computations indicate the load-bearing capacity may have been significantly reduced, tests of cores drilled from the area in question may be required.
5. If the compressive strength tests fail to meet the minimum requirements specified, the concrete represented by such tests will be considered deficient in strength and subject to additional testing as herein specified.

C. Formed Concrete Dimensional Tolerances

1. Formed concrete having any dimension smaller or greater than required, and outside the specified tolerance limits, will be considered deficient in strength and subject to additional testing as herein specified.
2. Formed concrete having any dimension greater than required will be rejected if the appearance or function of the structure is adversely affected, or if the larger dimensions interfere with other construction. Repair, or remove and replace rejected concrete as required to meet the construction conditions. When permitted, accomplish the removal of excessive material in a manner to maintain the strength of the section without affecting function and appearance.

D. Strength of Concrete Structures

1. The strength of the concrete structure in-place will be considered potentially deficient if it fails to comply with any of the requirements that control the strength of structure, including the following conditions:
 - a. Failure to meet compressive strength tests requirements.
 - b. Concrete that differs from the required dimensions or location in such a manner to reduce strength.
 - c. Concrete subjected to damaging mechanical disturbances; particularly load stresses, heavy shock, and excessive vibration.
 - d. Poor workmanship and quality control likely to result in deficient strength.

E. Testing Concrete Structure for Strength

1. When there is evidence that the strength of the concrete structure in-place does not meet specification requirements, the concrete testing service shall take cores drilled from hardened concrete for compressive strength determination, complying with ASTM C 42 and as follows:
 - a. Take at least three representative cores from each member or area of suspect strength, from locations directed by the ENGINEER.
 - b. Test cores in a saturated-surface-dry condition per ACI 318 if the concrete will be wet during the use of the completed structure.
 - c. Test cores in an air-dry condition per ACI 318 if the concrete will be dry at all times during use of the completed structure.
2. Strength of concrete for each series of cores will be considered satisfactory if their average compressive strength is at least 85% and no single core is less than 75% of the 28-day required compressive strength.
3. Report test results in writing to the ENGINEER on the same day that tests are made. Include in test reports the project identification name and number, date, name of DEVELOPER/CONTRACTOR, name of concrete testing service, location of test core in the structure, type or class of concrete represented by core sample, nominal maximum size aggregate, design compressive strength, compression breaking strength and type of break (corrected for length-diameter ratio), direction of applied load to core with respect to horizontal plane of the concrete as placed, and the moisture condition of the core at time of testing.
4. Fill core holes solid with non-shrink, non-metallic expanding mortar and finish to match adjacent concrete surfaces.
5. Conduct static load test and evaluations complying with ACI 318 if the results of the core tests are unsatisfactory, or if core tests are impracticable to obtain, as directed by the ENGINEER.
6. Correct all concrete work that is found structurally inadequate by core tests or by results of static load tests, as directed by the ENGINEER.

F. Repair of Defective Areas

1. With prior approval of the ENGINEER, as to method and procedure, all repairs of defective areas shall conform to ACI 301, Chapter 9, except that the specified bonding compound must be used.

END OF SECTION

SECTION 03351
CONTROLLED LOW STRENGTH FILL MATERIAL

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, tools, equipment, and incidentals necessary to install flowable fill (controlled low strength material CLSM), as specified herein.

1.02 REFERENCES

- A. ACI 214 - Recommended Practice for Evaluation of Strength Test Results of Concrete.
- B. ASTM C192 - Making and Curing Concrete Test Specimen in the Laboratory.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide CLSM containing cement and water. At the DEVELOPER/CONTRACTOR's option, aggregate, or chemical admixtures in any proportions such that the final product meets the strength and flow consistency requirements included in this specification. It shall not contain fly ash.
- B. Provide materials meeting the requirements of the following subsections:
 - Portland Cement, Type 1 or Type 2: NYSDOT 701-01
 - Water: NYSDOT 712-01

If used, provide materials meeting the following requirements:

 - Aggregates: Gradation: 100% passing the 2.0 mm sieve and a maximum of 20% passing the 75 μ m sieve.
 - Chemical Admixtures: Provide admixtures that comply with δ 711-08. The mix may include high air generators manufactured for CLSM.
- C. Certify that the CLSM will have a 28 day compressive strength between 100 psi and 150 psi, and provide this certification to the ENGINEER.
- D. CLSM shall meet or exceed the minimum standard(s) associated with NYSDOT Item No. 204.02.

2.02 MIXES AND TESTING

- A. Design the CLSM mix so that it sets within 2 hrs/days.

- B. Prior to placement, the CLSM will have a minimum diameter spread of 200 mm as determined from the following procedure:
- Fill a hollow plastic or metal cylinder 150 mm in length and 75 mm inside diameter with the CLSM and strike off the surface.
 - Raise the flow cylinder 150 mm in a continuous motion without rotation.
 - Immediately measure the spread of the CLSM along two diameters which are perpendicular to each other.
- C. Cast three (3) specimens (cylinders) for each batch in accordance with applicable ASTM and AIC Standards and deliver them to the Concrete Test Service within seven days of the pour date for evaluation.
- D. CLSM mixes shall not be used in the work until accepted by the ENGINEER.

PART 3 - EXECUTION

3.01 CONSTRUCTION DETAILS

- A. Mix the materials at a stationary mixing plant which is either a continuous or a batch type plant, designed to accurately proportion either by volume or by weight, so that when the materials are incorporated in the mix, a thorough and uniform mix will result.
- B. The mix may be transported in open haul units provided the material is placed within 30 minutes of the end of mixing. Use a rotating drum unit capable of 2 – 6 rpm to transport material which cannot be placed within 30 minutes after the end of mixing.
- C. In work involving quantities of CLSM less than 2 cubic meters, the ENGINEER may permit the DEVELOPER/CONTRACTOR to use a small construction mixer. Provide a mixer capable of mixing CLSM that has the specified compressive strength and flow consistency. Mix all components so as to produce a uniform specified compressive strength and flow consistency. Mix all components so as to produce a uniform product.
- D. Narrower trench widths can be employed when using CLSM due to the self-compacting properties of the material. Construction personnel and equipment are not required to be in the trench for compaction operations. Refer to the current NYSDOT Standard Sheet for Controlled Low Strength material (CLSM) Installation Details for Circular and Elliptical Metal Pipes, Structural Plate Pipes and Pipe Arches, and Reinforced Concrete and Other Rigid Pipes. For installations that require that construction personnel temporarily occupy the trench follow all OSHA requirements.

3.02 FILL AND BACKFILL AT STRUCTURES, CULVERTS, AND PIPES

- A. Place the CLSM using a method approved by the ENGINEER, in accordance with the appropriate NYSDOT Standard Sheet for additional guidance on the use of CLSM as backfill material.
- B. When placing CLSM for pipe backfill, discharge the material onto the top of the pipe at the center.

- C. Do not place CLSM in contact with aluminum pipe, including connections, fixtures, etc., unless the aluminum has been coated with an approved primer.
- D. Do not place CLSM containing fly ash in contact with cast iron or ductile iron pipes, fittings or appurtenances.
- E. CLSM should be kept encapsulated with soil, as it is highly erodible and disintegrates when left exposed to the environment.
- F. In situations where CLSM is used as backfill around lightweight pipe, take precautions to counteract the pipe's buoyancy.

END OF SECTION

SECTION 11004
SUBMERSIBLE GRINDER PUMPS

PART I - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, tools, equipment and incidentals required to provide submersible grinder pumps and accessories as specified herein.
- B. To ensure that all the equipment required is properly coordinated and will function in accordance with the intent of the Specifications, all the equipment specified for each pump application shall be obtained from a single pump manufacturer in whom the responsibility for the proper function of all the equipment as integrated and coordinated units shall be vested.

1.02 QUALITY ASSURANCE

A. Manufacturer's Qualifications

- 1. Submersible sewage pumps provided under this section shall be the standard product in regular production by manufacturers whose products have proven reliable in similar service for at least five years.

B. Reference Standards

Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

- 1. Standards for the Hydraulic Institute
- 2. National Electric Code
- 3. Standards of National Electrical Manufacturers Association
- 4. Institute of Electrical and Electronic Engineers
- 5. American National Standards Institute
- 6. Standards of American Water Works Association
- 7. American Gear Manufacturers' Association
- 8. Standards of American Society for Testing and Materials
- 9. Occupational Safety & Health Administration (OSHA)
- 10. Ten State Standards.

1.03 SUBMITTALS

A. Shop Drawings:

- 1. Manufacturer's literature illustrations, specifications and engineering data including: dimensions, materials, size, weight, performance data and curves showing overall pump efficiencies, flow rate, head, brake horsepower, motor horsepower, speed and shut-off head.
- 2. Shop drawings showing fabrication, assembly, installation and wiring diagrams.

3. Anticipated performance curves for each pump showing the relationship between TDH capacity, efficiency and NPSH from shutoff to minimum head conditions. The curves shall show the maximum and minimum recommended pump delivery at the design speed.
- B. Operation and Maintenance Manuals
1. Complete installations, operation and maintenance data including copies of all approved shop drawings.

1.04 GUARANTEE AND WARRANTY

- A. The pump, controls and accessories shall be provided with an 18-month guarantee. This guarantee shall be in written form and provided with the shop drawings.

PART II - PRODUCTS

2.01 DETAILS OF CONSTRUCTION

A. Pump

1. The pump shall be of the centrifugal OR progressing cavity type.

B. Grinder

1. The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects," such as paper, wood, plastic, glass, wipes, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump and the 1-1/4" diameter stainless steel discharge piping

C. Motor

1. As a maximum, the motor shall be a 1 HP, 1725 RPM, 240 Volt 60 Hertz, 1 Phase, capacitor start, ball bearing, air-cooled induction type with Class F installation, low starting current not to exceed 30 amperes and high starting torque of 8.4 foot pounds. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor.

D. Accessory Equipment

Provide the following accessories for each pump as required for a complete installation.

1. Guide Rails

The guide rail package shall include one stainless steel pipe with pilots. Guide rail pipe shall be 1" minimum, Schedule 40, stainless steel (304). Upper guide rail brackets shall be cast iron.

2. Pump Guides

The guides attached to the pump which position pump on or between the guide rails, shall have coal-tar epoxy coating. The guides are to be attached to the pump volute with 316 stainless steel hex head cap screws.

3. Lift Cable/Chain

A 1/4" diameter stainless steel lift chain shall be permanently attached to the pump. Provision shall be made for attaching upper end of this cable to the wet well access frame.

4. Hardware

All bolts, machine screws, nuts, washers, and lock washers for complete assembly of access cover, guide rails, and discharge elbow shall be furnished by manufacturer in 316 stainless steel.

5. Wet Well

The wet well shall be fiberglass, with dimensions as indicated in the pump schedule, with a blank fiberglass cover as provided by the Manufacturer.

6. Valves

The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve and anti-siphon valve built into the stainless steel discharge piping. Moving parts will be made of a 300 Series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength.

F. Product and Manufacturer

Provide submersible sewage pumps as manufactured by one of the following:

1. F.E. Myers
2. E-One
3. Approved Equal is not considered

2.02 CONTROLS AND CONTROL EQUIPMENT

A. Pump Controller

1. A wet well level-responsive automatic pump controller and abnormal level alarm module shall be furnished to control pump in response to direct-acting liquid level sensors in the wet well.

B. Alarm Panel

1. 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.
2. 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.
3. The alarm panel shall include the following features: external audible and visual alarm; push-to-run switch; push-to-silence switch; redundant pump start; and high level alarm capability. The visual alarm lamp shall be inside a red, oblong lens, mounted to the top of the enclosure in such a manner as to maintain NEMA 4X rating.

C. Generator Receptacle and Auto Transfer

1. The alarm panel shall include a 20 amp, 250 VAC generator plug receptacle with a spring-loaded, gasketed cover suitably mounted to provide access for connection of an external generator while maintaining a 4X rating. Automatic transfer capability shall be provided that automatically transfers from AC power to generator power during a power outage.

2.03 TOOLS, SPARE PARTS AND MAINTENANCE MATERIALS

A. Each pump shall be furnished with the following:

1. One (1) set of special tools required for maintenance of the pumps as required, including an impeller puller, if required.
2. One (1) complete set of shaft seals for each type and size of pump.
3. Provide one (1) spare grinder pump as detailed on contract drawings pump station schedule.

2.04 PAINTING

- A. Pump, motors, drives, frames, baseplates, control panels, and appurtenances, etc., shall receive manufacturer's standard finish paint system prior to shipment.
- B. Machined, polished, and non-ferrous surfaces shall be coated with corrosion prevention compound.

PART III - EXECUTION

3.01 PUMP AND MOTOR TEST

- A. The pump manufacturer shall perform the following inspections and tests on each pump before shipment from the factory.
 - 1. Impeller, motor rating and electrical connections shall first be checked for compliance with specifications.
 - 2. A motor and cable insulation test for moisture content or insulation defects shall be made.
 - 3. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.
 - 4. The pump shall be run for 30 minutes submerged.
 - 5. During the (4) test amperage and voltage shall be recorded.
 - 6. After operation test (4), the insulation test (2) is to be performed again.
 - 7. A written report certifying the foregoing steps shall be supplied with each pump, including data under (6), at the time of shipment.
 - 8. Immediately prior to shipment, each pump cable end shall be fitted with a shrink to fit rubber boot or plastic dipped to protect the pump from water seepage that could occur on site before the electrical installation is completed.

3.02 INSTALLATION

- A. Installation shall be in complete accordance with manufacturer's instructions and recommendations.
- B. Installation shall include furnishing and applying an initial supply of grease and oil, recommended by the manufacturer.
- C. Support piping independent of pump.
- D. Check and align pumps, motors and flexible couplings.
- E. The DEVELOPER/CONTRACTOR shall confirm the power load at each residency prior to ordering pumps.
- F. Make adjustments required to place system in proper operating condition.

3.03 START-UP AND TESTING

- A. The Manufacturer shall provide the services of qualified factory trained technician(s) who shall inspect the placement and wiring of each station, perform field tests as specified herein, and instruct the Owner personnel in the operation and maintenance of the equipment before the stations are accepted by the Owner.

- B. Upon completion of the installation, the authorized factory technician(s) will perform the following test on each station:
1. Make certain the discharge shut-off valve in the station is fully open.
 2. Turn ON the alarm power circuit and verify the alarm is functioning properly.
 3. Turn ON the pump power circuit. Initiate the pump operation to verify automatic “on/off” controls are operative. The pump should immediately turn ON.
 4. Consult the Manufacturer’s Service Manual for detailed start-up procedures.
- C. Upon completion of the start-up and testing, the start-up authorization form describing the results of the tests performed for each grinder pump station shall be submitted to the Town and Engineer. Final acceptance of the system will not occur until authorization forms have been received for each pump station installed and any installation deficiencies corrected.

END OF SECTION

SECTION 15103
BUTTERFLY VALVES

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, tools, equipment, and incidentals necessary for the installation of butterfly valves and valve boxes as specified herein.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Butterfly valves shall be in accordance with AWWA Standard C504 for Class 150B service, latest specification, and as manufactured by Henry Pratt Company, ValMatic, or Approved Equal.
- B. The direction of opening shall be to the left, conforming to those in service and according to Town's Standard. This shall be verified by the DEVELOPER/CONTRACTOR before ordering valves.
- C. Butterfly valves shall be designed and configured for buried service application.

2.02 MATERIALS AND CONSTRUCTION

- A. Butterfly valves shall be short body type, with ends to fit the service intended and specified and shall be Class 150B designed for working pressure of 150 psi. Valves shall be suitable for throttling service.
- B. All valves shall be designed for a maximum non-shock shutoff pressure of 150 psi and test pressure of 175 psi.
- C. Valves shall be tight closing, rubber seat type with recessed rubber seats securely mounted to the valve body or rubber seat securely affixed to the disc.
- D. Materials of construction shall be as follows:
 - 1. Body shall be cast iron ASTM A126.
 - 2. Valve shafts shall be solid one piece design. Shafts shall be 18-8 stainless steel, Type 304.
 - 3. Valve discs shall be made of cast iron, ASTM A126 Class B.
 - 4. Rubber seats may be new natural or synthetic rubber, applied to either the body or the disk and shall be cemented and clamped; epoxy bonded; or vulcanized to the body.

5. Valve bearings shall be sleeve type that is corrosion resistant and self-lubricate.
6. Operators shall be of the traveling nut design and as specified in Section 3, AWWA C-504 for buried service. Buried operators shall be furnished with extension stem and operating nut, valve box and cover.
7.
 - a. Valve box shall be two-piece screw type, 5-1/4" shaft, as manufactured by Bibby-Ste-Croix, or Approved Equal.
 - b. The cover shall be slotted for easy removal with the word "Water" cast into the top.
8. Valves connected by spool pieces to main line outlets (or tees) shall have mechanical joint ends. Suitable steel rods shall be installed between the main mechanical joint bell outlet and the valve (and/or fittings) to resist movement under pressure when the valve is closed.
9. All bolts and nuts shall be fluorocarbon coated, high strength corrosion-resistant low alloy steel.

PART 3 - EXECUTION

3.01 TESTING AND INSTALLATION

- A. Each butterfly valve shall have the leakage test required by Section 5 of the AWWA Standard C-504 performed with the pressure differential applied in both directions. The manufacturer shall furnish certified copies of the reports covering the two directional leakage tests in accordance with Section 5 of AWWA C-504.
- B. Chlorination and disinfection of valves will be done concurrently with the watermains.
- C. Valves shall be installed in accordance with the Standard Details and AWWA C600 – installation of ductile iron watermain and appurtenances.
- D. Each butterfly valve shall have a field leakage test performed with the pressure differential (175 psi pressure on one side; 0 psi pressure on the other) applied in BOTH directions. This requirement does not, however, waive the requirement stipulated in paragraph A above.
- E. Buried valves shall be cleaned and manually operated before installation. All buried valves shall be set vertically. Care shall be taken to ensure that valves are kept in the closed position.

3.02 APPLICATION

- A. The butterfly type valve shall be the sole type used on watermains of 14-inch diameter and up.

END OF SECTION

SECTION 15105
RESILIENT WEDGE GATE VALVES

PART I - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, tools, equipment, and incidentals necessary for the installation of gate valves and valve boxes as specified herein.

PART II - PRODUCTS

2.01 GENERAL

- A. Resilient-seated gate valves with non-rising stems shall be in accordance with AWWA Standard C509, latest revision, and shall be manufactured by Mueller Company, Model A2361-77. Approved Equal is not considered.
- B. The direction of opening shall be to the left to conform to those in service and according to the Town's standard. This shall be verified by the DEVELOPER/CONTRACTOR before ordering valves.
- C. Valves installed in a straight run of pipe will be regarded as a dead end and, therefore, will require restraining. Valves installed near a change in direction, or on short runs, will also require restrained joints.

2.02 MATERIALS AND CONSTRUCTION

- A. The design working pressure for all valve sizes shall be 200 psi. Each valve body shall be tested at 400 psi.
- B. The valve gate shall be fully encapsulated with a synthetic elastomer and shall seat against a corrosion-resistant surface.
- C. Materials of construction shall be as follows:
 - 1. The body, bonnet, seal plate, gate, handwheel and hub nut shall be ductile iron conforming to ASTM A536 standards.
 - 2. Ends shall conform to standards for ductile iron fittings as specified in Section 02555.
 - 3. Non-rising valve stem, stem nuts, glands and bushings shall be bronze.
 - 4. Shaft O-ring seals shall be synthetic rubber or Buna-N.
 - 5. All internal parts shall be accessible without removing the main body from the pressure line.
 - 6. Operators shall be as specified in AWWA C-509 for submerged, buried or in-plant service. Buried operators shall be furnished with extension stem and operating nut, valve box and cover.

7. Valve boxes shall be as manufactured by Bibby-Ste. Croix, or Approved Equal, as follows:
 - a. Valve boxes for gate valves shall be three-piece screw type valve box, 5¼" shaft, Model C.
 - b. The cover shall be slotted for easy removal with the word "Water" cast into the top.
8. Valves connected by spool pieces to main line outlets (or tees) shall have mechanical joint ends. Suitable steel rods shall be installed between the main mechanical joint bell outlet and the valve (and/or fittings) to resist movement under pressure when the valve is closed.
9. All outside surfaces of ferrous parts are to be protected with two coats of asphalt varnish material and all interior surfaces of ferrous parts are to be protected with a corrosion resistant coating.
10. All bolts and nuts shall be fluorocarbon coated, high strength corrosion resistant low alloy steel.

PART III - EXECUTION

3.01 TESTING AND INSTALLATION

- A. Inspection and testing shall be as specified in AWWA C509, latest revision, Section 6. Each valve shall be tested from both directions by the manufacturer for a bubble-tight, 200 psi differential, sealing ability.
- B. Chlorination and disinfection of valves will be done concurrently with the watermains.
- C. Each gate valve shall have a field leakage test performed with the pressure differential (175 psi pressure on one side; 0 psi pressure on the other) applied in BOTH directions. This requirement does not, however, waive the requirement stipulated in paragraph A above.

The duration of each field test in each direction shall be a minimum of two (2) hours.

- D. Marking and shipping shall conform to AWWA C509, Section 7.
- E. Installation shall conform with the applicable paragraphs of AWWA C509 Appendix.

3.02 APPLICATION

- A. Resilient wedge gate type valves shall be the sole type valve used for watermains up to and including 12-inch diameter.

END OF SECTION

SECTION 15121
CASING PIPE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Specified

1. The Work specified shall include all labor, materials, tools, equipment, services and incidentals necessary to furnish and install steel casing pipe, as specified herein.

1.02 QUALITY ASSURANCE

A. All materials shall be new, of first quality and in first class condition. They shall be of the type and manufacturer shown or specified, and substitutions will not be permitted unless specified by the ENGINEER.

B. Reference Standards

1. ASTM A123, Zinc (Hot Galvanized) Coatings of Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Bars, Plate Bars and Strips
2. ASTM A139, Electric Fusion (ARC) Welding Steel Pipe
3. ASTM A153, Zinc Coating (Hot Dip) on Iron and Steel Hardware
4. ASTM A307, Low Carbon Steel Externally and Internally Threaded Standard Fasteners
5. ASTM A252, Welded and Seamless Pipe Piles
6. ASTM A570, Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality
7. ASTM C32, Standard Specification for Sewer and Manhole Brick (made from clay or shale)
8. ASTM C207, Standard Specification for Hydrated Lime for Masonry Purposes

C. Steel casing pipe and all incidentals shall be furnished by one supplier.

D. Requirements of Regulatory Agencies

1. The DEVELOPER/CONTRACTOR shall be responsible for obtaining all required permits and shall comply with all provisions thereof at his own expense.
2. The DEVELOPER/CONTRACTOR shall, obtain all additional permits, provide insurance, bonds and guarantees, and all else required by the governing

authorities at his own expense. The DEVELOPER/CONTRACTOR's responsibility under this paragraph may include, but not be limited to the following:

- a. Constructing and removing temporary facilities or structures.
- b. Providing details of construction methods.
- c. Providing detailed construction schedules.
- d. Reimbursing the applicable authority for any and all expenses incurred by them in connection with the Work.
- e. Traffic maintenance.
- f. Coordination of scheduling with the Authority.
- g. CCTV inspection of casing pipe prior to carrier pipe installation
- h. Necessary clean-up and restoration.

E. Tolerances

1. The casing pipe shall be installed on the lines and grades shown on the Design Drawings and within tolerances required to allow the carrier pipe to pass through the crossing in accordance with the lines and grades shown, specified, or directed.

F. Welding

1. Welding shall be done in strict accordance with manufacturer's written requirements.
2. Welding operators shall be prequalified in accordance with the standard qualification procedure of the American Welding Society, and certificates attesting thereto shall be delivered to the ENGINEER prior to beginning of any welding operations.

1.03 SUBMITTALS

- A. Shop Drawings identifying the casing pipe materials and installation procedure.
- B. Certifications for welding operators.
- C. All permits necessary for highway crossings.

PART 2 - PRODUCTS

2.01 PROPERTIES OF STEEL CASING PIPE

- A. Design Criteria: Steel Casing Pipe
 1. Minimum Tensile Strength - 60,000 PSI
 2. Minimum Yield Strength - 35,000 PSI
 3. Minimum Wall Thickness

(for casing pipes up to and including 24" diameter) – 0.313 inches

2.02 MATERIALS

A. Steel Casing Pipe

1. Steel casing pipe shall be fabricated in accordance with the above listed specifications to the lengths and diameters shown on the Design Drawings.
2. All steel casing pipe must be new in first-class condition. Used or recycled casing pipe will not be allowed, regardless of condition.

B. Brick Bulkheads

1. Brick shall meet the requirements of ASTM C32, Grade MS.
2. Mortar shall be composed of Portland Cement, hydrated lime and sand in which the volume of sand shall not exceed three times the sum of the volumes of cement and lime.
 - a. Cement shall be type II Portland Cement.
 - b. Hydrated lime shall be types conforming to ASTM C207.

C. Cathodic Protection

1. Two (2) seventeen pound magnesium anodes shall be provided and installed on each end of the casing for cathodic protection.
2. Connections to the pipe shall be made by the thermite brazing method, Cadweld or approved equal. Before the connection is made, the pipe shall be cleaned to bare metal by means of scraping, filing or other approved methods. After the connection has been made, it shall be covered with a heavy coal tar enamel or approved equal.
3. Cadweld connections of wire to pipe shall be made using Cadweld #15 type cartridges for steel piping, and Cadweld "XF" type of suitable charge for cast iron piping. Proper sleeves shall be used on the wires in accordance with the manufacturers recommendations.

D. Casing Spacers

1. Non-metallic casing spacer, PSI Ranger II or Approved Equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General

1. Installation of the casing pipes shall include installation of the steel casing pipe

by either the boring and/or jacking method in both earth and/or rock wherever it is encountered.

2. Bulkheads shall be installed at each end of the casing pipe of sufficient strength and quality to support the filling operation and to support annular fill. Vents shall be provided as required to assure complete filling of annular space as required by applicable authorities.
3. When a carrier pipe is installed inside a casing pipe, the DEVELOPER/CONTRACTOR shall be required to fill the entire annular space around the carrier pipe with sand or pea gravel.
4. Recovery pits shall be excavated at each bore or jack location to determine possible conflicts in alignment with existing utilities not shown on the plans.
5. The DEVELOPER/CONTRACTOR is responsible for proper line and grade at each crossing.

B. Boring

1. The boring method shall consist of pushing the casing pipe into the fill with a boring auger rotating inside the pipe to remove the spoil.
2. The front of the casing pipe shall be provided with suitable mechanical arrangements or devices that will positively prevent the auger and cutting head from leading the pipe so that there will be no unsupported excavation ahead of the pipe.
3. The equipment and mechanical arrangements or devices used to bore and remove the earth and/or rock shall be removable form within the casing pipe in the event an obstruction is encountered.
4. The face of the cutting edge shall be arranged to provide reasonable obstruction to the free flow of soft or poor soil.
5. Water or other liquids shall not be used to facilitate casing emplacement or spoil removal.
6. The diameter of the boring hole shall be essentially the same as the outside diameter of the pipe.

C. Jacking

1. The steel casing pipe installed by the jacking method shall be weldable steel pipe.
2. No type of auger, boring or drilling equipment shall be used.
3. Bracing and backstops shall be designed of sufficient rating such that jacking can be accomplished in a continuous manner until the leading edge of the pipe reaches the final position shown on the Contract Drawings.

4. The diameter of the boring hole shall be essentially the same as the outside diameter of the pipe.

D. Obstruction

If an obstruction is encountered during installation by jacking or boring and it is impossible to advance the casing pipe, the DEVELOPER/CONTRACTOR shall choose one of the following:

1. Abandon the casing pipe in place and fill completely with grout. Provide whatever bulk heading is necessary to accomplish the grouting operation. The crossing will be moved to another location acceptable to the ENGINEER and the crossing re-bored at the DEVELOPER/CONTRACTOR's expense.
2. As acceptable to the ENGINEER and authority having jurisdiction, the DEVELOPER/CONTRACTOR may continue the casing pipe by tunneling and installation of liner plates.

E. Welding

1. Welding shall be done in accordance with the manufacturer's written requirements.
2. Welding operators shall be prequalified in accordance with the standard qualification procedure of the American Welding Society, and certification attesting thereto shall be delivered to the ENGINEER prior to beginning of any welding operation.

F. Inspection

1. All pipe casings will be inspected by the ENGINEER prior to installation.
2. Prior to the work in this section, the DEVELOPER/CONTRACTOR shall inspect the installation area to determine if the work of other trades has progressed to the point where the installation may properly commence.
3. The DEVELOPER/CONTRACTOR shall verify that the installation can proceed in accordance with all pertinent codes and regulations, the original design and the referenced standards.

G. Discrepancies

1. If the above referenced inspection reveals discrepancies, the DEVELOPER/CONTRACTOR shall notify the ENGINEER immediately.
2. The DEVELOPER/CONTRACTOR shall not proceed with the installation in areas of discrepancy until said discrepancy is resolved.

H. Blasting

1. Blasting is not allowed.

I. Annular Fill and Bulkhead

1. Provide vents as required to assure complete filling of annular space and as required by the applicable authorities.
2. Prior to the filling of the annular space, carrier pipe shall be properly and sufficiently secured against floatation and against all movement that would disturb joints.
 - a. The DEVELOPER/CONTRACTOR shall be responsible for all improper joints including all joints disturbed by placing annular fill.
3. After the carrier pipe is installed in casing, DEVELOPER/CONTRACTOR shall fill annular space with pea gravel between carrier pipe and casing and construct brick and mortar bulkheads as specified herein.
4. Fill annular space in three (3) stages in the presence of the ENGINEER to his/her satisfaction.
5. The volume of pea gravel used shall be compared to the annular space volume to ensure complete filling. Incomplete filling of annular space will not be considered acceptable.
6. Install bulkheads at pipe joints at each end of the casing of sufficient strength and quality to support the filling operation, and to support annular fill.

END OF SECTION

SECTION 15502
HYDRANTS

PART I - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, tools, equipment, and incidentals necessary to install hydrants and valve assemblies as specified herein.

PART II - PRODUCTS

2.01 GENERAL

- A. Fire hydrants shall be in accordance with AWWA Standard C502 for Fire Hydrants for Ordinary Water Works Service, latest specification, and as manufactured by the Clow-Eddy Model F2641. Approved equal it not considered.
- B. The units shall be 5¼" valve opening size furnished with two (2) 2½" hose and one (1) 4½" pumper connections, with threads to match the existing hydrants now in use. The DEVELOPER/CONTRACTOR shall verify the size of threads in use and shall open left. Hydrants shall be furnished and installed with a gate valve, buried valve operator, extension stem with operating nut, valve box and cover; 6" dia. ductile iron branch and standpipe; stone or gravel drain pit; and concrete support and blocking.

2.03 MATERIALS AND CONSTRUCTION

- A. The hydrants shall be designed for a minimum working pressure of 150 psi.
- B. They shall be designed with the so-called "breakaway" feature.
- C. Hydrants shall be furnished with plugged drains.
- D. Caps with chain attachment to hydrant body shall be furnished for all outlets.
- E. Hydrants shall be painted red, conforming to the Town of Lewiston's Color Code.
- F. Materials of construction shall be as follows:
 - 1. Gray cast iron - barrel, bonnet, footpiece and outlet caps.
 - 2. Bronze (grade selected by manufacturer for best service) - drain valve parts, outlets, valve seats and threaded portions of the stems.
 - 3. Steel - stem parts other than those threaded, drain rod.
 - 4. Other miscellaneous parts shall be according to AWWA C502 and as selected by the manufacturer for best usage.

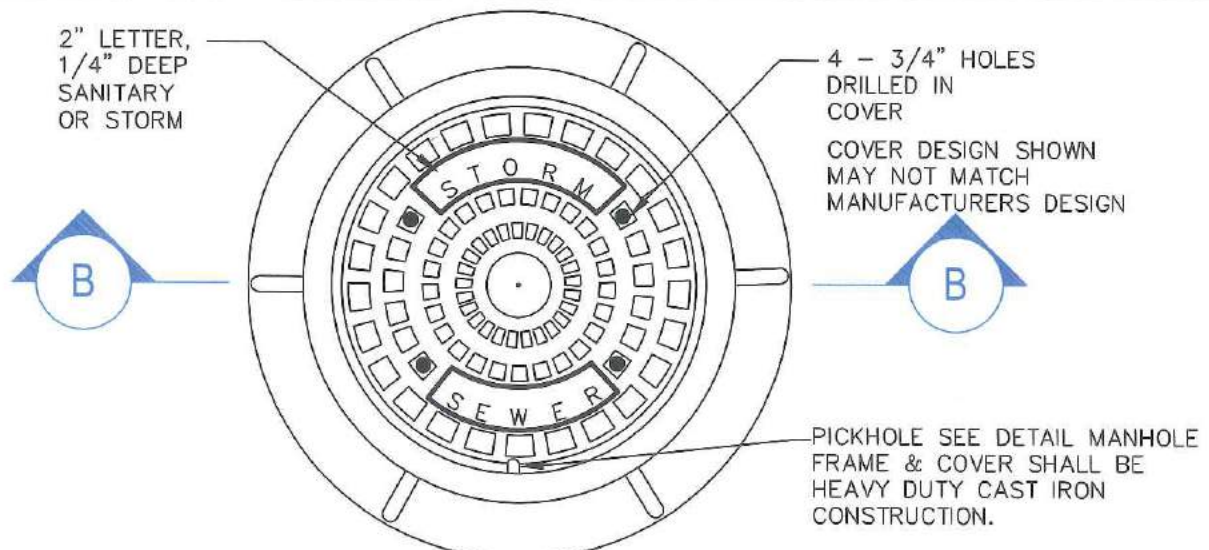
PART III - EXECUTION

3.01 TESTING AND INSTALLATION

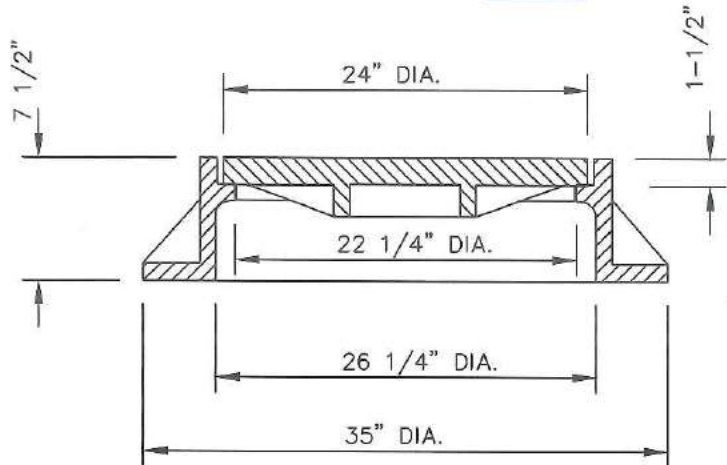
- A. The hydrants shall be set in accordance with the Town Standard Details and Sect. 11 of AWWA Standard C600 - Installation of Ductile Iron Water Mains and Appurtenances. Standpipe heights may be required to vary, so as to adapt to site conditions at the locations in the field.
- B. Standpipe and branch leading to the hydrant shall be 6" dia. ductile iron pipe and restrained. The hydrant shall be harnessed to the gate valve and the gate valve harnessed to the main line tee fitting.
- C. Chlorination and disinfection of hydrants will be done concurrently with the watermains.

END OF SECTION

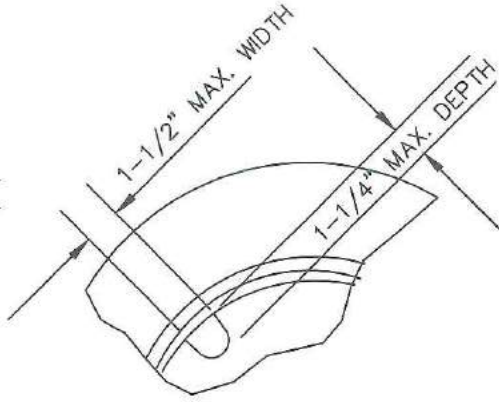
Storm Sewer Details



PLAN



SECTION



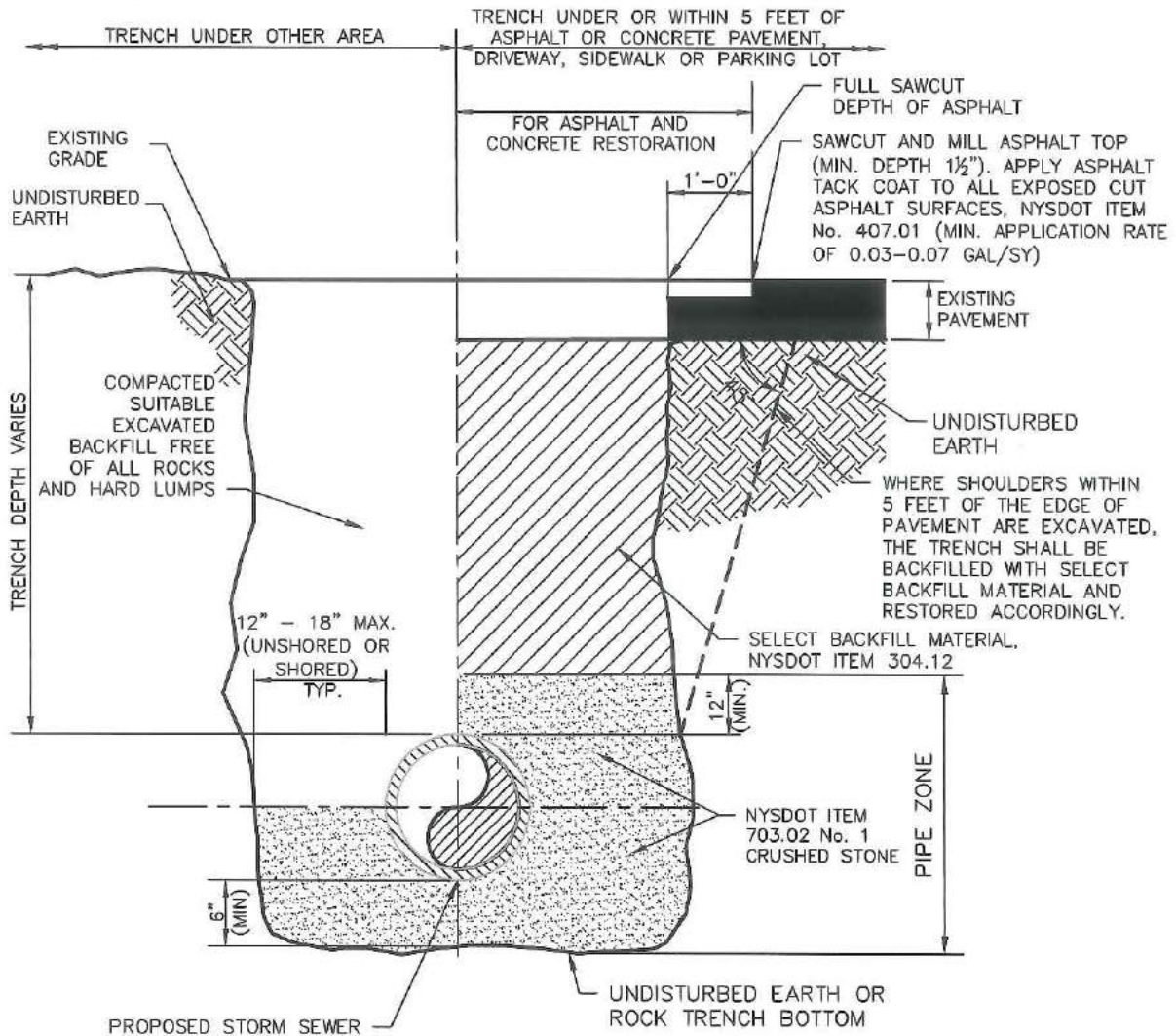
PICKHOLE DETAIL

STANDARD FRAME AND COVER NOTE

1. MATERIAL ASTM A48 CLASS 30B CAST IRON.
2. UNIT MUST WITHSTAND H-20 WHEEL LOADING.
3. ALL DIMENSIONS ARE TO BE CONSIDERED MINIMUM WITH THE EXCEPTION OF THE EXCEPTION OF THE COVER, WHICH MUST CONFORM EXACTLY TO MAINTAIN INTERCHANGEABILITY WITHIN THE COUNTY.
4. COVER WEIGHT 210 LBS.(MAX)
5. COATING NOT REQUIRED.
6. FRAMES AND COVERS SHALL HAVE MACHINED BEARING SURFACES.
7. NO COMMERCIAL BRAND NAME LETTERING WILL BE ALLOWED ON THE EXPOSED SURFACE FOR THE COVER.
8. FOR PIPE SIZE 8" AND OVER

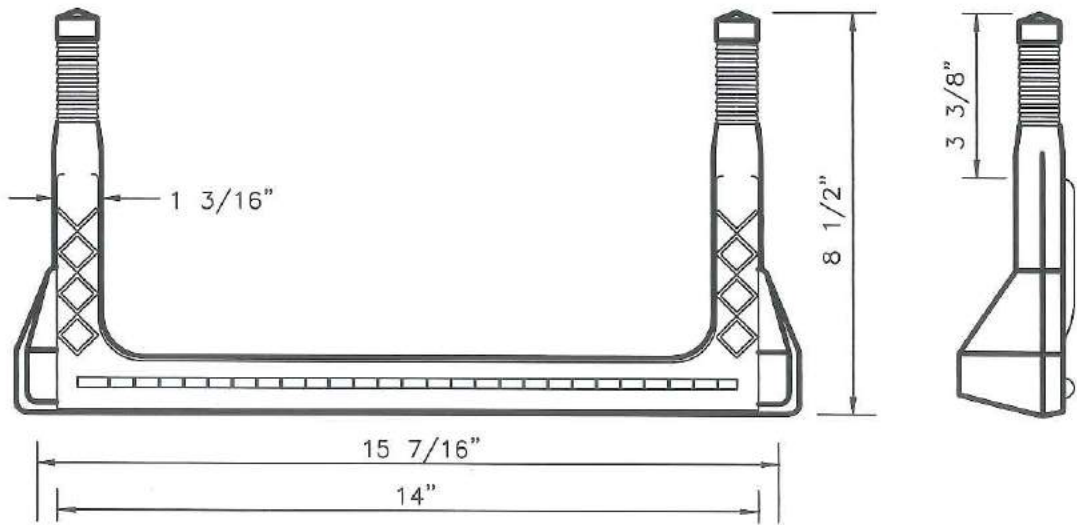
ST-01
 FRAME AND COVER DETAIL
 TOWN OF LEWISTON, N.Y.



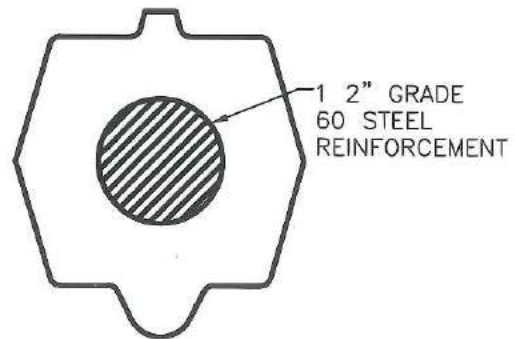
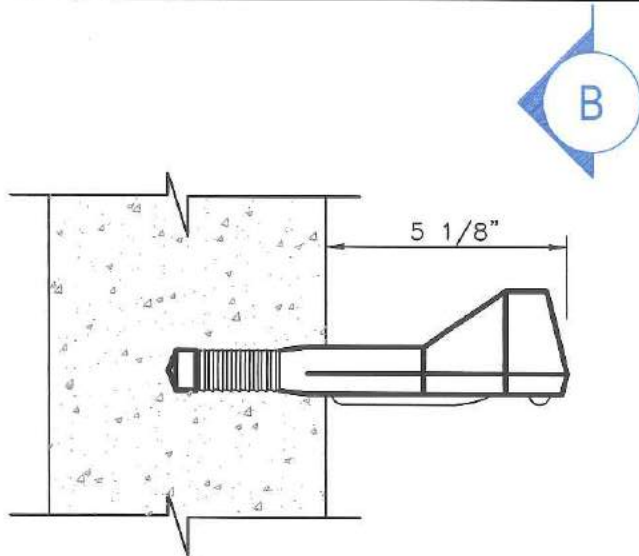


ST-02
 STORM TRENCH DETAIL
 TOWN OF LEWISTON, N.Y.





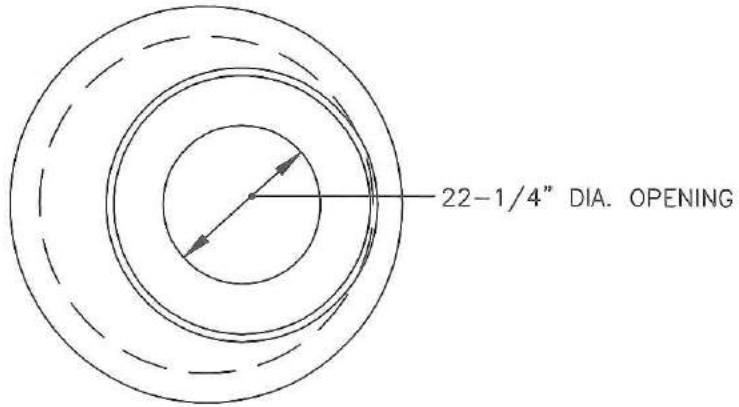
M.A. INDUSTRIES, INC.
OR APPROVED EQUAL



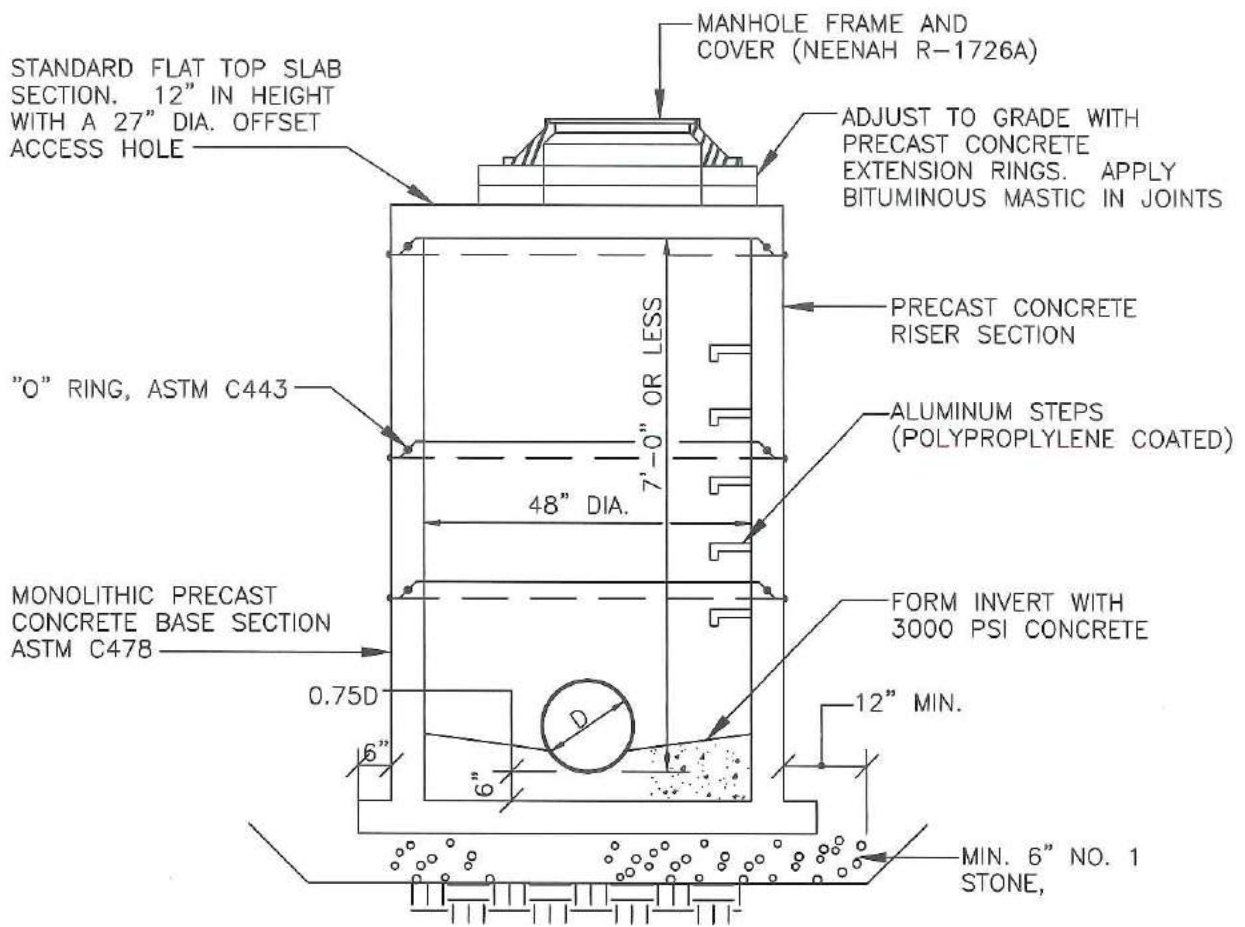
SECTION — **B**

ST-03
COPOLYMER POLYPROPYLENE
PLASTIC MANHOLE STEP
TOWN OF LEWISTON, N.Y.





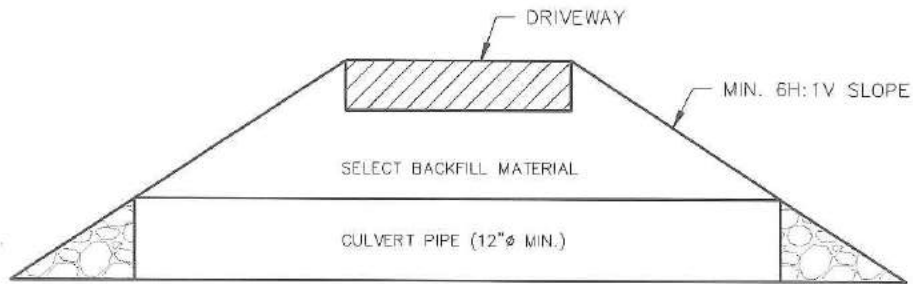
PLAN



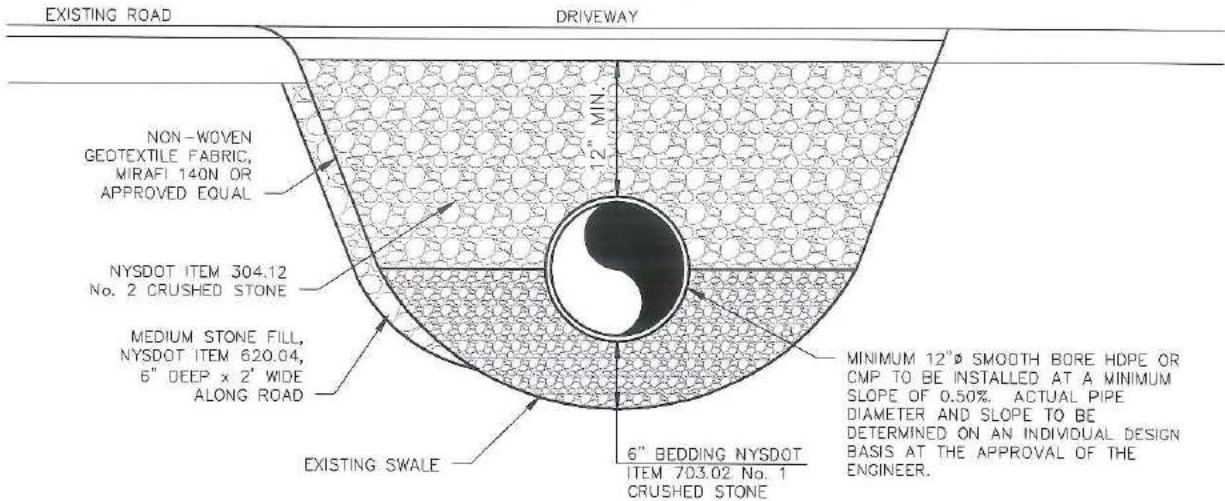
SECTION

ST-04
 MONOLITHIC PRECAST BASE
 STORM MANHOLE SECTION
 TOWN OF LEWISTON, N.Y.





ELEVATION



SECTION

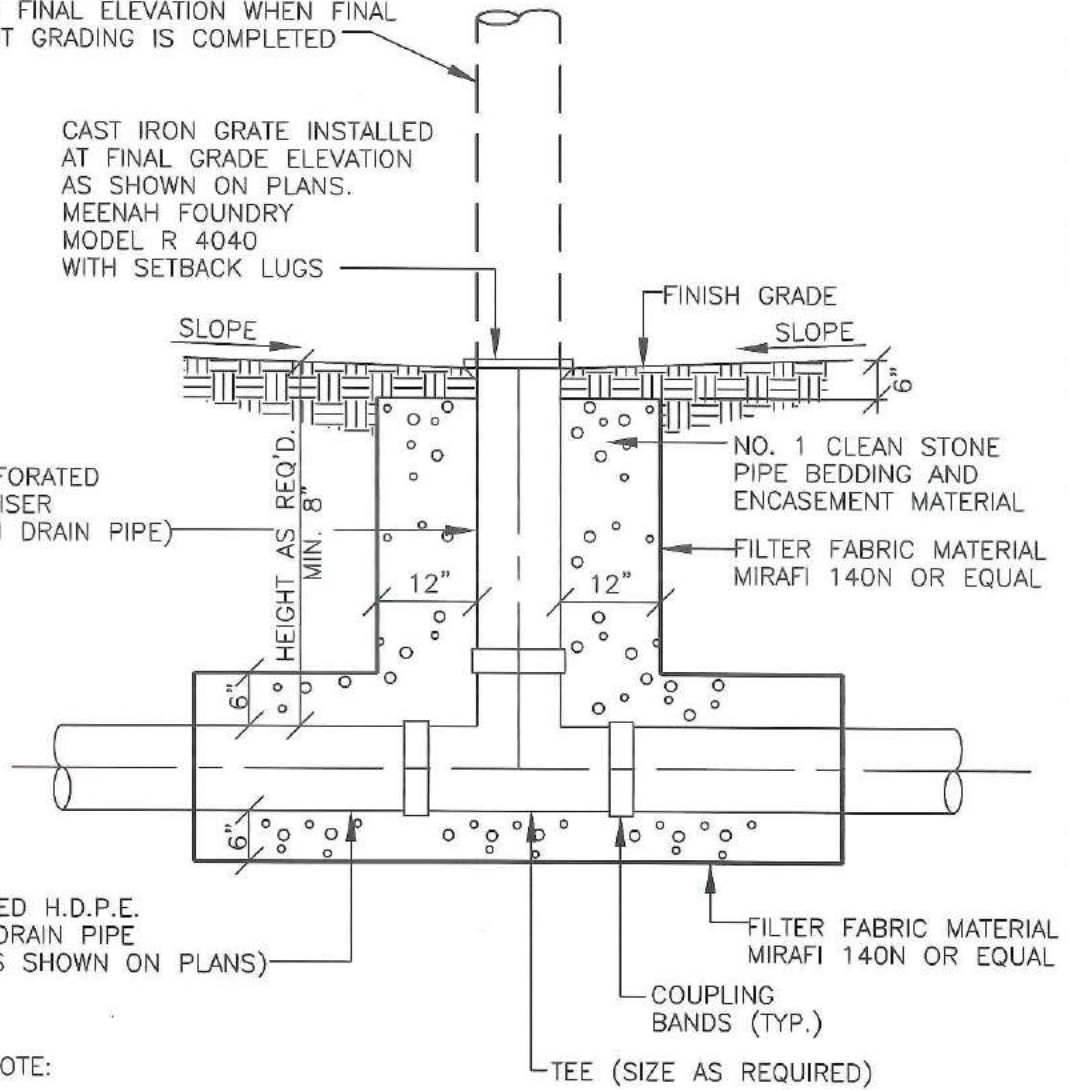
ST-05
 DRIVEWAY/CULVERT
 DETAIL
 TOWN OF LEWISTON, N.Y.



LEAVE RISER MIN. 4'-0"
 ABOVE GRADE, TO BE SET
 TO FINAL ELEVATION WHEN FINAL
 LOT GRADING IS COMPLETED

CAST IRON GRATE INSTALLED
 AT FINAL GRADE ELEVATION
 AS SHOWN ON PLANS.
 MEENAH FOUNDRY
 MODEL R 4040
 WITH SETBACK LUGS

PROPOSED PERFORATED
 STORM DRAIN RISER
 (SIZE TO MATCH DRAIN PIPE)



PROPOSED H.D.P.E.
 STORM DRAIN PIPE
 (SIZE AS SHOWN ON PLANS)

FILTER FABRIC MATERIAL
 MIRAFI 140N OR EQUAL

COUPLING
 BANDS (TYP.)

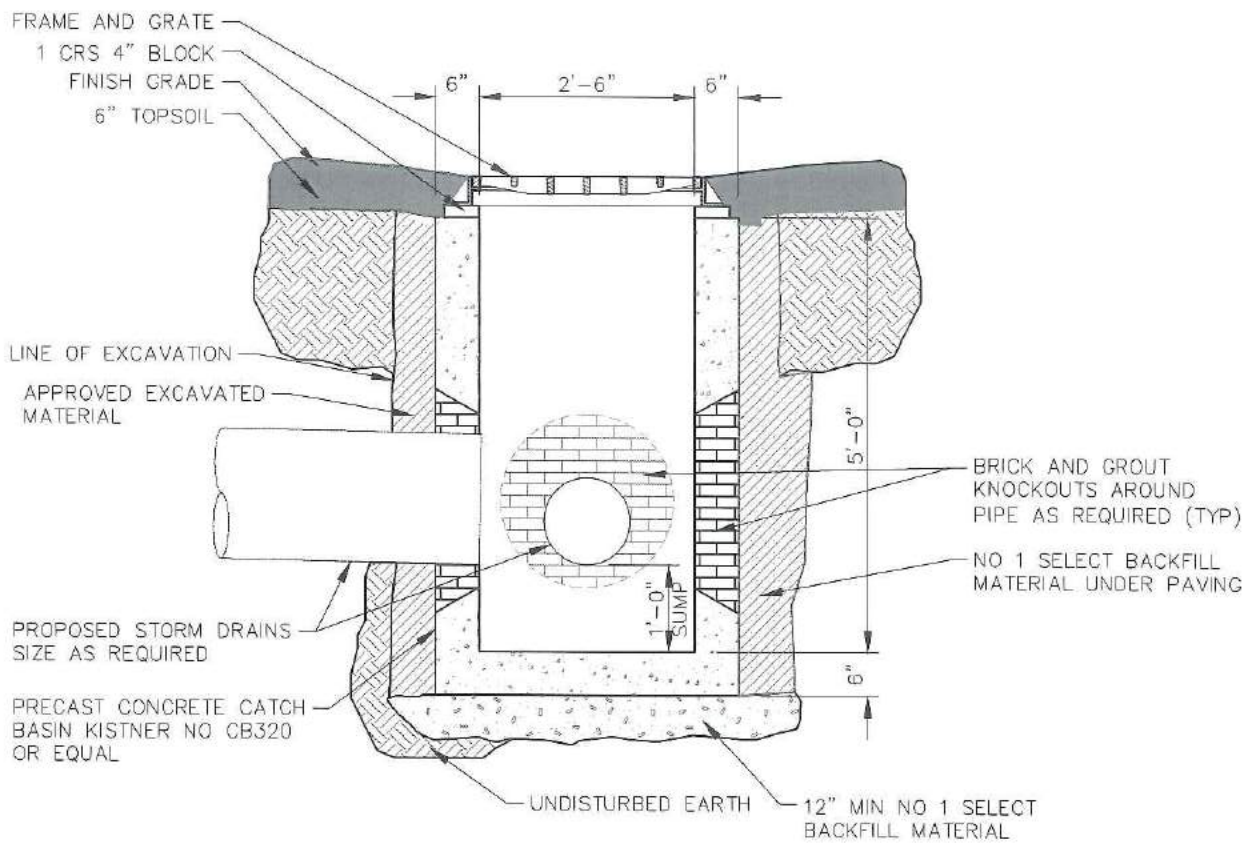
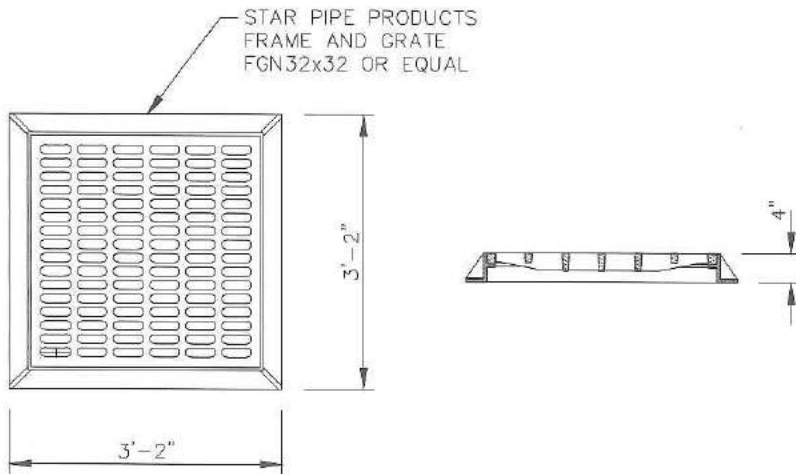
TEE (SIZE AS REQUIRED)

NOTE:

- 1.) DRAINAGE FABRIC TO BE INSTALLED FOR ENTIRE LENGTH OF DRAINAGE PIPE TRENCH.
- 2.) HDPE SMOOTH INTERIOR PERFORATED PIPE SHALL BE AN ACCEPTABLE PIPE MATERIAL.

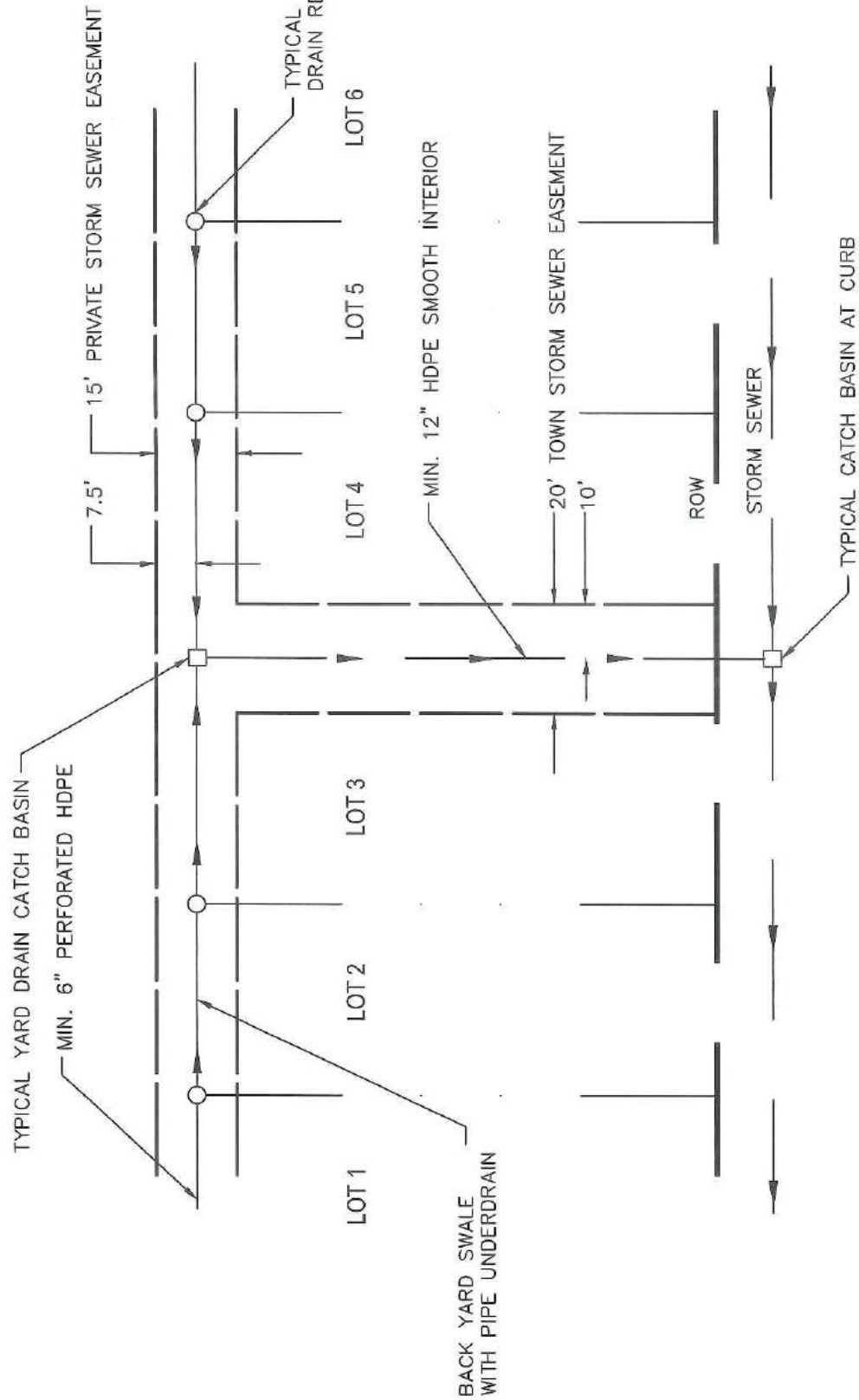
ST-06
 YARD DRAIN DETAIL
 TOWN OF LEWISTON, N.Y.





ST-07
TYPICAL REAR YARD
CATCH BASIN
TOWN OF LEWISTON, N.Y.

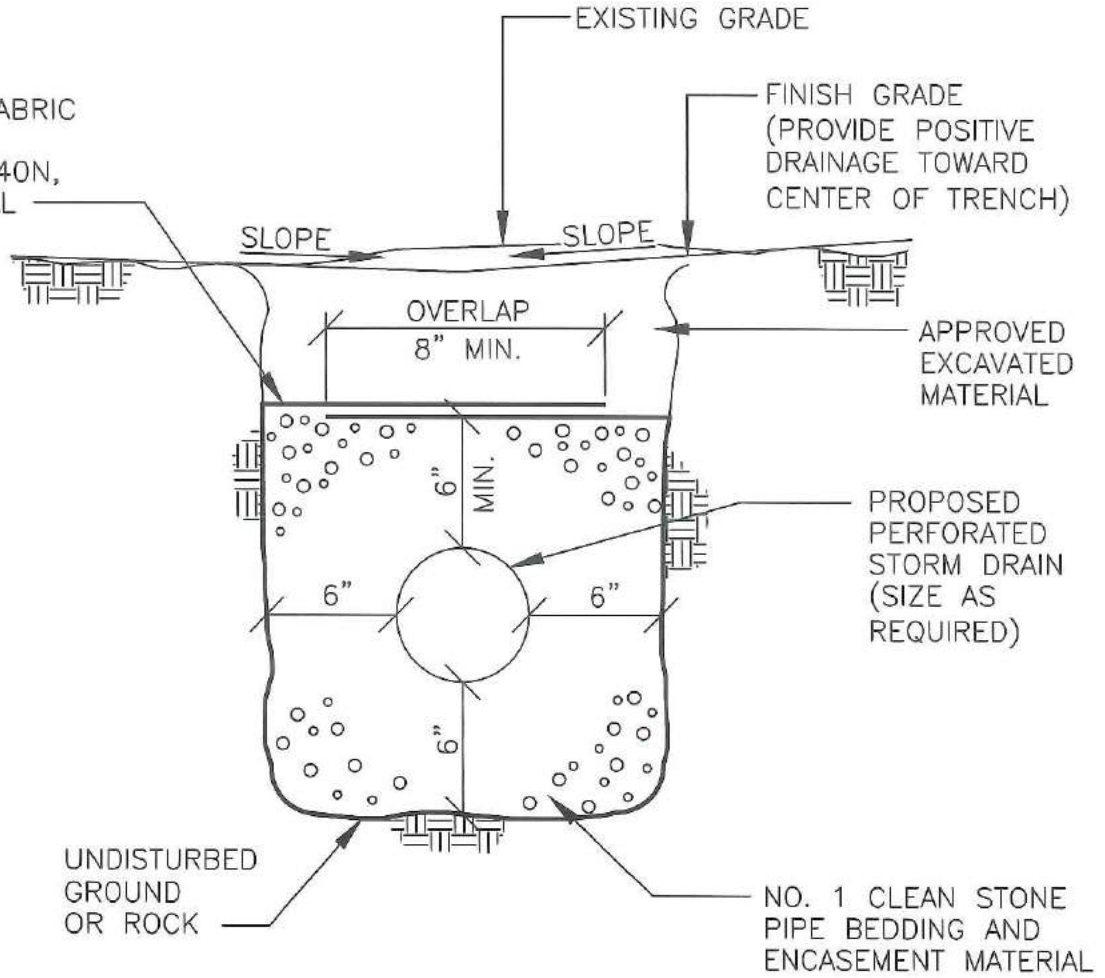




ST-08
 TYPICAL REAR YARD
 DRAINAGE LAYOUT
 TOWN OF LEWISTON, N.Y.

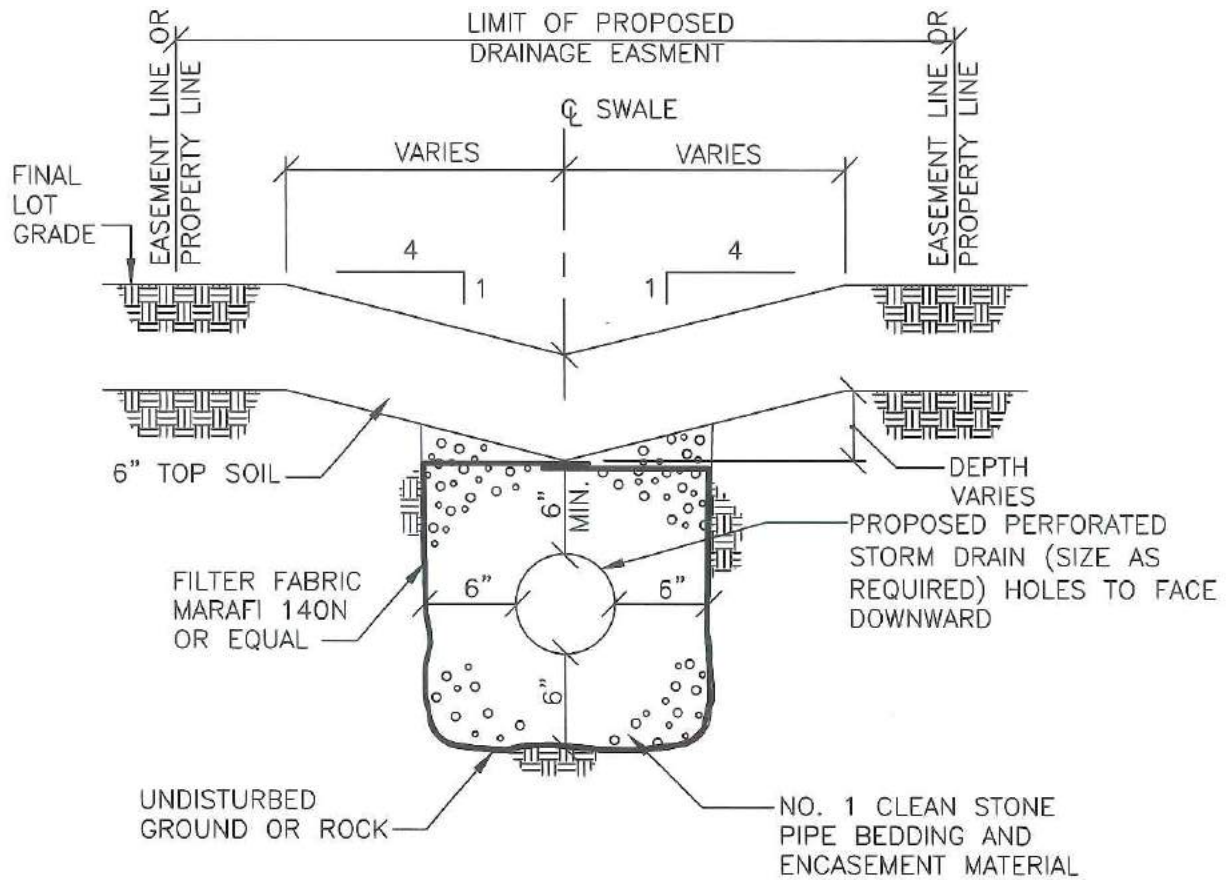


FILTER FABRIC MATERIAL
MIRAFI 140N,
OR EQUAL



ST-09
TYPICAL REAR YARD
STORM DRAIN TRENCH
TOWN OF LEWISTON, N.Y.





NOTES:

- 1.) ALL REAR YARD SWALES TO RECEIVE 6" OF TOPSOIL AND SEED BY HYDROSEEDING.
- 2.) ALL BACKYARD SWALES SHALL BE INSTALLED BY THE DEVELOPER AS PART OF THE STORM SEWER PUBLIC IMPROVEMENT PERMIT

ST-10
 BACKYARD SWALE WITH
 PIPE UNDERDRAIN DETAIL
 TOWN OF LEWISTON, N.Y.



DRILL OVERSIZE HOLE.
EXTEND BAR THROUGH
HOLE IN ORDER THAT
TRASH RACK CANNOT BE
REMOVED. (TYP FOR ALL
HORIZONTAL BARS)

BOTTOM OF BARS TO
BE FLUSH WITH INVERT
OF STRUCTURE

12"x12"x6'-0"
CONCRETE BLOCK

#4 BARS, WELDED,
TO FORM GRATE,
GALVANIZED COATED

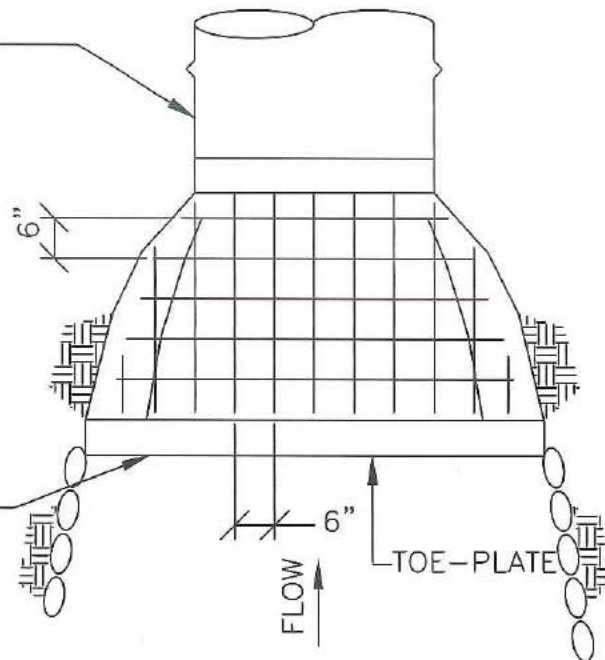
END
WINGWALL
STRUCTURE

TOE-PLATE

ELEVATION

PIPE (SIZE
AS REQUIRED)

12"x12"x6'-0"
CONCRETE BLOCK
UNDER TOE-PLATE

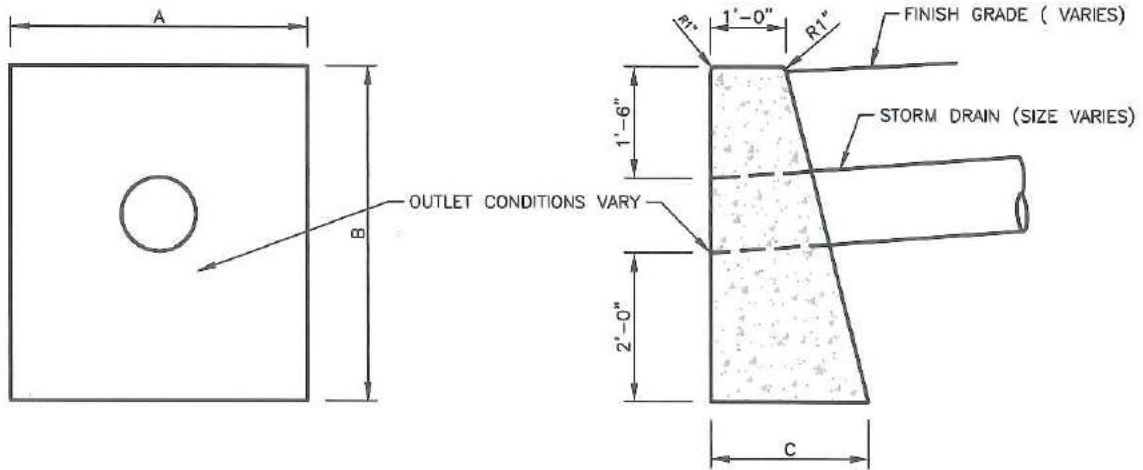


PLAN

NOTE:
TRASH RACK BARS ONLY TO BE
INSTALLED AT LOCATIONS WHERE
DIRECTED BY ENGINEER AND IF
PIPE SIZE 24"Ø AND LARGER.

ST-11
STORM DRAIN OUTLET
DETAIL
TOWN OF LEWISTON, N.Y.

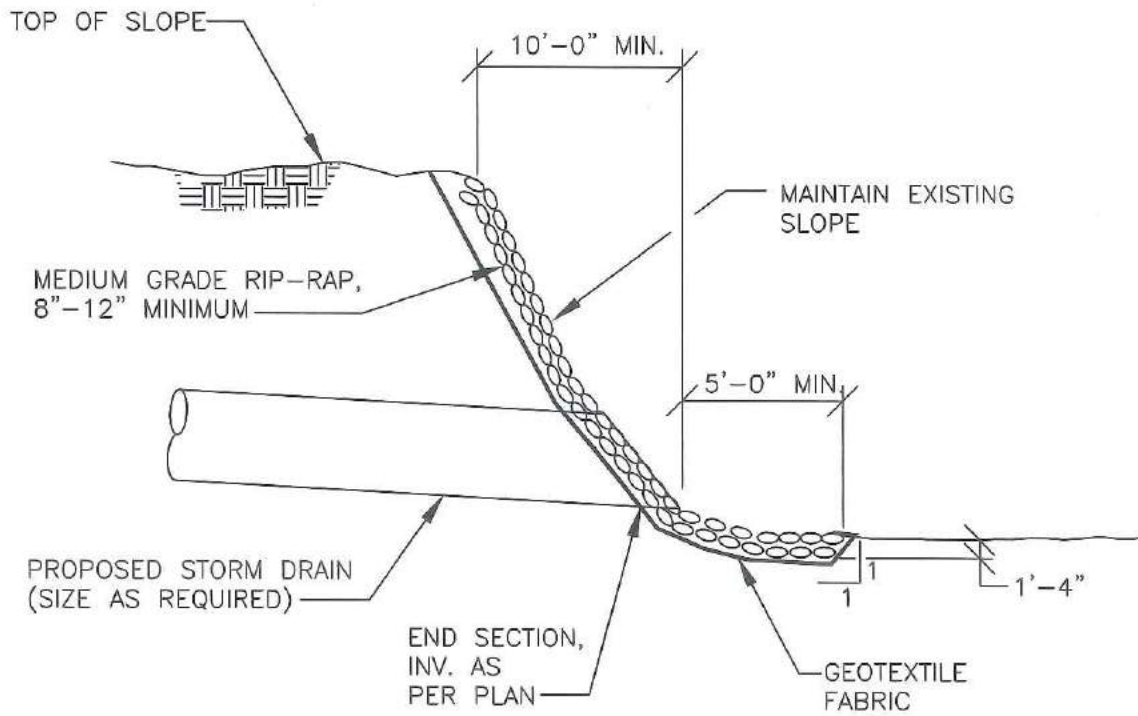




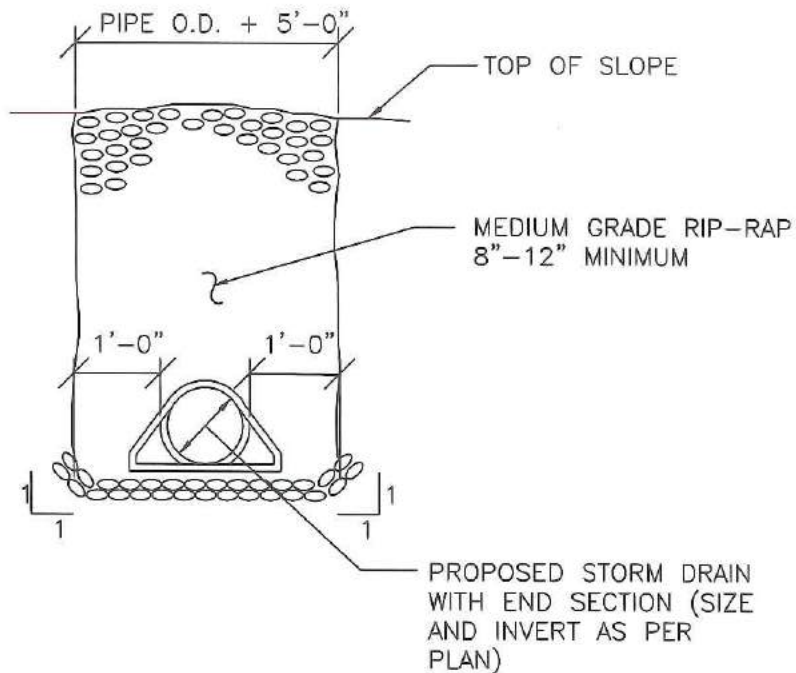
DIAMETER OF PIPE	DIMENSIONS OF HEADWALL			CUBIC YARDS OF CONCRETE
	A	B	C	
12"	4'-0"	4'-6"	2'-1 1/2"	1.04
18"	6'-0"	5'-0"	2'-3"	1.80
24"	8'-0"	5'-6"	2'-4 1/2"	2.70
30"	10'-0"	6'-0"	2'-6"	3.90
36"	12'-0"	6'-6"	2'-7 1/2"	5.20
42"	14'-0"	7'-0"	2'-9"	6.80
48"	16'-0"	7'-6"	2'-10 1/2"	8.60
54"	18'-0"	8'-0"	3'-0"	9.50
60"	20'-0"	8'-6"	3'-1 1/2"	12.90

ST-12
TYPICAL STORM DRAIN
OUTLET HEADWALL DETAIL
TOWN OF LEWISTON, N.Y.





SECTION



NOTE:
THIS DETAIL SHALL BE EMPLOYED AS DIRECTED BY THE TOWN OF LEWISTON

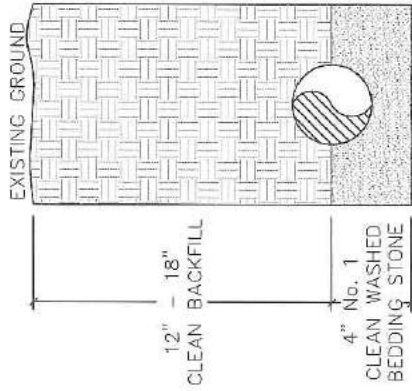
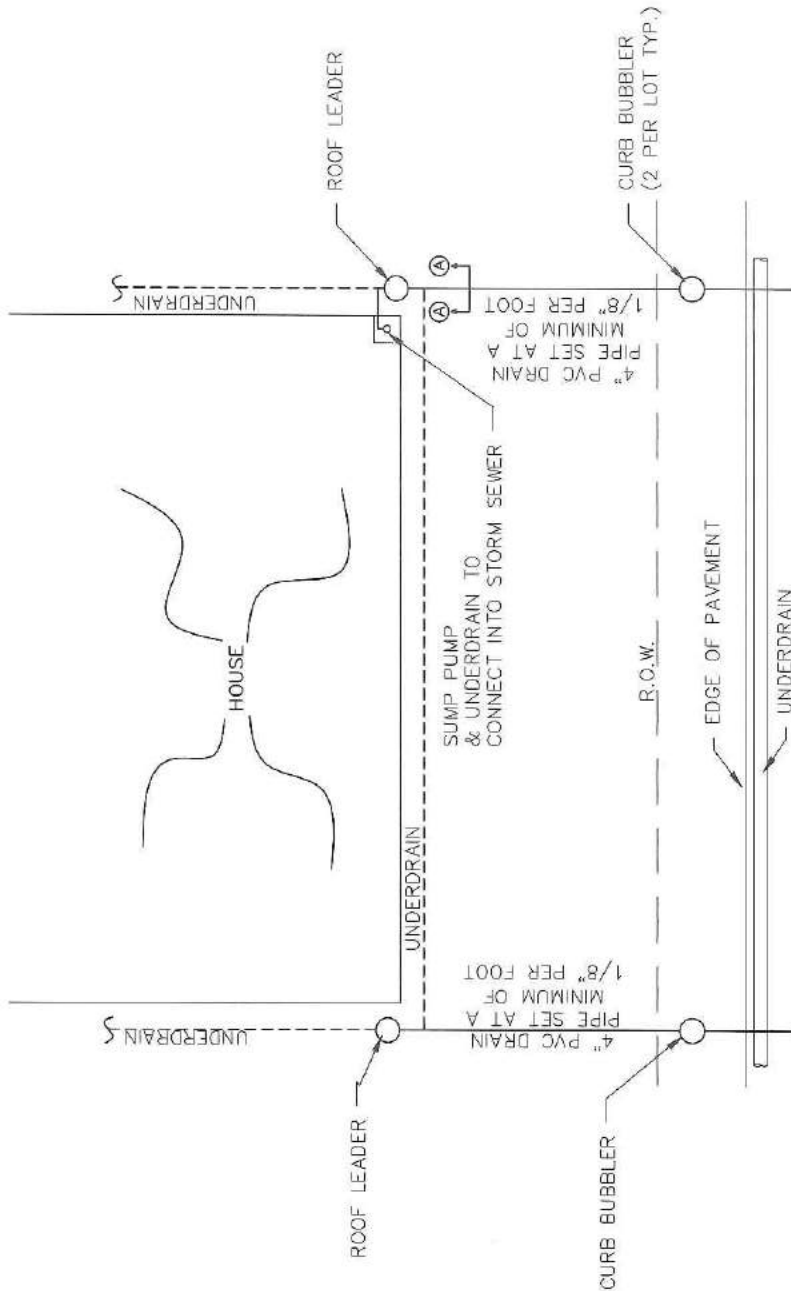
ST-13
STORM DRAIN OUTLET
RIP-RAP DETAIL
TOWN OF LEWISTON, N.Y.



INSPECTION REQUIRED

PLEASE CALL: 716-754-8213
 MONDAY - FRIDAY
 7:00am - 3:00pm

NOTE:
 1. 4" DRAIN PIPE SHOULD BE SET AT A
 MINIMUM OF 1/8" PER FOOT.



SECTION A-A

NOTE:

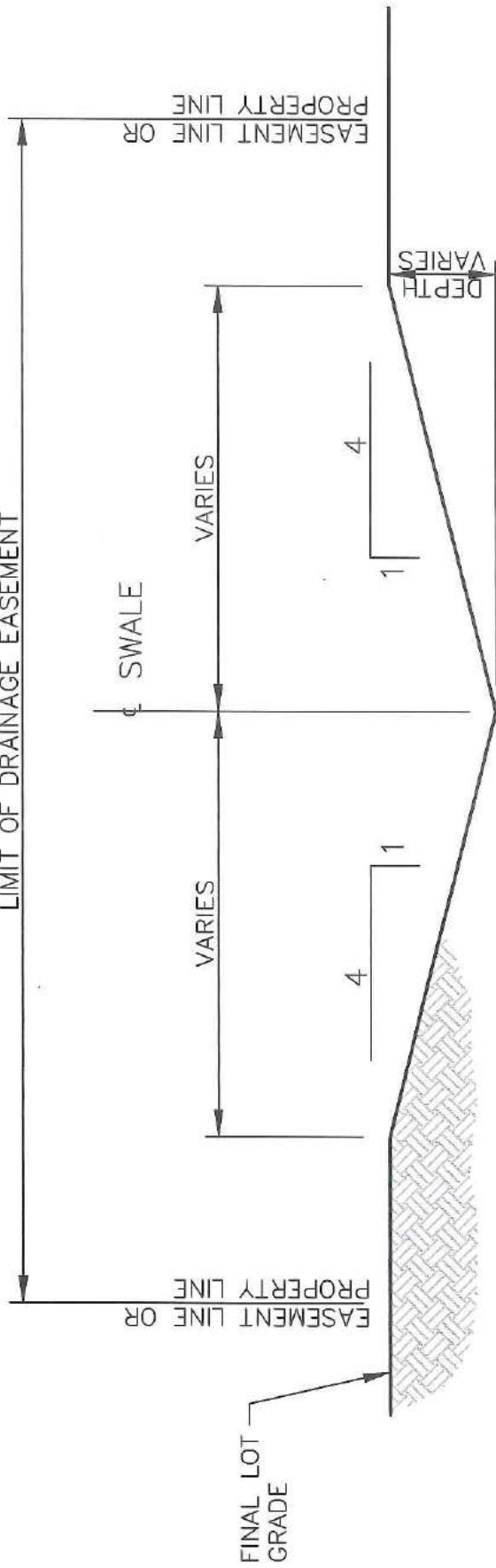
1. SEE ST-16 FOR DISCHARGE TO ROADSIDE DITCH

ST-14
RESIDENTIAL STORM SEWER
CONNECTION DETAIL
TOWN OF LEWISTON, N.Y.



NOVEMBER 2014

LIMIT OF DRAINAGE EASEMENT



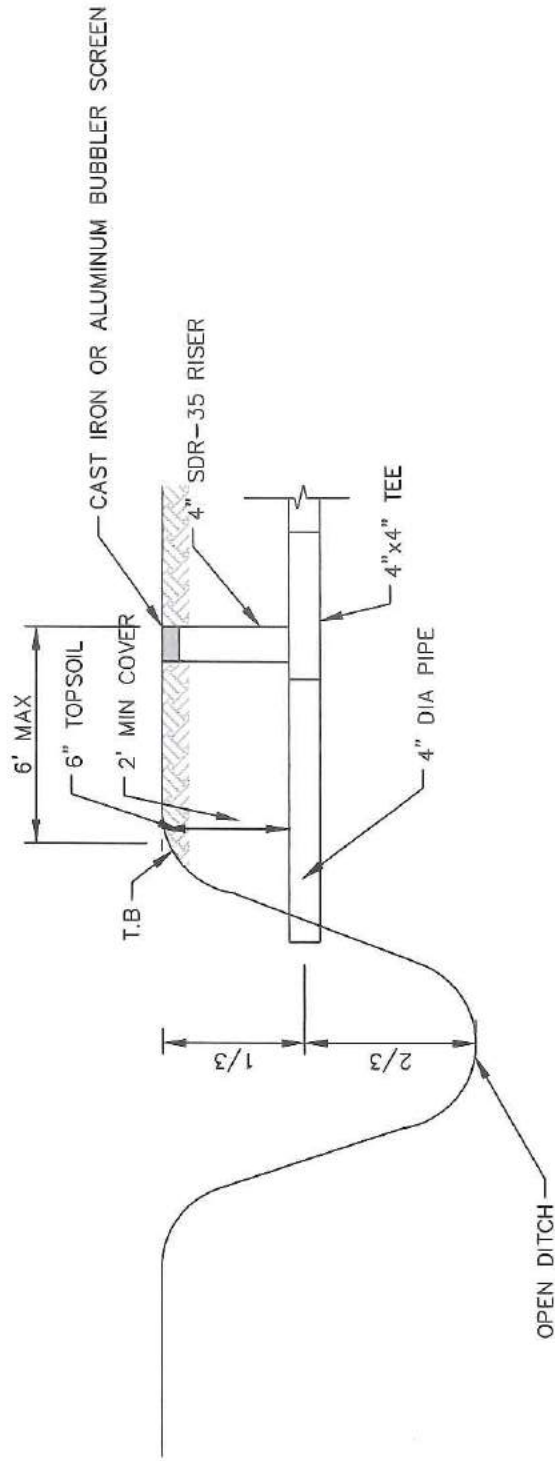
NOTES:

1. ALL REAR YARD SWALES TO RECEIVE 6" OF TOPSOIL AND SEED BY HYDROSEEDING.
2. ALL REAR YARD SWALES SHALL BE INSTALLED BY THE DEVELOPER AS PART OF THE STORM SEWER PUBLIC IMPROVEMENT PERMIT.
3. SWALES OVER 18" IN DEPTH MAY BE SUBJECT TO PIPING AS ORDERED BY THE ENGINEER.
4. FOR USE WHERE APPROVED BY TOWN ENGINEER ONLY.



NOVEMBER 2014

ST-15
TYPICAL DRAINAGE SWALE
DETAIL
TOWN OF LEWISTON, N.Y.



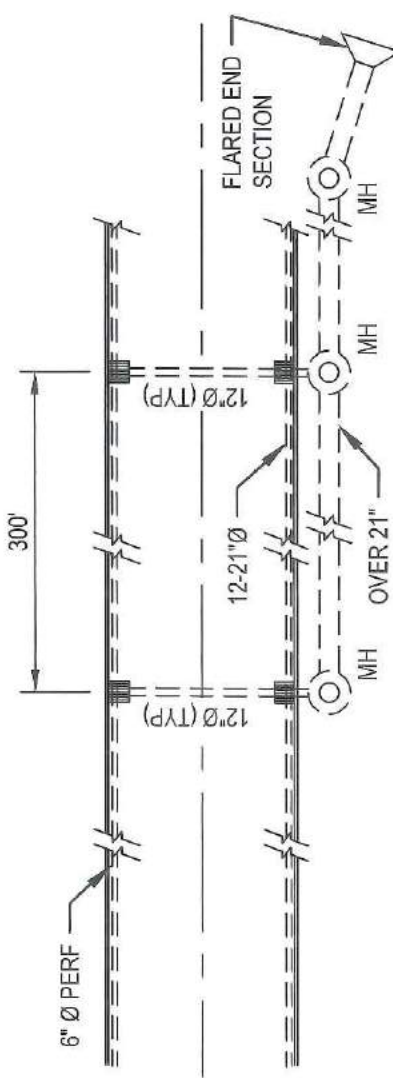
NOTE:

1. ALL PIPE SHALL BE SDR-35 WITH GLUED JOINTS AND CLEANED WITH PURPLE CLEANER.
2. THE PIPE ENTERING THE DITCH SHALL BE INSTALLED WITH IN THE TOP 1/3 OF THE DITCH AND HAVE A MINIMUM OF 18" OF COVER OVER THE PIPE.

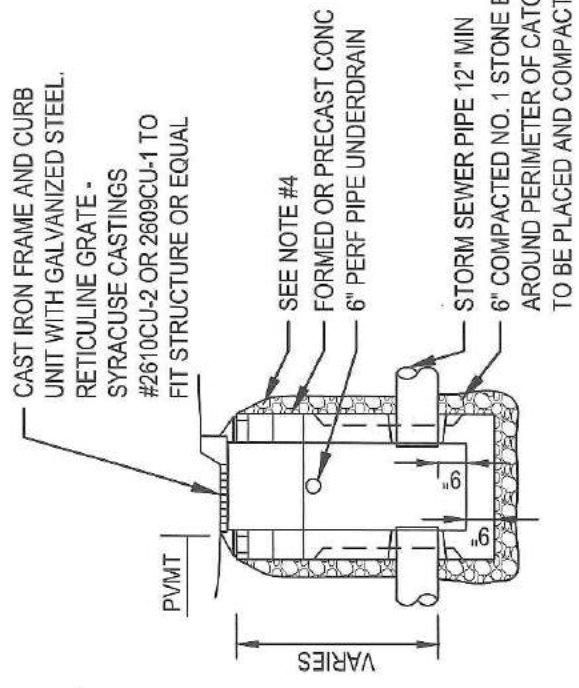
ST-16
 SWALE BUBBLER
 DETAIL
 TOWN OF LEWISTON, N.Y.



NOVEMBER 2014

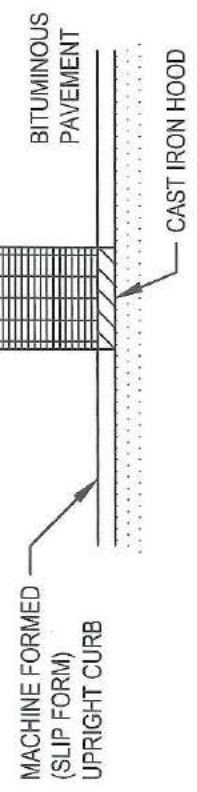


PLAN
NTS



UPRIGHT CURB - DROP INLET DETAIL
NTS

CAST IRON FRAME AND CURB UNIT WITH GALVANIZED STEEL.
RETICULINE GRATE-SYRACUSE CASTINGS #2610CU-2 OR 2609CU-1 TO FIT STRUCTURE OR EQUAL



UPRIGHT CURB - DROP INLET PLAN VIEW
NTS

NOTES:

1. MAXIMUM FRAME AND RIM ADJUSTMENT TO BE 12". SEE NOTE #4.
2. WALL THICKNESS FOR STRUCTURES TO BE 6".
3. ALL PIPES SHALL BE CUT FLUSH WITH INSIDE WALLS OF STRUCTURE.
4. FOR ADJUSTMENTS OVER 6" AND NOT TO EXCEED 12", A PRECAST CONCRETE ADJUSTMENT ELEMENT(S) MANUFACTURED IN ACCORDANCE WITH NYSDOT STANDARD SPECIFICATION NO. 706-04 SHALL BE USED. A MAXIMUM OF 2" OF MORTAR SHALL BE ALLOWED ON BOTH THE TOP AND BOTTOM OF THE PRECAST DEVICES. MORTAR SHALL BE MORTAR FOR CONCRETE MASONRY CONFORMING TO NYSDOT STANDARD SPECIFICATION NO. 705-21.
5. PRECAST CATCH BASIN TO BE 4000 PSI MINIMUM.

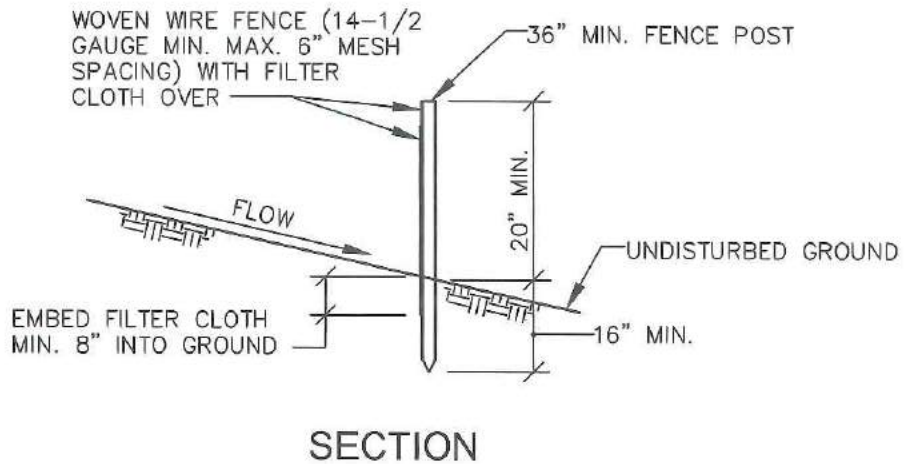
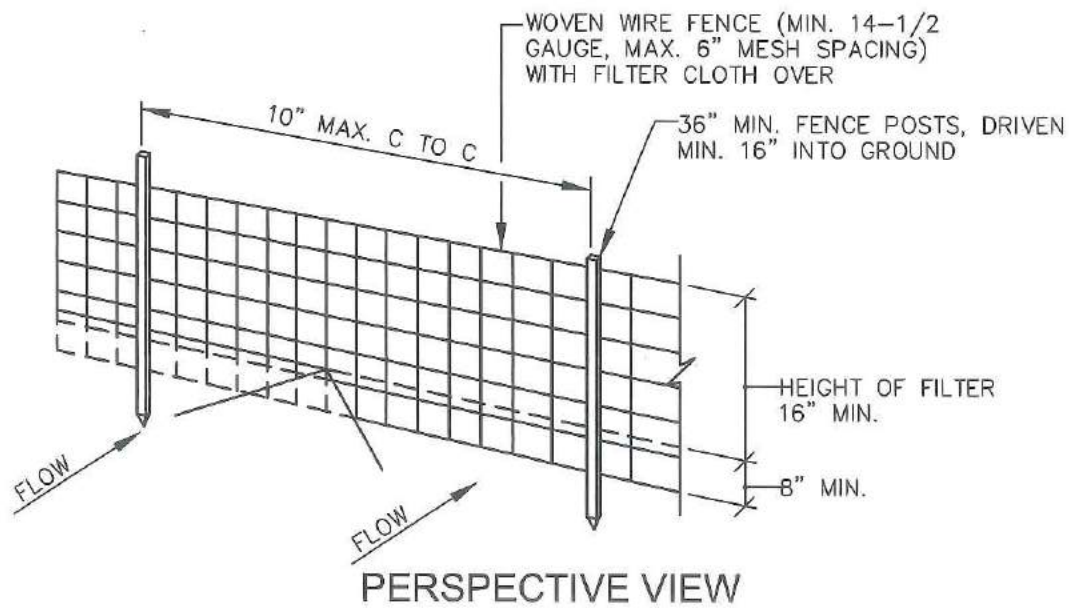
NOTE:

1. THERE SHALL BE NO JOINTS IN THE UPRIGHT CURB AND GUTTER DRAIN WITHIN (3) THREE FEET OF A CATCHBASIN



JANUARY 2018

ST-17
DROP INLET DETAILS
TOWN OF LEWISTON, N.Y.



CONSTRUCTION NOTES FOR FABRICATED SILT FENCE

- 1.) WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES.
- 2.) FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION.
- 3.) WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY SIX INCHES AND FOLDED.
- 4.) MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN BULGES DEVELOP IN THE SILT FENCE.

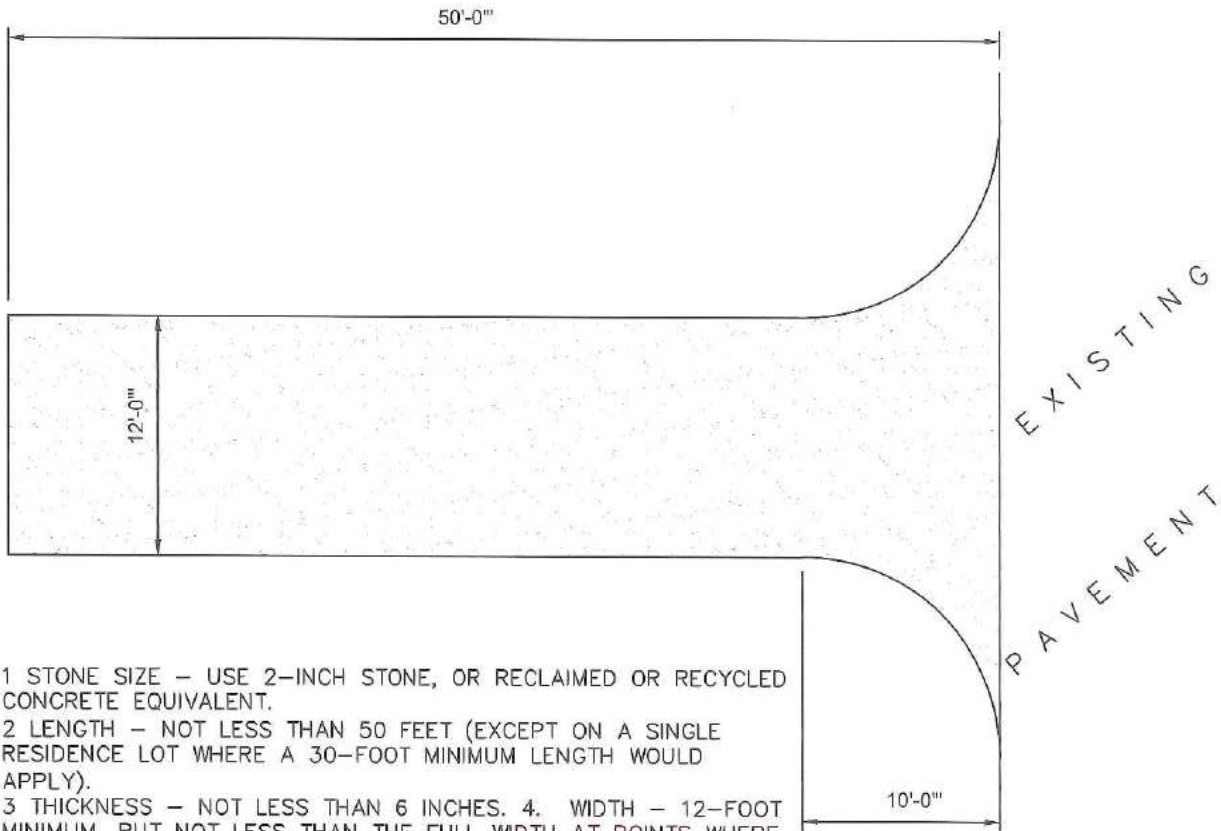
POSTS: Steel either T or U type or 2" hardwood.

FENCE: Woven wire, 14-1/2 Ga. 6" max. mesh opening.

FILTER CLOTH: Filter x, Mirafi 100x, Stabi-Linka T140N or approved equal.

PREFABRICATED UNIT: Geofab, Envirofence, or approved equal.

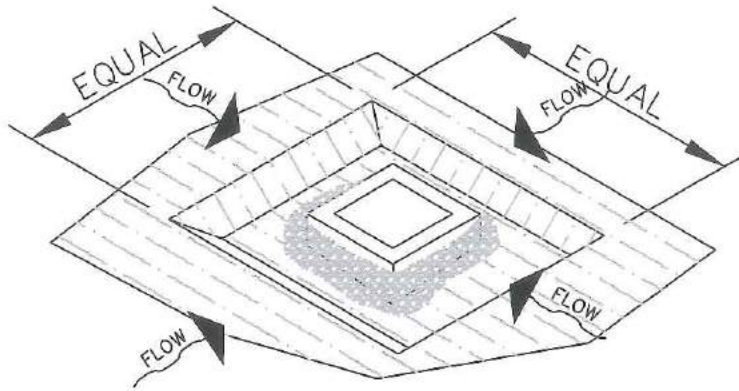




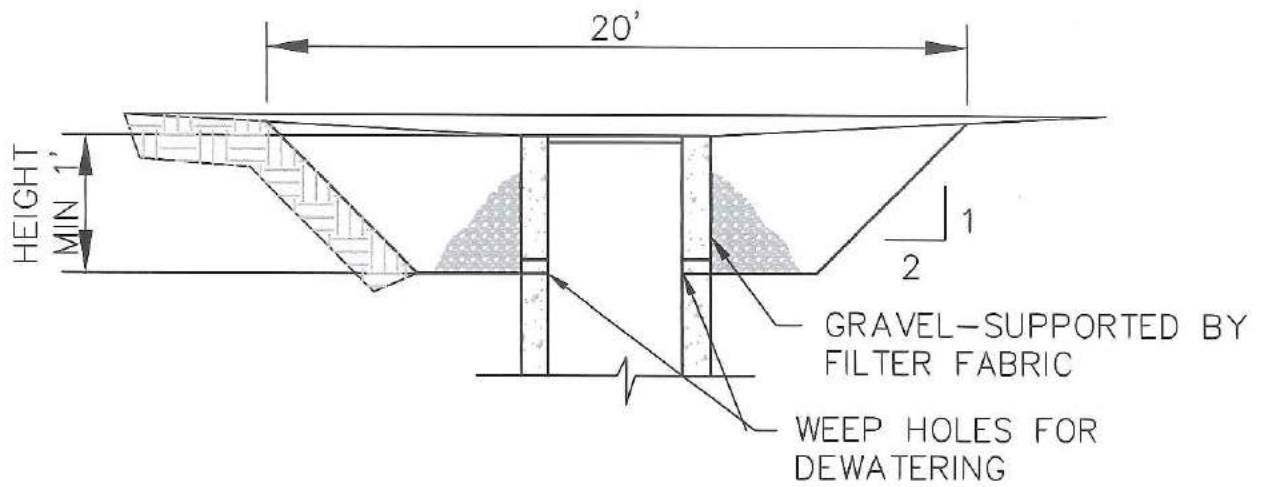
- 1 STONE SIZE – USE 2-INCH STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
- 2 LENGTH – NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30-FOOT MINIMUM LENGTH WOULD APPLY).
- 3 THICKNESS – NOT LESS THAN 6 INCHES. 4. WIDTH – 12-FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. 24-FOOT IF SINGLE ENTRANCE TO SITE.
- 4 FILTER CLOTH – WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
- 5 SURFACE WATER – ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
- 6 MAINTENANCE – THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACTED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
- 7 WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
- 8 PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

E-02
 STABILIZED CONSTRUCTION
 ENTRANCE DETAIL
 TOWN OF LEWISTON, N.Y.





PLAN

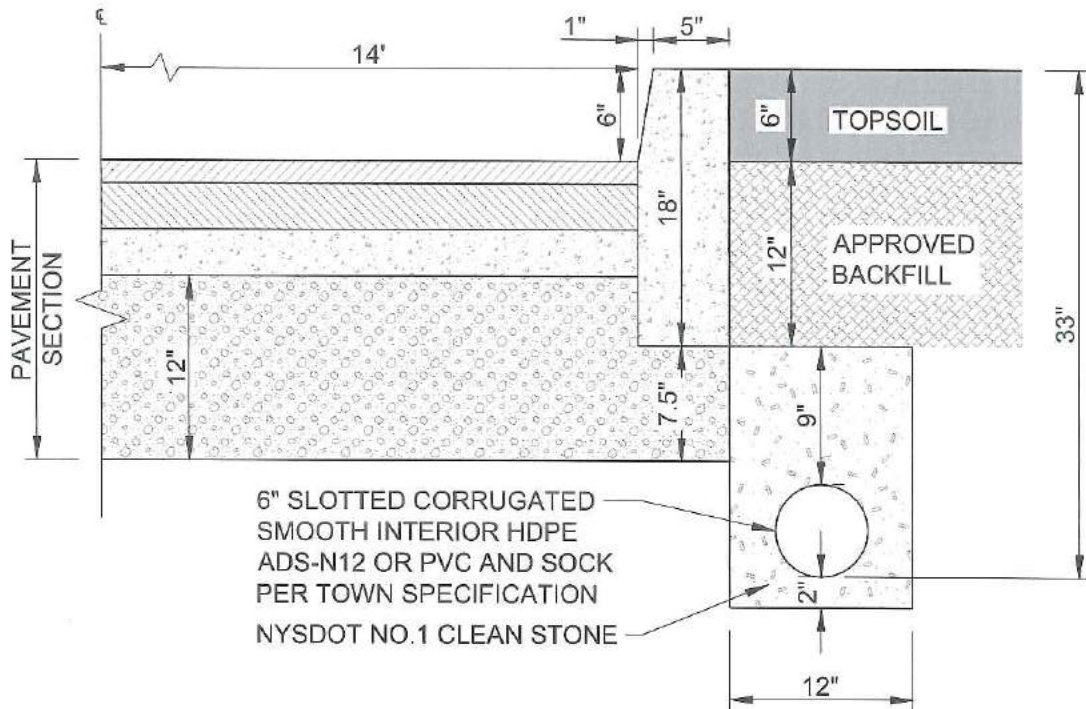


SECTION

E-03
CATCH BASIN
INLET PROTECTION
TOWN OF LEWISTON, N.Y.



Pavement, Curb, and Sidewalk Details



6" SLOTTED CORRUGATED
SMOOTH INTERIOR HDPE
ADS-N12 OR PVC AND SOCK
PER TOWN SPECIFICATION
NYSDOT NO.1 CLEAN STONE

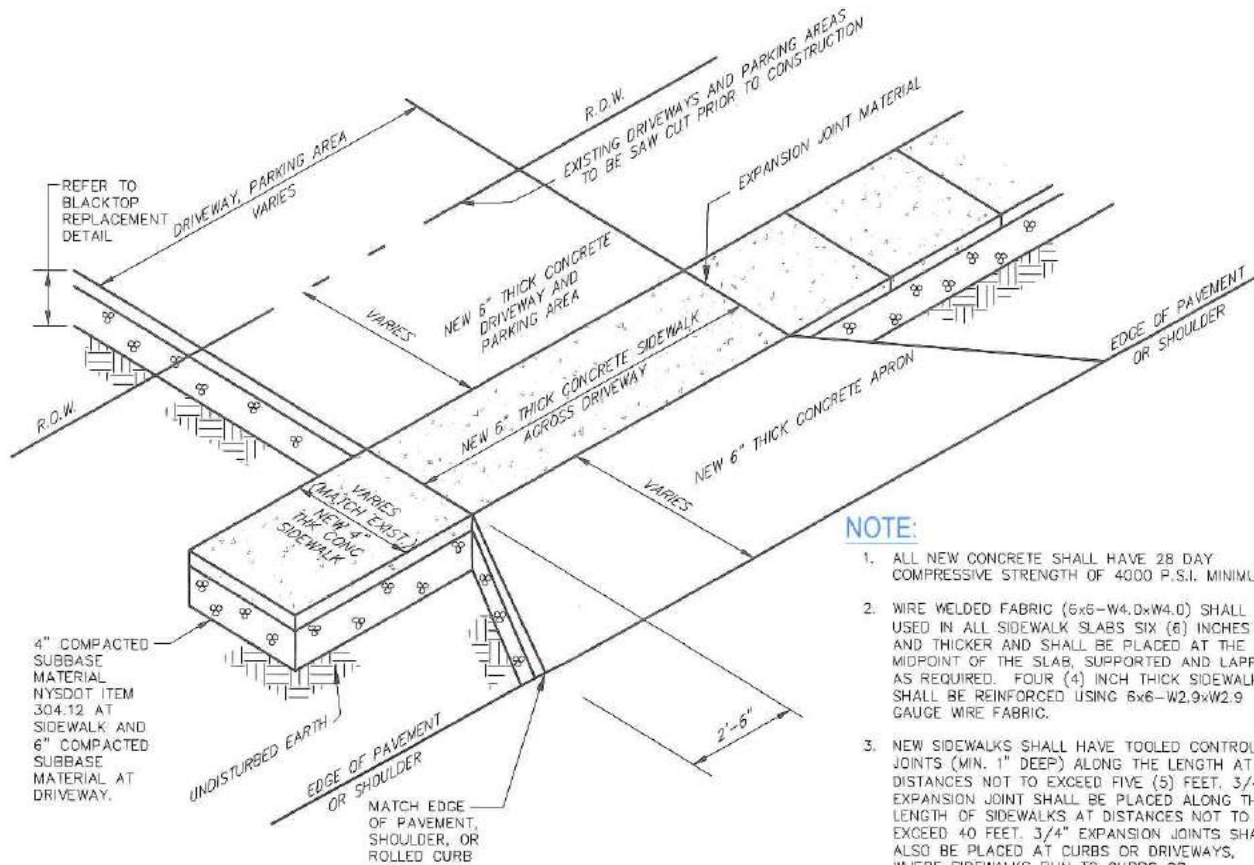
NOTES:

1. FORMED UPRIGHT CONCRETE CURB SHALL BE 4,000 PSI MIX (28 DAY)
2. PROVIDE FINE BROOM FINISH TO EXPOSED PORTION OF CONCRETE CURB



DECEMBER 2017

P-01
6" UPRIGHT CURB
DETAIL
TOWN OF LEWISTON, N.Y.



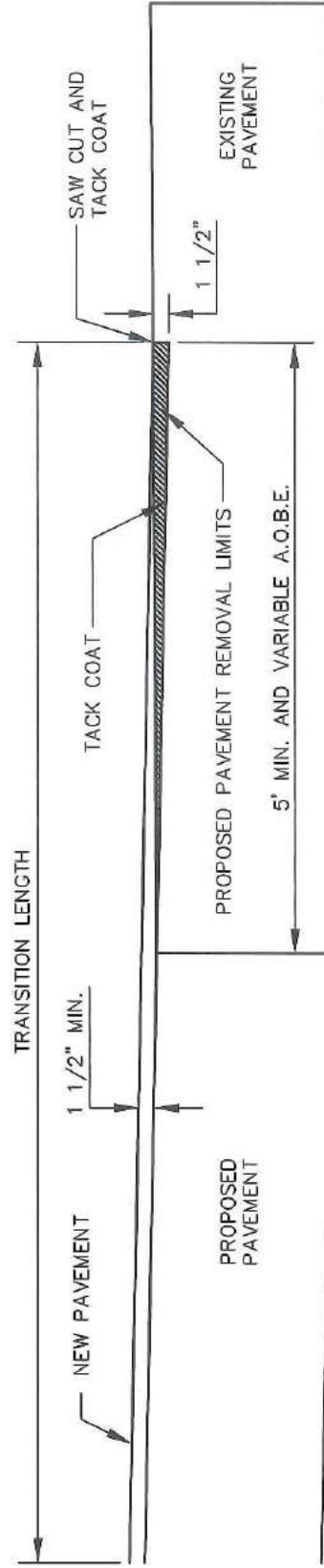
NOTE:

1. ALL NEW CONCRETE SHALL HAVE 28 DAY COMPRESSIVE STRENGTH OF 4000 P.S.I. MINIMUM.
2. WIRE WELDED FABRIC (6x6-W4.0xW4.0) SHALL BE USED IN ALL SIDEWALK SLABS SIX (6) INCHES AND THICKER AND SHALL BE PLACED AT THE MIDPOINT OF THE SLAB, SUPPORTED AND LAPPED AS REQUIRED. FOUR (4) INCH THICK SIDEWALKS SHALL BE REINFORCED USING 6x6-W2.9xW2.9 GAUGE WIRE FABRIC.
3. NEW SIDEWALKS SHALL HAVE TOOLED CONTROL JOINTS (MIN. 1" DEEP) ALONG THE LENGTH AT DISTANCES NOT TO EXCEED FIVE (5) FEET. 3/4" EXPANSION JOINT SHALL BE PLACED ALONG THE LENGTH OF SIDEWALKS AT DISTANCES NOT TO EXCEED 40 FEET. 3/4" EXPANSION JOINTS SHALL ALSO BE PLACED AT CURBS OR DRIVEWAYS, WHERE SIDEWALKS RUN TO CURBS OR DRIVEWAYS.
4. ALL NEW CONCRETE TO RECEIVE MEDIUM BROOM FINISH AND APPLICATION OF CURING AND ANTI-SPALLING COMPOUND, SONNEBORNE BUILDING PRODUCTS OR APPROVED EQUAL.
5. A MINIMUM CROSS GRADIENT OF 1/4" PER FOOT TOWARDS THE STORM WATER CONVEYANCE SYSTEM SHALL BE MAINTAINED THROUGHOUT.

P-02

**CONCRETE SIDEWALK, DRIVEWAY, PARKING
AREA AND APRON REPLACEMENT DETAIL
TOWN OF LEWISTON, N.Y.**

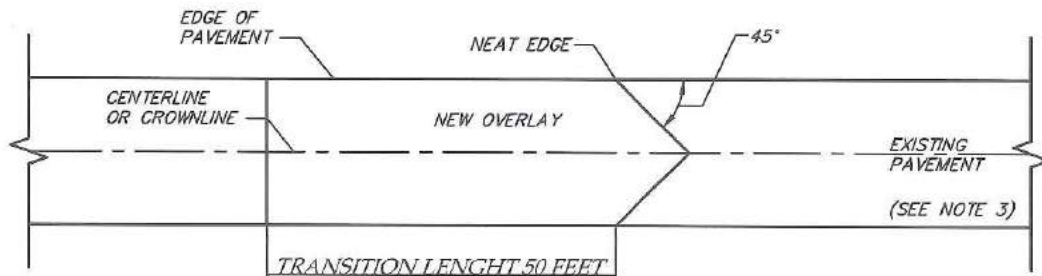




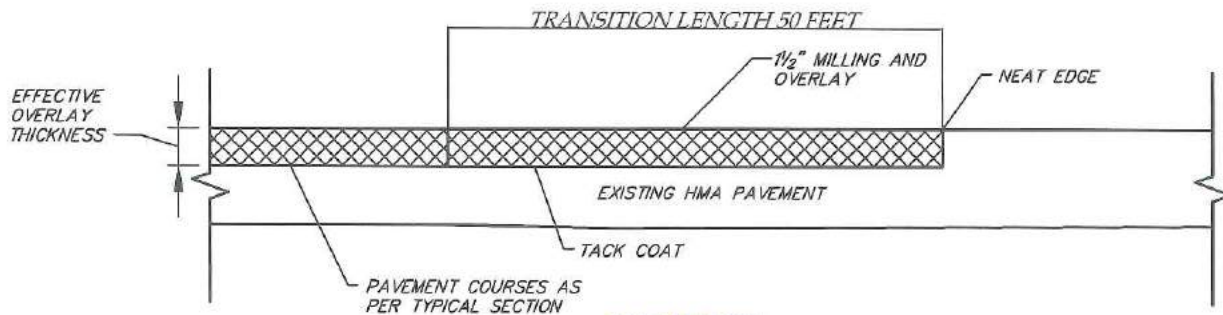
P-03
 BUTT JOINT FOR ASPHALT
 CONCRETE TRANSITIONS
 TOWN OF LEWISTON, N.Y.



NOVEMBER 2014



PLAN



ELEVATION

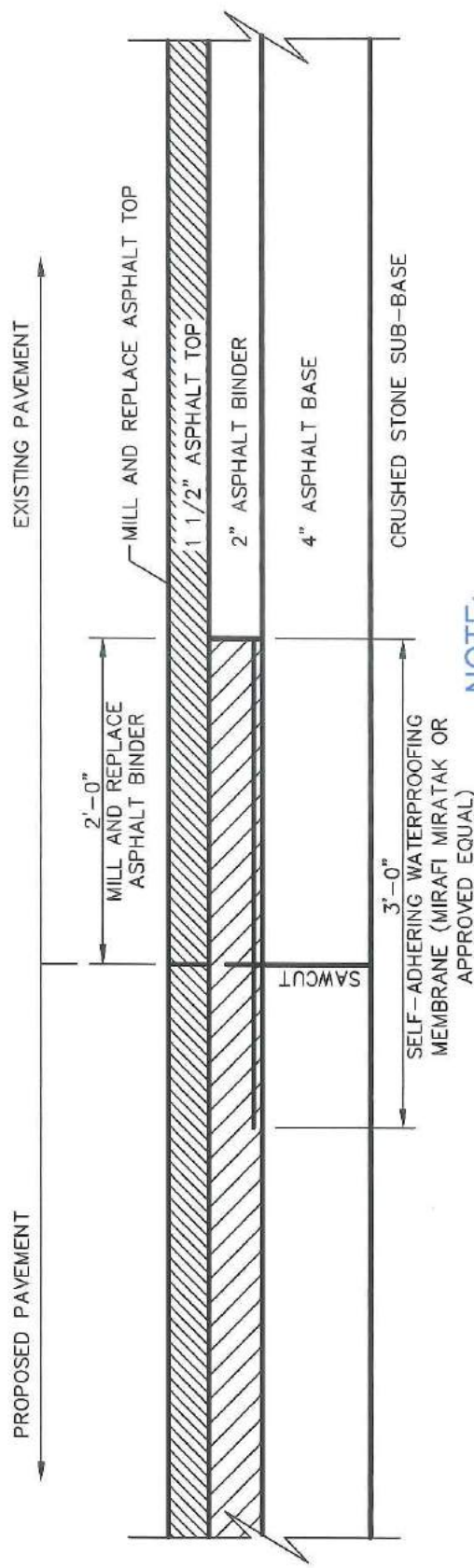
NOTES:

1. HOT MIX ASPHALT OVERLAY (HMA) SPLICES SHALL BE USED AT: ENDS OF HMA OVERLAY HIGHWAY SECTIONS, MAJOR INTERSECTION, AND OTHER LOCATIONS INDICATED ON PLANS.
2. ALL SURFACES OF THE HMA OVERLAY SPLICE TRANSITION AREA SHALL BE CLEANED AND TACK COATED PRIOR TO HMA PLACEMENT. THE COST OF MILLING REBATES, AND TACK COST IN THE HMA OVERLAY SPLICE TRANSITION AREA SHALL BE PAID FOR UNDER THEIR RESPECTIVE ITEMS. COST OF LEAVING A NEAT EDGE SHALL BE INCLUDED IN THE MILLING ITEM.
3. SAW CUTS SHALL BE MADE SO THAT SURFACE RUNOFF IS DIRECTED TO THE EDGE OF PAVEMENT

HOT MIX ASPHALT OVERLAY SPLICE DETAIL

NOT TO SCALE





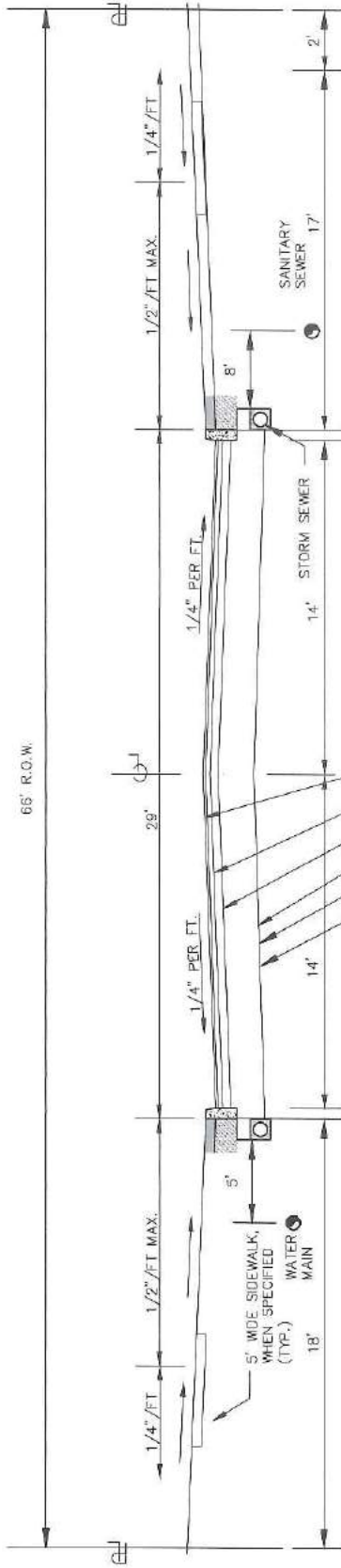
NOTE:

THE PROPOSED JOINT MEMBRANE SHALL BE INSTALLED IN ACCORDANCE WITH THE MINIMUM REQUIREMENTS OF THE MANUFACTURER. ASPHALT TACK COAT SHALL BE APPLIED TO ALL MILLED AND CUT SURFACES PRIOR TO REPLACEMENT OF ASPHALT MATERIALS. LIQUID ASPHALT SHALL ALSO BE APPLIED TO THE FINISHED SURFACE JOINT.

P-05
 JOINT MILLING DETAIL
 TOWN OF LEWISTON, N.Y.



NOVEMBER 2014



NOTE:

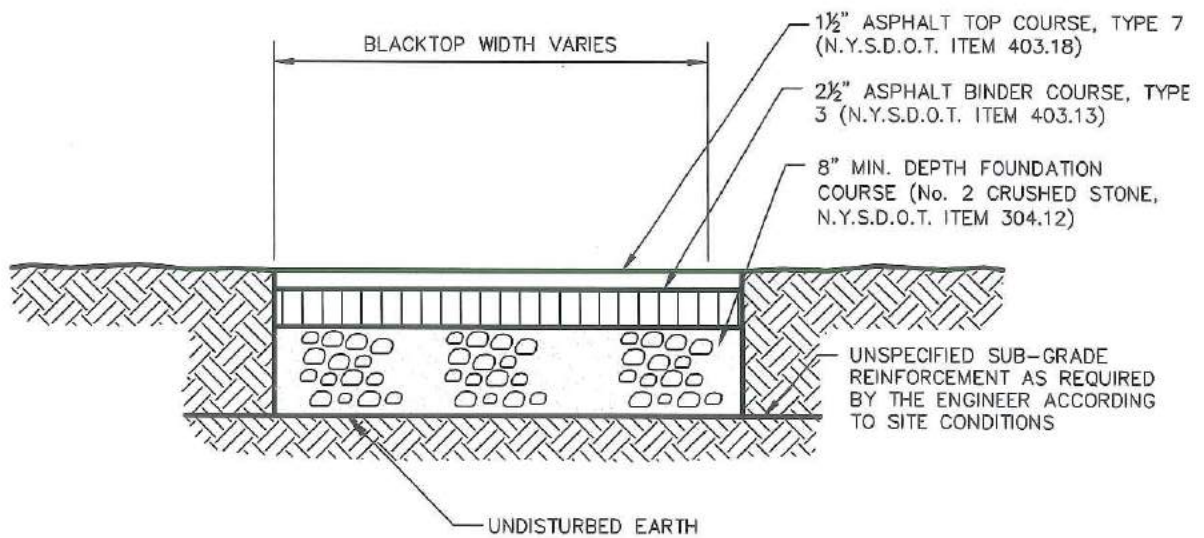
1. SEE CURB DETAIL.
2. SEE PAVEMENT SECTION DETAIL.
3. FIRE HYDRANTS SHALL BE LOCATED ADJACENT TO THE WATER MAIN. NO PARKING IS ALLOWED ON THE "HYDRANT" SIDE OF THE STREET. CONTRACTOR SHALL COORDINATE WITH THE HIGHWAY SUPERINTENDENT FOR NUMBER AND LOCATION OF NO PARKING SIGNS. CONTRACTOR SHALL PROVIDE AND INSTALL THE REQUIRED NUMBER OF SIGNS.
4. THE CONTRACTOR SHALL PERFORM NUCLEAR DENSITY TESTING ON THE ROADWAY BASE.

- 1 1/2" ASPHALT CONCRETE - TYPE 7 F2 TOP COURSE (HIGH FRICTION) NYS DOT ITEM No. 403.198202
- 2" ASPHALT CONCRETE - TYPE 3 BINDER COURSE NYS DOT ITEM No. 403.138902
- 4" ASPHALT CONCRETE - TYPE 1 BASE COURSE NYS DOT ITEM No. 403.118902
- 12" SUBBASE COURSE No. 2 R.O.C. STONE NYS DOT ITEM No. 304.12
- GEOTEXTILE FABRIC, MIRIFI 600X OR EQUAL
- UNSPECIFIED SUB-GRADE REINFORCEMENT AS REQUIRED BY THE ENGINEER ACCORDING TO SITE CONDITIONS



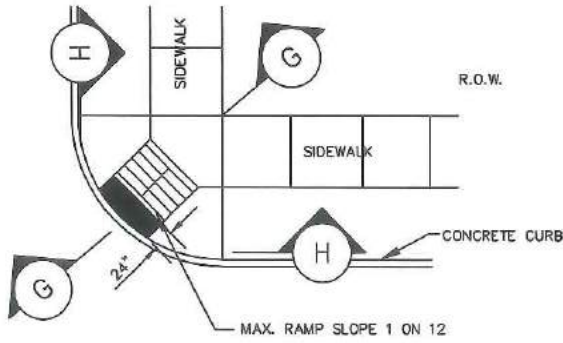
JANUARY 2018

P-06
NEW TOWN (LOCAL)
ROAD SECTION
TOWN OF LEWISTON, N.Y.

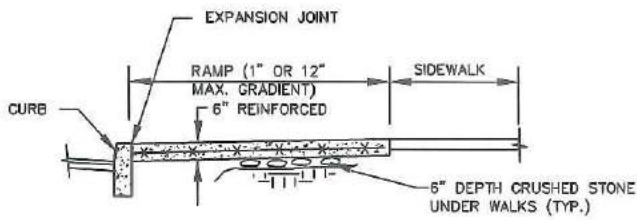


P-07
 ASPHALT DRIVEWAY, PARKING AREA
 AND APRON REPLACEMENT DETAIL
 TOWN OF LEWISTON, N.Y.

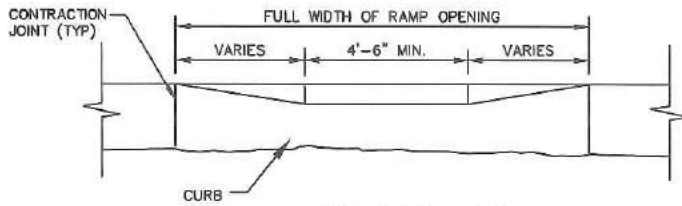




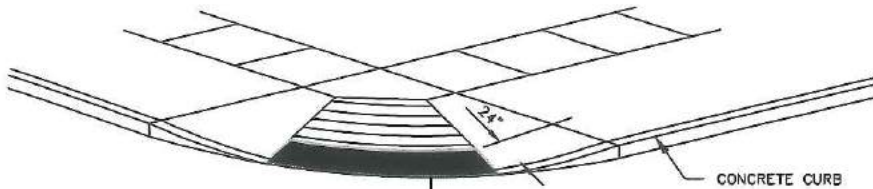
PLAN VIEW



SECTION G



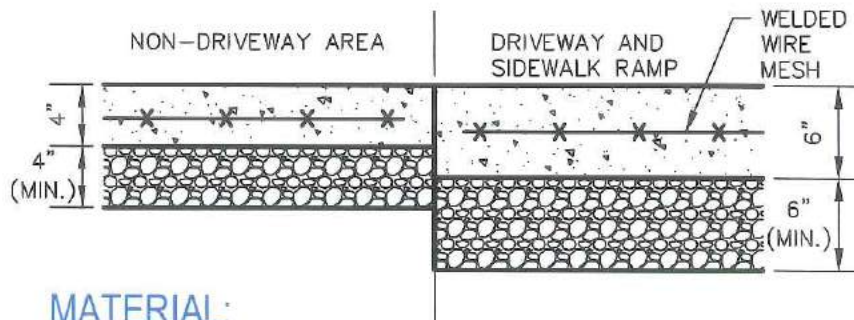
SECTION H



NOTE:

APPROVED TRUNCATED DOME PATTERN DETECTABLE WARNING SURFACE, ADA TITLE III, 28 CFR PART 36, APPENDIX A, SECTION 4.29.2. WARNING SURFACE SHALL ALSO PROVIDE A LIGHT-ON-DARK OR DARK-ON-LIGHT VISUAL CONTRAST WITH THE CONCRETE WALK SURFACE. THIS REQUIREMENT IS TYPICAL OF ALL RAMP. THE WARNING SURFACE SHALL BE FULL WIDTH OF THE RAMP AND 24" IN DEPTH. COLOR SHALL BE DARK GRAY (FEDERAL COLOR No. 36118). MATERIAL SHALL BE VITRIFIED POLYMER COMPOSITE AS MANUFACTURED BY ARMOR-TILE FOR CAST-IN-PLACE INSTALLATION OR APPROVED EQUAL.



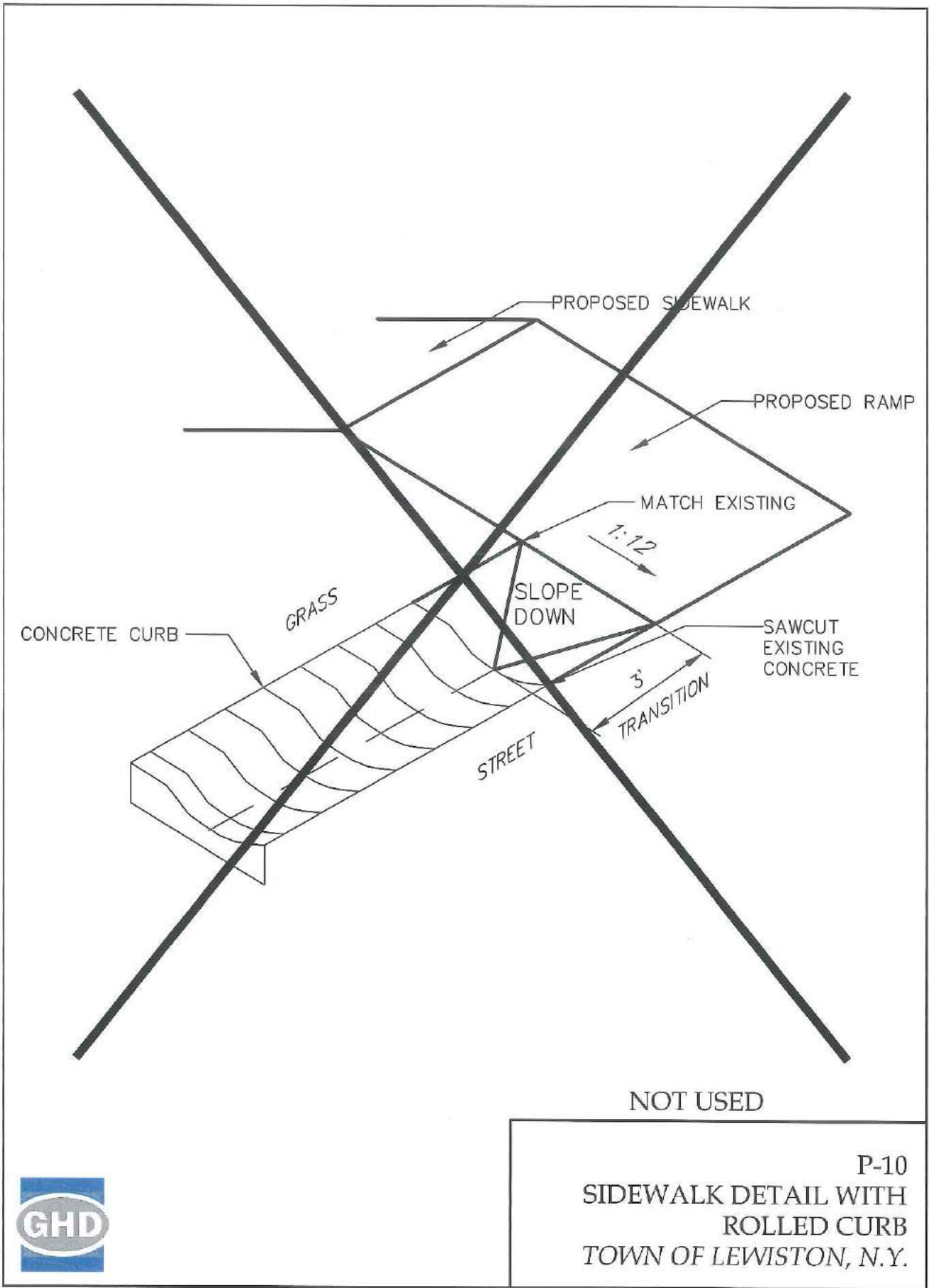


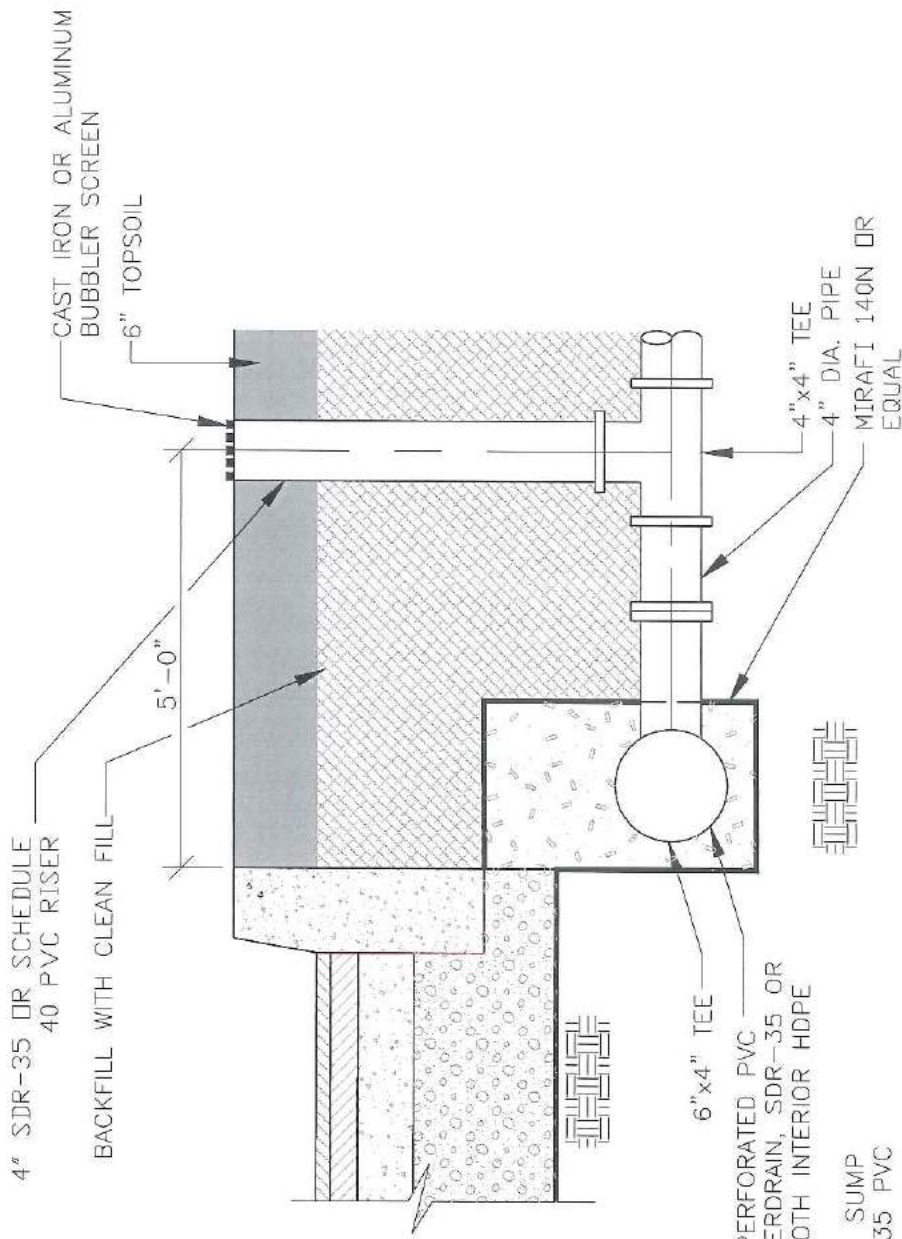
MATERIAL:

1. BEDDING – COMPACTED SELECT MATERIAL, NYSDOT ITEM 304.12
2. CONCRETE – 4,000 PSI (MIN. 28 DAY COMPRESSIVE STRENGTH)
3. WELDED WIRE MESH – 6x6-W4.0xW4.0 (DRIVEWAY)
6x6-W2.9xW2.9 (NON-DRIVEWAY)

P-09
 SIDEWALK DETAIL
 TOWN OF LEWISTON, N.Y.







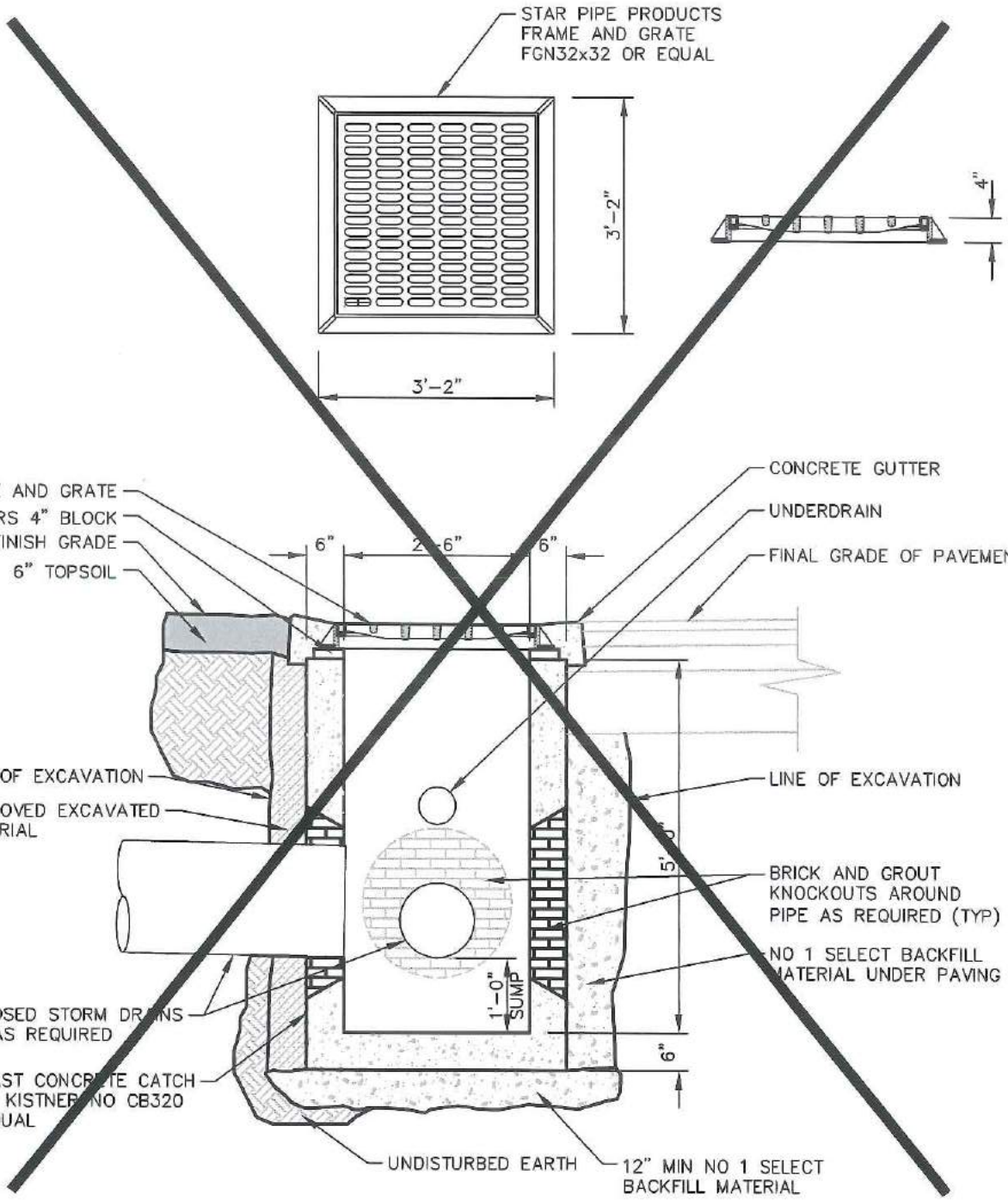
NOTES:

- 1.) BUILDING DOWNSPOUTS AND SUMP DRAINS SHALL BE 4" SDR-35 PVC OR 4" SCHEDULE 40 PVC.
- 2.) ALL PVC FITTINGS TO BE SOLVENT WELDED.
- 2.) TWO (2) BUBBLERS PER LOT ARE REQUIRED.

P-11
CURB BUBBLER DETAIL

TOWN OF LEWISTON, N.Y.

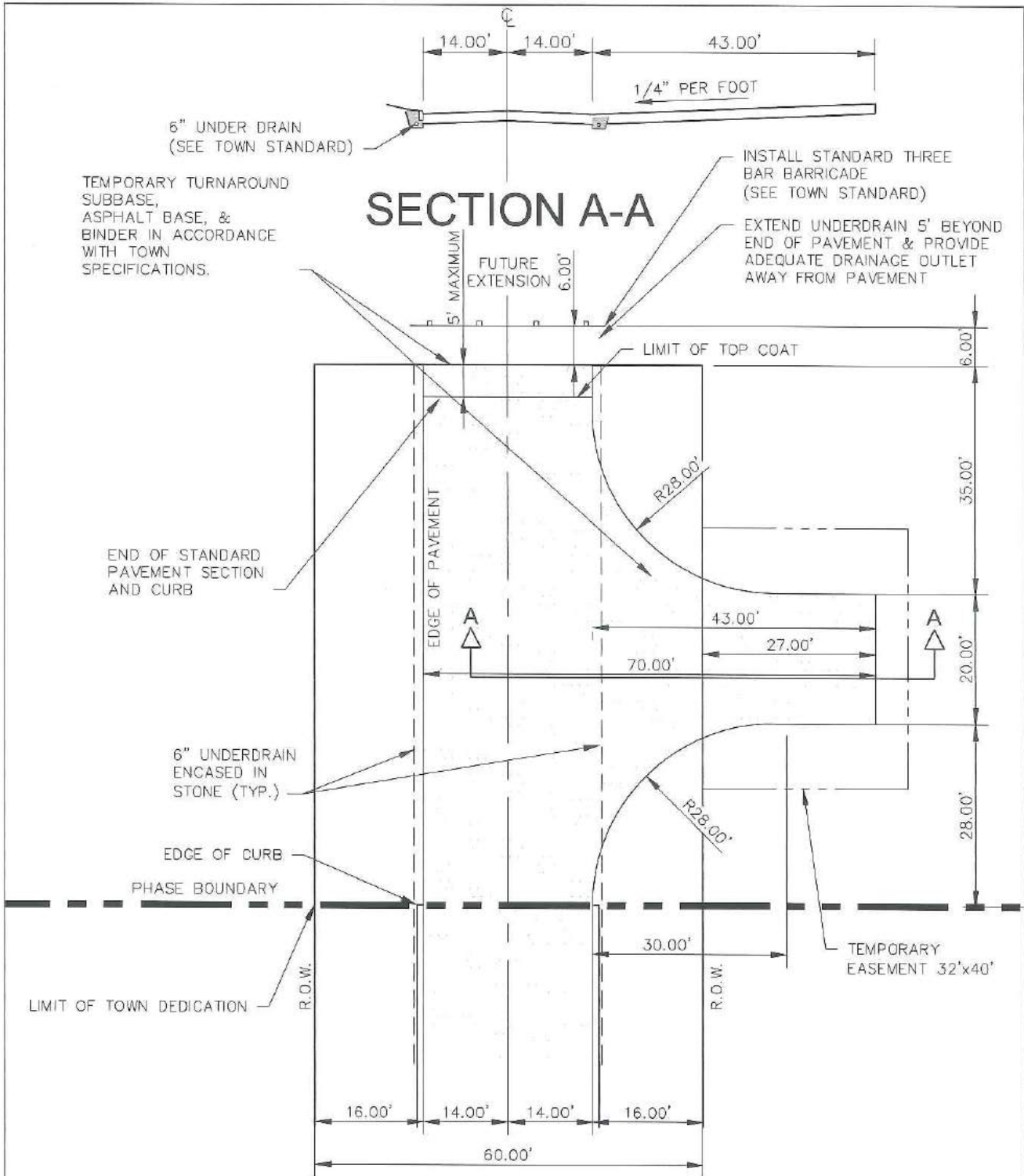




NOT USED

P-12
 TYPICAL CATCH BASIN
 AT CURB DETAIL
 TOWN OF LEWISTON, N.Y.





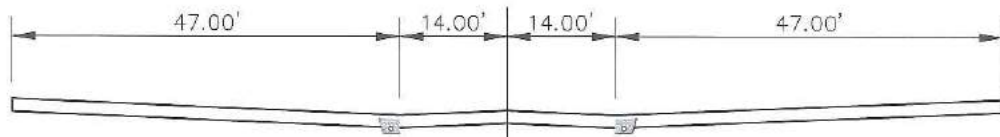
PLAN

IF THE PROJECT IS PHASED THE FOLLOWINGS SERVICES SHALL BE INSTALLED BEYOND THE PHASE BOUNDARY TO THE LIMIT OF THE THREE BAR BARRICADE

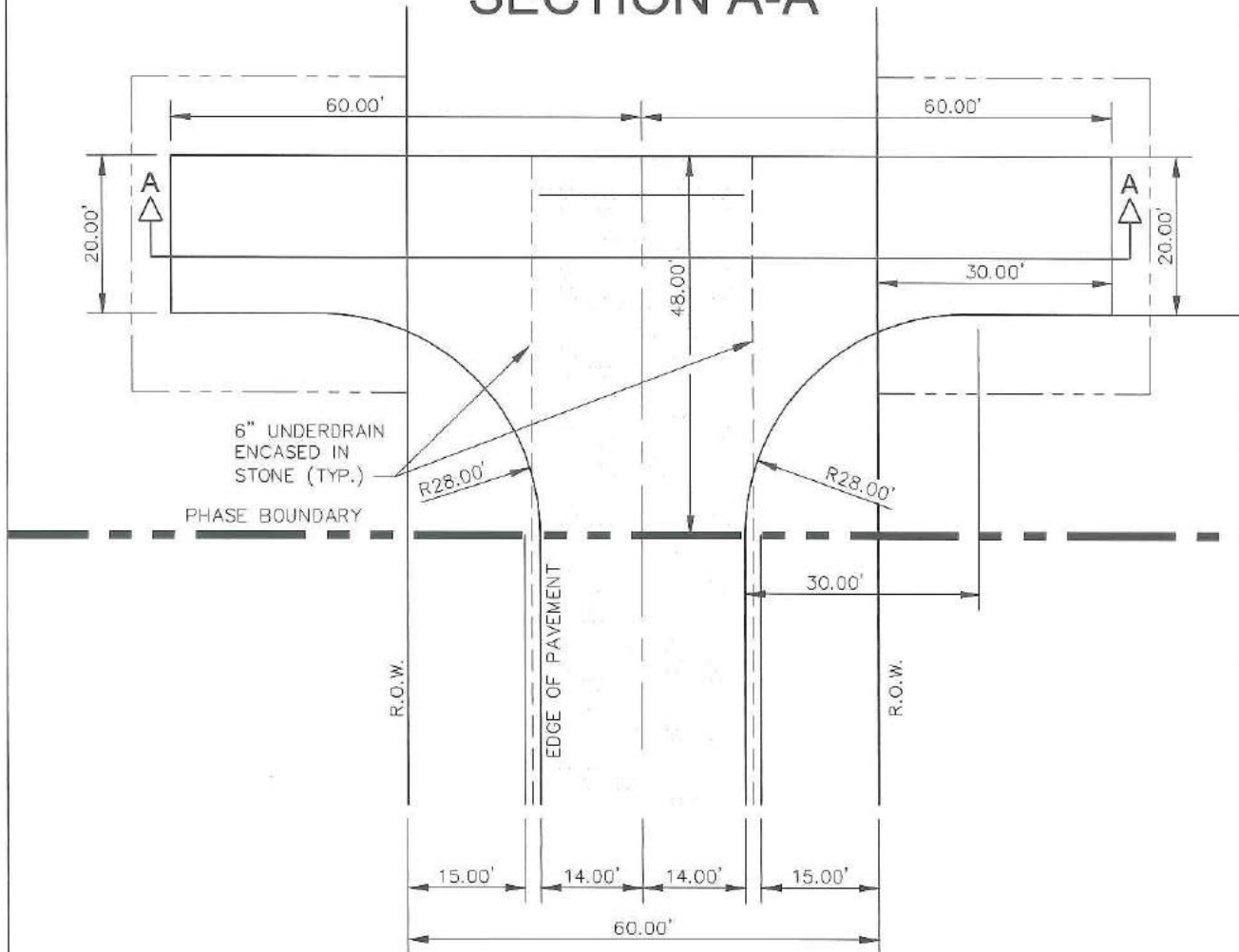
1. SANITARY SEWER SERVICE
2. CURB BUBBLERS
3. STORM SEWER SYSTEM



P-13 ALTERNATE 1
TEMPORARY TURNAROUND
DETAIL
TOWN OF LEWISTON, N.Y.



SECTION A-A

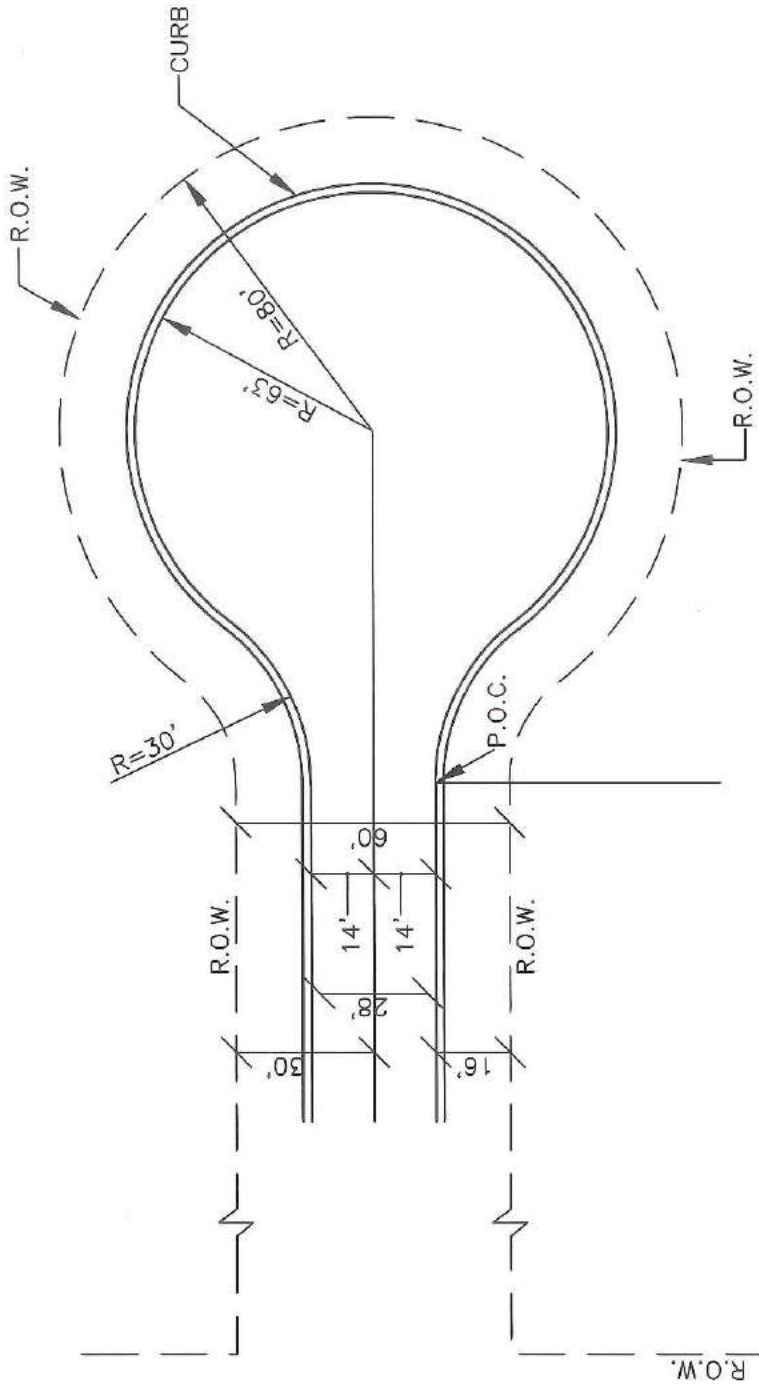


PLAN

- IF THE PROJECT IS PHASED THE FOLLOWINGS SERVICES SHALL BE INSTALLED BEYOND THE PHASE BOUNDARY TO THE LIMIT OF THE THREE BAR BARRICADE
1. SANITARY SEWER SERVICE
 2. CURB BUBBLERS
 3. STORM SEWER SYSTEM



P-13 ALTERNATE 2
 TEMPORARY TURNAROUND
 DETAIL
 TOWN OF LEWISTON, N.Y.

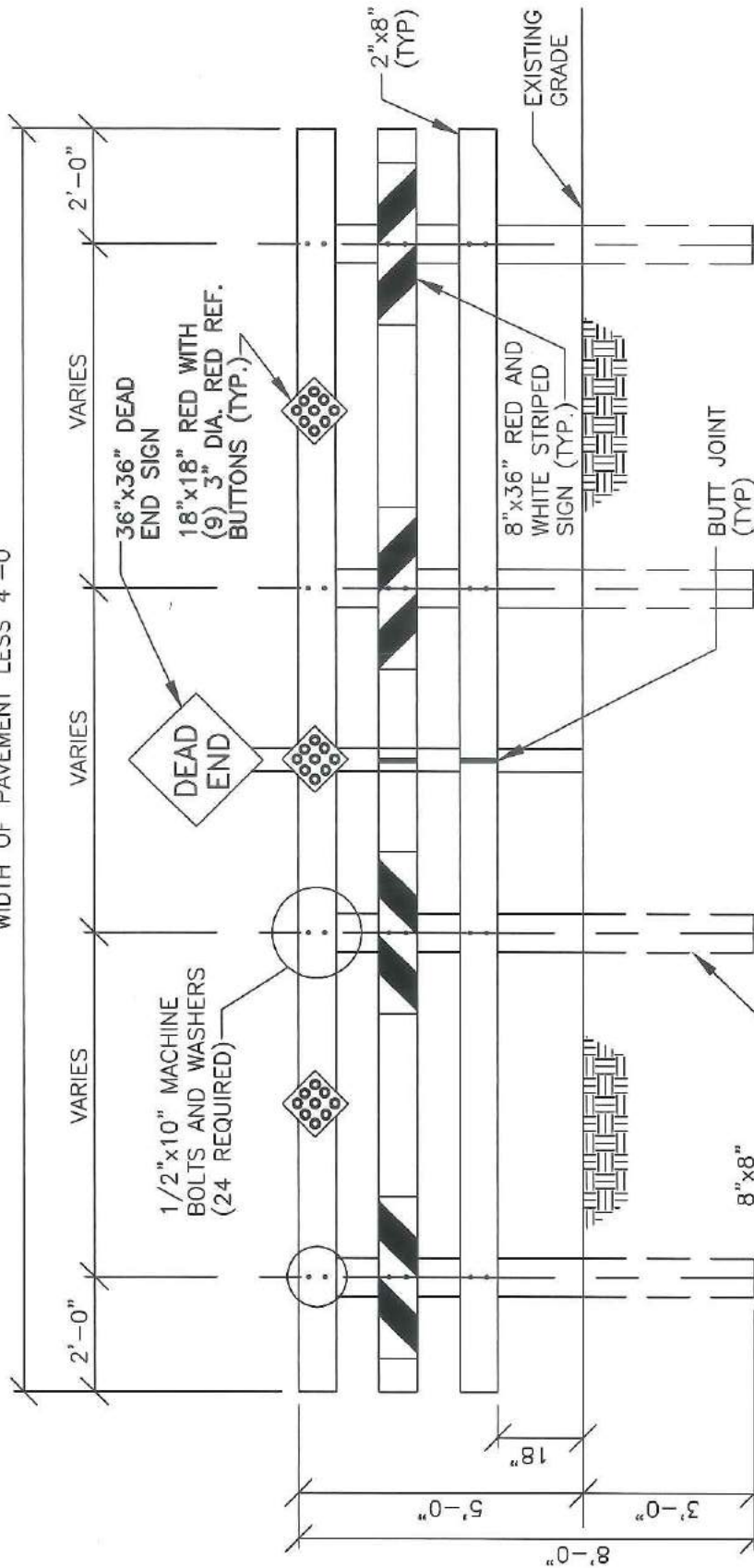


NOTE:
 1) MAXIMUM LENGTH OF CUL-DE-SAC
 CANNOT EXCEED 600' AS MEASURED FROM
 THE EXISTING STREET EDGE OF PAVEMENT
 TO END OF CUL-DE-SAC.

P-14
 TYPICAL CUL-DE-SAC
 DETAIL
 TOWN OF LEWISTON, N.Y.



WIDTH OF PAVEMENT LESS 4'-0"



NOTES:

- 1) TEMPORARY TURN AROUND IS TO BE USED IF PROJECT IS PHASED.
- 2) BARRICADE SHALL BE PLACED APPROXIMATELY 6'-0" BEHIND PAVEMENT EDGE.
- 3) THE WOOD POSTS SHALL BE OF SOUND AND CLEAR SEASONED WHITE OAK OR CEDAR, OR PRESSURE TREATED. RAILS SHALL BE OF SEASONED SPRUCE, DOUGLAS FIR OR SOUTHERN PINE. RAILROAD TIES ARE NOT ALLOWED.
- 4) BELOW GRADE PORTION OF WOOD POSTS SHALL BE DIPPED OR COATED WHILE DRY IN BITUMINOUS MATERIAL CONFORMING TO N.Y.S. SPEC. ITEM NO. 61. THE POSTS SHALL BE THOROUGHLY DRY BEFORE SET IN GROUND.
- 5) ALL SIGN MATERIAL SHALL BE ENGINEER GRADE 3-M MATERIAL.

P-15
TYPICAL 3 BAR BARRICADE
DETAIL
TOWN OF LEWISTON, N.Y.

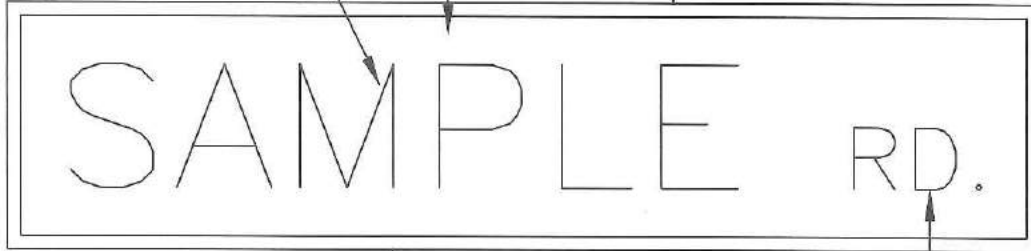


NOVEMBER 2014

APPLIED CUT OUT LETTERS
(*WHITE 3290 ENGINEER
GRADE OR SILVER 3870 HIGH
INTENSITY GRADE) 4" HIGHWAY
GOTHIC "C" SERIES

BACKGROUND (*GREEN 3277
ENGINEER GRADE OR GREEN
3877 HIGH INTENSITY GRADE)

1/2" BORDER (*SCOTCHLITE
ENGINEER GRADE 3290 WHITE
OR SCOTCHLITE 3870 HIGH
INTENSITY GRADE SILVER)

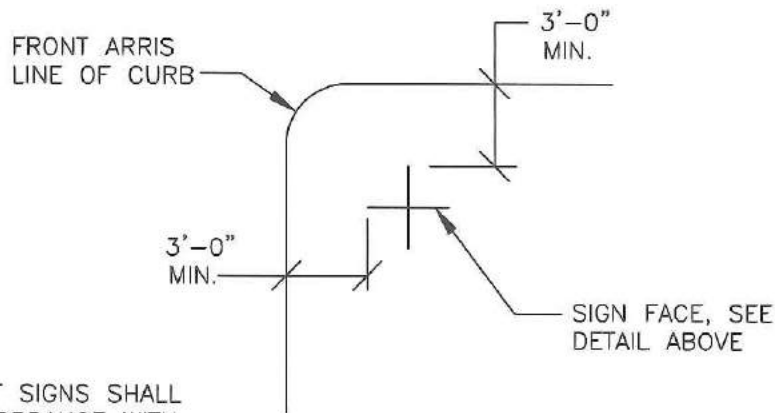


SIGN BLANK, 8"x
DIMENSION C, 5052H38
ALUMINUM .080"

APPLIED CUT OUT LETTERS
(*WHITE 3290 ENGINEER
GRADE OR SILVER 3870 HIGH
INTENSITY GRADE) 2" HIGHWAY
GOTHIC "C" SERIES

NOTE:
(*) DENOTES 3M COMPANY
REFLECTIVE MATERIALS

SIGN FACE DETAIL



NOTE:
ALL STREET SIGNS SHALL
BE IN ACCORDANCE WITH
APPLICABLE NYSDOT
SPECIFICATIONS.

PLAN

P-16
STANDARD SIGN DETAIL

TOWN OF LEWISTON, N.Y.



STREET NAME PANEL

3/8" SPACER WITH ALUMINUM
FLAT WASHERS OF TYPE
REQUIRED FOR 1/4" BOLT

3/8"x3-1/4" STEEL GALVANIZED
OR STAINLESS STEEL BOLTS, NUTS
AND LOCKWASHERS

3/8"x3-1/4" ALUMINUM BOLT
WITH NUT, LOCKWASHER AND
FLAT WASHER (4 REQUIRED
FOR TWO SIGN PANEL)

POST, 1-3/4"x3/4"x12'-0"
12 GA. GALVANIZED STEEL OR
2-1/4"x2-1/4"x12'-0" 3/16"
ALUMINUM WITH 5/16" HOLES
AT 1" O.C.

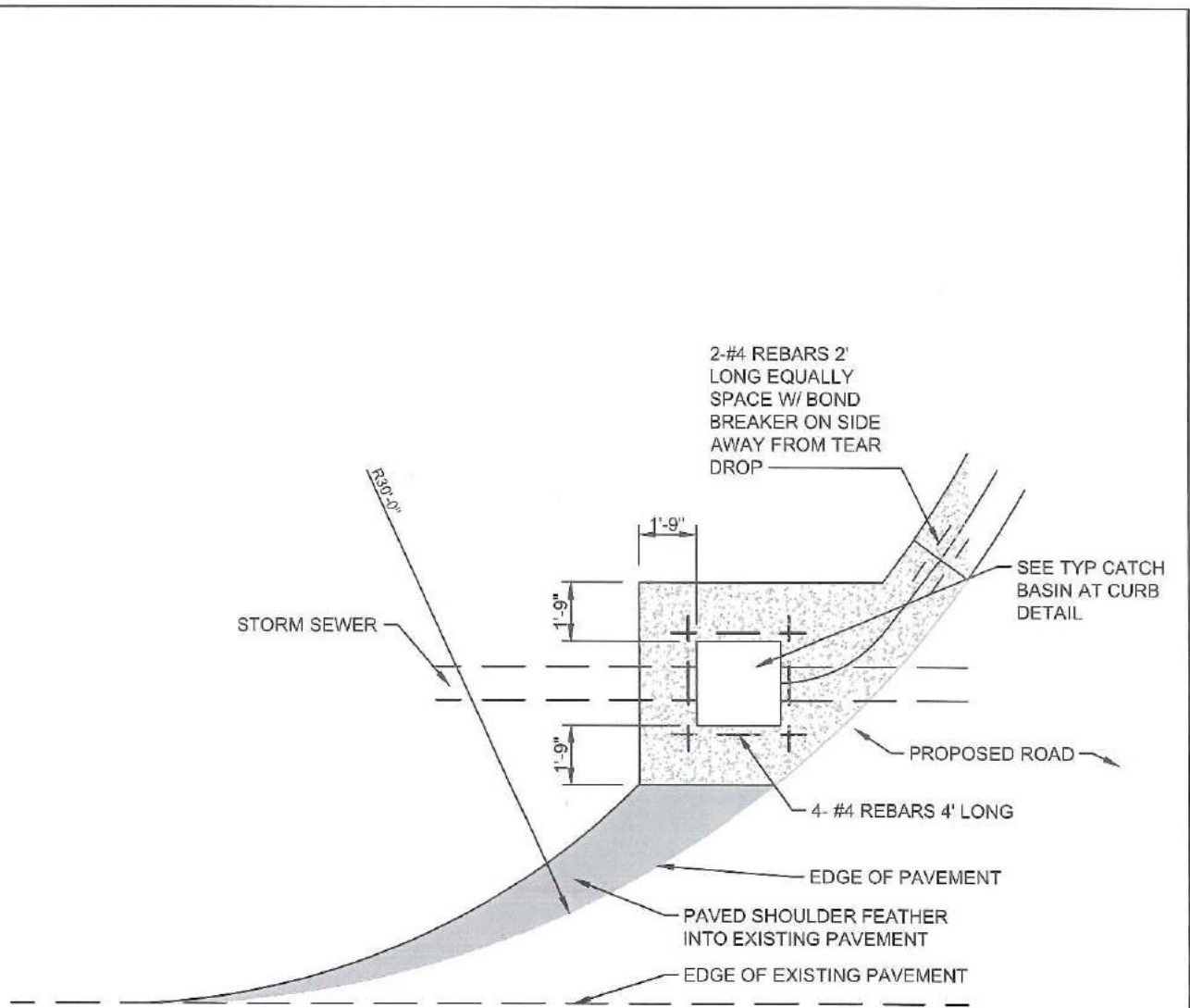
IMBEDDED POST SLEEVE,
2"x2"x5'-0" MIN. 12 GA.
GALVANIZED STEEL TUBE

FINISH GRADE

3/8"x3-1/4" STEEL GALVANIZED
OR STAINLESS STEEL BOLT, NUT
AND LOCKWASHER INSERTED
THROUGH TOP SECTION OF SLEEVE.
AFTER INSTALLATION, BOLT SHALL
BE SCORED TO PREVENT REMOVAL

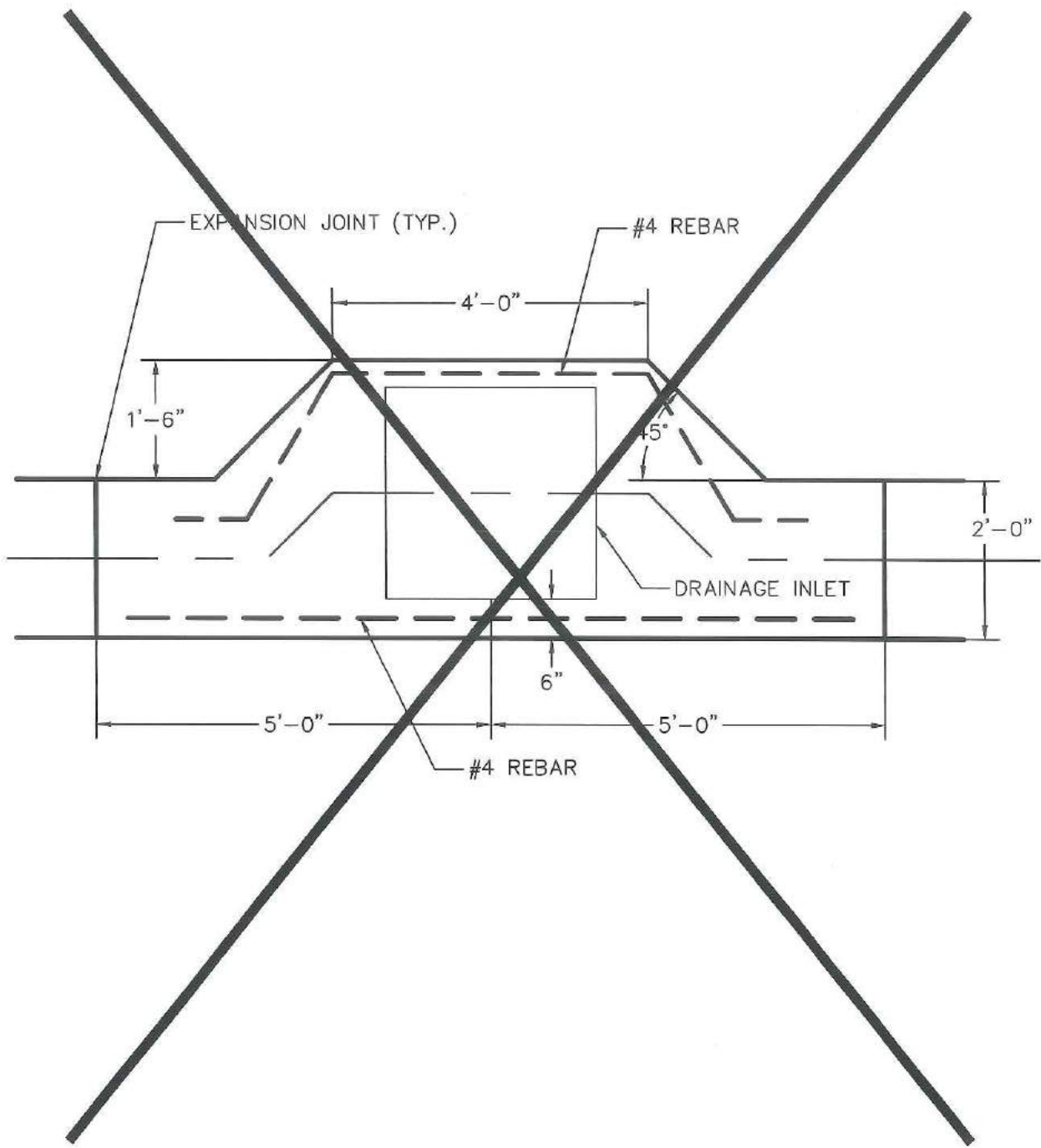
NOTE:
CONTRACTOR TO COORDINATE
WITH HIGHWAY SUPERINTENDENT
FOR PLACEMENT OF STREET SIGNS





P-18
 TYPICAL TEAR DROP
 GUTTER DETAIL
 TOWN OF LEWISTON, N.Y.

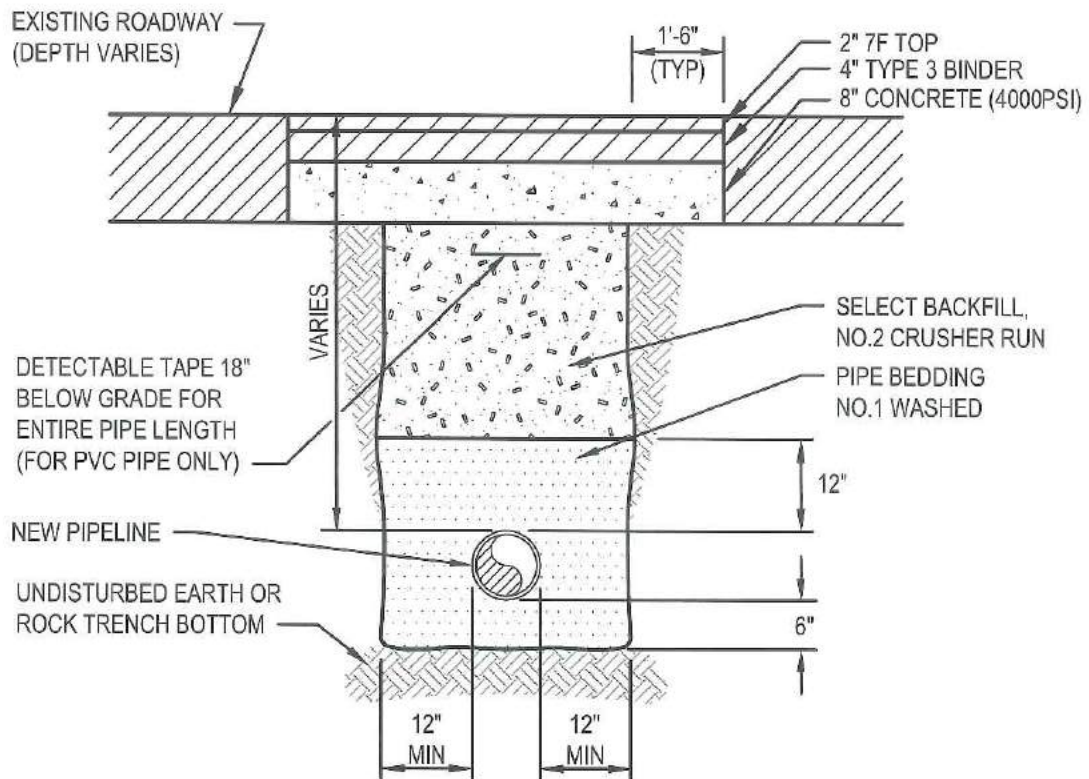




NOT USED

P-19
 TYPICAL CONCRETE GUTTER
 APRON DETAIL
 TOWN OF LEWISTON, N.Y.

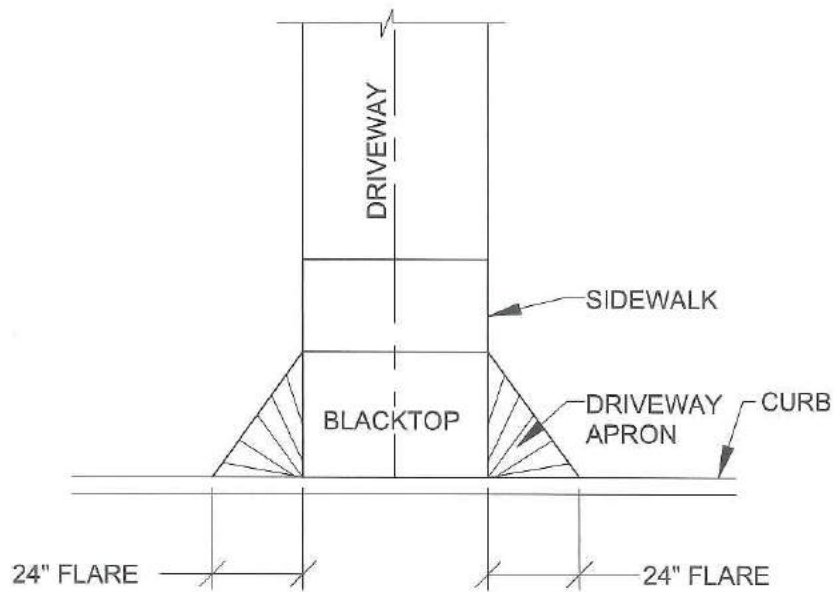




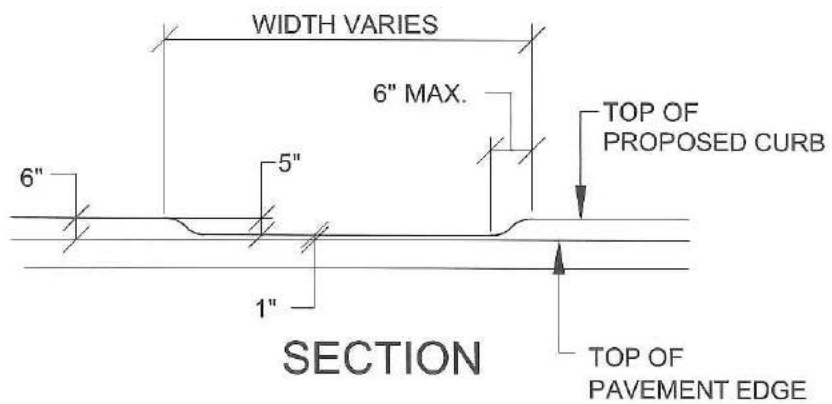
NOTES:

1. AS PART OF THE TOWN HIGHWAY WORK PERMIT, THE CONTRACTOR WILL BE REQUIRED TO PROVIDE A \$5,000 ROAD CROSSING BOND.





PLAN

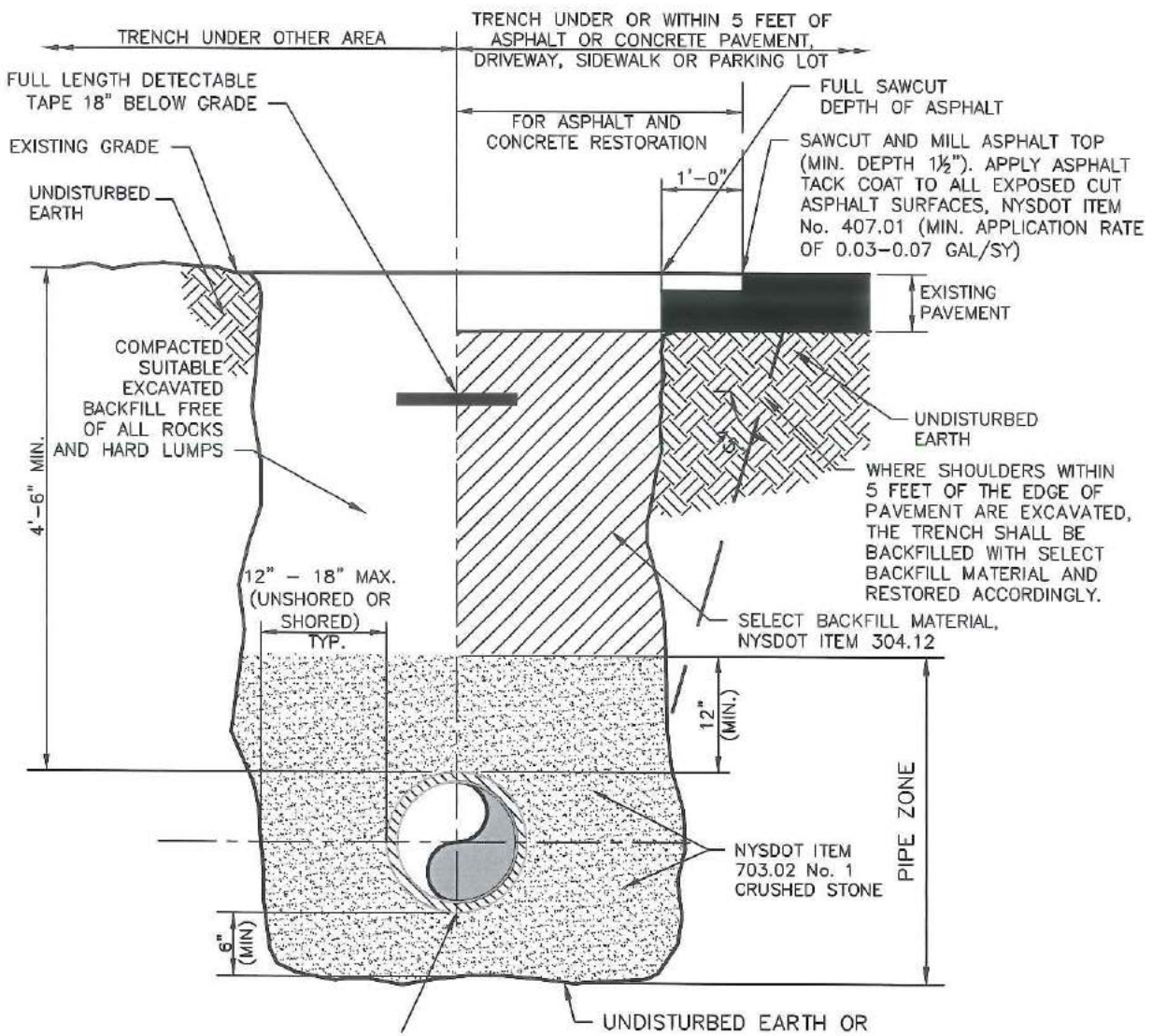


SECTION

P-21
 TYPICAL DRIVEWAY
 CURB-CUT DETAIL
 TOWN OF LEWISTON, N.Y.



Watermain Details



W-01
 WATERLINE TRENCH
 DETAIL
 TOWN OF LEWISTON, N.Y.



MATERIAL SPECIFICATION

PIPE: DUCTILE IRON PRESSURE PIPE
MECHANICAL JOINTS, DOUBLE CEMENT
LINED, AWWA C-151, CLASS 52

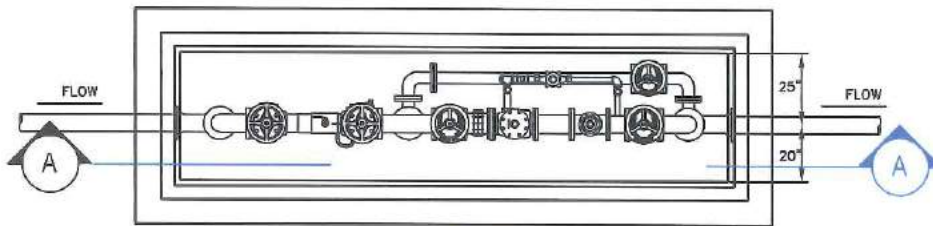
FITTINGS:
(BELOW GROUND) MECHANICAL JOINT, DUCTILE IRON WITH GASKETS,
CEMENT LINED WITH RETAINER GLANDS

FITTINGS:
(ABOVE GROUND) STANDARD 125# DUCTILE IRON FLANGED, DOUBLE CEMENT LINED.

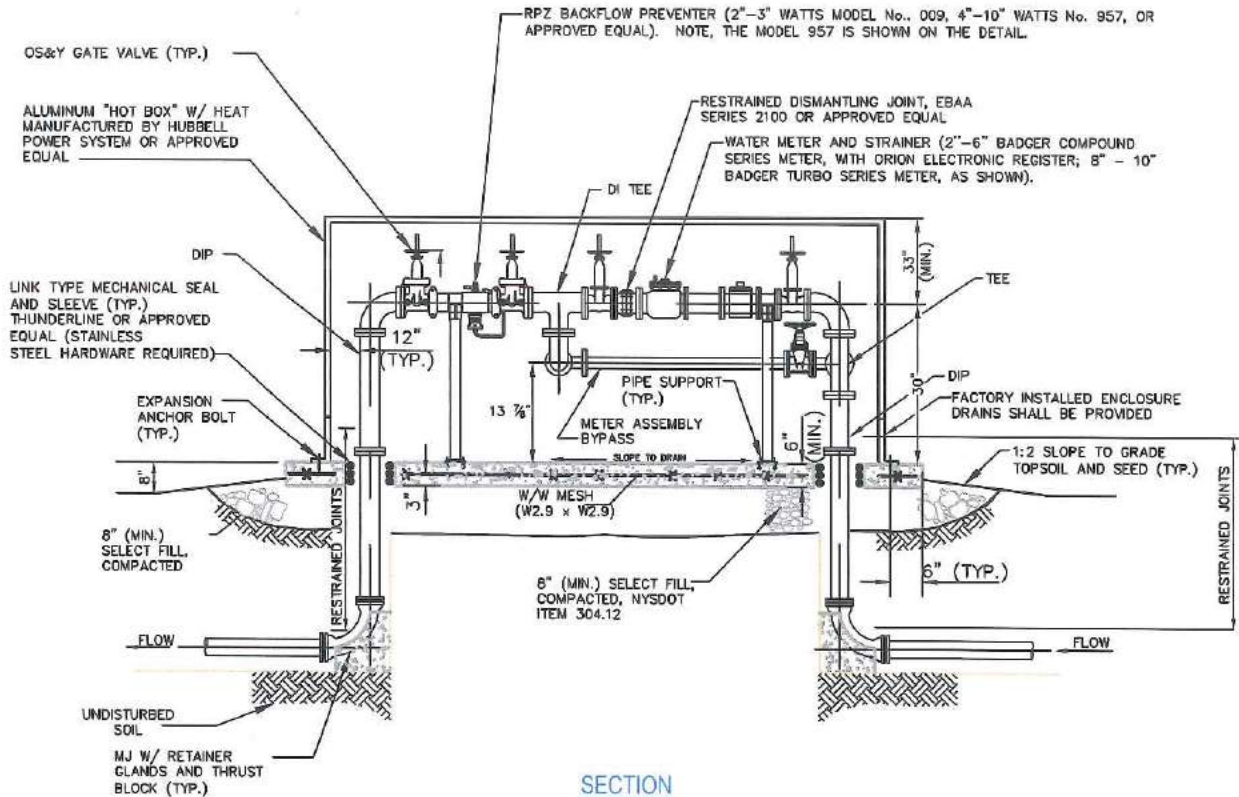
EXPANSION BOLTS: WEJ-IT (OR APPROVED EQUAL), 1/2"Ø MINIMUM.

RPZBP NOTES

1. WATER SERVICE SHALL BE DISINFECTED IN ACCORDANCE WITH AWWA SPECIFICATION C 651-92 (EXCEPT SECTION 5.1)
2. ALUMINUM "HOT BOX" IS TO BE INSULATED AND HEATED TO PREVENT FREEZING OF PIPE CONTENT, AND SHALL INCLUDE PROTECTED CONVENIENCE OUTLET(S). HEATING UNIT(S) AND CONVENIENCE OUTLET(S) TO BE PROVIDED BY THE MANUFACTURER.
3. ALL MATERIALS AND INSTALLATION OF ELECTRICAL WORK SHALL BE IN ACCORDANCE WITH THE CURRENT VERSION(S) OF THE NATIONAL ELECTRIC CODE, NFPA, ADA, OSHA, AND THE TOWN OF LEWISTON CODES.



PLAN
N.T.S.

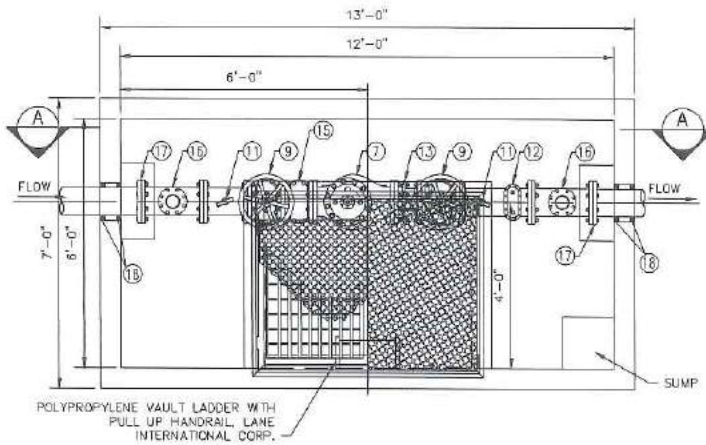


SECTION
NOT TO SCALE

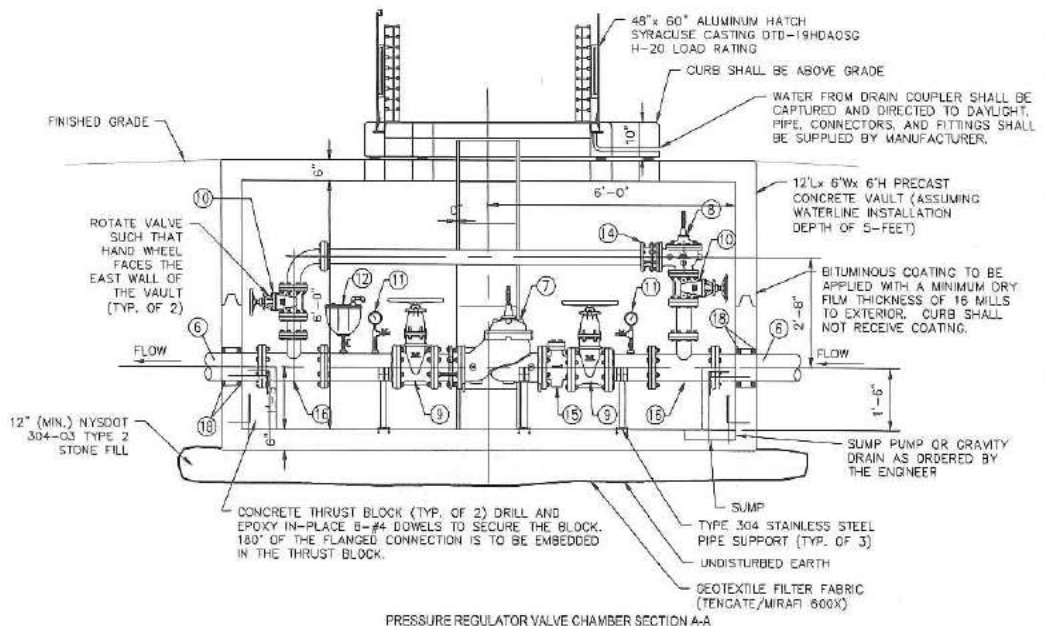
W-02
2"-10" WATER METER AND RPZBP
ENCLOSURE AND ASSEMBLY DETAIL
TOWN OF LEWISTON, N.Y.



INTERIOR PIT PIPE SCHEDULE				
ITEM	DESCRIPTION	SIZE	FLANGE RATING	QTY
7	CLA-VNL MODEL 90-01-FR FULL INTERNAL PORT PRESSURE REDUCING CONTROL VALVE, CLASS 150# FLANGED BODY WITH 1/2" STRAINER, (3) ISOLATION BALL VALVES, AND PRESSURE REDUCING PILOT ASSEMBLY. SPRING RANGE AND LOW PRESSURE SET POINT TO BE DETERMINED BY THE ENGINEER. APPROVED EQUAL IS NOT CONSIDERED.	8"	ANSI 150	1
8	CLA-VNL MODEL 90-01-FR FULL INTERNAL PORT PRESSURE REDUCING CONTROL VALVE, CLASS 150# FLANGED BODY WITH 1/2" STRAINER, (3) ISOLATION BALL VALVES, AND PRESSURE REDUCING PILOT ASSEMBLY. SPRING RANGE AND LOW PRESSURE SET POINT TO BE DETERMINED BY THE ENGINEER. APPROVED EQUAL IS NOT CONSIDERED.	4"	ANSI 150	1
9	AMVA C-508 NRS RESILIENT WEDGE GATE VALVE c/w LH OPEN HAND WHEEL OPERATOR. JKS GATE VALVE OR APPROVED EQUAL.	8"	ANSI 125	2
10	AMVA C-508 NRS RESILIENT WEDGE GATE VALVE c/w LH OPEN HAND WHEEL OPERATOR. JKS GATE VALVE OR APPROVED EQUAL.	4"	ANSI 125	2
11	PRESSURE GAUGE ASSEMBLY. ENFM SERIES 0211 w/4"API DUAL SCALE, GLYCERINE FILLED, 94" FACE, 1/2" BALL VALVE ISOLATION AND 3/8" BLEED/TEST BALL VALVE.			2
12	AIR RELEASE VALVE c/w 1/2" ISOLATION BALL VALVE AND 180° VENT PIPE RETURN. FUSION BONDED EPOXY LINED AND COATED. VALMATIC MODEL 15A.3 OR APPROVED EQUAL.	1"		1
13	ROMAC DUAOD RESTRAINED DISMANTLING JOINT, c/w FUSION EPOXY COATING AND SST HARDWARE OR APPROVED EQUAL.	8"	ANSI 125	1
14	ROMAC DUAOD RESTRAINED DISMANTLING JOINT, c/w FUSION EPOXY COATING AND SST HARDWARE OR APPROVED EQUAL.	4"	ANSI 125	1
15	MARS Z-PLATE FABRICATED STEEL STRAINER OR APPROVED EQUAL.	8"	ANSI 125	1
16	8" x 8" x 4" TEE	8", 4"	ANSI 125	2
17	EDAA WEGFLANGE SERIES 1000 OR APPROVED EQUAL.	8"	ANSI 150	2
18	DOUBLE MECHANICAL SEALS, LINK SEAL METAFLEX OR APPROVED EQUAL. 12-INCH DIAMETER CORE DRILLED HOLE.			



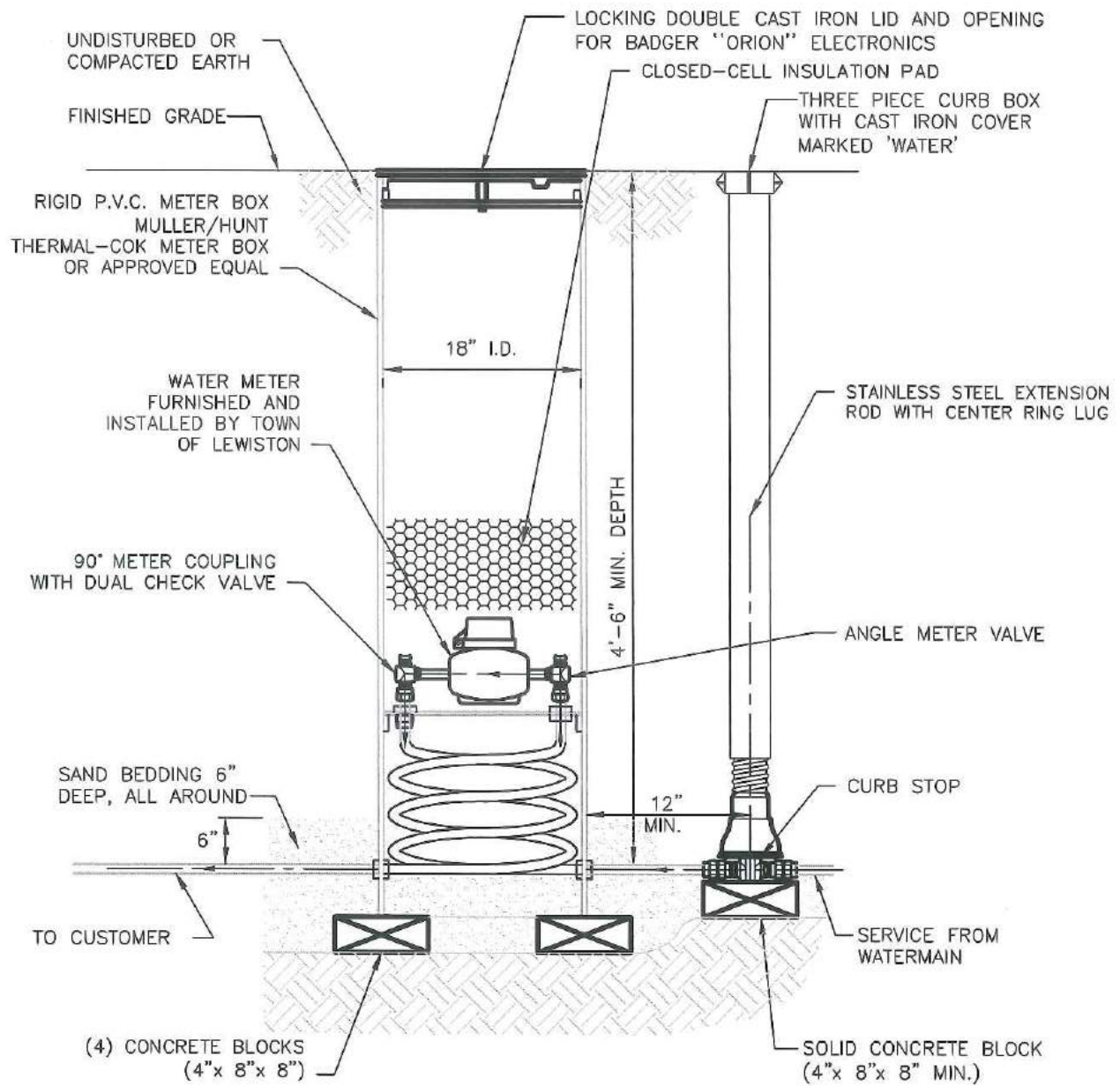
PRESSURE REGULATOR VALVE CHAMBER PLAN



PRESSURE REGULATOR VALVE CHAMBER SECTION A-A

W-03
**8" PRESSURE REGULATOR VALVE
 CHAMBER AND ASSEMBLY DETAIL**
 TOWN OF LEWISTON, N.Y.





SECTION

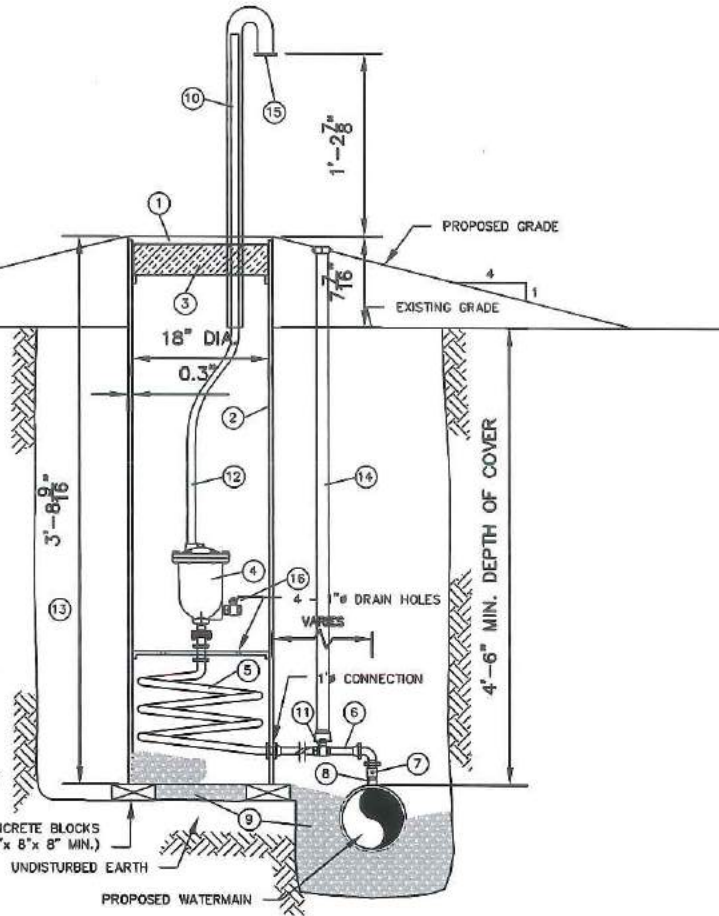
W-04
 WATER METER VAULT
 DETAIL
 TOWN OF LEWISTON, N.Y.



SCHEDULE OF MATERIALS

- ① CAST IRON COVER WITH SIDE MOUNTED PENTAGON NUT LOCK
- ② 18" DIA. x 6' LONG OPEN BOTTOM METER/VALVE CHAMBER
- ③ 4" THICK INSULATING DIAPHRAGM/PAD CLOSED CELL FOAM
- ④ 1" AUTOMATIC AIR RELEASE VALVE VALMATIC 38
- ⑤ 1"Ø POLYBUTYLENE TUBING, MIN. 200 P.S.I. WORKING PRESSURE
- ⑥ 1"Ø TYPE K COPPER TUBING
- ⑦ 1"Ø BRASS BALL TYPE CORPORATION STOP AND 90° BEND
- ⑧ BRASS PIPE SADDLE
- ⑨ WATERMAIN PIPE BEDDING STONE, NYSDOT ITEM 703.02
- ⑩ 2"Ø EXTRA HEAVY STEEL PIPE VENT WITH SCREEN ATTACHED TO COVER
- ⑪ 1"Ø BRASS BALL TYPE CURB STOP
- ⑫ 1"Ø CTS (DR-9) HDPE TUBING AND 1"Ø BRASS FEMALE THREAD TO HDPE TUBE CONNECTOR
- ⑬ EXCAVATED MATERIAL BACKFILL TAMPED TO MINIMIZE SETTLEMENT (CARE MUST BE TAKEN TO AVOID DEFORMATION OF THE CHAMBER)
- ⑭ CURB BOX WITH STAINLESS STEEL EXTENSION ROD
- ⑮ APPROVED UNI-DIRECTIONAL AIR FLOW DIAPHRAGM
- ⑯ APPROVED ½"Ø BALL VALVE

(4) CONCRETE BLOCKS
(4" x 8" x 8" MIN.)



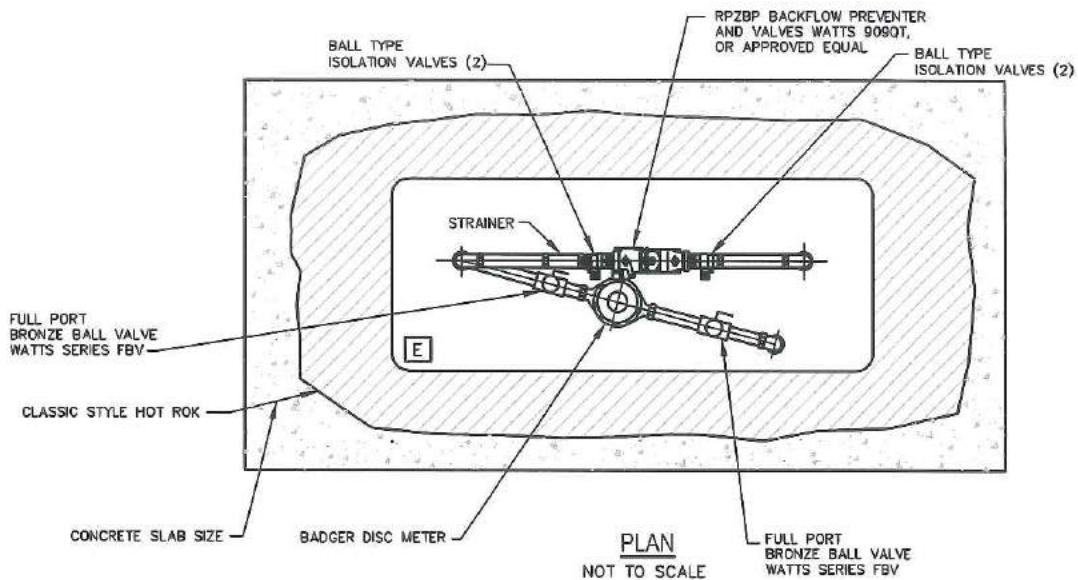
W-05
**AUTOMATIC AIR RELEASE
 VALVE AND CHAMBER DETAIL**
 TOWN OF LEWISTON, N.Y.



3/4" - 1 1/2" RPZBP AND METER DETAIL

GENERAL NOTES:

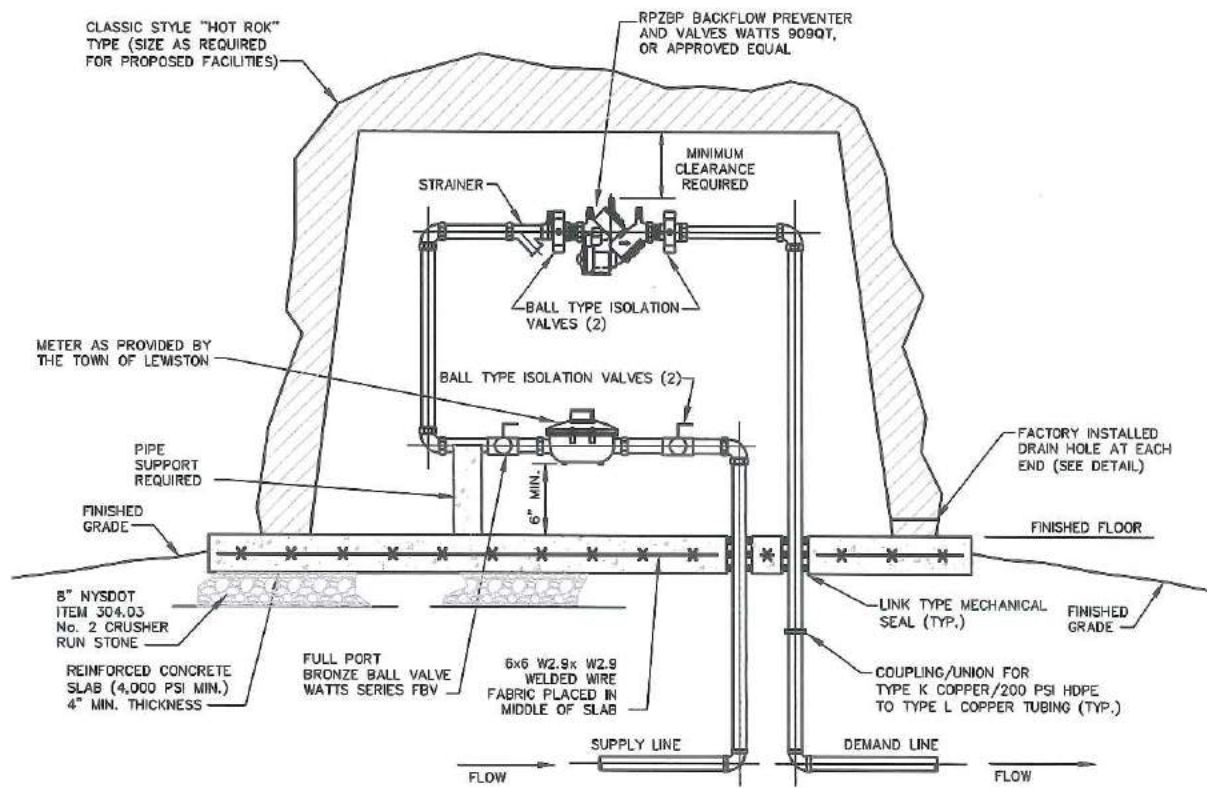
1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND INSPECTIONS, INCLUDING ASSOCIATED COSTS.
2. MAINTAIN MINIMUM CLEARANCE ALL AROUND THE INSTALLATION AS PER GOVERNING AGENCY REQUIREMENTS.
3. WATER SERVICE SHALL BE DISINFECTED IN ACCORDANCE WITH LATEST REVISION OF AWWA STANDARD C 651 (EXCEPT SECTION 5.1).
4. WATER PIPING ABOVE GRADE SHALL BE TYPE "L" HARD DRAWN SEAMLESS COPPER PER ASTM B88 AND FEDERAL SPECIFICATION WW-T-799. JOIN WITH WROUGHT COPPER PRESSURE FITTINGS USING 95-5 TIN-ANTIMONY "LEAD FREE" SOLDER AND NON-CORROSIVE PASTE TYPE FLUX.
5. METER, RPZBP RELIEF DRAINAGE PIPING TO DRAIN PIPE AS REQUIRED BY CODE.
6. ALL MATERIALS AND INSTALLATION OF ELECTRICAL WORK SHALL BE IN ACCORDANCE WITH THE CURRENT VERSION(S) OF THE NATIONAL ELECTRICAL CODE, NFPA, ADA, OSHA, AND THE TOWN OF LEWISTON CODES. TO BE DESIGNED ON AN INDIVIDUAL BASIS.
7. ENCLOSURE IS TO BE INSULATED AND HEATED TO PREVENT FREEZING OF PIPE CONTENT, AND SHALL INCLUDE PROTECTED CONVENIENCE OUTLET(S). HEATING UNIT(S) AND CONVENIENCE OUTLET(S) TO BE PROVIDED BY THE ENCLOSURE MANUFACTURER.
8. THE CONTRACTOR SHALL BE RESPONSIBLE TO TEST THE REDUCED PRESSURE ZONE BACKFLOW PREVENTER (RPZBP) AND PROVIDE WRITTEN CERTIFICATION SIGNED BY A NYS CERTIFIED TESTER OF PROPER OPERATION. THE INDIVIDUAL CONDUCTING THE TESTING SHALL HAVE A CURRENT NYS LICENSE/CERTIFICATION FOR TESTING SAID DEVICE.



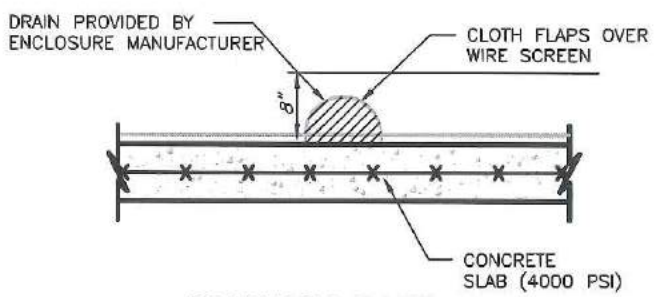
1 OF 2

W-06
3/4" - 1 1/2" RPZBP AND
METER PLAN
TOWN OF LEWISTON, N.Y.





SECTION

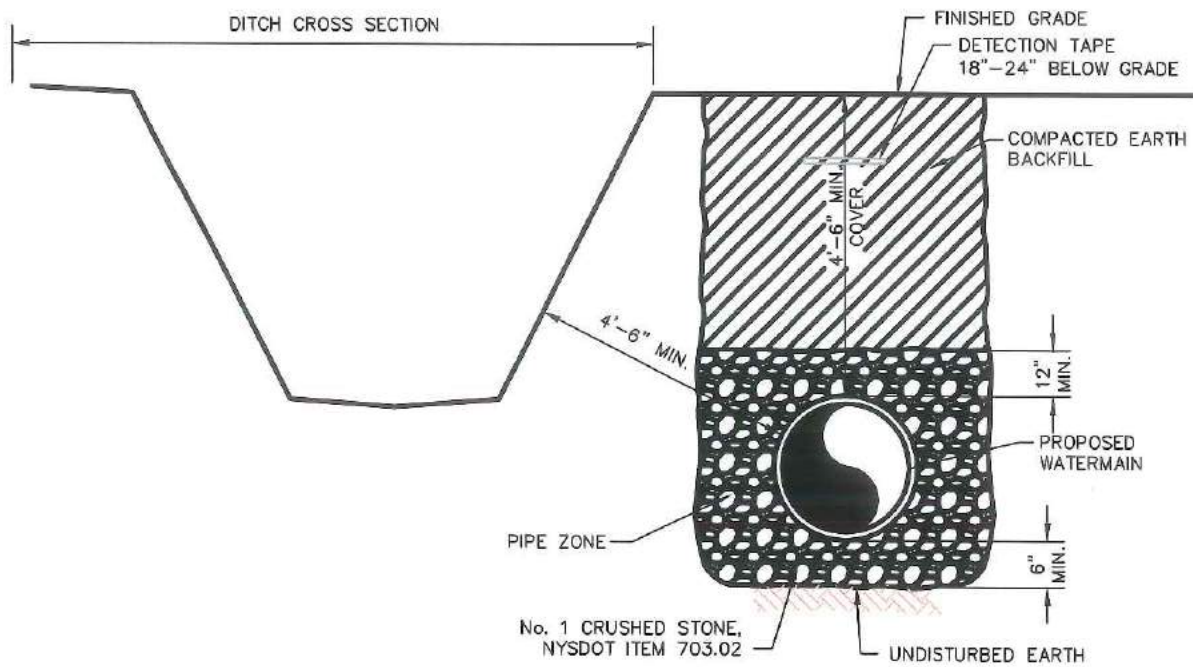


DRAIN HOLE DETAIL
NOT TO SCALE

NOTE:
DRAINS ARE TO BE KEPT CLEAR OF SNOW AND DEBRIS.
RODENT SCREEN IS REQUIRED FOR ALL OPENINGS.

W-07
 $\frac{3}{4}$ " - $1\frac{1}{2}$ " RPZBP AND METER
 SECTION AND DETAIL
 TOWN OF LEWISTON, N.Y.

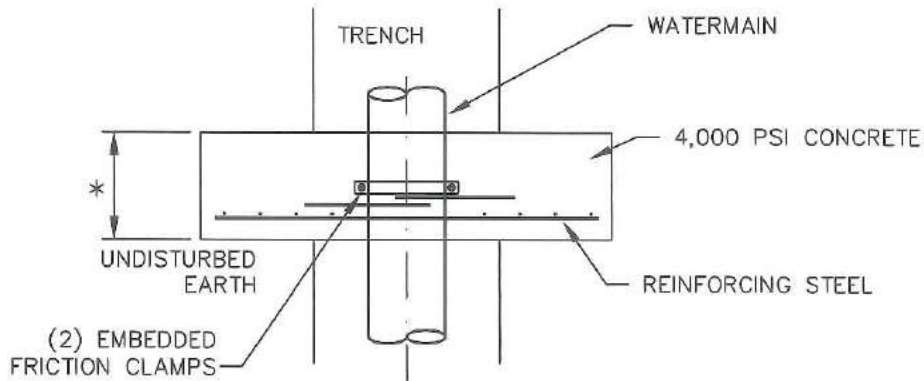




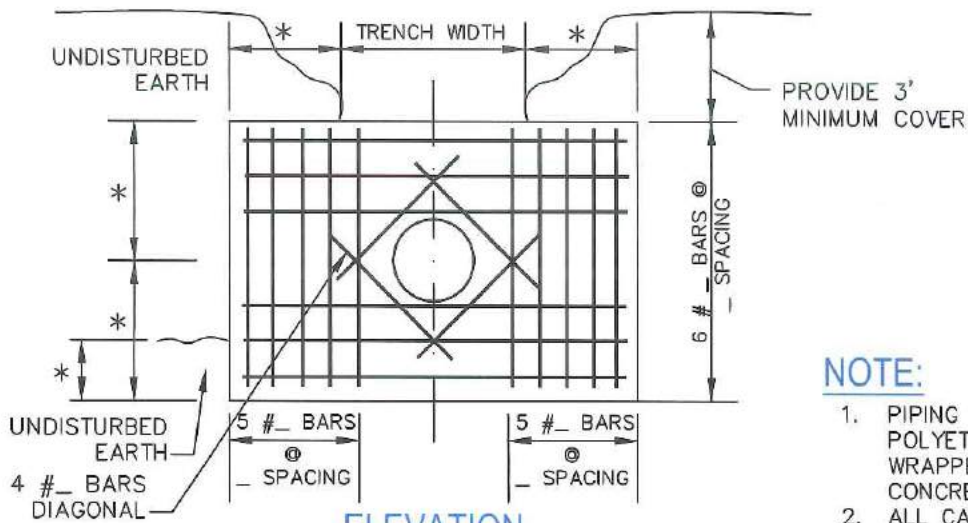
W-08

WATERMAIN ALIGNMENT ADJACENT TO
DRAINAGE DITCH CROSS-SECTION DETAIL
TOWN OF LEWISTON, N.Y.





PLAN



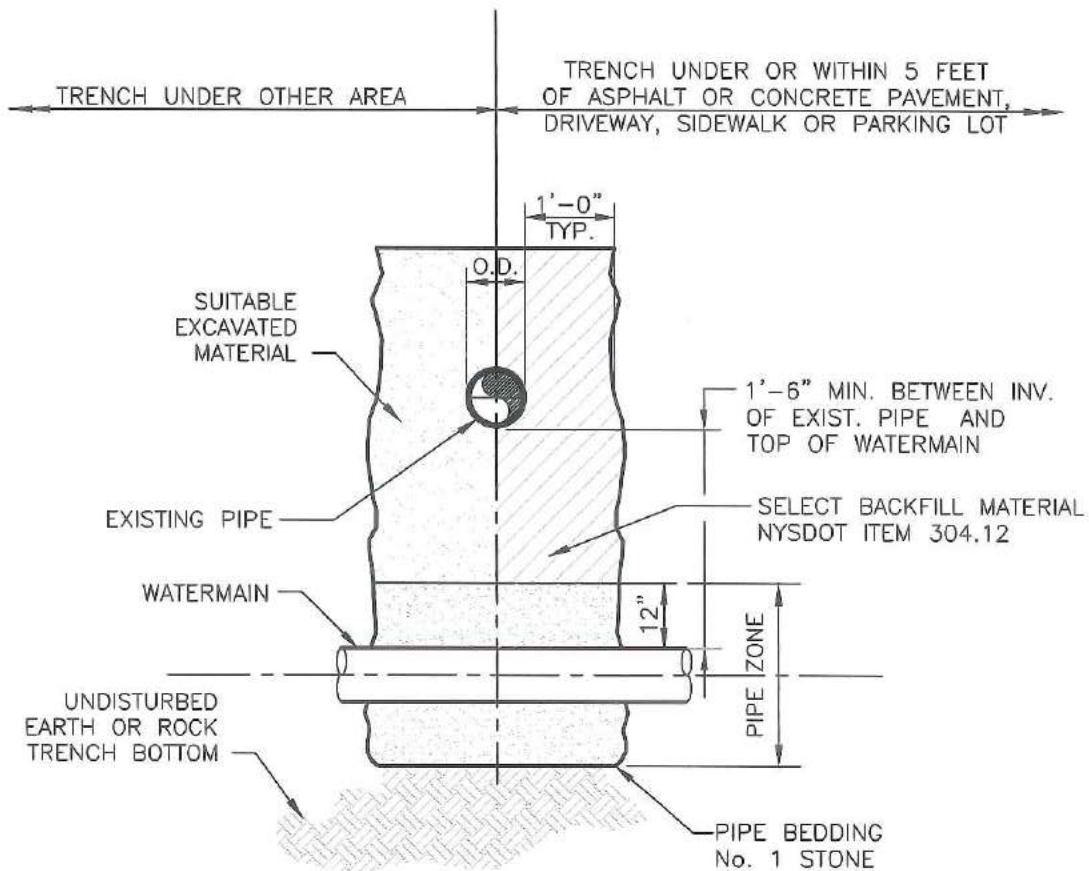
ELEVATION

* DIMENSIONS, REINFORCEMENT, AND SPACING TO BE DETERMINED BY ENGINEER

NOTE:

1. PIPING TO BE POLYETHYLENE WRAPPED PRIOR TO CONCRETE PLACEMENT.
2. ALL CARBON STEEL TO BE COATED WITH BITUMASTIC.
3. USE HIGH EARLY CEMENT AND ALLOW CONCRETE TO ACHIEVE 90% STRENGTH BEFORE PLACING WATER MAIN INTO SERVICE.



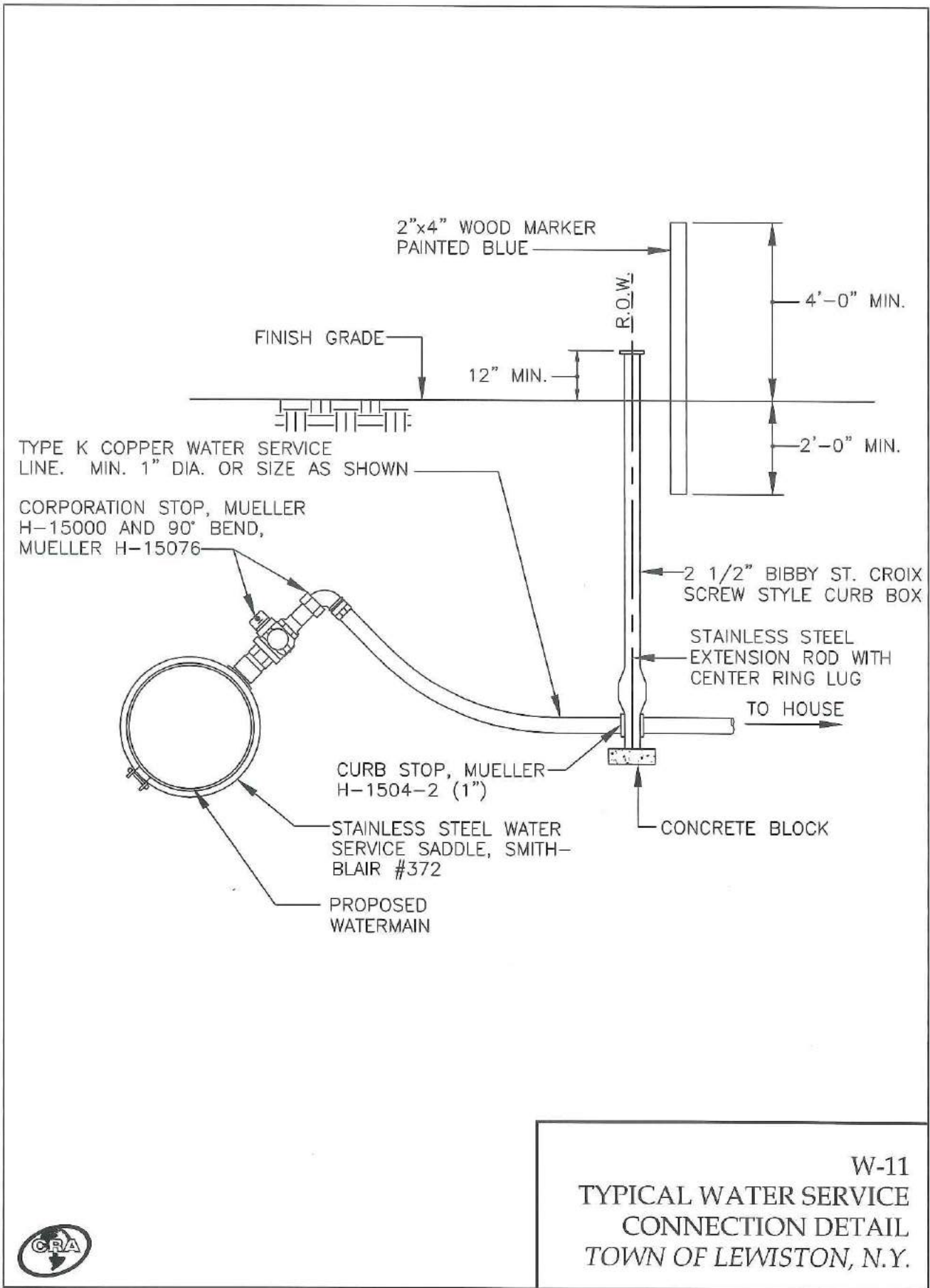


NOTES:

1. ALL EXISTING UTILITIES MUST BE SUPPORTED DURING CONSTRUCTION OF THE NEW WATERMAIN.
2. WHEN CROSSING A SEWERLINE WITH A NEW WATERMAIN, ONE FULL PIPE LENGTH (18 FT. MIN.) SHALL BE USED AT THE POINT OF CROSSING. THE WATERMAIN SHALL BE PLACED SO THAT BOTH JOINT ENDS ARE AS FAR AS POSSIBLE FROM THE EXISTING SEWERLINE.

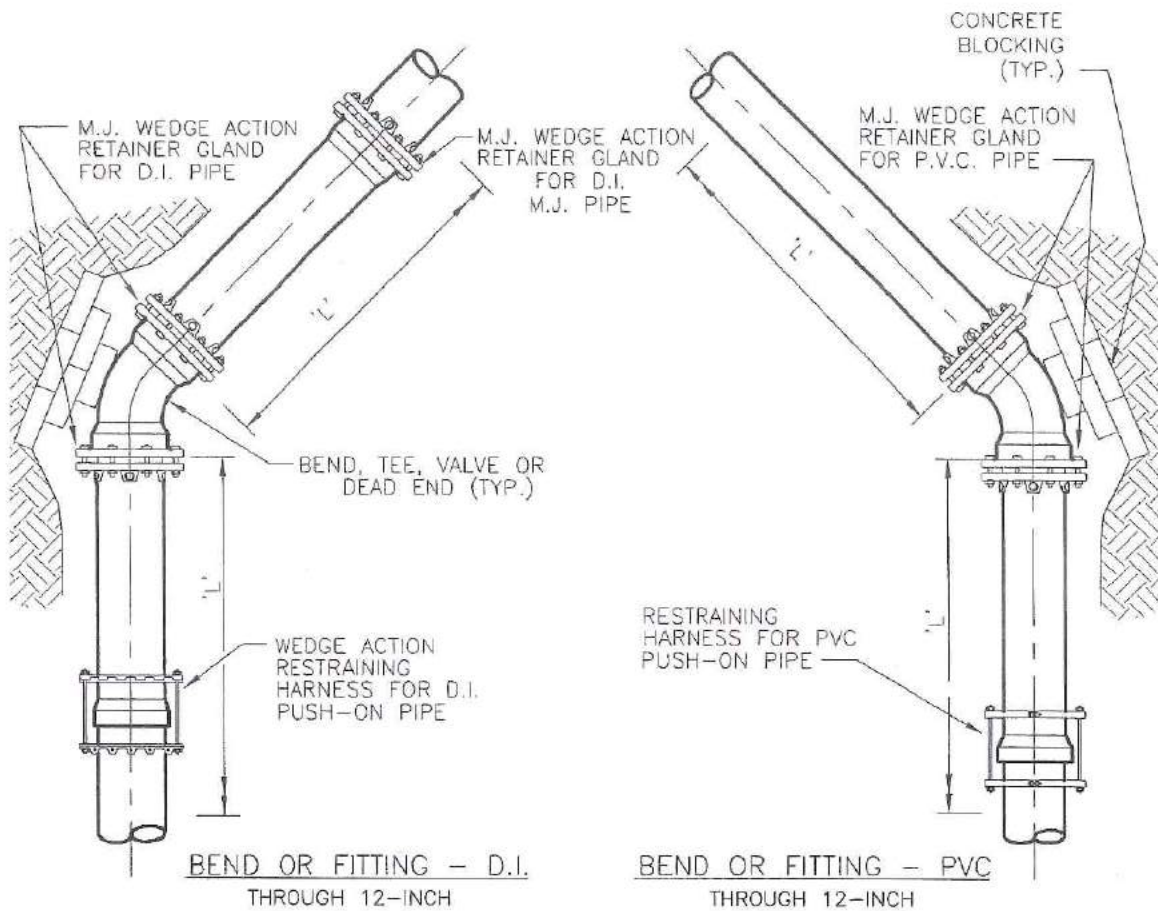
W-10
TYPICAL PIPE
CROSSING DETAIL
TOWN OF LEWISTON, N.Y.





W-11
 TYPICAL WATER SERVICE
 CONNECTION DETAIL
 TOWN OF LEWISTON, N.Y.





W-12
 RESTRAINED JOINT PLAN
 TOWN OF LEWISTON, N.Y.



DUCTILE IRON PIPE (POLYWRAPPED) RESTRAINED JOINT SCHEDULE				
PIPE SIZE	11.25' ELBOW	22.5' ELBOW	45' ELBOW	TEE BRANCH, VALVE OR DEAD END
	'L'	'L'	'L'	'L'
6"	3'-0"	5'-0"	10'-0"	99'-0"
8"	4'-0"	7'-0"	13'-0"	130'-0"
10"	4'-0"	8'-0"	16'-0"	156'-0"
12"	5'-0"	9'-0"	19'-0"	184'-0"

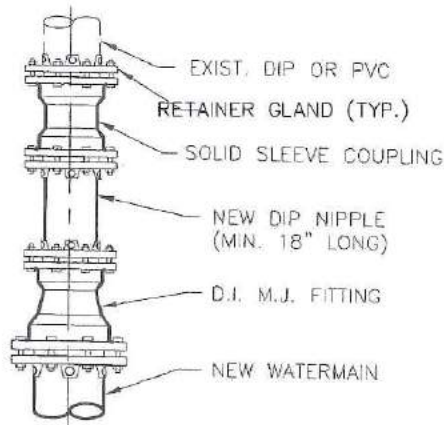
PVC PIPE RESTRAINED JOINT SCHEDULE				
PIPE SIZE	11.25' ELBOW	22.5' ELBOW	45' ELBOW	TEE BRANCH, VALVE OR DEAD END
	'L'	'L'	'L'	'L'
6"	3'-0"	5'-0"	9'-0"	63'-0"
8"	3'-0"	6'-0"	12'-0"	83'-0"
10"	4'-0"	7'-0"	14'-0"	100'-0"
12"	4'-0"	8'-0"	17'-0"	119'-0"

NOTES:

1. ASSUMPTIONS: TEST PRESSURE 200 PSI, COMPACTED NATIVE CLAY AS BACKFILL MATERIAL, DEPTH OF COVER 5'.
2. RETAINER GLANDS SHALL BE EBAA IRON SERIES 1100, SERIES 2000, OR APPROVED EQUAL.
3. PUSH-ON JOINT RESTRAINT SHALL BE EBAA IRON SERIES 1500TD OR APPROVED EQUAL.

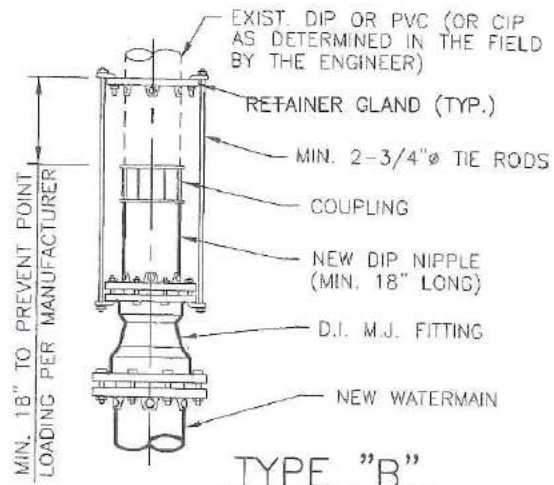
W-13
 RESTRAINED JOINT
 SCHEDULE
 TOWN OF LEWISTON, N.Y.





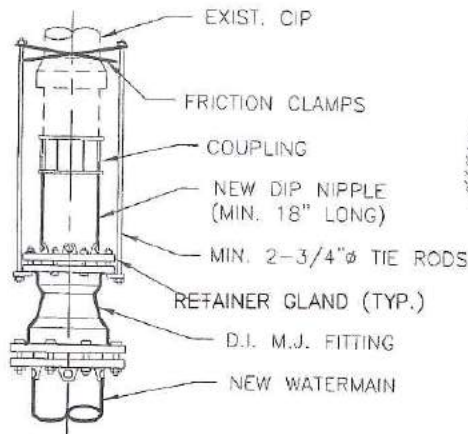
TYPE "A"

CONNECTION TO DIP OR PVC
N.T.S.



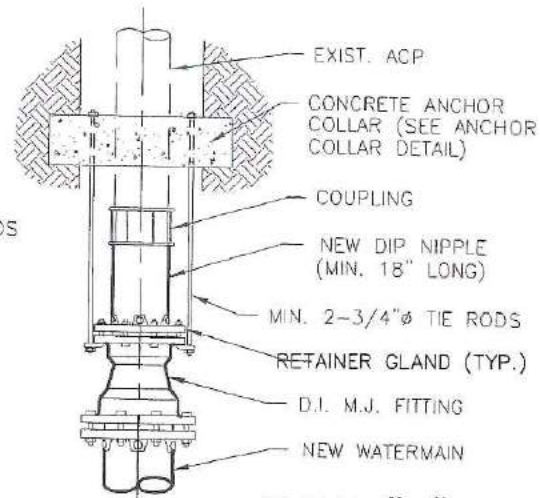
TYPE "B"

CONNECTION TO DIP, PVC OR CIP
N.T.S.



TYPE "C"

CONNECTION TO CIP
N.T.S.



TYPE "D"

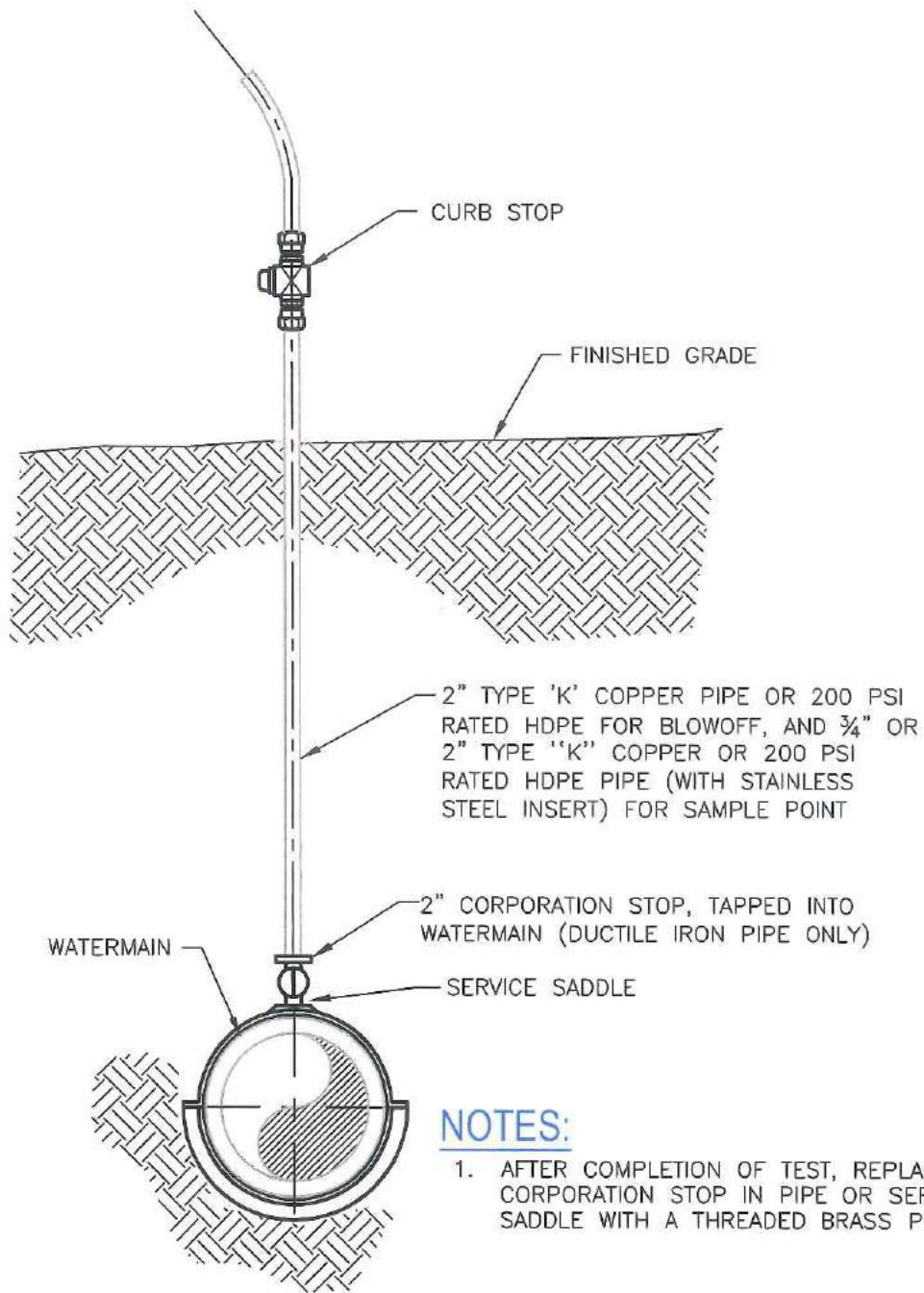
CONNECTION TO ACP
N.T.S.

NOTES:

1. VALVES AND TEES MAY BE HARNESSED SIMILARLY.
2. HARNESSING IS FOR RESISTANCE TO INTERNAL PRESSURE—PIPE ITSELF MUST BE SUPPORTED ON FIRM BEDDING AND CAREFULLY BACKFILLED.
3. COAT ALL EXPOSED SURFACES OF HARNESS ASSEMBLY WITH BITUMINOUS COATING.
4. TIE RODS SHALL BE PLACED ON SIDES OF PIPE.
5. RETAINER GLANDS SHALL BE EBAA IRON SERIES 1100, SERIES 2000, OR APPROVED EQUAL.

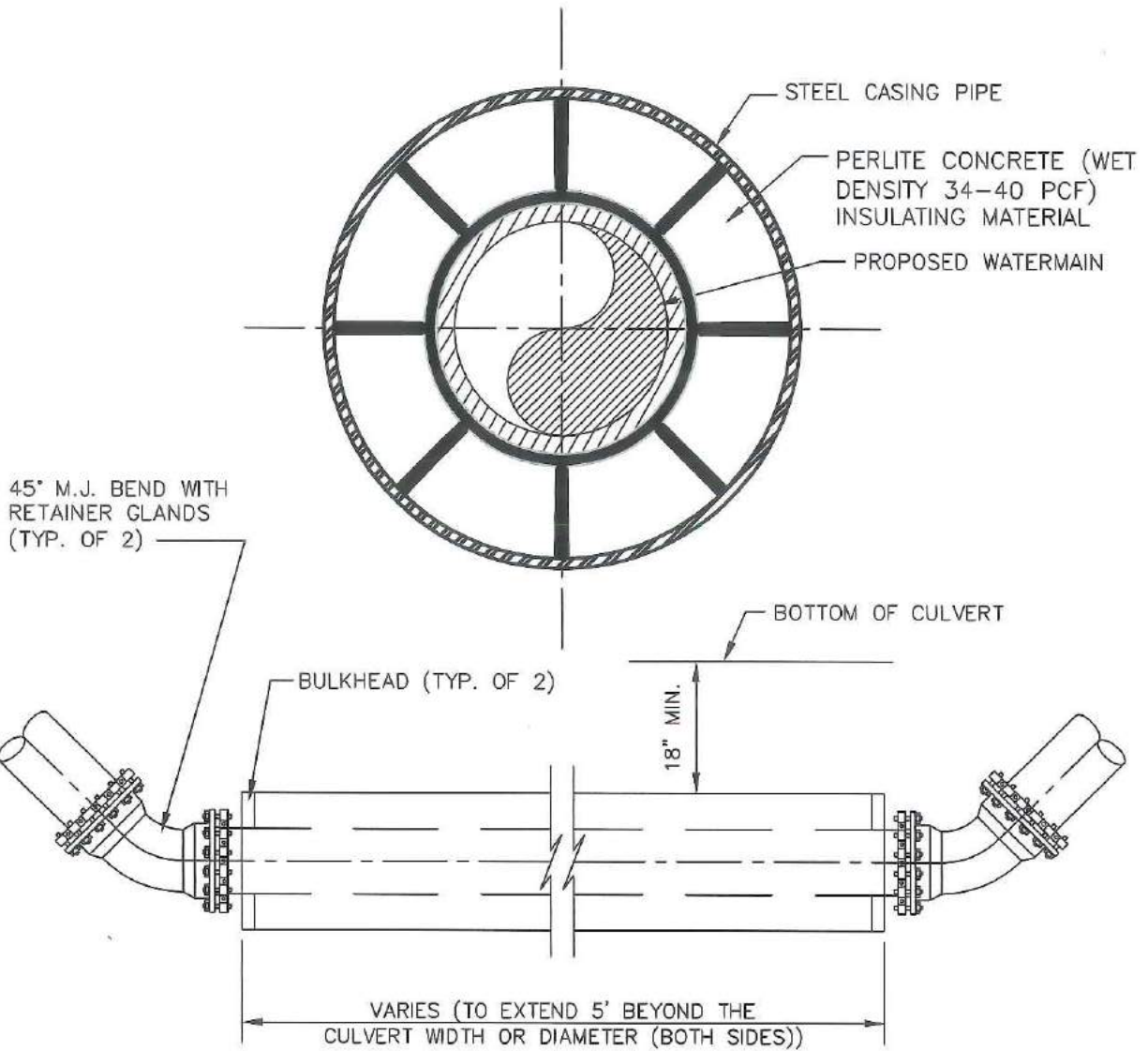


W-14
STANDARD CONNECTION
TO EXISTING WATERMAIN
TOWN OF LEWISTON, N.Y.



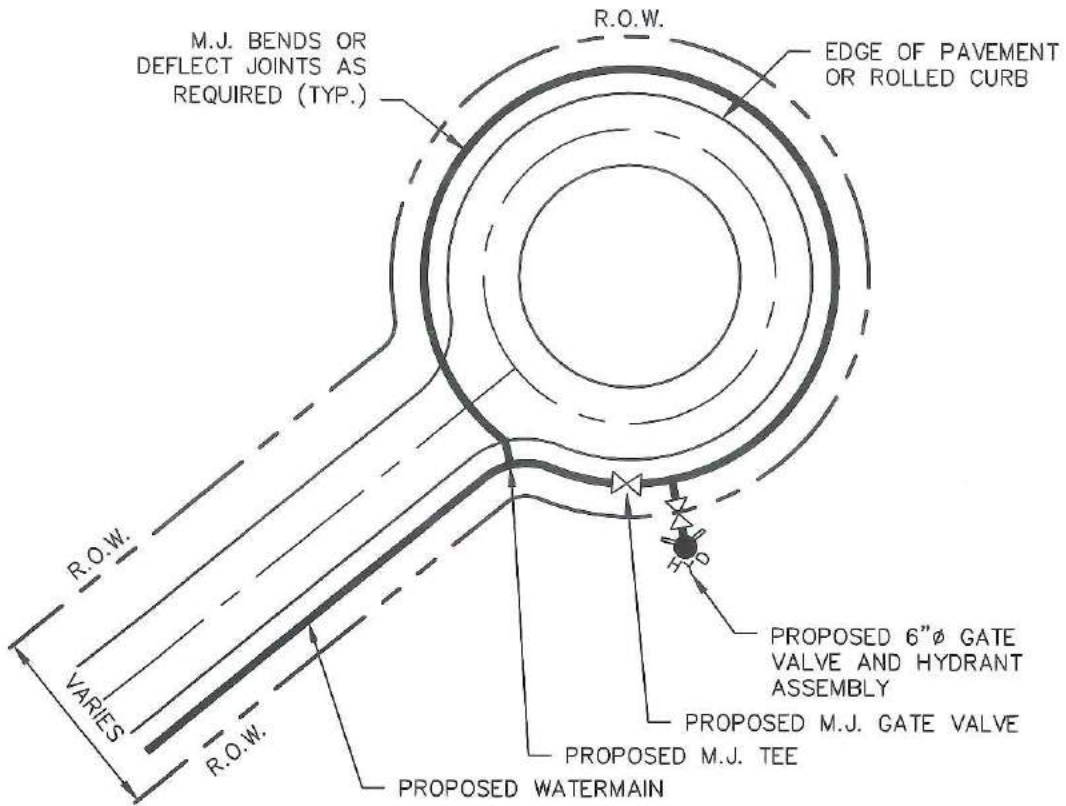
W-15
 TEMPORARY BLOW-OFF/
 SAMPLING POINT DETAIL
 TOWN OF LEWISTON, N.Y.





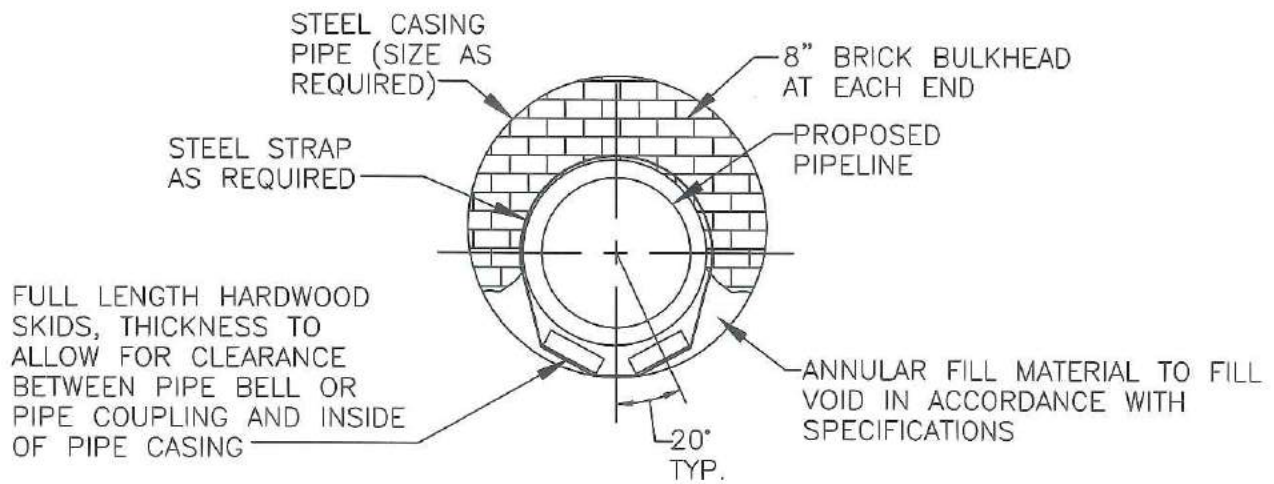
W-16
 CULVERT CROSSING
 DETAIL
 TOWN OF LEWISTON, N.Y.





W-17
 CUL-DE-SAC FLUSHING
 DETAIL
 TOWN OF LEWISTON, N.Y.

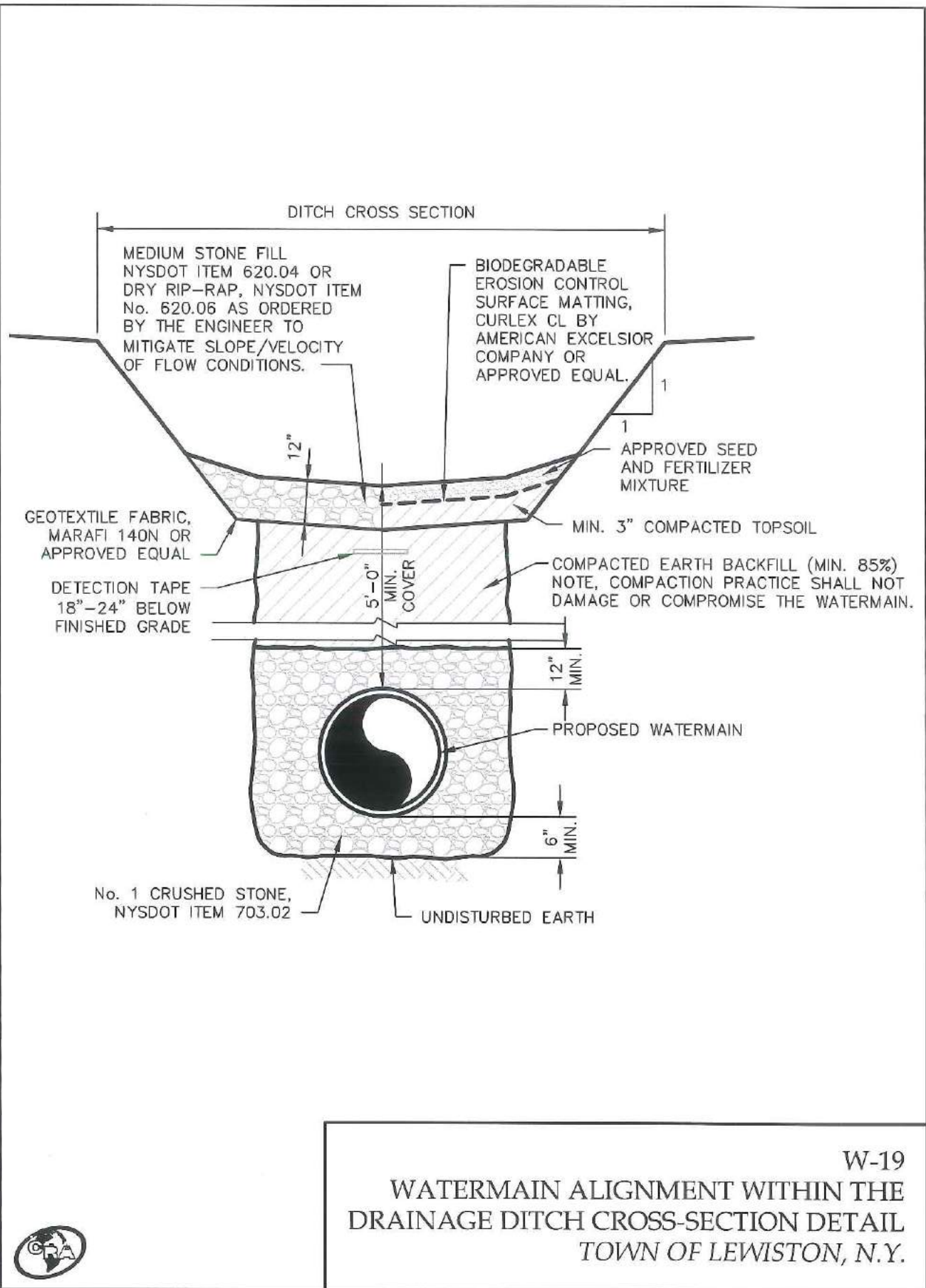


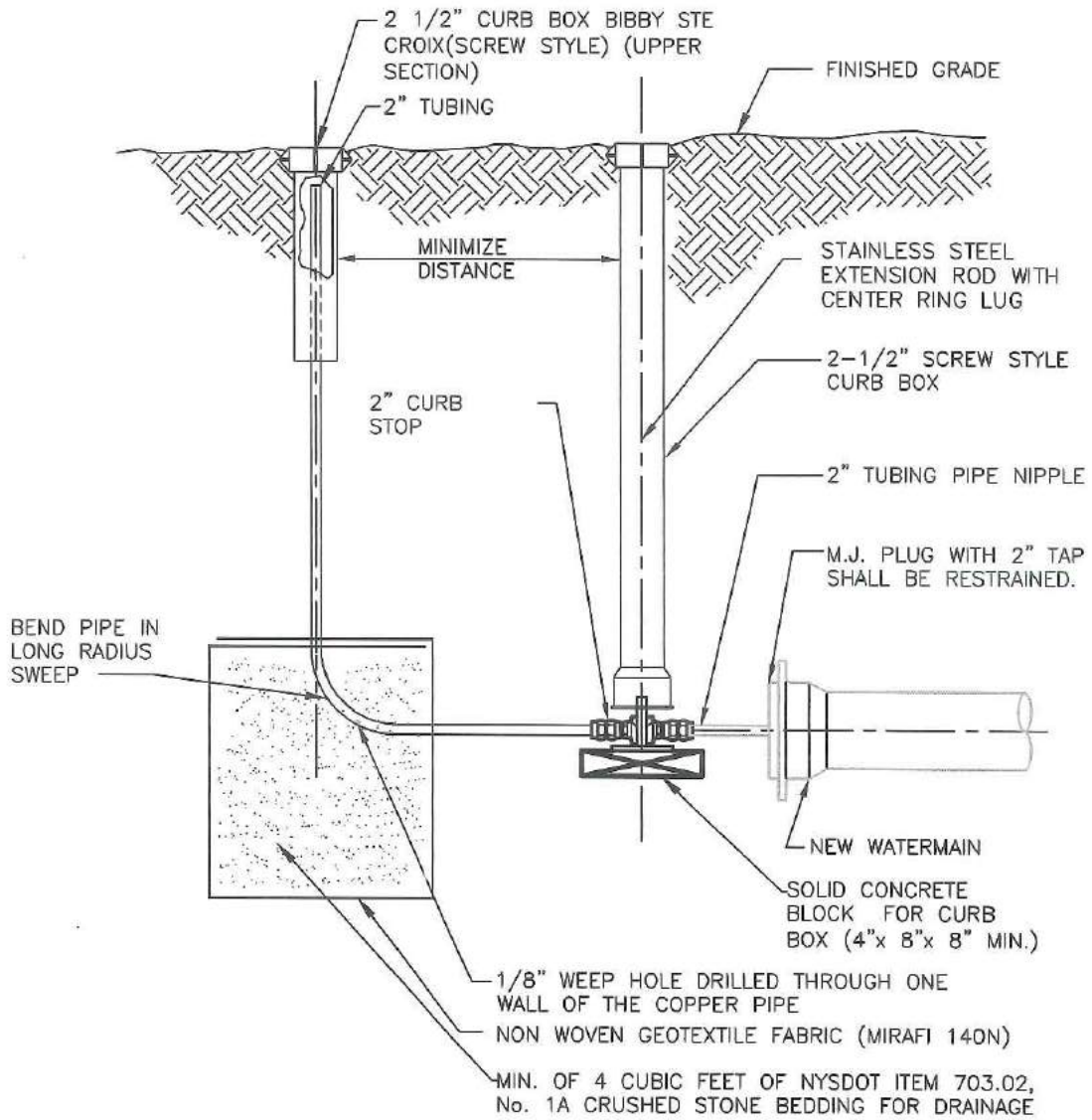


NOTE: ALL PIPE JOINTS WITHIN THE PIPE CASING SHALL BE RESTRAINED PIPE JOINTS.

W-18
 TYPICAL CASING PIPE
 DETAIL
 TOWN OF LEWISTON, N.Y.

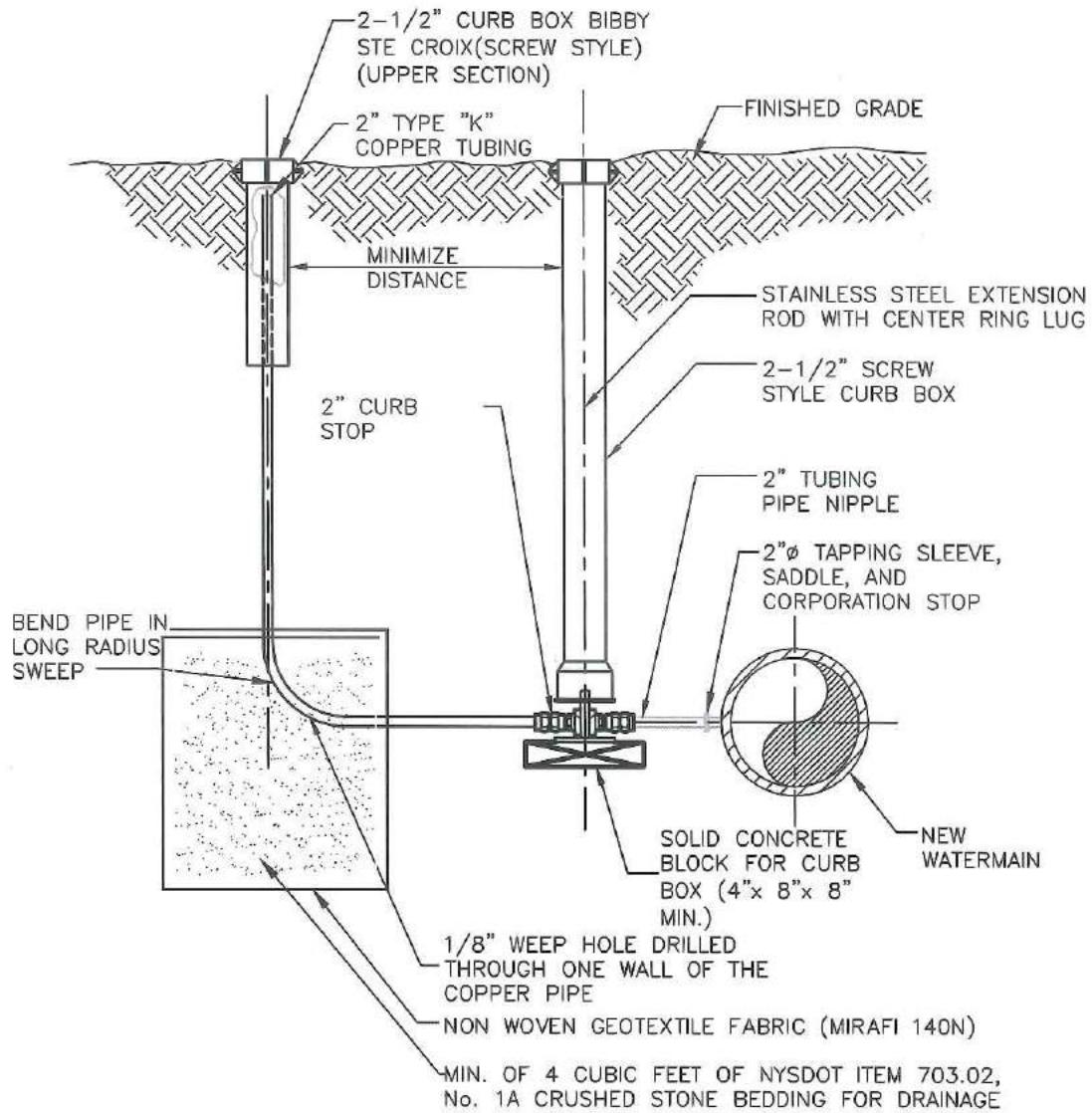






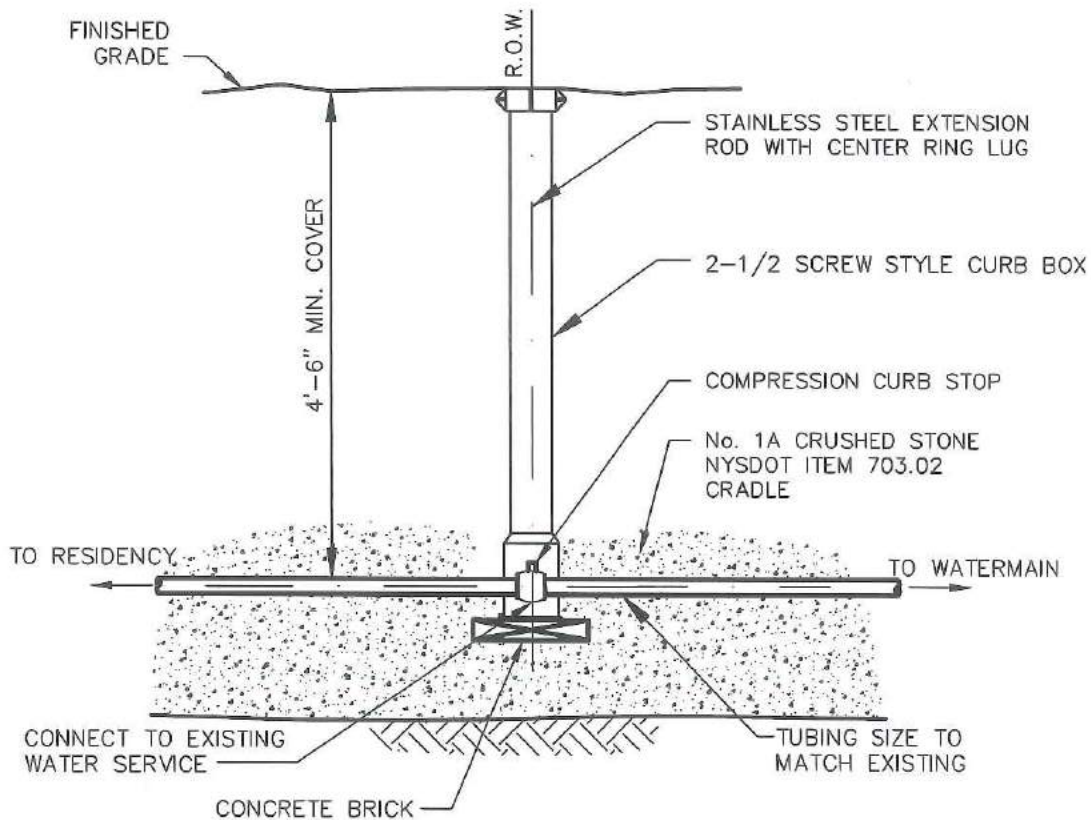
W-20
 PERMANENT BLOW-OFF
 TYPE A
 TOWN OF LEWISTON, N.Y.





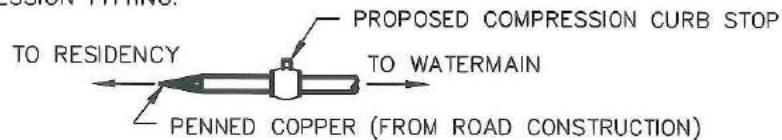
W-21
PERMANENT BLOW-OFF
TYPE B
TOWN OF LEWISTON, N.Y.





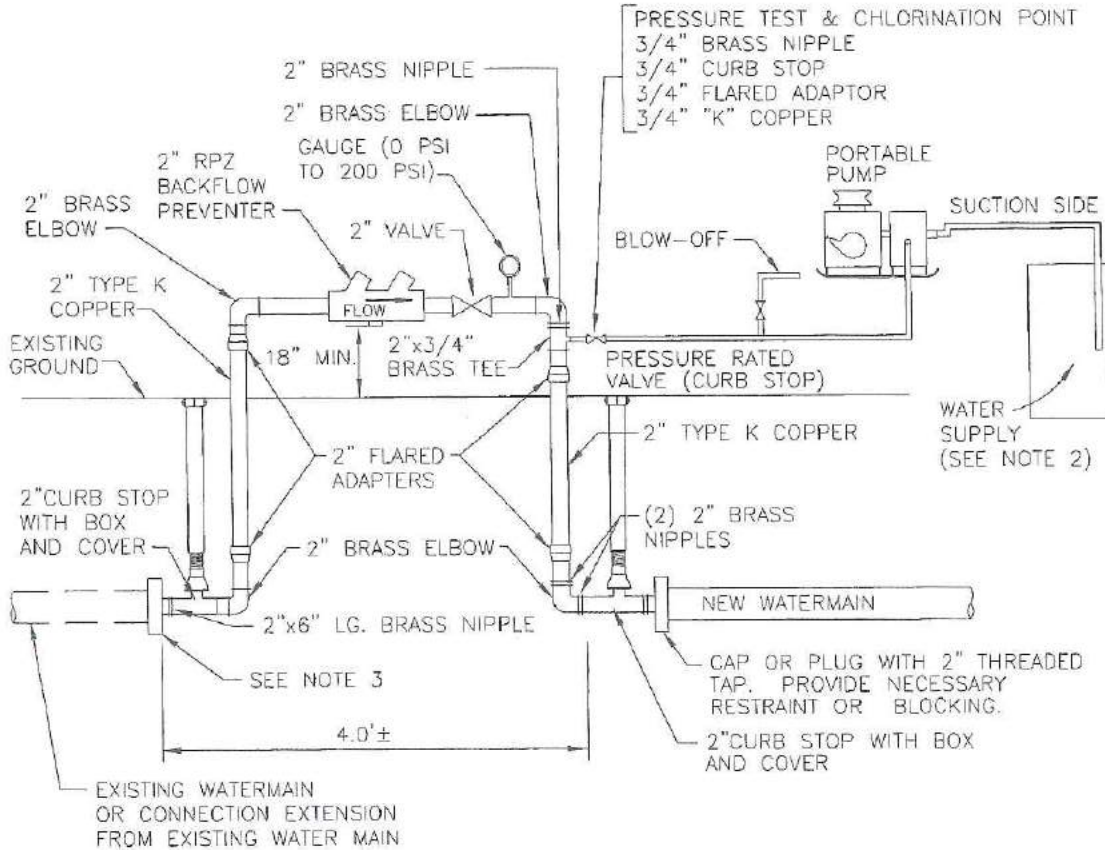
NOTE:

1. THE CONTRACTOR SHALL COMPACT BACKFILL MATERIAL TO A POINT 2' BEYOND THE CENTERLINE OF THE VALVE BOX IN BOTH DIRECTIONS. MATERIAL SHALL BE COMPACTED TO A MINIMUM OF 30" ABOVE THE SERVICE IN ORDER TO AVOID SETTLEMENT AND INSURE THAT THE VALVE BOX REMAINS PLUMB AFTER COMPLETION OF BACKFILLING. THE CONTRACTOR SHALL TAKE CARE NOT TO DAMAGE THE SERVICE FROM COMPACTION ACTIVITIES.
2. EXISTING SERVICES SHALL BE CRIMPED AND ABANDONED IN PLACE.
3. CURB BOXES SHALL NOT BE PLACED IN ASPHALT OR CONCRETE PAVEMENTS.
4. CONTRACTOR TO RESIDENCY SHALL REMOVE PENNED COPPER FROM COMPRESSION FITTING.



W-22
CURB STOP BOX DETAIL
 TOWN OF LEWISTON, N.Y.





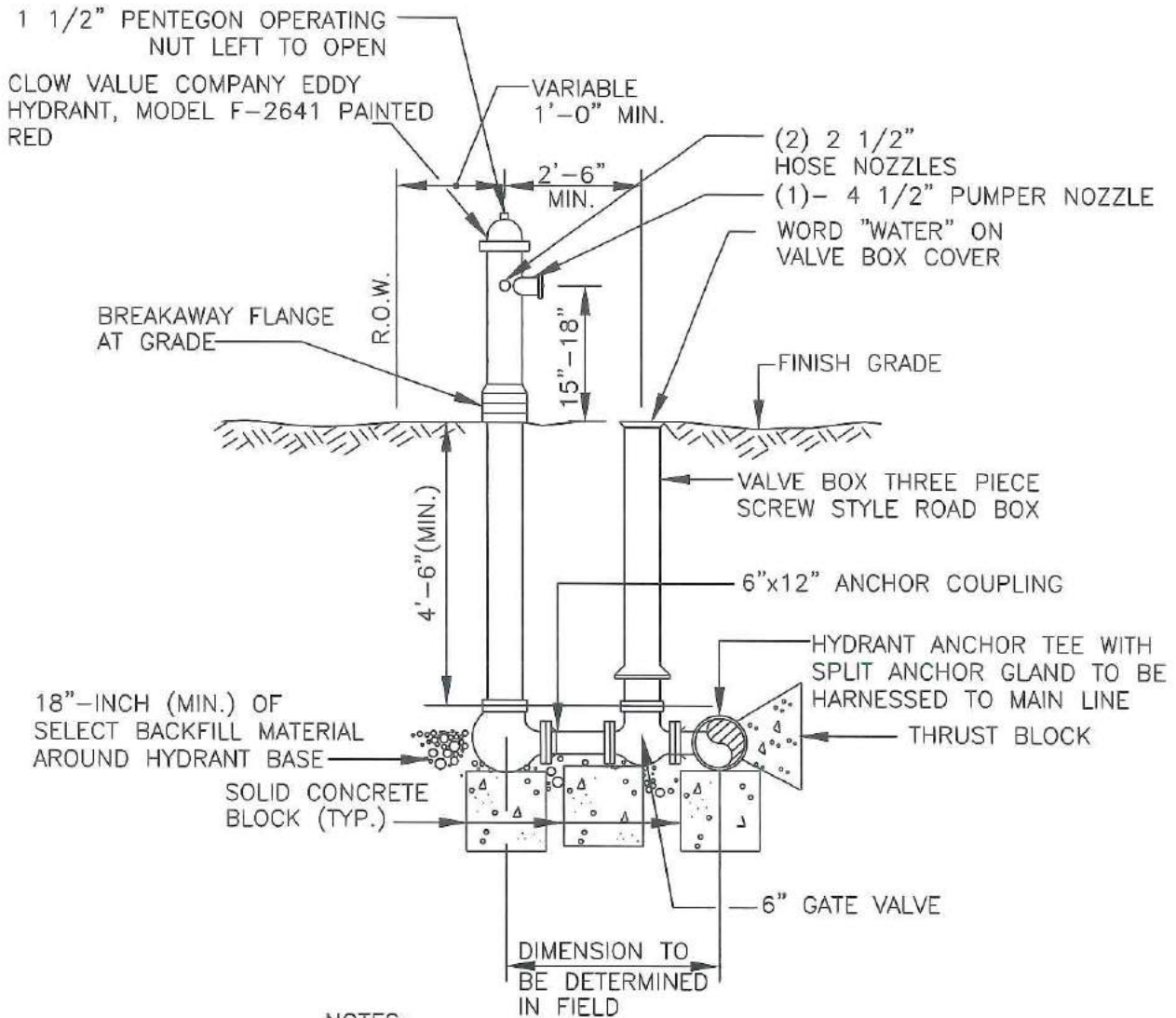
NOTES:

1. BACTERIOLOGICAL WATER SAMPLES SHALL BE TAKEN AT WATERMAIN BEGINNING AND END STATIONS AND AT MAXIMUM 1000 FT. SPACING.
2. FOR PRESSURE TESTING PROVIDE CLEAN WATER SUPPLY. FOR DISINFECTION PROVIDE CHLORINATED WATER SUPPLY.
3. CAP OR PLUG WITH 2-INCH THREADED TAP OR 2-INCH TAP INTO MAIN. PROVIDE NECESSARY RESTRAINT AND BLOCKING.

DETAIL

N.T.S.



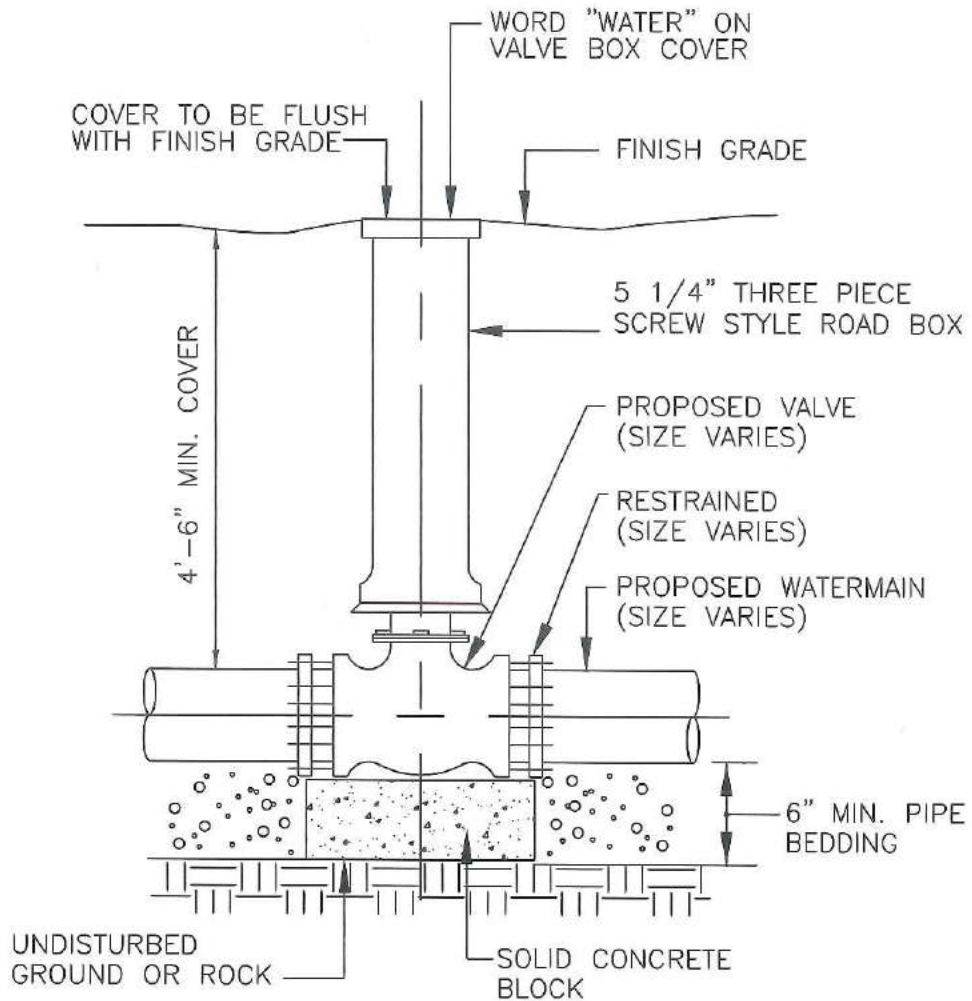


NOTES:

- 1.) PLUGGING OF WEEPS IN ACCORDANCE WITH LOCAL HEALTH DEPARTMENT REQUIREMENTS.
- 2.) HYDRANT TO BE SET WITH PUMPER NOZZLE SET TO FACE STREET.
- 3.) ALL PIPE SHALL BE DUCTILE IRON PIPE CLASS 52.
- 4.) ALL FITTINGS SHALL BE DUCTILE IRON CLASS 350.

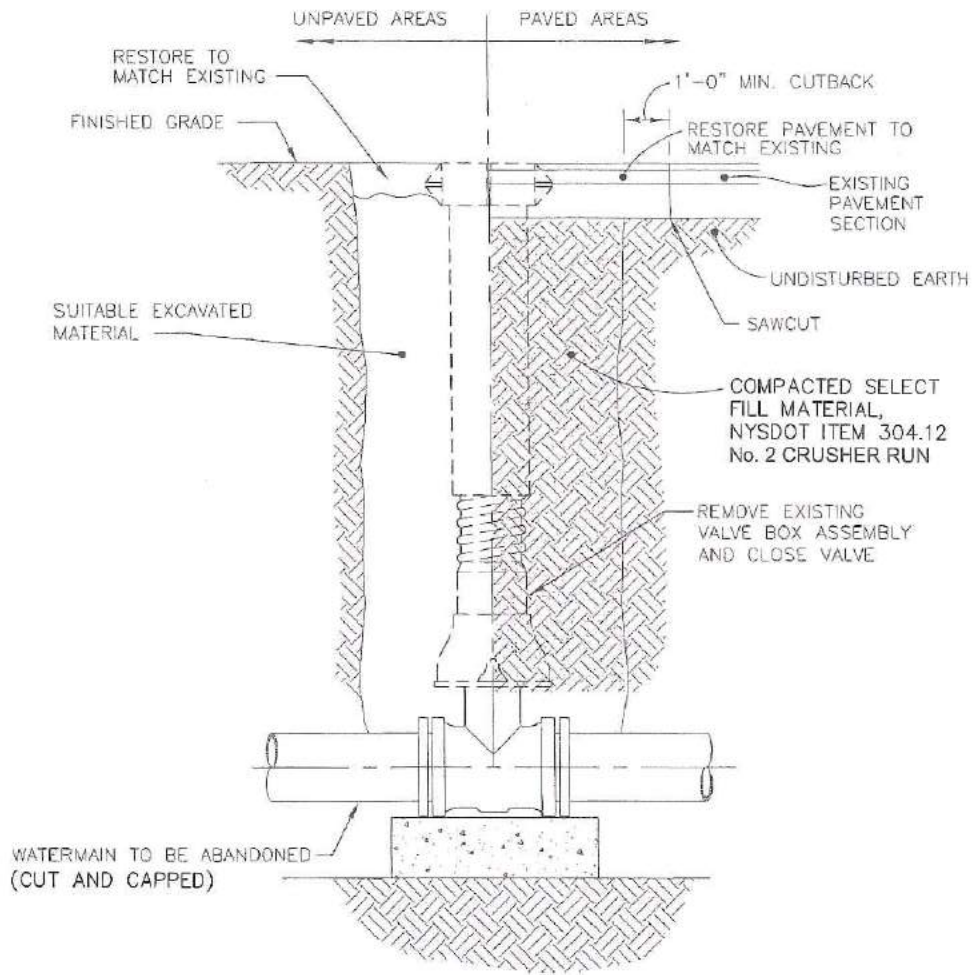
W-24
TYPICAL FIRE HYDRANT
INSTALLATION DETAIL
TOWN OF LEWISTON, N.Y.





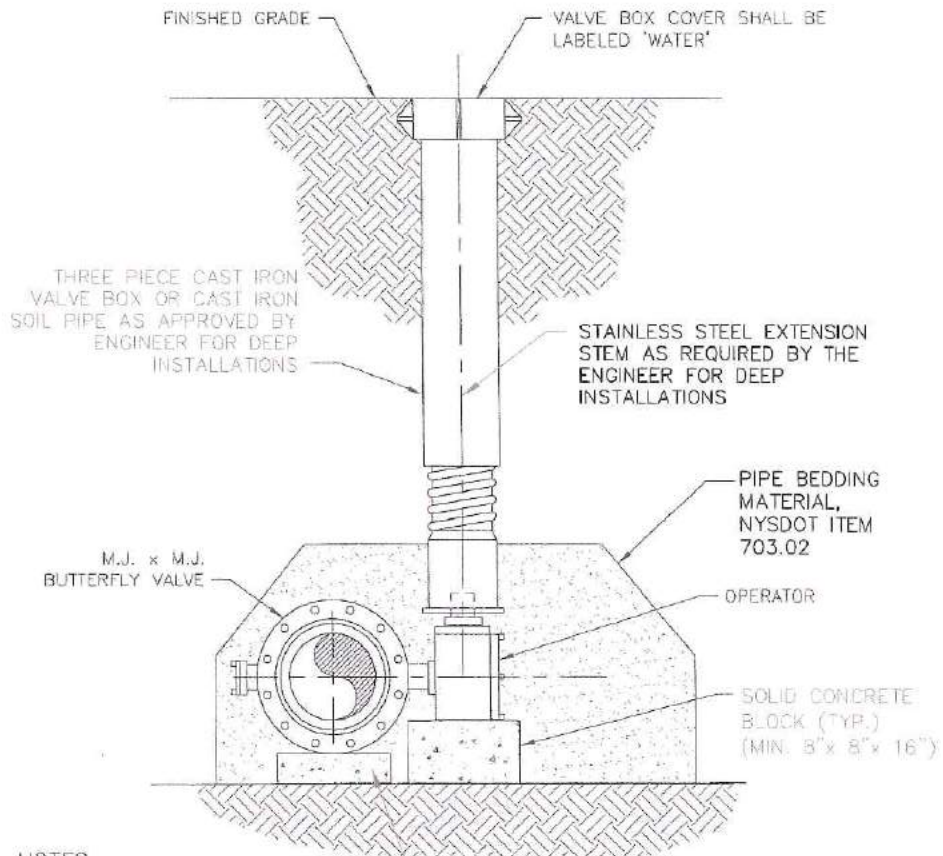
W-25
 TYPICAL LINE VALVE
 DETAIL
 TOWN OF LEWISTON, N.Y.





W-26
 EXISTING VALVE
 ABANDONMENT DETAIL
 TOWN OF LEWISTON, N.Y.





NOTES:

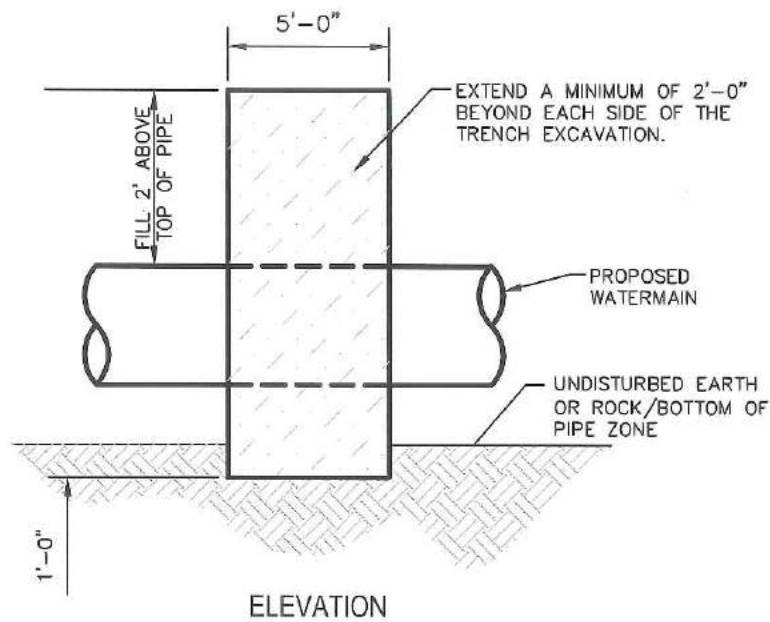
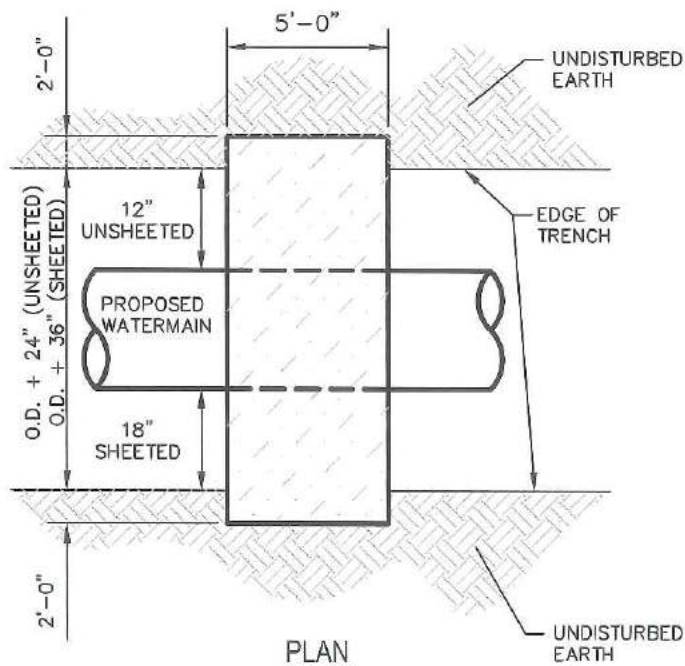
1. VALVE SHALL NOT SUPPORT VALVE BOX.
2. POSITION VALVE SO THAT OPERATOR IS ON SIDE OF WATERMAIN OPPOSITE THE ϕ OF ROADWAY.

SECTION

N.T.S.

W-27
**BUTTERFLY VALVE
 SETTING DETAIL
 TOWN OF LEWISTON, N.Y.**





TRENCH BARRIER NOTES:

1. AT LOCATION AS SHOWN OR DIRECTED BY THE ENGINEER, APPROVED COHESIVE SOIL IS TO BE PLACED WITHIN THE TRENCH TO PREVENT SUBSURFACE DRAINAGE THROUGH THE BEDDING AND BACKFILL MATERIALS.
2. THE REQUIRED COHESIVE SOIL BARRIERS SHALL EXTEND THE FULL CROSS-SECTION OF THE TRENCH FOR A MINIMUM LENGTH OF FIVE (5) FEET.
3. NATURAL SUBSOIL CONSISTING OF COHESIVE MATERIAL CAN BE USED FOR BACKFILLING AS DESCRIBED ABOVE. WHERE IN THE OPINION OF THE ENGINEER, THE MATERIAL RESULTING FROM THE EXCAVATION IS GRANULAR OR COHESIONLESS AND WOULD NOT PROVIDE A BARRIER TO THE MOVEMENT OF WATER, APPROVED COHESIVE SOIL MUST BE PROVIDED.
4. COHESIVE SOILS PLACED IN TRENCHES SHALL BE PLACED IN 9 TO 10 INCH LIFTS AND COMPACTED USING APPROVED METHODS.

W-28
COHESIVE FILL TRENCH
BARRIER DETAIL
TOWN OF LEWISTON, N.Y.



MIN. REQUIRED HARNESING LENGTHS (AT 170 PSI TEST PRESSURE AND 4'-6" COVER)									
DEFLECTION	6" PVC	8" PVC	10" PVC	12" PVC	6" D.I.P.	8" D.I.P.	10" D.I.P.	12" D.I.P.	
11-1/4°	13'	13'	15'	18'	12'	12'	14'	16'	
22-1/2°	25'	25'	30'	34'	23'	23'	28'	32'	
45°	48'	48'	57'	67'	45'	45'	54'	63'	
90° - TEE (BRANCH ONLY) OR DEAD END	99'	99'	120'	140'	94'	94'	112'	130'	

NOTES:

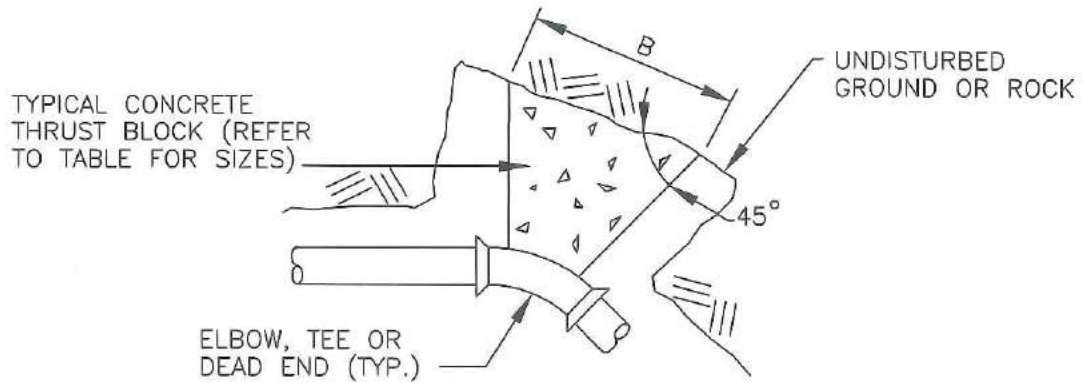
1. THRUST RESTRAINT SHALL BE PROVIDED BY MECHANICAL METHODS IN ACCORDANCE WITH SPECIFICATIONS FOR THE LENGTHS SHOWN IN THE TABLE. THRUST BLOCKS SHALL BE USED AT ALL BENDS AND AS SHOWN ON THE DRAWINGS OR ORDERED BY THE ENGINEER. HARNESING LENGTHS SHOWN ARE TO BE INSTALLED ON BOTH SIDES OF THE FITTINGS.
2. CONTRACTOR SHALL PROVIDE ALL REQUIRED HARNESING NECESSARY FOR TESTING PURPOSES. LENGTH AND LOCATION OF HARNESING SHALL BE DETERMINED BASED UPON CONTRACTORS OPERATIONS.



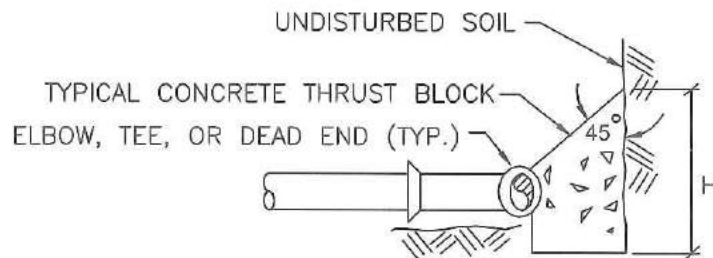
NOVEMBER 2014

W-29
HARNESING TABLE

TOWN OF LEWISTON, N.Y.



PLAN



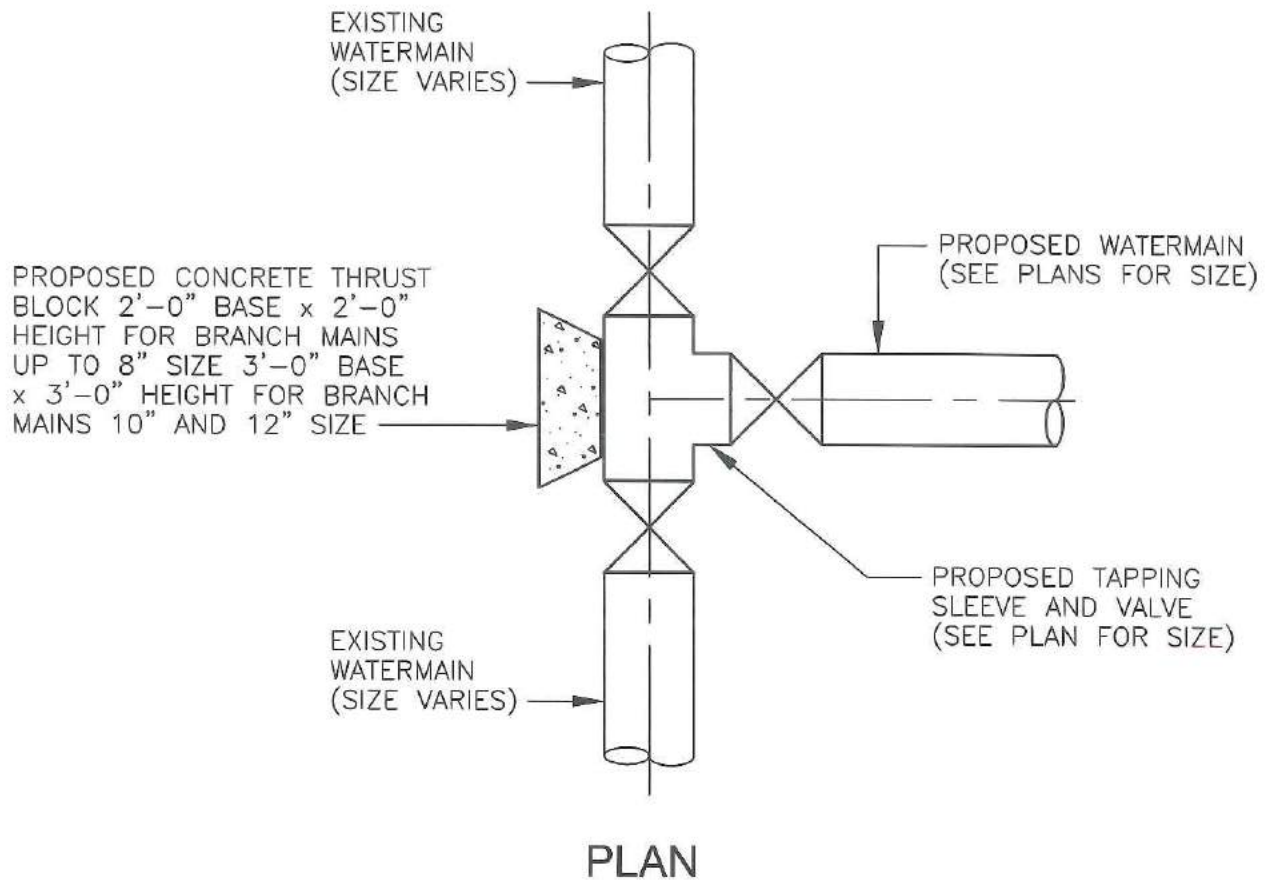
PROFILE

MINIMUM REQUIRED HORIZONTAL THRUST BLOCK SIZE D.I.P. & P.V.C WATERLINE								
DEFLECTION ANGLE	PIPE DIAMETER (in.) (AT 170 PSI TEST)							
	6"		8"		10"		12"	
	B	H	B	H	B	H	B	H
90° / TEE	2.00'	1.25'	2.50'	1.50'	3.00'	2.00'	4.00'	2.00'
DEAD END	2.00'	1.25'	2.50'	1.50'	3.00'	2.00'	4.00'	2.00'
45°	1.75'	1.00'	2.25'	1.25'	3.00'	1.75'	3.50'	1.75'
22-1/2°	1.25'	0.75'	2.00'	1.00'	2.00'	1.25'	2.25'	1.50'
11-1/4°	1.00'	0.50'	1.50'	1.00'	1.75'	1.00'	1.75'	1.00'

NOTE: THRUST BLOCKS PERMITTED ONLY WHERE SHOWN OR IN LOCATION APPROVED BY ENGINEER.

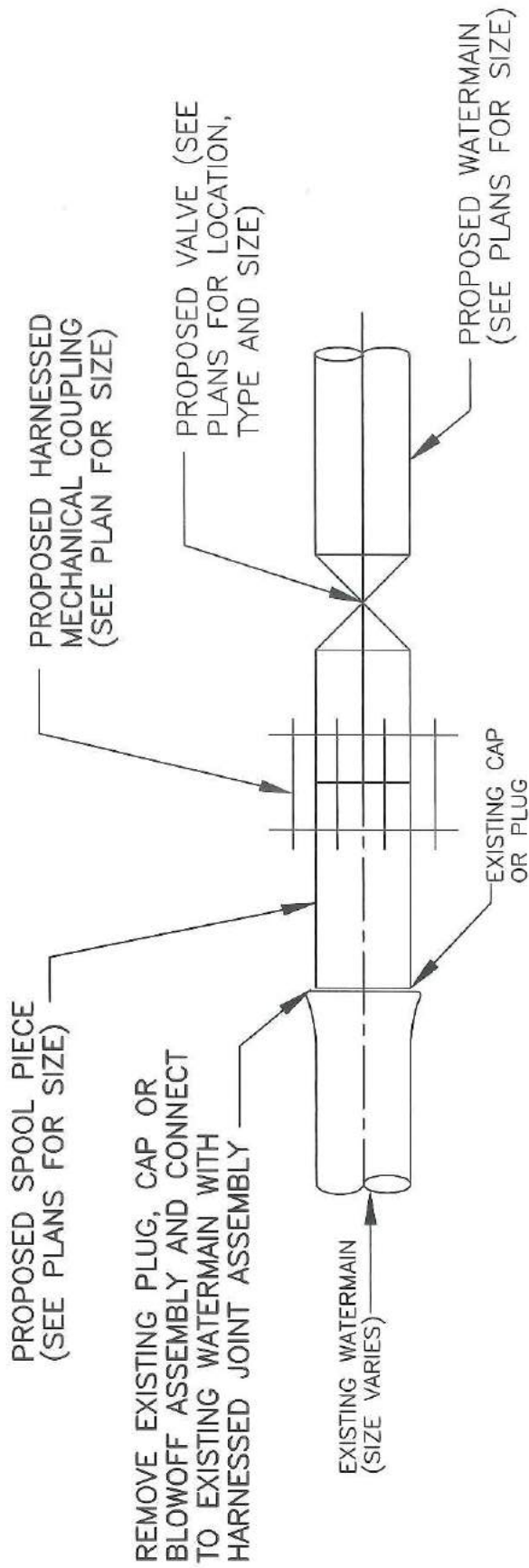
W-30
TYPICAL CONCRETE
THRUST BLOCKS
TOWN OF LEWISTON, N.Y.





W-31
 TYPICAL INTERCONNECTION
 DETAIL
 TOWN OF LEWISTON, N.Y.



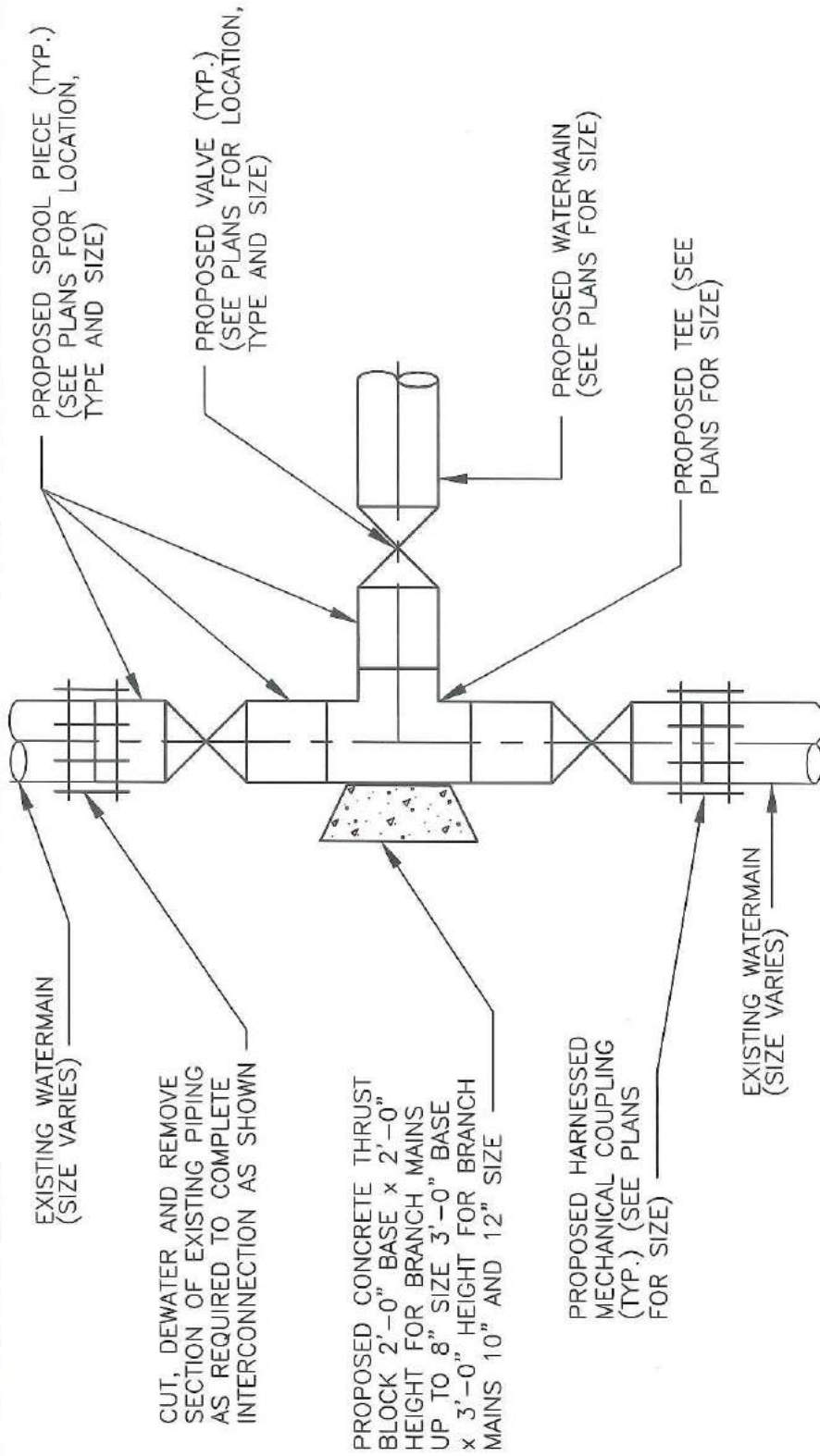


NOTE:
EXISTING CONDITION AND ARRANGEMENT OF CAP OR PLUG IS NOT
KNOWN. ACTUAL CONNECTION TO EXISTING MAIN WILL BE
DEPENDENT UPON CONDITIONS ENCOUNTERED.

W-32
TYPICAL INTERCONNECTION
TYPE "B"
TOWN OF LEWISTON, N.Y.



NOVEMBER 2014

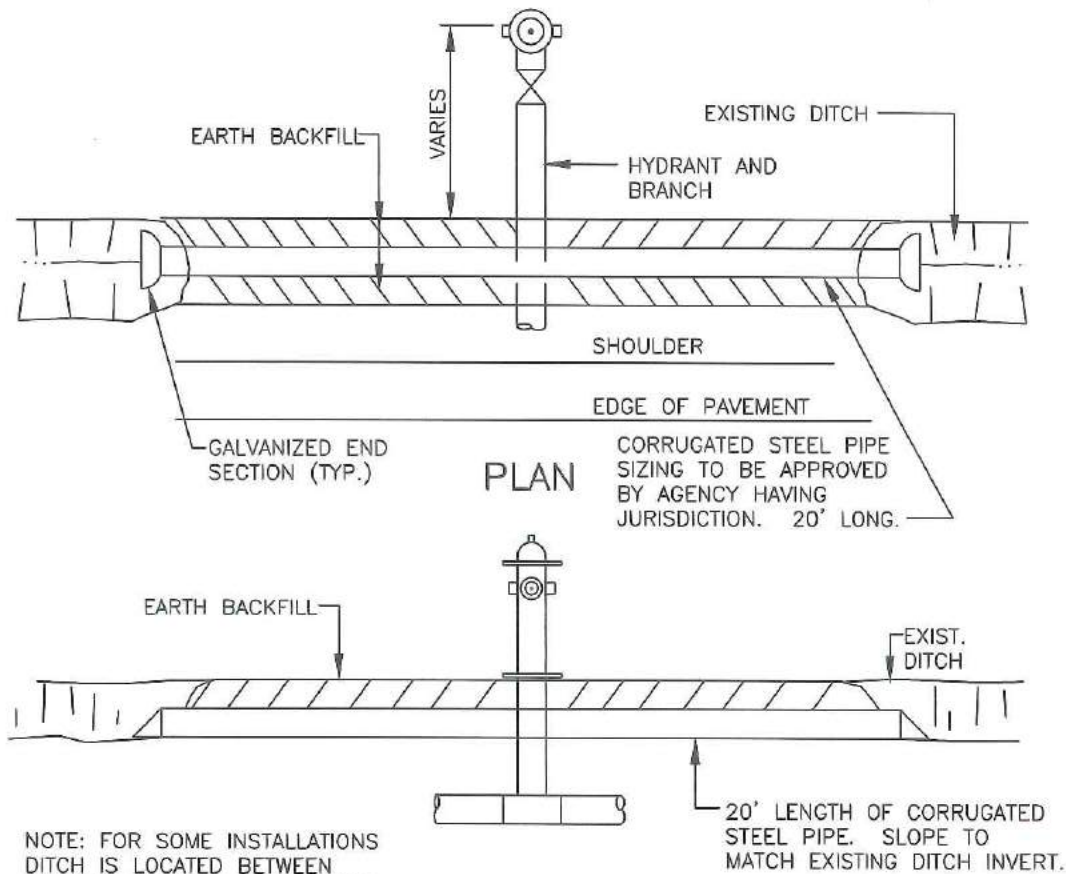


NOTE: PROPOSED VALVES SHOWN ON THIS DETAIL FOR TYPICAL TYPE "C" INTERCONNECTION MAY NOT BE REQUIRED. REFER TO PLANS FOR VALVE LOCATION, SIZE AND TYPES REQUIRED. IF REDUCERS ARE REQUIRED TO CONNECT TO EXISTING PIPING OF A DIFFERENT SIZE AS SHOWN ON THE PLANS THEY SHALL BE FURNISHED AND INSTALLED UNDER THE TYPE "C" INTERCONNECTION.

PLAN

W-33
 TYPICAL INTERCONNECTION
 TYPE "C"
 TOWN OF LEWISTON, N.Y.





NOTE: FOR SOME INSTALLATIONS DITCH IS LOCATED BETWEEN SHOULDER AND MAIN LINE PIPE. CMP INSTALLATION SHALL BE CENTERED ON HYDRANT TEE LOCATION.

SECTION

NOTE:

1. ALL CMP PIPING SHALL BE FULLY COATED INSIDE AND OUT; CMP PIPING MATERIALS SHALL CONFORM TO NYSDOT SPECIFICATIONS, SECTION 707.
2. CMP PIPING INSTALLATION SHALL CONFORM TO NYSDOT SPECIFICATIONS, SECTION 603 AND OTHER REQUIREMENTS OF AGENCY HAVING JURISDICTION.
3. CMP PIPE INSTALLATION AT HYDRANT LOCATIONS IS INCLUDED FOR PAYMENT UNDER BID ITEM FOR FURNISHING AND INSTALLING NEW HYDRANTS.

W-34
TYPICAL CMP PIPE INSTALLATION
AT HYDRANT
TOWN OF LEWISTON, N.Y.

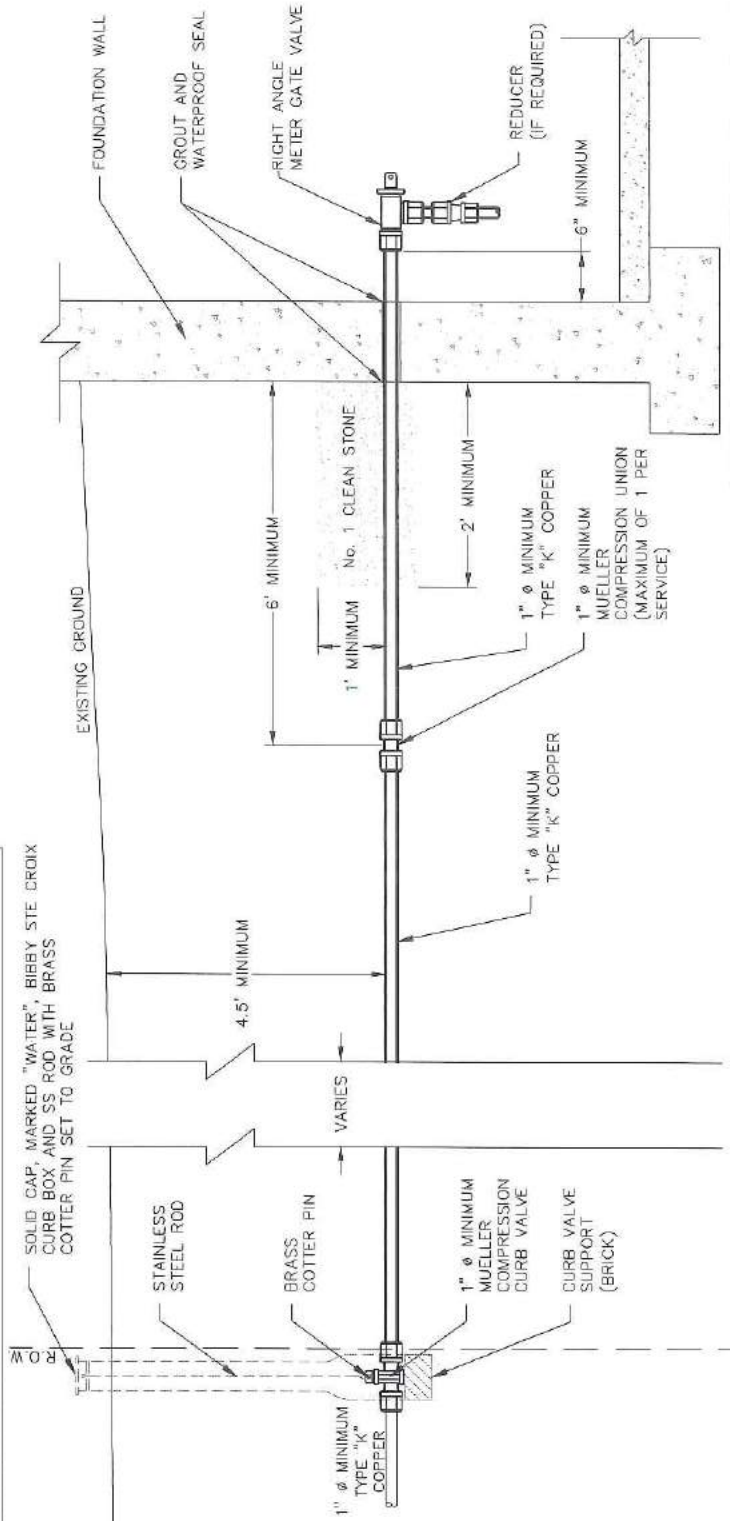


INSPECTION REQUIRED

PLEASE CALL: 716-754-8213
 MONDAY - FRIDAY
 8:00am - 3:00pm

NOTES:

1. ALL PIPE SHALL BE 1" ϕ MINIMUM AND TYPE "K" COPPER.
2. NO MORE THAN 1 UNION BETWEEN CURB VALVE AND FOUNDATION WALL, IF MORE THAN 1 UNION THEN A METER PIT IS REQUIRED AT THE PROPERTY LINE.
3. ALL VALVES SHALL BE 1" ϕ MINIMUM MUELLER COMPRESSION VALVES.
4. OWNER WILL SUPPLY RIGHT ANGLE METER VALVES.
5. LINE VALVES WILL BE REQUIRED ON BOTH SIDES OF THE METER.
6. METER MUST BE HUNG HORIZONTALLY.
7. BACKFLOW PREVENTER MUST BE INSTALLED AFTER THE METER.
8. TYPE "K" COPPER ONLY TO BE USED FROM WATER MAIN TO HOUSE. PLASTIC TUBING WITH INSERTS MAY BE USED IF AN APPROVED METER PIT AND WATER METER ARE PLACED AT THE STREET SIDE PROPERLY LINE.



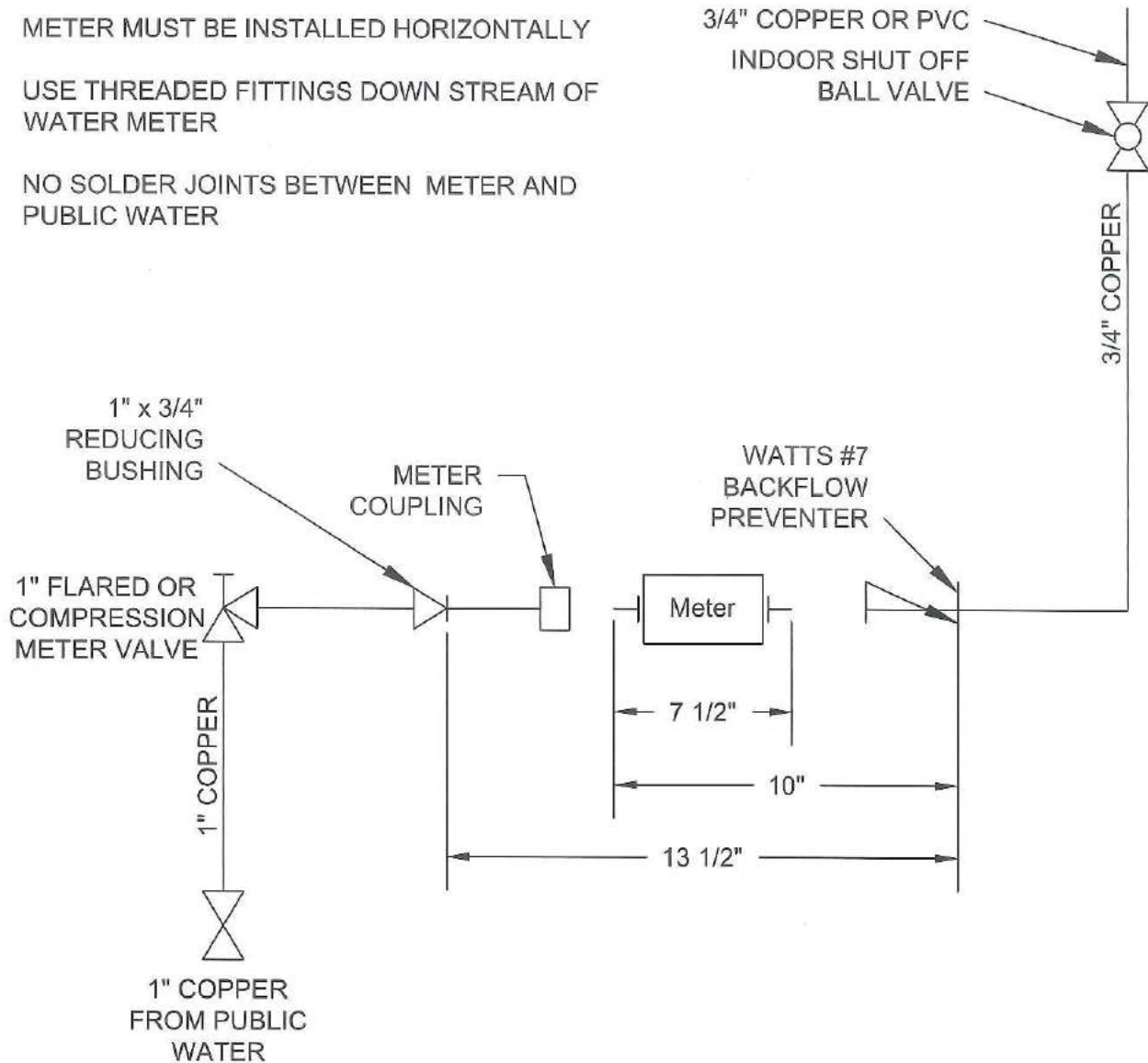
W-35
 NEW WATER SERVICE
 CONNECTION DETAIL
 TOWN OF LEWISTON, N.Y.



NOVEMBER 2014

NOTES:

1. METER PIT IS REQUIRED IF BUILDING SETBACK IS 200' OR MORE
2. METER TO BE INSTALLED 6" FROM BUILDING WALL
3. METER MUST BE INSTALLED HORIZONTALLY
4. USE THREADED FITTINGS DOWN STREAM OF WATER METER
5. NO SOLDER JOINTS BETWEEN METER AND PUBLIC WATER

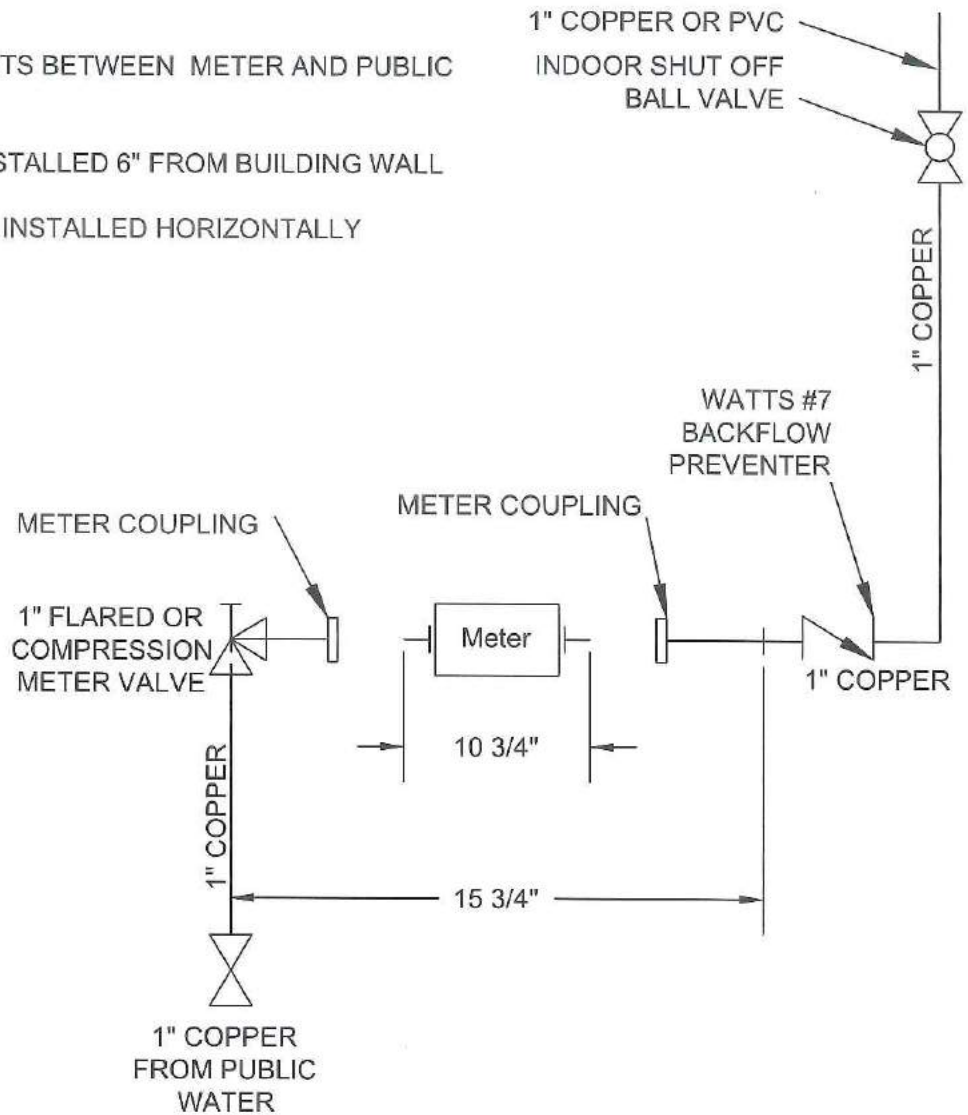


W-36
INSTALLATION GUIDE FOR
3/4" WATER METER
TOWN OF LEWISTON, N.Y.



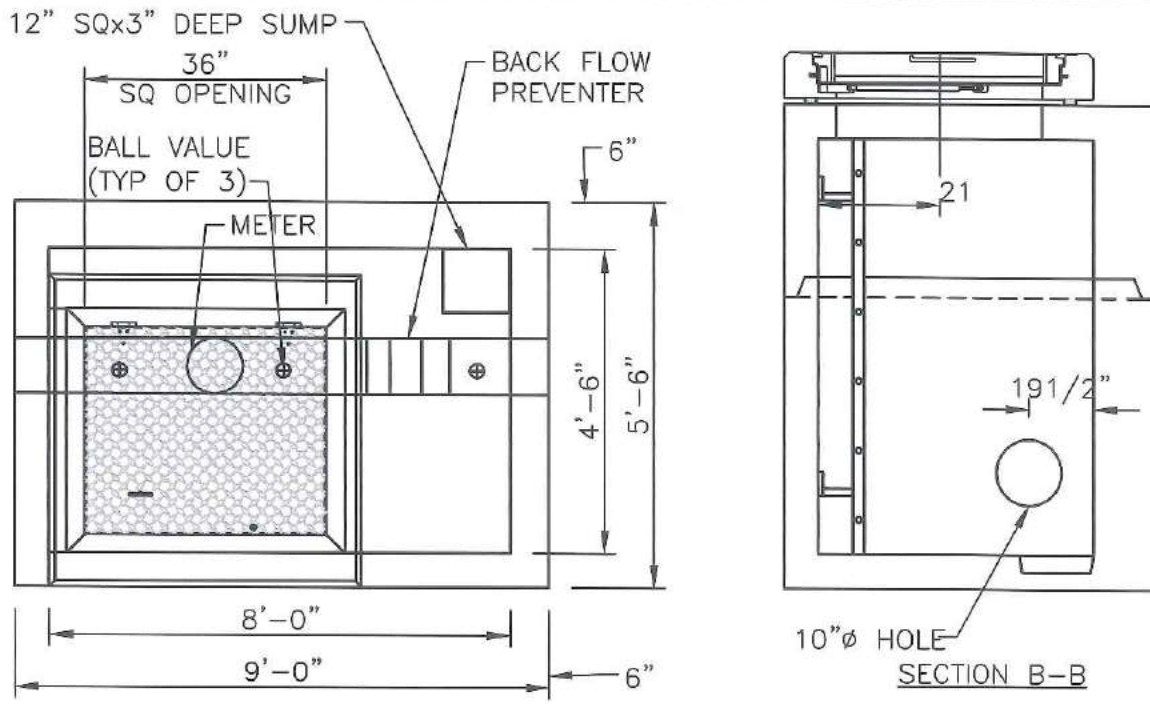
NOTES:

1. 1" WATER METER PIT IS REQUIRED IF BUILDING SETBACK IS 200' OR MORE
2. USE THREADED FITTINGS DOWN STREAM OF WATER METER
3. NO SOLDER JOINTS BETWEEN METER AND PUBLIC WATER
4. METER TO BE INSTALLED 6" FROM BUILDING WALL
5. METER MUST BE INSTALLED HORIZONTALLY

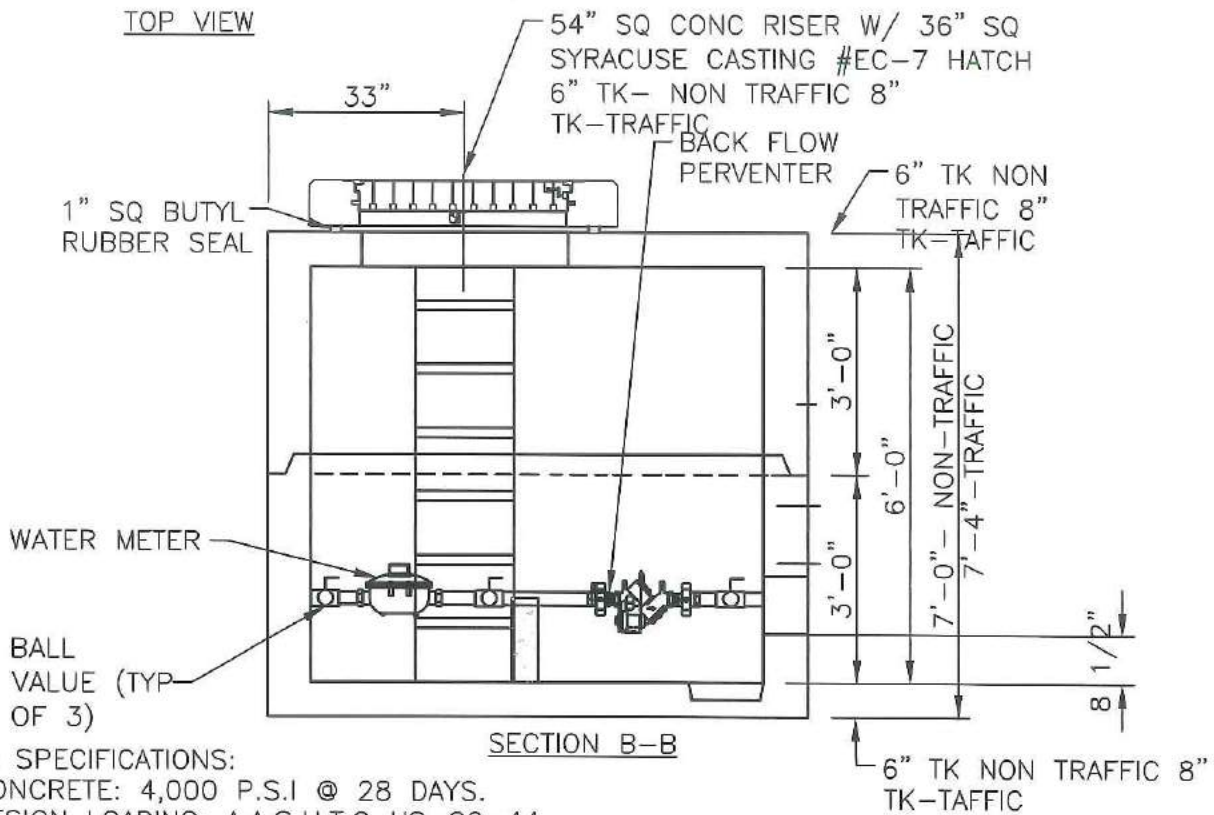


W-37
INSTALLATION GUIDE
FOR 1" WATER METER
TOWN OF LEWISTON, N.Y.





TOP VIEW

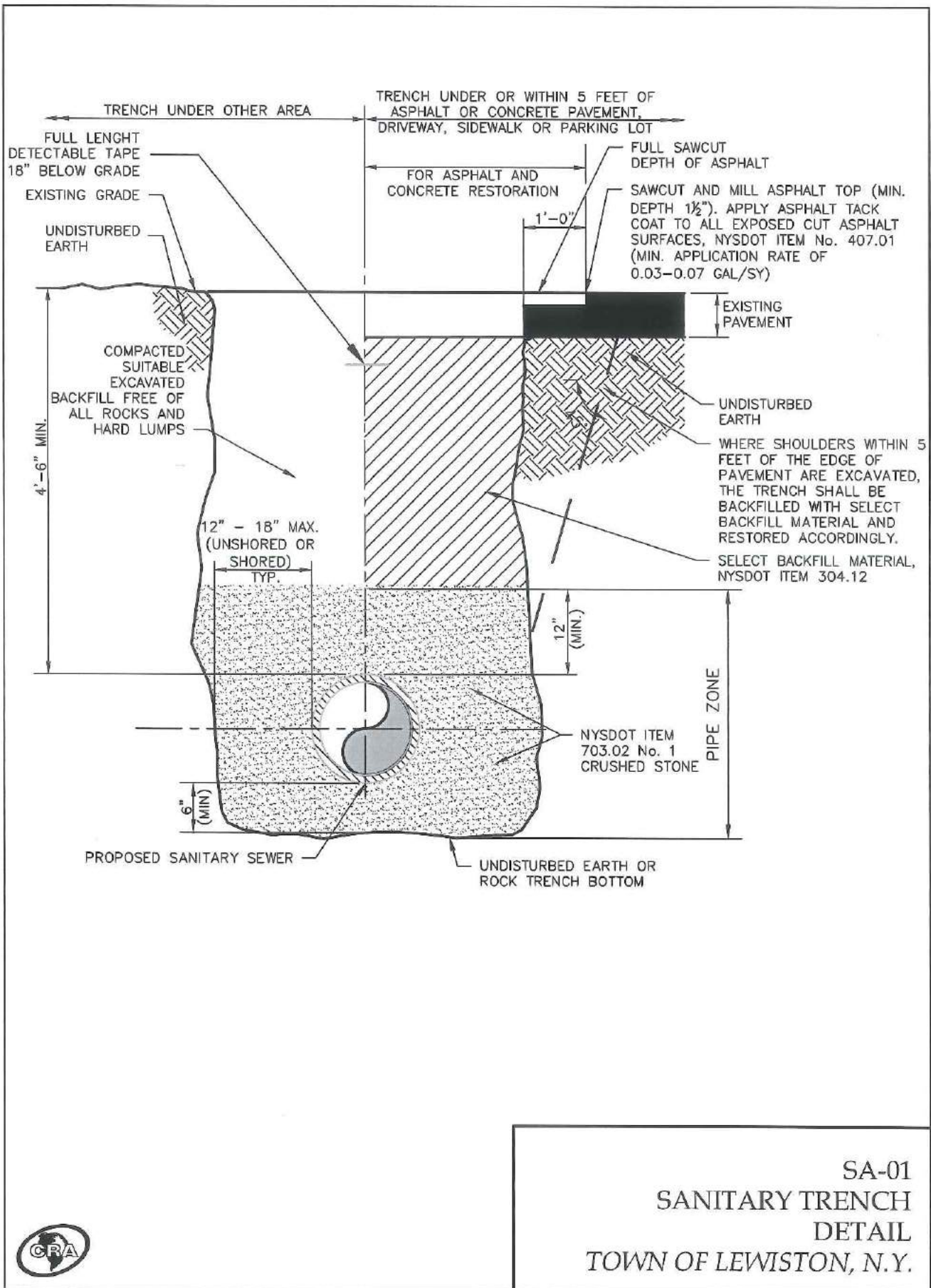


- A: SPECIFICATIONS:
- CONCRETE: 4,000 P.S.I @ 28 DAYS.
 - DESIGN LOADING: A.A.S.H.T.O HS-20-44
 - WATERTIGHT PIPE TO PIT BOOT AVAILABLE(SEE DETAIL).
 - SAFETY LADDER, A.S.T.M A36 GALV 1/4"x2" BOLTS BY G.C, EXP INSERTS BY G.C
 - LADDER UP SAFETY POST, BLACK ENAMEL, MODEL # LU-1



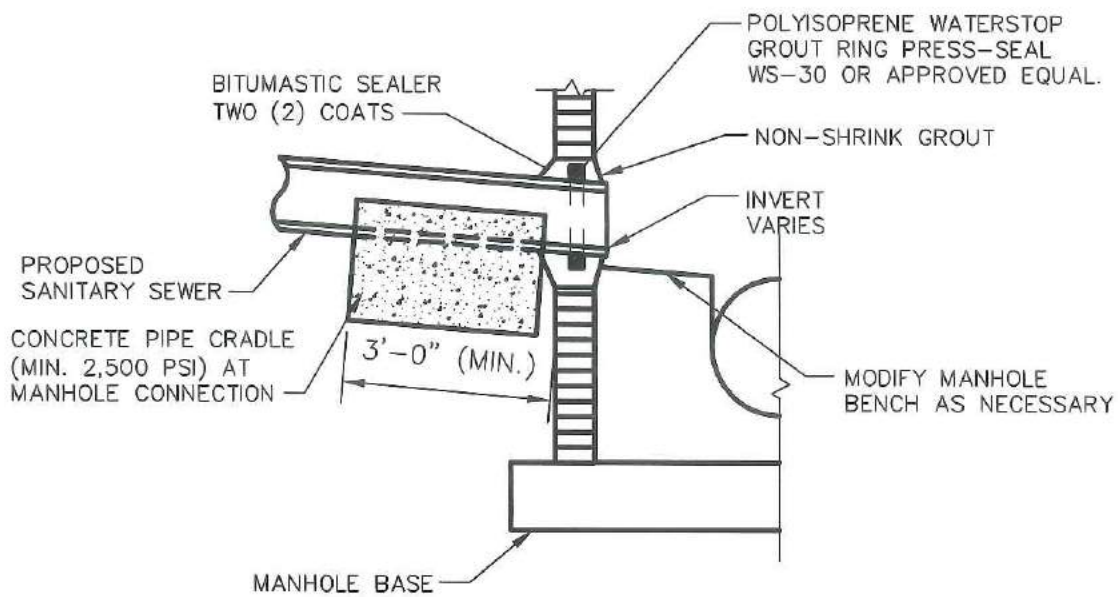
W-38
 INSTALLATION GUIDE
 FOR 1" WATER METER
 TOWN OF LEWISTON, N.Y.

Sanitary Sewer Details



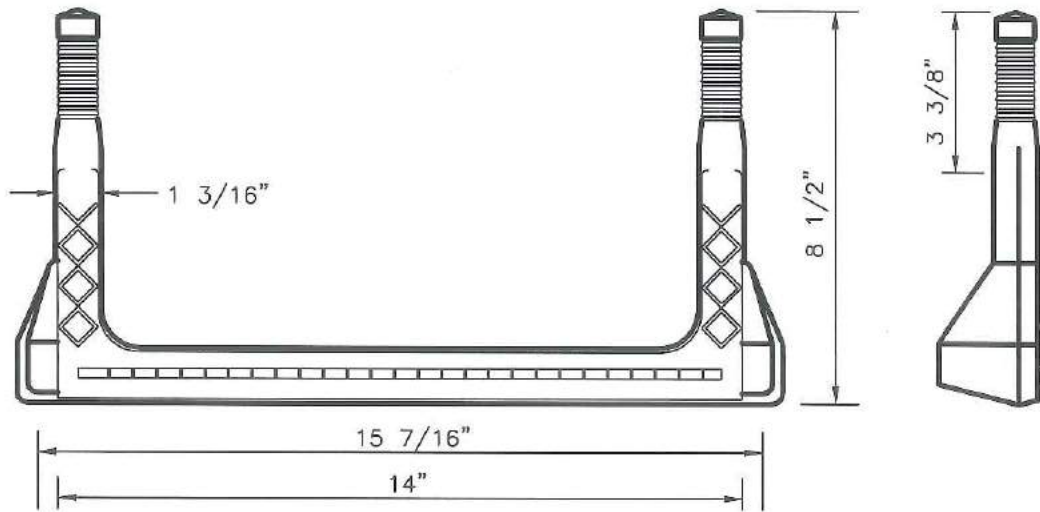
SA-01
 SANITARY TRENCH
 DETAIL
 TOWN OF LEWISTON, N.Y.



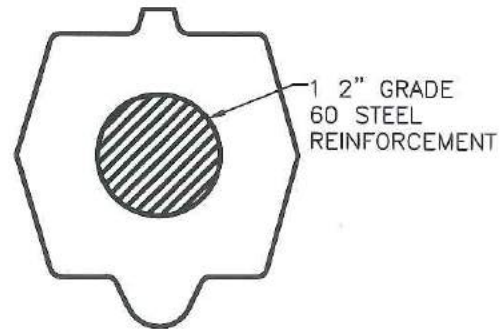
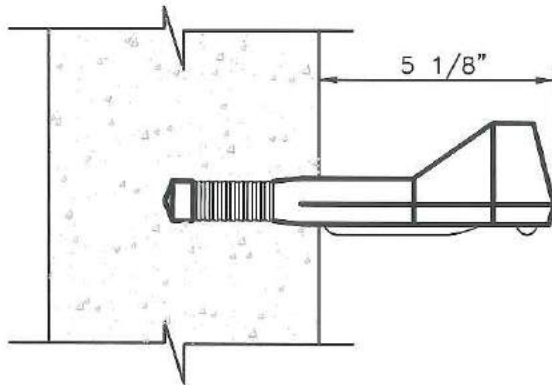
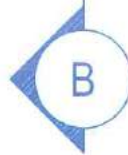


SA-02
 CONNECTION TO EXISTING BRICK
 SANITARY MANHOLE DETAIL
 TOWN OF LEWISTON, N.Y.





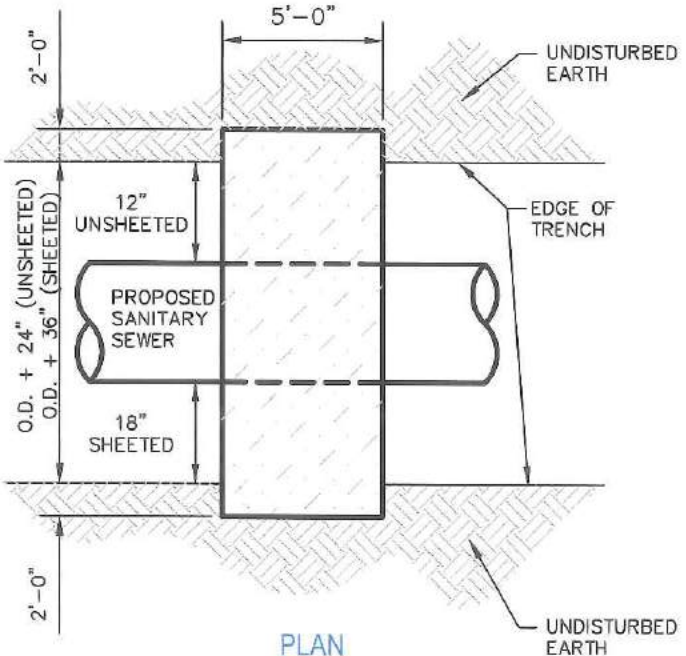
M.A. INDUSTRIES, INC.
OR APPROVED EQUAL



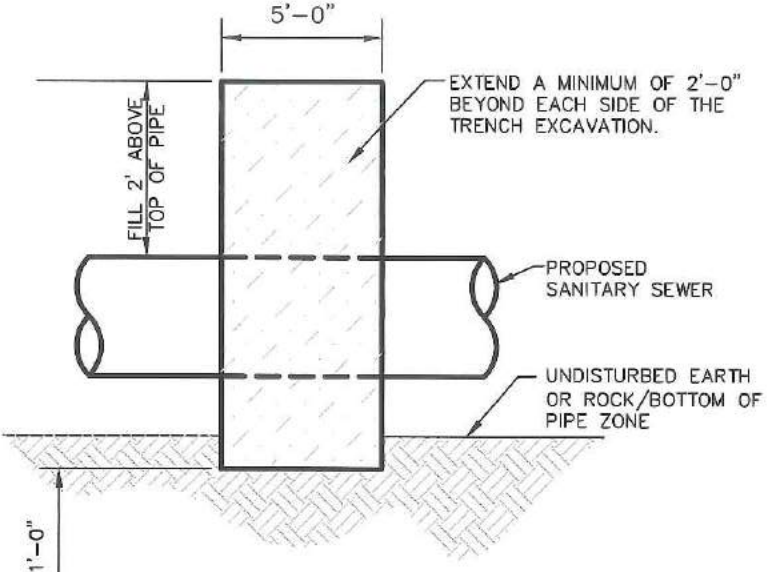
SECTION — (B)

SA-03
COPOLYMER POLYPROPYLENE
PLASTIC MANHOLE STEP
TOWN OF LEWISTON, N.Y.





PLAN



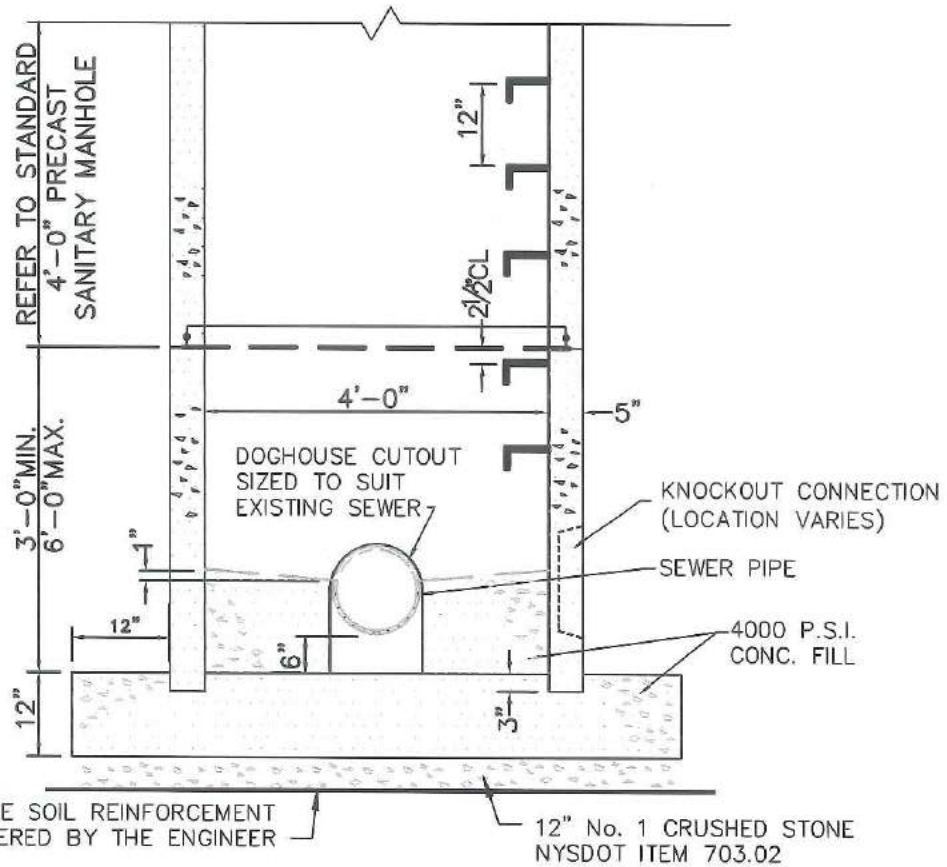
ELEVATION

TRENCH BARRIER NOTES:

1. AT LOCATION AS SHOWN OR DIRECTED BY THE ENGINEER, APPROVED COHESIVE SOIL (CLAY) IS TO BE PLACED WITHIN THE TRENCH TO PREVENT SUBSURFACE DRAINAGE THROUGH THE BEDDING AND BACKFILL MATERIALS.
2. THE REQUIRED COHESIVE SOIL BARRIERS SHALL EXTEND THE FULL CROSS-SECTION OF THE TRENCH FOR A MINIMUM LENGTH OF FIVE (5) FEET.
3. NATURAL SUBSOIL CONSISTING OF COHESIVE MATERIAL CAN BE USED FOR BACKFILLING AS DESCRIBED ABOVE. WHERE IN THE OPINION OF THE ENGINEER, THE MATERIAL RESULTING FROM THE EXCAVATION IS GRANULAR OR COHESIONLESS AND WOULD NOT PROVIDE A BARRIER TO THE MOVEMENT OF WATER, APPROVED COHESIVE SOIL MUST BE PROVIDED.
4. COHESIVE SOILS PLACED IN TRENCHES SHALL BE PLACED IN 9 TO 10 INCH LIFTS AND COMPACTED USING APPROVED METHODS.

SA-04
 COHESIVE FILL TRENCH
 BARRIER DETAIL
 TOWN OF LEWISTON, N.Y.



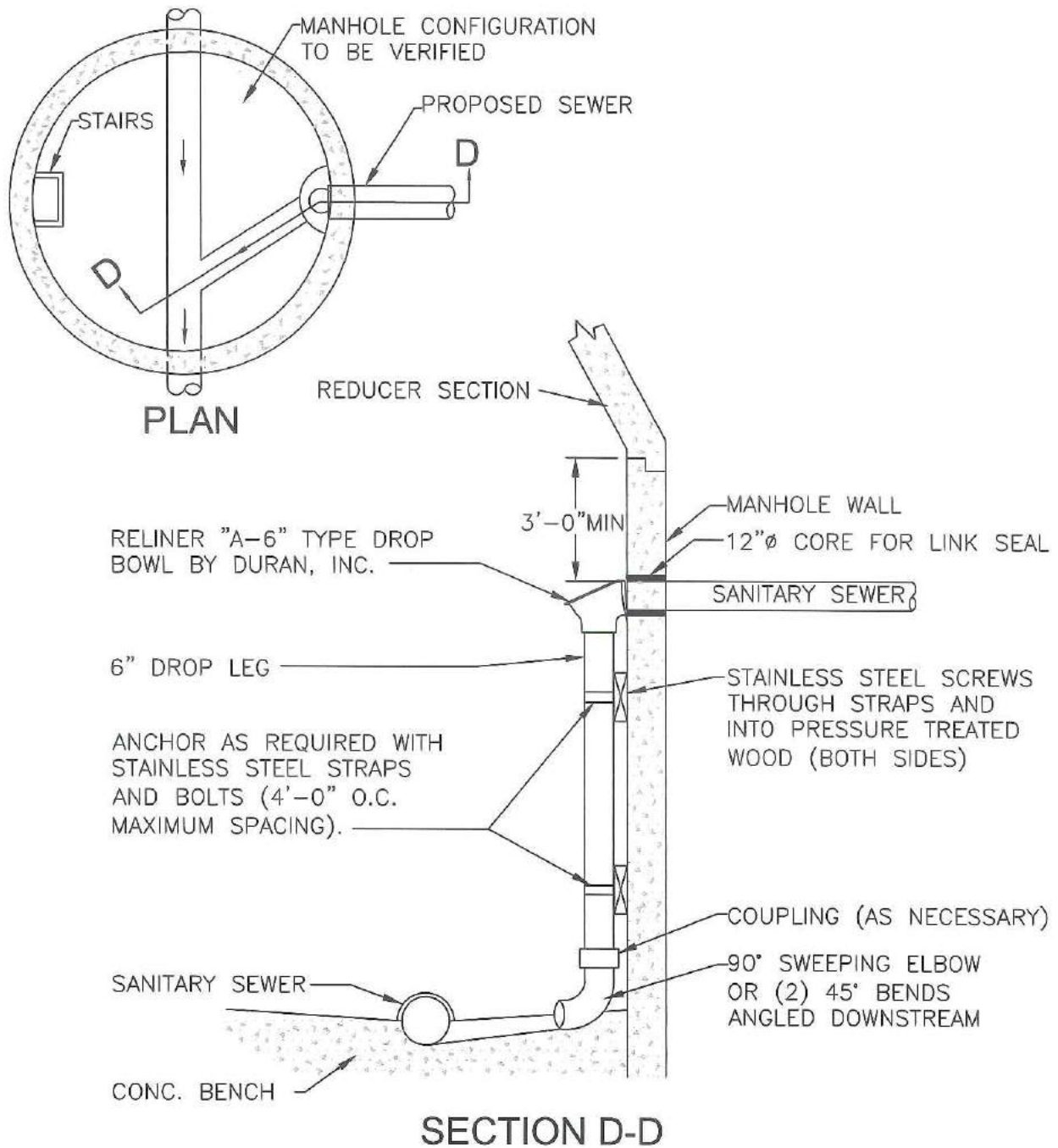


NOTE:

AREA AROUND DOGHOUSE CUTOUT AND PIPE TO BE MADE WATERTIGHT BY INSTALLATION OF AN APPROVED RUBBER POLYMER WATER STOP SLIPPED OVER THE PIPE AND TIGHTENED ONTO THE PIPE WITH INTEGRAL STAINLESS STEEL TAKE-UP CLAMP(S). PRESS-SEAL GASKET CORP. OR APPROVED EQUAL. THE ANNULAR SPACE AROUND THE PIPE AND MANHOLE WALL SHALL BE CLOSED FROM INSIDE FACE TO OUTSIDE FACE OF THE MANHOLE WALL WITH AN APPROVED NON-SHRINK GROUT. OUTSIDE GROUTED SURFACE TO BE PAINTED WITH AN APPROVED WATERPROOFING BITUMINOUS MATERIAL. REFER TO DETAIL.

SA-05
**PRECAST DOGHOUSE BASE MANHOLE FOR SEWERS
 24 (DEPENDENT UPON PIPE MATERIAL) OR LESS
 TOWN OF LEWISTON, N.Y.**



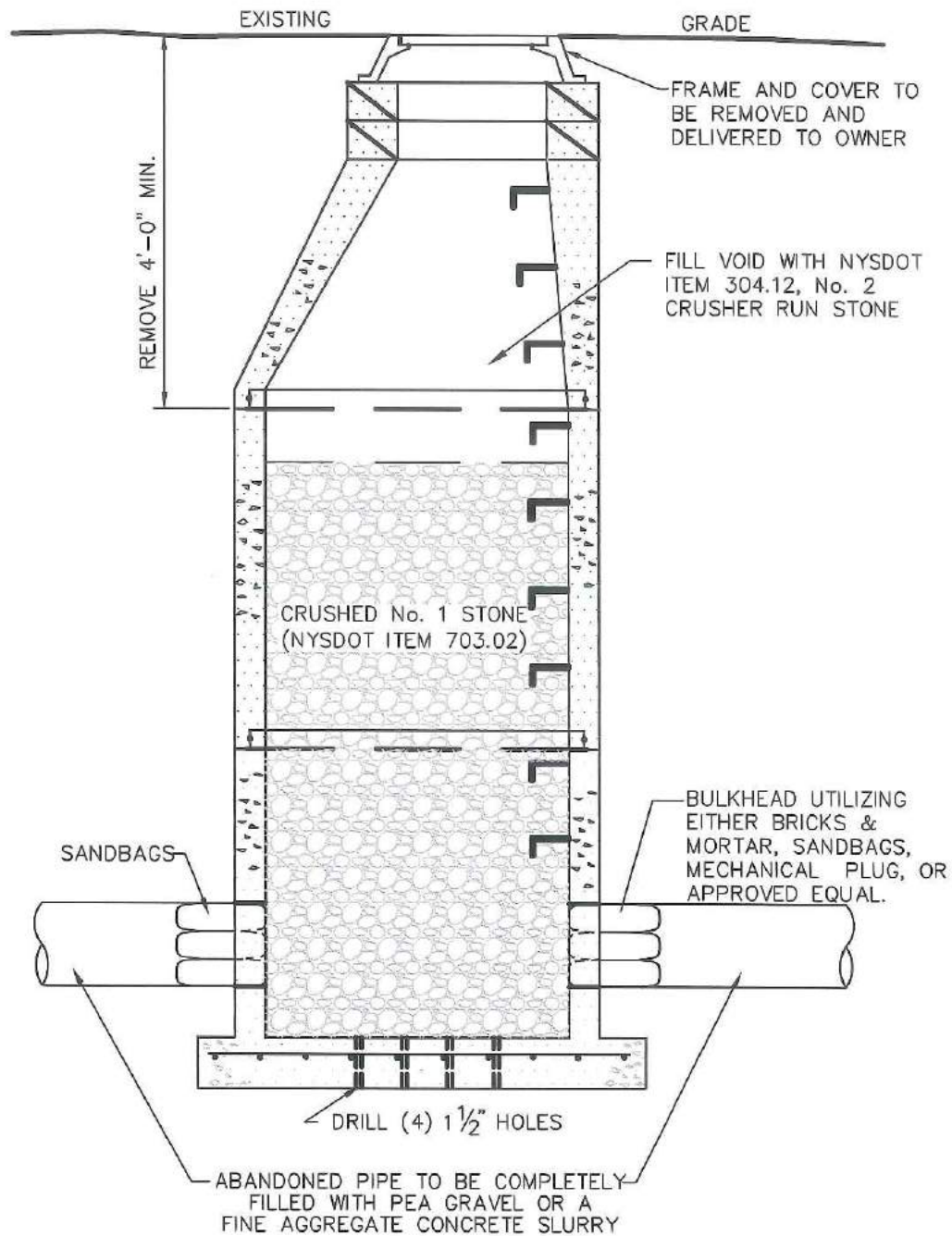


NOTES:

1. A DROP PIPE SHALL BE PROVIDED FOR A SEWER ENTERING A MANHOLE AT AN ELEVATION OF 24 INCHES OR MORE ABOVE THE MANHOLE INVERT. ONLY INSIDE DROP ASSEMBLIES WILL BE ALLOWED.

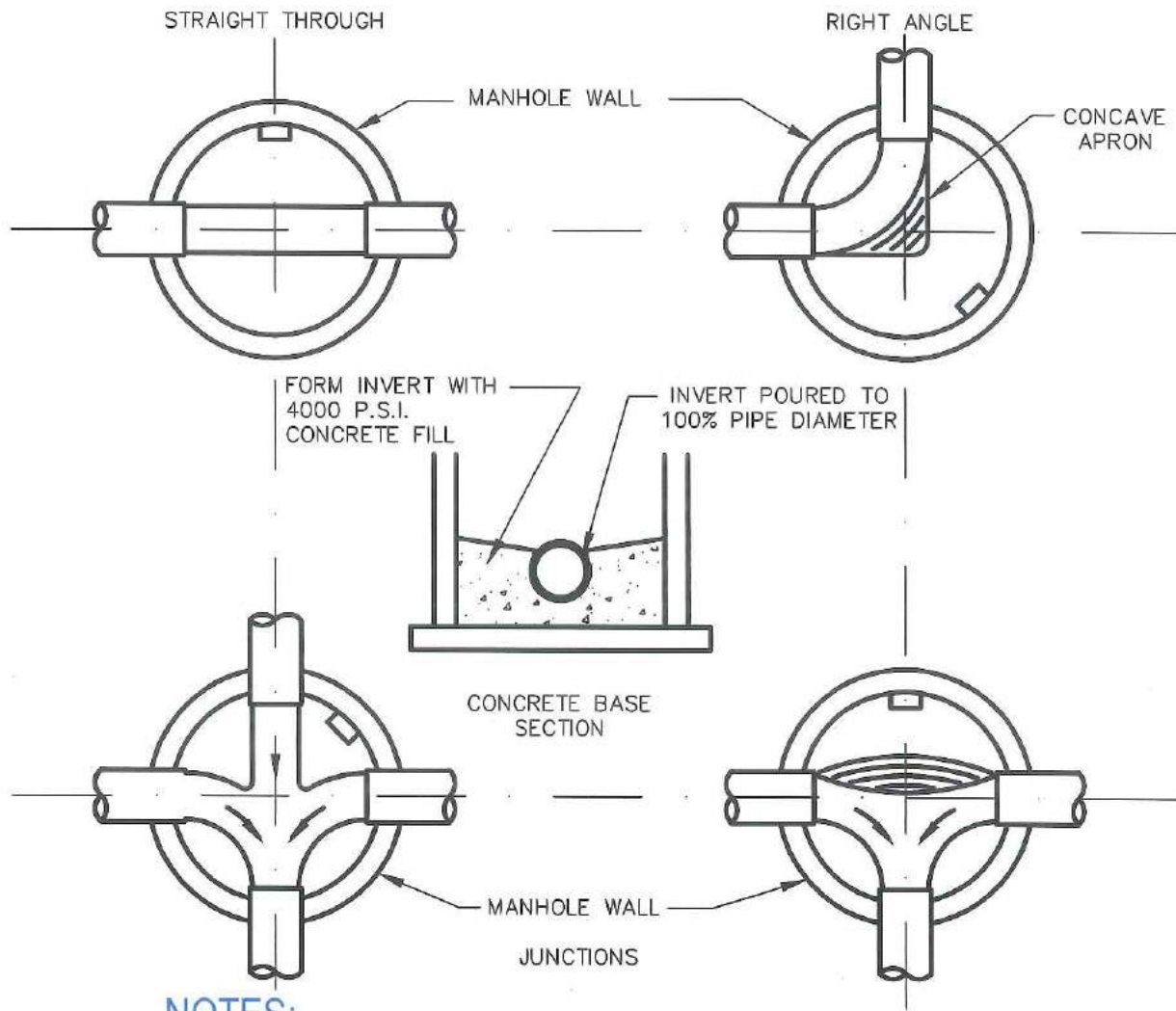
SA-06
 TYPICAL INSIDE DROP
 PIPE DETAIL
 TOWN OF LEWISTON, N.Y.





SA-07
 SANITARY SEWER AND MANHOLE
 ABANDONMENT DETAIL
 TOWN OF LEWISTON, N.Y.



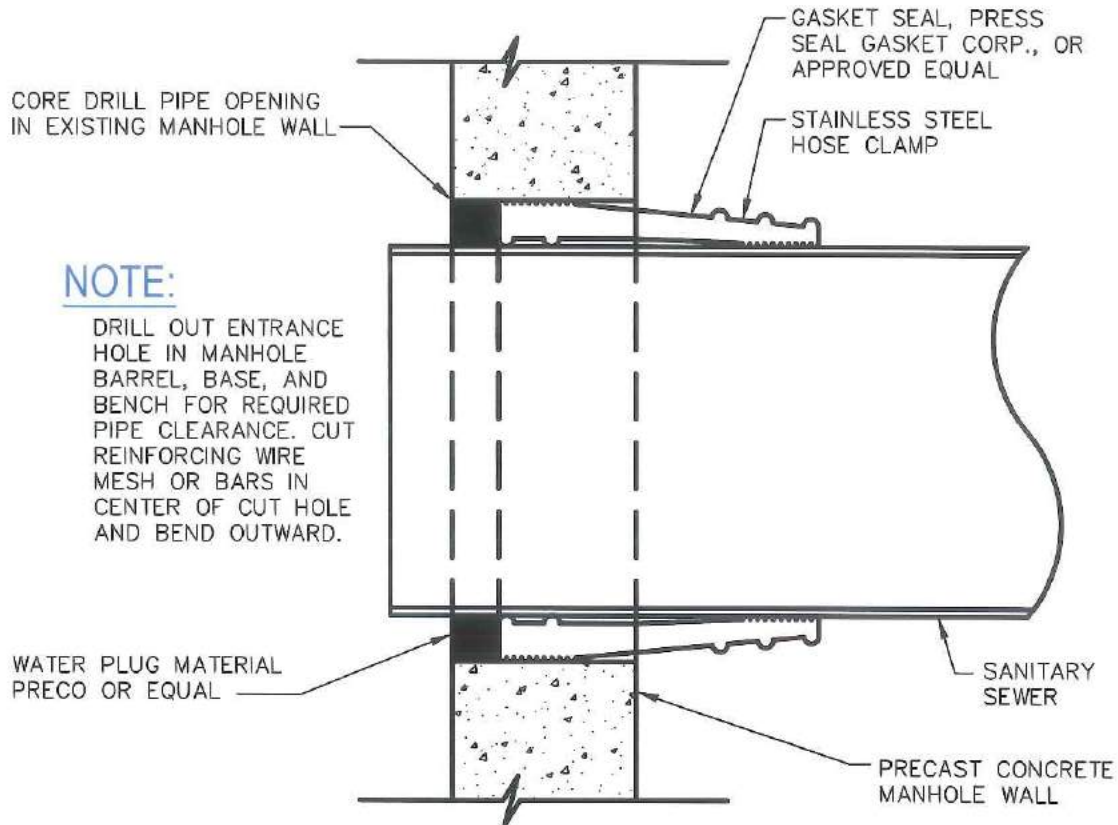


NOTES:

FLOW CHANNELS MUST ALLOW PLACEMENT, REMOVAL AND PASSAGE OF T.V. CAMERAS. THE CAMERA DIMENSIONS ARE APPROXIMATELY 26" LONG x 6-1/2" SQUARE. A BLOCK OF WOOD OF THESE DIMENSIONS MAY BE USED TO SIMULATE THE SIZE OF THE CAMERA. THIS WILL SIMPLIFY THE FORMATION OF FLOW CHANNELS AND INVERTS. DEPTH OF ALL CHANNELS TO BE 100% OF PIPE DIAMETER. FINISH ALL CHANNELS AT PROPER GRADE AS TO ALLOW SMOOTH AND UNOBSTRUCTED FLOW. ALL INVERTS TO BE FLUSH WITH THE INSIDE OF THE PIPE AT EACH END.

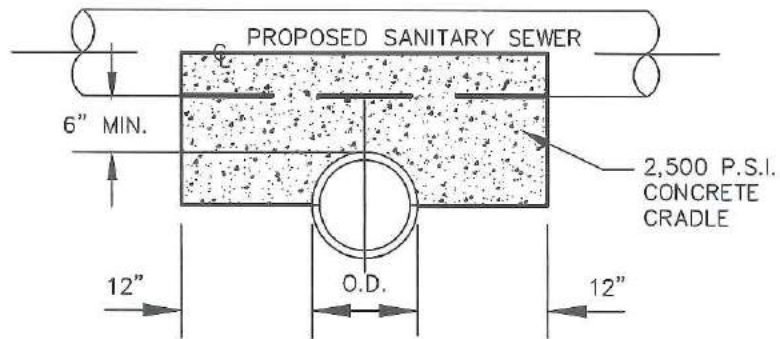
SA-08
 SANITARY SEWER FLOW
 CHANNEL DETAILS
 TOWN OF LEWISTON, N.Y.





SA-09
 MANHOLE CONNECTION
 DETAIL
 TOWN OF LEWISTON, N.Y.





SA-10
CONCRETE CRADLE

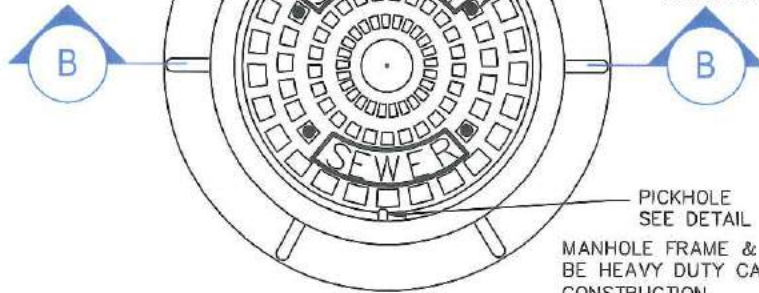
TOWN OF LEWISTON, N.Y.



2" LETTER,
1/4" DEEP
SANITARY
OR STORM

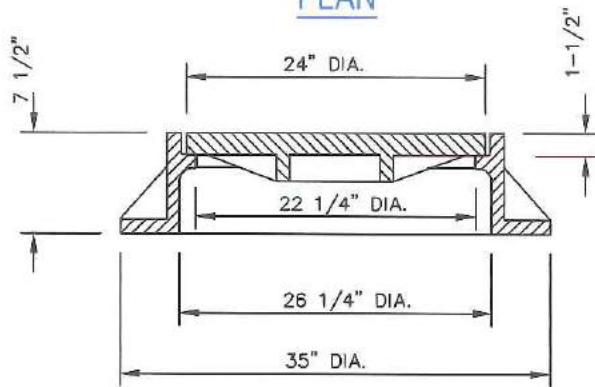
4 - 3/4" HOLES
DRILLED IN
COVER

COVER DESIGN SHOWN MAY NOT
MATCH MANUFACTURERS DESIGN

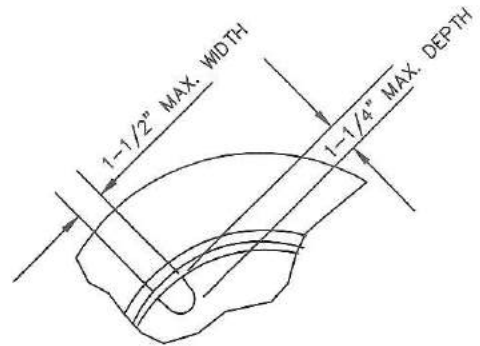


PICKHOLE
SEE DETAIL
MANHOLE FRAME & COVER SHALL
BE HEAVY DUTY CAST IRON
CONSTRUCTION.

PLAN



SECTION (B)



PICKHOLE DETAIL

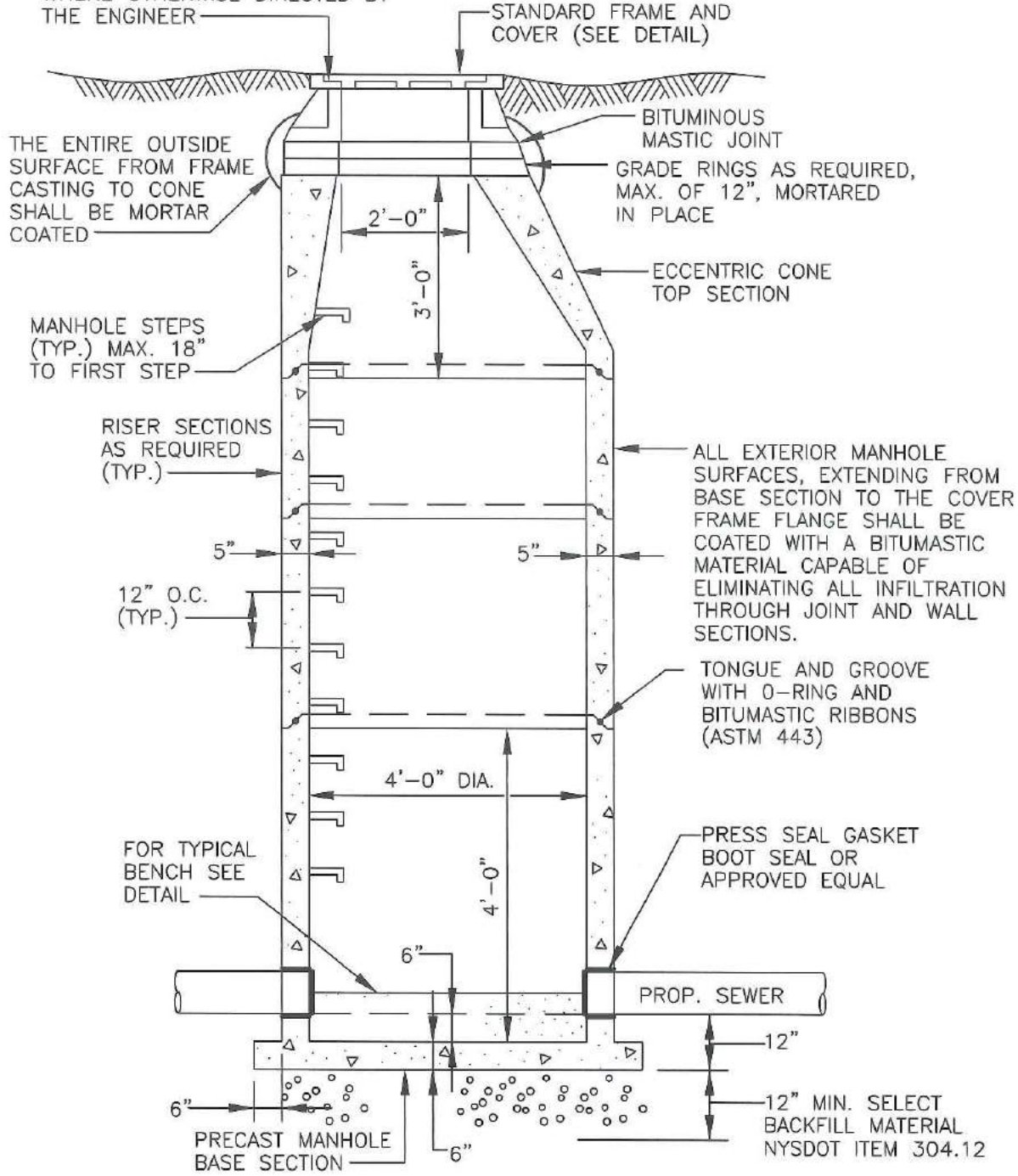
SA-11
FRAME AND COVER DETAIL

TOWN OF LEWISTON, N.Y.



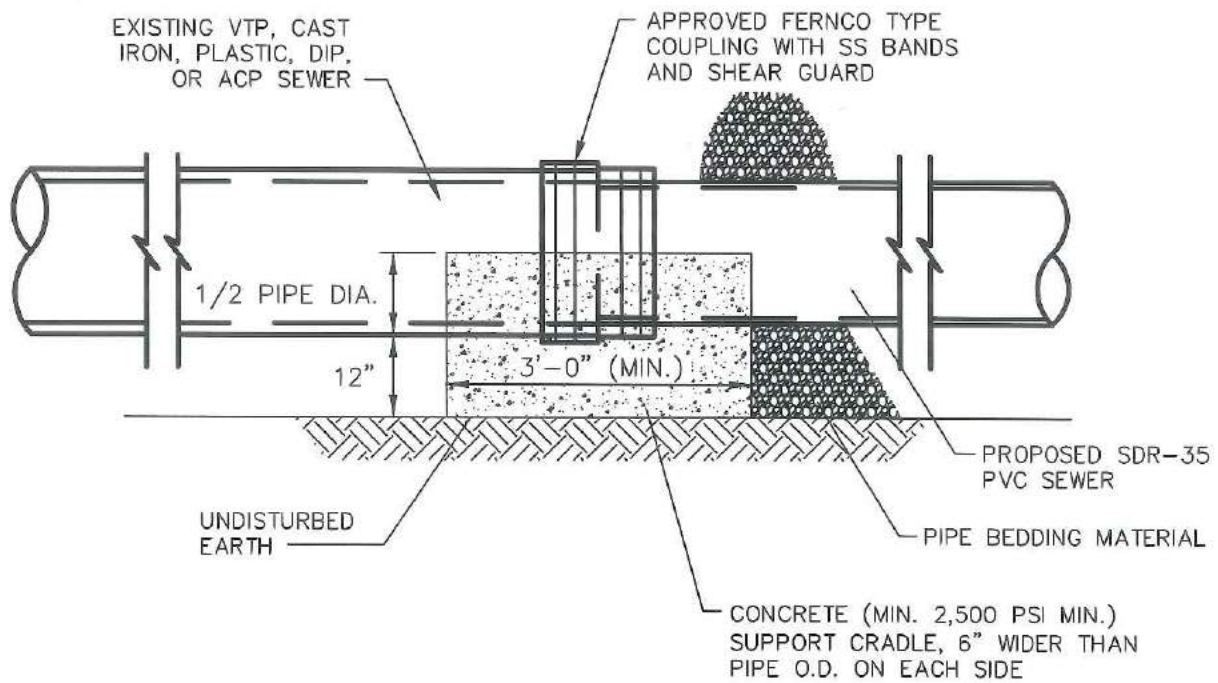
RIM ELEVATION TO BE 3" ABOVE FINISH GRADE IN DEVELOPED AREAS, 12" MIN. ABOVE ADJACENT GROUND IN UNDEVELOPED AREAS EXCEPT WHERE OTHERWISE DIRECTED BY THE ENGINEER

NOTE: CONTRACTOR SHALL INSTALL A 4"Ø PERFORATED PLASTIC DRAIN PIPE AND CAP FOR INFILTRATION TEST WHERE REQUIRED.



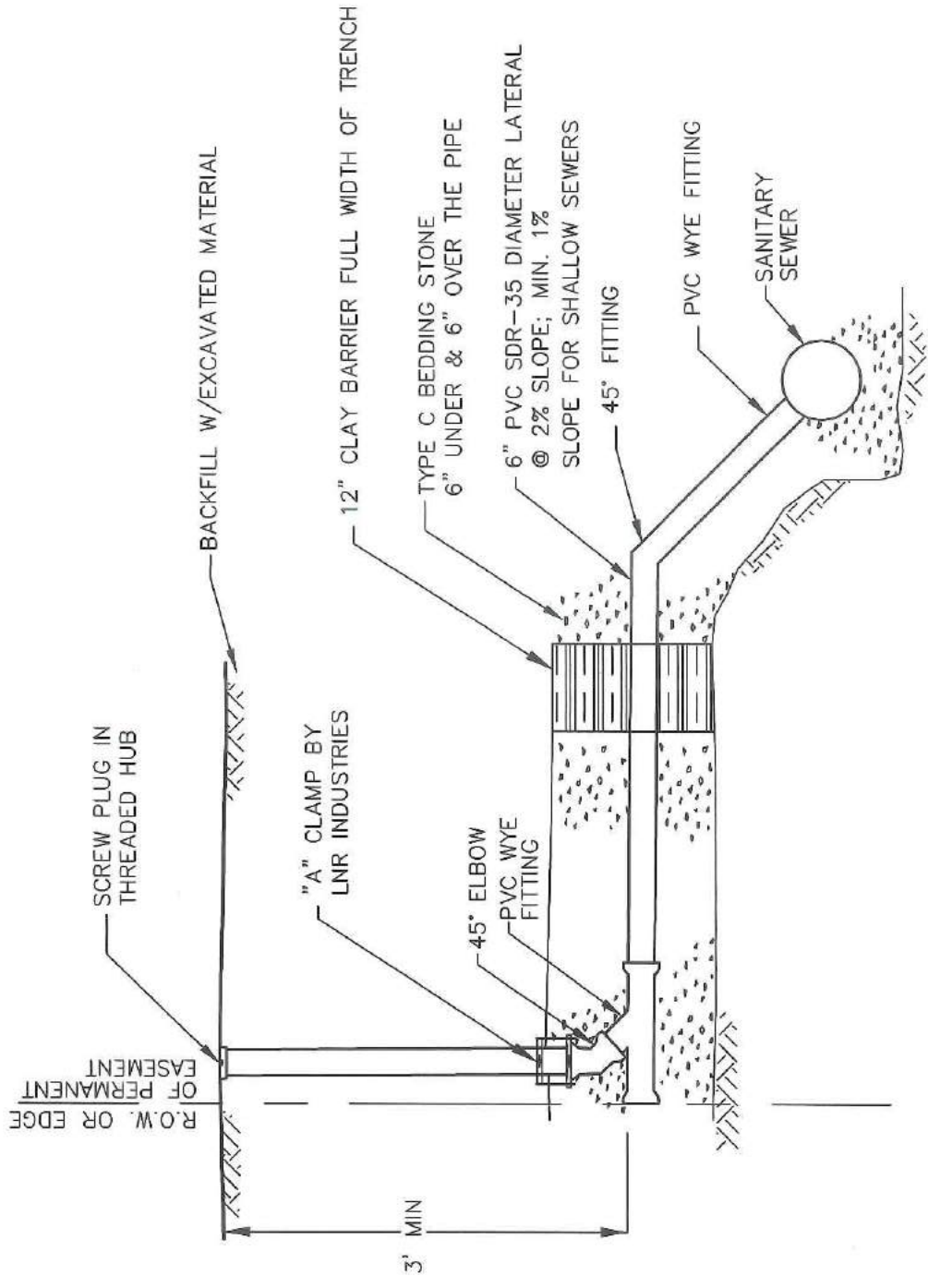
SA-12
TYPICAL PRECAST SANITARY
MANHOLE DETAIL
TOWN OF LEWISTON, N.Y.





SA-13
 SANITARY SEWER
 CONNECTION DETAIL
 TOWN OF LEWISTON, N.Y.

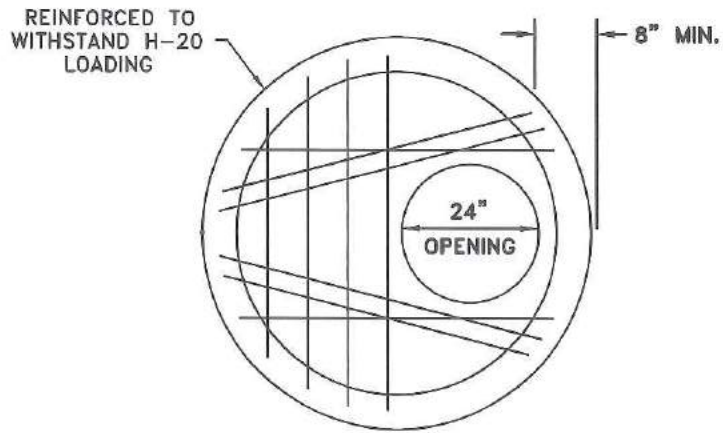




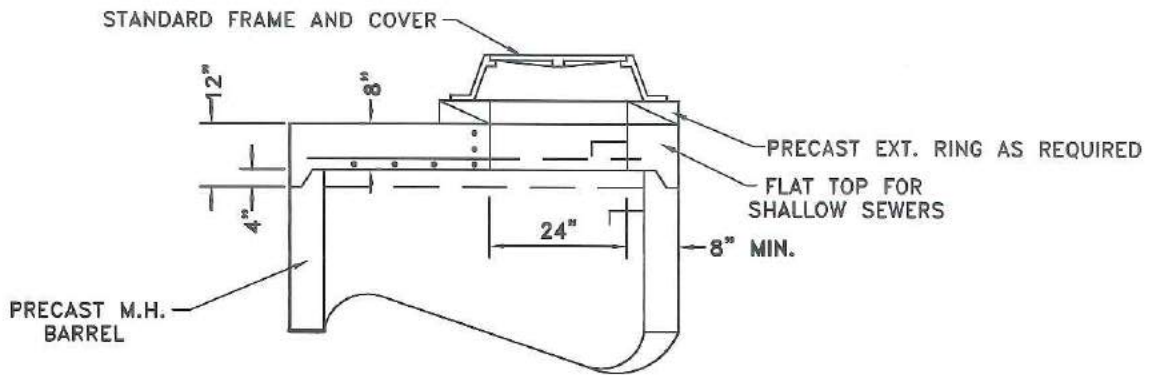
SA-14
 TYPICAL SEWER SERVICE
 CONNECTION DETAIL
 TOWN OF LEWISTON, N.Y.



NOVEMBER 2014



PLAN



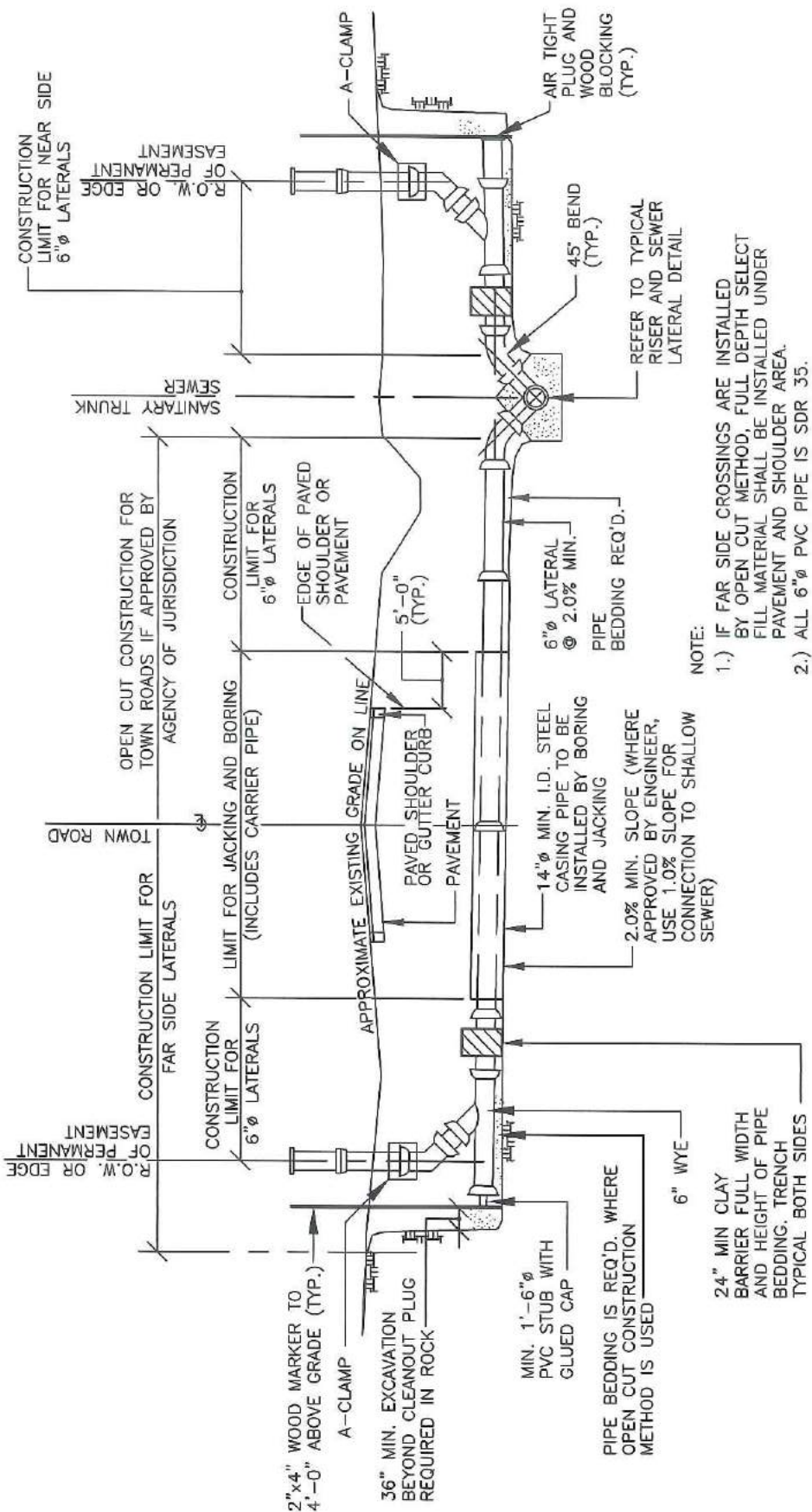
SECTION

NOTE:
 FLAT TOP MANHOLES WILL ONLY BE PERMITTED FOR SHALLOW SEWERS.
 5.5 FEET OR LESS DEPTH RIM TO INVERT.

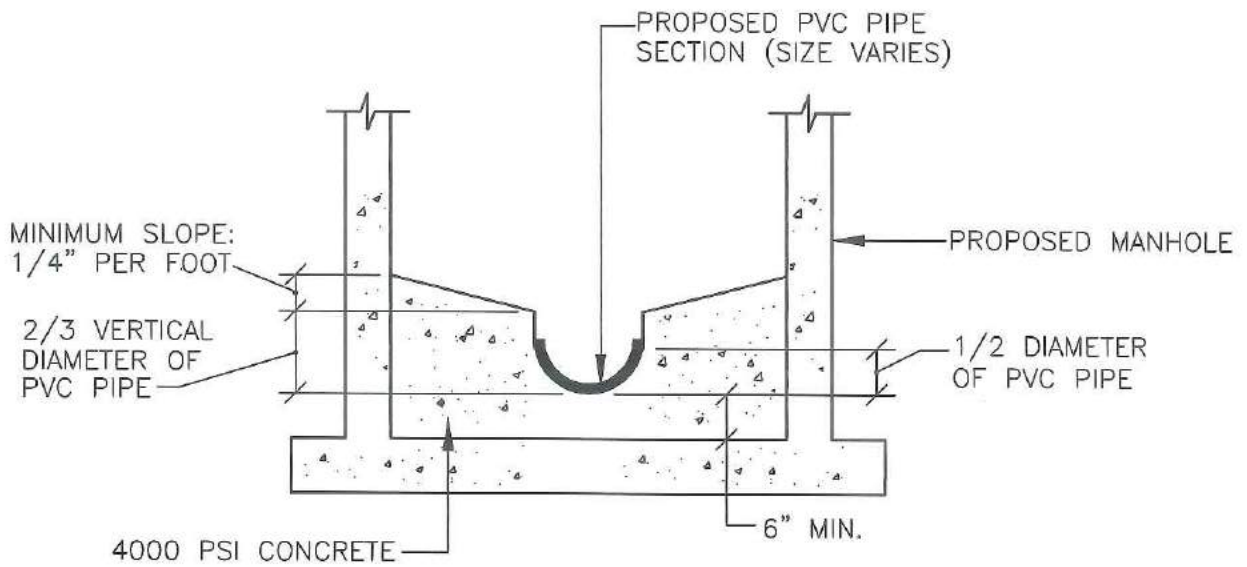
SA-15
 FLAT TOP
 MANHOLE DETAIL
 TOWN OF LEWISTON, N.Y.



SA-16
 TYPICAL CROSSING HOUSE
 LATERAL DETAIL
 TOWN OF LEWISTON, N.Y.

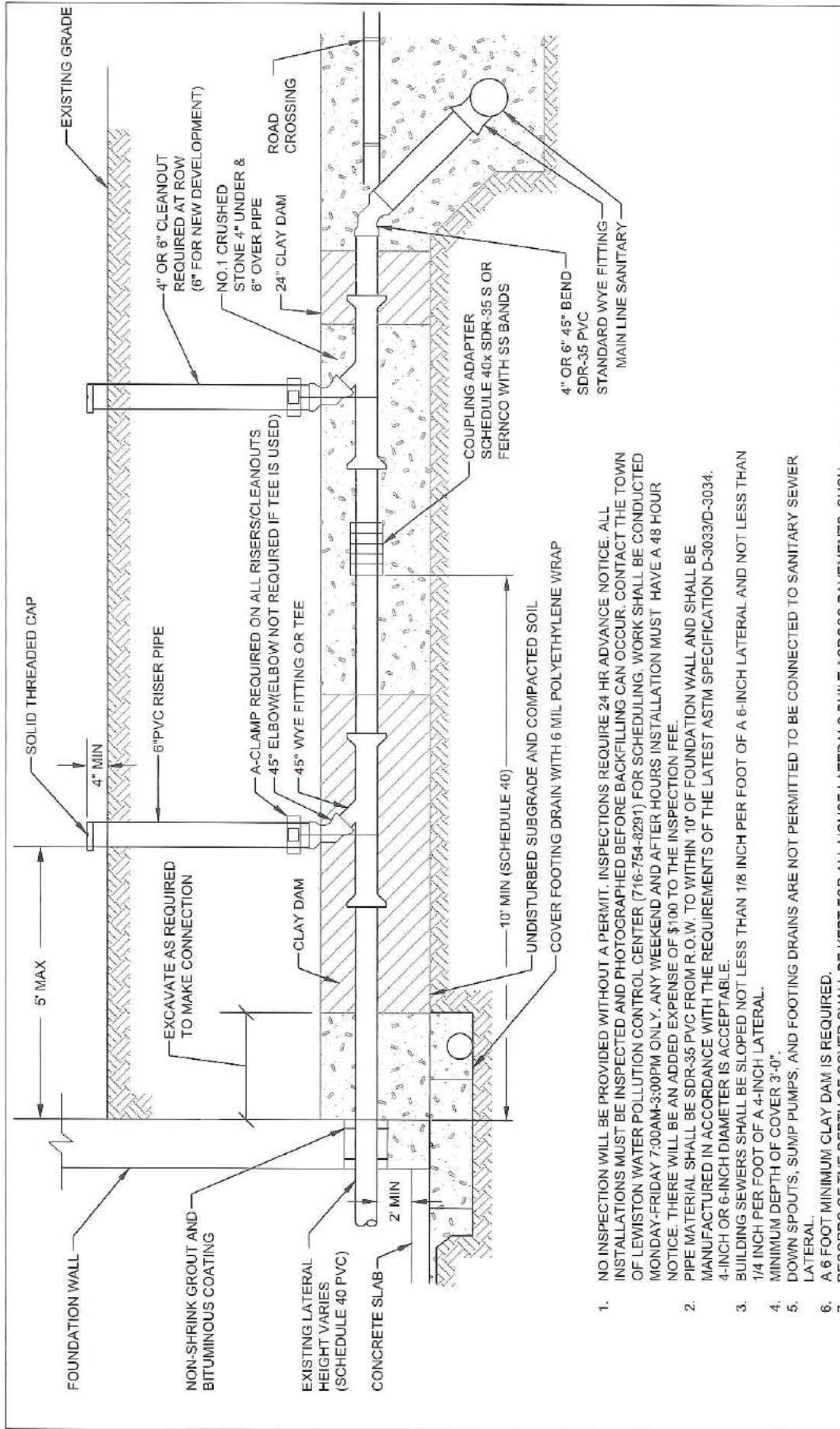


APRIL 2016



SA-17
TYPICAL BENCH DETAIL
TOWN OF LEWISTON, N.Y.





SA-18
NEW SERVICE
CONNECTION DETAIL
TOWN OF LEWISTON, N.Y.

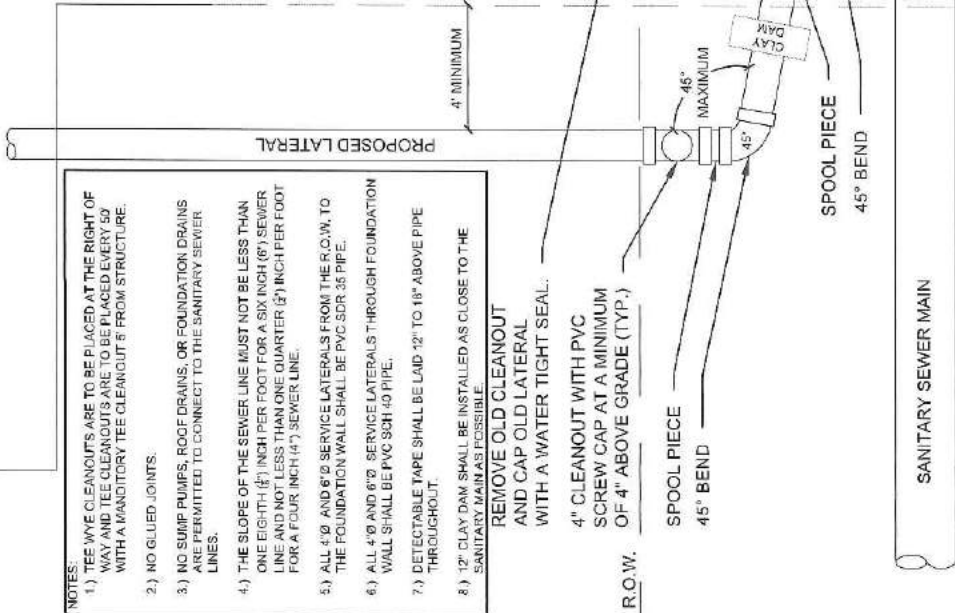
1. NO INSPECTION WILL BE PROVIDED WITHOUT A PERMIT. INSPECTIONS REQUIRE 24 HR ADVANCE NOTICE. ALL INSTALLATIONS MUST BE INSPECTED AND PHOTOGRAPHED BEFORE BACKFILLING CAN OCCUR. CONTACT THE TOWN OF LEWISTON WATER POLLUTION CONTROL CENTER (716-754-8291) FOR SCHEDULING. WORK SHALL BE CONDUCTED MONDAY-FRIDAY 7:00AM-3:00PM ONLY. ANY WEEKEND AND AFTER HOURS INSTALLATION MUST HAVE A 48 HOUR NOTICE. THERE WILL BE AN ADDED EXPENSE OF \$100 TO THE INSPECTION FEE.
2. PIPE MATERIAL SHALL BE SDR-35 PVC FROM R.O.W. TO WITHIN 10' OF FOUNDATION WALL AND SHALL BE MANUFACTURED IN ACCORDANCE WITH THE REQUIREMENTS OF THE LATEST ASTM SPECIFICATION D-3033/D-3034. 4-INCH OR 6-INCH DIAMETER IS ACCEPTABLE.
3. BUILDING SEWERS SHALL BE SLOPED NOT LESS THAN 1/8 INCH PER FOOT OF A 6-INCH LATERAL AND NOT LESS THAN 1/4 INCH PER FOOT OF A 4-INCH LATERAL.
4. MINIMUM DEPTH OF COVER 3'-0".
5. DOWN SPOUTS, SUMP PUMPS, AND FOOTING DRAINS ARE NOT PERMITTED TO BE CONNECTED TO SANITARY SEWER LATERAL.
6. A 6 FOOT MINIMUM CLAY DAM IS REQUIRED.
7. RECORDS OF THE DEPTH OF COVER SHALL BE KEPT FOR ALL HOUSE LATERALS BUILT ACROSS PAVEMENTS. SUCH RECORDS SHALL IDENTIFY THE LATERALS BY THE USE OF HOUSE NUMBER AND SHALL SHOW LOCATION OF THE HOUSE LATERAL WITH A MINIMUM OF THREE (3) TIES.
8. IF ALL THE ABOVE SPECIFICATIONS AND DETAILS ARE NOT MET THE CONTRACTOR WILL BE REQUIRED TO RE-EXCAVATE FOR INSPECTION.
9. A 6 FOOT MINIMUM CLAY DAM IS REQUIRED. MAX 50' BETWEEN CLEANOUTS ON 4" LATERALS AND 100' BETWEEN CLEANOUTS ON 6" LATERALS. ANY CHANGES IN DIRECTION GREATER THAN 45° SHALL BE PROVIDED WITH CLEANOUTS ACCESSIBLE FOR CLEANING.
10. CLAY DAM INCLUDES GRADATION BY MEANS OF MECHANICAL COMPACTION. THE SELECTION OF EQUIPMENT IS THE CONTRACTORS RESPONSIBILITY, BUT IS SUBJECT TO THE APPROVAL OF THE ENGINEER.
11. IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE THE CLAY MATERIAL MEETS UNIFIED SOILS CLASSIFICATION.
12. 4" DETECTABLE WARNING TAPE SHALL BE INSTALLED APPROXIMATELY 24" BELOW FINISH GRADE.



APRIL 2016 (REV 1 - MARCH 2017)

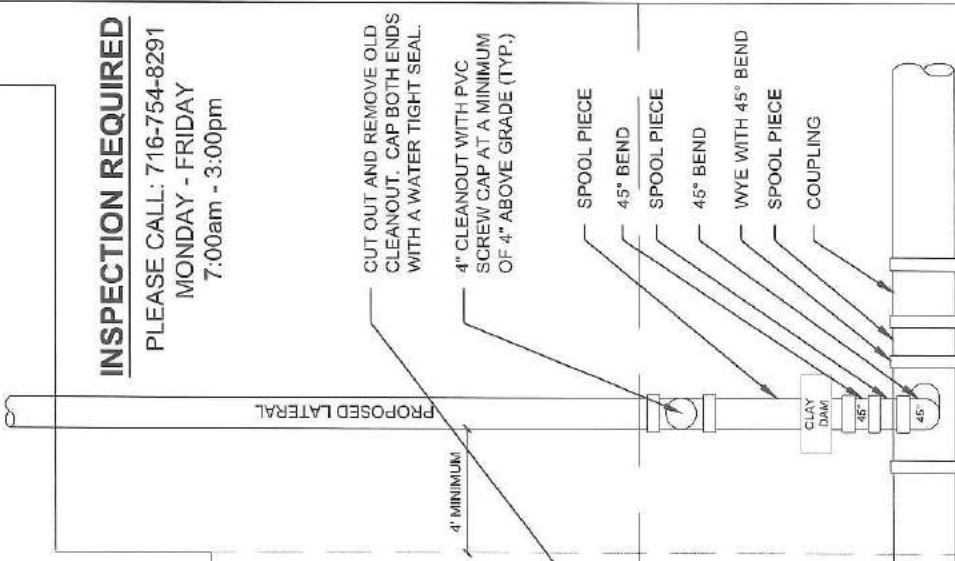
OPTION "A"

- NOTES:**
- 1.) TEE WYE CLEANOUTS ARE TO BE PLACED AT THE RIGHT OF WAY AND TEE CLEANOUTS ARE TO BE PLACED EVERY 50' WITH A MANDATORY TEE CLEANOUT 6' FROM STRUCTURE.
 - 2.) NO GLUED JOINTS.
 - 3.) NO SUMP PUMPS, ROOF DRAINS, OR FOUNDATION DRAINS ARE PERMITTED TO CONNECT TO THE SANITARY SEWER LINES.
 - 4.) THE SLOPE OF THE SEWER LINE MUST NOT BE LESS THAN ONE EIGHTH (1/8") INCH PER FOOT FOR A SIX INCH (6") SEWER LINE AND NOT LESS THAN ONE QUARTER (1/4") INCH PER FOOT FOR A FOUR INCH (4") SEWER LINE.
 - 5.) ALL 4" AND 6" SERVICE LATERALS FROM THE R.O.W. TO THE FOUNDATION WALL SHALL BE PVC SDR 35 PIPE.
 - 6.) ALL 4" AND 6" SERVICE LATERALS THROUGH FOUNDATION WALL SHALL BE PVC SCH 40 PIPE.
 - 7.) DETECTABLE TAPE SHALL BE LAID 12" TO 18" ABOVE PIPE THROUGHOUT.
 - 8.) 12" CLAY DAM SHALL BE INSTALLED AS CLOSE TO THE SANITARY MAIN AS POSSIBLE.



R.O.W.

OPTION "B"



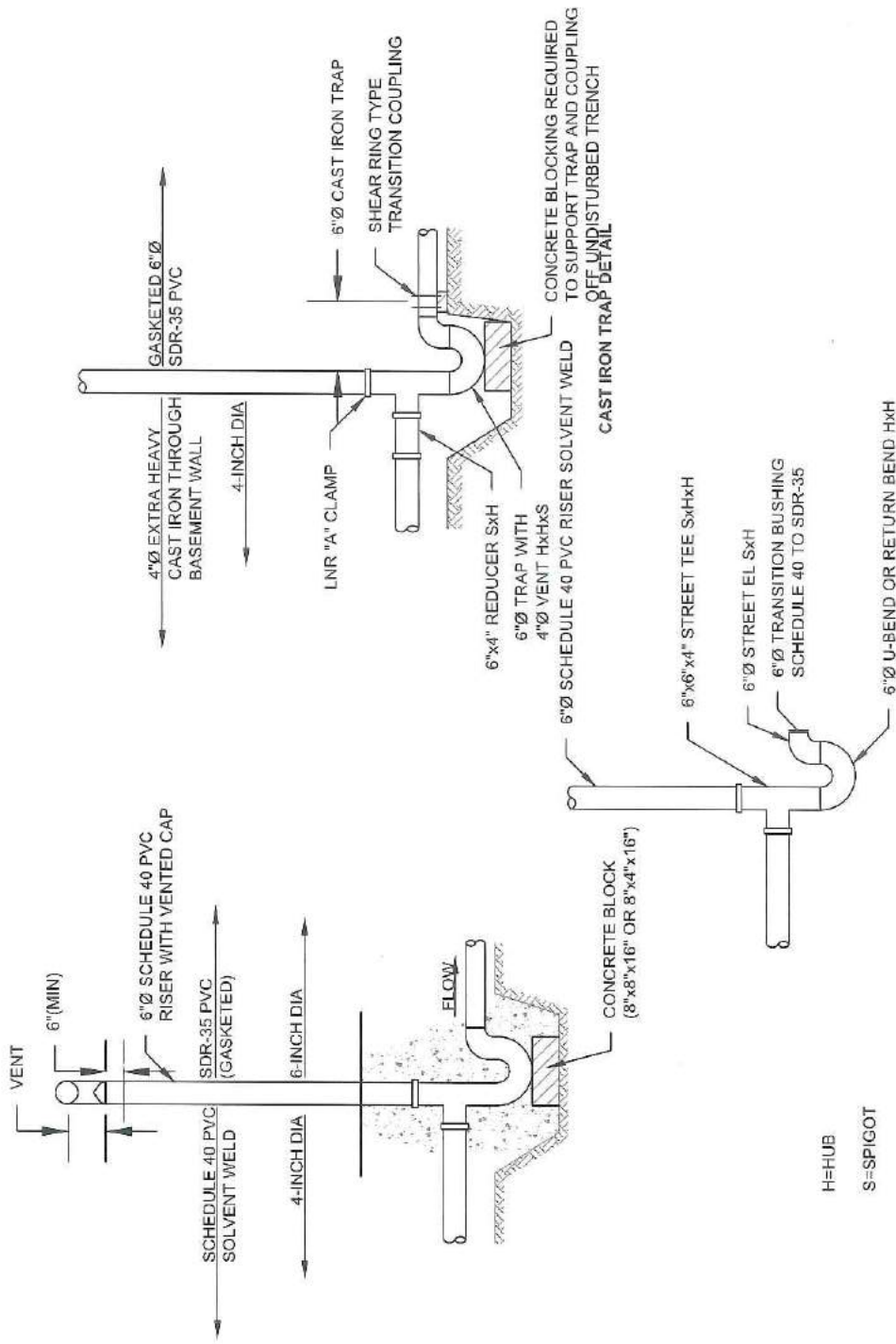
INSPECTION REQUIRED
 PLEASE CALL: 716-754-8291
 MONDAY - FRIDAY
 7:00am - 3:00pm

CUT OUT AND REMOVE OLD CLEANOUT. CAP BOTH ENDS WITH A WATER TIGHT SEAL.

4" CLEANOUT WITH PVC SCREW CAP AT A MINIMUM OF 4" ABOVE GRADE (TYP.)

SA-19
SANITARY SERVICE
RELOCATION DETAIL
TOWN OF LEWISTON, N.Y.

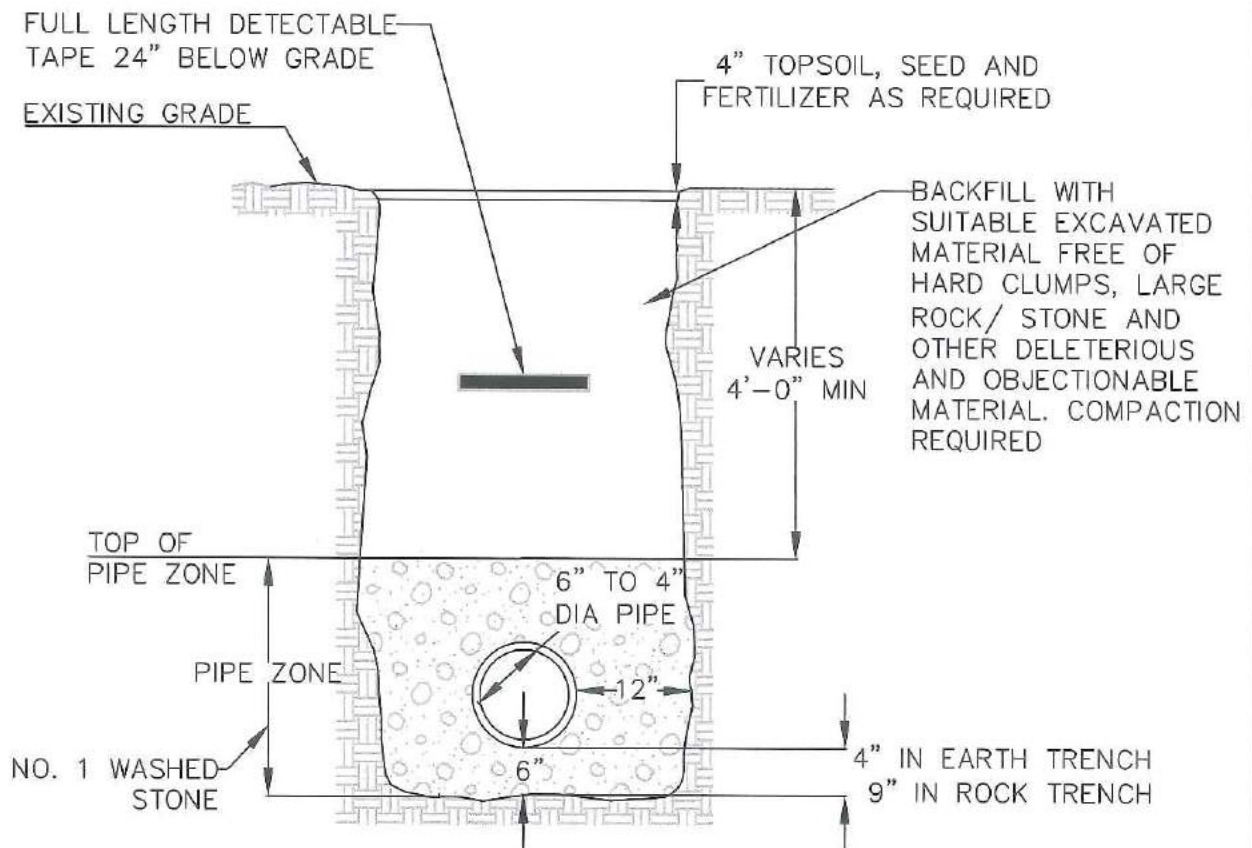




SA-20
PVC/CAST
IRON TRAP
TOWN OF LEWISTON, N.Y.



NOVEMBER 2014

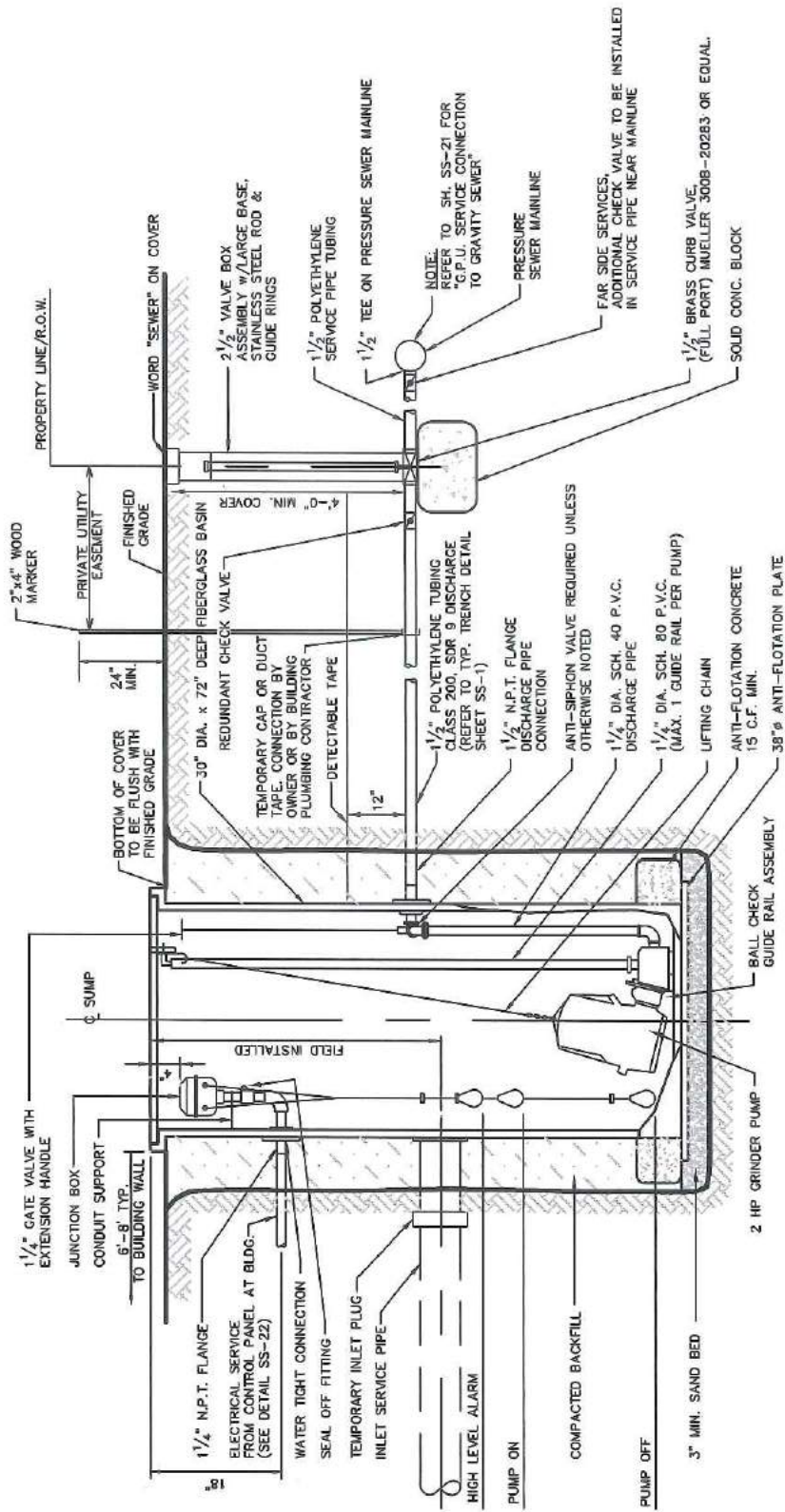


NOTES:

1. SEWER SHALL BE INSTALLED IN LAWN AREAS
2. DO NOT BACKFILL ABOVE SPRING LINE UNTIL BUILDING SEWER HAS BEEN INSPECTED FOR ALIGNMENT, GRADE, AND INSTALLATION.
3. TRENCHING OPERATIONS SHALL INCLUDE ALL NECESSARY DEWATERING.
4. PIPE ZONE MATERIAL SHALL BE NO. 1 WASHED STONE AS PER NYS DOT STANDARD SPECIFICATION AND COMPACTED IN 6" LIFTS TO 95% STANDARD PROCTOR MAXIMUM DENSITY WITH EQUIPMENT ACCEPTABLE TO PIPE MANUFACTURER.
5. BACKFILL SHALL BE A SUITABLE MATERIAL REMOVED FROM EXCAVATION EXCEPT WHERE OTHER MATERIAL IS SPECIFIED. DEBRIS, FROZEN MATERIAL LARGE CLOUDS OR STONE, ORGANIC MATERIAL OR OTHER UNSUITABLE MATERIAL SHALL NOT BE USED FOR BACKFILL.
6. BACKFILL SHALL BE PLACED IN SUCH A MANNER AS NOT TO DISTURB THE ALIGNMENT OF THE PIPE.

SA-21
TYPICAL BUILDING SEWER TRENCH
DETAIL
TOWN OF LEWISTON, N.Y.



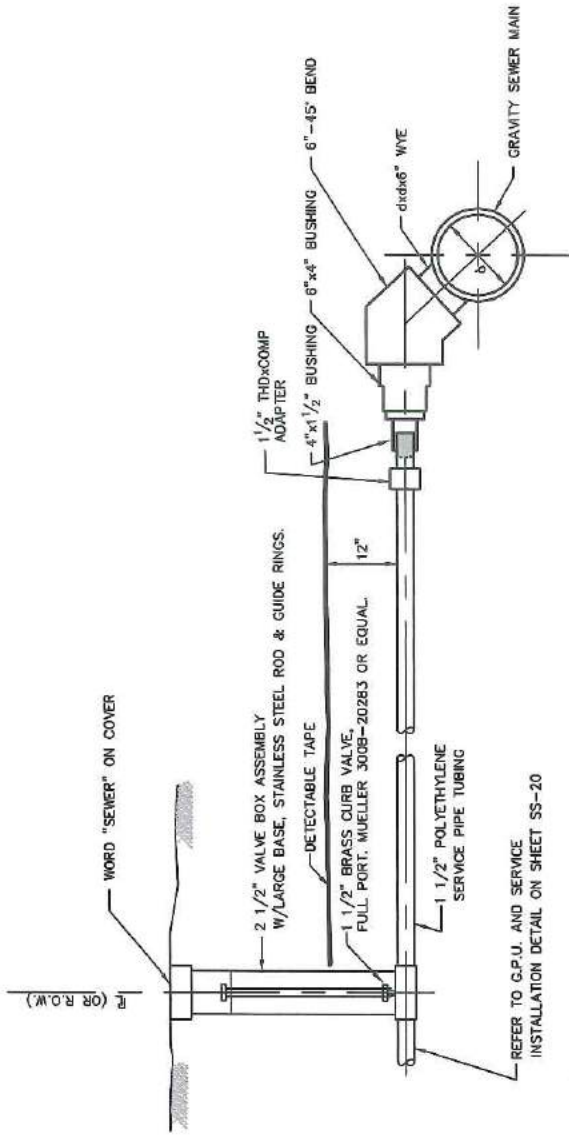


NOTE:
 EXTEND 1 1/2" SERVICE PIPE THROUGH PRIVATE UTILITY EASEMENT.

SA-22
 INDIVIDUAL SIMPLEX GRINDER PUMP UNIT (G.P.U.)
 & SERVICE INSTALLATION DETAIL
 TOWN OF LEWISTON, N.Y.

NOTE:
 1. MYERS PUMP OR EQUIV. WILL BE ACCEPTED.





REFER TO G.P.U. AND SERVICE
INSTALLATION DETAIL ON SHEET SS-20

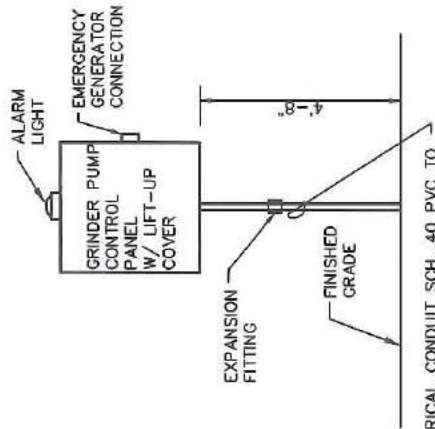
SA-23
G.P.U. SERVICE CONNECTION & SERVICE TO
GRAVITY SEWERLINE DETAIL
TOWN OF LEWISTON, N.Y.

NOTE:
1. MYERS PUMP OR EONE WILL BE ACCEPTED.



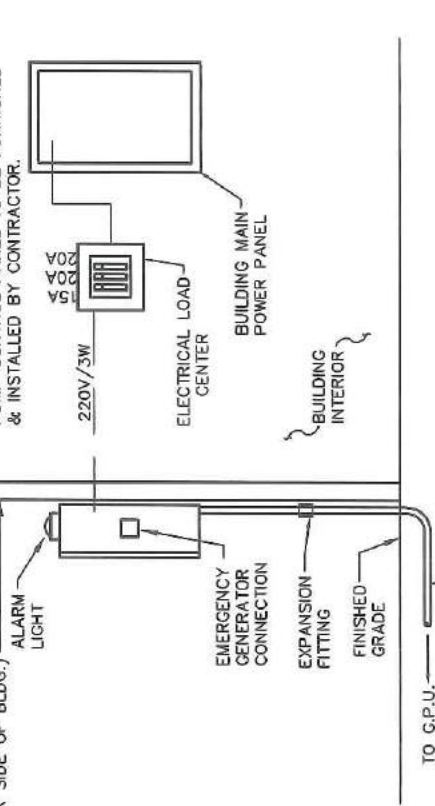
AUGUST 2015

NOTE: ANNUNCIATOR TO BE WIRED IN PARALLEL WITH EMERGENCY LIGHT.



FRONT

BUILDING EXTERIOR WALL—
PANEL & ALARM LIGHT
MUST BE VISIBLE FROM THE ROAD
(NOT ON BACK SIDE OF BLDG.)



SIDE

ALL WIRES BETWEEN THE CONTROL PANEL
AND THE GRINDER PUMP UNIT/FLOATS
TO BE COLOR CODED AS PER THE SPECIFICATIONS.

TO G.P.U.

NOTE:

1. MYERS PUMP OR EOne WILL BE ACCEPTED.



AUGUST 2015

SA-24
SIMPLEX GRINDER PUMP GRAVITY SEWERLINE
CONTROL PANEL INSTALLATION DETAIL
TOWN OF LEWISTON, N.Y.